Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2412005 A1 1998/10/29

(21) 2 412 005

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) Date de dépôt/Filing Date: 1998/04/24
(41) Mise à la disp. pub./Open to Public Insp.: 1998/10/29
(62) Demande originale/Original Application: 2 286 300
(30) Priorité/Priority: 1997/04/24 (9/123782) JP

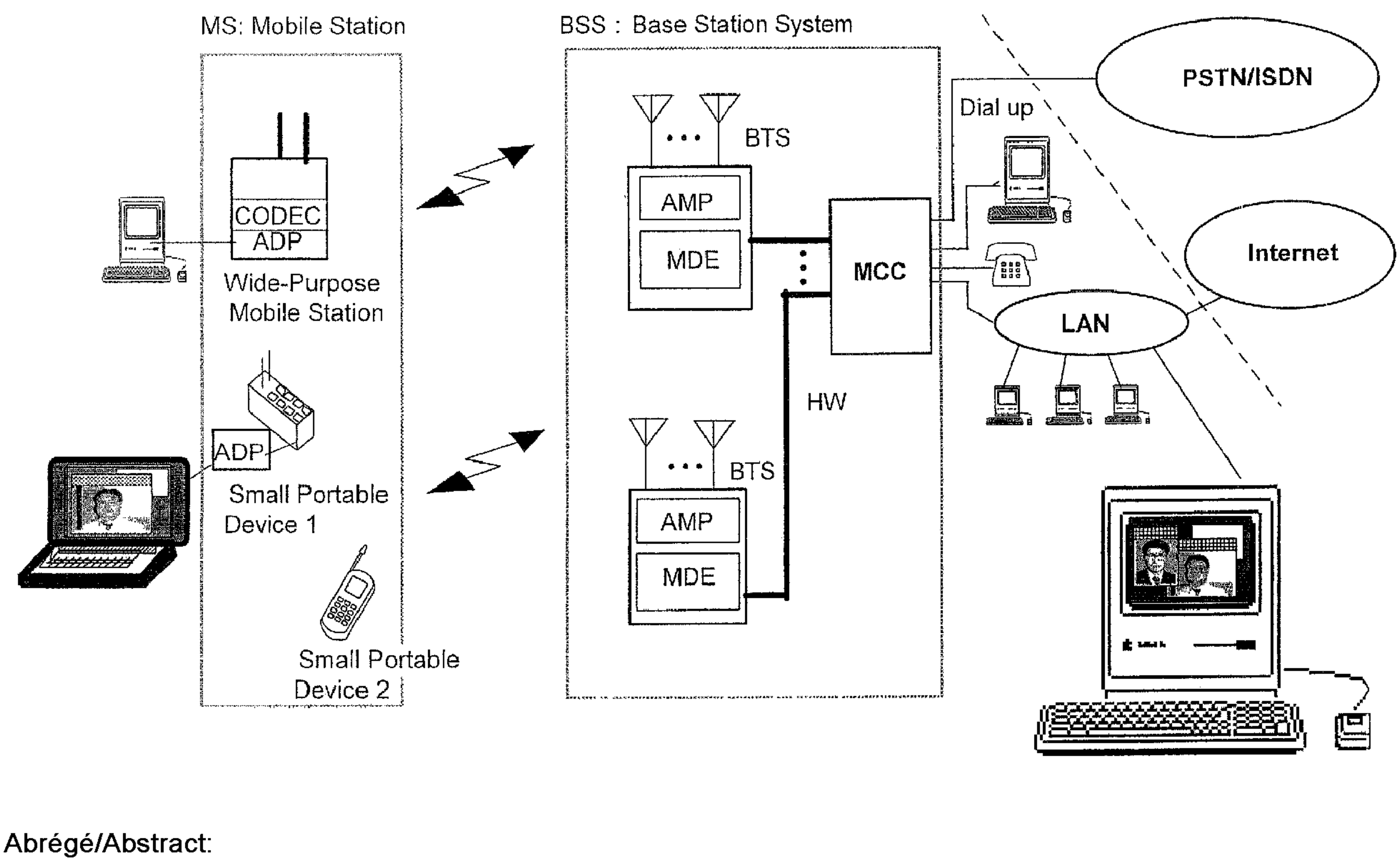
(51) Cl.Int.[7]/Int.Cl.[7] H04Q 7/36, H04Q 3/47, H04Q 7/38, H04B 7/216, H04Q 7/32, H04Q 7/30, H04L 12/28, H04L 9/28

(71) Demandeur/Applicant:
NTT MOBILE COMMUNICATIONS NETWORK INC., JP

(72) Inventeurs/Inventors:
TAMURA, MOTOSHI, JP;
MIKI, MUTSUMARU, JP;
OKAMOTO, AKIKO, JP;
KUSUNOSE, KENYA, JP;
UCHIKOSHI, AKIHIRO, JP;
...

(74) Agent: KIRBY EADES GALE BAKER

(54) Titre : PROCEDE ET SYSTEME DE COMMUNICATION MOBILE
(54) Title: METHOD AND SYTEM FOR MOBILE COMMUNICATIONS



(57) Abrégé/Abstract:
When a network pages the temporary user mobile identifier of a mobile station, the mobile station sends a response to the network. Next, the network checks the authenticity of the user using a ciphering key, corresponding to the temporary user mobile identifier and a random number. If the temporary user mobile identifier is authenticated, a normal incoming call acceptance procedure is executed. If the mobile station is authenticated although the temporary user mobile identifier is wrong, the network reassigns a new temporary user mobile identifier to the mobile station and stops the current communication. In communication, the network and the mobile station mutually notify encipherment-onset time and negotiate about encipherment manner with each other. In addition, diversity handover is commenced upon a call attempt. Furthermore, if a branch replacement is necessary, the current branch is replaced by new branches capable of executing the diversity handover. Additionally, when a new call occurs to or from the mobile station capable of treating a plurality of calls simultaneously, the

(72) **Inventeurs(suite)/Inventors(continued)**: IGARASHI, DAISUKE, JP; YAMAGATA, KATSUHIKO, JP; SATO, TAKAAKI, JP; HAGIWARA, JUNICHIRO, JP; WATANABE, YASUYUKI, JP; HAMAJIMA, TAKUYA, JP; HATA, MASAFUMI, JP; ISHIKAWA, NOBUTAKA, JP; YASUDA, YOSHIYUKI, JP; YUNOKI, KAZUFUMI, JP; UCHIYAMA, NOBUHIDE, JP

(57) **Abrégé(suite)/Abstract(continued)**:
mobile station uses the same branch structure and the same communication frequency band for all of calls. Additionally, when a new call occurs to or from the mobile station capable of treating a plurality of calls simultaneously, a branch structure and a communication frequency band, which can continue all of the calls, are selected and used. Therefore, the mobile communications system is suitable for transmission of various sorts of data in accordance with the development of multimedia.

ABSTRACT

When a network pages the temporary user mobile identifier of a mobile station, the mobile station sends a response to the network. Next, the network checks the authenticity of the user using a ciphering key, corresponding to the temporary user mobile identifier and a random number. If the temporary user mobile identifier is authenticated, a normal incoming call acceptance procedure is executed. If the mobile station is authenticated although the temporary user mobile identifier is wrong, the network reassigns a new temporary user mobile identifier to the mobile station and stops the current communication. In communication, the network and the mobile station mutually notify encipherment-onset time and negotiate about encipherment manner with each other. In addition, diversity handover is commenced upon a call attempt. Furthermore, if a branch replacement is necessary, the current branch is replaced by new branches capable of executing the diversity handover. Additionally, when a new call occurs to or from the mobile station capable of treating a plurality of calls simultaneously, the mobile station uses the same branch structure and the same communication frequency band for all of calls. Additionally, when a new call occurs to or from the mobile station capable of treating a plurality of calls simultaneously, a branch structure and a communication frequency band, which can continue all of the calls, are selected and used. Therefore, the mobile communications system is suitable for transmission of various sorts of data in accordance with the development of multimedia.

DEMANDES OU BREVETS VOLUMINEUX

LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS COMPREND PLUS D'UN TOME.

CECI EST LE TOME 1 DE 2

NOTE: Pour les tomes additionels, veillez contacter le Bureau Canadien des Brevets.

JUMBO APPLICATIONS / PATENTS

THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE THAN ONE VOLUME.

THIS IS VOLUME 1 OF 2

NOTE: For additional volumes please contact the Canadian Patent Office.

DESCRIPTION

METHOD AND SYSTEM FOR MOBILE COMMUNICATIONS

This is a division of copending Canadian Patent Application Serial No. 2,286,300 filed April 24, 1998 from PCT/JP98/01906 filed April 24, 1998.

TECHNICAL FIELD

The present invention generally relates to a method and system for mobile communication and especially relates to a method and system adopted to transmission of various sorts of data in accordance with the development of multimedia.

BACKGROUND ART

Conventionally, portable telephones have been widely spread, and TDMA (time division multiple access) and FDMA (frequency division multiple access) were used for access methods for portable telephones. In these days, CDMA (code division multiple access) is being adopted instead of TDMA and FDMA because of various merits, such as high efficiency at usage of frequency band, facility of change of transmission rate, and preservation from eavesdropping.

However, CDMA according to prior art is prepared mainly for voice transmission and therefore is not suitable for data communication. In recent years, as the development of multimedia, not only voice but also various kinds of data that can be processed in computers and so on should be transmitted. Therefore, communication access between mobile stations and network should be suitable for transmitting various types of data in the near future.

DISCLOSURE OF INVENTION

It is therefore an object of the present invention to provide a method and system for mobile communication suitable for transmitting various types of data in accordance with the development of multimedia.

The present invention provides a method for mobile communication carried out among a plurality of mobile stations and a network, personal identifiers being previously and respectively assigned to the mobile stations, the method comprising the steps of: assigning temporary identifiers respectively to mobile stations which are communicable with the network; storing the personal identifiers and the temporary identifiers of the mobile stations by the network; storing the personal identifier and the temporary identifier of each mobile station by the mobile station; detecting by the network that one of the temporary identifiers stored in itself is different from that stored in the corresponding mobile station; and reassigning by the network another temporary identifier to the mobile station of which the former temporary identifier stored in the network is detected to be different from that stored in the corresponding mobile station.

By virtue of the above invention, it is possible to provide a method and system for CDMA wireless communication suitable for transmitting various types of data in accordance with the development of multimedia.

The present invention provides a base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the controller comprising enciphering means for enciphering transmitted information, which has been received from the switching center and should be transmitted to the mobile station, so as to generate enciphered transmitted information.

In addition, the present invention provides a base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the controller comprising: retransmission-control-information-adding means for adding retransmission control information to enciphered transmitted information which has been previously enciphered by the switching center; and transmitting means for transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

Additionally, the present invention provides a switching center communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations and a base station controller, the switching center comprising enciphering means for enciphering transmitted information, which should be transmitted to the mobile station, so as to generate enciphered transmitted information.

In addition, the present invention provides a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system being characterized in that the base station controller enciphers information, which should be transmitted from the side of the switching center to the side of the mobile station, before distributing the information to the radio base stations.

Additionally, the present invention provides a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system being characterized in that the switching center enciphers information, which should be transmitted from the side of the switching center to the side of the mobile station, before distributing the information to the radio base stations.

In addition, the present invention provides a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system comprising layer-2-enciphering-means for enciphering information that should be processed only in one or more layers which are the same as or higher than layer 2 of the OSI reference model.

Additionally, the present invention provides a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system comprising: layer-3-enciphering-means for enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model; and layer-2-mutual-notifying-means for facilitating notification between layers of different devices corresponding to layer 2 of the OSI reference model about an onset of transmission of enciphered information.

Furthermore, the present invention provides a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system comprising: layer-3-enciphering-means for enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model; retransmission-control-information-adding means, at a layer corresponding to layer 2 of the OSI reference model, for adding retransmission control information to information which has been previously enciphered by the layer-3-enciphering means; and transmitting means for transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

In addition, the present invention provides a method for controlling a base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the system for mobile communication comprising the step of enciphering transmitted information, which has been received from the switching center and should be transmitted to the mobile station, so as to generate enciphered transmitted information.

Furthermore, the present invention provides a method for controlling a base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the method comprising the steps of: adding retransmission control information to enciphered transmitted information which has been previously enciphered by the switching center; and transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

Furthermore, the present invention provides a method for controlling a switching center communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations and a base station controller, the method comprising the step of enciphering transmitted information, which should be transmitted to the mobile station, so as to generate enciphered transmitted information.

Additionally, the present invention provides a method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the step of, at the base station controller, enciphering information, which should be transmitted from the side of the switching center to the side of the mobile station, before transmitting the information to the base station controller.

Furthermore, the present invention provides a method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the step of, at the switching center, enciphering information, which should be transmitted from the side of the switching center to the side of the mobile station, before distributing the information to the radio base stations.

In addition, the present invention provides a method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the step of enciphering information that should be processed only in one or more layers which are the same as or higher than layer 2 of the OSI reference model.

Additionally, the present invention provides a method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the steps of: enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model; and facilitating notification between layers of different devices corresponding to layer 2 of the OSI reference model about an onset of transmission of enciphered information.

The present invention provides a method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the steps of: enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model; adding retransmission control information at a layer corresponding to layer 2 of the OSI reference model to information which has been previously enciphered by the enciphering step; and transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

By virtue of the invention as described above, it is possible for a mobile station to conduct diversity reception although the mobile station cannot simultaneously process enciphered transmission signal and non-enciphered transmission signal.

In addition, the present invention provides a mobile station communicating with a network over the air, comprising decipherment-onset-time-setting-means for setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the network and independently of a time to start enciphering a transmission signal in the mobile station.

Furthermore, the present invention provides a mobile station further comprising deciphering means for deciphering an enciphered reception signal received from the network over the air, the decipherment-onset-time-setting-means including encipherment-onset-request-determining means for determining if a reception encipherment onset request is received from the network or not; and decipherment-instructing means for instructing the deciphering means to start deciphering in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

Additionally, the present invention provides a mobile station communicating with a network over the air, comprising encipherment-onset-time-setting-means for setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

Furthermore, the present invention provides a mobile station further comprising transmission-encipherment-onset-requesting means for transmitting a transmission encipherment onset request to the network over the air; and enciphering means for enciphering the transmission signal so as to generate an enciphered transmission signal, the encipherment-onset-time-setting-means including encipherment-instructing means for instructing the enciphering means to start enciphering in accordance with a time when the transmission encipherment onset request has been transmitted.

In addition, the present invention provides a controller in a network communicating with a mobile station over the air, comprising decipherment-onset-time-setting-means for setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the mobile station and independently of a time to start enciphering a transmission signal in the controller.

Furthermore, the present invention provides a controller in a network further comprising deciphering means for deciphering an enciphered reception signal received from the mobile station over the air, the decipherment-onset-time-setting-means including encipherment-onset-request-determining means for determining if a reception encipherment onset request is received from the network or not; and decipherment-instructing means for instructing the deciphering means to start deciphering in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

The present invention provides a controller in a network communicating with a mobile station over the air, comprising encipherment-onset-time-setting-means for setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

Furthermore, the present invention provides a controller in a network further comprising transmission-encipherment-onset-requesting means for transmitting a transmission encipherment onset request to the mobile station over the air; and enciphering means for enciphering the transmission signal so as to generate an enciphered transmission signal, the encipherment-onset-time-setting-means including encipherment-instructing means for instructing the enciphering means to start enciphering in accordance with a time when the transmission encipherment onset request has been transmitted.

Additionally, the present invention provides a system for mobile communication comprising a mobile station and a network communicating with each other over the air,

the network comprising: encipherment-onset-requesting means for transmitting an encipherment onset request to the mobile station over the air; first-enciphered-transmission-signal-generating means for enciphering a first transmission signal which should be transmitted from the network to the mobile station after the transmission of the encipherment onset request, thereby generating a first enciphered transmission signal; first-enciphered-transmission-signal-transmitting means for transmitting the first enciphered transmission signal to the mobile station; response determining means for determining if an encipher onset response by the mobile station indicating that the encipherment onset request is acceptable is received or not; and first deciphering means for starting to decipher a second enciphered transmission signal from the mobile station on the basis of the determination of the response determining means when the mobile station accepts the encipherment onset request,

the mobile station comprising: request determining means for determining if the encipherment onset request is received or not; encipherment-onset-responding means for transmitting the encipherment onset response on the basis of the determination of the request determining means when the encipherment onset request is accepted; second deciphering means for starting to decipher the first enciphered transmission signal from the network when the encipherment onset request is accepted; second-enciphered-transmission-signal-generating means for enciphering a second transmission signal which should be transmitted from the mobile station to the network after the transmission of the encipherment onset response, thereby generating a second enciphered transmission signal; and second-enciphered-transmission-signal-transmitting means for transmitting the second enciphered transmission signal to the network.

In addition, the present invention provides a method for controlling a mobile station communicating with a network over the air, comprising the step of setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the network and independently of a time to start enciphering a transmission signal in the mobile station.

Furthermore, the present invention provides a method for controlling a mobile station, further comprising the step of deciphering an enciphered reception signal received from the network over the air, the step of setting a time to start deciphering including the steps of determining if a reception encipherment onset request is received from the network or not; and instructing to start the deciphering step in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

Additionally, the present invention provides a method for controlling a mobile station communicating with a network over the air, comprising the step of setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

Furthermore, the present invention provides a method for controlling a mobile station, further comprising the steps of transmitting a transmission encipherment onset request to the network over the air; and enciphering the transmission signal so as to generate an enciphered transmission signal, the step of setting a time to start enciphering including the step of instructing to start the enciphering step in accordance with a time when the transmission encipherment onset request has been transmitted.

In addition, the present invention provides a method for controlling a controller in a network communicating with a mobile station over the air, comprising the step of setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the mobile station and independently of a time to start enciphering a transmission signal in the controller.

Furthermore, the present invention provides a method for controlling a controller in a network further comprising the step of deciphering an enciphered reception signal received from the mobile station over the air, the step of setting a time to start deciphering including the steps of determining if a reception encipherment onset request is received from the network or not; and instructing to start the deciphering step in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

Additionally, the present invention provides a method for controlling a controller in a network communicating with a mobile station over the air, comprising the step of setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

Furthermore, the present invention provides a method for controlling a controller in a network further comprising the steps of transmitting a transmission encipherment onset request to the mobile station over the air; and enciphering the transmission signal so as to generate an enciphered transmission signal, the step of setting a time to start enciphering including the step of instructing to start the enciphering step in accordance with a time when the transmission encipherment onset request has been transmitted.

In addition, the present invention provides a method for controlling a system for mobile communication in which a mobile station and a network communicate with each other over the air, the method comprising the steps of: transmitting an encipherment onset request from the network to the mobile station over the air; enciphering a first transmission signal which should be transmitted from the network to the mobile station after the transmission of the encipherment onset request, thereby generating a first enciphered transmission signal; transmitting the first enciphered transmission signal to the mobile station; determining if an encipher onset response by the mobile station indicating that the encipherment onset request is acceptable is received or not; starting to decipher a second enciphered transmission signal from the mobile station on the basis of the determination of the response determining step when the mobile station accepts the encipherment onset request; determining if the encipherment onset request is received or not; transmitting the encipherment onset response on the basis of the determination of the request determining step when the encipherment onset request is accepted; starting to decipher the first enciphered transmission signal from the network when the encipherment onset request is accepted; enciphering a second transmission signal which should be transmitted from the mobile station to the network after the transmission of the encipherment onset response, thereby generating a second enciphered transmission signal; and transmitting the second enciphered transmission signal to the network.

By virtue of the aspects of the invention as set forth, although the structural elements in the network are not provided with the function to read both of enciphered and non-enciphered signals simultaneously as simplifying the system, the timing of the encipherment onset is aligned in the base station and the network, so that the communication between the mobile station and the network can be facilitated surely and smoothly.

Additionally, the present invention provides a mobile station communicating with a network over the air, comprising encipherment-procedure-notifying-means for notifying the network about encipherment-procedure-specifying-information specifying one or more possible encipherment procedures of the mobile station.

Furthermore, the present invention provides a mobile station, wherein the encipherment-procedure-notifying-means further including enciphering-key-generation-procedure-notifying-means for notifying the network about enciphering-key-generation-procedure-specifying-information specifying one or more possible enciphering key generation procedures of the mobile station.

In addition, the present invention provides a mobile station communicating with a network over the air, comprising encipherment communication means for conducting an encipherment procedure corresponding to an encipherment request given by the network and for communicating with the network.

Furthermore, the present invention provides a mobile station, wherein the encipherment communication means includes enciphering-key-generating-means for generating an enciphering key corresponding to enciphering-key-generation-procedure-specifying-means specifying an enciphering key generation procedure notified by the network; and enciphering means for conducting an encipherment procedure using the enciphering key generated by the enciphering-key-generating-means.

Additionally, the present invention provides a controller in a network communicating with a mobile station over the air, comprising encipherment-procedure-selecting means for selecting an encipherment procedure for communication in accordance with encipherment-procedure-specifying-information, specifying one or more possible encipherment procedures of the mobile station, notified by the mobile station; and encipherment requesting means for notifying the mobile station about an encipherment request requesting the mobile station to conduct an encipherment using the encipherment procedure selected by the encipherment-procedure-selecting means.

Furthermore, the present invention provides a controller in a network further comprising enciphering-key-generation-procedure-selecting-means for selecting an enciphering key generation procedure in accordance with enciphering-key-generation-procedure-specifying-information, specifying one or more possible encipherment procedures of the mobile station, notified by the mobile station; and enciphering-key-notifying means for notifying the base station about the enciphering key generation procedure selected by the enciphering-key-generation-procedure-selecting-means.

By virtue of the aspects of the invention as set forth, it is possible to select the encipherment procedure adapted to the security level instructed by the mobile station or the mobile station user, thereby conducting the encipherment procedure. It is also possible select the encipherment procedure adapted to the multimedia service for transporting voice or moving picture from the mobile station or the network, thereby conducting the encipherment procedure. Furthermore, if it is necessary to enhance the security level for future extension of communication systems and for newly executed services, it will be possible to readily introduce a newly developed encipherment procedure. In addition, if a plurality of networks are provided with the ability for conducting one or more common encipherment procedures, it is possible to conduct one of the encipherment procedures when the mobile station roams across the service areas of the networks although all of the possible encipherment procedures are not commonly shared. Even in this case, it is also possible in each network to conduct one or more original encipherment procedures.

The present invention provides a method for controlling access links between a mobile station and a network, characterized in that a plurality of branches are established between the network and the mobile station upon a call attempt to or from the mobile station located at a position where the mobile station can communicate using diversity handover, the plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate using diversity handover, thereby enabling the mobile station to commence the diversity handover using the plurality of branches.

In addition, the present invention provides a mobile station characterized in that it establishes a plurality of branches between the network and the mobile station upon the reception of a message from the network when no access link is established between the network and the mobile station, the message including a request for establishing the branches, thereby commencing the diversity handover using the plurality of branches.

Additionally, the present invention provides a base station controller characterized in that it establishes a plurality of branches between a network and a mobile station upon a call attempt to or from the mobile station at a location where the mobile station can communicate using diversity handover, the plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate using diversity handover.

In addition, the present invention provides a base station controller characterized in that it transmits a message to both of a base station and a mobile station upon a call attempt to or from the mobile station at a location where the mobile station can communicate by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using a plurality of branches, the message including a request for establishing a plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate by means of intra-cell diversity handover.

Additionally, the present invention provides a base station controller characterized in that it transmits a message to a plurality of base stations upon a call attempt to or from the mobile station at a location where the mobile station can communicate by means of inter-cell diversity handover wherein the mobile station communicates with the plurality of base stations, the message including a request for establishing a plurality of branches between the mobile station and the corresponding base stations.

In addition, the present invention provides a base station characterized in that it establishes a plurality of branches between the base station and the mobile station according to an instruction from a base station controller upon a call attempt to or from the mobile station at a location where the mobile station can communicate by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using the plurality of branches, the plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate by means of intra-cell diversity handover, thereby enabling the mobile station to commence the intra-cell diversity handover.

By virtue of the aspects of the invention as set forth, when there is the mobile station at a location where it can communicate by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using the plurality of branches, a series of procedures for establishing the main branch and for adding the auxiliary branch can be carried out upon the call attempt to or from the mobile station. Therefore, the number of signal flows can be reduced, so that it is possible to transit diversity handover condition efficiently and to decrease the interference to other radio access links.

The present invention provides a method for controlling a branch replacement characterized in that at least a current branch between a network and a mobile station are replaced with a plurality of branches necessary for communication using diversity handover when the branch replacement is necessary for the mobile station and when it is recognized that the mobile station can commence communicating using diversity handover if the branch replacement is carried out, thereby enabling the mobile station to commence diversity handover.

Additionally, the present invention provides a mobile station characterized in that it replaces at least a current branch between a network and the mobile station with a plurality of branches necessary for communication using diversity handover when a branch replacement is necessary for the mobile station and when the mobile station can commence communicating using the diversity handover branches if the branch replacement is carried out, thereby commencing diversity handover.

In addition, the present invention provides a base station controller characterized in that it replaces at least a current branch between a network and a mobile station with a plurality of branches necessary for communication using diversity handover when a branch replacement is necessary for the mobile station and when it is recognized that the mobile station can commence communicating using diversity handover if the branch replacement is carried out, thereby enabling the mobile station to commence diversity handover.

Additionally, the present invention provides a base station controller characterized in that it transmits a message to a base station and a mobile station when a branch replacement is necessary for the mobile station and when it is recognized that, if the branch replacement is carried out, the mobile station can commence communicating by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using a plurality of branches, the message including an instruction to carry out the branch replacement and an instruction to add at least one auxiliary branch for additional use in order to communicate using diversity handover.

In addition, the present invention provides a base station controller characterized in that it transmits an instruction to a plurality of base stations and a message to a mobile station when a branch replacement is necessary for the mobile station and when it is recognized that the mobile station can commence communicating by means of inter-cell diversity handover if the branch replacement is carried out, the instruction instructing the base stations to set branches necessary for the diversity handover, the message including an instruction to carry out the branch replacement and an instruction to add at least one auxiliary branch for additional use in order to communicate using diversity handover.

Additionally, the present invention provides a base station characterized in that it replaces a branch for a mobile station and adds at least one auxiliary branch for the mobile station according to instructions of a message once the base station receives the message from a base station controller, the message including an instruction to carry out branch replacement and an instruction to add at least one auxiliary branch for additional use in order to communicate using diversity handover, thereby commencing the intra-cell diversity handover.

The aspects of the invention as set forth replaces the current branch or branches with the branches adapted to diversity handover upon a trigger for the branch replacement when it is recognized that the diversity handover can be commenced if the branch replacement is conducted. Therefore, the number of signal flows can be reduced, so that it is possible to transit diversity handover condition efficiently and to decrease the interference to other radio access links.

The present invention provides a branch controlling method for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, at least either of branch structures for both of the calls or at least either of communication frequency bands for both of the calls is controlled, so that the branch structures are the same as each other and the communication frequency bands are the same as each other.

In addition, the present invention provides a branch controlling method for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, a branch structure and a communication frequency band being the same as those for the existent call are assigned to the new call.

Additionally, the present invention provides a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the mobile station uses a branch structure being the same as that for the existent call to the new call and a communication frequency band being the same as that for the existent call to the new call in accordance with an instruction from a network.

In addition, the present invention provides a base station controller adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the base station controller controls at least either of branch structures for both of the calls or at least either of communication frequency bands for both of the calls, so that the branch structures are the same as each other and the communication frequency bands are the same as each other.

Additionally, the present invention provides a base station controller adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the base station controller assigns a branch structure and a communication frequency band being the same as that for the existent call to the new call.

By virtue of the aspects of the invention as set forth, it is possible to assigns the same branch structure and the same frequency band for the plurality of calls including the existent and new calls, so as to ease the control for both of the calls.

The present invention provides a branch controlling method adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call and when it is impossible to assign a branch structure or a communication frequency band, being the same as the branch structure or the communication frequency band for the existent call, to the new call, another branch structure or another communication frequency band which can continue both of the existent and new calls is selected, and the selected branch structure or communication frequency band is assigned to both of the existent and new calls.

The present invention provides a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call and when it is impossible to assign a branch structure or a communication frequency band, being the same as the branch structure or the communication frequency band for the existent call, to the new call, the mobile station assigns another branch structure or another communication frequency band, which can continue both of the existent and new calls, to both of the existent and new calls in accordance with an instruction from a network.

The present invention provides a base station controller adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call and when it is impossible to assign a branch structure or a communication frequency band, being the same as the branch structure or the communication frequency band for the existent call, to the new call, the base station controller selects another branch structure or another communication frequency band which can continue both of the existent and new calls, and assigns the selected branch structure or communication frequency band to both of the existent and new calls.

By virtue of the aspects of the invention as set forth, it is possible to assigns the same branch structure and the same frequency band for the plurality of calls including the existent and new calls, so as to ease the control for both of the calls.

The present invention provides a branch controlling method adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls, a branch structure or a communication frequency band which can continue all of the calls is selected, and the selected branch structure or communication frequency band are assigned to all of the calls commonly.

The present invention provides a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls, the mobile station, according to an instruction from a network, alters a branch structure or a communication frequency band for all of the calls to a new branch structure or a new communication frequency band for all of the calls commonly.

The present invention provides a base station controller adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls, the base station controller selects a branch structure or a communication frequency band which can continue all of the calls, and assigns the selected branch structure or communication frequency band to all of the calls commonly.

By virtue of the aspects of the invention as set forth, it is possible to assigns the same branch structure and the same frequency band for the plurality of calls during communicating although handover is carried out, so as to ease the control for all of the calls.

The present invention provides a branch controlling method adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls and when there is not a branch structure which can continue all of the calls in relation to the mobile station or when there is not a communication frequency band which can continue all of the calls in relation to the mobile station, another branch structure or another communication frequency band which can continue a plurality of calls being high in priority among the calls are selected; the other call or calls are released; and the selected branch structure and communication frequency band are assigned to the priority calls.

In addition, the present invention provides a mobile station characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls and when there is not a branch structure which can continue all of the calls in relation to the mobile station or when there is not a communication frequency band which can continue all of the calls in relation to the mobile station, the mobile station, according to an instruction from a network, releases a call or calls being low in priority; and assigns a branch structure and a communication frequency band selected by the network to a plurality of calls being high in priority.

Additionally, the present invention provides a base station controller adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls and when there is not a branch structure which can continue all of the calls in relation to the mobile station or there is not a communication frequency band which can continue all of the calls in relation to the mobile station, the base station controller selects another branch structure and another communication frequency band which can continue a plurality of calls being high in priority among the calls; releases the other call or calls; and assigns the selected branch structure and communication frequency band to the priority calls.

By virtue of the aspects of the invention as set forth, it is possible to continue the calls with a high priority when the trigger for handover occurs although there are not a branch structure and a communication frequency band which can continue all of the calls. In other words, it is possible to continue at least the calls with a high priority although there are not ample wireless communication resources.

In addition, the present invention provides a method for establishing a control channel in a mobile communication system wherein a mobile station treats a plurality of calls using a plurality of sets of wireless communication resources, characterized in that a single control channel is established between the mobile station and a network for transporting control information therebetween in a manner that the control channel is formed by one of the sets of wireless communication resources which are being used for a plurality of calls by the mobile station.

By virtue of the invention, it is possible to reduce the number of hardware elements for transporting control information in comparison with the case that all of the plurality of calls utilize control channels, respectively. In addition, it is possible to exclude complicated control procedures, e.g., management of the transportation order of control information in the plurality of control channels.

Additionally, the present invention provides a method for controlling to replace a control channel, characterized in that while a mobile station treats a plurality of calls using a plurality of sets of wireless communication resources and transmits or receives control information to or from a network via a single control channel formed by one of the sets of the wireless communication resources, and when a first call using the control channel formed by one of the sets of the wireless communication resources should be released and a second call should be continued, the control channel, which is formed by one of the sets of the wireless communication resources and should be released, is replaced with a new control channel formed by another set of the wireless communication resources, thereby continuing to control the second call.

In addition, the present invention provides a base station controller, characterized in that while a mobile station treats a plurality of calls using a plurality of sets of wireless communication resources and transmits or receives control information to or from a network via a control channel formed by one of the sets of the wireless communication resources, and when a first call using the control channel formed by one of the sets of the wireless communication resources should be released and a second call should be continued, the controller replaces the control channel, which is formed by one of the sets of the wireless communication resources and should be released, to a new control channel formed by another set of the wireless communication resources, thereby continuing to control the second call.

By virtue of the aspects of the invention as set forth, while a mobile station transmits or receives control information with respect to a plurality of calls via a common control channel, and when a first call using the control channel formed by one of the sets of the wireless communication resources should be released and a second call should be continued by means of another set of the wireless communication resources, the control channel is replaced. Accordingly, after the replacement, by means of the new control channel, it is possible to continue the transportation of control signal for the second call.

The present invention provides a method for determining a radio zone and an uplink transmission power, characterized in that

each of base stations transmits broadcast information indicating a perch channel transmission power level and an uplink interference level via a corresponding perch channel; and

a mobile station receives the broadcast information from near base stations around the mobile station;

detects respective reception levels of the perch channels for the near base stations;

calculates respective path losses between the mobile station and respective near base stations on the basis of the respective reception levels and the respective perch channel transmission power levels within the broadcast information;

calculates respective necessary uplink transmission power levels between the mobile station and respective near base stations on the basis of the calculated respective path losses, the respective uplink interference levels within the broadcast information, and required signal-to-interference ratios involved in reception by the near base stations;

selects a radio zone in which the necessary uplink transmission power level is minimum among the respective necessary uplink transmission power levels, the base station of the selected radio zone being ready for communication with the mobile station or being able to commence communication with the mobile station after handover; and controls an uplink transmission power in the selected radio zone based on the necessary uplink transmission power level of the selected radio zone.

Additionally, the present invention provides a base station comprising means for transmitting broadcast information indicating a perch channel transmission power level and an uplink interference level via a perch channel.

In addition, the present invention provides a mobile station characterized in that it

receives broadcast information from near base stations around the mobile station via respective perch channels, the broadcast information from each of the near base stations indicating a perch channel transmission power level and an uplink interference level;

detects respective reception levels of the perch channels for the near base stations;

calculates respective path losses between the mobile station and respective near base stations on the basis of the respective reception levels and the respective perch channel transmission power levels within the broadcast information;

calculates respective necessary uplink transmission power levels between the mobile station and respective near base stations on the basis of the calculated respective path losses, the respective uplink interference levels within the broadcast information, and required signal-to-interference ratios involved in reception by the near base stations;

selects a radio zone of which the necessary uplink transmission power level is minimum among the respective necessary uplink transmission power levels, the base station of the selected radio zone being ready for communication with the mobile station or being able to commence communication with the mobile station after handover; and

controls an uplink transmission power in the selected radio zone based on the necessary uplink transmission power level of the selected radio zone.

By virtue of the aspects of the invention as set forth, although perch channel transmission power levels for respective base stations are different from each other or one another, it is possible to optimize the uplink transmission power of the mobile station.

The present invention provides a handover controlling method for additionally establishing a handover branch between a mobile station and a network, characterized in that a procedure for additional establishment of a branch is completed with a state transition to which the mobile station can commence communicating without waiting for a confirmation of synchronization for all branches.

The present invention provides a handover controlling method further characterized in that the procedure for additional branch establishment is completed with confirmation of synchronization for one branch among the branches established for the mobile station.

Additionally, the present invention provides a mobile station characterized in that if the mobile station has received a request from a network to establish a new additional branch between the network and the mobile station, the mobile station establishes the new branch and then starts diversity reception upon reception of a signal through the new branch.

In addition, the present invention provides a base station characterized in that if the base station has received a request from a base station controller to establish a new additional branch between a mobile station and the base station for carrying out intra-cell diversity handover, the base station additionally establishes the new branch and then starts intra-cell diversity reception upon reception of a signal through the new branch.

Additionally, the present invention provides a base station characterized in that if the base station has received a request from a base station controller to establish a new additional branch between a mobile station and the base station for carrying out inter-cell diversity handover, the base station establishes the new branch and then starts sending the received signals to the base station controller that executes inter-cell diversity reception upon reception of a signal through the new branch.

In addition, the present invention provides a base station controller characterized in that when the base station controller establishes a new additional branch between a mobile station and a network, the base station controller provides a request for establishing the new branch and then completes a procedure for additional establishment of the new branch without waiting for a confirmation of synchronization for all branches between the mobile station and the network.

Furthermore, the present invention provides a base station controller further characterized in that it provides the request for establishing the new branch being necessary for inter-cell diversity handover, and then starts inter-cell diversity reception upon reception of signals through the branches being necessary for inter-cell diversity handover.

By virtue of the aspects of the invention as set forth, since the procedure for additional establishment of the new branch is completed when the mobile station can communicate, the additional establishment procedure can be ended in a short time period.

The present invention provides a radio mobile communication system wherein a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that the system comprises code-resource-assigning means for assigning at least a part of an assignable code resource to one of the channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

Furthermore, the present invention provides a radio mobile communication system further comprising channel-assigning means for assigning one of the channels, to which a part of the assignable code resource is assigned, to a mobile station in accordance with a transmission rate necessary for the mobile station.

Additionally, the present invention provides a radio mobile communication system wherein a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that the system comprises a plurality of assignable code resources, each of code resources corresponding to a certain bandwidth and being independent of the other code resources; and reassigning means for reassigning a part of an assignable code resource to one of the channels to which a part of another assignable code resource is already assigned if there is not an unused code resource corresponding to a bandwidth suitable for a necessary transmission rate when assigning an unused assignable code resource to one of the channels in accordance with the necessary transmission rate.

Additionally, the present invention provides a radio mobile communication system further comprising unused-code-resource determining means for determining if there is an unused code resource corresponding to a bandwidth suitable for a necessary transmission rate or not when assigning an unused assignable code resource to one of the channels in accordance with the necessary transmission rate necessary.

Furthermore, the present invention provides a radio mobile communication system according to claim 91, wherein at least one standard code resource corresponding to a predetermined bandwidth is preselected and the system comprises assignment-possibility-determining means for determining at predetermined moments if there is at least one unused standard code resource or not, the reassigning means reassigning a part of an assignable code resource to one of the channels to which a part of another assignable code resource is already assigned until an unused standard code resource is reserved if the determination result by the assignment-possibility-determining means has been negative.

In addition, the present invention provides a radio base station for which a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that it comprises code-resource-assignment-possibility-determining means for determining whether or not it is possible to assign at least a part of an assignable code resource to one of channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

The present invention provides a base station controller further comprising channel-assigning means for assigning a channel, to which a part of assignable code resource is assigned, to a mobile station in accordance with a transmission rate necessary for the mobile station.

Additionally, the present invention provides a method for controlling a radio mobile communication system wherein a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that the method comprises code-resource-assigning step for assigning at least a part of an assignable code resource to one of the channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

In addition, the present invention provides a method for controlling a radio mobile communication system including a plurality of assignable code resources, each of code resources corresponding to a certain bandwidth and being independent of the other code resources, a plurality of channels being capable ofbeing established on a single carrier frequency by code division multiplex access, characterized in that in order to assign an unused assignable code resource to one of the channels in accordance with a necessary transmission rate, the method comprises the steps of determining whether or not there is an unused code resource having a code resource length in accordance with the necessary transmission rate; and reassigning a part of an assignable code resource to one of the channels to which a part of another assignable code resource is already assigned if the determination indicates that there is not an unused code resource having a bandwidth suitable for the necessary transmission rate.

Additionally, the present invention provides a method for controlling radio base station for which a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that it comprises a code-resource-assignment-possibility-determining step for determining whether or not it is possible to assign at least a part of an assignable code resource to one of channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

In addition, the present invention provides a method for controlling a radio base station comprising a channel-assigning step for assigning a channel, to which a part of an assignable code resource is assigned to a mobile station in accordance with a transmission rate necessary for the mobile station.

By virtue of the aspects of the invention as set forth, it is possible to minimize the number of reassignments or rearrangements of code resources for channels, and call generations do not involve the rearrangement of code resource. Therefore, it is possible to reduce connection time delay.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a block diagram showing the entire structure of a mobile communications system in accordance with W-CDMA of one embodiment of the present invention.

Figure 2 is a block diagram showing a part of the system, particularly showing access interfaces in the system.

Figure 3 is a diagram showing the functional network architecture of the system, in which functional entities are arranged in a communication control plane and a radio resource control plane.

Figure 4 is a diagram showing the functional network architecture of the system, in which functional entities are arranged in a communication control plane and a radio resource control plane.

Figure 5 is a diagram showing the functional model of a part of the invented system for describing an origination for initial call.

Figure 6 is a diagram showing the functional model of a part of the invented system for describing an origination for additional call.

Figures 7 and 8 form an information flow diagram showing the origination for initial call.

Figure 9 is an information flow diagram showing the origination for additional call.

Figure 10 is a diagram showing the functional model of a part of the invented system for describing acceptance of initial incoming call.

Figure 11 is a diagram showing the functional model of a part of the invented system for describing acceptance of additional incoming call.

Figures 12 through 14 form an information flow diagram showing the acceptance of initial incoming call.

Figures 15 and 16 form an information flow diagram showing the acceptance of additional incoming call.

Figure 17 is a diagram showing the functional model of a part of the invented system for describing a disconnection instructed by a user.

Figure 18 is an information flow diagram showing the disconnection instructed by a user.

Figure 19 is a diagram showing the functional model of a part of the invented system for describing a disconnection instructed by the network.

Figure 20 is an information flow diagram showing the disconnection instructed by the network.

Figure 21 is a diagram showing the functional model of a part of the invented system for describing an abnormal release caused from a radio link failure detected by a mobile terminal.

Figure 22 is an information flow diagram of the abnormal release caused from the radio link failure detected by the mobile terminal.

Figure 23 is a diagram showing the functional model of a part of the invented system for describing an abnormal release caused from a radio link failure detected by the network.

Figure 24 is an information flow diagram of the abnormal release caused from the radio link failure detected by the network.

Figure 25 is a diagram showing the functional model of a part of the invented system for describing a user disconnect.

Figure 26 is an information flow diagram of the user disconnect.

Figure 27 is a diagram showing the functional model of a part of the invented system for describing an SDCCH setup process.

Figure 28 is an information flow diagram of the SDCCH setup process.

Figure 29 is a diagram showing the functional model of a part of the invented system for describing a bearer setup for the radio resource selection.

Figure 30 is an information flow diagram of the bearer setup, executed in the communication control plane, for the radio resource selection.

Figure 31 is a diagram showing the functional model of a part of the invented system for describing a radio bearer release.

Figure 32 is an information flow diagram of the radio bearer release.

Figure 33 is a diagram showing the functional model of a part of the invented system for describing an SDCCH release.

Figure 34 is an information flow diagram of the SDCCH release.

Figure 35 is a flow chart showing handover processes in general.

Figure 36 is an information flow diagram showing processes 1 and 2 described above.

Figure 37 is an information flow diagram representing a sequence in which information flows are transported for starting non-soft handover execution, the sequence corresponding to process 1 in Figure 35.

Figure 38 is an information flow diagram representing a sequence in which information flows are transported for starting handover branch addition, the sequence corresponding to process 1 in Figure 35.

Figure 39 is an information flow diagram representing a sequence in which information flows are transported for starting handover branch deletion, the sequence corresponding to process 1 in Figure 35.

Figure 40 is a diagram showing the functional model of a part of the invented system for describing an inter-sector handover branch addition in a single cell.

Figure 41 is an information flow diagram of the inter-sector handover branch addition in a single cell, executed in the communication control plane.

Figure 42 is a diagram showing the functional model of a part of the invented system for describing an inter-cell handover branch addition.

Figure 43 is an information flow diagram of the inter-cell handover branch addition, executed in the communication control plane.

Figure 44 is a diagram showing the functional model of a part of the invented system for describing an inter-sector handover branch deletion in a single cell.

Figure 45 is an information flow diagram of the inter-sector handover branch deletion in a single cell, executed in the communication control plane.

Figure 46 is a diagram showing the functional model of a part of the invented system for describing an inter-cell handover branch deletion.

Figure 47 is an information flow diagram of the inter-cell handover branch deletion, executed in the communication control plane.

Figure 48 is a diagram showing the functional model of a part of the invented system for describing an intra-cell branch replacement handover.

Figure 49 is an information flow diagram of the intra-cell branch replacement handover executed in the communication control plane.

Figure 50 is a diagram showing the functional model of a part of the invented system for describing an inter-cell branch replacement handover.

Figure 51 is an information flow diagram of the inter-cell branch replacement handover executed in the communication control plane.

Figure 52 is a diagram showing the functional model of a part of the invented system for describing an ACCH replacement procedure.

Figures 53 and 54 cooperate to form an information flow diagram of the ACCH replacement procedure executed in the communication control plane.

Figure 55 is a diagram showing the functional model of a part of the invented system for describing a code replacement.

Figure 56 is an information flow diagram of the code replacement procedure executed in the communication control plane.

Figure 57 is a diagram showing the functional model of a part of the invented system for describing a transmission power control. Figure 58 is an information flow diagram of the transmission power control executed in the communication control plane.

Figure 59 is a diagram showing the functional model of a part of the invented system for describing a terminal location updating.

Figures 60 and 61 form an information flow diagram of the terminal location updating.

Figure 62 is a diagram showing the functional model of a part of the invented system for describing a user authentication.

Figure 63 is an information flow diagram representing the user authentication procedure in the invented system.

Figure 64 is a diagram showing functional entities in the invented system for describing an encipherment onset time notification.

Figure 65 is an information flow diagram representing the encipherment onset time notification.

Figure 66 is a diagram showing functional entities in the invented system for describing a TMUI assignment.

Figure 67 is an information flow diagram representing the TMUI assignment.

Figure 68 is an information flow diagram representing a user ID retrieval.

Figure 69 is a diagram representing the correlation between physical node configuration and functional entities in the invented system.

Figure 70 is a diagram representing the signaling layer 2 protocol architecture over the radio interface.

Figure 71 is a diagram representing a sample frame structure for the BSC function termination.

Figure 72 is a diagram representing the format of a sequenced data PDU (SD PDU).

Figure 73 is a diagram representing the format of a sequenced-data-with-status-request PDU (SD-with-POLL PDU).

Figure 74 is a diagram representing the format of a POLL PDU.

Figure 75 is a diagram representing the format of a STAT PDU.

Figure 76 is a diagram representing the format of a USTAT PDU.

Figure 77 is a diagram representing the format of a UD PDU and a MD PDU.

Figure 78 is a diagram representing the format of a Begin PDU (BGN PDU).

Figure 79 is a diagram representing the format of a BGAK PDU.

Figure 80 is a diagram representing the format of a BGREJ PDU.

Figure 81 is a diagram representing the format of an END PDU.

Figure 82 is a diagram representing the format of an ENDAK PDU.

Figure 83 is a diagram representing the format of an RS PDU.

Figure 84 is a diagram representing the format of an RSAK PDU.

Figure 85 is a diagram representing the format of an ER PDU.

Figure 86 is a diagram representing the format of an ERAK PDU.

Figure 87 is a diagram representing the frame format of an MDU and the frame format on the broadcasting channel (BCCH).

Figure 88 is a diagram representing the frame format of an MDU and the frame format on the perch channel (PCH).

Figure 89 is a diagram representing the frame format of an MDU and the format of long and short frame on the random access channel (RACH).

Figure 90 is a diagram representing the frame format of an MDU and the format of long frame on the forward access channel (FACH).

Figure 91 is a diagram representing the frame format of an MDU and the format of short frame on the forward access channel (FACH).

Figure 92 is a diagram representing the frame format of an MDU and the frame format on the stand alone dedicated control channel (SDCCH)

Figure 93 is a diagram representing the frame format of an MDU and the frame format on the associated control channel (ACCH).

Figure 94 is a diagram representing the frame format of an MDU and the frame format on the user packet channel (UPCH)

Figure 95 is a conceptual diagram representing an example of the radio interface protocol architecture of layer 3 of the invented system.

Figure 96 represents the basic format of RBC entity message of the invented system.

Figure 97 represents structures of frames of an RBC entity message.

Figure 98 is a diagram representing a common structure of CC (call/connection control) entity protocol messages.

Figure 99 is a diagram representing a protocol discriminator of the CC entity protocol messages.

Figure 100 is a diagram representing a call reference of the CC entity protocol messages.

Figure 101 is a diagram representing a dummy call reference of the CC entity protocol messages.

Figure 102 is a diagram representing the format of a message type identifier of each CC entity message.

Figures 103 and 104 are diagrams respectively representing the formats of variable length information elements according to FPLMTS.

Figure 105 is a diagram representing the coding format of a broadband locking shift information element.

Figure 106 is a diagram representing the coding format of a broadband non-locking shift information element.

Figures 107 through 111 form a diagram representing the coding format of an AAL parameter information element.

Figure 112 is a diagram representing the format of an ATM traffic descriptor information element.

Figure 113 is a diagram representing the format of a broadband bearer capability information element.

Figure 114 is a diagram representing the format of a broadband high layer information element.

Figures 115 and 116 form a diagram representing the format of a broadband low layer information element.

Figure 117 is a diagram representing the format of a called party number information element.

Figure 118 is a diagram representing the format of a called party sub-address information element.

Figure 119 is a diagram representing the format of a calling party number information element.

Figure 120 is a diagram representing the format of a calling party sub-address information element.

Figure 121 is a diagram representing the format of a connection identifier information element.

Figure 122 is a diagram representing the format of an end-to-end transit delay information element.

Figure 123 is a diagram representing the format of a QOS (quality of service) parameter information element.

Figure 124 is a diagram representing the format of a broadband repeat indicator information element.

Figure 125 is a diagram representing the format of a broadband sending complete information element.

Figure 126 is a diagram representing the format of a transit network selection information element.

Figure 127 is a diagram representing the format of a notification indicator information element.

Figure 128 is a diagram representing the format of an OAM traffic descriptor information element.

Figure 129 is a diagram representing the format of a narrow-band bearer capability information element.

Figure 130 is a diagram representing the format of a narrow-band high layer compatibility information element.

Figure 131 is a diagram representing the format of a narrow-band low layer compatibility information element.

Figure 132 is a diagram representing the format of a progress indicator information element.

Figure 133 is a diagram representing the format of a TMUI information element.

Figure 134 is a diagram representing the format of a TMUI assignment source ID.

Figure 135 is a diagram representing the format of an IMUI.

Figure 136 is a diagram representing the format of an execution authentication type.

Figure 137 is a diagram representing the format of an authentication random pattern.

Figure 138 is a diagram representing the format of an authentication ciphering pattern.

Figure 139 is a diagram representing the format of an execution ciphering type.

Figure 140 is a diagram representing the format of a TC information.

Figure 141 is a diagram representing the format of a message type identifier of the RBC entity message.

Figure 142 is a diagram representing the format of an information element identifier.

Figure 143 is a diagram representing the format of a radio bearer setup message specific parameter.

Figure 144 is a diagram representing the format of a radio bearer release message specific parameter.

Figure 145 is a diagram representing the format of a radio bearer release complete message specific parameter.

Figure 146 is a diagram representing the format of a handover command message specific parameter.

Figure 147 is a diagram representing the format of a handover response message specific parameter.

Figures 148 to 151 form a diagram representing the format of a radio bearer setup information.

Figures 152 through 154 form a diagram representing the format of a DHO (diversity handover) branch addition information element.

Figure 155 is a diagram representing the format of a DHO (diversity handover) branch deletion information element.

Figure 156 is a diagram representing the format of an ACCH replacement information element.

Figures 157 through 159 form a diagram representing the format of a branch replacement information element.

Figures 160 through 163 form a diagram representing the format of a user rate replacement information element.

Figures 164 and 165 form a diagram representing the format of a code replacement information element.

Figure 166 is a diagram representing the format of a message type identifier in RRC entity messages.

Figure 167 is a diagram representing the format of a facility information element.

Figure 168 and 169 form a diagram representing the format of an ROSE PDU.

Figure 170 is a diagram representing the common format of parameters of number of visited candidate sectors, number of in-use visited sectors, number of candidate sectors to be added at DHO, number of sectors to be deleted at DHO, and candidate sectors for HHO.

Figure 171 is a diagram representing the format of a BTS number parameter.

Figure 172 is a diagram representing the format of a sector number parameter.

Figure 173 is a diagram representing the format of a perch channel reception SIR parameter.

Figure 174 is a diagram representing the format of a perch channel transmission power parameter.

Figure 175 is a diagram representing the format of a long code phase difference parameter.

Figure 176 is a diagram representing the format of a parameter of the number of RBC IDs.

Figure 177 is a diagram representing the format of a parameter of the RBC

ID.

Figure 178 is a diagram representing the format of a parameter of the necessary SIR.

Figure 179 is a diagram representing the format of a parameter of FER measurement.

Figure 180 is a diagram representing the format of a TAC entity message.

Figure 181 is a diagram representing the format of a protocol discriminator.

Figure 182 is a diagram representing the format of a message type identifier.

Figure 183 is a diagram representing the format of a terminal association setup message specific parameter.

Figure 184 is a diagram representing the format of a paging response message specific parameter.

Figure 185 is a diagram representing the format of a terminal association release message specific parameter.

Figure 186 is a diagram representing the format of a cause information element.

Figure 187 is a diagram representing the format of a mobile station type information element.

Figure 188 is a diagram representing the format of a paged MS ID information element.

Figure 189 is a diagram representing the format of a paging ID information element.

Figure 190 is a diagram representing the format of a TMUI information element.

Figure 191 is a diagram representing the format of an extensional information element for TAC entity messages.

Figure 192 is a diagram representing the format of a message type information element.

Figure 193 is a diagram representing the format of a length information element.

Figure 194 is a diagram representing the format of a perch channel reception SIR information element.

Figure 195 is a diagram representing the format of a short code number information element.

Figure 196 is a diagram representing the format of a frame offset group information element.

Figure 197 is a diagram representing the format of a slot offset group information element.

Figure 198 is a diagram representing the format of a network number group information element.

Figure 199 is a diagram representing the format of a network version information element.

Figure 200 is a diagram representing the format of a mobile station common parameter version information element.

Figure 201 is a diagram representing the format of a BTS number information element.

Figure 202 is a diagram representing the format of a sector number information element.

Figure 203 is a diagram representing the format of an information element indicating the number (N) of registration areas overlapped in one radio zone.

Figure 204 is a diagram representing the format of an area number information element.

Figure 205 is a diagram representing the format of an information element indicating the calibrated power level necessary for reception at the base station.

Figure 206 is a diagram representing the format of an information element indicating the calibrated power level necessary for reception at the base station.

Figure 207 is a diagram representing the format of an information element indicating the number (M) of perch channel LC for determination of visited zone.

Figure 208 is a diagram representing the format of an information element indicating the number (K) of frequency bands used by base station.

Figure 209 is a diagram representing the format of a frequency band information element.

Figure 210 is a diagram representing the format of a BCCH reception duration information element.

Figure 211 is a diagram representing the format of an information element indicating the number of paged mobile stations.

Figure 212 is a diagram representing the format of a paged MS ID information element.

Figure 213 is a diagram representing the format of a paging ID information element.

Figure 214 is a conceptual diagram representing the protocol architecture on a BTS-MCC interface.

Figure 215 is a diagram representing the format of a BC entity message.

Figure 216 is a diagram representing the format of a BSM entity message.

Figure 217 is a diagram representing the format of the pattern of fundamental information elements in the BSM entity message.

Figure 218 is a diagram representing the format of the pattern of each fundamental information element in the BC entity message.

Figure 219 is a diagram representing the format of a protocol discriminator of a BC entity message.

Figure 220 is a diagram representing the format of a message type identifier of a BC entity message.

Figure 221 is a diagram representing the format of a parameter of link reference of a BC entity message.

Figure 222 is a diagram representing the format of an information element identifier of a BC entity message.

Figure 223 is a diagram representing the format of a length of information element of a BC entity message.

Figure 224 is a diagram representing the format of an AAL type parameter of a BC entity message.

Figure 225 is a diagram representing the format of a link identifier of a BC entity message.

Figure 226 is a diagram representing the format of a transmission quality parameter of a BC entity message.

Figure 227 is a diagram representing the format of a sector number of a BC entity message.

Figure 228 is a diagram representing the format of a bearer capability parameter of a BC entity message.

Figure 229 is a diagram representing the format of a frequency selection information of a BC entity message.

Figure 230 is a diagram representing the format of a frequency of a BC entity message.

Figure 231 is a diagram representing the format of a frame offset group parameter of a BC entity message.

Figure 232 is a diagram representing the format of a slot offset group of a BC entity message.

Figure 233 is a diagram representing the format of a long code phase difference parameter of a BC entity message.

Figure 234 is a diagram representing the format of a reverse long code number of a BC entity message.

Figure 235 is a diagram representing the format of a reverse short code type parameter of a BC entity message.

Figure 236 is a diagram representing the format of a parameter of the number of reverse short codes of a BC entity message.

Figure 237 is a diagram representing the format of a reverse short code number of a BC entity message.

Figure 238 is a diagram representing the format of a forward short code type parameter of a BC entity message.

Figure 239 is a diagram representing the format of a parameter of number of forward short codes of a BC entity message.

Figure 240 is a diagram representing the format of an AAL type parameter for ACCH of a BC entity message.

Figure 241 is a diagram representing the format of a link identifier for ACCH of a BC entity message.

Figure 242 is a diagram representing the format of a transmission quality for ACCH of a BC entity message.

Figure 243 is a diagram representing the format of a forward short code number of a BC entity message.

Figure 244 is a diagram representing the format of a result parameter of a BC entity message.

Figure 245 is a diagram representing the format of a cause parameter of a BC entity message.

Figure 246 is a diagram representing the format of an initial transmission power parameter of a BC entity message.

Figure 247 is a diagram representing the format of a location identity parameter of a BC entity message.

Figure 248 is a diagram representing the format of a protocol discriminator of a BSM entity message.

Figure 249 is a diagram representing the format of a message type identifier of a BSM entity message.

Figure 250 is a diagram representing the format of a PCHs calculation information of a BSM entity message.

Figure 251 is a diagram representing the format of an area number of a BSM entity message.

Figure 252 is a diagram representing the format of a paged MS ID of a BSM entity message.

Figure 253 is a diagram representing the format of a paging ID of a BSM entity message.

Figure 254 represents an SDL diagram for base station management.

Figure 255 represents an SDL diagram for bearer control in the SDCCH executed in the BSC function of the network.

Figure 256 represents an SDL diagram for bearer control in the TCH/ACCH executed in the BSC function of the network.

Figure 257 represents an SDL diagram for bearer control in the SDCCH executed in the BTS.

Figure 258 represents an SDL diagram for bearer control in the TCH/ACCH executed in the BTS.

Figure 259 is a diagram showing radio zones and a travelling mobile station in the invented system for describing an exemplified handover process.

Figure 260 is a block diagram showing an example of mobile communications system wherein a mobile station communicates through a plurality of calls.

Figure 261 is a block diagram showing the invented mobile communications system wherein a mobile station communicates through a plurality of calls and capable of replacing an associated control channel.

Figure 262 is a sequential diagram representing the ACCH replacement procedure carried out by the invented system.

Figure 263 is a diagram showing the OSI reference model.

Figure 264 is a diagram representing a sequential operation by the network and a mobile station MS in the invented system, which starts after a call attempt comes in the network.

Figure 265 is a table indicating the glossary of the abbreviations used in the present specification.

Figure 266 is a table representing the features of services provided by the invented system.

Figure 267 is a table representing the features of the voice bearer service at 8 kbps provided by the invented system.

Figure 268 is a table representing the features of the unrestricted bearer service at 64 kbps provided by the invented system.

Figure 269 is a table representing the features of the multiple-rate unrestricted bearer service provided by the invented system.

Figure 270 is a table representing the correlation between FE numbers and functional entities in the system.

Figure 271 is a table representing the correlation between the relationship designations and the related functional entities.

Figure 272 is a table representing the detail of a TA SETUP request indication.

Figure 273 is a table representing the detail of another TA SETUP request indication.

Figure 274 is a table representing the detail of a TA SETUP PERMISSION request indication.

Figure 275 is a table representing the detail of a REVERSE LONG CODE RETRIEVAL request indication used to retrieve the reverse long code.

Figure 276 is a table representing the detail of another REVERSE LONG CODE RETRIEVAL request indication used to retrieve the reverse long code.

Figure 277 is a table representing the detail of a REVERSE LONG CODE RETRIEVAL response confirmation used to retrieve the reverse long code.

Figure 278 is a table representing the detail of a TERMINAL STATUS UPDATE request indication used to update the terminal status.

Figure 279 is a table representing the detail of a TERMINAL STATUS UPDATE response confirmation.

Figure 280 is a table representing the detail of an ADD-ROUTING INFORMATION request indication sent to an LRDF to add the routing address to the subscriber's profile.

Figure 281 is a table representing the detail of an ADD-ROUTING INFORMATION response confirmation.

Figure 282 is a table representing the detail of a TA SETUP PERMISSION response confirmation issued by the LRCF to inform the TACF that the mobile terminal access to the network is authorized.

Figure 283 is a table representing the detail of a REVERSE LONG CODE RETRIEVAL response confirmation used to retrieve the reverse long code.

Figure 284 is a table representing the detail of a TA SETUP response confirmation used to notify that the terminal access has been established.

Figure 285 is a table representing the detail of another TA SETUP response confirmation used to confirm that the setup of terminal access and the connection between a CCAF and TACAF have been completed.

Figure 286 is a table representing the detail of a SETUP request indication used to request the establishment of a connection.

Figure 287 is a table representing the detail of a TACF INSTANCE ID INDICATION request indication used to retrieve the reverse long code.

Figure 288 is a table representing the detail of a CELL CONDITION MEASUREMENT request indication.

Figure 289 is a table representing the detail of a CELL CONDITION MEASUREMENT response confirmation that provides the result of the cell selection information measurement requested by the CELL CONDITION MEASUREMENT request indication.

Figure 290 is a table representing the detail of a CELL CONDITION REPORT request indication.

Figure 291 is a table representing the detail of a CALL SETUP PERMISSION request indication issued by an SSF to request the authorization of the calling user.

Figure 292 is a table representing the detail of a USER PROFILE RETRIEVAL request indication used to request the user profile to be retrieved.

Figure 293 is a table representing the detail of a USER PROFILE RETRIEVAL response confirmation.

Figure 294 is a table representing the detail of a CALL SETUP PERMISSION response confirmation issued by the LRCF to inform the calling user is authorized.

Figure 295 is a table representing the detail of a SETUP request indication used to request the establishment of a connection.

Figure 296 is a table representing the detail of a PROCEEDING request indication.

Figure 297 is a table representing the detail of a MEASUREMENT CONDITION NOTIFICATION request indication used by the network to indicate conditions, which the mobile terminal measures, and to report the cell selection information.

Figure 298 is a table representing the detail of another MEASUREMENT CONDITION NOTIFICATION request indication used by the network to indicate conditions, which the mobile terminal measures, and to report cell selecting information.

Figure 299 is a table representing the detail of a REPORT request indication used to report status and/or other types of information (e.g. alerting, suspended, hold, and resume) transported within the network.

Figure 300 is a table representing the detail of another REPORT request indication used to report status and/or other types of information (e.g. alerting, suspended, hold, and resume) transported within the network.

Figure 301 is a table representing the detail of a SETUP response confirmation used to confirm that the connection has been established.

Figure 302 is a table representing the detail of another SETUP response confirmation used to confirm that the connection has been established.

Figure 303 is a table representing the detail of a SETUP request indication used to report the establishment of a connection.

Figure 304 is a table representing the detail of a ROUTING INFORMATION QUERY request indication used to inquire the routing information.

Figure 305 is a table representing the detail of a TERMINAL ID RETRIEVAL request indication used to request the user profile to be retrieved.

Figure 306 is a table representing the detail of a TERMINAL ID RETRIEVAL response confirmation that is the response to the TERMINAL ID RETRIEVAL request indication.

Figure 307 is a table representing the detail of a TERMINAL STATUS QUERY request indication used to inquire the terminal status (e.g. if terminal access is active or not).

Figure 308 is a table representing the detail of a TERMINAL STATUS QUERY response confirmation that is the response to the TERMINAL STATUS QUERY request indication.

Figure 309 is a table representing the detail of a TERMINAL STATUS UPDATE request indication used to update the terminal status.

Figure 310 is a table representing the detail of a TERMINAL STATUS UPDATE response confirmation that is the response to the TERMINAL STATUS UPDATE request indication.

Figure 311 is a table representing the detail of a PAGING AREA QUERY request indication used to inquire the paging area where TACF resides when it is observed that the terminal access is not active. Figure 312 is a table representing the detail of a PAGING AREA QUERY response confirmation is the response to the PAGING AREA QUERY request indication.

Figure 313 is a table representing the detail of a PAGE request indication used to trigger a TACF of paging.

Figure 314 is a table representing the detail of a PAGING request indication used to page a mobile terminal for determining its position in the network and for the routing for a call.

Figure 315 is a table representing the detail of a PAGING response confirmation used to respond to the request indication.

Figure 316 is a table representing the detail of a PAGE response confirmation that is the response to the request indication and notifies a LRCF of the paging result.

Figure 317 is a table representing the detail of a REVERSE LONG CODE RETRIEVAL request indication used to retrieve the reverse long code.

Figure 318 is a table representing the detail of another REVERSE LONG CODE RETRIEVAL request indication used to retrieve the reverse long code.

Figure 319 is a table representing the detail of a REVERSE LONG CODE RETRIEVAL response confirmation used to retrieve the reverse long code.

Figure 320 is a table representing the detail of a CELL CONDITION MEASUREMENT request indication used by the MRRC to trigger the measurement of cell selecting information.

Figure 321 is a table representing the detail of a CELL CONDITION MEASUREMENT response confirmation provides the result of the cell selection information measurement requested by the CELL CONDITION MEASUREMENT request indication.

Figure 322 is a table representing the detail of a CELL CONDITION REPORT request indication used by the mobile terminal to report the cell selection information.

Figure 323 is a table representing the detail of an ADD-ROUTING INFORMATION request indication sent to the LRDFp to add the routing information to the subscriber's profile.

Figure 324 is a table representing the detail of an ADD-ROUTING INFORMATION response confirmation that is the response to the ADD-ROUTING INFORMATION request indication.

Figure 325 is a table representing the detail of a PAGE AUTHORIZED request indication at relationship rg used to notify the TACF of the result of the terminal authentication.

Figure 326 is a table representing the detail of a REVERSE LONG CODE RETRIEVAL response confirmation used to retrieve the reverse long code.

Figure 327 is a table representing the detail of a ROUTING INFORMATION QUERY response confirmation that is the response to the request indication.

Figure 328 is a table representing the detail of a SETUP request indication used to request the establishment of a connection.

Figure 329 is a table representing the detail of a TERMINATION ATTEMPT request indication used to request the user's profile which may be needed to proceed the call process.

Figure 330 is a table representing the detail of a USER PROFILE RETRIEVAL request indication used to retrieve the called user's profile from the LRDF.

Figure 331 is a table representing the detail of a USER PROFILE RETRIEVAL response confirmation that is the response to the request indication from the LRCF.

Figure 332 is a table representing the detail of a TERMINATION ATTEMPT response confirmation that is the response to the request indication from the SSF.

Figure 333 is a table representing the detail of a SETUP request indication used to request the establishment of a connection.

Figure 334 is a table representing the detail of a PROCEEDING request indication optionally reports that the received connection setup is valid and authenticated and that further routing and progressing of the call is proceeding.

Figure 335 is a table representing the detail of a MEASUREMENT CONDITION NOTIFICATION request indication used by the network to indicate conditions, which the mobile terminal measures, and to report the cell selection information.

Figure 336 is a table representing the detail of a REPORT request indication used to report status and/or other types of information transported in the network.

Figure 337 is a table representing the detail of a SETUP response confirmation used to confirm that the connection has been established.

Figure 338 is a table representing the detail of a CONNECTED request indication used to acknowledge that a previously sent SETUP response confirmation has been received and accepted.

Figure 339 is a table representing the detail of a RELEASE request indication used to release the resources associated with the call connection, such as call ID and channels.

Figure 340 is a table representing the detail of a RELEASE response confirmation used to indicate that all resources pervasively associated with the connection have been released.

Figure 341 is a table representing the detail of a TA RELEASE request indication used to inform an SCF that the attempt of call release has been detected.

Figure 342 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE request indication used to idle the terminal call status.

Figure 343 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE response confirmation that is the response to the TERMINAL-STATUS-MAKE-IDLE request indication.

Figure 344 is a table representing the detail of a TA RELEASE response confirmation used for the confirmation to the TA RELEASE request indication.

Figure 345 is a table representing the detail of a RELEASE request indication used to release the resources associated with the call connection such as the call reference and channels.

Figure 346 is a table representing the detail of a RELEASE response confirmation used to indicate that all resources previously associated with the connection have been released.

Figure 347 is a table representing the detail of a TA RELEASE request indication issued by the TACF to inform the LRCF that the attempt of call release has been detected.

Figure 348 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE request indication used to idle the terminal call status.

Figure 349 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE response confirmation that is the response to the TERMINAL-STATUS-MAKE-IDLE request indication.

Figure 350 is a table representing the detail of a TA RELEASE response confirmation used for a confirmation of the TERMINAL-STATUS-MAKE-IDLE request indication.

Figure 351 is a table representing the detail of a RADIO LINK FAILURE request indication used to notify a radio link failure detected by a BCAF or BCFr.

Figure 352 is a table representing the detail of a RELEASE NOTIFICATION request indication used to indicate that a connection between the network and the terminal has been released.

Figure 353 is a table representing the detail of a RADIO LINK FAILURE request indication used to notify that the link failure has been detected.

Figure 354 is a table representing the detail of another RADIO LINK FAILURE request indication used to notify that the link failure has been detected.

Figure 355 is a table representing the detail of a RADIO LINK FAILURE response confirmation that is a response confirmation of the RADIO LINK FAILURE request indication.

Figure 356 is a table representing the detail of a RADIO BEARER RELEASE request indication used to request to release radio bearers.

Figure 357 is a table representing the detail of a BEARER RELEASE request indication issued by the TACF to the BCF to release the radio bearer.

Figure 358 is a table representing the detail of a BEARER RELEASE response confirmation that is a response confirmation of the BEARER RELEASE request indication.

Figure 359 is a table representing the detail of another BEARER RELEASE request indication sent by an anchor TACF to request a serving TACF to release the bearer involved in the call that should be released.

Figure 360 is a table representing the detail of another BEARER RELEASE request indication issued by the TACF to BCF to release the radio bearer.

Figure 361 is a table representing the detail of another BEARER RELEASE response confirmation that is a response confirmation of the BEARER RELEASE request indication.

Figure 362 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE request indication issued by the TACF to release the bearer-and-radio-bearer.

Figure 363 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE response confirmation used for a confirmation of the release of the bearer-and-radio-bearer requested by the BEARER-AND-RADIO-BEARER RELEASE request indication.

Figure 364 is a table representing the detail of another BEARER RELEASE response confirmation that is a confirmation response to inform the TACF that the previous request to release the radio bearer has been completed.

Figure 365 is a table representing the detail of a TA RELEASE request indication issued by the TACF to inform the LRCF that the attempt of releasing call has detected.

Figure 366 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE request indication used to request to update the user profile.

Figure 367 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE response confirmation that is a response to the TERMINAL-STATUS-MAKE-IDLE request indication.

Figure 368 is a table representing the detail of a TA RELEASE response confirmation used for a response confirmation of the TA RELEASE request indication.

Figure 369 is a table representing the detail of a RADIO LINK FAILURE request indication used to notify that a link failure has been detected and reported by either BCFr or BCFa.

Figure 370 is a table representing the detail of another RADIO LINK FAILURE request indication used to notify that the link failure has been detected.

Figure 371 is a table representing the detail of a RADIO LINK FAILURE response confirmation that is a confirmation response to the RADIO LINK FAILURE request indication.

Figure 372 is a table representing the detail of a RADIO BEARER RELEASE request indication used to request to release the radio bearer.

Figure 373 is a table representing the detail of a RELEASE NOTIFICATION request indication used to indicate that the connection between the network and the terminal has been released.

Figure 374 is a table representing the detail of a RADIO BEARER RELEASE response confirmation that is a response confirmation of the RADIO BEARER RELEASE request indication.

Figure 375 is a table representing the detail of a BEARER RELEASE request indication issued by the TACF to BCF to release the radio bearer.

Figure 376 is a table representing the detail of a BEARER RELEASE response confirmation that is a response confirmation of the BEARER RELEASE request indication.

Figure 377 is a table representing the detail of another BEARER RELEASE request indication sent by the anchor TACF to request the serving TACF to release the radio bearer involved in the call that should be released.

Figure 378 is a table representing the detail of another BEARER RELEASE request indication issued by the TACF to BCF to release the radio bearer.

Figure 379 is a table representing the detail of a BEARER RELEASE response confirmation that is a response confirmation of the BEARER RELEASE request indication.

Figure 380 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE request indication issued by the TACF to release the bearer and radio bearer.

Figure 381 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE response confirmation used for a confirmation of the release of the bearer and radio bearer requested by the BEARER-AND-RADIO-BEARER RELEASE request indication.

Figure 382 is a table representing the detail of another BEARER RELEASE response confirmation that is a confirmation response for informing the TACF that the previous request to release the radio bearer has been completed.

Figure 383 is a table representing the detail of a RADIO BEARER RELEASE request indication issued to request to release the radio bearer.

Figure 384 is a table representing the detail of another RADIO BEARER RELEASE response confirmation used to confirm the release of radio bearer requested by the RADIO BEARER RELEASE request indication.

Figure 385 is a table representing the detail of a TA RELEASE request indication issued by the TACF to inform the LRCF that the attempt of call release has been detected.

Figure 386 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE request indication used to request to update the user profile.

Figure 387 is a table representing the detail of a TERMINAL-STATUS-MAKE-IDLE response confirmation that is a response to the TERMINAL-STATUS-MAKE-IDLE request indication.

Figure 388 is a table representing the detail of another TA RELEASE response confirmation is used for confirmation to the TA RELEASE request indication.

Figure 389 is a table representing the detail of a CALL DISCONNECT request indication used to notify the LRCF that a "user disconnect" has been detected.

Figure 390 is a table representing the detail of a USER-PROFILE-UPDATE request indication used to request to update the user profile.

Figure 391 is a table representing the detail of a USER-PROFILE-UPDATE response confirmation that is a response to the USER-PROFILE-UPDATE response confirmation.

Figure 392 is a table representing the detail of a CALL DISCONNECT response confirmation that is a response to the request made by the CALL DISCONNECT request indication.

Figure 393 is a table representing the detail of a SIGNALING CHANNEL SETUP REQUEST request indication used by the MCF and TACF to request the network to setup the signaling channels.

Figure 394 is a table representing the detail of a SIGNALING CHANNEL SETUP request indication used by an SCMAF to request to the network to allocate the signaling channels.

Figure 395 is a table representing the detail of a SIGNALING CHANNEL SETUP response confirmation used by the SCMF to allocate the radio resources to the signaling channels.

Figure 396 is a table representing the detail of a SIGNALING CHANNEL SETUP REQUESTED request indication used to indicate the reception of the signaling channel setup request (initial access detection) from the mobile terminal and to request the network to setup the corresponding signaling channels in the network.

Figure 397 is a table representing the detail of a SIGNALING CONNECTION SETUP request indication used by the TACF and SACF to setup the signaling connection among them and the SCMF.

Figure 398 is a table representing the detail of a SIGNALING CONNECTION SETUP response confirmation used to report the establishment of the signaling channels including the physical radio channel and the intra-network channel.

Figure 399 is a table representing the detail of a SIGNALING CHANNEL SETUP REQUEST response confirmation used by the SCMAF to report the setup of the signaling channels to the network.

Figure 400 is a table representing the detail of a BEARER SETUP request indication used to request the establishment of the access bearer from the CCF to TACF.

Figure 401 is a table representing the detail of a CHANNEL SELECTION response confirmation used to report reserved radio resources to the TACF, which requested the reservation.

Figure 402 is a table representing the detail of a BEARER SETUP request indication sent from the TACF to BCF to request the establishment of the access bearer.

Figure 403 is a table representing the detail of a BEARER SETUP response confirmation sent to confirm the establishment of the access bearer and to indicate the bearer ID of the bearer between the BCF and BCF.

Figure 404 is a table representing the detail of another BEARER SETUP request indication used to request the establishment of the access bearer from the TACFa to TACFv.

Figure 405 is a table representing the detail of another BEARER SETUP request indication sent from the TACF to BCF to request the establishment of the access bearer.

Figure 406 is a table representing the detail of another BEARER SETUP response confirmation sent from the BCF to TACF to request the establishment of the access bearer.

Figure 407 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP request indication sent from the TACF to BCFr to request the establishment of the radio bearer and the bearer between the BCF and BCFr.

Figure 408 is a table representing the detail of a RADIO BEARER SETUP PROCEEDING request indication used by the BCFr to report that the instructed radio bearer setup is valid and the establishment of the radio bearer is proceeding.

Figure 409 is a table representing the detail of a RADIO BEARER SETUP REQUEST request indication issued by the TACF, which controls a new access bearer, to the TACF, which has the signaling connection, to request to newly assign a radio bearer to the mobile terminal.

Figure 410 is a table representing the detail of a RADIO BEARER SETUP request indication sent from the TACF to TACAF to request the establishment of the radio bearer.

Figure 411 is a table representing the detail of another RADIO BEARER SETUP request indication sent from the TACAF to BCAF to request the establishment of the radio bearer.

Figure 412 is a table representing the detail of a RADIO BEARER SETUP response confirmation sent from the BCAF to TACAF to confirm that the establishment of radio bearer has been completed.

Figure 413 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP response confirmation sent to confirm that the establishment of radio bearer and bearer between the BCF and BCFr have been completed.

Figure 414 is a table representing the detail of a BEARER SETUP response confirmation used to confirm that the establishment of access bearer has been completed.

Figure 415 is a table representing the detail of another BEARER SETUP response confirmation used to confirm that the establishment of access bearer has been completed.

Figure 416 is a table representing the detail of a BEARER RELEASE request indication sent by an anchor CCF to notify an anchor TACF that the attempt or event of call release has been detected and that the bearer involved in the call is being released.

Figure 417 is a table representing the detail of a RADIO BEARER RELEASE request indication used by the TACFa to request to release the radio bearer.

Figure 418 is a table representing the detail of a RADIO BEARER RELEASE response confirmation that is a response confirmation of the RADIO BEARER RELEASE request indication.

Figure 419 is a table representing the detail of a BEARER RELEASE request indication issued by the TACF to BCF to release the radio bearer.

Figure 420 is a table representing the detail of a BEARER RELEASE response confirmation that is a response confirmation of the BEARER RELEASE request indication.

Figure 421 is a table representing the detail of another BEARER RELEASE request indication sent by the TACFa to request the TACFv to release the bearer involved in the call is being released.

Figure 422 is a table representing the detail of another BEARER RELEASE request indication issued by the TACF to BCF to release the radio bearer.

Figure 423 is a table representing the detail of a BEARER RELEASE response confirmation that is a response confirmation of the BEARER RELEASE request indication.

Figure 424 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE request indication issued by the TACF to release the bearer and radio bearer.

Figure 425 is a table representing the detail of a BEARER-AND-RADIO-

BEARER RELEASE response confirmation used for a confirmation of the release of the bearer and radio bearer requested by the BEARER-AND-RADIO-BEARER RELEASE request indication.

Figure 426 is a table representing the detail of another BEARER RELEASE response confirmation that is a confirmation of the BEARER RELEASE request indication.

Figure 427 is a table representing the detail of another BEARER RELEASE response confirmation that is a response confirmation to inform the CCF that the previous request to release the radio bearer has been completed.

Figure 428 is a table representing the detail of another RADIO BEARER RELEASE request indication issued by the TACAF to request the radio bearer release.

Figure 429 is a table representing the detail of another RADIO BEARER RELEASE request indication used by the BOCA to confirm the radio bearer release requested by the RADIO BEARER RELEASE request indication.

Figure 430 is a table representing the detail of a SIGNALING CHANNEL RELEASE REQUEST request indication used by the MCF and TACF to request the release of a signaling channel.

Figure 431 is a table representing the detail of a SIGNALING CONNECTION RELEASE request indication used by the TACF and SACF to request the release of the signaling channel (in both of the network and the radio resources).

Figure 432 is a table representing the detail of a SIGNALING CONNECTION RELEASE response confirmation used to report the release of the signaling channel.

Figure 433 is a table representing the detail of a BEARER SETUP request indication sent from the TACFa to TACFv to request the setup of an access bearer.

Figure 434 is a table representing the detail of an INTRA-BCFr HANDOVER BRANCH ADDITION request indication.

Figure 435 is a table representing the detail of an INTRA-BCFr HANDOVER BRANCH ADDITION response confirmation that is a response to the INTRA-BCFr

HANDOVER BRANCH ADDITION request indication and is sent from the BCFr to TACF to indicate the completion of setup of the physical radio channel(s).

Figure 436 is a table representing the detail of a RADIO BEARER SETUP REQUEST request indication sent from the visited TACF, which controls the newly assigned radio bearer, to TACFa to request to setup the radio bearer between the mobile terminal and BCFr controlled by the visited TACF.

Figure 437 is a table representing the detail of a HANDOVER BRANCH ADDITION request indication sent from the TACF to TACAF to notify of the intra-BCFr handover branch addition, and requesting to add a new physical radio channel to an existing physical radio channel.

Figure 438 is a table representing the detail of a RADIO BEARER SETUP request indication sent from the TACAF to BCAF to request to setup a radio bearer.

Figure 439 is a table representing the detail of a RADIO BEARER SETUP response confirmation that is a response to the RADIO BEARER SETUP request indication sent from the BCAF to TACAF to indicate the completion of the radio bearer setup.

Figure 440 is a table representing the detail of a HANDOVER CONNECTION SETUP request indication notifying of a handover initiation and to request to setup an access bearer.

Figure 441 is a table representing the detail of a HANDOVER CONNECTION SETUP response confirmation sent from the BCF to TACF to confirm the HANDOVER CONNECTION SETUP request indication.

Figure 442 is a table representing the detail of a BEARER SETUP request indication sent from the TACFa to TACFv to setup an access bearer.

Figure 443 is a table representing the detail of another BEARER SETUP request indication sent from the TACF to BCF to request the bearer setup.

Figure 444 is a table representing the detail of a BEARER SETUP response confirmation sent from the BCF to TACF to confirm the BEARER SETUP request indication.

Figure 445 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP request indication.

Figure 446 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP response confirmation sent from the BCFr to TACF to indicate the completion of setting up of the radio bearer and bearer between the BCFr and BCF.

Figure 447 is a table representing the detail of a RADIO BEARER SETUP REQUEST request indication sent from the visited TACF, which controls the newly assigned radio bearer, to the TACFa to request to setup the radio bearer between the mobile terminal and BCFr.

Figure 448 is a table representing the detail of a HANDOVER BRANCH ADDITION request indication notifying of the handover branch addition request.

Figure 449 is a table representing the detail of a RADIO BEARER SETUP request indication sent from the TACAF to BCAF.

Figure 450 is a table representing the detail of a RADIO BEARER SETUP response confirmation sent from the BCAF to TACAF to indicate the completion of the radio bearer setup.

Figure 451 is a table representing the detail of a BEARER SETUP response confirmation sent from the TACFa to TACFv to confirm the establishment of the access bearer.

Figure 452 is a table representing the detail of a HANDOVER BRANCH DELETION request indication.

Figure 453 is a table representing the detail of a HANDOVER BRANCH DELETION response confirmation sent from the TACAF to TACF to confirm the HANDOVER BRANCH DELETION request indication.

Figure 454 is a table representing the detail of a BEARER RELEASE request indication sent from the TACFa to TACFv to release the access bearer.

Figure 455 is a table representing the detail of an INTRA-BCFr HANDOVER

BRANCH DELETION request indication sent from the TACF to BCFr to request the release of the physical radio channel(s).

Figure 456 is a table representing the detail of an INTRA-BCFr HANDOVER BRANCH DELETION response confirmation sent from the BCFr to TACF to indicate the release of the physical radio channel(s).

Figure 457 is a table representing the detail of a BEARER RELEASE response confirmation sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication.

Figure 458 is a table representing the detail of a HANDOVER BRANCH DELETION request indication sent from the TACF to TACAF.

Figure 459 is a table representing the detail of a HANDOVER BRANCH DELETION response confirmation sent from the TACAF to TACF to confirm the HANDOVER BRANCH DELETION request indication.

Figure 460 is a table representing the detail of a RADIO BEARER RELEASE request indication sent from the TACAF to BCAF to request the radio bearer release.

Figure 461 is a table representing the detail of a RADIO BEARER RELEASE response confirmation sent from the BCFr to TACAF to indicate the completion of the radio bearer release.

Figure 462 is a table representing the detail of a HANDOVER CONNECTION RELEASE request indication sent from the TACF to BCF to release the indicated bearer in the diversity handover state.

Figure 463 is a table representing the detail of a HANDOVER CONNECTION RELEASE response confirmation sent from the BCF to TACF to confirm the HANDOVER CONNECTION RELEASE request indication.

Figure 464 is a table representing the detail of a BEARER RELEASE request indication sent from the TACFa to TACFv to release the access bearer.

Figure 465 is a table representing the detail of another BEARER RELEASE request indication sent from the TACF to BCF to request the bearer release.

Figure 466 is a table representing the detail of a BEARER RELEASE response confirmation sent from the BCF to TACF to confirm the BEARER RELEASE request indication.

Figure 467 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE request indication sent from the TACF to BCFr to request the bearer between the BCF and BCFr and the radio bearer.

Figure 468 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE response confirmation sent from the BCFr to TACF to indicate the completion of the release of the bearer and the radio bearer.

Figure 469 is a table representing the detail of a BEARER RELEASE response confirmation sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication.

Figure 470 is a table representing the detail of a BEARER SETUP request indication sent from the TACFa to TACFv to setup an access bearer.

Figure 471 is a table representing the detail of an INTRA-BCFr HANDOVER BRANCH REPLACEMENT response confirmation sent from the BCFr to TACF to indicate the completion of the setup of the physical radio channel(s).

Figure 472 is a table representing the detail of an INTRA-BCFr HANDOVER BRANCH REPLACEMENT PROCEEDING request indication sent from the BCFr to TACF to indicate that the request of the handover branch replacement is accepted.

Figure 473 is a table representing the detail of a RADIO BEARER SETUP REQUEST request indication sent from the visited TACF, which controls the newly assigned radio bearer, to the anchor TACFa to request to setup the radio bearer between the mobile terminal and BCFr controlled by the visited TACF.

Figure 474 is a table representing the detail of a NON-SOFT HANDOVER EXECUTION request indication sent from the TACF to TACAF to notify of a non-soft handover execution request initiation.

Figure 475 is a table representing the detail of a RADIO BEARER SETUP request indication sent from the TACAF to BCAF to request to setup a radio bearer.

Figure 476 is a table representing the detail of a RADIO BEARER SETUP response confirmation sent from the BCAF to TACAF to indicate the completion of the radio bearer setup.

Figure 477 is a table representing the detail of a RADIO BEARER RELEASE request indication sent from the TACAF to BCAF to request the radio bearer release.

Figure 478 is a table representing the detail of a RADIO BEARER RELEASE response confirmation sent from the BCAF to TACAF to indicate the completion of the radio bearer release.

Figure 479 is a table representing the detail of a BEARER SETUP response confirmation sent from the TACFa to TACFv to confirm the establishment of the access bearer.

Figure 480 is a table representing the detail of a HANDOVER CONNECTION SETUP request indication sent from the TACFa to BCFa to notify of a handover initiation.

Figure 481 is a table representing the detail of a HANDOVER CONNECTION SETUP response confirmation sent from the BCF to TACF to confirm the HANDOVER CONNECTION SETUP request indication.

Figure 482 is a table representing the detail of a BEARER SETUP request indication sent from the TACFa to TACFv to set up a new handover link.

Figure 483 is a table representing the detail of another BEARER SETUP request indication sent from the TACF to BCF to request a new handover link in the network.

Figure 484 is a table representing the detail of a BEARER SETUP response confirmation sent from the BCF to TACF to confirm a BEARER SETUP request indication.

Figure 485 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP request indication sent from the TACF to BCFr to request to set up a bearer between the BCF and BCFr and a radio bearer.

Figure 486 is a table representing the detail of a RADIO BEARER SETUP PROCEEDING request indication sent from the BCFr to TACF to indicate that the request of the access radio link setup is accepted and that the BCFr starts setting up the access radio link.

Figure 487 is a table representing the detail of a RADIO BEARER SETUP REQUEST request indication.

Figure 488 is a table representing the detail of a NON-SOFT HANDOVER EXECUTION request indication sent from the TACF to TACAF to notify of a NON-SOFT HANDOVER EXECUTION request indication.

Figure 489 is a table representing the detail of a RADIO BEARER SETUP request indication sent from the TACAF to BCAF to request to set up an access radio link.

Figure 490 is a table representing the detail of a RADIO BEARER SETUP response confirmation sent from the BCAF to TACAF to indicate the completion of the setup of the access radio link.

Figure 491 is a table representing the detail of a RADIO BEARER RELEASE request indication sent from the TACAF to BCAF to request to release the access radio link.

Figure 492 is a table representing the detail of a RADIO BEARER RELEASE response confirmation sent from the BCAF to TACAF to request to release the access radio link.

Figure 493 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP response confirmation sent from the BCFr to TACF to indicate the completion of the setup of the access radio link and the link between the BCFr and BCF.

Figure 494 is a table representing the detail of a BEARER SETUP response confirmation sent from the TACFa to TACFv to confirm the establishment of the handover link.

Figure 495 is a table representing the detail of a HANDOVER CONNECTION RELEASE request indication sent from the TACF to BCFa to request to remove the indicated handover link.

Figure 496 is a table representing the detail of a HANDOVER CONNECTION RELEASE response confirmation sent from the BCF to TACF to confirm the HANDOVER CONNECTION RELEASE request indication.

Figure 497 is a table representing the detail of a BEARER RELEASE request indication sent from the TACFa to TACFv to request to release the handover link in the network.

Figure 498 is a table representing the detail of another BEARER RELEASE request indication sent from the TACF to BCF to request to release the handover link in the network.

Figure 499 is a table representing the detail of a BEARER RELEASE response confirmation sent from the BCF to TACF to confirm the BEARER RELEASE request indication.

Figure 500 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE request indication sent from the TACF to BCFr to request to release the access link or handover link between the BCF and BCFr and between BCAF and BCF.

Figure 501 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE response confirmation sent from the BCFr to TACF to indicate the completion of the release of the access link or hand over link.

Figure 502 is a table representing the detail of a BEARER RELEASE response confirmation sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication.

Figure 503 is a table representing the detail of a HANDOVER CONNECTION SETUP request indication sent from a TACFa to a BAFa to notify of a handover initiation and to request to setup an ACCH.

Figure 504 is a table representing the detail of a HANDOVER CONNECTION SETUP response confirmation sent from the BCF to the TACFa to confirm the HANDOVER CONNECTION SETUP request indication.

Figure 505 is a table representing the detail of a BEARER SETUP request indication sent from the TACFa to a TACFv to setup an access bearer for the ACCH.

Figure 506 is a table representing the detail of another BEARER SETUP request indication sent from the TACFv to the BCF to setup an access bearer for the ACCH.

Figure 507 is a table representing the detail of a BEARER SETUP response confirmation sent from the BCF to the TACFv to confirm the BEARER SETUP request indication.

Figure 508 is a table representing the detail of a BEARER-AND-RADIO-BEARER SETUP request indication sent from the TACFv to the BCFr.

Figure 509 is a table representing the detail of a RADIO BEARER SETUP PROCEEDING request indication sent from the BCFr to the TACFv.

Figure 510 is a table representing the detail of a RADIO BEARER SETUP REQUEST request indication.

Figure 511 is a table representing the detail of another RADIO BEARER SETUP request indication sent from the TACFa to TACAF.

Figure 512 is a table representing the detail of another RADIO BEARER SETUP request indication sent from the TACAF to BCAF.

Figure 513 is a table representing the detail of a RADIO BEARER SETUP response confirmation sent from the BCAF to the TACAF to indicate the completion of the radio bearer setup for the new ACCH.

Figure 514 is a table representing the detail of a RADIO BEARER RELEASE request indication sent from the TACAF to another BCAF to request to release a previous radio bearer.

Figure 515 is a table representing the detail of a RADIO BEARER RELEASE response confirmation sent from the BCAF to the TACAF to indicate the completion of the radio bearer release.

Figure 516 is a table representing the detail of a HANDOVER CONNECTION RELEASE request indication sent from the TACFa to the BCFa to request to remove the previous bearer in the soft handover state.

Figure 517 is a table representing the detail of a HANDOVER CONNECTION RELEASE response confirmation sent from the BCF to the TACF to confirm the HANDOVER CONNECTION RELEASE request indication.

Figure 518 is a table representing the detail of a BEARER RELEASE request indication sent from the TACFa to TACFv to request to release the access bearer

Figure 519 is a table representing the detail of another BEARER RELEASE request indication sent from the TACF to BCF to request to release the bearer.

Figure 520 is a table representing the detail of a BEARER RELEASE response confirmation sent from the BCF to the TACF to confirm the BEARER RELEASE request indication.

Figure 521 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE request indication sent from the TACF to BCFr to request to release the bearer between the BCF and BCFr and the radio bearer.

Figure 522 is a table representing the detail of a BEARER-AND-RADIO-BEARER RELEASE response confirmation sent from the BCFr to TACAF to indicate the completion of the release of the bearer and radio bearer.

Figure 523 is a table representing the detail of a BEARER RELEASE response confirmation sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication.

Figure 524 is a table representing the detail of a CODE REPLACEMENT request indication sent from a BCFr to a TACF to request change of codes.

Figure 525 is a table representing the detail of another CODE

REPLACEMENT request indication sent from the visited TACF to a TACFa to request change of codes.

Figure 526 is a table representing the detail of another CODE REPLACEMENT request indication sent from the TACF to a TACAF to request change of codes.

Figure 527 is a table representing the detail of another CODE REPLACEMENT request indication sent from the TACAF to the BCAF to request to change of codes.

Figure 528 is a table representing the detail of a CODE REPLACEMENT response confirmation sent from the BCAF to the TACAF to indicate the completion of the change of codes.

Figure 529 is a table representing the detail of another CODE REPLACEMENT response confirmation sent from the TACAF to the TACFa to confirm the CODE REPLACEMENT request indication.

Figure 530 is a table representing the detail of another CODE REPLACEMENT response confirmation sent from the TACFa to the TACFv to confirm the CODE REPLACEMENT request indication.

Figure 531 is a table representing the detail of another CODE REPLACEMENT response confirmation sent from the TACF to the BCFr to confirm the CODE REPLACEMENT request indication.

Figure 532 is a table representing the detail of a CELL CONDITION REPORT request indication sent from an MRRC to an RRC periodically to notify of the radio conditions of respective handover branches.

Figure 533 is a table representing the detail of a TRANSMISSION POWER CONTROL request indication sent from a TACFa to TACFv to notify of the instructed transmission power.

Figure 534 is a table representing the detail of another TRANSMISSION POWER CONTROL request indication sent from a TACFv to BCFr to notify of the instructed transmission power.

Figure 535 is a table representing the detail of an LAI UPDATE request indication sent from the visited SCF to the SDF.

Figure 536 is a table representing the detail of a TERMINAL LOCATION UPDATE request indication sent from the SACF to the visited SCF.

Figure 537 is a table representing the detail of another TERMINAL LOCATION UPDATE request indication sent from the MCF to the SACF.

Figure 538 is a table representing the detail of an AUTHENTICATION INFORMATION RETRIEVAL request indication and an AUTHENTICATION INFORMATION RETRIEVAL response confirmation.

Figure 539 is a table representing the detail of an AUTHENTICATION CHALLENGE request indication and the AUTHENTICATION CHALLENGE response confirmation transported between the LRCF and TACF; and the LRCF and SACF.

Figure 540 is a table representing the detail of an AUTHENTICATION CHALLENGE request indication and an AUTHENTICATION CHALLENGE response confirmation transported between the TACF and TACAF; and the SACF and MCF.

Figure 541 is a table representing the detail of an AUTHENTICATION request indication and an AUTHENTICATION response confirmation.

Figure 542 is a table representing the detail of a start ciphering IF transported between the TACF and TACAF; and the LRCF to TACF.

Figure 543 is a table representing the detail of another start ciphering IF transported between the LRCF and SACF.

Figure 544 is a table representing the detail of a TMUI ASSIGNMENT request indication and a TMUI ASSIGNMENT response confirmation transported between the TACF and TACAF.

Figure 545 is a table representing the detail of a TMUI QUERY request indication and a TMUI QUERY response confirmation.

Figure 546 is a table representing the detail of a TMUI MODIFY request indication and a TMUI MODIFY response confirmation.

Figure 547 is a table representing the detail of another TMUI ASSIGNMENT request indication and another TMUI ASSIGNMENT response confirmation transported between the LRCF to TACF.

Figure 548 is a table representing the detail of another TMUI ASSIGNMENT request indication and another TMUI ASSIGNMENT response confirmation transported between the LRCF and SACF.

Figure 549 is a table representing the detail of another TMUI ASSIGNMENT request indication and another TMUI ASSIGNMENT response confirmation transported between the SACF and MCF.

Figure 550 is a table representing the detail of an IMUI RETRIEVAL request indication and an IMUI RETRIEVAL response confirmation transported between the LRCF and LRDF.

Figure 551 is a table representing the detail of another IMUI RETRIEVAL request indication and another IMUI RETRIEVAL response confirmation transported between the SACF and LRCF.

Figure 552 is a table representing the detail of another IMUI RETRIEVAL request indication and another IMUI RETRIEVAL response confirmation transported between the MCF and SACF.

Figure 553 is a table representing the detail of another IMUI RETRIEVAL request indication and another IMUI RETRIEVAL response confirmation transported between the TACF and LRCF.

Figure 554 is a table representing the detail of another IMUI RETRIEVAL request indication and another IMUI RETRIEVAL response confirmation transported between the TACAF and TACF.

Figure 555 is a table representing the detail of the service access point identifier in a layer 3 compatible sub-sub-layer PDU.

Figure 556 is a table representing the detail of the ST in the layer 3 compatible sub-sub-layer PDU.

Figure 557 is a table representing the detail of the code type indicator in the layer 3 compatible sub-sub-layer PDU.

Figure 558 is a table representing the detail of the reserved parameter in the layer 3 compatible sub-sub-layer PDU.

Figures 559 and 560 form a table representing various types of LLC protocol data units (PDUs).

Figure 561 is a table representing the relationship between the length of CRC fields in an MAC PDU and channels through which corresponding frame is transmitted.

Figure 562 is a table representing the bit coding of the ST field in a layer 1 frame and the meaning thereof.

Figure 563 is a table representing the bit coding of the BI field in a layer 1 frame and the meaning thereof.

Figure 564 is a table representing the bit coding of the uplink interference field in a layer 1 frame and the meaning thereof.

Figure 565 is a table representing the relationship between the usage of the PID field in a layer 1 frame and the range of PID value.

Figure 566 is a table representing the bit coding of the U/C field in a layer 1 frame and the meaning thereof.

Figure 567 is a table representing the bit coding of the TN field in a layer 1 frame and the meanings thereof.

Figure 568 is a table representing the bit coding of the MO field in a layer 1 frame and the meanings thereof.

Figure 569 is a table representing the relationship between the length of CRC fields and channels through which corresponding frames are transmitted.

Figure 570 is a list representing various messages belonging to CC (call/connection control) entity message.

Figure 571 through 573 form a list representing information elements constituting an alerting message.

Figure 574 through 576 form a list representing information elements constituting a call proceeding message.

Figure 577 through 581 form a list representing information elements constituting a connect message.

Figure 582 is a list representing information elements constituting a connect acknowledge message.

Figures 583 through 585 form a list representing information elements constituting a progress message.

Figures 586 through 594 form a list representing information elements constituting a setup message.

Figure 595 is a list representing information elements constituting a release message.

Figure 596 is a list representing information elements constituting a release complete message.

Figure 597 is a list representing information elements constituting an information message.

Figure 598 is a list representing a message (mobility facility message) belonging to the MM-T (terminal mobility management) entity message.

Figure 599 is a list representing the generic formats of the mobility facility message.

Figures 600 and 601 form a list representing information elements constituting a mobility facility message transferred from a mobile station to the network for requesting terminal location registration.

Figure 602 is a list representing information elements constituting a mobility facility message indicating "return result" issued when the terminal location has been normally registered.

Figure 603 is a list representing information elements constituting a mobility facility message indicating "return error" issued when an abnormality, for example, an application error has occurred.

Figure 604 is a list representing information elements constituting a mobility facility message indicating "return error" when an abnormality, for example, a discrepancy of an information element has occurred.

Figure 605 is a list representing information elements constituting a mobility facility message transferred for notifying a mobile station of the TMUI allocated to the mobile station.

Figure 606 is a list representing information elements constituting a mobility facility message indicating "return result" issued when the TMUI has been normally assigned.

Figure 607 is a list representing information elements constituting a mobility facility message indicating "return error" issued when an abnormality, for example, an application error has occurred.

Figure 608 is a list representing information elements constituting a mobility facility message indicating "return error" when an abnormality, for example, a discrepancy of an information element has occurred.

Figures 609 and 610 form a list representing information elements constituting a mobility facility message transferred from the network to a mobile station for authenticating the mobile station by the mobile service switching center.

Figure 611 is a list representing information elements constituting a mobility facility message indicating "return result" issued when the authentication has been normally requested.

Figure 612 is a list representing information elements constituting a mobility facility message indicating "return error" issued when an abnormality, for example, an application error has occurred.

Figure 613 is a list representing information elements constituting a mobility facility message indicating "return error" when an abnormality, for example, a discrepancy of an information element has occurred.

Figure 614 is a list representing information elements constituting a mobility facility message transferred for notifying a mobile station of ciphering onset.

Figure 615 is a list representing information elements constituting a mobility facility message indicating "return result" issued when the ciphering onset has been normally notified.

Figure 616 is a list representing information elements constituting a mobility facility message indicating "return error" issued when an abnormality, for example, an application error has occurred.

Figure 617 is a list representing information elements constituting a mobility facility message indicating "return error" when an abnormality, for example, a discrepancy of an information element has occurred.

Figure 618 is a list representing information elements constituting a mobility facility message transferred for inquiring of a mobile station as to the IMUI of the mobile station.

Figure 619 is a list representing information elements constituting a mobility facility message indicating "return result" issued when the IMUI has been normally inquired.

Figure 620 is a list representing information elements constituting a mobility facility message indicating "return error" issued when an abnormality, for example, an application error has occurred.

Figure 621 is a list representing information elements constituting a mobility facility message indicating "return error" when an abnormality, for example, a discrepancy of an information element has occurred.

Figure 622 is a list representing messages belonging to RBC entity message.

Figure 623 is a list representing classification of RBC entity message.

Figure 624 is a list representing the format of radio bearer setup message.

Figure 625 is a list representing the format of radio bearer release message.

Figure 626 is a list representing the format of radio bearer release complete message.

Figure 627 is a list representing the format of handover command message.

Figure 628 is a list representing the format of handover response message.

Figure 629 is a list representing a message (radio resource facility message) belonging to RRC entity message.

Figure 630 is a list representing the format of the RRC facility message.

Figure 631 is a list representing TAC entity messages.

Figure 632 is a list representing the relationship between TAC entity message and information flow.

Figure 633 is a list representing the format of a terminal association setup message.

Figure 634 is a list representing the format of a terminal association connect message.

Figure 635 is a list representing the format of a paging response message.

Figure 636 is a list representing the format of a terminal association release message.

Figure 637 is a list representing the format of a terminal association release complete message.

Figure 638 is a list representing the format of a page authorized message.

Figure 639 is a list representing the format of a signaling channel setup request message.

Figure 640 is a list representing the format of a signaling channel setup response message.

Figure 641 is a list representing the format of a signaling channel setup failure message.

Figure 642 is a list representing the format of a first broadcast information message.

Figure 643 is a list representing the format of a second broadcast information message.

Figure 644 is a list representing the format of a paging message.

Figure 645 is a list representing the bit coding manner of a protocol discriminator in the CC entity message.

Figures 646 and 647 form a list representing the bit coding manner of a message type identifier.

Figures 648 and 649 form a list representing the bit coding manner of a variable length information element according to FPLMTS.

Figure 650 is a list representing the bit coding manner of a broadband locking shift information element.

Figure 651 is a list representing the bit coding manner of a broadband non-locking shift information element.

Figures 652 through 654 form a list representing the bit coding manner of an AAL parameter information element.

Figure 655 is a list representing the bit coding manner of an ATM traffic descriptor information element.

Figure 656 is a list representing the bit coding manner of a broadband bearer capability information element.

Figure 657 is a list representing the bit coding manner of a broadband high layer information element.

Figures 658 through 660 form a list representing the bit coding manner of a broadband low layer information element.

Figure 661 is a list representing the bit coding manner of a called party number information element.

Figure 662 is a list representing the bit coding manner of a called party sub-address information element.

Figures 663 and 664 form a list representing the bit coding manner of a calling party number information element.

Figure 665 is a list representing the bit coding manner of a calling party sub-address information element.

Figure 666 is a list representing the bit coding manner of a connection identifier information element.

Figure 667 is a list representing the bit coding manner of an end-to-end transit delay information element.

Figure 668 is a list representing the bit coding manner of a QOS parameter information element.

Figure 669 is a list representing the bit coding manner of a broadband repeat indicator information element.

Figure 670 is a list representing the bit coding manner of a transit network selection information element.

Figure 671 is a list representing the bit coding manner of an OAM traffic descriptor information element.

Figure 672 is a list representing the bit coding manner of an MM-T specific information elements.

Figure 673 is a list representing parameters of a candidate zone information for call attempt or acceptance.

Figure 674 is a list representing parameters of an in-use zone information.

Figure 675 is a list representing parameters of an added zone information for DHO.

Figure 676 is a list representing parameters of a deleted zone information for DHO.

Figure 677 is a list representing parameters of a HHO zone information.

Figure 678 is a list representing parameters of an outer loop information.

Figure 679 is a list representing parameters of a quality deterioration notification information.

Figure 680 is a list representing the bit coding manner of a TAC entity message.

Figure 681 is a list representing TAC entity message specific parameters.

Figure 682 is a list representing the bit coding manner of a terminal association setup message specific parameter.

Figure 683 is a list representing the bit coding manner of a paging response message specific parameter.

Figure 684 is a list representing the bit coding manner of a terminal association release message specific parameter.

Figure 685 is a list representing information elements which may be contained in subfields of TAC entity message specific parameters.

Figure 686 is a list representing the bit coding manner of a cause information element.

Figure 687 is a list representing the bit coding manner of a mobile station type information element.

Figure 688 is a list representing the bit coding manner of a paged MS ID information element.

Figure 689 is a list representing the bit coding manner of a paging ID information element.

Figure 690 is a list representing types of BC entity messages.

Figure 691 is a list representing a classification of BC entity messages.

Figure 692 is a list representing structural information elements of a link setup requested message.

Figure 693 is a list representing structural information elements of a link setup message.

Figure 694 is a list representing structural information elements of a link setup proceeding message.

Figure 695 is a list representing structural information elements of a link setup response message.

Figure 696 is a list representing structural information elements of a link facility message sent from the MSCNW to the BTS.

Figure 697 is a list representing structural information elements of another link facility message sent from the BTS to the MSCNW.

Figure 698 is a list representing structural information elements of a link release message.

Figure 699 is a list representing structural information elements of a link release complete message.

Figure 700 is a list representing the combinations of the fundamental information elements in the link setup message in various uses.

Figure 701 is a list representing the combinations of the fundamental information elements in the link setup proceeding message in various uses.

Figure 702 is a list representing the combinations of the fundamental information elements in the link setup response message in various uses.

Figure 703 and 704 form a list representing the combinations of the fundamental information elements in the link facility message in various uses.

Figure 705 and 706 form a list representing the combinations of the fundamental information elements in the other link facility message in various uses.

Figure 707 is a list representing a message belonging to the BSM entity message.

Figure 708 is a list representing structural information elements of a paging message.

Figure 709 is a list representing the format of a link ID information element.

Figure 710 is a list representing the format of a TCH setup request information element without frequency indication.

Figure 711 is a list representing the format of a TCH setup request information element without frequency indication.

Figure 712 is a list representing the format of a TCH setup request information element with frequency indication.

Figure 713 is a list representing the format of a DHO branch addition request information element.

Figure 714 is a list representing the format of an intra-BS DHO branch addition request information element.

Figure 715 is a list representing the format of an ACCH setup request information element.

Figure 716 is a list representing the format of a TCH setup acceptance information element without frequency indication.

Figure 717 is a list representing the format of a TCH setup acceptance information element without frequency indication.

Figure 718 is a list representing the format of a TCH setup acceptance information element with frequency indication.

Figure 719 is a list representing the format of a TCH setup response information element without frequency indication.

Figure 720 is a list representing the format of a TCH setup response information element without frequency indication.

Figure 721 is a list representing the format of a TCH setup response information element with frequency indication.

Figure 722 is a list representing the format of a DHO branch addition response information element.

Figure 723 is a list representing the format of an intra-BS DHO branch addition response information element.

Figure 724 is a list representing the format of an ACCH setup response information element.

Figure 725 is a list representing the format of an intra-BS DHO branch addition request information element.

Figure 726 is a list representing the format of an intra-BS DHO branch deletion request information element.

Figure 727 is a list representing the format of an intra-BS HHO branch addition request information element.

Figure 728 is a list representing the format of an ACCH release request information element.

Figure 729 is a list representing the format of a frequency replacement setup request information element without frequency indication.

Figure 730 is a list representing the format of a frequency replacement setup request information element with frequency indication.

Figure 731 is a list representing the format of a setup completion notification information element.

Figure 732 is a list representing the format of an intra-BS HHO branch deletion response information element.

Figure 733 is a list representing the format of an intra-BS HHO branch addition response information element.

Figure 734 is a list representing the format of an ACCH release response information element.

Figure 735 is a list representing the format of a frequency-indicated frequency replacement setup response information element.

Figure 736 is a list representing the format of a frequency-indicated frequency replacement setup request information element.

Figure 737 is a list representing the format of a frequency-non-indicated frequency replacement setup acceptance information element.

Figure 738 is a list representing the format of a frequency-non-indicated frequency replacement setup response information element.

Figure 739 is a list representing the format of a code replacement request information element.

Figure 740 is a list representing the format of a TCH release request information element.

Figure 741 is a list representing the format of an SDCCH release request information element.

Figure 742 is a list representing the format of a cause information element.

Figure 743 is a list representing the format of an SDCCH setup request information element.

Figure 744 is a list representing the format of an LAI setup request information element.

Figure 745 is a list representing the format of a protocol discriminator of a BC entity message.

Figure 746 is a list representing the format of a message type identifier of a BC entity message.

Figure 747 is a list representing the format of a protocol discriminator of a BSM entity message.

Figure 748 is a list representing the format of a message type identifier of a BSM entity message.

Figure 749 is a list representing the format of a number type parameter indicating the type of number which is included at octet 4 and later octets in the paged MS ID shown in Figure 252.

Figure 750 is a list representing the format of a number length parameter indicating the length of number which is included at octet 4 and later octets in the paged MS ID shown in Figure 252.

Figure 751 is a block diagram showing a part of the mobile communications system in which a signal is ciphered and successfully received.

Figure 752 is a block diagram similar to Figure 751, but the ciphered signal is not successfully received.

Figure 753 is a block diagram showing a part of the mobile communications system for the description of an encipherment procedure.

Figure 754 is a block diagram representing the operation of the encipherment procedure in the invented system.

Figure 755 is a ciphering procedure sequence diagram in normal operation where the network and the mobile station commence to encipher transmitted signals and to decipher received signals after transmission of an enciphering onset request from the network to the mobile station.

Figure 756 is a sequence diagram representing a disadvantage of the ciphering procedure sequence represented in Figure 755.

Figure 757 is a ciphering procedure sequence diagram in normal operation according to a control method described in section 3.1.

Figure 758 is a sequence diagram representing an advantage of the ciphering procedure sequence according to a control method described in section 3.1.

Figure 759 is a schematic sequence diagram representing an encipherment method in a mobile communications system, in which only a specific encipherment manner is adopted.

Figure 760 represents a schematic sequence diagram representing a selection of encipherment manner by negotiation between mobile station and network in accordance with a control method described in section 3.2.

Figures 761 and 762 constitute a detailed sequence diagram representing the control method described in section 3.2.

Figure 763 is a diagram representing a conventional method for establishing access link for a mobile station when the mobile station locates at a position where intra-cell diversity handover can be carried out.

Figure 764 is a diagram representing a conventional method for establishing access link for a mobile station when the mobile station locates at a position where inter-cell diversity handover can be carried out.

Figure 765 is a sequential flow diagram representing a series of information flows transported between the mobile station and the network for carrying out the access link setup procedure.

Figure 766 is a sequential flow diagram representing a series of information flows transported between the mobile station and the network for entering the intra-cell diversity handover procedure.

Figure 767 is a sequential flow diagram representing a series of information flows transported between the mobile station and the network for entering the intra-cell diversity handover procedure.

Figure 768 is a diagram representing features of the invented system for starting diversity handover simultaneously with the access link setup.

Figure 769 is a sequential flow diagram representing the start of intra-cell diversity handover simultaneously with the access link setup.

Figure 770 is a sequential flow diagram representing the start of inter-cell diversity handover simultaneously with the access link setup.

Figure 771 is a diagram representing a situation where transition to diversity handover is necessary immediately after the completion of branch replacement.

Figure 772 is a sequential flow diagram representing a series of information flows transported between the mobile station and the network for carrying out the branch replacement.

Figure 773 is a sequential flow diagram representing an operation in the invented system which is carried out when the mobile station moves to a diversity handover zone.

Figure 774 is a diagram representing an embodying method for controlling branch structure and frequency band in the system according to the presented invention when a call attempt occurs to or from a mobile station that can treats a plurality of calls simultaneously and is treating a call.

Figure 775 is a sequential flow diagram representing the operation exemplified in Figure 774 of the system.

Figure 776 is a diagram representing another embodying method for controlling branch structure and frequency band in the system according to the presented invention when a call attempt occurs to or from a mobile station that can treats a plurality of calls simultaneously and is treating a call.

Figure 777 is a diagram representing another embodying method for controlling branch structure and frequency band in the system according to the presented invention when a call attempt occurs to or from a mobile station that can treats a plurality of calls simultaneously and is treating a call.

Figure 778 is a sequential flow diagram representing the operation exemplified in Figure 776 of the system.

Figure 779 is a sequential flow diagram representing the operation exemplified in Figure 777 of the system.

Figure 780 is a diagram representing a control method executed in the system according to the present invention when a trigger of handover occurs to the mobile station which is treating a plurality of calls.

Figure 781 is a diagram representing another control method executed in the system according to the present invention when a trigger of handover occurs to the mobile station which is treating a plurality of calls.

Figure 782 is a sequential flow diagram representing the operation exemplified in Figure 780 of the system.

Figure 783 is a sequential flow diagram representing the operation exemplified in Figure 781 of the system.

Figure 784 is a diagram representing another control method executed in the system according to the present invention when a trigger of handover occurs to the mobile station which is treating a plurality of calls.

Figure 785 is a sequential flow diagram representing the operation exemplified in Figure 784 of the system.

Figure 786 is a sequential flow diagram representing an operation for the start of inter-cell diversity handover simultaneously with the access link setup.

Figure 787 is a flowchart of an operation of the mobile station, which is appropriate to realizing the operation in Figure 786.

Figure 788 is a sequential flow diagram representing a conventional operation for access link setup for a mobile station when the mobile station is located at the position where it can carry out intra-cell diversity handover.

Figure 789 is a flowchart of an operation of the mobile station for realizing the operation in Figure 786.

Figure 790 is a diagram showing a part of the invented system for describing the ACCH replacement.

Figure 791 is a sequential diagram representing an alteration of the ACCH replacement procedure, similar to that shown in Figures 53 and 54, but is not accompany with the replacement of wired access link.

Figure 792 is a diagram for describing the uplink transmission power control for the mobile stations in the invented system.

Figure 793 and 794 are diagrams representing a method for reassigning code resources in section 3.10.

BEST MODE FOR CARRYING OUT INVENTION

1. GENERAL DESCRIPTION OF SYSTEM

1.1. INTRODUCTION

This system is a mobile communications system wherein W-CDMA (wide-band code division multiple access) is adopted for the radio access manner in order to enhance efficiency for frequency utilization, to process multiplexed and high-rate signals flexibly, and to improve the communication quality to the level equivalent to fixed networks.

1.2 ENTIRE SYSTEM STRUCTURE

First, with reference to Figure 1, the entire structure of a W-CDMA mobile communications system in accordance with an embodiment of the present invention will be described. As shown in Figure 1, the system comprises mobile stations MS and a radio base station system BSS. The base station system BSS is constituted of base transceiver systems BTS and a mobile communications control center MCC connected to the base transceiver systems via cable transmission lines HW. The mobile stations MS include a wide-purpose mobile station, a small portable mobile station 2 connected to a personal computer, a small portable mobile station 3 that is a traditional portable telephones, and so on. The mobile communications control center MCC is connected with the personal computers via a fixed PSTN or ISDN, telephone network, or LAN. With such a structure, high-quality voice data, N-ISDN, packets or modem signals may be transformed.

1.3 ABBREVIATIONS

Glossary of the abbreviations used in the present specification is indicated in

Figure 265. In addition, the technical terms, which are used in the present specification but not defined, comply with ITU-T Recommendation Q.65.

2. ACCESS INTERFACES

2.1 GENERAL DESCRIPTION OF ACCESS INTERFACES

Chapter 2 prescribes access interfaces of W-CDMA mobile communications system. The access interfaces in this system include, as shown in Figure 2, a radio interface served for communication between the mobile station MS and the base transceiver systems BTS, and a BTS-MCC interface served for communication between the base transceiver systems BTS and the mobile communications control center MCC. Although this specification describes the W-CDMA mobile communications system to enable any person skilled in the art to make or use the present invention, the present invention is not intended to be limited to the described W-CDMA mobile communications system, but is intended to cover any mobile communications system according to any kind of access manner within the attached claims.

To prescribe the interfaces, this chapter includes the following items:

1) Services Provided by the System and the System Capabilities in Compliance with the Protocols

2) System Functional Structure and Control Manners for Realizing the Services and System Capabilities

3) Rules for Reference Model Structure and Interfaces in Compliance with the Protocols

4) Physical Architecture and Physical Condition of the Radio Interface

5) Signal Transfer Protocol for the Radio Interface (Layer-2)

6) Control Protocol for the Radio Interface (Layer-3)

7) Physical Architecture and Electrical Condition of the BS-MCC Interface

8) Information Transmission Protocol for the BS-MCC Interface (ATM Layer

and AAL type-2)

9) Signal Transfer Protocol for the BS-MCC Interface (AAL)

10) Control Protocol for the BS-MCC Interface (Layer-3)

The control manners and protocol specifications described in this chapter comply with recommendation drafts Q.FNA, Q.FIF, Q.FSA, and Q.FSR prepared on the basis of the discussions at TTC IMT-2000 Study Committee, Network Aspect ad hoc.

2.2 FEATURES OF ACCESS INTERFACES

Next, features of access interfaces will be described.

2.2.1 HANDOVER

A plurality of radio zones are arranged in a mobile communications system and each zone is provided with a base station. To start communication between one of the base stations and a mobile station, a kind of wireless channel called a perch channel is employed. More specifically, a plurality of perch channels of which the frequency bands are different from each other are established between the base station and the mobile station for selecting one of traffic channels for actual communication. That is to say, the traffic channel TCH for transporting voice or messages is selected by virtue of the perch channels.

When a mobile station MS travels across the boundary of radio zones, lowered is the level of the electric field of the radio wave received from the base station of the zone from which the mobile station has exited, thereby depreciating the communication quality. Accordingly, it is necessary for the mobile station to alter the currently communicating base station to a new base station from which the reception is more excellent, so that the traffic channel TCH employed by the mobile station MS is replaced. This replacement is called handover.

In order to facilitate handover, it is preferable that the frequency band of the former traffic channel TCH and that of the new traffic channel TCH are the same with each other. In accordance with traditional mobile communications, a mobile station MS measures the respective levels of the electric fields of in relation to circumferential perch channels and selects candidate base stations for handover. The mobile station then informs the network of a handover request designating the candidate base stations for handover.

However, if the traffic channel TCH of the same frequency band as that of the currently communicating channel is not preselected for candidate cells in circumferential zones, it is impossible that the cells serve the mobile station although the mobile station has transmitted the handover request. Therefore, it is necessary for the network to exclude, from the candidate cells, the cell without preselection of traffic channel TCH of the same frequency band as that of the currently communicating traffic channel in accordance with the prior art.

Accordingly, in the present system, the mobile station MS sends the network a handover request wherein previously excluded is the cell that does not preselect the traffic channel TCH at the same frequency band as the current communication. Next, this feature will be described with reference to Figure 259 in more detail.

Figure 259 represents an example of handover procedure in the present communications system. In Figure 259, a mobile station MS is communicating at a frequency band f2 in a zone 1. Assume the mobile station MS travels from zone 1 to zone 2; and strength ranking of the reception level (level of the electric field of the received wave) measured by the mobile station MS at the frequency band f2 is zone 2, zone 3, and zone 4. In this case, the traditional handover request designates that the primary candidate zone is zone 2, the secondary candidate is zone 3, and the third candidate is zone 4.

On the contrary, according to the present communications system, broadcasting information indicating the preselection condition of the traffic channels TCH with reference to the respective circumferential zones is informed to the mobile station MS as will be described at section 2.5.2.4.2.6. Using the broadcasting information, the mobile station recognizes the zone in which the traffic channel TCH at the same frequency band as the current communication is not preselected, so as to exclude the recognized zone from the handover candidates. Therefore, the mobile station MS in the embodiment informs the network of the handover request designating that the primary candidate zone is zone 3 and the secondary candidate is zone 4.

As will be described in section 2.3.2.2.4, the present communications system can carry out a handover branch addition, handover branch deletion, and branch replacement handover. The above-discussed procedure in view of the preselection status of traffic channel may be carried out at the handover branch addition and the branch replacement handover.

With reference to Figure 37, description will be given with respect to an example of sequential operation wherein the mobile station MS completes to request handover. In Figure 37, MRRC, MRTR, RFTR, and RRC designate functional entities arranged in the mobile station MS. MRRC controls the radio resources. MRTR controls an encipherment procedure and outputting procedure and measures the radio environment, that is, the respective reception levels in relation to the circumferential radio zones. RFTR controls an encipherment procedure and outputting procedure. RRC controls the radio resources.

As shown in Figure 37, MRRC provides a CELL CONDITION MEASUREMENT request indication indicating a request for measurement of the wireless environment to MRTR at periodic intervals. Upon the reception of it, MRTR measures the respective reception levels in relation to the circumferential radio zones and transmits MRRC the measurement result as a CELL CONDITION MEASUREMENT response confirmation. Next, MRRC compares the reception level of the currently communicating wireless channel with the reception levels of the wireless channels from the circumferential zones. If the latter is stronger than the former, MRRC conducts the following process to execute handover.

MRRC excludes the zone to which the traffic channel is not preselected on the basis of the broadcast information, and ranks the zones in strength order with reference to the same frequency band as the current communication. Then, MRRC rearranges the remaining zones in order of strength rank, the remaining zones being the candidates for handover; generates a NON-SOFT HANDOVER EXECUTION TRIGGER request indication designating the strength order of the remaining zones; and sends the NON-SOFT HANDOVER EXECUTION TRIGGER request indication to TACF in the network via RRC.

The notification of non-soft handover execution trigger requirement to TACF triggers the handover. Then, the network selects the base station among the candidate base stations in order to execute the handover and notifies the mobile station MS about the selected base station, thereby activating the traffic channel in relation to the base station. Accordingly, it is possible for the network to exclude complicated control procedures, e.g., detection procedure of the frequency band that the mobile station MS uses for communication and determination procedure as to whether the traffic channel TCH of the same frequency band is preselected by the candidate zone or not. Subsequent operation following the handover trigger is illustrated in Figure 49.

2.2.2 REPLACEMENT OF ACCH

Associated control channel (ACCH) is a kind of control channel utilizing the same radio resources as those for the traffic channel TCH that is used for voice or data transportation. By means of ACCH, control signals may be transported between the mobile station MS and base station BS.

There is a kind of communications system wherein one mobile station MS can treat a plurality of calls simultaneously. In addition, there is another kind of communications system wherein one mobile station MS realizes a call using a plurality of radio physical channels. These systems are suitable for radio bearer services. In these kinds of systems, sometimes it is necessary that control signals may be transported between the mobile station MS, which is treating the plurality of calls, and base station BS.

For this purpose, it would be possible to form ACCHs corresponding to all of the plurality of calls for transporting control signals, ACCHs being constituted of wireless communication resources which are also utilized by the traffic channels. However, this technique needs many hardware elements for transporting control signals and complicated control procedures for managing the transportation order of control signals in the plurality of ACCHs.

Accordingly, in the present communications system, when the mobile station treats a plurality of calls using a plurality sets of wireless communication resources which are also being utilized by a plurality of traffic channels, one set of the wireless communication resources is selected and then the control channel, which uses this set, is established between the mobile station and the base station for transporting the control information therebetween.

The method for establishing ACCH in the communications system will be described next in more detail.

Figure 260 illustrates an example of mobile communications system wherein a mobile station treats a plurality of calls. In Figure 260, traffic channels respectively corresponding to the plurality of calls are established between a mobile station MS and a base station BS, whereby the calls can be treated simultaneously. For treating the multiple calls, only one ACCH (e.g., ACCH1 in Figure 260) is selected from the multiple ACCHs corresponding to multiple traffic channels, and shared for transporting all control signals in relation to the mobile station in the system.

Therefore, by virtue of the system, it is possible to reduce the number of hardware elements for transporting control signals in comparison with the case that all of the plurality of calls respectively utilize multiple ACCHs, corresponding to the multiple traffic channels. In addition, it is possible to exclude complicated control procedures, e.g., management of the transportation order of control information in the plurality of ACCHs.

In the system shown in Figure 260, however, when a set of wireless communication resources involved in the single ACCH is released due to the release of one of the traffic channels by the ending of the call, it is difficult to secure the ACCH to continue the other call. The same problem may occur when the transmission rate in the ACCH is altered.

Accordingly, in addition to sharing the single ACCH by the multiple traffic channels for realizing the multiple calls simultaneously by the single mobile station MS, when the single set of wireless communication resources involved in the single ACCH is released, the ACCH is replaced by another ACCH. Figure 261 illustrates functional entities to realize the ACCH replacement of the system. In this illustration, the mobile station MS treats two calls, namely first call and second call, simultaneously, the first and second calls utilizing the traffic channel TCH1 or TCH2 respectively. However, only one associated control channel ACCH1 is served for transporting control information between the network and the mobile station MS in an initial state.

As shown in Figure 261, the mobile station MS includes functional entities called TACAF, BCAF1, and BCAF2. TACAF controls the access and instructs to release and establish the ACCHs. BCAF1 controls the radio bearer for the first call while BCAF2 controls the radio bearer for the second call. BACF1 and BACF2 execute to release and establish the corresponding ACCHs, respectively.

The base station BS includes functional entities called BCFr1 and BCFr2 while the network includes a functional entity called TACF which functions as a base station controller (BSC). BCFr1 and BCFr2 respectively control the radio bearers for the first and second calls and execute to activate and release the corresponding ACCHs. TACF controls the access and instructs to activate and release the ACCHs.

Assume that the second call utilizing the traffic channel TCH2 should be continued while the first call utilizing the traffic channel TCH1 is ended. The ACCH replacement procedure will be described in the sequential diagram in Figure 262.

In the procedure, first, once the first call utilizing the traffic channel TCH1 is ended, the traffic channel TCH1 is released. Once TACF detects the release trigger of the traffic channel TCH1, TACF determines whether ACCH1 on the same physical channel as the traffic channel TCH1 is used or not. In addition, TACF determines whether an ACCH is necessary for continuing the traffic channel TCH2 although the traffic channel TCH1 is released.

If those determinations are affirmative, TACF sends BCFr2, which is in charge of the second call, an activation request for ACCH2 that is accompanying with the traffic channel TCH2. In response, BCFr2 activates ACCH2. Then, BCFr2 sends a completion report indicating the completion of the activation of ACCH2 to TACF.

Upon the completion report, TACF informs TACAF of a replacement request for switching to ACCH2. The reception of the replacement request causes TACAF to inform BACF2 of an establishment request for ACCH2, so that BCAF2 establishes ACCH2. Additionally, TACF informs BCAF1 of a release requirement for ACCH1, so that BCAF1 releases ACCH1.

Next, TACAF sends TACF a replacement completion report indicating the completion of the replacement of ACCH. Then, TACF informs BCFr1 of a request for releasing ACCH1, so that BCFr1 releases ACCH. Consequently, the ACCH replacement is completed, so that transportation of control information between the mobile station and the network may be accomplished via ACCH2, which uses the same radio resources as the traffic channel TCH2. The ACCH replacement procedure will be described again in more detail at section 2.4.3.5.7.

2.2.3 PROCEDURES FOR ENCIPHERMENT ONSET MOMENT NOTIFICATION

Since mobile communications are carried out over the air, signals are sometimes ciphered (encoded into cipher) at the source terminal to be preserved from intercept or manipulation by a third party. The destination terminal deciphers the ciphered signals (decodes them to make out the meaning).

However, in communication of the enciphered signals (control signals), if the onset moment of the encipherment is unclear, it is impossible to decipher smoothly. That is, if the onset time of the decipherment may be misestimated, the meaning of signals cannot be made out.

With reference to Figures 751 and 752, a trouble occurring in relation to timing error of encipherment onset and decipherment onset will be described.

Figure 751 represents a mobile communications system in which an encipherment transfer is conducted. Assume that a mobile station MS can receive signals using a diversity handover technique. As illustrated in Figure 751, a base station controller RNC distributes the same series of transmission signals (non-enciphered signals) to a plurality of radio base stations BS1 to BS3 for diversity handover of the mobile station. Then, the radio base stations BS1 to BS3 enciphers the series of signals and transmits the enciphered signals to the single mobile station MS.

In this system, since the respective base stations execute the encipherment processes, there is likelihood that the onset moment of the encipherment varies among the base stations. It is possible in theory to align the encipherment onset moment among the base stations, but difficult in practice. More specifically, the base station controller RNC should negotiate with the radio base stations BS1 to BS3 in advance for matching the encipherment onset time. However, it is difficult in practice to prevent the timing error completely.

As described above, it is necessary that the same kind of signal (i.e., enciphered transmission signal or non-enciphered transmission signal) should be transmitted from all of the base stations BS1 to BS3 for realizing the diversity combining at the mobile station. However, layer 1 of the OSI reference model supervises between the mobile station and the respective base stations although layer 3 supervises between the mobile station MS and the base station controller RNC or between the mobile station MS and the mobile service switching center MSC.

Accordingly, as shown in Figure 752, if the encipherment is conducted for Layer 1 of the OSI reference model, a group of base stations (e.g., BS2 and BS3) transmit enciphered signal while another group of the base stations (e.g., BS1) transmit non-enciphered signal at the same time. Therefore, it is impossible for a type of mobile station, which cannot process in parallel the enciphered signal and non-enciphered signal in view of structure simplification and production-cost reduction, to conduct diversity combining.

Therefore, it is an object to provide a communications system wherein even a type of mobile station, which cannot process in parallel an enciphered signal and non-enciphered signal, can carry out diversity reception securely. In the system, the mobile station MS and the mobile communications control center MCC mutually inform of the encipherment moment, so as to appropriately decipher for errorless communication.

With reference to the functional model in Figure 64, the encipherment onset moment notification procedures will be described. As shown in Figure 64, the mobile station MS includes functional entities called UIMF, MCF, and TACAF. UIMF stores information on the station user and serves the user authentication and encipherment calculation. MCF functions as an interface with the network for realizing services that are not related to calls. TACAF controls the access processes to the mobile station terminal, e.g., the origination, paging, and so on.

The network on the other hand includes functional entities called SACF, TACF, LRCF, and LRDF. SACF is connected with MCF to function as an interface with the mobile terminal for realizing services that are not related to calls. TACF is connected with TACAF to control the access processes to the mobile station terminal, e.g., the origination, paging, and so on. LRCF is connected with TACF and SACF to control mobility management. LRDF stores various data on mobility management.

With such a structure, prior to the mutual notification of the encipherment onset, a user authentication procedure (refer to section 2.4.5.1) is executed as shown in Figure 63. In execution of the user authentication procedure, a certificated encipherment key is previously stored at UIMF and LRDF of the network and mobile terminal and delivered to TACAF, MCF, TACF, and SACF.

Then, mutual notification of the encipherment onset time is carried out in accordance with the sequence shown in Figure 65. More specifically, first, LRCF of the network sends a START CIPHERING request indication for indicating that the network will start encipherment to TACAF and MCF of the mobile terminal via TACF and SACF of the network. Consequently, the mobile terminal can recognize that the succeeding signals transmitted from the network will be ciphered. After the transmission of the START CIPHERING request indication, TACF and SACF of the network cipher succeeding signals according to a preselected encipherment procedure using a preselected ciphering key. Once the mobile terminal receives the enciphered signal, TACAF and MCF controls the decipherment of the received signals. In advance to the decipherment, TACAF and MCF receive the encipherment key from UIMF to carry out the decipherment. Accordingly, the downlink signal transmitted from the network can be transported in secret and interpreted by only the mobile terminal.

Next, TACAF and MCF of the mobile terminal send a START CIPHERING response confirmation to TACF and SACF of the network, this confirmation indicating that mobile station will next start to transmit enciphered signals. Consequently, the network entities can recognize that the succeeding signals transmitted from the mobile terminal will be ciphered. After the transmission of the START CIPHERING response confirmation, TACAF and MCF of the mobile terminal cipher succeeding signals according to a preselected encipherment procedure using a preselected ciphering key. Once the terminal entities receive the enciphered signal, TACF and SCF decipher the received signals. Accordingly, the uplink signal transmitted from the mobile terminal can be transported in secret and interpreted by only the network.

Next, it will be discussed which kind of information should be ciphered. In the invented system, the source device can freely decide the information to be ciphered as long as the destination device is notified of the ciphered information and communications at layers 1 through 3 are established.

It is known that open system interconnection protocols should be adapted to the open system interconnection reference model illustrated in Figure 263. The OSI model defines the hierarchy consisting of seven functional layers for managing various functions from physical interconnection to application.

The lowest layer, layer 1 is called the physical layer. The physical layer prescribes mechanical or electrical procedures or means, for example, configurations of connection plugs.

Layer 2, datalink layer operates to establish, maintain, and release an individual data link and to detect and recover the error occurring in the physical layer.

Layer 3, network layer sets up and manages an end-to-end connection between different networks, whereby the upper layers can proceed their respective functions without processing for the network type.

Layer 4, transport layer controls the transparent end-to-end data relaying service between session entities.

Layer 5, session layer establishes or releases the session connection.

The sixth or presentation layer negotiates agreeable technique for data encoding and punctuation.

The seventh or application layer identifies the communicating source and instructs the service quality.

The international telecommunication union (ITU) scribes the line circuit interface at layer 3 that corresponds to layers 3 through 7 in the OSI reference model.

The relationship of the OSI reference model and the present system will be described in more detail with reference to Figure 753. Figure 753 is a general view of the present system.

The system illustrated in Figure 753 includes a mobile station MS, a plurality of radio base stations BS communicable with the mobile station MS over the air, an base station controller RNC for controlling the base stations BS, and a mobile service switching center MSC for connecting the base station controller RNC with a fixed network. In addition, the system meets the following conditions:

i) Both of the mobile station MS and the base station controller RNC can carry out diversity reception and distribution.

ii) Layer 1 of the OSI reference model for the radio channel supervises between the mobile station MS and the respective base stations BS.

iii) Layer 2 of the OSI reference model for the radio channel supervises between the mobile station MS and the base station controller RNC.

iv) Layer 3 of the OSI reference model for the system supervises between the mobile station MS and the base station controller RNC or between the mobile station MS and the mobile service switching center MSC.

In addition, Layer 2 should meet the following functional conditions:

i) At the source, it has a function to retransmit layer-2 frames

ii) At the destination, it has a function to reassemble layer-3-frames from received layer-2-frames in the regular order even if a layer-3-frame was divided into a plurality of layer-2-frames at the source.

iii) At the destination, it does not have a function to interpret a ciphered signal and non-ciphered signal both corresponding to the same information when it receives them simultaneously.

Under the above-mentioned conditions, assume that layer 2 conducts the encipherment procedure on layer 2. In this case, as shown in Figure 754, an application in the mobile service switching center MSC sends an encipherment onset indication at step S1. The encipherment onset indication is transferred from layer 3 to a layer-2-controller at step S2, to a layer-2-cipherer/decipherer at step S3, and to the mobile station MS at step S4.

The network application then sends an encipherment onset request to the layer-2-cipherer/decipherer of the mobile station MS via the layer-2-cipherer/decipherer of the network at step S5. Afterward, the application of the mobile service switching center MSC makes the layer-2-cipherer/decipherer of the base station controller RNC carry out the encipherment process, whereby the signal transmitted from the layer-2-cipherer/decipherer are enciphered.

In the mobile station MS, the encipherment onset indication is transferred from layer-2-cipherer/decipherer to layer-2-controller at step S6, to layer 3 at step S7, and finally to the application at step S8. Upon the reception of the encipherment onset indication, the application of the mobile station instructs or sets the layer-2-cipherer/decipherer to decipher the transmitted signal from the network at step S9.

If the second layer conducts the encipherment process under the above-described conditions, the encipherment is started at the network before the signals are distributed to the radio base stations BS for diversity handover in the network. Therefore, the mobile stations can receives the ciphered signals from the respective base stations, thereby achieving diversity handover surely even if it cannot process in parallel an enciphered signal and non-enciphered signal.

However, in this case, it is possible that the application of the mobile station requests the layer-2-cipherer/decipherer to decipher signals (Step S9) simultaneously with the retransmission request from the layer-2-controller in the mobile station to the network (Steps S10 to S12). If the network begins to retransmit the requested signals (Steps S13 and S14) before the completion of the decipherment set-up in the layer-2-cipherer/decipherer, the layer-2-cipherer/decipherer will not decipher the enciphered signal and transfer it as it is to the layer-2-controller. In this case, the layer-2-frame sequence number of the signals may not be interpreted. This phenomenon is caused from that although layer 2 (datalink layer) detects errors occurring at layer 1 (physical layer) referring to CRCs attached to the signal frames and facilitates the retransmission, layer 2 also provides the encipherment procedures.

This results in problems: the first problem is that the retransmitted layer-2 frames cannot be utilized, and the second problem is that it is impossible to reassemble layer-3-frames from received layer-2-frames in the regular order if a layer-3-frame was divided into a plurality of layer-2-frames at the source.

Accordingly, it is preferable that the mutual notification of the encipherment onset (transmission of START CIPHERING request indication and START CIPHERING response confirmation) is conducted at the layer which is layer 3 or higher rather than layer 2 in the OSI reference model. Therefore, in the system, ciphered is only information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model although the mutual notification of the encipherment onset time is conducted at layer 2.

Consequently, although normal reception is not achieved by an error occurring in layer 1 (physical layer), the retransmission can be made out by the error detection and retransmission in layer 2 independently of layer 1. The retransmission causes the reception of the non-received signals in the proper order by the destination. Therefore, the destination can recognize the encipherment onset time at an improved precision. However, if the reliability of layers 1 and 2 can be improved, it is possible to cipher at layer 2.

2.2.4 REASSIGNMENT OF TMUI

In the system, an IMUI (international mobile user identity) is already assigned to each of the mobile stations. Each mobile station stores the corresponding IMUI while the network stores a plurality of IMUI of the mobile stations.

Communication may be carried out using the IMUIs, but they can be intercepted by a third party since mobile communications may be achieved by the air interface. This results in that the third party can communicate using the intercepted IMUI.

Therefore, in the present system, the network assigns another identity, namely, TMUI (temporary mobile user identity) to each of the mobile stations that is communicable with the network and notifies the corresponding mobile station about TMUI. More specifically, the TMUI is enciphered to be preserved from being intercepted, and then transmitted through the air interface to the mobile station.

The assignment of TMUI is conducted at the location registration procedure. If the location registration procedure is failed, the location registration procedure should be repeated again. Therefore, confusion of TMUI at each mobile station will not occur in theory. However, if a machine storing TMUI in a mobile station or the network malfunctions, such confusion of TMUI and IMUI may occur.

In this case, recovery process is needed for correcting the confusion. Therefore, the system adopts the following procedures, which should be carried out by the network and the mobile station MS.

Figure 264 represents a sequential operation by the network and a mobile station MS. This operation starts after a call attempt comes into the network from a user terminal other than the mobile station MS illustrated in Figure 264. Once the network (more exactly, the mobile communications control center) receives a call income, the mobile communications control center first carries out a paging in a manner that TMUI of the incoming call destination is specified, as shown in Figure 264. This paging process is a broadcasting of TMUI to the areas of which the mobile communications control center MCC is in charge.

As mentioned above, TMUI is assigned to each mobile station MS communicable with the mobile communications control center MCC and each mobile station MS stores its TMUI. Therefore, once mobile stations MS receive the broadcast TMUI, each mobile station determines whether the broadcast TMUI is coincident with the TMUI stored therein. If the determination is affirmative, only the corresponding mobile station MS sends a paging response to the mobile communications control center MCC at step S2.

Next, the network checks the authenticity of the user (see section 2.3.2.4.1). More specifically, the network generates a necessary authentication information (random number) for checking the authenticity of the accessing mobile station MS and transmits it to the mobile station MS at step S3. Once the mobile station MS receives the authentication information, the mobile station MS executes an arithmetic operation based on the authentication information (random number) and transmits the authentication calculation result as an authentication response at step S4. The authentication calculation uses an authentication key stored in each mobile station MS previously. The network stores the authentication keys of the respective users at its storage device (e.g., SDF) in a manner that the respective authentication keys are associated with the respective IMUIs and TMUIs for finding the correlation.

Then, the network reads out the authentication key corresponding to the temporary mobile user identity used for the paging at step S1. Next, the network executes the authentication calculation on the basis of the read authentication key and the authentication information (random number) transmitted at step S3, and determines whether or not this calculation result is coincident with the calculation result by the mobile station MS at step S5. If the determination is affirmative (the results are coincident), the mobile station MS is authenticated (the mobile station belongs to a proper subscriber and is the proper call destination). Afterward, a normal incoming call acceptance procedure is executed.

However, if the determination is negative (the results are not coincident), the mobile station MS is not the call destination. Such a discord is caused from that the replying mobile station MS is fraudfull or TMUI managed by the network and TMUI managed by the proper subscriber's mobile station became discord with each other accidentally. Accordingly, the network checks the authenticity of the mobile station using the international mobile user identity.

Specifically, first the network (in fact, the mobile communications control center) transmits an IMUI transmission request to the mobile station MS for instructing it to transmit the IMUI at step S6. In response, the mobile station MS notifies the IMUI stored in itself.

The network then generates the random number again as the authentication information and sends it to the mobile station MS. In response, the mobile station MS uses the authentication information and the authentication key stored in itself to execute an authentication calculation and sends the authentication calculation result as an authentication response to the network at step S9.

The network then accesses to the storage device thereof and reads out the authentication key corresponding to the IMUI obtained at step S7. Next, the network executes the authentication calculation on the basis of the read authentication key and the authentication information (random number) transmitted at step S8, and determines if this calculation result is coincident with the calculation result by the mobile station MS or not at step S10. If the determination at step S10 is negative (the results are not coincident), the mobile station MS is completely fraudfull, so that the radio channel between the network and the mobile station MS is disengaged, thereby finishing the communication at step S12.

On the contrary, if the determination at step S10 is affirmative (the results are coincident), the mobile station MS can be considered to belong to a proper subscriber, but its TMUI was altered accidentally. Thus, the mobile communications control center MCC reassigns TMUI at step S11. In other words, as long as the mobile station MS belongs to a proper subscriber, it can obtain TMUI again and afterward it can communicates with the network by means of the newly assigned TMUI although the former TMUI has been changed to null accidentally. However, since the mobile station is not a call destination in fact (although the mobile station belongs to a proper subscriber), the radio channel between the network and the mobile station is disconnected, so that the communication is ended at step S12.

As described above, according to this reassignment of TMUI, although TMUI stored in the network and TMUI stored in the mobile station MS is different, the network can recognize that mobile station MS belongs to a proper subscriber as long as the IMUI is correct and can reassign the new TMUI to the mobile station MS. Therefore, although the former TMUI has been changed to null accidentally, the mobile station can be returned quickly to the normal condition in which it can communicate normally.

Furthermore, when the location of the mobile station is registered or the mobile station request the call origination as well as the incoming call acceptance described above, the authentication using the TMUI is conducted. In this case, the reassignment of the TMUI is conducted if necessary. In the network, the TMUIs are managed by SDF, which will be described later. SDF can be, for example, arranged in a location register for managing various information on subscribers in the network.

2.3 BRIEF DESCRIPTION OF SYSTEM

Next, the system will be described briefly.

2.3.1 PROVIDED SERVICES

This system can totally provide various information transfers including voice transfer and data transfer. This system can also provide one mobile station with a plurality of bearer services at the same time. For example, the single mobile station can benefit by two unrestricted digital bearer services at 64 kbps simultaneously. Furthermore, unlike the traditionally PDC mobile communications system, the wire communication meets the requirements of ATM and the radio communication meets the requirements of CDMA, whereby transfer is achieved at improved quality and improved velocity.

Figure 266 shows the features of services, which can be provided by this system. In addition, the present system can be connected with another system managed in accordance with PSTN, N-ISDN, PLML, B-ISDN, or IMT-2000.

2.3.1.1 BEARER SERVICES

This system can provide the following bearer services.

(1) Circuit Switching Mode

a) Voice Bearer Service at 8 kbps

This bearer service is provided for supporting voice services. The digital signals at the Um reference point comply with ITU-T recommendation G.729. However, the bit transparency is not ensured. This bearer service will not be utilized for voice-band data communication. The features of the voice bearer service at 8 kbps are listed in Figure 267.

b) Unrestricted Bearer Service at 64 kbps

This bearer service provides information transfer at 64 kbps, the information being not changed between the Um reference points. The features of the unrestricted bearer service at 64 kbps are listed in Figure 268.

c) Multiplex-Rate unrestricted Bearer Service at n × 64 kbps (n is a natural number, e.g., 6)

This bearer service provides information transfer at 384 kbps wherein subrate information is multiplexed with one another, the subrate information being not changed between the Um reference points. The features of the multiple-rate unrestricted bearer service are listed in Figure 269.

(2) PACKET SWITCHING MODE (should be studied further)

This system can provide bearer services at the packet switching mode in addition to those at the circuit switching mode.

2.3.1.2 MOBILITY SERVICE

In order to facilitate the mobility or portability services, international mobile user identity (IMUI) is adopted. IMUI is previously assigned to each of the mobile stations for identifying the respective mobile stations. Each mobile station stores its IMUI while the network mobile communications control center MCC stores a plurality of IMUIs of the mobile stations that are served by the network. When one mobile station moves to a next radio zone, the IMUI of the mobile station is utilized for the location registration and handover, so as to enable the mobile station to communicate irrespectively of its location.

2.3.1.3 QUALITY REQUIREMENTS

This system enables error correction coding and retransmission functions. Therefore, the average bit-error rate in the network and the air interface is ensured to be less than 10^{-3} in relation to voice transfer. In relation to transfer of information, e.g., data or control information other than voice, the average bit-error rate is ensured to be less than 10^{-6}.

2.3.2 SYSTEM CAPABILITIES

2.3.2.1 SYSTEM CAPABILITIES ON CONNECTION SERVICES

2.3.2.1.1 ORIGINATION

"Origination" is a series of controlling procedures for setting up the intra-network and network-MS access links necessary for communicating with a called terminal and for setting up connection to the called terminal on the basis of an access of a calling mobile station upon a call attempt by the user of the calling mobile station. "Origination" procedures include an SDCCH control, user identity retrieval, user authentication, encipherment-onset time notification, establishment of access link, mutual information transfer to and from the calling user terminal, and analysis.

The system comprises the following capabilities for the origination procedures. First, it is possible to establish an SDCCH (stand-alone dedicated control channel) to inform the network of the call attempt by the mobile station MS. SDCCH will be described later in more detail at the section entitled "SDCCH Control" of this chapter. Furthermore, in order to establish the association (terminal association) between the mobile station and the network, the system comprises the following functions.

a) The network is notified of the call attempt indicating the temporary mobile user identity (TMUI) of a calling mobile station by the mobile station, thereby setting up the terminal association. In addition, the network is informed of feature capabilities of the mobile station by the mobile station and the information on the capabilities is stored in the network, so that the network controls to allow or reject the another call attempt to the mobile station.

b) The network recognizes the calling mobile station, which has requested the call attempt, and transfers unique information about the calling mobile station from a network data base to analyzing functional entities and control functional entities. If the network cannot recognize the temporary mobile user identity (TMUI) the calling mobile station, the network sends an inquiry about the international mobile user identity (IMUI) to the calling mobile station for recognition.

c) The user authentication of the mobile station is executed as described above. The user authentication will be described in more detail at the section entitled "User Authentication" of this chapter.

d) In order to preserve signals transmitted through the control channel and the information channel between the mobile station and the network from being intercepted and manipulated by a third party, signals are ciphered. The encipherment will be described in more detail at the section entitled "Encipherment" of this chapter.

e) The mobile station is informed of successes and failures of the above-mentioned respective procedures.

In addition, the network is informed of the services required by the calling mobile station after the establishment of the terminal association. In addition, the network informs the calling mobile station of the acceptance of the call attempt after the establishment of the terminal association.

Additionally, a call origination control function is informed of an instance of the terminal association control function, whereby they are associating with each other.

The mobile station informs the network of the environmental radio condition around the mobile station when the calling mobile station sends the call attempt, whereby the network recognizes the condition.

Upon the reception of the call attempt from the mobile station, the user profile of the originating terminal is retrieved and analyzed, so that the services that can be provided for the originating terminal are determined.

On the basis of the analysis of on the call attempt from the mobile station, appropriate network resources, for instance, voice coder-decoders, data trunks, and wired channels in the network are captured, set up, and activated.

The access link for the traffic channel and the associated control channel, which are suitable for the services requested by the calling mobile station, can be established (refer to the section entitled "Access Link Establishment" in this chapter). Once the associated control channel is established, the SDCCH transferring previously the control signals is released. The release of the SDCCH will be described in more detail at the section entitled "SDCCH Control" in this chapter.

The called user terminal is requested to communicate with the originating user terminal. While the called terminal is requested to communicate, the originating user terminal is informed of the calling to the called user terminal and the response from the called user terminal.

The calling or called mobile terminal, for which the call has been established, can originate another call (additional call). However, since the mobile terminal has been already authenticated, the authentication process is not carried out for the additional call.

In addition, although a call has been established between terminals, another call requested from a third party may be established.

2.3.2.1.2 INCOMING CALL ACCEPTANCE

"Incoming call acceptance" is a series of controlling procedures wherein the networks calls a destination user mobile station upon a service request from a calling user terminal, and receives the response from the destination user mobile station so that access-links within the network and between the network and the mobile station are established, and connection between those mobile stations are established for the communication between the calling and destination user terminals. "Incoming call acceptance" procedures include paging, SDCCH control, user identity retrieval, user authentication, encipherment-onset time notification, routing in the network, establishment of access link, mutual information transfer to and from the called user terminal, and analysis.

The system comprises the following capabilities for the termination procedures.

First, the network receives a call attempt from a calling user terminal which may be a subscriber terminal of this system or another system connected thereto. Then, the network retrieves the profile of the called user terminal on the basis of the mobile user identity of the called user terminal. Therefore, the network can obtain various information necessary for analyzing the services which can be provided for the called user terminal, for analyzing the condition of the called user terminal, for determining if paging is necessary or not, for determining the areas for the paging, and for establishing the terminal association between the network and the called user terminal. Then, the paging function entity of the network is activated for paging. However, the paging is not carried out for the additional call.

The called mobile station is called by means of the mobile user identity of this mobile station. The network can recognize the responding mobile station. Usually, in this procedure, TUMI may be used for the mobile user identity. If the network detects an abnormality of the TMUI, the IMUI uniquely given to the mobile station is used. The paging procedure may be realized by the following capabilities.

a) The network recognizes the area or areas where the called mobile station is paged, and then determines the paging channels used for the paging. Then, the network distributes a paging signal to intra-network nodes (base terminal systems). In response, each BTS transmits a paging signal in its coverage sector for paging the called mobile station within the necessary area.

b) An SDCCH is established in order that the mobile station sends the network a response to the paging. This feature will be described in more detail at the section entitled "SDCCH" control in this chapter.

c) Once the called mobile station sends the network the response to the paging, the terminal association between the called mobile station and the network is activated. In addition, the response signal can be identified by a paging ID corresponding to the calling signal. Furthermore, the mobile station notifies the network about the capability of the mobile station. The network stores the information on the mobile station capability for future reception management of another new call attempt to the mobile station.

The mobile station informs the network of the environmental radio condition around the mobile station when the mobile station responds to the paging, whereby the network recognizes the condition.

Once the mobile station responds to the paging, the network establishes the terminal association between the network and the mobile station. The establishment of the terminal association is executed as follows:

a) The user authentication of the mobile station is executed as described above. The user authentication will be described in more detail at the section entitled "User Authentication" of this chapter.

b) In order to preserve signals transmitted through the control channel and the information channel between the mobile station and the network from being intercepted and manipulated by a third party, signals are ciphered. The encipherment will be described in more detail at the section entitled "Encipherment" of this chapter.

c) The mobile station is informed of successes and failures of the above-mentioned respective procedures.

After the establishment of the terminal association, a routing process is carried out for specifying the route to the intra-network control node which has controlled the establishment, and then the intra-network control node is informed of the setting up of the channels within the network and the services requested by the originating user terminal, so as to activated the incoming call acceptance control function. Additionally, the incoming call acceptance control function is informed of an instance of the terminal association control function, whereby they are associating with each other.

Upon the call attempt, the user profile of the called terminal is retrieved and analyzed, so that the services that can be provided for the called terminal are determined.

On the basis of the analysis of on the call attempt, appropriate network resources, for instance, voice coder-decoders, data trunks, and wired channels in the network are captured, activated and set up.

The access link for the traffic channel and the associated control channel, which are suitable for the call attempt, can be established as will be described at the section entitled "Access Link Establishment" in this chapter. Once the associated control channel is established, the SDCCH transferring previously the control signals is released. The release of the SDCCH will be described in more detail at the section entitled "SDCCH Control" in this chapter.

The called user terminal is informed of a service request from the originating user terminal. While the called terminal is informed of the service request, the originating user terminal is informed of the calling to the called user terminal and the response from the called user terminal.

Although a call has been established between terminals, another call requested from a third party may be established.

In addition, the calling or called mobile terminal, for which the call has been established, can respond to another call (additional call). However, since the mobile terminal has been already authenticated, the authentication process is not carried out for the additional call.

Furthermore, if a plurality of mobile stations respond to the incoming call acceptance paging, a new TMUI is, during the termination procedures, reassigned to one of the mobile station where the stored TMUI is changed accidentally.

2.3.2.1.3 CALL RELEASE

"Call release" is a series of procedures for releasing the link within the network and the access link between the mobile terminal and the network used for a call, and releasing the connection between the mobile terminal and the other user terminal. The call release is carried out upon a call release request from the mobile terminal or the other user terminal, or upon a detection of the deterioration of the radio communication quality. The call release includes a user disconnection procedure (updating the user status data) and a procedure for releasing access links.

When releasing the last call for a mobile station, the association between the mobile station and the network is released. This process accompanies with updating the status data in connection with the mobile station.

For executing the call release, the system comprises the following capabilities.

The network is notified of a call release request from a user terminal, and the user terminal is notified of the acceptance of the release request by the network.

In addition, the network informs the user terminal of a call release request from the other user terminal.

In order to update the user status data when the call release occurs, the user profile is updated.

The access link corresponding to the released call is also released as will be described in more detail at section 3.2.2.3 entitled "Access Link Release."

It is determined as to if the released call is the last call for the mobile station or not. If it is the last call, the status data in connection with the mobile station managed in the network is updated to indicate none call status.

Call can be also released upon an access link release procedure (refer to section 3.2.2.3 entitled "Access Link Release") resulting from the detection of out of synchronization.

Call can be also released upon a call release request from the mobile terminal.

Call can be also released if the originating mobile station abandons the call.

2.3.2.2 SYSTEM CAPABILITIES ON ACCESS LINK CONTROL

2.3.2.2.1 SDCCH CONTROL

"SDCCH Control" includes a procedure for establishing an SDCCH (stand-alone dedicated control channel) for transporting control massages between the mobile station and the network and a wired access link for transporting the control messages within the network on the basis of an access of a mobile station; and a procedure for releasing the SDCCH and the wired access link within the network when they become not necessary. These procedures are carried out for every process, which needs the interaction between the mobile station and the network, e.g., the mobile station call origination process, the mobile station call termination process, and the mobile station location registration.

In order to execute the SDCCH control, the system comprises the following functions.

The mobile station executes a random access procedure over the RACH (random access channel) and requests the network to establish the SDCCH. In response, the network assigns radio resources (uplink and downlink codes) for the

SDCCH to the mobile station using a FACH (forward access channel). The relationship between the establishment request and the assigned the code resources are determined by a random number (personal identification or PID) contained in the request message transmitted by the mobile station.

In addition, the network can select the radio resources (uplink and downlink short codes) for the SDCCH for each sector from the resources managing for the sector. Unique uplink and downlink long codes are used for each base station. In addition, the phase of long codes used for each sector in a cell is different from that used for the other sectors in the same cell. Thus, the mobile station obtains the current downlink long codes by a cell search process or broadcast information from a broadcasting channel BCCH1 and obtains the current uplink long codes by broadcast information from the broadcasting channel BCCH1.

The network also establishes a wired access link for transferring the control messages within the network upon the establishment request for the SDCCH from the mobile station.

It is possible to recognize information on the location of the mobile station when requesting to establish the wired access link within the network.

It is possible to control the power for transmission through the RACH, FACH, and SDCCH. The control manner will be described at section 2.3.2.2.6 in more detail.

The network and mobile station can recognize that the status in which the SDCCH is unnecessary since, for instance, a process, e.g., the location registration which is not associated with call is ended or transited to the ACCH. Then, the network and mobile can release the SDCCH respectively.

2.3.2.2.2 ACCESS LINK ESTABLISHMENT

"Access link establishment" is a series of procedures for setting up a traffic channel for transferring user information and control channels for transferring control information between the network and the mobile station that originates a call or is called. These procedures include establishing wired access link in the network and radio access link between the network and the mobile station.

In order to execute the access link establishment, the system comprises the following capabilities.

The network determines information transfer capabilities and quality levels needed for the respective connection access links on the basis of a call/connection control request, and then allocates appropriate resources to the access links.

The mobile station designates candidate sectors, for which the wired access links or radio access links should be established, on the basis of the measurements of the perch channels and the broadcast information from the network. Then, the mobile station informs the network of the candidate sectors. The call acceptance control procedure will be described in more detail at section 2.3.2.2.7.

The network sets up the wired access link between the network and the respective candidate sectors. Each established wired access link includes the traffic channel for transferring user information and, if necessary, the control channel for transferring control signals.

The network stores the uplink long codes for radio access links in a database within the network according to MS identifiers (TMUI/IMUI). The network retrieves the information from the database to set up an access link.

The network selects radio resources for the radio access link in the specified sector and allocate them to the mobile station. The radio resource selection will be described in more detail at section 2.3.2.2.5.

The mobile station transmits information to the network for determining the initial power for transmission through the downlink radio access link, the information being based on the measurements on the perch channel and including information on the power for transmitting through the perch channel and the signal-to-interference ratio about the signal received from the perch channel.

The network determines the initial power for transmission through the downlink radio access link upon the reception of the information from the mobile station. The control of the transmission power will be described in more detail at section 2.3.2.2.6.

The base station controller receives information on the wired access links and the radio access links and is able to start diversity handover based on the information at the same time when the access links are established for the candidate base stations, and carries out diversity handover on the basis of the information on the candidate sectors. Handover procedures will be described in more detail at section 2.3.2.2.4.

The mobile station informs the network of the respective phase differences upon a broadcast information (periodical broadcasts at the intervals of 20 msec), each phase difference being the difference between the uplink long code phase of the sector to which the SDCCH is established and the uplink long code phase of another candidate sector.

The network synchronizes the uplink radio access links on the basis of the uplink long code phase difference information from the mobile station.

2.3.2.2.3 ACCESS LINK RELEASE

"Access link release" is a series of procedures for releasing all traffic channels for transferring user information between the network and the mobile station and all control channels for transferring control information therebetween. "Access link release" procedures include a procedure for releasing wired access links in the network and radio access links between the network and the mobile station.

In order to execute the access link release procedures, the system comprises the following capabilities.

Due to release of an individual connection or release of connections for a released call, the network releases the corresponding access link. The release of access link is requested from the network to the corresponding mobile station.

If the network detects out-of-synchronization status in connection with all handover branches involved in an access link and does not detect the synchronization status again for a certain time period counted by a squelch reservation timer, the network executes to release the access link.

If the mobile station detects out-of-synchronization status in connection with all handover branches involved in an access link, the mobile station stops to transmit over radio channels involved in the access link and causes the network to recognize that the out-of-synchronization status occurs. It is possible that the mobile station informs the network of the occurrence of the out-of-synchronization.

When an access link is released during diversity handover, all the handover branches involved in the access link are also released.

2.3.2.2.4 HANDOVER

"Handover" is a series of procedures for altering the access point through which a mobile station accesses the network while the communication therebetween is continued. The handover is necessary for the reason of travelling of the mobile station and deterioration of the communication quality, or in order to distribute traffic. The handover procedures include alteration of radio access link and if necessary, alteration of wired access link. In order to execute handover, the system comprises the following capabilities.

The system can execute various types of processes for realizing handover as described below.

a) INTER-SECTOR HANDOVER BRANCH ADDITION IN SINGLE CELL

Near the boundary between sectors in a single cell, added is a branch for a new sector, which is different from the sector currently used, but in the same cell. This addition does not accompany with an addition of the wired access link in the network.

b) INTER-CELL HANDOVER BRANCH ADDITION

Near the boundary between cells, added is a branch for a new cell, which is different from the cell used currently. This addition does accompany with an addition of the wired access link for the newly added cell in the network.

c) INTER-SECTOR HANDOVER BRANCH DELETION IN SINGLE CELL

Near the boundary between sectors in a single cell, deleted is one of handover branches for the sectors when intra-cell diversity is no longer necessary. This deletion does not accompany with a deletion of the wired access link in the network.

d) INTRA-CELL HANDOVER BRANCH DELETION

Near the boundary between cells, deleted is one of handover branches for the cells when inter-cell diversity is no longer necessary. This deletion does accompany with a deletion of the wired access link for the newly deleted cell in the network.

e) INTRA-CELL BRANCH REPLACEMENT HANDOVER

At a boundary between sectors in a single cell, all handover branches are released, and then a new access link is established for the sector, which should be newly served. If the service attributes are not necessary to be changed for this handover, the wired access link in the network is left.

f) INTER-CELL BRANCH REPLACEMENT HANDOVER

At a boundary between cells, all handover branches are released, and then a new access link is established for the cell, which should be newly served. If the service attributions are not necessary to be changed for this handover, the wired access link in the network is left.

g) INTRA-SECTOR FREQUENCY REPLACEMENT HANDOVER

For all handover branches being used for communication, the radio frequency is replaced by another frequency. This handover does not accompany with an addition or deletion of the wired access link in the network.

h) CODE REPLACEMENT HANDOVER

For a handover branch being used for communication, the downlink short code is replaced by annother downlink short code belonging to the same code type in the same sector. This handover does not accompany with a replacement of the wired access link in the network.

i) USER DATA RATE MODIFICATION

In order to alter user-to-user connection attributions, e.g., the user data rate or voice/data type, all handover branches for the connection is released, and then access links for the altered connection are established.

j) ACCH REPLACEMENT

Although radio resources used by an ACCH are released for the reason that a connection or call is released, it is sometimes necessary to continue another call. In this case, the ACCH is handed over to the wired access link and radio access link that has been used for the remaining call.

When control signals are transported through an ACCH corresponding to a connection, it is sometimes necessary to alter the transmission rate. In this case, the ACCH is handed over to the wired access link and radio access link that has been used for another connection.

k) CODE TYPE REPLACEMENT

"Code type replacement" may be carried out. In this case, for all handover branches being used for communication, the downlink short codes are replaced by downlink short codes belonging to a different code type in the same sector. This handover does not accompany with a replacement of the wired access link in the network.

By the above-mentioned handover branch addition, the maximum number of handover branches availed for all simultaneous connections is "N."

The mobile station, on the basis of the perch channel measurements and call acceptance information from the network, requests the network to activate the handover branch addition, handover branch deletion, and branch replacement handover. The request information for the activation includes the information for designating the candidate sectors for handover. The call acceptance control will be described in more detail at section 2.3.2.2.7.

Upon the reception of the activation request, the network selects the sectors for handover from the candidate sectors.

In the handover branch addition, the network assigns the radio frequency band, which is the same as of the currently used branch, to the channel for the additional branch, the radio frequency band being the radio resource. In addition, the network assigns the same uplink code resources to all of the branches for one connection. The selection of the radio resources will be described in more detail at section 2.3.2.2.5.

When it is impossible to carry out the handover because of a deficiency in necessary radio resources or intra-network resources, the network ignores the handover request from the mobile station. If the mobile station does not receive the handover executing instruction, from the network for a certain time, that should be transmitted upon the reception of the handover request from the same mobile station, the mobile station analyzes the necessity of handover again. Then, the mobile station requests the network to execute the handover again if it is determined to be necessary.

The mobile station sends the network the information to be used for determining the initial transmission power over the downlink access link of the additional branch. The information is based on the perch channel measurements.

Upon the reception of the information for determining the initial transmission power, the network determines initial transmission power over the downlink access link of the additional branch. The transmission power control will be described in more detail at section 2.3.2.2.6.

In the handover branch addition, based on a broadcast information (periodical report information) at the intervals of 20 msec, the mobile station informs the network of the phase difference of uplink long codes among the respective candidate sectors, and the group of frame offsets and group of slot offsets used in the mobile station.

Upon the reception of notification of the uplink long code phase difference information and the groups of frame offsets and slot offsets, the network establishes the synchronization of the uplink radio access link of the sector corresponding to the added branch.

At the same time for execution of the branch addition, intra-sector frequency replacement handover, or user data rate modification, it is possible to execute the handover branch addition at boundary between sectors in single cell or at the boundary between cells. By the handover branch addition at boundary between sectors in single cell or at the boundary between cells, the maximum number of newly added handover branches is N - 1.

The handover branch addition and handover branch deletion can be executed at the same time. After the execution of the handover branch addition and handover branch deletion in the combined manner, the maximum number of the branches is "N."

At the same time for execution of the access link establishment, the handover branch addition, branch replacement handover for another connection, ACCH replacement, or the code type replacement may be executed for another connection.

The network requests the mobile station to replace the short codes in order to utilize the short code resources efficiently.

At the same time for the releasing access links, the ACCH replacement is also carried out.

However, handover of the SDCCH is not carried out.

2.3.2.2.5 RADIO RESOURCE SELECTION

"Radio resource selection" is a selection of suitable radio resources, for instance, radio frequency channel, short codes, offsets, on the basis of information transmitted from the mobile station to executing the SDCCH establishment, access link establishment, and the procedures for handover. For the radio resource selection, the system comprises the following capabilities.

The mobile station informs the network of the radio capabilities, for example, the available radio frequency channels or available spreading codes of the mobile station.

The network retrieves uplink long codes from a database in the network, the uplink long codes being associated with respective mobile stations, so that each mobile station corresponds to unique uplink long codes.

The network manages the states of respective uplink short codes (if the uplink short codes are used by mobile stations or not) for each sector and selects the uplink short codes for respective connections. The network also determines to execute or refuse the requested radio resource selection on the basis of the respective uplink interference levels of the sectors, requested transmission rate, and requested quality level.

The network manages the states of respective downlink short codes (the downlink short codes are used by the respective mobile station or not) and selects the downlink short codes for respective connections in accordance with a request.

The network selects the group of radio frame offsets and group of slot offsets during the radio resource selection for the SDCCH establishment and access link establishment.

2.3.2.2.6 TRANSMISSION POWER CONTROL

"Transmission power control" includes an initial transmission power determination process for determining the initial transmission power for transmitting signals through the radio access link at the start of signal transmission through the RACH (random access channel) or the FACH (forward access channel), at the SDCCH (stand alone dedicated control channel) establishment, at access link establishment, or at procedures for handover; and a downlink transmission power control for respective handover branches during diversity handover. However, the transmission power control does not include the transmission power control executed at layer 1.

(1) INITIAL UPLINK TRANSMISSION POWER DETERMINATION

Power for transmission over the uplink radio channel from the mobile station to the base station should be minimized as small as possible to reduce the capacity of the uplink radio channel and to prevent other radio access links from affected. For this purpose, it is preferable to select the radio zone in which the power can be minimized for signal conveyance when selecting the radio zone whose base station should be ready (on standby) for communication with the mobile station immediately or will commence communication with the mobile station after handover. Therefore, means for the selection is necessary.

However, traditional mobile stations simply detect respective reception levels or respective SIRs (signal-to-interference ratios) of channels for the base stations as information used for radio zone selection. Furthermore, the respective transmission power levels vary according to the base stations sometimes. Therefore, in traditional communications systems, it is impossible for each mobile station to optimize the uplink transmission power from the mobile station itself to the network.

In order to resolve these issues and determine the initial uplink transmission power optimally, the system comprises the following capabilities.

Using the periodical report (information broadcast at the intervals of 20 msec) via perch channels, the network broadcasts calibrated perch channel transmission power levels. The calibrated perch channel transmission power levels has been calibrated in view of the respective path losses at cables and so on within the respective base stations.

Using the periodical report (information broadcast at the intervals of 20 msec) via perch channels, the network also broadcasts uplink interference levels.

On the basis of the calibrated perch channel transmission power levels, the respective uplink interference levels, the respective perch channel reception power levels measured at the mobile station, and respective signal-to-interference ratios involved in reception at the respective near base stations, the mobile station can determine the initial uplink transmission power level. The signal-to-interference ratios as reference data are previously stored in the mobile station.

With reference to Figure 792, the initial uplink transmission power determination will be described below.

In Figure 792, two base stations "A" and "B" transmits the broadcast information via the corresponding perch channels. The calibrated perch channel transmission power levels are Pa and Pb, respectively. The respective reception levels of the broadcast information at the mobile station via the perch channels from the base stations are Ra and Rb. The mobile station can calculate the respective path losses on the basis of the perch channel transmission power levels Pa and Pb indicated in the broadcast information and the respective perch channel reception levels Ra and Rb. More specifically, the path loss Lpa from the base station "A" to the mobile station is calculated by the next formula.

$$Lpa = Pa - Ra$$

The path loss Lpb may be calculated similarly.

On the basis of the calculated respective path losses in relation to the base stations, the respective uplink interference levels in relation to the base stations, and respective signal-to-interference ratios involved in reception at the respective near base stations, the mobile station calculates respective necessary uplink transmission power levels between the mobile station and respective near base stations. This calculation is conducted for selecting the radio zone to which a mobile station should camp on or should be handed over. More specifically, the mobile station selects the radio zone in which the necessary uplink transmission power level is minimum among the respective necessary uplink transmission power levels, and optimizes (minimizes) the uplink transmission power in accordance with the selected radio zone (selected base station). Accordingly, although the respective transmission power levels of the perch channels vary according to the base stations, each mobile station can optimize the uplink transmission power in the invented system.

(2) INITIAL DOWNLINK TRANSMISSION POWER DETERMINATION

1) FACH AND DOWNLINK SDCCH

The mobile station sends information via RACH to inform the network (more exactly, BTS) of the signal-to-interference ratio in relation to the perch channel reception at the mobile station. The BTS determines the initial downlink transmission power through the FACH (forward access channel) or SDCCH (stand alone dedicated control channel) on the basis of the perch channel signal-to-interference ratio in relation to the reception at the mobile station, the perch channel transmission power level, the required signal-to-interference ratio involved in reception at the mobile station via the FACH or SDCCH, and a rate-calibration parameter. The perch channel transmission power level is stored as a reference data for the BTS.

2) DOWNLINK TCH

Using a broadcast channel (BCCH1) mapped at the perch channel, the network (more exactly, BTS) broadcasts a perch channel transmission power levels, which is not calibrated. Using the SDCCH, the mobile station informs the network (more specifically, the base station controller function) of the perch channel reception SIR at the mobile station. Using the SDCCH, the mobile station informs the network (the base station controller function) of the perch channel transmission power level which is not calibrated.

On the basis of the perch channel signal-to-interference ratio in relation to the reception at the mobile station, the non-calibrated perch channel transmission power level, the required signal-to-interference ratio involved in reception at the mobile station via the TCH (traffic channel), and a rate-calibration parameter, the BSC function in the network calculates the initial downlink transmission power through the TCH. The required SIR involved in reception at the mobile station via the TCH is stored as a reference data for the BSC function. If there are a plurality of candidate zones from which selected is the zone to which the traffic channel is established, the BSC function calculates the respective initial downlink transmission power levels of the respective zones and selects the minimal power level. The branch for the zone corresponding to the minimal power level is the main branch.

The BSC function of the network informs the base station of the initial downlink transmission power level.

The mobile station can execute the low-rate downlink transmission power control according to layer 3 since it is possible that high-rate transmission power control is not executed ordinarily due to the deterioration of transportation via a radio branch during diversity handover.

The mobile station informs the BSC function in the network of the non-calibrated perch channel transmission power level and the perch channel reception SIR periodically.

The mobile station increases or decreases the SIR involved in the reception at mobile station, so that the reception quality at the mobile station maintains a standard quality.

On the basis of the updated values, the network calculates and/or determines the transmission power level again.

2.3.2.2.7 CALL ACCEPTANCE CONTROL

"Call acceptance control" is a series of control procedures wherein the uplink interference level, downlink transmission power, and activated equipment resources, which can be measured or detected by the base station, are compared with respective allowable limits; a leeway/restriction (idle/busy) information is produced on the basis of the comparison; and a call attempt is allowed or restricted on the basis of the leeway/restriction information at a call origination, incoming call acceptance, bearer alteration, or handover. The call acceptance control can be conducted at the network and the mobile station.

However, the call acceptance control at the mobile station is an option. If the call acceptance control is conducted at the mobile station, it is possible to reduce the number of wastable call attempts, establishment attempts of traffic channels, bearer alteration requests, and handover requests. Therefore, the load involved in control procedures in the network can be lessened.

On the other hand, the call acceptance control at the network is inevitable since the network should recognize the number of call acceptances and the congestion status of traffic.

(1) CALL ACCEPTANCE CONTROL AT MOBILE STATION

In order that the mobile station carries out the call acceptance control, the system comprises the following capabilities.

Using broadcasting channels (BCCH2), the network broadcasts a call acceptance information.

The mobile station refers to the broadcast information, via broadcasting channels BCCH2 from candidate base stations from which selected is the base station to which the traffic channel should be established, directly before the commencement of the random access for the first call origination, transmission of the setup message for the second call origination, reception ofthe setup message for call termination, handover trigger transmission, and transmission of the setup message to alter the bearer.

On the basis of the call acceptance information, the mobile station determines to allow or reject the call attempt.

(2) CALL ACCEPTANCE CONTROL AT NETWORK

Upon the reception of a request for activating TCH, the network determines to allow or reject the call attempt on the basis of the call acceptance information.

2.3.2.2.8 STANDBY CONTROL

"Standby control" is controlling to transit the state, so that the mobile station can transmit and receive after the power of mobile station is turned on or after the mobile station visits from outside to inside of the network. Additionally, a procedure for changing the radio zone to camp on due to the travel of the mobile station is called "standby zone transition control."

(1) STANDBY CONTROL

In order to execute the standby control, the system comprises the following capabilities.

Using the periodical report (information broadcast at the intervals of 20 msec) via perch channels, the network broadcasts the calibrated perch channel transmission power levels. The calibrated perch channel transmission power levels are calibrated in view of the respective path losses at cables and so on within the respective base stations.

Referring to the calibrated perch channel transmission power levels in relation to the zones in which the downlink long codes may be used and the perch channel reception power levels at the mobile station, the mobile station selects the zone having the minimum path loss. Then, the mobile station refers to the broadcast information via BCCH1 corresponding to the selected zone.

Using a broadcast channel (BCCH1) mapped at the perch channel, the network broadcasts a standby permission level, standby deterioration level, network number, restricted information, and so on.

Referring to the broadcast information via BCCH1, the mobile station determines to allow or reject the standby.

The network, using the broadcast information via BCCH1 at the perch channel, broadcasts the information on the data format in the control channel.

Referring to the broadcast information via BCCH1, the mobile station determines the paging channel to which the mobile station is connected.

Referring to the broadcast information via BCCH1, the mobile station determines the RACH, which the mobile station should use.

The network, using the broadcast information via BCCH1 at the perch channel, broadcasts the information on the uplink long codes for the corresponding zone.

Referring to the broadcast information via BCCH1, the mobile station determines the uplink long codes used for the RACH and SDCCH.

(2) STANDBY ZONE TRANSITION CONTROL

In order to execute the standby zone transition control, the system comprises the following capabilities.

The network, using the broadcast information via BCCH1 at the perch channel, broadcasts information on the downlink long codes for the circumferential zones.

The mobile station retrieves the information on the downlink long codes for the circumferential zones from the broadcast information via BCCH1, and conducts the zone transition.

2.3.2.3 SYSTEM CAPABILITIES ON MOBILITY MANAGEMENT

Next, system capabilities on mobility management will be described.

2.3.2.3.1 TERMINAL LOCATION REGISTRATION AND UPDATE

For permitting the travel of the mobile terminals, the terminal locations are supervised by the network. Therefore, the terminal location data is registered when a user terminal is first detected by the network (when the power of the mobile terminal is turned on or the user terminal roams to the network from another network). The terminal location data is automatically updated when the location of a mobile terminal changes in the same network.

In order to execute the terminal location registration and update, the system comprises the following capabilities.

The network informs a mobile station of the location information, so that the mobile stations recognize the location information.

When the mobile station travels in the network, the network recognizes that the mobile station moves from the location that is managed by the network and requests to update the location information managed in the mobile station.

An SDCCH (stand alone dedicated control channel) is established for transporting the control signals for the location registration between the network and the mobile station (refer to the section entitled "SDCCH Control").

Terminal authentication is carried out to prevent the network from an access by an improper mobile terminal. Insofar as a terminal is authenticated, the location information on the terminal is updated in the network.

The network can assign a new TMUI (temporary mobile user identity) to a mobile station.

The network starts the authentication with the IMUI of a mobile station if the mobile station is not authenticated by the TMUI check.

The network notifies the mobile station of the location registration completion.

If the mobile station does not receive the location registration/update completion report, the mobile station triggers the location registration/update procedure again.

2.3.2.4 SYSTEM CAPABILITIES ON SECURITY SERVICES

Next, system capabilities on security services will be described.

2.3.2.4.1 USER AUTHENTICATION

"User authentication" is to determine if each mobile user terminal sending a call attempt to the network is proper or not. The user authentication is carried out when a mobile station originates a first call, when a first call is directed to a mobile station, or when the location is registered.

In order to execute the user authentication, the system comprises the following capabilities.

When a mobile station accesses the network, the network produces various information (an authentication calculation result and random number) being necessary for the authentication of the mobile station, and requests the mobile station to execute an authentication calculation. The network produces an encipherment key used in an encipherment calculation after the authentication.

The mobile station produces an authentication calculation result based on the random number sent by the network and informs the network of the result.

The authentication calculation results made by the network and the mobile station are compared with each other.

The network sends an inquiry about the international mobile user identity (IMUI) to the mobile station if the mobile station has not been authenticated at the authentication procedure using the temporary mobile user identity (TMUI). The network then produces the authentication information and executes the authentication procedure using the IMUI.

If the mobile station is not authenticated even at the authentication procedure using the information based on the IMUI, the origination procedure, the termination procedure, or location registration procedure is stopped.

2.3.2.4.2 ENCIPHERMENT

"Encipherment" is a series of procedures to cipher control signals or user signals transported through the SDCCH, ACCH, or TCH for preventing the signals from being intercepted or edited by a third party. The encipherment is carried out at the origination procedure, the termination procedure, or location registration procedure.

In order to execute the encipherment, various information, e.g., encipherment keys and relevant information for producing the encipherment keys, for ciphering or deciphering control signals or user signals that should be transported via wireless interfaces are managed. The information is delivered within the network and to the destination mobile station when the encipherment is conducted.

The delivered information is used for ciphering the signals and the ciphered signals are transported via radio interfaces.

The onset time of ciphering and onset time of deciphering are mutually notified between the network and the mobile station.

2.3.2.4.3 TMUI MANAGEMENT

TMUI is a temporary terminal identifier or user identifier transported via the air interface in order to keep the IMUI a secret and to decrease the total length of the terminal identifier. The network assigns the TMUIs to the mobile stations communicable with the network and informs the respective mobile stations of the individual TMUIs. After the TMUI assignment, the network manages each TMUI all the while the corresponding mobile station exists in the coverage area of the network. The TMUI assignment may be executed at the location registration procedure, origination procedure, and termination procedure. However, in the invented system, the assignments of TMUIs at origination procedure and termination procedure are option.

In order to execute the TMUI management, the system comprises the following capabilities.

When the network accesses a mobile station for the location registration, location update, origination (option), or termination (option), the network prepares a TMUI for the mobile station and stores it.

The network informs the mobile station of the TMUI and confirms that the mobile station stores the TMUI. When the location is registered, the mobile station is informed of information indicating the TMUI and the node where the TMUI is assigned. However, at the origination or termination, the mobile station is informed of only the TMUI.

The TMUI is sent from the network to the mobile station via the air interface after ciphering for preventing the TMUI being intercepted improperly at the air interface.

In order to prevent double assignment of the TMUIs, the association of TMUIs and the mobile stations are managed.

2.3.2.5 SYSTEM CAPABILITIES ON SYSTEM MANAGEMENT

Next, system capabilities on system management will be described.

2.3.2.5.1 REQUIREMENT FOR SYSTEM SYNCHRONIZATION

"Requirement for system synchronization" is a requirement for synchronization in the system including the network and a mobile station in order to perform diversity handover with a minimum buffering delay. In this system, the MSC (MCC) and the serving BTSs operate according to the standard clock signal at the regular intervals of 640 msec, so that the time alignment is established among the MSC (MCC) and the serving BTSs. However, the phase difference among the MSC function and the serving BTSs is allowable insofar as it is equal to or less than 5 msec. In other words, the requirement for system synchronization is the phase difference within 5 msec.

2.4 CONTROL MANNERS

Next, control manners will be described.

2.4.1 FUNCTIONAL NETWORK ARCHITECTURE

Figure 3 shows the functional network architecture of the system. The functions of the functional entities comply with ITU-T Recommendations.

In Figure 3, CCAF (call control agent function) in a mobile terminal is an interface between the user mobile terminal and CCF (call control function) of the network for providing access for users. TACAF (terminal access control agent function) in a mobile terminal controls access for the mobile terminal, e.g., terminal paging detection.

BCAF (bearer control agent function) in the mobile terminal controls radio bearers for the mobile terminal. BCF (bearer control function) controls bearers. BCFr (bearer control function (radio bearer associated)) in the network controls radio bearers.

TACF (terminal access control function) in the network controls access for the mobile terminal, e.g., terminal paging execution. CCF (call control function) controls call and connection. SCF (service control function) controls services. SDF (service data function) stores various data for execution of services.

LRCF (location registration control function) controls the mobility management. LRDF (location registration data function) stores various data for mobility management. SSF (service switching function) is an interface between the CCF and SCF and detects the trigger for a service control. SRF (specialized resource function) controls access to a special device, e.g., information storing device.

MCF (mobile control function) in the mobile terminal is an interface to the network for a non-call service. SACF (service access control function) in the network is an interface to the mobile station for a non-call service. MRRC in the mobile station controls radio resources. RRC in the network controls radio resources.

MRTR (mobile radio transmission and reception) in the mobile station controls the encipherment or transmission and so on. RFTR (radio frequency transmission and reception) in the network controls the encipherment or transmission and so on. UIMF (user identification management function) stores the information on the mobile users and provides the user authentication and encipherment. In the following description, the UIMF may be sometimes called UTMF.

Figure 4 is a diagram showing the functional network architecture of the system, in which functional entities are arranged in a communication control plane and a radio resource control plane. In Figure 4, functional entity numbers (FE numbers) are attached to respective functional entities. The correlation between the FE numbers and the functional entities are also represented in Figure 270.

In addition, relationships between functional entities are shown in Figure 4. The designations of the relationships are also stated in the following.

The relationship between FE01 and FE06 (CCAF'-CCF') is called Relationship ra.

The relationship between FE02 and FE05 (TACAF-TACF) is called Relationship rb.

The relationship between FE07 and FE09 (LRCF-SSF) is called Relationship rc.

The relationship between FE07 and FE08 (LRCF-LRDF) is called Relationship rd.

The relationship between FE09 and FE10 (SSF-SRF) is called Relationship re.

The relationship between FE07 and FE10 (LRCF-SRF) is called Relationship rf.

The relationship between FE05 and FE07 (TACF-LRCF) is called Relationship rg.

The relationship between FE05 and FE12 (TACF-SACF) is called Relationship rh.

The relationship between FE05 and FE06 (TACF-CCF') is called Relationship ri.

The relationship between FE05 and FE04 (TACF-BCF) is called Relationship rj.

The relationship between FE05 and FE04a is called relationship rja.

The relationship between FE05 and FE04b is called relationship rjb.

The relationship between FE07 and FE12 (LRCF-SACF) is called relationship rk.

The relationship between FE11 and FE12 (MCF-SACF) is called relationship rl.

The relationship between FE01 and FE02 (CCAF'-TACAF) is called relationship rm.

The relationship between FE02 and FE03 (TACAF-BCAF) is called relationship rn.

The relationship between FE13 and FE14 (MRRC-MRTR) is called relationship ro.

The relationship between FE13 and FE15 (MRRC-RRC) is called relationship rp.

The relationship between FE15 and FE16 (RRC-RFTR) is called relationship rq.

The relationship between FE03 and FE04 (BCAF-BCF) is called relationship rr.

The relationship between FE04 and FE06 (BCF-CCF) is called relationship rs.

The relationship between FE05 and FE15 (TACF-RRC) is called relationship rt.

The relationship between FE02 and FE13 (TACAF-MRRC) is called relationship ru.

The relationship between FE02 and FE17 (TACAF-TIMF) is called relationship rv.

The relationship between FE11 and FE17 (MCF-TIMF) is called relationship rw.

The relationship between FE01 and FE18 (CCAF'-UIMF) is called relationship rx.

The relationship between FE11 and FE18 (MCF-UIMF) is called relationship ry.

The relationship between FE04a and FE04b (BCFr-BCF) is called relationship r44.

The relationship between FE06 and FE06 (CCF'-CCF') is called relationship r66.

The relationship between FE07 and FE07 (LRCF-LRCF) is called relationship r77.

The relationship between FE05 and FE05 (TACF-TACF) is called relationship r55.

The relationship between FE08 and FE08 (LRDF-LRDF) is called relationship r88.

The above-described relationships between the functional entities are also represented in Figure 271.

2.4.2 INFORMATION FLOWS OF USUAL COMMUNICATION SERVICES

2.4.2.1 ORIGINATION FOR INITIAL CALL AND ADDITIONAL CALL

a) FUNCTIONAL MODEL

a-1) INITIAL OUTGOING CALL

Figure 5 shows the functional model of a part of the invented system for describing the origination for initial call. Radio bearers are selected under the BCFr controlled by the same TACF that received a call setup request. According to the radio resource selection scenario, multiple FEs are selected.

a-2) ADDITIONAL OUTGOING CALL

Figure 6 shows the functional model of a part of the invented system for describing the origination for additional call. Radio bearers are selected under the BCFr controlled by the same TACF that received a call setup request. According to the radio resource selection scenario, multiple FEs are selected.

b) INFORMATION FLOWS

b-1) INITIAL OUTGOING CALL

Figures 7 and 8 form an information flow diagram showing the origination for initial call.

b-2) ADDITIONAL OUTGOING CALL

Figure 9 is an information flow diagram showing the origination for additional call.

c) DEFINITIONS OF INFORMATION FLOWS, INFORMATION ELEMENTS, AND FUNCTIONAL ENTITY ACTIONS

The information flow diagrams will be described supplementally in the following and information elements in the flow diagrams will be discussed and represented in tables.

A TA SETUP request indication is used by CCAF in the case of a mobile terminal call origination to request to set up a mobile terminal access to the network and the connection between the CCAF and TACAF. Figure 272 represents the detail of the TA SETUP request indication.

Another TA SETUP request indication is sent from TACAF to request the establishment of the terminal access, i.e., signaling connection between TACAF and TACF. Figure 273 represents the detail of the TA SETUP request indication. For the user ID in Figure 273, TMUI should be used to maintain confidentiality of IMUI. In this case, TMUI assignment source ID should not be included in order to reduce data length.

A TA SETUP PERMISSION request indication is issued by the TACF to inform to request the authorization of the mobile terminal access to the network. Figure 274 represents the detail of the TA SETUP PERMISSION request indication.

A REVERSE LONG CODE RETRIEVAL request indication is used to retrieve a reverse (uplink) long code. Figure 275 represents the detail of the REVERSE

LONG CODE RETRIEVAL request indication.

Another REVERSE LONG CODE RETRIEVAL request indication is used to retrieve the reverse long code. Figure 276 represents the detail of the REVERSE LONG CODE RETRIEVAL request indication.

A REVERSE LONG CODE RETRIEVAL response confirmation is also used to retrieve the reverse long code. Figure 277 represents the detail of the REVERSE LONG CODE RETRIEVAL response confirmation.

A TERMINAL STATUS UPDATE request indication is used to update the terminal status. Figure 278 represents the detail of the TERMINAL STATUS UPDATE request indication.

A TERMINAL STATUS UPDATE response confirmation is a response to the request indication. Figure 279 represents the detail of the TERMINAL STATUS UPDATE response confirmation.

An ADD-ROUTING INFORMATION request indication is sent to the LRDF to add a routing address to the subscriber's profile. This information flow is sent only when the authentic mobile terminal has been found and the above related information has been obtained. Figure 280 represents the detail of the ADD-ROUTING INFORMATION request indication.

An ADD-ROUTING INFORMATION response confirmation is a response to the request indication. Figure 281 represents the detail of the ADD-ROUTING INFORMATION response confirmation.

A TA SETUP PERMISSION response confirmation is issued by the LRCF to inform the TACF that the mobile terminal access to the network is authorized. Figure 282 represents the detail of the TA SETUP PERMISSION response confirmation.

A REVERSE LONG CODE RETRIEVAL response confirmation is used to retrieve the reverse long code. Figure 283 represents the detail of the REVERSE LONG CODE RETRIEVAL response confirmation.

A TA SETUP response confirmation is used to notify that the mobile terminal access has been established. Figure 284 represents the detail of the TA SETUP response confirmation.

Another TA SETUP response confirmation is used to confirm that the setup of the terminal access and the connection between the CCAF and TACAF have been completed. Figure 285 represents the detail of the TA SETUP response confirmation.

A SETUP request indication is used to request the establishment of the connection. Figure 286 represents the detail of the SETUP request indication.

A TACF INSTANCE ID INDICATIONquest indication is used to retrieve the reverse long code. Figure 287 represents the detail of the TACF INSTANCE ID INDICATIONquest indication.

A CELL CONDITION MEASUREMENT request indication is used by MRRC to trigger measurement of cell selection information. This is a requesting information flow whose confirmation (CELL CONDITION MEASUREMENT response confirmation) provides the result of the measurement. Figure 288 represents the detail of the CELL CONDITION MEASUREMENT request indication.

A CELL CONDITION MEASUREMENT response confirmation provides the result of the cell selection information measurement requested by the CELL CONDITION MEASUREMENT request indication. Figure 289 represents the detail of the CELL CONDITION MEASUREMENT response confirmation.

A CELL CONDITION REPORT request indication is used by the mobile terminal to report the cell selection information. The information is used by the network to select radio channels. This information flow does not require any confirmation. Figure 290 represents the detail of the CELL CONDITION REPORT request indication.

A CALL SETUP PERMISSION request indication is issued by the SSF to request the authorization of the calling user. Figure 291 represents the detail of the CALL SETUP PERMISSION request indication.

A USER PROFILE RETRIEVAL request indication is used to request the user profile to be retrieved. Figure 292 represents the detail of the USER PROFILE RETRIEVAL request indication.

A USER PROFILE RETRIEVAL response confirmation is a response to the request indication. Figure 293 represents the detail of the USER PROFILE RETRIEVAL response confirmation.

A CALL SETUP PERMISSION response confirmation is issued by the LRCF to inform the calling user is authorized. Figure 294 represents the detail of the CALL SETUP PERMISSION response confirmation.

A SETUP request indication is used to request the establishment of a connection. Figure 295 represents the detail of the SETUP request indication.

A PROCEEDING request indication optionally reports that the indicated connection set-up is valid and authorized and that further routing and progressing of the call is proceeding. This information flow does not require any confirmation. Figure 296 represents the detail of the PROCEEDING request indication.

A MEASUREMENT CONDITION NOTIFICATION request indication is transmitted at relationship rt between the TACF and the RRC and is used by the network to indicate conditions, which the mobile terminal measures, and to report the cell selection information. When the mobile terminal is on an idle mode, the network indicates the MEASUREMENT CONDITION NOTIFICATION request indication periodically. When the mobile terminal is in communication, the network indicates the MEASUREMENT CONDITION NOTIFICATION request indication at the change of conditions. This information flow does not require any confirmation. Figure 297 represents the detail of the MEASUREMENT CONDITION NOTIFICATION request indication.

Another MEASUREMENT CONDITION NOTIFICATION request indication is transmitted at relationship rp between the MRRC and the RRC and is used by the network to indicate conditions, which the mobile terminal measures, and to report cell selecting information. When the mobile terminal is on an idle mode, the network indicates the MEASUREMENT CONDITION NOTIFICATION request indication periodically. When the mobile terminal is in communication, the network indicates the MEASUREMENT CONDITION NOTIFICATION request indication at the change of conditions. This information flow does not require any confirmation. Figure 298 represents the detail of the MEASUREMENT CONDITION NOTIFICATION request indication.

A REPORT request indication, at relationship r66 between a CCF' and another CCF', is an information flow that is used to report status and/or other types of information transported within the network. The type of information (e.g. alerting, suspended, hold, and resume) may be indicated. This information flow does not require any confirmation. Figure 299 represents the detail of the REPORT request indication.

Another REPORT request indication, at relationship ra between the CCAF' and the CCF', is an information flow that is used to report the status information and/or other types of information transported within the network. The type of information (e.g. alerting, suspended, hold, and resume) may be indicated. This information flow does not require any confirmation. Figure 300 represents the detail of the REPORT request indication.

A SETUP response confirmation at relationship r66 is used to confirm that the connection has been established. Figure 301 represents the detail of the SETUP response confirmation.

Another SETUP response confirmation at relationship ra is used to confirm that the connection has been established. Figure 302 represents the detail of the SETUP response confirmation.

2.4.2.2 TERMINATION FOR INITIAL CALL AND ADDITIONAL CALL

a) FUNCTIONAL MODEL

a-1) INITIAL INCOMING CALL

Figure 10 shows the functional model of a part of the invented system for describing the termination for initial call.

a-2) ADDITIONAL INCOMING CALL

Figure 11 shows the functional model of a part of the invented system for describing the termination for additional call.

b) INFORMATION FLOWS

b-1) INITIAL INCOMING CALL

Figures 12 through 14 form an information flow diagram showing the termination for initial call.

b-2) ADDITIONAL INCOMING CALL

Figures 15 and 16 form an information flow diagram showing the termination for additional call.

c) DEFINITIONS OF INFORMATION FLOWS, INFORMATION ELEMENTS, AND FUNCTIONAL ENTITY ACTIONS

The information flow diagrams will be described supplementally in the following and information elements in the flow diagrams will be discussed and represented in tables.

A SETUP request indication is used to report the establishment of a connection. The detail is represented in Figure 303.

A ROUTING INFORMATION QUERY request indication is used to inquire the routing information. The detail is represented in Figure 304. Either called user number or roaming number may be used as an identifier of the called user. Roaming number is used in this example represented in Figure 304.

A TERMINAL ID RETRIEVAL request indication is used to request the user profile to be retrieved. The detail is represented in Figure 305. The roaming number item in Figure 305 is used in this information flow to specify the user whose profile should be retrieved, instead of the called user ID. The selection item in Figure

305 specifies the data which should be retrieved. This information element in this information flow specifies the user ID.

A TERMINAL ID RETRIEVAL response confirmation is a response to the TERMINAL ID RETRIEVAL request indication. The detail is represented in Figure 306.

A TERMINAL STATUS QUERY request indication is used to inquire the terminal status (e.g. if terminal access is active or not). The detail is represented in Figure 307. The selection item in Figure 307 specifies the data which should be retrieved. This information element in this information flow specifies the user's call status.

A TERMINAL STATUS QUERY response confirmation is a response to the TERMINAL STATUS QUERY request indication. The detail is represented in Figure 308.

A TERMINAL STATUS UPDATE request indication is used to update the terminal status. The detail is represented in Figure 309.

A TERMINAL STATUS UPDATE response confirmation is a response to the TERMINAL STATUS UPDATE request indication. The detail is represented in Figure 310.

A PAGING AREA QUERY request indication is used to inquire the paging area where TACF resides when it is observed that the terminal access is not active. The detail is represented in Figure 311. The selection item represented in Figure 311 specifies the data which should be retrieved. This information element in this information flow specifies the paging area.

A PAGING AREA QUERY response confirmation is a response to the PAGING AREA QUERY request indication. The detail is shown in Figure 312.

A PAGE request indication at relationship rg is used to trigger a TACF of paging. The detail of the PAGE request indication is represented in Figure 313. Paging relationship ID in Figure 313 is generated by the LRCF and is used to correlate the request and the response.

A PAGING request indication at relationship rb is used to page a mobile terminal for determining its position in the network and for the routing for a call. This information flow requires a confirmation. The detail of the PAGING request indication is represented in Figure 314. The paging ID in Figure 314 is generated by the TACF and used to identify the response.

A PAGING response confirmation is used to respond to the request indication. The detail is represented in Figure 315.

A PAGE response confirmation is a response to the request indication and notifies the LRCF of the paging result. LRCF initiates SLP for the user authentication of the responding user after receiving this information flow. The detail is represented in Figure 316. This information flow is also used in case of no response wherein if the optional information elements in Figure 316 are not read out, it is regarded that the paging request by the network is not responded by any terminals.

A REVERSE LONG CODE RETRIEVAL request indication is used to retrieve a reverse (uplink) long code. The detail of the reverse long code at relationship rg is represented in Figure 317.

Another REVERSE LONG CODE RETRIEVAL request indication is used to retrieve the reverse long code. The detail of the reverse long code at relationship rd is represented in Figure 318.

A REVERSE LONG CODE RETRIEVAL response confirmation is used to retrieve the reverse long code. The detail is represented in Figure 319.

A CELL CONDITION MEASUREMENT request indication is used by the MRRC to trigger the measurement of cell selecting information. This information flow requires a confirmation. The confirmation (CELL CONDITION MEASUREMENT response confirmation) provides the result of the measurement. The detail of the CELL CONDITION MEASUREMENT request indication is represented in Figure 320.

A CELL CONDITION MEASUREMENT response confirmation provides the result of the cell selection information measurement requested by the CELL CONDITION MEASUREMENT request indication. The detail of the CELL CONDITION MEASUREMENT response confirmation is represented in Figure 321.

A CELL CONDITION REPORT request indication is used by the mobile terminal to report the cell selection information. The information is used by the network to select radio channels. This information flow does not require any confirmation. The detail is represented in Figure 322.

An ADD-ROUTING INFORMATION request indication is sent to the LRDFp to add the routing information to the subscriber's profile. This information flow is only sent when the authentic mobile terminal has been found and the above related information has been obtained. The detail is represented in Figure 323.

An ADD-ROUTING INFORMATION response confirmation is a response to the ADD-ROUTING INFORMATION request indication. The detail of the ADD-ROUTING INFORMATION response confirmation is represented in Figure 324.

A PAGE AUTHORIZED request indication at relationship rg is used to notify the TACF of the result of the terminal authentication. The detail is represented in Figure 325.

A REVERSE LONG CODE RETRIEVAL response confirmation is used to retrieve the reverse long code. The detail is represented in Figure 326.

A PAGE AUTHORIZED request indication is used to notify the TACF of the result of the terminal authentication.

A ROUTING INFORMATION QUERY response confirmation is a response to the request indication. The detail is represented in Figure 327. The routing address item and TACF instance ID item in Figure 327 are used in this case to specify the routing information. The routing address item is used for routing in the visited network.

A SETUP request indication is used to request the establishment of a connection. The detail is represented in Figure 328.

A TERMINATION ATTEMPT request indication is used to request the user's profile which may be needed to proceed the call process. The detail is represented in Figure 329.

A USER PROFILE RETRIEVAL request indication is used to retrieve the called user's profile from the LRDF. The detail is represented in Figure 330.

A USER PROFILE RETRIEVAL response confirmation is a response to the request indication from the LRCF. The detail is represented in Figure 331.

A TERMINATION ATTEMPT response confirmation is a response to the request indication from the SSF. The detail is represented in Figure 332.

A SETUP request indication is used to request the establishment of a connection. The detail is represented in Figure 333.

A PROCEEDING request indication optionally reports that the instructed connection setup is valid and authenticated and that further routing and progressing of the call is proceeding. This information flow does not require any confirmation. The detail is represented in Figure 334.

A MEASUREMENT CONDITION NOTIFICATION request indication is used by the network to indicate conditions, which the mobile terminal measures, and to report the cell selection information. When the mobile terminal is on an idle mode, the network indicates the MEASUREMENT CONDITION NOTIFICATION request indication periodically. When the mobile terminal is in communication, the network indicates the MEASUREMENT CONDITION NOTIFICATION request indication at the change of conditions. This information flow does not require any confirmation. The detail of the MEASUREMENT CONDITION NOTIFICATION request indication is represented in Figure 335.

A REPORT request indication is an information element that is used to report status and/or other types of information transported in the network. The type of information may be indicated (e.g. alerting, suspended, hold, resume). This information flow does not require any confirmation. The detail of the REPORT request indication is represented in Figure 336.

A SETUP response confirmation is used to confirm that the connection has been established. The detail is represented in Figure 337.

A CONNECTED request indication is used to acknowledge that a previously sent SETUP response confirmation has been received and accepted. This information flow does not require any confirmation. The detail is represented in Figure 338.

2.4.2.3 CALL RELEASE

2.4.2.3.1 DISCONNECTION INSTRUCTED BY USER

(a) FUNCTIONAL MODEL

Figure 17 shows the functional model of a part of the invented system for describing the disconnection instructed by a user.

(b) INFORMATION FLOWS

Figure 18 is an information flow diagram showing the disconnection instructed by a user.

(c) DEFINITIONS OF INFORMATION FLOWS

A RELEASE request indication is used to release resources associated with a call connection, such as call ID or channels. This information flow requires a confirmation. The detail is represented in Figure 339.

A RELEASE response confirmation is used to indicate that all resources pervasively associated with the connection have been released. The detail is represented in Figure 340.

A TA RELEASE request indication is issued by the TACF to inform the SCF that an attempt of call release has been detected. This information flow is issued when the last call is released and the control relationship between the terminal and the network should be released. The detail is represented in Figure 341.

A TERMINAL-STATUS-MAKE-IDLE request indication is used to idle the terminal call status. The detail is represented in Figure 342.

A TERMINAL-STATUS-MAKE-IDLE response confirmation is a response to the TERMINAL-STATUS-MAKE-IDLE request indication. The detail of the TERMINAL-STATUS-MAKE-IDLE response confirmation is represented in Figure 343.

A TA RELEASE response confirmation is used for the confirmation to the TA RELEASE request indication. The detail of the TA RELEASE response confirmation is represented in Figure 344.

2.4.2.3.2 DISCONNECTION INSTRUCTED BY NETWORK

(a) FUNCTIONAL MODEL

Figure 19 shows the functional model of a part of the invented system for describing the disconnection instructed by the network.

(b) INFORMATION FLOWS

Figure 20 is an information flow diagram showing the disconnection instructed by the network.

(c) DEFINITIONS OF INFORMATION FLOWS

The information flow diagram will be described supplementally in the following and information elements in the flow diagram will be discussed and represented in tables.

A RELEASE request indication is used to release resources associated with a call connection such as the call reference or channels. This information flow requires a confirmation. The detail is represented in Figure 345.

A RELEASE response confirmation is used to indicate that all resources previously associated with the connection have been released. The detail is represented in Figure 346.

A TA RELEASE request indication is issued by the TACF to inform the LRCF that an attempt of call release has been detected. This information flow is issued when the last call is released and the control relationship between the terminal and the network should be released. The detail is represented in Figure 347.

A TERMINAL-STATUS-MAKE-IDLE request indication is used to idle the terminal call status. The detail is represented in Figure 348.

A TERMINAL-STATUS-MAKE-IDLE response confirmation is a response to the TERMINAL-STATUS-MAKE-IDLE request indication. The detail is represented in Figure 349.

A TA RELEASE response confirmation is used for the response confirmation of the TERMINAL-STATUS-MAKE-IDLE request indication. The detail is represented in Figure 350.

2.4.2.3.3 ABNORMAL RELEASE

2.4.2.3.3.1 ABNORMAL RELEASE CAUSED FROM RADIO LINK FAILURE DETECTED BY MOBILE TERMINAL

2.4.2.3.3.1.1 COMMON PROCEDURE MODULE USED

A common procedure module used in this release process is the "user disconnect."

2.4.2.3.3.1.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 21 shows the functional model of a part of the invented system for describing the abnormal release caused from a radio link failure (squelch condition) detected by a mobile terminal.

b) INFORMATION FLOWS

Figure 22 shows an information flow diagram of the abnormal release, executed in the communication control plane, caused from the radio link failure detected by the mobile terminal.

c) DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 22 will be described below and information elements of the flows are represented in tables. The order of description is the same as the order of the flows in Figure 22.

A RADIO LINK FAILURE request indication is used to notify a radio link failure detected by the BCAF or BCFr. In this flow procedure, this information flow is issued by the BCAF. The detail is represented in Figure 351.

A RELEASE NOTIFICATION request indication is used to indicate that the connection between the network and the terminal has been released. The information flow does not require any confirmation. The detail is represented in Figure 352.

A RADIO LINK FAILURE request indication is used to notify that the link failure has been detected. The detail is represented in Figure 353.

Another RADIO LINK FAILURE request indication is used to notify that the link failure has been detected. The detail is represented in Figure 354.

A RADIO LINK FAILURE response confirmation is a response confirmation of the RADIO LINK FAILURE request indication. The detail is represented in Figure 355.

A RADIO BEARER RELEASE request indication is used to request to release radio bearers. This is originated by network. The detail is represented in Figure 356.

A TA RELEASE request indication is issued by the TACF to request the release of terminal access. This information flow is issued for only the last call release.

A BEARER RELEASE request indication is issued by the TACF to the BCF to release the radio bearer. The detail is represented in Figure 357.

A BEARER RELEASE response confirmation is a response confirmation of the bearer release request indication. The detail is represented in Figure 358.

Another BEARER RELEASE request indication is sent by the anchor TACF to request the serving TACF to release the bearer involved in the call that should be released. The detail is represented in Figure 359.

Another BEARER RELEASE request indication is issued by the TACF to BCF to release the radio bearer. The detail is represented in Figure 360.

Another BEARER RELEASE response confirmation is a response confirmation of the BEARER RELEASE request indication. The detail is represented in Figure 361.

A BEARER-AND-RADIO-BEARER RELEASE request indication is issued by the TACF to release the bearer-and-radio-bearer. The detail is represented in Figure 362.

A BEARER-AND-RADIO-BEARER RELEASE response confirmation is used for a confirmation of the release of the bearer-and-radio-bearer requested by the BEARER-AND-RADIO-BEARER RELEASE request indication. The detail is represented in Figure 363.

Another BEARER RELEASE response confirmation is a confirmation response to inform the TACF that the previous request to release the radio bearer has been completed. The detail is represented in Figure 364.

A TA RELEASE request indication is issued by the TACF to inform the LRCF that the attempt of releasing call has detected. The detail is represented in Figure 365.

A TERMINAL-STATUS-MAKE-IDLE request indication is used to request to update the user profile. For call release, this information flow is used to update the user's call status to idle. The detail is represented in Figure 366.

A TERMINAL-STATUS-MAKE-IDLE response confirmation is a response to the TERMINAL-STATUS-MAKE-IDLE request indication. The detail is represented in Figure 367.

A TA RELEASE response confirmation is used for a response confirmation of the TA RELEASE request indication. The detail is represented in Figure 368.

2.4.2.3.3.2 ABNORMAL RELEASE CAUSED FROM RADIO LINK FAILURE DETECTED BY NETWORK

2.4.2.3.3.2.1 COMMON PROCEDURE MODULE USED

A common procedure module used in this release process is the "user disconnect."

2.4.2.3.3.2.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 23 shows the functional model of a part of the invented system for describing the abnormal release caused from a radio link failure (squelch condition) detected by the network.

b) INFORMATION FLOWS

Figure 24 shows an information flow diagram of the abnormal release, executed in the communication control plane, caused from the radio link failure detected by the network.

c) DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 24 will be described below and information elements of the flows are represented in tables. The order of description is the same as the order of the flows in Figure 24.

A RADIO LINK FAILURE request indication is used to notify that a link failure has been detected and reported by either BCFr or BCFa. The detail is represented in Figure 369.

Another RADIO LINK FAILURE request indication is used to notify that the link failure has been detected. The detail is represented in Figure 370.

A RADIO LINK FAILURE response confirmation is a confirmation response to the RADIO LINK FAILURE request indication. The detail is represented in Figure 371.

A RADIO BEARER RELEASE request indication is used to request to release the radio bearer. This is originated by the network. The detail is represented in Figure 372.

A RELEASE NOTIFICATION request indication is used to indicate that the connection between the network and the terminal has been released. The information flow does not require any confirmation. The detail is represented in Figure 373.

A RADIO BEARER RELEASE response confirmation is a response confirmation of the RADIO BEARER RELEASE request indication. The detail is represented in Figure 374.

A TA RELEASE request indication is issued by the TACF to request the release of terminal access. This information flow is issued for only the last call.

A TA RELEASE response confirmation is a response confirmation of the TA RELEASE request indication.

A BEARER RELEASE request indication is issued by the TACF to BCF to release the radio bearer. The detail is represented in Figure 375.

A BEARER RELEASE response confirmation is a response confirmation of the BEARER RELEASE request indication. The detail is represented in Figure 376.

Another BEARER RELEASE request indication is sent by the anchor TACF to request the serving TACF to release the radio bearer involved in the call that should be released. The detail is represented in Figure 377.

Another BEARER RELEASE request indication is issued by the TACF to BCF to release the radio bearer. The detail is represented in Figure 378.

A BEARER RELEASE response confirmation is a response confirmation of the BEARER RELEASE request indication. The detail is represented in Figure 379.

A BEARER-AND-RADIO-BEARER RELEASE request indication is issued by the TACF to release the bearer-and-radio-bearer. The detail is represented in Figure 380.

A BEARER-AND-RADIO-BEARER RELEASE response confirmation is used for a confirmation of the release of the bearer and radio bearer requested by the BEARER-AND-RADIO-BEARER RELEASE request indication. The detail is represented in Figure 381.

Another BEARER RELEASE response confirmation is a confirmation response for informing the TACF that the previous request to release the radio bearer has been completed. The detail is represented in Figure 382.

A RADIO BEARER RELEASE request indication is issued to request to release the radio bearer. The detail is represented in Figure 383.

Another RADIO BEARER RELEASE response confirmation is used to confirm the release of radio bearer requested by the RADIO BEARER RELEASE request indication. The detail is represented in Figure 384.

A TA RELEASE request indication is issued by the TACF to inform the LRCF that the attempt of call release has been detected. The detail is represented in Figure 385.

A TERMINAL-STATUS-MAKE-IDLE request indication is used to request to update the user profile. For call release, this information flow is used to update the user's call status to idle. The detail is represented in Figure 386.

A TERMINAL-STATUS-MAKE-IDLE response confirmation is a response to the TERMINAL-STATUS-MAKE-IDLE request indication. The detail is represented in Figure 387.

Another TA RELEASE response confirmation is used for confirmation to the TA RELEASE request indication. The detail is represented in Figure 388.

2.4.2.3.4 USER DISCONNECT

2.4.2.3.4.1 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 25 shows the functional model of a part of the invented system for describing the "user disconnect."

b) INFORMATION FLOWS

Figure 26 shows an information flow diagram of the "user disconnect."

c) DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 26 will be described below and information elements in the flows are represented in tables. The order of description is the same as the order of the flows in Figure 26.

A CALL DISCONNECT request indication is used to notify the LRCF that a "user disconnect" has been detected. The detail is represented in Figure 389.

A USER-PROFILE-UPDATE request indication is used to request to update the user profile. For call release, this information flow is used to indicate the call has been released. The detail is represented in Figure 390.

A USER-PROFILE-UPDATE response confirmation is a response to the USER-PROFILE-UPDATE response confirmation. The detail is represented in Figure 391.

A CALL DISCONNECT response confirmation is a response to the request made by the CALL DISCONNECT request indication. The detail is represented in Figure 392.

2.4.3 INFORMATION FLOW DIAGRAMS FOR ACCESS LINK CONTROL

2.4.3.1 SDCCH SETUP

First, the SDCCH setup process will be described.

2.4.3.1.1 COMMON PROCEDURE MODULES USED

2.4.3.1.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 27 shows the functional model of a part of the invented system for describing the SDCCH setup process.

b) INFORMATION FLOWS

Figure 28 shows an information flow diagram of the SDCCH setup process.

c) DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 28 will be described below and information elements of the flows are represented in tables. The order of description is the same as the order of the flows in Figure 28.

A SIGNALING CHANNEL SETUP REQUEST request indication is used by the MCF and TACF to request the network to setup the signaling channels. The detail is represented in Figure 393.

A SIGNALING CHANNEL SETUP request indication is used by the SCMAF to request to the network to allocate the signaling channels. The detail is represented in Figure 394.

A SIGNALING CHANNEL SETUP response confirmation is used by the SCMF to allocate the radio resources to the signaling channels. The detail is represented in Figure 395.

A SIGNALING CHANNEL SETUP REQUESTED request indication is used to indicate the reception of the signaling channel setup request (initial access detection) from the mobile terminal and to request the network to setup the corresponding signaling channels in the network. The detail is represented in Figure 396.

A SIGNALING CONNECTION SETUP request indication is used by the TACF and SACF to setup the signaling connection among them and the SCMF. The detail is represented in Figure 397.

A SIGNALING CONNECTION SETUP response confirmation is used to report the establishment of the signaling channels including the physical radio channel and the intra-network channel. The detail is represented in Figure 398.

A SIGNALING CHANNEL SETUP REQUEST response confirmation is used by the SCMAF to report the setup of the signaling channels to the network. The detail is represented in Figure 399.

2.4.3.2 BEARER SETUP

Next, bearer setup procedures for the radio resource selection will be described,

2.4.3.2.1 COMMON PROCEDURE MODULES USED

2.4.3.2.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Radio resources are selected under a base station which is different from the one that received a call setup request from a mobile terminal while the BSs are controlled by different TACFs. The CCF only has the relationship with the TACFa and does not have the relationship with the TACFv. The TACFa controls both bearer selection and bearer setup. There are three BCFs: BCF1, BCF2, and BCFr.

Figure 29 shows the functional model of a part of the invented system for describing the bearer setup for the radio resource selection.

b) INFORMATION FLOWS

Figure 30 shows an information flow diagram of the bearer setup, executed in the communication control plane, for the radio resource selection.

2.4.3.2.2.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 30 will be described below and information elements of the flows are represented in tables. The order of description is the same as the order of the flows in Figure 30.

A BEARER SETUP request indication is used to request the establishment of the access bearer from the CCF to TACF. The detail is represented in Figure 400. The information elements asterisked in Figure 400 are contained in the bearer capability element in Figure 286 sent from the CCAF.

A CHANNEL SELECTION request indication is used by the TACF to request to select and reserve radio resources which can support the required bearer capability. This interaction occurs when new radio resources are necessary for call setup and handover.

A CHANNEL SELECTION response confirmation is used to report the reserved radio resources to the TACF, which requested the reservation. The detail is represented in Figure 401.

A BEARER SETUP request indication is sent from the TACF to BCF to request the establishment of the access bearer. The detail is represented in Figure 402.

A BEARER SETUP response confirmation is sent to confirm the establishment of the access bearer and to indicate the bearer ID of the bearer between the BCF and BCF. The detail is represented in Figure 403.

Another BEARER SETUP request indication is used to request the establishment of the access bearer from the TACFa to TACFv. The detail is represented in Figure 404.

Another BEARER SETUP request indication is sent from the TACF to BCF to request the establishment of the access bearer. The detail is represented in Figure 405.

Another BEARER SETUP response confirmation is sent from the BCF to TACF to request the establishment of the access bearer. The detail is represented in Figure 406.

A BEARER-AND-RADIO-BEARER SETUP request indication is sent from the TACF to BCFr to request the establishment of the radio bearer and the bearer between the BCF and BCFr. The detail is represented in Figure 407.

A RADIO BEARER SETUP PROCEEDING request indication is used by the BCFr to report that the instructed radio bearer setup is valid and the establishment of the radio bearer is proceeding. This information flow does not require any confirmation. The detail is represented in Figure 408.

A RADIO BEARER SETUP REQUEST request indication is issued by the TACF, which controls a new access bearer, to the TACF, which has the signaling connection, to request to newly assign a radio bearer to the mobile terminal. The detail is represented in Figure 409.

A RADIO BEARER SETUP request indication is sent from the TACF to TACAF to request the establishment of the radio bearer. The detail is represented in Figure 410.

Another RADIO BEARER SETUP request indication is sent from the TACAF to BCAF to request the establishment of the radio bearer. The detail is represented in Figure 411.

A RADIO BEARER SETUP response confirmation is sent from the BCAF to TACAF to confirm that the establishment of radio bearer has been completed. The detail is represented in Figure 412.

A BEARER-AND-RADIO-BEARER SETUP response confirmation is sent to confirm that the establishment of radio bearer and bearer between the BCF and BCFr have been completed. The detail is represented in Figure 413.

A BEARER SETUP response confirmation is used to confirm that the establishment of access bearer has been completed. The detail is represented in Figure 414.

Another BEARER SETUP response confirmation is used to confirm that the establishment of access bearer has been completed. The detail is represented in Figure 415.

2.4.3.3 RADIO BEARER RELEASE

2.4.3.3.1 RADIO BEARER RELEASE FOR TACF ANCHOR APPROACH

2.4.3.3.1.1 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 31 shows the functional model of a part of the invented system for describing the radio bearer release.

b) INFORMATION FLOWS

Figure 32 shows an information flow diagram of the radio bearer release.

2.4.3.3.1.2 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 32 will be described below and information elements of the flows are represented in tables. The order of description is the same as the order of the flows in Figure 32.

A BEARER RELEASE request indication is sent by the anchor CCF to notify the anchor TACF that the attempt or event of call release has been detected and that the bearer involved in the call is being released. The detail is represented in Figure 416.

A RADIO BEARER RELEASE request indication is used by the TACFa to request to release the radio bearer. This is originated by the network. The detail is represented in Figure 417.

A RADIO BEARER RELEASE response confirmation is a response confirmation of the RADIO BEARER RELEASE request indication. The detail is represented in Figure 418.

A TA RELEASE request indication is issued by the TACFa to request the release of the terminal access. This information flow is issued only for the last call release.

A TA RELEASE response confirmation is a response confirmation of the TA RELEASE request indication.

A BEARER RELEASE request indication is issued by the TACF to BCF to release the radio bearer. The detail is represented in Figure 419.

A BEARER RELEASE response confirmation is a response confirmation of the BEARER RELEASE request indication. The detail is represented in Figure 420.

Another BEARER RELEASE request indication is sent by the TACFa to request the TACFv to release the bearer involved in the call is being released. The detail is represented in Figure 421.

Another BEARER RELEASE request indication is issued by the TACF to BCF to release the radio bearer. The detail is represented in Figure 422.

A BEARER RELEASE response confirmation is a response confirmation of the BEARER RELEASE request indication. The detail is represented in Figure 423.

A BEARER-AND-RADIO-BEARER RELEASE request indication is issued by the TACF to release the bearer and radio bearer. The detail is represented in Figure 424.

A BEARER-AND-RADIO-BEARER RELEASE response confirmation is used for a confirmation of the release of the bearer and radio bearer requested by the BEARER-AND-RADIO-BEARER RELEASE request indication. The detail is represented in Figure 425.

Another BEARER RELEASE response confirmation is a confirmation of the BEARER RELEASE request indication. The detail is represented in Figure 426.

Another BEARER RELEASE response confirmation is a response confirmation to inform the CCF that the previous request to release the radio bearer has been completed. The detail is represented in Figure 427.

Another RADIO BEARER RELEASE request indication is issued by the TACAF to request the radio bearer release. The detail is represented in Figure 428.

Another RADIO BEARER RELEASE request indication is used by the BCAF to confirm the radio bearer release requested by the RADIO BEARER RELEASE request indication. The detail is represented in Figure 429.

2.4.3.4 SDCCH RELEASE

Next, SDCCH release procedures will be described.

2.4.3.4.1 COMMON PROCEDURE MODULES USED

2.4.3.4.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 33 shows the functional model of a part of the invented system for describing the SDCCH release.

b) INFORMATION FLOWS

Figure 34 shows an information flow diagram of the SDCCH release.

2.4.3.4.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 34 will be described below and information elements of the flows are represented in tables. The order of description is the same as the order of the flows in Figure 34.

A SIGNALING CHANNEL RELEASE REQUEST request indication is used by the MCF and TACF to request the release of a signaling channel. The detail is represented in Figure 430.

A SIGNALING CONNECTION RELEASE request indication is used by the TACF and SACF to request the release of the signaling channel (in both of the network and the radio resources). The detail is represented in Figure 431.

A SIGNALING CONNECTION RELEASE response confirmation is used to report the release of the signaling channel. The detail is represented in Figure 432.

2.4.3.5 HANDOVER

2.4.3.5.0 HANDOVER PROCESS AND RELEVANT PROCEDURE MODULES

Process 1: Handover trigger

Detection of handover triggering.

Process 2: Handover resource reservation

Reservation of radio resources for handover.

Process 3: Handover execution

Preparing at network side, if any.

Request the mobile terminal as indicated by trigger.

Process 4: Handover completion

Release of unneeded radio bearer and resources.

Figure 35 shows a flow chart showing handover processes in general. Figure 36 is an information flow diagram showing processes 1 and 2 described above.

Figure 37 is an information flow diagram representing a sequence in which information flows are transported for starting non-soft handover execution, the sequence corresponding to process 1 in Figure 35. Figure 38 is an information flow diagram representing a sequence in which information flows are transported for starting handover branch addition, the sequence corresponding to process 1 in Figure 35. Figure 39 is an information flow diagram representing a sequence in which information flows are transported for starting handover branch deletion, the sequence corresponding to process 1 in Figure 35.

2.4.3.5.1 INTER-SECTOR HANDOVER BRANCH ADDITION IN SINGLE CELL (HANDOVER CONTROLLED BY SAME BCFr)

2.4.3.5.1.1 COMMON PROCEDURE MODULES

2.4.3.5.1.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 40 shows the functional model of a part of the invented system for describing the inter-sector handover branch addition in a single cell.

b) INFORMATION FLOWS

Figure 41 shows an information flow diagram of the inter-sector handover branch addition in a single cell, executed in the communication control plane.

2.4.3.5.1.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 41 will be described below and information elements of the flows are represented in tables.

A BEARER SETUP request indication is sent from the TACFa to TACFv to request the setup of an access bearer. The detail is represented in Figure 433. This information flow identifies the bearer between the BCFa and BCFv.

An INTRA-BCFr HANDOVER BRANCH ADDITION request indication is sent from the TACF to BCFr to request to setup new physical radio channel(s). The detail is represented in Figure 434.

An INTRA-BCFr HANDOVER BRANCH ADDITION response confirmation is a response to the INTRA-BCFr HANDOVER BRANCH ADDITION request indication and is sent from the BCFr to TACF to indicate the completion of setup of the physical radio channel(s). The detail is represented in Figure 435.

A RADIO BEARER SETUP REQUEST request indication is sent from the visited TACF, which controls the newly assigned radio bearer, to TACFa to request to setup the radio bearer between the mobile terminal and BCFr controlled by the visited TACF. The detail is represented in Figure 436.

A HANDOVER BRANCH ADDITION request indication is sent from the TACF to TACAF to notify of the intra-BCFr handover branch addition, and requests to add a new physical radio channel to an existing physical radio channel. The detail is represented in Figure 437. The information element marked by *1 in Figure 437 may be repeated a plurality of times, the number of repetition is the same as the number of the handover branches at the mobile terminal. The information elements marked by *2 in Figure 437 may be repeated a plurality of times, the number of repetition is the same as the number of the calls related to the TACF.

A HANDOVER BRANCH ADDITION response confirmation is sent from the TACAF to TACF to notify of the reception of the HANDOVER BRANCH ADDITION request indication.

A RADIO BEARER SETUP request indication is sent from the TACAF to BCAF to request to setup a radio bearer. The detail is represented in Figure 438.

A RADIO BEARER SETUP response confirmation is a response to the RADIO BEARER SETUP request indication sent from the BCAF to TACAF to indicate the completion of the radio bearer setup. The detail is represented in Figure 439.

2.4.3.5.2 INTER-CELL HANDOVER BRANCH ADDITION

2.4.3.5.2.1 COMMON PROCEDURE MODULES

2.4.3.5.2.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 42 shows the functional model of a part of the invented system for describing the inter-cell handover branch addition.

b) INFORMATION FLOWS

Figure 43 shows an information flow diagram of the inter-cell handover branch addition, executed in the communication control plane.

2.4.3.5.2.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

A HANDOVER CONNECTION SETUP request indication is sent from the TACFa to BCFa to notify of a handover initiation and to request to setup an access bearer. The detail is represented in Figure 440. The information element marked by *1 in Figure 440 identifies the bearer between the CCF and BCF.

A HANDOVER CONNECTION SETUP response confirmation is sent from the BCF to TACF to confirm the HANDOVER CONNECTION SETUP request indication. The detail is represented in Figure 441. The asterisked information element in Figure 441 identifies the bearer between the BCFa and BCFv.

A BEARER SETUP request indication is sent from the TACFa to TACFv to setup an access bearer. The detail is represented in Figure 442. The asterisked information element in Figure 442 identifies the bearer between the BCFa and BCFv.

Another BEARER SETUP request indication is sent from the TACF to BCF to request the bearer setup. The detail is represented in Figure 443. The asterisked information element in Figure 443 identifies the bearer between the BCF and CCF.

A BEARER SETUP response confirmation is sent from the BCF to TACF to confirm the BEARER SETUP request indication. The detail is represented in Figure 444. The asterisked information element in Figure 444 identifies the bearer between the BCF and BCFr.

A BEARER-AND-RADIO-BEARER SETUP request indication is sent from the TACF to BCFr to request to setup a bearer between the BCF and BCFr and a radio bearer. The detail is represented in Figure 445.

A BEARER-AND-RADIO-BEARER SETUP response confirmation is a response to the BEARER-AND-RADIO-BEARER SETUP request indication and is sent from the BCFr to TACF to indicate the completion of setting up of the radio bearer and bearer between the BCFr and BCF. The detail is represented in Figure 446.

A RADIO BEARER SETUP REQUEST request indication is sent from the visited TACF, which controls the newly assigned radio bearer, to the TACFa to request to setup the radio bearer between the mobile terminal and BCFr. The detail is represented in Figure 447.

A HANDOVER BRANCH ADDITION request indication is sent from the TACF to TACAF to notify of the HANDOVER BRANCH ADDITION request indication and to request to setup a new physical radio channel(s) without releasing the existing physical radio channel(s). The detail is represented in Figure 448. The information elements marked by *1 in Figure 448 may be repeated a plurality of times, the number of repetition is the same as the number of the destination cells. The information elements marked by *2 in Figure 448 may be repeated a plurality of times, the number of repetition is the same as the number of the calls related to the TACF.

A HANDOVER BRANCH ADDITION response confirmation is sent from the TACAF to TACF to notify of the reception of the HANDOVER BRANCH ADDITION INITIATION request indication.

A RADIO BEARER SETUP request indication is sent from the TACAF to BCAF to request to setup a radio bearer. The detail is represented in Figure 449.

A RADIO BEARER SETUP response confirmation is a response to the RADIO BEARER SETUP request indication and is sent from the BCAF to TACAF to indicate the completion of the radio bearer setup. The detail is represented in Figure 450.

A BEARER SETUP response confirmation is sent from the TACFa to TACFv to confirm the establishment of the access bearer. The detail is represented in Figure 451.

2.4.3.5.3 INTER-SECTOR HANDOVER BRANCH DELETION IN SINGLE CELL (HANDOVER CONTROLLED BY SAME BCFr)

2.4.3.5.3.1 COMMON PROCEDURE MODULES

2.4.3.5.3.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 44 shows the functional model of a part of the invented system for describing the inter-sector handover branch deletion in a single cell.

b) INFORMATION FLOWS

Figure 45 shows an information flow diagram of the inter-sector handover branch deletion in a single cell, executed in the communication control plane.

2.4.3.5.3.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

A HANDOVER BRANCH DELETION request indication is sent from the

TACF to TACAF to request to release the physical radio channel(s). The detail is represented in Figure 452. The information elements marked by *1 in Figure 452 may be repeated a plurality of times, the number of repetition is the same as the number of the handover branches related to the terminal. The information elements marked by *2 in Figure 452 may be repeated a plurality of times, the number of repetition is the same as the number of the calls related to the terminal. The Handover branch ID element in Figure 452 is used to uniquely identify the route by which an access link is carried.

A HANDOVER BRANCH DELETION response confirmation is sent from the TACAF to TACF to confirm the HANDOVER BRANCH DELETION request indication. The detail is represented in Figure 453.

A BEARER RELEASE request indication is sent from the TACFa to TACFv to release the access bearer. The detail is represented in Figure 454.

An INTRA-BCFr HANDOVER BRANCH DELETION request indication is sent from the TACF to BCFr to request the release of the physical radio channel(s). The detail is represented in Figure 455. The asterisked information element in Figure 455 is included when this information flow is sent from BCFr to TACF.

An INTRA-BCFr HANDOVER BRANCH DELETION response confirmation is a response to the INTRA-BCFr HANDOVER BRANCH DELETION request indication and is sent from the BCFr to TACF to indicate the release of the physical radio channel(s). The detail is represented in Figure 456.

A BEARER RELEASE response confirmation is sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication. The detail is represented in Figure 457.

2.4.3.5.4 INTER-CELL HANDOVER BRANCH DELETION AT LOCATIONS OTHER THAN BOUNDARY BETWEEN CELLS

2.4.3.5.4.1 COMMON PROCEDURE MODULES

2.4.3.5.4.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 46 shows the functional model of a part of the invented system for describing the inter-cell handover branch deletion.

b) INFORMATION FLOWS

Figure 47 shows an information flow diagram of the inter-cell handover branch deletion, executed in the communication control plane.

2.4.3.5.4.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 47 will be described below and information elements of the flows are represented in tables.

A HANDOVER BRANCH DELETION request indication is sent from the TACF to TACAF to request to release the physical radio channel(s). The detail is represented in Figure 458. The information elements marked by *1 in Figure 458 may be repeated a plurality of times, the number of repetition is the same as the number of the handover branches related to the terminal. The information element marked by *2 in Figure 458 may be repeated a plurality of times, the number of repetition is the same as the number of the calls related to the terminal. The handover branch ID element in Figure 458 is used to uniquely identify the route by which an access radio link is carried.

A HANDOVER BRANCH DELETION response confirmation is sent from the TACAF to TACF to confirm the HANDOVER BRANCH DELETION request indication. The detail is represented in Figure 459.

A RADIO BEARER RELEASE request indication is sent from the TACAF to BCAF to request the radio bearer release. The detail is represented in Figure 460.

A RADIO BEARER RELEASE response confirmation is a response to the RADIO BEARER RELEASE request indication and is sent from the BCFr to TACAF to indicate the completion of the radio bearer release. The detail is represented in

Figure 461.

A HANDOVER CONNECTION RELEASE request indication is sent from the TACF to BCF to release the indicated bearer in the diversity handover state. The detail is represented in Figure 462.

A HANDOVER CONNECTION RELEASE response confirmation is sent from the BCF to TACF to confirm the HANDOVER CONNECTION RELEASE request indication. The detail is represented in Figure 463.

A BEARER RELEASE request indication is sent from the TACFa to TACFv to release the access bearer. The detail is represented in Figure 464.

Another BEARER RELEASE request indication is sent from the TACF to BCF to request the bearer release. The detail is represented in Figure 465.

A BEARER RELEASE response confirmation is sent from the BCF to TACF to confirm the BEARER RELEASE request indication. The detail is represented in Figure 466.

A BEARER-AND-RADIO-BEARER RELEASE request indication is sent from the TACF to BCFr to request the bearer between the BCF and BCFr and the radio bearer. The detail is represented in Figure 467. The asterisked information element in Figure 467 is included when this information flow is sent from BCFr to TACF.

A BEARER-AND-RADIO-BEARER RELEASE response confirmation is a response to the BEARER-AND-RADIO-BEARER RELEASE request indication and is sent from the BCFr to TACF to indicate the completion of the release of the bearer and the radio bearer. The detail is represented in Figure 468.

A BEARER RELEASE response confirmation is sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication. The detail is represented in Figure 469.

2.4.3.5.5 INTRA-CELL BRANCH REPLACEMENT HANDOVER

2.4.3.5.5.1 COMMON PROCEDURE MODULES USED

2.4.3.5.5.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 48 shows the functional model of a part of the invented system for describing the intra-cell branch replacement handover.

b) INFORMATION FLOWS

Figure 49 shows an information flow diagram of the intra-cell branch replacement handover executed in the communication control plane.

2.4.3.5.5.3 DEFINITIONS OF INFORMATION FLOWS AND INFORMATION ELEMENTS

Information flows in Figure 49 will be described below and information elements of the flows are represented in tables.

A BEARER SETUP request indication is sent from the TACFa to TACFv to setup an access bearer. The detail is represented in Figure 470. The asterisked information element in Figure 470 identifies the bearer between the BCFa and BCFv.

An INTRA-BCFr HANDOVER BRANCH REPLACEMENT request indication is sent from the TACF to BCFr to request to set up new physical radio channel(s).

An INTRA-BCFr HANDOVER BRANCH REPLACEMENT response confirmation is a response to the INTRA-BCFr HANDOVER BRANCH REPLACEMENT request indication and is sent from the BCFr to TACF to indicate the completion of the setup of the physical radio channel(s). The detail is represented in Figure 471. The information element marked by *1 in Figure 471 may be repeated a plurality of times, the number of repetition is the same as the number of the radio links to be setup.

An INTRA-BCFr HANDOVER BRANCH REPLACEMENT PROCEEDING request indication is sent from the BCFr to TACF to indicate that the request of the handover branch replacement is accepted. The detail is represented in Figure 472.

A RADIO BEARER SETUP REQUEST request indication is sent from the visited TACF, which controls the newly assigned radio bearer, to the anchor TACFa to request to setup the radio bearer between the mobile terminal and BCFr controlled by the visited TACF. The detail is represented in Figure 473.

A NON-SOFT HANDOVER EXECUTION request indication is sent from the TACF to TACAF to notify of a non-soft handover execution request initiation and to request to replace an existing radio channel by the designated physical radio channel. The detail is represented in Figure 474. The information element marked by *1 in Figure 474 may be repeated a plurality of times, the number of repetition is the same as the number of the handover branches related to the terminal. The information element marked by *2 in Figure 474 may be repeated a plurality of times, the number of repetition is the same as the number of the calls related to the TACF.

A RADIO BEARER SETUP request indication is sent from the TACAF to BCAF to request to setup a radio bearer. The detail is represented in Figure 475.

A RADIO BEARER SETUP response confirmation is a response to the RADIO BEARER SETUP request indication and is sent from the BCAF to TACAF to indicate the completion of the radio bearer setup. The detail is represented in Figure 476.

A RADIO BEARER RELEASE request indication is sent from the TACAF to BCAF to request the radio bearer release. The detail is represented in Figure 477.

A RADIO BEARER RELEASE response confirmation is a response to the RADIO BEARER RELEASE request indication and is sent from the BCAF to TACAF to indicate the completion of the radio bearer release. The detail is represented in Figure 478.

A BEARER SETUP response confirmation is sent from the TACFa to TACFv to confirm the establishment of the access bearer. The detail is represented in Figure 479.

2.4.3.5.6 INTER-CELL BRANCH REPLACEMENT HANDOVER

2.4.3.5.6.1 COMMON PROCEDURE MODULES USED

2.4.3.5.6.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 50 shows the functional model of a part of the invented system for describing the inter-cell branch replacement handover.

b) INFORMATION FLOWS

Figure 51 shows an information flow diagram of the inter-cell branch replacement handover executed in the communication control plane.

2.4.3.5.6.3 DEFINITIONS OF INFORMATION FLOWS AND ASSOCIATED INFORMATION ELEMENTS

Information flows in Figure 51 will be described below and information elements of the flows are represented in tables.

A HANDOVER CONNECTION SETUP request indication is sent from the TACFa to BCFa to notify of a handover initiation and to request to set up a new handover link. The detail is represented in Figure 480. The information element marked by *1 in Figure 480 is mandatory in case that the network has more than one handover mode.

A HANDOVER CONNECTION SETUP response confirmation is sent from the BCF to TACF to confirm the HANDOVER CONNECTION SETUP request indication. The detail is represented in Figure 481. The asterisked information element in Figure 481 identifies the bearer between the BCFa and BCFv.

A BEARER SETUP request indication is sent from the TACFa to TACFv to set up a new handover link. The detail is represented in Figure 482. The asterisked information element in Figure 482 identifies the link between the BCFa and BCFv. There may be another functional entity for transition of link between the BCFa and BCFv. The expression of inter-BCF link should be studied further.

Another BEARER SETUP request indication is sent from the TACF to BCF to request a new handover link in the network. The detail is represented in Figure 483. The asterisked information element in Figure 483 identifies the link between the

BCFa and BCFv. There may be another functional entity for transition of link between the BCFa and BCFv. The expression of inter-BCF link should be studied further.

A BEARER SETUP response confirmation is sent from the BCF to TACF to confirm a BEARER SETUP request indication. The detail is represented in Figure 484. The asterisked information element in Figure 484 identifies the link between the BCF and BCFr. There may be another functional entity for transition of link between the BCFa and BCFv. The expression of inter-BCF link should be studied further.

A BEARER-AND-RADIO-BEARER SETUP request indication is sent from the TACF to BCFr to request to set up a bearer between the BCF and BCFr and a radio bearer. The detail is represented in Figure 485.

A RADIO BEARER SETUP PROCEEDING request indication is sent from the BCFr to TACF to indicate that the request of the access radio link setup is accepted and that the BCFr starts setting up the access radio link. The detail is represented in Figure 486.i

A RADIO BEARER SETUP REQUEST request indication is sent from the visited TACF, which controls the newly assigned access radio link, to TACFa to request to set up the access radio link between the mobile terminal and the BCFr controlled by the visited TACF. The detail is represented in Figure 487.

A NON-SOFT HANDOVER EXECUTION request indication is sent from the TACF to TACAF to notify of a NON-SOFT HANDOVER EXECUTION request indication and to request to replace an existing physical radio channel by a designated physical radio channel. The detail is represented in Figure 488. The information element marked by *1 in Figure 488 may be repeated a plurality of times, the number of repetition is the same as the number of the handover branches related to the terminal. The information element marked by *2 in Figure 488 may be repeated a plurality of times, the number of repetition is the same as the number of the access links related to the TACF.

A RADIO BEARER SETUP request indication is sent from the TACAF to BCAF to request to set up an access radio link. The detail is represented in Figure 489.

A RADIO BEARER SETUP response confirmation is a response to the RADIO BEARER SETUP request indication and is sent from the BCAF to TACAF to indicate the completion of the setup of the access radio link. The detail is represented in Figure 490.

A RADIO BEARER RELEASE request indication is sent from the TACAF to BCAF to request to release the access radio link. The detail is represented in Figure 491.

A RADIO BEARER RELEASE response confirmation is a response to the RADIO BEARER RELEASE request indication and is sent from the BCAF to TACAF to request to release the access radio link. The detail is represented in Figure 492.

A BEARER-AND-RADIO-BEARER SETUP response confirmation is a response to the BEARER-AND-RADIO-BEARER SETUP request indication and is sent from the BCFr to TACF to indicate the completion of the setup of the access radio link and the link between the BCFr and BCF. The detail is represented in Figure 493.

A BEARER SETUP response confirmation is sent from the TACFa to TACFv to confirm the establishment of the handover link. The detail is represented in Figure 494.

A HANDOVER CONNECTION RELEASE request indication is sent from the TACF to BCFa to request to remove the indicated handover link. The detail is represented in Figure 495.

A HANDOVER CONNECTION RELEASE response confirmation is sent from the BCF to TACF to confirm the HANDOVER CONNECTION RELEASE request indication. The detail is represented in Figure 496.

A BEARER RELEASE request indication is sent from the TACFa to TACFv to request to release the handover link in the network. The detail is represented in Figure 497.

Another BEARER RELEASE request indication is sent from the TACF to BCF to request to release the handover link in the network. The detail is represented in Figure 498.

A BEARER RELEASE response confirmation is sent from the BCF to TACF to confirm the BEARER RELEASE request indication. The detail is represented in Figure 499.

A BEARER-AND-RADIO-BEARER RELEASE request indication is sent from the TACF to BCFr to request to release the access link or handover link between the BCF and BCFr and between BCAF and BCF. The detail is represented in Figure 500. The asterisked information element in Figure 500 us included when this information flow is sent from the BCFr and TACF.

A BEARER-AND-RADIO-BEARER RELEASE response confirmation is a response to the BEARER-AND-RADIO-BEARER RELEASE request indication and is sent from the BCFr to TACF to indicate the completion of the release of the access link or hand over link. The detail is represented in Figure 501.

A BEARER RELEASE response confirmation is sent from the TACFv to TACFa to confirm the BEARER RELEASE request indication. The detail is represented in Figure 502.

2.4.3.5.7 ACCH REPLACEMENT

Figure 790 shows a part of the invented system for describing the ACCH replacement. In Figure 790, a service control center 1, connected to a public network (not shown), controls or manages a plurality of (two in the example in Figure 790) mobile service switching centers 2a and 2b. Each mobile service switching center 2a or 2b is connected with a base station controller 3a or 3b via a plurality of lines. The base station controller 3a controls base stations 6a to 6d while the base station controller 3b controls base stations 6e to 6h. The base stations 6a to 6h possess radio zones 5a to 5h, respectively, and one of the base stations is communicable with a mobile station 7 when the mobile station 7 visits the corresponding radio zone.

In relation to Figure 790, assume that the mobile station 7 exists in the radio zone 5b and treats a plurality of calls using a plurality of traffic channels. At least one ACCH (associated control channel), utilizing the same radio resources as those for one of the traffic channels that are used for voice or data transportation, is necessary.

As already described at section 2.2.2, one ACCH (for example, ACCH1 in Figure 790) is selected in accordance with the invented system, and is used for transporting all of the control signals involved in the mobile station 7. Therefore, it is possible to reduce the number of hardware elements for transporting control signals in comparison with the case that the calls respectively utilize multiple ACCHs. In addition, it is possible to exclude complicated control procedures, e.g., adjustment of the transportation order of control information in the plurality of ACCHs.

In such a communications system, however, when a set of wireless communication resources involved in the single ACCH is released due to the release of one of the traffic channels by the ending of the call, it is difficult to secure the ACCH to continue the other call. The same problem may occur when the transmission rate in the ACCH is altered. Consequently, when the radio resources involved in the employed ACCH are released due to a connection or call release, and when another call should be continued, ACCH replacement is necessary. ACCH replacement is also necessary when altering the transmission rate in the ACCH.

Accordingly, in addition to sharing the single ACCH by the multiple traffic channels for realizing the multiple calls simultaneously by the single mobile station 7, when the single set of wireless communication resources involved in the single ACCH is released, the ACCH is replaced by another ACCH.

2.4.3.5.7.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 52 shows functional entities involved in the ACCH replacement of the invented system. As shown in Figure 52, these functional entities can be categorized into two types: the first type is functional entities arranged in the mobile terminal and the second type is functional entities arranged in the visited network including base stations. The arrangement and the function of the functional entities will be described next briefly.

The mobile communications control center 2a or 2b in Figure 790 is provided with a CCFa (call control function) which is a functional entity for controlling call and connection. The index "a" of CCFa is the abbreviation of "anchor" that means it is fixed at the start of communication and does not move although the mobile terminal 6 moves.

The base station controller 3a or 3b is provided with a TACFa (terminal access control function) and a BCFa (bearer control function). The TACFa is a functional entity for controlling the access from the network to the mobile station 7 and for instructing the activation and release of the ACCH. The BCFa (bearer control function) is a functional entity for controlling the bearer. As similar to above, the index "a" is the abbreviation of "anchor."

The base station controller 3a or 3b, which may be the same as or other than that with the TACFa and BCFa, is provided with a TACFv and BCFv. The index "v" is the abbreviation of "visited."

Either of the base stations 4a and 4b that are controlled by the base station controller with the TACFv and BCFv is provided with a BCFr (bearer control function) associated with radio bearers. The BCFr controls radio bearers and activates and releases the ACCH.

The mobile terminal 6 is provided with a TACAF (terminal access control agent function) and BCAF (bearer control agent function). The TACAF is a functional entity for controlling the access to the mobile terminal and for instructing the release and establishment of the ACCH. The BCAF is a functional entity for controlling the radio bearer of the mobile terminal and for executing the release and establishment of the ACCH.

The index "1" or "2" is attached to the functional entities. The index "1" means that the corresponding entity is served for the first call while the index "2" means that the corresponding entity is served for the second call within a plurality of calls that the mobile terminal 7 is carrying out.。

(b) INFORMATION FLOWS

Figures 53 and 54 cooperate to form an information flow diagram showing the ACCH replacement procedure executed in the communication control plane.

2.4.3.5.7.3 DEFINITIONS OF INFORMATION FLOWS AND ASSOCIATED INFORMATION ELEMENTS

Information flows and information elements in Figures 53 and 54 will be described below and the information elements are represented in tables. With reference to the sequential chart in Figures 53 and 54, the ACCH replacement procedure will be described.

The ACCH replacement procedure in Figures 53 and 54 is started under the condition described below.

(a) Previously, a mobile station has treated first and second calls using traffic channels TCH1 and TCH2.

(b) Then, the first call by the traffic channel TCH1 is now being finished.

(c) An associated control channel ACCH1 and the traffic channel TCH1 have used the same radio resources. The associated control channel ACCH1 has been commonly shared by the first and second calls for transporting control signals.

(d) The traffic channel TCH1 and the associated control channel ACCH1 will be released due to the finish of the first call. However, it is necessary to maintain the second call through the traffic channel TCH2, so that another associated control channel is necessary. Therefore, it is necessary to replace the associated control channel ACCH1 by another associated control channel ACCH2 that uses the same resources as of the traffic channel TCH2.

Consequently, the procedure illustrated in Figures 53 and 54 starts under the conduction, which is the same as that, under which the procedure illustrated in Figure 262 starts. In other words, the chart shown in Figures 53 and 54 is essentially the same as the chart in Figure 262, but represents in more detail the replacement procedure for replacing the radio bearer between the BCAF1 and BCFr1 for the first call with the radio bearer between the BCAF2 and BCFr2 for the second call.

When conditions (a) to (d) are satisfied, a trigger for replacing ACCH is generated as represented in Figure 53. If the TACFa detects this trigger, the TACFa determines a connection to which the ACCH should be newly setup and then sends a HANDOVER CONNECTION SETUP request indication to the BAFa to notify of the handover initiation and to request to setup an ACCH. As represented in Figure 503, the HANDOVER CONNECTION SETUP request indication contains a BCF-TACF relationship ID element, base station ID element, and handover mode element. In the tables, "M" is the abbreviation of mandatory while "O" is the abbreviation of optional. The handover mode element in Figure 503 is mandatory when the network has more than one handover mode.

As shown in Figure 53, the BCFa captures a DHT for the new ACCH, and then sends a HANDOVER CONNECTION SETUP response confirmation to the TACFa to confirm the HANDOVER CONNECTION SETUP request indication. The HANDOVER CONNECTION SETUP response confirmation contains a TACF-BCF relationship ID element and inter-BCF bearer ID element as represented in Figure 504. The bearer ID element in Figure 504 identifies the bearer between the BCFa and BCFv.

Then, a BEARER SETUP request indication is sent from the TACFa to TACFv2, which corresponds to the second call, to setup an access bearer for the ACCH. The BEARER SETUP request indication contains a TACF-BCF relationship ID element, inter-BCF bearer ID element, base station ID element, and user information rate element as represented in Figure 505. The bearer ID element identifies the bearer between the BCFa and BCFv.

The TACFv2 sets up a to-BTS short cell connection for the ACCH and then selects a link reference which is the same as of that the traffic channel TCH2 for realizing the second call. Then, the TACFv2 sends another BEARER SETUP request indication to the BCFv2. The BEARER SETUP request indication requests to setup a bearer for ACCH2 which is associated with the traffic channel TCH2. The BEARER SETUP request indication contains a TACF-BCF relationship ID element, inter-BCF bearer ID element, user information rate element, and base station ID element, as represented in Figure 506. The bearer ID element identifies the bearer between the BCFa and BCFv.

Once the BCFv2 receives the BEARER SETUP request indication, the BCFv2 setup the requested bearer and sends a BEARER SETUP response confirmation to the TACFv2 to confirm the BEARER SETUP request indication. The BEARER SETUP response confirmation contains a TACF-BCF relationship ID element and BCF-BCFr bearer ID element as represented in Figure 507. The bearer ID identifies the bearer between the BCF and BCFr.

When the TACFv2 receives the BEARER SETUP response confirmation, TACFv2 sends a BEARER-AND-RADIO-BEARER SETUP request indication to the BCFr2 to request to setup a bearer between the BCF and BCFr and a radio bearer from the ACCH. The BEARER-AND-RADIO-BEARER SETUP request indication contains a TACF-BCFr relationship ID element and bearer ID element as represented in Figure 508.

Upon the reception of the BEARER-AND-RADIO-BEARER SETUP request indication, the BCFr2 in light of the link reference specifies the traffic channel TCH2 and enables to start the transmission through ACCH2. Then, the BCFr2 sends a RADIO BEARER SETUP PROCEEDING request indication to the TACFv2 to indicate that the request of the radio bearer setup is accepted and that the BCFr starts setting up the radio bearer for ACCH2. The RADIO BEARER SETUP PROCEEDING request indication contains a TACF-BCFr relationship ID as represented in Figure 509.

Upon the reception of the RADIO BEARER SETUP PROCEEDING request indication, a RADIO BEARER SETUP REQUEST request indication is sent from the visited TACFv2, which controls the newly assigned radio bearer, to the TACFa to request to setup a radio bearer for ACCH2 between the mobile terminal and the BCFr controlled by the visited TACF. The RADIO BEARER SETUP REQUEST request indication contains a TACF-TACF relationship ID as represented in Figure 510.

Next, another RADIO BEARER SETUP request indication is sent from the TACFa to TACAF to notify of the ACCH replacement handover execution initiation and to request to replace the existing physical radio channel for the first call with the designated physical radio channel for the ACCH. The RADIO BEARER SETUP request indication contains a call ID as represented in Figure 511.

Upon the reception of the RADIO BEARER SETUP request indication, the TACAF as shown in Figure 54 sends BCAF2 another RADIO BEARER SETUP request indication. The RADIO BEARER SETUP request indication requests to setup a radio bearer for the ACCH (ACCH2) and contains a TACAF-BCAF relationship ID as represented in Figure 512.

Upon the reception of the RADIO BEARER SETUP request indication, the BCAF2 establishes the new ACCH and then sends a RADIO BEARER SETUP response confirmation to the TACAF to indicate the completion of the radio bearer setup for the new ACCH. The RADIO BEARER SETUP response confirmation contains a TACAF-BCAF relationship ID as represented in Figure 513.

Then, the TACAF sends another RADIO BEARER SETUP response confirmation to the TACFa to indicate the completion of setting up of the radio bearer for the ACCH (ACCH2). The RADIO BEARER SETUP response confirmation contains a TACAF-BCAF relationship ID in the same fashion as that represented in Figure 513.

Next, the TACAF sends the BCAF1 a RADIO BEARER RELEASE request indication to request to release the previous radio bearer. The RADIO BEARER RELEASE request indication contains a TACAF-BCAF relationship ID as represented in Figure 514.

Upon the reception of the RADIO BEARER RELEASE request indication, the BCAF1 releases the previously employed ACCH (ACCH1 associated with the traffic channel TCH1) and then replies a RADIO BEARER RELEASE response confirmation to the TACAF to indicate the completion of the radio bearer release. The RADIO BEARER RELEASE response confirmation contains a TACAF-BCAF relationship ID as represented in Figure 515.

On the other hand, when receiving the RADIO BEARER SETUP response confirmation, the TACFa sends the BCFa a HANDOVER CONNECTION RELEASE request indication to request to remove the previous bearer in the soft handover state. The HANDOVER CONNECTION RELEASE request indication contains a TACF-BCF relationship ID element and released bearer ID element as represented in Figure 516.

Upon the reception of the HANDOVER CONNECTION RELEASE request indication, the BCFa releases the previous DHT and sends a HANDOVER CONNECTION RELEASE response confirmation to the TACFa to confirm the HANDOVER CONNECTION RELEASE request indication. The HANDOVER CONNECTION RELEASE response confirmation contains a TACF-BCF relationship ID as represented in Figure 517.

Next, the TACFa sends the TACFv1 a BEARER RELEASE request indication to request to release the access bearer. The BEARER RELEASE request indication contains a TACF-TACF relationship ID as represented in Figure 518.

Upon the reception of the BEARER RELEASE request indication, the TACFv1 sends the BCFv1 another BEARER RELEASE request indication to request to release the bearer. The BEARER RELEASE request indication contains a TACF-BCF relationship ID as represented in Figure 519.

Upon the reception of the BEARER RELEASE request indication, the BCFv1 sends the TACFv1 another BEARER RELEASE request indication to confirm the BEARER RELEASE request indication, and then release the previous resources. The BEARER RELEASE response confirmation contains a TACF-BCF relationship ID element as represented in Figure 520.

Upon the reception of the BEARER RELEASE response confirmation, the TACFv1 sends the BCFr1 a BEARER-AND-RADIO-BEARER RELEASE request indication to request to release the bearer between the BCF and BCFr and the radio bearer. The BEARER-AND-RADIO-BEARER RELEASE request indication contains a TACF-BCFr relationship ID element and a cause element as represented in Figure 521. The cause element is however included when this information element is sent from the BCFr to TACF.

On the other hand, when receiving the BEARER-AND-RADIO-BEARER RELEASE request indication, the BCFr1 stops the transmission. Then, the BCFr1 sends the TACFv1 a BEARER-AND-RADIO-BEARER RELEASE response confirmation and then releases the previous resources. The BEARER-AND-RADIO-BEARER RELEASE response confirmation is a response to the BEARER-AND-RADIO-BEARER request indication and indicates the completion of the release of the bearer and radio bearer. The BEARER-AND-RADIO-BEARER RELEASE response confirmation contains a TACF-BCFr relationship ID as represented in Figure 522.

Upon the reception of the BEARER-AND-RADIO-BEARER RELEASE response confirmation, the TACFv1 sends the TACFa a BEARER RELEASE response confirmation to confirm the BEARER RELEASE request indication. The BEARER

RELEASE response confirmation contains a TACF-TACF relationship ID as represented in Figure 523.

In the above description of the ACCH replacement procedure, it is omitted to describe the procedure when the mobile station carries out the diversity handover for simplifying the description. If the mobile station 7 (refer to Figure 790) carries out the diversity handover, the above-mentioned functional entities (TACFv1、BCFv1、TACFv2、BCFv2、BCFr1、BCFr2) are respectively provided with the base station controllers or the base stations, to which branches are established, and are controlled by the TACFa in the same manner as represented in Figures 53 and 54. Accordingly, the ACCH replacement may be executed even at the diversity handover status. In this case, information elements are simultaneously transported between the TACFa of all of the base station controllers and the TACAFv of the mobile terminal.

In the ACCH replacement procedure, a wired access link is newly established between a base station controller at which the TACFa is disposed and a base station, and then the radio access link between the mobile terminal and the network is replaced. Accordingly, the ACCH replacement is accomplished.

However, in an alteration, it is possible to replace the ACCH without the new establishment of the wired access link. This alteration will be described with reference to Figure 791.

As represented in Figure 791, a trigger for replacing ACCH is generated. If the TACFa detects this trigger, the TACFa determines a connection to which the ACCH should be newly setup; and then sends an ACCH REPLACEMENT SETUP request indication to the TACFv2 where the new ACCH should be setup. Upon the reception of the reception, the TACFv2 further sends an ACCH REPLACEMENT SETUP request indication to the BCFr2. As a result, the BCFr2 sets up the new ACCH and starts transmission through the ACCH. Then, the BCFr2 replies a notification of the completion of the ACCH setup to the TACFv2. Upon the reception of the reception of the notification, the TACFv2 sends another notification of the completion of the ACCH setup to the TACFa. The TACFa sends a RADIO ACCESS LINK SETUP request indication as similar to the foregoing procedure represented in Figures 53 and 54. As a result, the BCAF2 sets up the new ACCH while the BCAF1 releases the existent ACCH. In addition, the TACAF sends the TACFa a RADIO ACCESS LINK SET UP response confirmation.

Upon the reception of the RADIO ACCESS LINK SETUP response confirmation, the TACFa sends the TACFv1 an ACCH RELEASE request indication. Then, the TACFv1 further sends the ACCH RELEASE request indication to the BCFr1. As a result, the BCFr1 stops transmission through the existent ACCH, releases the existent ACCH and sends back the TACFv1 an ACCH RELEASE response confirmation. Then, the TACFv1 notifies the TACFa of the completion of the release of the existent ACCH.

In this procedure, since the ACCH replacement is accomplished by the functional entities illustrated in Figure 791, it is not carried out to newly set up a radio access link in the network.

2.4.3.5.8 CODE REPLACEMENT

2.4.3.5.8.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 55 shows the functional model of a part of the invented system for describing a code replacement.

b) INFORMATION FLOWS

Figure 56 shows an information flow diagram of the code replacement executed in the communication control plane.

2.4.3.5.8.3 DEFINITIONS OF INFORMATION FLOWS AND ASSOCIATED INFORMATION ELEMENTS

Information flows and information elements in Figure 56 will be described below and the information elements are represented in tables.

A CODE REPLACEMENT request indication is sent from a BCFr to a TACF to request change of codes. The detail of the CODE REPLACEMENT request indication is represented in Figure 524.

Another CODE REPLACEMENT request indication is sent from the visited TACF to a TACFa to request change of codes. The detail of the CODE REPLACEMENT request indication is represented in Figure 525.

Another CODE REPLACEMENT request indication is sent from the TACF to a TACAF to request change of codes. The detail of the CODE REPLACEMENT request indication is represented in Figure 526. The element marked by *1 in Figure 526 may be repeated a plurality of times, the number of repetition is the same as the number of the handover branches related to the terminal. The element marked by *2 in Figure 526 may be repeated a plurality of times, the number of repetition is the same as the number of calls related to the TACF.

Another CODE REPLACEMENT request indication is sent from the TACAF to the BCAF to request to change of codes. The detail of the CODE REPLACEMENT request indication is represented in Figure 527.

A CODE REPLACEMENT response confirmation is a response to the CODE REPLACEMENT request indication and is sent from the BCAF to the TACAF to indicate the completion of the change of codes. The detail of the CODE REPLACEMENT response confirmation is represented in Figure 528.

Another CODE REPLACEMENT response confirmation is a response to the CODE REPLACEMENT request indication and is sent from the TACAF to the TACFa to confirm the CODE REPLACEMENT request indication. The detail of the CODE REPLACEMENT response confirmation is represented in Figure 529.

Another CODE REPLACEMENT response confirmation is sent from the TACFa to the TACFv to confirm the CODE REPLACEMENT request indication. The detail of the CODE REPLACEMENT response confirmation is represented in Figure

530.

Another CODE REPLACEMENT response confirmation is sent from the TACF to the BCFr to confirm the CODE REPLACEMENT request indication. The detail of the CODE REPLACEMENT response confirmation is represented in Figure 531.

2.4.3.6 TRANSMISSION POWER CONTROL

2.4.3.6.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 57 shows the functional model of a part of the invented system for describing a transmission power control.

b) INFORMATION FLOWS

Figure 58 shows an information flow diagram of the transmission power control executed in the communication control plane.

2.4.3.6.3 DEFINITIONS OF INFORMATION FLOWS AND ASSOCIATED INFORMATION ELEMENTS

Information flows and information elements in Figure 58 will be described below and the information elements are represented in tables.

A CELL CONDITION REPORT request indication is sent from an MRRC to an RRC periodically to notify of the radio conditions of respective handover branches. The detail of the CELL CONDITION REPORT request indication is represented in Figure 532.

A TRANSMISSION POWER CONTROL request indication is sent from a TACFa to TACFv to notify of the instructed transmission power. The detail of the TRANSMISSION POWER CONTROL request indication is represented in Figure 533.

Another TRANSMISSION POWER CONTROL request indication is sent from a TACFv to BCFr to notify of the instructed transmission power. The detail of the

TRANSMISSION POWER CONTROL request indication is represented in Figure 534.

2.4.4 INFORMATION FLOWS OF MOBILITY SERVICES

2.4.4.1 TERMINAL LOCATION UPDATING

2.4.4.1.1 COMMON PROCEDURE MODULES USED

Common procedure modules used within the terminal location updating service are the TMUI inquiry, the FPLMTS user ID retrieval, the user authentication procedure, the ciphering start time notification, and the TMUI assignment.

2.4.4.1.2 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 59 shows the functional model of a part of the invented system for describing a terminal location updating.

b) INFORMATION FLOWS

Figures 60 and 61 form an information flow diagram of the terminal location updating.

2.4.4.1.3 DEFINITIONS OF INFORMATION FLOWS AND ASSOCIATED INFORMATION ELEMENTS

Information flow in Figures 60 and 61 will be described below and information elements of the flows are represented in tables.

Relationship rd (LRCF-LRDF)

An LAI UPDATE request indication is sent from the visited SCF to the SDF for requesting to update the location area information. A response confirmation is returned to the visited SCF from the SDF to confirm the completion of updating the location area information. Figure 535 represents the details of the LAI UPDATE request indication and the LAI UPDATE response confirmation.

Relationship rk (SACF-LRCF)

A TERMINAL LOCATION UPDATE request indication is sent from the SACF to the visited SCF for requesting to update the location information of the mobile terminal. A response confirmation is returned to the SACF from the visited SCF to confirm the completion of updating the terminal location information. Figure 536 represents the details of the TERMINAL LOCATION UPDATE request indication and the TERMINAL LOCATION UPDATE response confirmation.

Relationship rl (MCF-SACF)

Another TERMINAL LOCATION UPDATE request indication is sent from the MCF to the SACF for requesting to update the location information of the mobile terminal. A response confirmation is returned to the MCF from the SACF to confirm the completion of updating the terminal location information. Figure 537 represents the details of the TERMINAL LOCATION UPDATE request indication and the TERMINAL LOCATION UPDATE response confirmation.

[Notes}

1) The relationship ID element identifies the relationship between requests and responses.

2) TMUI and TMUI assignment source ID should be used for the FPLMTS user ID element for relationships rl and rk.

3) The terminal status element indicates whether the terminal can accept a call or not.

4) The TC information is a terminal data information which indicates terminal capabilities.

2.4.5 INFORMATION FLOWS OF SECURITY SERVICES

2.4.5.1 USER AUTHENTICATION

a) FUNCTIONAL MODEL

Figure 62 shows the functional model of a part of the invented system for describing a user authentication.

b) INFORMATION FLOWS

Figure 63 shows an information flow diagram of the user authentication.

c) DEFINITIONS OF INFORMATION FLOWS, INFORMATION ELEMENTS, AND FUNCTIONAL ENTITY ACTIONS

Information flows and functional entity actions in Figure 63 will be described below and information elements of the flows are represented in tables.

Relationship rd (LRCF-LRDF)

An authentication information retrieval information flow is used to request the security information from the visited LRDF for the user authentication. Figure 538 represents the detail of the AUTHENTICATION INFORMATION RETRIEVAL request indication and the AUTHENTICATION INFORMATION RETRIEVAL response confirmation.

Relationship rg (LRCF-TACF) and Relationship rk(LRCF-SACF)

An AUTHENTICATION CHALLENGE IF is used to verify the identity of the user. That is, an authentication challenge initiated by a network is sent from LRCF to TACF/SACF for requesting the return of the authentication calculation result. Figure 539 represents the detail of the AUTHENTICATION CHALLENGE request indication and the AUTHENTICATION CHALLENGE response confirmation.

Relationship rb (TACFF-TACAF) and Relationship rl (SACF-MCF)

Another AUTHENTICATION CHALLENGE IF is used to verify the identity of the user. That is, an authentication challenge initiated by the network is sent from TACFF to TACAF and from SACF to MCF for requesting the return of the authentication calculation result. Figure 540 represents the detail of the AUTHENTICATION CHALLENGE request indication and the AUTHENTICATION CHALLENGE response confirmation.

Relationship rv(UIMF-TACAF) and Relationship ry (UIMF-MCF)

An AUTHENTICATION request indication is used to send a random number and to request to calculate a response with the random number and authentication key retained in the UIMF. An AUTHENTICATION response confirmation is used to send the authentication calculation result. Figure 541 represents the detail of the AUTHENTICATION request indication and the AUTHENTICATION response confirmation.

2.4.5.2 CIPHERING START TIME NOTIFICATION

2.4.5.2.1 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 64 shows the functional model of a part of the invented system for describing a ciphering start time notification.

b) INFORMATION FLOWS

Figure 65 shows an information flow diagram of the ciphering start time notification.

c) DEFINITIONS OF INFORMATION FLOWS, INFORMATION ELEMENTS, AND FUNCTIONAL ENTITY ACTIONS

Information flows and functional entity actions in Figure 65 will be described below and information elements of the flows are represented in tables.

Relationship rb (TACF-TACAF)

A START CIPHERING request indication is used to request that the terminal begins to apply the encryption procedure to information transmitted between itself and the network. This needs a confirming information flow.

Relationship rg (LRCF-TACF)

Another START CIPHERING request indication is used to request that the terminal begins to apply the encryption procedure to information transmitted between itself and the network. This needs a confirming information flow. Figure 542 represents the details of the START CIPHERING request indication and the START CIPHERING response confirmation.

Relationship rk (LRCF-SACF)

Another START CIPHERING request indication is used to request that the terminal begins to apply the encryption procedure to information transmitted between itself and the network. This needs a confirming information flow. Figure 543 represents the details of the START CIPHERING request indication and the START CIPHERING response confirmation.

Relationship rl (SACF-MCF)

Another START CIPHERING request indication is used to request that the terminal begins to apply the encryption procedure to information transmitted between itself and the network. This needs a confirming information flow.

2.4.5.3. TMUI MANAGEMENT AND USER ID RETRIEVAL

2.4.5.3.1 TMUI ASSIGNMENT

2.4.5.3.1.1 INFORMATION FLOW DIAGRAM

a) FUNCTIONAL MODEL

Figure 66 shows the functional model of a part of the invented system for describing a TMUI assignment.

b) INFORMATION FLOWS

Figure 67 shows an information flow diagram of the TMUI assignment. In Figure 67, the relationship between MCF and SACF is used for the user authentication in non-call related case while the relationship between TACAF and TACF is used for the user authentication in call related case. However, this could be accommodated with the relationship between MCF and SACF as well. An AUTHENTICATION INFORMATION RETRIEVAL request indication and an AUTHENTICATION INFORMATION response confirmation are used if no user authentication information is available in the visited network.

c) DEFINITIONS OF INFORMATION FLOWS, INFORMATION ELEMENTS, AND FUNCTIONAL ENTITY ACTIONS

Information flows and functional entity actions in Figure 67 will be described below and information elements of the flows are represented in tables.

Relationship rb (TACF-TACAF)

A TMUI ASSIGNMENT request indication is used to assign and convey the TMUI to the user after the network has verified the identity of the user. A response confirmation is returned for acknowledging the successful assignment of the TMUI. Figure 544 represents the details of the TMUI ASSIGNMENT request indication and the response confirmation.

Relationship rd (LRCF-LRDF)

A TMUI QUERY IF is used to request a new TMUI available from the visited LRDF. Figure 545 represents the details of the TMUI QUERY request indication and response confirmation.

A TMUI MODIFY request indication is used to request the visited LRDF to modify the TMUI information for the user. Then, a confirmation is sent after it has been modified. Figure 546 represents the details of the TMUI MODIFY request indication and response confirmation.

Relationship rg (LRCF-TACF)

Another TMUI ASSIGNMENT request indication is used to assign and convey the TMUI to the user after the network has verified the identity of the user. A response confirmation is returned for acknowledging the successful assignment of the TMUI. Figure 547 represents the details of the TMUI ASSIGNMENT request indication and the response confirmation.

Relationship rk (LRCF-SACF)

Another TMUI ASSIGNMENT request indication is used to assign and convey the TMUI to the user after the network has verified the identity of the user. A response confirmation is returned for acknowledging the successful assignment of the TMUI. Figure 548 represents the details of the TMUI ASSIGNMENT request indication and the response confirmation.

Relationship rl (SACF-MCF)

Another TMUI ASSIGNMENT request indication is used to assign and convey the TMUI to the user after the network has verified the identity of the user. A response confirmation is returned for acknowledging the successful assignment of the TMUI. Figure 549 represents the details of the TMUI ASSIGNMENT request indication and the response confirmation.

2.4.5.3.2 USER ID RETRIEVAL

This procedure is used to convert the TMUI to the IMUI of an FPLMTS user. This procedure is initiated by the newly visited network when the network receives the TMUI or a set of TMUI and TMUI assignment source ID as the FPLMTS user ID from the mobile terminal. When newly visited LRCF receives the TMUI or a set of TMUI and TMUI assignment source ID from the mobile terminal, the LRCF should analyze which procedure (selected from the following procedures) would be executed.

1) Terminal Location Registration and Update

Case A) TMUI has been assigned by the newly visited LRDF.

Case B) TMUI has been assigned by another LRDF.

In this rule, case B is not described.

2) Mobile Originating Call

3) Unsuccessful Case: If the newly visited network cannot retrieve successfully (e.g., loses TMUI), then the newly visited network attempts to retrieve the FPLMTS user's IMUI from the UIMF.

2.4.5.3.2.1 INFORMATION FLOW DIAGRAM

Figure 68 shows an information flow diagram of the user ID retrieval.

2.4.5.3.2.2 INFORMATION FLOWS AND ASSOCIATED INFORMATION ELEMENTS

Relationship rd (LRCF-LRDF)

An IMUI RETRIEVAL request indication is used to retrieve an IMUI on the basis of its corresponding TMUI. This information flow is sent from the LRCF to the LRDF in the same network. An IMUI RETRIEVAL response confirmation is a response to the request indication. The details of the IMUI RETRIEVAL request indication and response confirmation are represented in Figure 550. In case that a call is originated from the mobile terminal, the TMUI assignment source ID element in Figure 550 is not included.

Relationship rl (SACF-LRCF)

Another IMUI RETRIEVAL request indication is used to retrieve the IMUI from the mobile terminal. This information flow is used only when the network does not convert the TMUI of the FPLMT user into the IMUI. This information flow is sent from the SCF to the SACF in the visited network. An IMUI RETRIEVAL response confirmation is a response to the request. The details of the IMUI RETRIEVAL request indication and response confirmation are represented in Figure 551.

Relationship rk (MCF-SACF)

Another IMUI RETRIEVAL request indication is used to retrieve the IMUI from the mobile terminal. This information flow is used only when the network does not convert the TMUI of the FPLMT user into the IMUI. This information flow is sent from the SACF to the MCF in the visited network. An IMUI RETRIEVAL response confirmation is a response to the request. The details of the IMUI RETRIEVAL request indication and response confirmation are represented in Figure 552.

Relationship rg (TACF-LRCF)

Another IMUI RETRIEVAL request indication is used to retrieve the IMUI from the mobile terminal. This information flow is used only when the network does not convert the TMUI of the FPLMT user into the IMUI. This information flow is sent from the LRCF to the TACF in the visited network. An IMUI RETRIEVAL response confirmation is a response to the request. The details of the IMUI RETRIEVAL request indication and response confirmation are represented in Figure 553.

Relationship rb (TACAF-TACF)

Another IMUI RETRIEVAL request indication is used to retrieve the IMUI from the mobile terminal. This information flow is used only when the network does not convert the TMUI of the FPLMT user into the IMUI. This information flow is sent from the TACF to the TACAF in the visited network. An IMUI RETRIEVAL response confirmation is a response to the request. The details of the IMUI RETRIEVAL request indication and response confirmation are represented in Figure 554.

2.4.6 SDL DIAGRAMS

SDL diagrams for functional entities (Figures 254 to 258) complies with IMT-2000 Recommendation Draft Q.FIF. Scenario 3 in the access link setup procedure, however, shall not be applied in this document. The number attached in the texts on the information flow transmission/reception between FEs in the SDL diagrams indicates the FEA number in the ITU Recommendation Draft Q.FIF.

2.5 PROTOCOL SPECIFICATIONS

2.5.1 REFERENCE CONFIGURATION

The correlation between physical node configuration and functional entities in the invented system is represented in Figure 69. The system is provided with radio interfaces and BTS-MCC interfaces to specify the protocol.

2.5.2 RADIO INTERFACE SPECIFICATION

2.5.2.1 GENERAL

Section 2.5.2 describes layer 1-3 protocol specifications for the radio interface.

2.5.2.2 LAYER 1

The description in connection with layer 1 protocol is omitted.

2.5.2.3 LAYER 2

2.5.2.3.1 GENERAL

Layer 2 consists of a LAC (link access control) sub-layer and a MAC (medium access control) sub-layer. The LAC sub-layer consists of a layer-3-coordination sub-sub-layer and an LLC (logical link control) sub-sub-layer. Figure 70 shows the signaling layer 2 protocol architecture over the radio interface. Figure 71 shows a sample frame structure for the BSC function termination.

2.5.2.3.1.1 LAC (LINK ACCESS CONTROL) SUB-LAYER

The LAC transfers variable length service data units (SDUs) between users at layer 2 with high reliability.

2.5.2.3.1.1.1 LAYER-3-COORDINATION SUB-SUB-LAYER

The layer-3-coordination sub-sub-layer performs primitive/parameter mapping between LLC and layer 3, and disassembles/assembles a layer data unit to/from LLC SDUs.

2.5.2.3.1.1.2 LLC (LOGICAL LINK CONTROL) SUB-SUB-LAYER

The LLC sub-sub-layer offers a high-reliability transfer function using error control, flow control, and so on.

2.5.2.3.1.2 MAC (MEDIUM ACCESS CONTROL) SUB-LAYER

The MAC sub-layer detects an error of LLC PDUs and disassembles/assembles an LLC PDU to/from layer 1 frames.

2.5.2.3.2 FUNCTIONS

2.5.2.3.2.1 FUNCTIONS OF LAC (LINK ACCESS CONTROL) SUB-LAYER

2.5.2.3.2.1.1 LAYER-3-COORDINATION SUB-SUB-LAYER

a) SIGNALING LAYER 3 PDU ASSEMBLY AND DISASSEMBLY

This function provides for assembling a signaling layer 3 data unit from LLC PDUs and for disassembling a signaling layer 3 PDU to LLC PDUs.

b) LINK CONTROL

This function specifies the layer 3 entity which should process the LAC SDU with the SAPI. The application should be studied further.

c) CODE TYPE IDENTIFICATION

This function identifies the code type when adopting the hybrid ARQ.

2.5.2.3.2.1.2 LLC (LOGICAL LINK CONTROL) SUB-SUB-LAYER

a) SEQUENCE INTEGRITY

This function preserves the order of LLC SDUs that were submitted for transfer by this layer.

b) ERROR CORRECTION BY SELECTIVE RETRANSMISSION

Through a sequencing mechanism, the receiving LLC entity can detect missing LLC SDUs. This function corrects the sequence errors by means of retransmission.

c) FLOW CONTROL

This function allows an LLC receiver to control the rate at which a peer LLC transmitter entity may send information.

d) ERROR REPORTING TO LAYER MANAGEMENT

This function indicates to layer management errors which have occurred.

e) KEEP ALIVE

This function verifies that two peer LLC entities participating in a link are remaining in a link connection established state even in the case of a prolonged absence of data transfer.

f) LOCAL DATA RETRIEVAL

This function allows the local LLC user to retrieve in-sequence SDUs which have not yet been released by the LLC entity.

g) CONNECTION CONTROL

This function performs the establishment, release, and resynchronization of an LLC link. It also allows the transmission of variable length user-to-user information without a guarantee of delivery.

h) TRANSFER OF USER-DATA

This function is used for the conveyance of user data between users of the LLC. LLC supports both assured and unassured data transfer.

i) PROTOCOL ERROR DETECTION AND RECOVERY

This function detects errors and recovers from errors in the operation of the protocol.

j) STATUS REPORTING

This function allows a transmitter peer entity and a receiver peer entity to exchange status information.

2.5.2.3.2.2 FUNCTIONS OF MAC (MEDIUM ACCESS CONTROL) SUB-LAYER

a) CRC ERROR DETECTION AND HANDLING

This function provides for detecting and handling LLC PDU corruption by means of CRC. Corrupted LLC PDUs are discarded.

b) ASSEMBLY AND DISASSEMBLY OF LLC PDU OR BTS LAYER 3 PDU FROM/TO LAYER 1 FRAMES

This function provides for assembling an LLC PDU or BTS layer 3 PDU from layer 1 frames and for disassembling an LLC PDU or BTS layer 3 PDU to layer 1 frames.

This function includes the padding function to extend the length of the MAC PDU to an integer multiple of the length of layer 1 frames. Before transferring through the RACH, a sequence number should be attached in order to prevent the MAC PDU from being received twice.

c) ADDRESS CONTROL

This function identifies the logical link in the RACH/FACH, e.g., for respective mobile terminals, using a personal identity system.

d) IDENTITY OF SIGNAL CONTENT

This function classifies information, transmitted over the RACH, FACH, and UPCH, into user information or control information.

e) IDENTITY OF TERMINATING NODE

This function classifies nodes, where signals are terminated, into the BTS function node and the BSC function node.

2.5.2.3.3 FORMATS AND PARAMETERS OF DATA UNITS

2.5.2.3.3.1 FORMAT AND PARAMETERS OF PDUs IN LAC SUB-LAYER

2.5.2.3.3.1.1 LAYER 3 COMPATIBLE SUB-SUB-LAYER PDU

a) SAPI (SERVICE ACCESS POINT IDENTIFIER)

This indicates to layer 3 the type of service provided by layer 2. This parameter is represented in Figure 555.

b) ST

This parameter is attached to layer 3 compatible sub-sub-layer PDUs when disassembling a layer 3 PDU to those. This parameter is referred for future assembling a layer 3 PDU estimation from those in the correct order. This parameter is represented in Figure 556.

c) CODE TYPE INDICATOR

This parameter indicates the type of code to adopt the hybrid ARQ. The adoption shall depend on the version. This parameter is represented in Figure 557.

d) RESERVED PARAMETER

This parameter indicates the version of layer-3-coordination sub-sub-layer, and so on. This parameter is represented in Figure 558.

2.5.2.3.3.1.2 LLC PDUs

2.5.2.3.3.1.2.1 TYPES OF LLC PDUs

Various types of LLC protocol data units (PDUs) are listed in Figures 559 and 560. Definitions of the types of LLC PDUs will be described below.

a) BGN PDU (BEGIN)

The BGN PDU is used to establish an LLC link between two peer entities. The BGN PDU requests to clear peer's transmitter and receiver buffers, and to initialize peer's transmitter and receiver state variables.

b) BGAK PDU (BEGIN ACKNOWLEDGE)

The BGAK PDU is used to acknowledge the acceptance of a layer 2 link setup request from a peer.

c) BGREJ PDU (BEGIN REJECT)

The BGREJ PDU is used to reject the layer 2 link setup request of the peer LLC entity.

d) END PDU (END)

The END PDU is used to release an LLC link between two peer entities.

e) ENDAK PDU (END ACKNOWLEDGE)

The ENDAK PDU is used to acknowledge the release of an LLC link.

f) RS PDU (Resynchronization)

The RS PDU is used to resynchronize the buffers and data transfer state variables.

g) RSAK PDU (RESYNCHRONIZATION ACKNOWLEDGE)

The RSAK PDU is used to acknowledge the acceptance of a resynchronization requested by the peer LLC entity.

h) ER PDU (ERROR RECOVERY)

The ER PDU is used to recover from protocol error.

i) ERAK PDU (ERROR RECOVERY ACKNOWLEDGE)

The ERAK PDU is used to acknowledge the recovery from protocol error.

j) SD PDU (SEQUENCED DATA)

The SD PDU is used to transfer, through an LLC link, sequentially numbered PDUs containing information fields provided by the LLC user.

k) POLL PDU (STATUS REQUEST)

The POLL PDU is used to request, across an LLC link, to transmit status information about the peer LLC entity.

l) STAT PDU (SOLICITED STATES RESPONSE)

The STAT PDU is used to respond to a status request (POLL PDU) received from a peer LLC entity. It contains information regarding the reception status of SD PDUs and SD-with-POLL PDUs in the N(R) field, credit information for the peer transmitter in the N(MR) field, and the sequence number in the N(PS) field corresponding to the POLL PDU or SD-with-POLL PDU to which it is in response.

m) USTAT PDU (UNSOLICITED STATES RESPONSE)

The USTAT PDU is used to respond to a detection of one or more new missing SD PDUs, based on the examination of the sequence number of the SD PDU. It contains information regarding the reception status of SD PDUs in the N(R) field, and an upper-window-edge information for the peer transmitter in the N(MR) field.

n) SD-with-POLL PDU (SEQUENCED DATA WITH STATUS REQUEST)

The SD-with-POLL PDU is used to transfer, through an LLC link, sequentially numbered PDUs containing information fields provided by the LLC user and used to request status information about the peer LLC entity.

o) UD PDU (UNNUMBERED DATA PDU)

The UD PDU is used for unassured data transfer between two LLC users. When an LLC user requests unacknowledged information transfer, the UD PDU is used to send information to the peer without affecting LLC states or variables. The UD PDUs does not carry a sequence number and therefore, the UD PDU may be lost without notification.

p) MD PDU (MANAGEMENT DATA PDU)

The MD PDU is used for transferring unassured management data between two management entities. When a management entity requests unacknowledged information transfer, the MD PDU is used to send information to the peer management entity without affecting LLC states or variables. The MD PDU does not carry a sequence number and therefore, the MD PDU may be lost without notification.

An invalid PDU is a PDU which:

a) has an unknown PDU type code, or

b) is not of the proper length of the PDU belonging to the stated types.

Invalid PDUs shall be discarded without notification to the sender. No additional action is taken as a result of the invalid PDU. Length violations from items b) and c) above are reported to layer management.

2.5.2.3.3.1.2.2 FORMATS OF LLC PDUs

Figures 72 through 88 represents formats of LLC PDUs. As listed at section 2.5.2.3.3.1.2.1, there are 16 types of PDUs.

Figure 72 represents the sequenced data PDU (SD PDU). Figure 73 represents the sequenced-data-with-status-request PDU (SD-with-POLL PDU). Figure 74 represents the POLL PDU. Figure 75 represents the STAT PDU. Figure 76 represents the USTAT PDU. Figure 77 represents the UD PDU and MD PDU. Figure 78 represents the Begin PDU (BGN PDU). Figure 79 represents the BGAK PDU. Figure 80 represents the BGREJ PDU. Figure 81 represents the END PDU. Figure 82 represents the ENDAK PDU. Figure 83 represents the RS PDU. Figure 84 represents the RSAK PDU. Figure 85 represents the ER PDU. Figure 86 represents the ERAK PDU. Features of these formats will be described below.

2.5.2.3.3.1.2.2.1 CODING CONVENTIONS

The coding of the LLC PDU conforms to the coding conventions specified in 2.1/I.361 [4]. LLC PDU is trailer oriented: i.e., the protocol control information is transmitted last.

2.5.2.3.3.1.2.2.2 RESERVED FIELD

There is a field of reserved bits (that may be refried to as R, Rsvd, Reserved) in each PDU. One function of the reserved field is to achieve the eight-bit alignment of PDU. Other functions should be studied further. When no functions other than the eight-bit-alignment are defined, this field shall be coded as zero. This field shall be ignored by the receiver.

2.5.2.3.3.1.2.2.3 PDU length

The maximum length of the information fields in SD, UD, and MD PDUs is k octets. The maximum value of k should be studied further. The value of k is determined at part of size negotiation procedures carried out outside LLC, upon bilateral agreement, and may be specified by another Recommendation utilizing LLC, or may be derived from the maximum length PDU size for protocols using LLC. The minimum value of k is 0 octets.

The maximum length of a variable length SSCOP-UU field is j octets. The maximum value of j should be studied further. The value of j is determined upon bilateral agreement, may be specified by another Recommendation utilizing LLC, or may be derived from requirements of protocols utilizing LLC. The minimum value of j is 0 octets.

2.5.2.3.3.1.2.2.4 CODINGS OF STAT AND USTAT PDU

Each USTAT PDU contains two list elements. Each STAT PDU contains zero or more list elements. Transmitted STAT messages may be segmented into two or more STAT PDUs.

The processing of a STAT PDU does not rely on information in other STAT PDUs. This is true even for the case when multiple STAT PDUs are generated in response to a single POLL PDU, and one or more of these PDUs are lost.

The span list items in the STAT and USTAT PDUs are odd or even elements of a list used for selective retransmission requests. Every odd element represents the first PDU of a missing gap, and every even element, except possibly the last one, represents the first PDU of a received sequence.

2.5.2.3.3.1.2.2.5 STATES OF LLC PROTOCOL ENTITY

This sub-clause describes the states of an LLC entity. These states are used in the specification of the peer-to-peer protocol. The states are conceptual and reflect general conditions of the LLC entity in the sequences of signals and PDU exchanges with its user and peer, respectively. In addition, other conditions are used in the description, in order to avoid identification of additional states, as detailed in the SDLs. The basic states will be described below.

State 1 (Idle)

Each LLC entity is conceptually initiated in an Idle state (state 1) and returns to this state upon the release of a connection.

State 2 (Outgoing Connection Pending)

An LLC entity requesting a connection with a peer is in an outgoing connection pending state (state 2) until it receives an acknowledgement from the peer.

State 3 (Incoming Connection Pending)

An LLC entity that has received a connection request from a peer and is waiting for its user's response is in an incoming connection pending (state 3).

State 4 (Outgoing Disconnection Pending)

An LLC entity requesting release of the peer-to-peer connection is in an outgoing disconnection pending state (state 4) until it receives a confirmation that the peer entity has released and transitioned to the Idle state (State 1).

State 5 (Outgoing Resynchronization Pending)

An LLC entity requesting resynchronization of the connection with a peer is in an outgoing resynchronization pending state (state 5).

State 6 (Incoming Resynchronization Pending)

An LLC entity that has received a resynchronization request from a peer and is waiting for its user's response is in an incoming resynchronization pending state (state 5).

State 7 (Outgoing Recovery Pending)

An LLC entity requesting recovery of an existing connection with a peer is in an outgoing recovery pending state (state 7).

State 8 (Recovery Response Pending)

An LLC entity that has completed recovery, notified its user of the recovery completion, and is awaiting for a response from the user is in a recovery response pending state (state 8).

State 9 (Incoming Recovery Pending)

An LLC entity that has received a recovery request from a peer and is waiting for its user's response is in an incoming recovery pending state (state 9).

State 10 (Data Transfer Ready)

Upon successful completion of the connection establishment, resynchronization, or error recovery procedures, both peer LLC entities will be in a data transfer ready state (state 10) and possible to execute data transfer.

2.5.2.3.3.1.2.4 LLC STATE VARIABLES

This section describes the state variables used in the peer-to-peer protocol. SD and POLL PDUs are sequentially and independently numbered, and may have a value between "0" and n minus 1 (where n is the modulus of the sequence number).

The modulus equals to 2^8, and therefore, the sequence number cycles through the entire range between 0 through 2^8 - 1. Therefore, all arithmetic operations on the following state variables or sequence numbers are affected by the modulus: VT(S), VT(PS), VT(A), VT(PA), VT(MS), VR(R), VR(H), and VR(MR). When performing arithmetic comparisons of transmitter variables, VT(A) is assumed as a base. When performing arithmetic comparisons of receiver variables, VR(R) is assumed as a base. In addition, the state variables VT(SQ) and VR(SQ) use the modulo 256 arithmetic. The LLC sub-sub-layer manages the following state variables at the transmitter.

a) VT(S) - SENDING STATE VARIABLE

This is the sequence number of an SD PDU to be transmitted next in the first transmission (i.e.. except for that in retransmissions). This is incremented after sending each SD PDU in the first transmission (i.e. except in retransmissions).

b) VT(PS) - POLL SENDING STATE VARIABLE

This is the sequence number of a POLL PDU or SD-with-POLL PDU transmitted currently. This is incremented before transmission of the next POLL or SD-with-POLL PDU.

c) VT(A) - ACKNOWLEDGEMENT STATE VARIABLE

This is the sequence number of an in-sequence SD PDU which is expected to be acknowledged next and forms the lower edge of an acknowledgement window acknowledging SD PDUs. The variable VT(A) is updated in response to the acknowledgement of transmitted SD PDUs.

d) VT(PA) - POLL ACKNOWLEDGEMENT STATE VARIABLE

This is the sequence number of an STAT PDU which is expected to be received next and forms the lower edge of the acknowledgement window constituted of STAT PDUs. If an STAT PDU containing an invalid parameter at the N(PS) field is received, a recovery is initiated or release is performed. Otherwise, if an acceptable STAT PDU is received, the variable VT(PA) is updated on the basis of the parameter at the N(PS) field of the received STAT PDU.

e) VT(MS) - MAXIMUM SENDABLE VALUE STATE VARIABLE

This is the sequence number of an SD PDU which is not allowed by the peer receiver. That is, the peer receiver sequentially receives SD PDUs having sequence numbers up to VT(MS) - 1. The variable VT(MS) represents the upper edge of the transmission window. The transmitter should not transmit a new SD PDU if the current VT(S) reaches VT(MS). The variable VT(MS) is updated in response to the reception of a USTAT PDU, STAT PDU, BGN PDU, BGAK PDU, RS PDU, RSAK PDU, ER PDU, or ERAK PDU.

f) VT(PD) - POLL DATA STATE VARIABLE

When acknowledgements are outstanding, this state variable represents the number of SD PDUs transmitted between transmissions of two POLL PDUs, or the number of SD PDUs transmitted before the transmission of the first POLL PDU after a POLL timer became active. The variable VT(PD) is incremented in response to the transmission of an SD PDU, and reset to zero in response to the transmission of a POLL PDU.

g) VT(CC) - CONNECTION CONTROL STATE VARIABLE

This variable represents the number of unacknowledged BGN, END, ER, or RS PDUs. The variable VT(CC) is incremented in response to the transmission of a BGN, END, ER, or RS PDU. If an END PDU is transmitted in response to a protocol error, LLC sub-sub-layer does not wait for receiving the corresponding ENDAK PDU and enters directly into state 1 (Idle) and the variable VT(CC) is not incremented

h) VT(SQ) - TRANSMITTER CONNECTION SEQUENCE STATE VARIABLE

This state variable is used to allow the receiver to identify retransmitted BGN, ER, and RS PDUs. This state variable is initialized to "0" in response to creation of the LLC process and incremented and then mapped into the N(SQ) field of a BGN, RS, or ER PDU before the initial transmission of the BGN, RS, or ER PDU as represented in Figures 78, 83 and 85.

Additionally, the LLC sub-sub-layer manages the following state variables at the receiver.

a) VR(R) - RECEPTION STATE VARIABLE

This state variable is the sequence number of an in-sequence SD PDU expected to be received next. This variable is incremented in response to the reception of the next SD PDU.

b) VR(H) - HIGHEST EXPECTED RECEPTION STATE VARIABLE

This state variable is the highest number among sequence numbers of in-sequence SD PDUs in a transmission window expected to be received next. The variable VR(H) may be updated in response to the reception of a new SD PDU or in response to the reception of a POLL PDU.

c) VR(MR) - MAXIMUM RECEIVABLE VALUE STATE VARIABLE

This is the sequence number of an SD PDU which is not allowed by the receiver. That is, the receiver sequentially receives SD PDUs having sequence numbers up to VR(MR) - 1. The receiver should discard the SD PDU having the parameter in the N(S) field being equal to or more than VR(MR). It is possible that the reception of such an SD PDU causes the transmission of a USTAT PDU. Updating manner of the variable VR(MR) can be optional with the device, but the variable VR(MR) should not be less than VR(H).

d) VR(SQ) - RECEIVER CONNECTION SEQUENCE STATE VARIABLE

This state variable is used to identify retransmitted BGN, ER, and RS PDUs. In reaction to the reception of a BGN, ER, or RS PDU, this state variable is compared with the value in the N(SQ) field of the received BGN, ER, or RS PDU, and then the value in the N(SQ) field is allocated to the variable VR(SQ). In the comparison, if they are different, the PDU is processed and the variable VR(SQ) is set to the parameter in the N(SQ) field. If they are equal to each other, the PDU is identified as a retransmitted one.

2.5.2.3.3.1.2.5 LLC PDU PARAMETER FIELDS

a) N(S)

The variable VT(S) is mapped to the N(S) field of a new SD, SD-with-POLL, or POLL PDU whenever the new SD, SD-with-POLL, or POLL PDU is generated as represented in Figures 72-74.

b) Information field

The information field of an SD, SD-with-POLL, MD, or UD PDU represented in Figures 72, 73, or 77 is mapped from the "message unit" parameter of an AA-DATA, MAA-UNITDATA, or AA-UNITDATA request. Afterward, the information in this field is mapped again to a "message unit" parameter of an corresponding AA-DATA, MAA-UNITDATA, or AA-UNITDATA indication.

c) N(PS)

After the variable VT(PS) has been incremented, the variable VT(PS) is mapped to the N(PS) field of an SD-with-POLL or POLL PDU whenever the SD-with-POLL or POLL PDU is generated as represented in Figures 73 and 74. In addition, the receiver of an SD-with-POLL or POLL PDU maps the contents of the N(PS) field of the received SD-with-POLL or POLL PDU into the N(PS) field of an STAT PDU as represented in Figure 75. To facilitate error recovery procedures, in addition to the mapping of the variable VT(PS) into the N(PS) field of the SD-with-POLL or POLL PDU, the SD-with-POLL or POLL PDU including the N(PS) field is stored in the transmitter buffer whenever the PDU is sent.

d) N(R)

The variable VR(R) is mapped to the N(R) field of a STAT or USTAT PDU whenever the STAT or USTAT PDU is generated as represented in Figures 75 and 76.

e) N(MR)

The variable VR(MR) is mapped to the N(MR) field of an STAT, USTAT, RS, RSAK, ER, ERAK, BGN, or BGAK PDU whenever such a PDU is generated as represented in Figures 75, 76, 78, 79, 83, 84, 85, and 86. This variable is the basis for credit granting by the receiver.

f) SSCOP-UU

The SSCOP-UU in a BGN, BGAK, BGREJ, END or RS PDU in Figures 78-81, and 83 is mapped to and from the "SSCOP-UU" parameter of the corresponding SSCOP signal.

g) SOURCE BIT (S)

In an END PDU, the source bit (S) field in Figure 81 conveys information as to whether the originator of the release initiation was the SSCOP user or the SSCOP itself. When the transmission of an END PDU is initiated by the user, this bit is set to "0." However, when the transmission of an END PDU is initiated by the SSCOP, this bit is set to "1." This bit is mapped into the "source" field of an AA-RELEASE indication.

h) N(SQ)

This field carries the connection sequence value. The variable VT(SQ) is mapped to the N(SQ) field of a new BGN, RS, or ER PDU whenever the new BGN, RS, or ER PDU is transmitted. The parameter in this field is used by the receiver with the variable VR(SQ) to identify retransmitted BGN, RS, and ER PDUs.

i) PDU TYPE FIELD

Codings with respect to the PDU type field is represented in the list formed by Figures 559 and 560.

2.5.2.3.3.1.2.6 LLC TIMER

Description with respect to the LLC timer will be omitted.

2.5.2.3.3.1.2.7 LLC PROTOCOL PARAMETERS

LLC protocol parameters will be described below.

a) Max-CC

This is the maximum number of the state variable VT(CC) and corresponds to the maximum limit of transmissions of a BGN, END, ER, or RS PDU.

b) Max-PD

This is the maximum number of the state variable VT(PD) before sending a POLL PDU and resetting VT(PD) to zero.

c) Max-STAT

This is the maximum number of list elements which can be contained in an STAT PDU. When the number of list items exceeds the Max-STAT, the STAT message shall be segmented. All of the PDUs carrying the segments made from an STAT message, except possibly the last one, contain Max-STAT list items. This parameter is not used for length check by the receiver of an STAT PDU, but is only used by the sender of the STAT message for segmentation purposes. This parameter should be an odd integer greater than or equal to 3. The default value of the Max-STAT should be studied further. This parameter can be changed dependently on the device.

The default value causes the STAT PDU to fill six ATM cells using AAL type 5 common part. In addition, the total length of a STAT PDU should not exceed the maximum length of an SD PDU.

d) Clear-buffers

This parameter is set upon connection establishment. It holds one of two values indicating "Yes" or "No," respectively. If this parameter is set to "Yes," the LLC sub-sub-layer can clear its transmission buffer and release transmission queue in response to a connection release. If this parameter is set to "No," the LLC sub-sub-layer can not clear its transmission buffer and release transmission queue even if connection release occurs. Additionally, if this parameter is set to "No," the LLC sub-sub-layer cannot clear selectively acknowledged messages from its transmission buffer if older ones are still outstanding.

e) Credit

This parameter is used to coodinate credit notifications to layer management. When the LLC sub-sub-layer is blocked from transmitting a new SD or SD-with-POLL

PDU due to insufficient credit, the credit parameter is assigned the value indicating "No." When the LLC sub-sub-layer is permitted to transmit a new SD or SD-with-POLL PDU, the credit parameter is assigned to the value indicating "Yes." The credit parameter is initially assigned "Yes."

2.5.2.3.3.1.2.8 LLC CREDIT AND FLOW CONTROL

2.5.2.3.3.1.2.8.1 CREDIT AND PEER-TO-PEER FLOW CONTROL

Credit is granted by the LLC receiver to allow the peer LLC transmitter to transmit new SD or SD-with-POLL PDUs. The process by which a receiver entity determined credit is optional, but is related to the buffer availability and the bandwidth and delay of the connection.

The variable VR(MR) is contained in the N(MR) field of each of BGN, BGAK, RS, RSAK, ER, ERAK, STAT and USTAT PDUs sent by the receiver, and then conveyed to the transmitter. The content of the N(MR) field is read out and stored as the variable VT(MS) at the transmitter. The variable VR(MR) sent to the transmitter is the sequence number of SD or SD-with-POLL PDU that the receiver will not accept.

The transmitter does not transmit any SD or SD-with-POLL PDU having the sequence number which exceeds the credit allowed. The receiver discards any SD or SD-with-POLL PDUs having the sequence number which exceeds the credit allowed. In one case, reception of such an SD or SD-with-POLL PDU may cause the transmission of a USTAT PDU.

Previously granted credit can be reduced in order for the receiver to perform flow control, but the receiver credit variable VR(MR) cannot be reduced below the variable VR(H). In other words, if a receiver has accepted and acknowledged the receipt of the SD or SD-with-POLL PDU having the sequence number which is VR(H) - 1, the credit value VR(MR) must be greater than or equal to VR(H).

The lower bound of the operating window according to the LLC protocol is the variable VT(A) while the upper bound thereof is VT(MS) - 1. The modulus of the protocol limits the sequence number range of the operating window to 2^8 - 1. Therefore, the acceptable sequence number (granted credit) at the receiver by the modulo arithmetic must be a value between VR(H) and VR(R) - 1. If VR(MR) = VR(R) = VR(H), the operating window size is zero. If VR(MR) = VR(R) - 1, the operating window size is maximum.

The LLC receiver allocates a buffer to support each connection. In principle, the available receiver buffer should match or exceed the credit granted to the transmitter to avoid the discard of successfully transmitted data. However, if limitted buffers are availabled for a connection, it is possible to grant credit in excess of the available buffer capacity. This method may obtain a higher throughput than can be achieved by limiting the credit to the availed buffer, with the possibility that data may need to be discarded if errors occur. The receiver cannot discard previously received and acknowledged, but not yet delivered, SD or SD-with-POLL PDUs. In addition, the receiver must allocate sufficient buffer capacity to receive and deliver the SD or SD-with-POLL PDU with the sequence number which is equal to VR(R) at all times unless VR(R) = VR(H) = VR(MR). The granting of credit in excess of buffer capacity should only be performed if limited buffers are available to support the connection and if the LLC receiver can still maintain the quality of service (QOS) required for the connection through this method.

2.5.2.3.3.1.2.8.2 LOCAL FLOW CONTROL

LLC events, such as receptions of PDUs and external and internal signals, are normally processed in the order in which they occurred. However, events pertaining to the exchange of LLC link status information have priority over other data transfer.

A device may detect congestion (for example, a long queuing delay) in its lower protocol layers. In this case, data transfer should be suspended in order to give priority to connection control messages. The means, by which an LLC entity decides whether or not congestion occurs, depends on the protocol environment, including protocol timer values.

If an LLC entity detects a local congestion ("lower layer busy"), it can elect to suspend the servicing AA-DATA request signals, AA-UNITDATA request signals, and MAA-UNITDATA request signals. It can also suspend the retransmission of requested SD or SD-with-POLL PDUs. The data transfer procedures allow this to occur without causing protocol errors.

Therefore, when transmitting PDUs to the peer receiver, all types of PDUs except for SD PDU, SD-with-POLL PDU, MD PDU, and UD PDU are given highest priority. The SD PDUs, SD-with-POLL PDUs, MD PDUs, and UD PDUs have equal priority. Retransmissions of SD PDUs have priority over new transmissions of SD PDUs if both PDU types are pending. These priorities are only internal to the LLC. The LLC 's local flow control at user's interface is dependent on the device.

2.5.2.3.3.2. FORMAT AND PARAMETERS OF MAC PDU IN MAC SUB-LAYER AND FRAME FORMATS AND PARAMETERS ON LOGICAL CHANNELS

In the following, the format and parameters of an MAC PDU in the MAC sub-layer and frame formats and parameters on logical channels will be described with reference to Figures 87-94. Figure 87 represents the frame format of an MDU and the frame format on the broadcasting channel (BCCH). Figure 88 represents the frame format of an MDU and the frame format on the perch channel (PCH). Figure 89 represents the frame format of an MDU and the format of long and short frame on the random access channel (RACH). Figure 90 represents the frame format of an MDU and the format of long frame on the forward access channel (FACH). Figure 91 represents the frame format of an MDU and the format of short frame on the forward access channel (FACH). Figure 92 represents the frame format of an MDU and the frame format on the stand alone dedicated control channel (SDCCH). Figure 93 represents the frame format of an MDU and the frame format on the associated control channel (ACCH). Figure 94 represents the frame format of an MDU and the frame format on the user packet channel (UPCH).

a) PAD

A PAD field is included in an MAC PDU (MAC sub-layer frame) to extend the length of the MAC PDU to an integer multiple of the length of a layer 1 frame (extend to integer octets). The bit or all bits in the PAD field should be "0."

b) LENGTH

A length field is interposed in the MAC PDU for indicating the amount of the MAC PDU including the PAD field by the octet.

c) CRC

A CRC field including an error detection code is attached to each MAC PDU, so that the receiver can detect any errors. The result should be used for a determination by a higher layer protocol as to whether the frame should be retransmitted. Figure 561 represents the relationship between the length of CRC fields and channels through which corresponding frame is transmitted.

d) ST

A segment type (ST) field is included in each layer 1 frame for indicating that the corresponding layer 1 frame is the top, middle, or end of the original MAC PDU. The segment type is attached when an MAC PDU is disassembled to layer 1 frames, and referred when an MAC PDU evaluation is assembled from the layer 1 frames. Figure 562 represents the bit coding of the ST field and the meaning thereof.

e) OTHERS

A BI field in the layer 1 frame in Figure 89 includes a BCCH identity (BI) information. Figure 563 represents the bit coding of the BI field and the meaning thereof.

An SFN field in the layer 1 frame in Figure 89 includes a system frame number (SFN) used for retrieval of the uplink long code phase and for synchronization of the super-frames.

An uplink interference field in the layer 1 frame in Figure 89 includes uplink interference information indicating the uplink interference level for the corresponding sector measured most recently. Figure 564 represents the bit coding of the uplink interference field and the meaning thereof. However, when the measurement has not been carried out, all of the bits in the uplink interference field should be one.

A PID field in the layer 1 frame in either of Figures 89 and 90 includes a personal identification (PID) of message or mobile station which is identified on the RACH or FACH. The identification shall be of the length of 16 bits. Figure 565 represents the relationship between the usage of the PID field and the range of PID value.

A U/C field in the layer 1 frame on the RACH, FACH or UPCH represented in either of Figures 89-91, and 94 includes an identifier for indicating that either of user information or control information is included in the layer 1 frame. Figure 566 represents the bit coding of the U/C field and the meaning thereof.

A TN field in the layer 1 frame on the RACH, FACH, or UPCH represented in either of Figures 89-91, and 94 includes an identifier of the termination or inception. Figure 567 represents the bit coding of the TN field and the meanings thereof.

An MO field in the short layer 1 frame on the FACH represented in Figure 91 includes a bit for identifying the mode of the FACH. Figure 568 represents the bit coding of the MO field and the meanings thereof.

A CRC field including an error detection code is attached to each layer 1 frame as represented in Figures 87 through 94, so that the receiver can detect any errors. Figure 569 represents the relationship between the length of CRC fields and channels through which corresponding frames are transmitted.

An S field is attached to the short layer 1 frame on the RACH as represented in Figure 89. When an MAC PDU evaluation is assembled from the short layer 1 frames on the RACH, the bit in the S field contributes to prevent the same layer 1 frame from duplicating in the MAC PDU.

A TA field in the layer 1 frames represented in either of Figures 87 through 94 includes tail bits as a convolutional code.

A D field represented in either of Figures 90 through 92 contains dummy bits.

2.5.2.4 LAYER 3 MESSAGES

Next, messages of layer 3 of the invented system will be described. In the following description, ITU-T Recommendations X, I, and Q series will be sometimes shortened to X, I, and Q.

2.5.2.4.1 PROTOCOL ARCHITECTURE

First, the protocol architecture of layer 3 will be described. Figure 95 is a conceptual diagram representing an example of the radio interface protocol architecture. Among the protocol control entities in Figure 95, CC (call/connection control) entity complies with Q.2931 and controls call and connection. MM-P entity complies with Q.2932 and manages mobility services for users, e.g., user authentication. MM-T (terminal mobility management) entity manages mobility services for mobile terminals, e.g., terminal location registration and user authentication. RRC (radio resource control) entity treats initiations for allocation and reservation of radio resources and for activation and deactivation of handover. TAC (terminal association control) entity establishes and releases signaling connections between mobile terminals and the network.

2.5.2.4.2 MESSAGE FORMATS

Next, message formats for layer 3 will be described.

2.5.2.4.2.1 FORMATS OF CC ENTITY MESSAGES

First, CC (call/connection control) entity messages will be described. Figure 570 is a list representing various messages belonging to the CC entity message. In the following, the messages represented in Figure 570 will be described with reference to lists in Figures 571 through 628. In the lists, "M" means mandatory information element while "O" means optional information element. "OF" means information element that will be used when ATM (asynchronous transfer mode) will be applied to radio transmission.

2.5.2.4.2.1.1 ALERTING MESSAGE

First, an alerting message will be described. The alerting message is transferred from a called user to the network and then transferred from the network to a calling user in order to indicate that calling procedure of the called user is started. Figure 571 through 573 form a list representing information elements constituting the alerting message. As represented in this list, the significance of the alerting message is global, the channel on which the alerting message is carried is the ACCH, and the direction is both.

In the list formed by Figure 571, the connection identifier, narrow-band bearer capability information element, narrow-band high layer compatibility information element, mobile bearer capability information element, and mobile high layer information element should be studied further. The broad-band higher layer information element is included if the higher layer information selection procedure is used. The mobile bearer capability information element will be used when bearer capability is selected.

2.5.2.4.2.1.2 CALL PROCEEDING MESSAGE

Next, a call proceeding message will be described. The call proceeding message is transferred from the network to a calling user or from a called user to the network in order to indicate that requested call setup is initiated and no additional call setup will be accepted. Figure 574 through 576 form a list representing information elements constituting the call proceeding message. As represented in this list, the significance of the call proceeding message is global, the channel on which the call proceeding message is carried is the SDCCH or ACCH, and the direction is both.

2.5.2.4.2.1.3 CONNECT MESSAGE

Next, a connect message will be described. The connect message is transferred from a called user to the network and from the network to a calling user in order to indicate that requested call is accepted by the called user. Figure 577 through 581 form a list representing information elements constituting the connect message. As represented in this list, the significance of the connect message is global, the channel on which the connect message is carried is the ACCH, and the direction is both.

As represented in this list, if the called user wants to reply the calling user the broadband low layer compatibility information, the broadband low layer compatibility information element is included in the connect message from the called user to the network. If the connect message from the called user to the network includes the broadband low layer compatibility information element, the broadband low layer compatibility information element is also included in the connect message from the network to the calling user. For the broadband low layer information negotiation, this information element is included in the connect message as an option, but some network may not transfer this information element to the calling user.

2.5.2.4.2.1.4 CONNECT ACKNOWLEDGE MESSAGE

Next, a connect acknowledge message will be described. The connect acknowledge message is transferred from the network to a called user in order to indicate that the call is established for the called user. In addition, the connect acknowledge message is transferred from a calling user to the network in order to enable symmetric call control procedure. Figure 582 is a list representing information elements constituting the connect acknowledge message. As represented in this list, the significance of the connect acknowledge message is local, the channel on which the connect acknowledge message is carried is the ACCH, and the direction is both.

The notification identifier information element is included if the notification procedure is applied. A plurality of notification identifier information elements can be included in this message. The maximum length and the allowable number of the elements depend on the network.

2.5.2.4.2.1.5 PROGRESS MESSAGE

Next, a progress message will be described. The progress message is transferred from the network or either of users in order to indicate the event as a call progress when the interworking is taken place. Figures 583 through 585 form a list representing information elements constituting the progress message. As represented in this list, the significance of the progress message is global, the channel on which the connect message is carried is the SDCCH or ACCH, and the direction is both.

2.5.2.4.2.1.6 SETUP MESSAGE

Next, a setup message will be described. The setup message is transferred from a calling user to the network and from the network to a called user in order to initiate a call setup. Figures 586 through 594 form a list representing information elements constituting the setup message. As represented in this list, the significance of the setup message is global, the channel on which the setup message is carried is the SDCCH or ACCH, and the direction is both.

2.5.2.4.2.1.7 RELEASE MESSAGE

Next, a release message will be described. The release message is transferred from the network or either of users in order to initiate that the device transmitting the release message has disconnected the FPLMTS connection for releasing connection identifier (if connection identifier is used) and call reference. The device which has received the release message should release the connection identifier, transmit a release complete message, and then release the call reference. The above description about the connection identifier will be valid only when the ATM will be applied on air interface in the future. Figure 595 is a list representing information elements constituting the release message. As represented in this list, the significance of the release message is global, the channel on which the release message is carried is the SDCCH or ACCH, and the direction is both.

2.5.2.4.2.1.8 RELEASE COMPLETE MESSAGE

Next, a release complete message will be described. The release complete message is transferred from the network or either of users in order to initiate that the device transmitting the release complete message has released the connection identifier (if connection identifier is used) and call reference. The connection identifier can be reused by releasing. The device which has received the release complete message should release the call reference. The above description about the connection identifier will be valid only when the ATM will be applied on air interface in the future. Figure 596 is a list representing information elements constituting the release complete message. As represented in this list, the significance of the release complete message is local, the channel on which the release complete message is carried is the SDCCH or ACCH, and the direction is both.

2.5.2.4.2.1.9 INFORMATION MESSAGE

Next, an information message will be described. The information message is transferred from the network or either of users in order to provide additional information, more specifically, additional information for call setup (e.g., overlap sending) or various information related to call. Figure 597 is a list representing information elements constituting the information message. As represented in this list, the significance of the information message is local (however, information with global significance can be transferred by this message), the channel on which the information message is carried is the SDCCH or ACCH, and the direction is both.

2.5.2.4.2.2 FORMAT OF MM-T ENTITY MESSAGE

Next, MM-T (terminal mobility management) entity message will be described.

2.5.2.4.2.2.1 MESSAGE BELONGING TO MM-T ENTITY MESSAGE

Figure 598 is a list representing a message (mobility facility message) belonging to the MM-T entity message.

With respect to various messages including the mobility facility message and others, discrimination can be carried out by the message type information element. That is, if more significant three bits in the message type information element are "011," the corresponding message belongs to messages prescribed in Q.2931. In addition, if the less significant five bits are "00010," the corresponding message belongs to messages prescribed in Q.2932. Otherwise, the corresponding message is the mobility facility message.

2.5.2.4.2.2.2 MOBILITY FACILITY MESSAGE

Figure 599 is a list representing the generic formats of the mobility facility message. As represented in this list, the significance of the mobility facility message is local, and the direction is both.

2.5.2.4.2.2.3 FACILITY

The facility information of the mobility facility message in Figure 599 is constituted of various information elements in fact. The contents of the facility information vary with the usage of the corresponding mobility facility message. Thus, lists of information elements of mobility facility message for various utilization will be explained.

(a) MOBILITY FACILITY MESSAGE FROM MS TO NETWORK FOR TERMINAL LOCATION REGISTRATION

Figures 600 and 601 form a list representing information elements constituting a mobility facility message transferred from the mobile station to the network for requesting terminal location registration when the terminal location should be updated or when the mobile station roams. As represented in the list, the protocol discriminator in this message indicates MM-T, the channel on which this message is carried is the SDCCH, and the direction is from MCF of the mobile station to SACF of the network.

(b) MOBILITY FACILITY MESSAGE FROM NETWORK TO MS FOR TERMINAL LOCATION REGISTRATION

When the terminal location should be updated or when the mobile station roams, another type of mobility facility message (as a response message to the request of terminal location registration) is transferred from the network to the mobile station. This response message can be classified into three sorts represented in three lists of Figures 602 through 604, respectively. As generically represented in those lists, the protocol discriminator in each of these messages indicates MM-T, the channel on which each message is carried is the SDCCH, and the direction is from SACF of the network to MCF of the mobile station.

(b-1) RESPONSE MESSAGE INDICATING "RETURN RESULT"

When the terminal location has been normally registered, the mobility facility message (response message) indicating "return result" represented in Figure 602 is sent.

(b-2) RESPONSE MESSAGE INDICATING "RETURN ERROR"

When an abnormality, for example, an application error has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 603 is sent.

(b-3) RESPONSE MESSAGE INDICATING "REJECT"

When an abnormality, for example, a discrepancy of an information element has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 604 is sent.

(c) MOBILITY FACILITY MESSAGE FROM NETWORK TO MS FOR TMUI ASSIGNMENT

Figure 605 is a list representing information elements constituting a mobility facility message transferred from the network to the mobile station for notifying the mobile station of the TMUI allocated to the mobile station. As represented in the list, the protocol discriminator in this message indicates MM-T, the channel on which this message is carried is the SDCCH, and the direction is from SACF and TACF of the network to MCF and TACAF of the mobile station.

(d) MOBILITY FACILITY MESSAGE FROM MS TO NETWORK FOR TMUI ASSIGNMENT

Another type of mobility facility message (as a response message to the TMUI assignment) is transferred from the mobile station to the network. This response message can be classified into three sorts represented in three lists of Figures 606 through 608, respectively. As generically represented in those lists, the protocol discriminator in each of these messages indicates MM-T, the channel on which each message is carried is the SDCCH, and the direction is from MCF and TACAF of the mobile station to SACF and TACF of the network.

(d-1) RESPONSE MESSAGE INDICATING "RETURN RESULT"

When the TMUI has been normally assigned, the mobility facility message (response message) indicating "return result" represented in Figure 606 is sent.

(d-2) RESPONSE MESSAGE INDICATING "RETURN ERROR"

When an abnormality, for example, an application error has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 607 is sent.

(d-3) RESPONSE MESSAGE INDICATING "REJECT"

When an abnormality, for example, a discrepancy of an information element has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 608 is sent.

(e) MOBILITY FACILITY MESSAGE FROM NETWORK TO MS FOR AUTHENTICATION CHALLENGE

Figures 609 and 610 form a list representing information elements constituting a mobility facility message transferred from the network to the mobile station for authenticating the mobile station by the mobile service switching center. As represented in the list, the protocol discriminator in this message indicates MM-T, the channel on which this message is carried is the SDCCH or ACCH, and the direction is from SACF and TACF of the network to MCF and TACAF of the mobile station.

(f) MOBILITY FACILITY MESSAGE FROM MS TO NETWORK FOR AUTHENTICATION CHALLENGE

Another type of mobility facility message (as a response message to the authentication challenge) is transferred from the mobile station to the network. This response message can be classified into three sorts represented in three lists of Figures 611 through 613, respectively. As generically represented in those lists, the protocol discriminator in each of these messages indicates MM-T, the channel on which each message is carried is the SDCCH or ACCH, and the direction is from MCF and TACAF of the mobile station to SACF and TACF of the network.

(f-1) RESPONSE MESSAGE INDICATING "RETURN RESULT"

When the authentication has been normally requested, the mobility facility message (response message) indicating "return result" represented in Figure 611 is sent.

(f-2) RESPONSE MESSAGE INDICATING "RETURN ERROR"

When an abnormality, for example, an application error has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 612 is sent.

(f-3) RESPONSE MESSAGE INDICATING "REJECT"

When an abnormality, for example, a discrepancy of an information element has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 613 is sent.

(g) MOBILITY FACILITY MESSAGE FROM NETWORK TO MS FOR CIPHERING START NOTIFICATION

Figure 614 is a list representing information elements constituting a mobility facility message transferred from the network to the mobile station for notifying the mobile station of ciphering onset. As represented in the list, the protocol discriminator in this message indicates MM-T, the channel on which this message is carried is the SDCCH or ACCH, and the direction is from SACF and TACF of the network to MCF and TACAF of the mobile station.

(h) MOBILITY FACILITY MESSAGE FROM MS TO NETWORK FOR CIPHERING START NOTIFICATION

Another type of mobility facility message (as a response message to the ciphering start notification) is transferred from the mobile station to the network. This response message can be classified into three sorts represented in three lists of Figures 615 through 617, respectively. As generically represented in those lists, the protocol discriminator in each of these messages indicates MM-T, the channel on which each message is carried is the SDCCH or ACCH, and the direction is from MCF and TACAF of the mobile station to SACF and TACF of the network.

(h-1) RESPONSE MESSAGE INDICATING "RETURN RESULT"

When the ciphering onset has been normally notified, the mobility facility message (response message) indicating "return result" represented in Figure 615 is sent.

(h-2) RESPONSE MESSAGE INDICATING "RETURN ERROR"

When an abnormality, for example, an application error has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 616 is sent.

(h-3) RESPONSE MESSAGE INDICATING "REJECT"

When an abnormality, for example, a discrepancy of an information element has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 617 is sent.

(i) MOBILITY FACILITY MESSAGE FROM NETWORK TO MS FOR IMUI RETRIEVAL

Figure 618 is a list representing information elements constituting a mobility facility message transferred from the network to the mobile station for inquiring of the mobile station as to the IMUI of the mobile station. As represented in the list, the protocol discriminator in this message indicates MM-T, the channel on which this message is carried is the SDCCH, and the direction is from SACF and TACF of the network to MCF and TACAF of the mobile station.

(j) MOBILITY FACILITY MESSAGE FROM MS TO NETWORK FOR IMUI RETRIEVAL

Another type of mobility facility message (as a response message to the IMUI inquiry) is transferred from the mobile station to the mobile service switching center. This response message can be classified into three sorts represented in three lists of Figures 619 through 621, respectively. As generically represented in those lists, the protocol discriminator in each of these messages indicates MM-T, the channel on which each message is carried is the SDCCH, and the direction is from MCF and TACAF of the mobile station to SACF and TACF of the network.

(j-1) RESPONSE MESSAGE INDICATING "RETURN RESULT"

When the IMUI has been normally inquired, the mobility facility message (response message) indicating "return result" represented in Figure 619 is sent.

(j-2) RESPONSE MESSAGE INDICATING "RETURN ERROR"

When an abnormality, for example, an application error has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 620 is sent.

(j-3) RESPONSE MESSAGE INDICATING "REJECT"

When an abnormality, for example, a discrepancy of an information element has occurred, the mobility facility message (response message) indicating "return error" represented in Figure 621 is sent.

2.5.2.4.2.3 FORMAT OF RBC ENTITY MESSAGE

Next, RBC (radio bearer control) entity message will be described.

2.5.2.4.2.3.1 MESSAGES BELONGING TO RBC ENTITY MESSAGE

Figure 622 is a list representing messages belonging to the RBC entity message.

2.5.2.4.2.3.2 CLASSIFICATION OF RBC ENTITY MESSAGE

RBC entity message can be classified into two types: one relates to setup and release of bearer so as to cause an RBC ID to change; and the other relates to maintain bearer so as not to cause an RBC ID to change. Figure 623 is a list representing the classification of RBC entity message.

2.5.2.4.2.3.3.1 BASIC MESSAGE FORMAT

Next, the basic format of RBC entity message will be described. Each EBC entity message comprises a fundamental part and an optional extensional part. The fundamental part is constituted of one or more message-specific-parameter fields and one or more optional fundamental information fields. Figure 96 represents the basic format of RBC entity message.

Message-specific-parameter field in Figure 96 contains at least one unique parameter of the message.

Each fundamental information field includes at least one parameter in conformance with the procedure that the message initiates. In other words, fundamental information elements in RBC entity messages vary with the necessary procedure. Fundamental information field can be used without any design change of the invented system.

On the contrary, extensional information field may be used if the performance of the invented system is extended.

Operation indicator field asterisked in Figure 96 is not included in the RBC entity message for the invented system. If a new type of message will be used in the system due to performance extension in the future, this field will be used.

2.5.2.4.2.3.3.2 STRUCTURES OF FRAMES OF RBC ENTITY MESSAGE

Figure 97 represents structures of frames of an RBC entity message. As represented in Figure 97, message-specific-parameter field is mandatory. As to each parameter, if the length is variable, the length field indicates that there is no instruction. As to each parameter, if there is not a parameter that may be used optionally, this fact is indicated by a bit or bits for indicating whether there is a parameter or not.

2.5.2.4.2.3.4 SPECIFIC MESSAGE FORMATS

Next, specific formats of various messages belonging to RBC entity message will be described.

2.5.2.4.2.3.4.1 RADIO BEARER SETUP MESSAGE

First, radio bearer setup message will be described. This message is sent from the network to a mobile station in order to setup a radio bearer therebetween. Figure 624 is a list representing the format of radio bearer setup message. The protocol discriminator of the message indicates RBC, the channel on which the message is carried is the SDCCH or ACCH, and the direction is from the network to the mobile station.

2.5.2.4.2.3.4.2 RADIO BEARER RELEASE MESSAGE

This message is sent from the network to a mobile station or from a mobile station to the network in order to release a radio bearer therebetween. Figure 625 is a list representing the format of radio bearer release message. The protocol discriminator of the message indicates RBC, the channel on which the message is carried is the ACCH, and the direction is from the network to the mobile station or from the mobile station to the network.

2.5.2.4.2.3.4.3 RADIO BEARER RELEASE COMPLETE MESSAGE

This message is sent from the network to a mobile station or from a mobile station to the network in order to notify of the release completion of a radio bearer therebetween. Figure 626 is a list representing the format of radio bearer release complete message. The protocol discriminator of the message indicates RBC, the channel on which the message is carried is the ACCH, and the direction is from the network to the mobile station or from the mobile station to the network.

2.5.2.4.2.3.4.4 HANDOVER COMMAND MESSAGE

This message is sent from the network to a mobile station in order to indicate the radio bearer therebetween that is added, deleted, replaced, or substituted at handover. Figure 627 is a list representing the format of handover command message. The protocol discriminator of the message indicates RBC, the channel on which the message is carried is the ACCH, and the direction is from the network to the mobile station.

2.5.2.4.2.3.4.4 HANDOVER RESPONSE MESSAGE

This message is sent to respond to a handover command massage, the handover command message initiating diversity handover (DHO) branch deletion, DHO branch addition, code replacement, and any combination thereof. Figure 628 is a list representing the format of handover response message. The protocol discriminator of the message indicates RBC, the channel on which the message is carried is the ACCH, and the direction is from the mobile station to the network.

2.5.2.4.2.4 FORMAT OF RRC ENTITY MESSAGE

Next, RRC (radio resource control) entity message will be described.

2.5.2.4.2.4.1 MESSAGE BELONGING TO RRC ENTITY MESSAGE

Figure 629 is a list representing a message (radio resource facility message) belonging to the RRC entity message. Utilization of the ROSE (remote operations service element) protocol as the protocol for the RRC entity should be studied further. Therefore, this description is based on the ROSE protocol.

2.5.2.4.2.4.2 RRC ENTITY MESSAGE FORMAT

2.5.2.4.2.4.2.1 MOBILITY FACILITY MESSAGE

Figure 630 is a list representing the format of the RRC facility message sent from a mobile station to the network for initiating the RRC procedure. As represented in this list, the protocol discriminator of the message indicates RRC, the channel on which the message is carried is the SDCCH or ACCH, and the direction is from the mobile station to the network.

2.5.2.4.2.5 TAC ENTITY MESSAGES

Next, TAC (terminal association control) entity messages will be described. Figure 631 is a list representing TAC entity messages. Figure 632 is a list representing the relationship between TAC entity message and information flow. The messages will be explained in detail.

2.5.2.4.2.5.1 TERMINAL ASSOCIATION SETUP MESSAGE

This message is sent from a mobile station to the network to indicate the start of the terminal association. Figure 633 is a list representing the format of the terminal association setup message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the SDCCH, and the direction is from TACAF of the mobile station to TACF of the network.

2.5.2.4.2.5.2 TERMINAL ASSOCIATION CONNECT MESSAGE

This message is sent from the network to the mobile station to respond to the terminal association setup message for notifying of the requested terminal association can be achieved normally. Figure 634 is a list representing the format of the terminal association connect message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the SDCCH, and the direction is from TACF of the network to TACAF of the mobile station.

2.5.2.4.2.5.3 PAGING RESPONSE MESSAGE

This message is sent from a mobile station to the network to respond to paging. Figure 635 is a list representing the format of the paging response message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the SDCCH, and the direction is from TACAF of the mobile station to TACF of the network.

2.5.2.4.2.5.4 TERMINAL ASSOCIATION RELEASE MESSAGE

This message is sent from the network to the mobile station or from the mobile station to the network in order to request to release the terminal association therebetween. Figure 636 is a list representing the format of the terminal association release message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the SDCCH or ACCH, and the direction is from TACF of the network to TACAF of the mobile station and from TACAF of the mobile station to TACF of the network.

2.5.2.4.2.5.5 TERMINAL ASSOCIATION RELEASE COMPLETE MESSAGE

This message is sent from the network to the mobile station or from the mobile station to the network in order to respond to the terminal association release message. Figure 637 is a list representing the format of the terminal association release complete message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the SDCCH or ACCH, and the direction is from TACF of the network to TACAF of the mobile station and from TACAF of the mobile station to TACF of the network.

2.5.2.4.2.5.6 PAGE AUTHORIZED MESSAGE

This message is sent from the network to the mobile station to notify that the terminals have been associated. Figure 638 is a list representing the format of the page authorized message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the SDCCH or ACCH, and the direction is from TACF of the network to TACAF of the mobile station.

2.5.2.4.2.6 OTHER MESSAGES

In the following, other layer 3 messages which are carried on RACH, FACH, BCCH, and PCH will be described.

2.5.2.4.2.6.1 SIGNALING CHANNEL SETUP REQUEST MESSAGE

This message is sent from a mobile station to a base transceiver system (BTS) in order to request to setup an SDCCH therebetween. Figure 639 is a list representing the format of the signaling channel setup request message. The channel on which the message is carried is the RACH, and the direction is from SCMAF of the mobile station to SCMF of the BTS.

Signaling channel setup request messages from mobile stations which randomly access the BTS can be identified by PIDs (personal identifications) corresponding to the mobile stations. As described above, a PID is a random number originally determined by the corresponding mobile station and is included in a layer 1 frame.

2.5.2.4.2.6.2 SIGNALING CHANNEL SETUP RESPONSE MESSAGE

A signaling channel setup response message is sent from a BTS to a mobile station in order to setup an SDCCH therebetween. Figure 640 is a list representing the format of the signaling channel setup response message. The channel on which the message is carried is the FACH, and the direction is from SCMF of the BTS to SCMAF of the mobile station. Signaling channel setup response messages to mobile stations can be identified by PIDs at the mobile stations.

A signaling channel setup failure message is sent from a BTS to a mobile station in order to notify of rejection of the request to setup an SDCCH therebetween. Figure 641 is a list representing the format of the signaling channel setup failure message. The channel on which the message is carried is the FACH, and the direction is from SCMF of the BTS to SCMAF of the mobile station. Signaling channel setup failure messages to mobile stations can be identified by PIDs at the mobile stations.

2.5.2.4.2.6.3 BROADCAST INFORMATION MESSAGES

A first broadcast information message is sent from a BTS to mobile stations in order to notify of various information, e.g., control channel structure information, information regarding mobile station decision of visited zone, and restriction information. Figure 642 is a list representing the format of the first broadcast information message. The channel on which the message is carried is the BCCH, and the direction is from BCFr of the BTS to each BCAF of mobile station.

A second broadcast information message is sent from a BTS to mobile stations in order to notify of call acceptance information. Figure 643 is a list representing the format of the second broadcast information message. The channel on which the message is carried is the BCCH, and the direction is from BCFr of the BTS to each BCAF of mobile station.

2.5.2.4.2.6.4 PAGING MESSAGE

This message is sent from a BTS to mobile stations in order to page to notify of a first calling a specific mobile station. Figure 644 is a list representing the format of the paging message. The protocol discriminator of the message indicates TAC, the channel on which the message is carried is the PCH, and the direction is from BCFr of the network to each TACAF of mobile station.

The paged MS ID in the list indicates the TMUI or IMUI of the paged mobile station. At the top of the paged MS ID field, an I/T bit is arranged for indicating that either of IMUI and TMUI is used.

The maximum length of the paging message is 112 bits. Coding manner of the paged MS ID asterisked in the list should be studied further. Even when IMUI is used for the paged MS ID, it is unnecessary to indicate all bits of IMUI by the paged MS ID since lower bits of the UMUI can be recognized from the PCHs calculation number.

2.5.2.4.3 FORMATS OF INFORMATION ELEMENTS IN MESSAGES

Next, formats of information elements in the aforementioned messages will be described.

2.5.2.4.3.1 FORMATS OF INFORMATION ELEMENTS IN CC ENTITY MESSAGES

2.5.2.4.3.1.1 COMMON INFORMATION ELEMENTS IN CC ENTITY MESSAGES

First, information elements which are common in CC entity messages will be described. Each of CC entity protocol messages may comprise:

(a) protocol discriminator,

(b) call reference,

(c) message type identifier, including a message compatibility instruction indicator, and

(d) variable length information elements if necessary. Information elements (a), (b), (c), and (d) are included in each of CC entity protocol messages commonly, as represented in Figure 98. However, variable length information elements differ with message types. Information elements (a), (b), and (c) are arranged in the order represented in Figure 98.

2.5.2.4.3.1.1.1 PROTOCOL DISCRIMINATOR

Protocol discriminator will be described next. The protocol discriminator is designed for distinguishing the CC entity message from other messages in the invented system. In addition, the protocol discriminator is used for distinguishing the message in the invented system from other messages prepared from OSI network layer protocol data unit encoded in compliance with other ITU-T recommendations, TTC standard or other standards.

The protocol discriminator is arranged at the top of each CC entity message as represented in Figure 98. The protocol discriminator is of eight-bit length as represented in Figure 99 and encoded in a manner represented in Figure 645.

In the invented system, the CC entity messages does not use the same signaling virtual channel as that of another layer 3 protocol message. Therefore, the encoding manners of the protocol discriminator are different. However, if the other layer 3 protocol message is capsuled according to ITU-T Recommendation Q.2931, this message forms an exception.

The values in Figure 645 are reserved for distinguishing the protocol discriminator from the first octet of a packet, including a general format discriminator, according to ITU-T Recommendation X.25.

2.5.2.4.3.1.1.2 CALL REFERENCE

Call reference is designed for identifying in a local user-network interface a message involved in a single call and is not used at the terminal devices interconnected via B-ISDN (broadband aspects of integrated services digital network). The call reference is arranged at the second part of each CC entity message and encoded in a manner represented in Figure 100. The entire length of the call reference information element is one octet and the length is indicated by bits 1 through 4.

As represented in Figure 100, the call reference information element includes a call reference value and a call reference flag. The call reference value of which all bits are "zero" (see Figure 100) is reserved for a global call reference. The call reference value of which all bits are "one" (see Figure 101) is reserved for a dummy call reference.

The call reference value is allocated to a call by the calling user side of a user-network interface. As a general rule, the sole call reference value is allocated to a call in a single signaling virtual channel by the calling user side. The call reference value is allocated at call onset and maintained to be used throughout the call. After termination of a call, the call reference value is released and may be allocated to another call.

It is possible that both sides of a signaling virtual channel link allocate the same call reference value to two calls, respectively, and the same call reference value is used for two calls in a single signaling virtual channel. In order to avoid such a coincidence by a wrong scenario, it is not desirable to reuse the released call reference value immediately after the release.

The call reference flag is restricted to have zero or one. The call reference flag identifies which side of the signaling virtual channel allocates the corresponding call reference. That is, with respect to messages from the calling user to the called user, the call reference flag is zero. With respect to messages from the called user to the calling user, the call reference flag is one. Therefore, although the same call reference value is simultaneously used for messages in two directions, they can be distinguished from each other.

The call reference flag is also similarly used for a global call reference, for example, at the initial setup procedure. As mentioned above, all bits of a global call reference value are zero (see Figure 100). The device, which has received a message including a global call reference, should interpret that this message is valid for all messages on the signaling virtual channel.

On the other hand, all bits of a dummy call reference value are one (see Figure 101). In the future, a dummy call reference value will be used for a specific additional service. The call reference flag is also similarly used for a global call reference. Dummy call reference is not used in procedures of the invented system, so that devices of the invented system should discard a message including a dummy call reference.

2.5.2.4.3.1.2 MESSAGE TYPE IDENTIFIER

Next, message type identifier, including message compatibility instruction indicator, will be described.

The message type identifier is designed for identifying the function of the message transmitted. The message type identifier is arranged at the third part of each CC entity message and encoded in a manner represented in Figures 102, 646, and 647. Figure 102 is a diagram representing the format of the message type identifier. Figures 646 and 647 form a table representing the coding of the message type identifier. As mentioned in Figure 646, octet 1 of the message type identifier encoded as "00000000" is used for an escape code for a nationally specific message type. In addition, as mentioned in Figure 646, octet 1 of the message type identifier encoded as "11111111" is reserved for extension for the case that all other values have been used.

On the other hand, the message compatibility instruction indicator is used by the message source terminal for explicitly instructing peer entity operation at the message destination terminal. The format and the coding manner of the message compatibility instruction indicator are represented in Figures 102 and 647. The message compatibility instruction indicator is valid only in the defined local interval. It is optional for the network to decide which value is set to the message compatibility instruction indicator of a message transmitted from the network to a user terminal insofar as the coding is not prescribed by another manner.

2.5.2.4.3.1.3 VARIABLE LENGTH INFORMATION ELEMENTS ACCORDING TO FPLMTS

Next, variable length information elements according to FPLMTS will be described.

2.5.2.4.3.1.3.1 CODING

Coding of the variable length information elements of CC entity messages will be described hereinafter. The coding was studied in order that the device which processes messages can detect information elements necessary for the process and can ignore other elements.

Figures 103 and 104 represent the formats of the variable length information elements according to FPLMTS. Figures 648 and 649 form a list representing the coding of the variable length information elements according to FPLMTS. Bit coding represented in Figures 103, 104, 648, and 649 are reserved for the information elements that will be described later.

As mentioned in Figure 104, information element identifier encoded as "11111111" is reserved for extension. If all other information element identifiers have been used, further 65536 information elements can be identified by virtue of the extension.

In the CC entity message, variable length information elements can be arranged in random order, but the following constitutes exceptions.

(a) If the broadband repeat indicator information element is not included and the same kind of information elements is included, the same kind of information elements should be arranged in succession. However, this rule is not applied for broadband locking shift information elements and broadband non-locking shift information elements.

(b) If the broadband repeat indicator information element is included and the same kind of information elements is included, the following rules will be applied.

The broadband repeat indicator information element should be arranged directly before the first element among the same kind of information elements.

The first element among the same kind of information elements, which is arranged directly after the broadband repeat indicator information element, should be interpreted to have the highest priority. The same kinds of information elements should be interpreted in such a manner that the element of higher priority is arranged ahead.

The information elements arranged after the broadband non-locking shift information element should be processed as an information element in the application of the above-described rules.

DEMANDES OU BREVETS VOLUMINEUX

LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS COMPREND PLUS D'UN TOME.

CECI EST LE TOME 1 DE 2

NOTE: Pour les tomes additionels, veillez contacter le Bureau Canadien des Brevets.

JUMBO APPLICATIONS / PATENTS

THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE THAN ONE VOLUME.

THIS IS VOLUME 1 OF 2

NOTE: For additional volumes please contact the Canadian Patent Office.

CLAIMS

1. A method for mobile communication carried out among a plurality of mobile stations and a network, personal identifiers being previously and respectively assigned to the mobile stations, the method comprising the steps of:

assigning temporary identifiers respectively to mobile stations which are communicable with the network;

storing the personal identifiers and the temporary identifiers of the mobile stations by the network;

storing the personal identifier and the temporary identifier of each mobile station by the mobile station;

detecting by the network that one of the temporary identifiers stored in itself is different from that stored in the corresponding mobile station; and

reassigning by the network another temporary identifier to the mobile station of which the former temporary identifier stored in the network is detected to be different from that stored in the corresponding mobile station.

2. A base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the controller comprising enciphering means for enciphering transmitted information, which has been received from the switching center and should be transmitted to the mobile station, so as to generate enciphered transmitted information.

3. A base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the controller comprising:

retransmission-control-information-adding means for adding retransmission control information to enciphered transmitted information which has been previously enciphered by the switching center; and

transmitting means for transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

4. A switching center communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations and the base station controller according to claim 2, the switching center comprising enciphering means for enciphering transmitted information, which should be transmitted to the mobile station, so as to generate enciphered transmitted information.

5. A system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system being characterized in that the base station controller enciphers information, which should be transmitted from the side of the switching center to the side of the mobile station, before transmitting the information to the base station controller.

6. A system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system being characterized in that the switching center enciphers information, which should be transmitted from the side of the switching center to the side of the mobile station, before distributing the information to the radio base stations.

7. A system for mobile communication including a mobile station which is able to

conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system comprising layer-2-enciphering-means for enciphering information that should be processed only in one or more layers which are the same as or higher than layer 2 of the OSI reference model.

8. A system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system comprising:

layer-3-enciphering-means for enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model; and

layer-2-mutual-notifying-means for facilitating notification between layers of different devices corresponding to layer 2 of the OSI reference model about an onset of transmission of enciphered information.

9. A system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the system comprising:

layer-3-enciphering-means for enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model;

retransmission-control-information-adding means, at a layer corresponding to layer 2 of the OSI reference model, for adding retransmission control information to information which has been previously enciphered by the layer-3-enciphering means; and transmitting means for transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

10. A method for controlling a base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the method comprising the step of enciphering transmitted information, which has been received from the switching center and should be transmitted to the mobile station, so as to generate enciphered transmitted information.

11. A method for controlling a base station controller communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations under control of a switching center, the method comprising the steps of:

adding retransmission control information to enciphered transmitted information which has been previously enciphered by the switching center; and

transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

12. A method for controlling a switching center communicating with a mobile station, which is able to conduct diversity reception, via a plurality of radio base stations and the base station controller according to claim 3, the method comprising the step of enciphering transmitted information, which should be transmitted to the mobile station, so as to generate enciphered transmitted information.

13. A method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the step of, at the base station

controller, enciphering information, which should be transmitted from the side of the switching center to the side of the mobile station, before distributing the information to the radio base stations.

14. A method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the step of, at the switching center, enciphering information, which should be transmitted from the side of the switching center to the side of the mobile station, before distributing the information to the radio base stations.

15. A method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the step of enciphering information that should be processed only in one or more layers which are the same as or higher than layer 2 of the OSI reference model.

16. A method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the steps of:

enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model; and

facilitating notification between layers of different devices corresponding to layer 2 of the OSI reference model about an onset of transmission of enciphered information.

17. A method for controlling a system for mobile communication including a mobile station which is able to conduct diversity reception, a plurality of radio base stations, and a base station controller communicating via the radio base stations under control of a switching center, the method comprising the steps of:

enciphering information that should be processed only in one or more layers which are the same as or higher than layer 3 of the OSI reference model;

adding retransmission control information at a layer corresponding to layer 2 of the OSI reference model to information which has been previously enciphered by the enciphering step; and

transmitting the enciphered transmitted information with the retransmission control information to the radio base stations.

18. A mobile station communicating with a network over the air, comprising decipherment-onset-time-setting-means for setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the network and independently of a time to start enciphering a transmission signal in the mobile station.

19. A mobile station according to claim 18 further comprising deciphering means for deciphering an enciphered reception signal received from the network over the air, the decipherment-onset-time-setting-means including:

encipherment-onset-request-determining means for determining if a reception encipherment onset request is received from the network or not; and

decipherment-instructing means for instructing the deciphering means to start deciphering in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

20. A mobile station communicating with a network over the air, comprising encipherment-onset-time-setting-means for setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

21. A mobile station according to claim 20 further comprising:

transmission-encipherment-onset-requesting means for transmitting a transmission encipherment onset request to the network over the air; and

enciphering means for enciphering the transmission signal so as to generate an enciphered transmission signal, the encipherment-onset-time-setting-means including encipherment-instructing means for instructing the enciphering means to start enciphering in accordance with a time when the transmission encipherment onset request has been transmitted.

22. A controller in a network communicating with a mobile station over the air, comprising decipherment-onset-time-setting-means for setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the mobile station and independently of a time to start enciphering a transmission signal in the controller.

23. A controller in a network according to claim 22 further comprising deciphering means for deciphering an enciphered reception signal received from the mobile station over the air, the decipherment-onset-time-setting-means including:

encipherment-onset-request-determining means for determining if a reception encipherment onset request is received from the network or not; and

decipherment-instructing means for instructing the deciphering means to start deciphering in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

24. A controller in a network communicating with a mobile station over the air, comprising encipherment-onset-time-setting-means for setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

25. A controller in a network according to claim 24, further comprising:

transmission-encipherment-onset-requesting means for transmitting a transmission encipherment onset request to the mobile station over the air; and

enciphering means for enciphering the transmission signal so as to generate an enciphered transmission signal, the encipherment-onset-time-setting-means including encipherment-instructing means for instructing the enciphering means to start enciphering in accordance with a time when the transmission encipherment onset request has been transmitted.

26. A system for mobile communication comprising a mobile station and a network communicating with each other over the air,

the network comprising:

encipherment-onset-requesting means for transmitting an encipherment onset request to the mobile station over the air;

first-enciphered-transmission-signal-generating means for enciphering a first transmission signal which should be transmitted from the network to the mobile station after the transmission of the encipherment onset request, thereby generating a first enciphered transmission signal;

first-enciphered-transmission-signal-transmitting means for transmitting the first enciphered transmission signal to the mobile station;

response determining means for determining if an encipher onset response by the mobile station indicating that the encipherment onset request is acceptable is received or not; and

first deciphering means for starting to decipher a second enciphered transmission signal from the mobile station on the basis of the determination of the response determining means when the mobile station accepts the encipherment onset request,

the mobile station comprising:

request determining means for determining if the encipherment onset request is received or not;

encipherment-onset-responding means for transmitting the encipherment onset response on the basis of the determination of the request determining means when the encipherment onset request is accepted;

second deciphering means for starting to decipher the first enciphered transmission signal from the network when the encipherment onset request is accepted;

second-enciphered-transmission-signal-generating means for enciphering a second transmission signal which should be transmitted from the mobile station to the network after the transmission of the encipherment onset response, thereby generating a second enciphered transmission signal; and

second-enciphered-transmission-signal-transmitting means for transmitting the second enciphered transmission signal to the network.

27. A method for controlling a mobile station communicating with a network over the air, comprising the step of setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the network and independently of a time to start enciphering a transmission signal in the mobile station.

28. A method for controlling a mobile station according to claim 27, further

comprising the step of deciphering an enciphered reception signal received from the network over the air, the step of setting a time to start deciphering including the steps of determining if a reception encipherment onset request is received from the network or not; and instructing to start the deciphering step in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

29. A method for controlling a mobile station communicating with a network over the air, comprising the step of setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

30. A method for controlling a mobile station according to claim 29, further comprising the steps of transmitting a transmission encipherment onset request to the network over the air; and enciphering the transmission signal so as to generate an enciphered transmission signal, the step of setting a time to start enciphering including the step of instructing to start the enciphering step in accordance with a time when the transmission encipherment onset request has been transmitted.

31. A method for controlling a controller in a network communicating with a mobile station over the air, comprising the step of setting a time to start deciphering an enciphered reception signal dependently on a time to start enciphering a transmission signal in the mobile station and independently of a time to start enciphering a transmission signal in the controller.

32. A method for controlling a controller in a network according to claim 31, further comprising the step of deciphering an enciphered reception signal received from the mobile station over the air, the step of setting a time to start deciphering including the steps of determining if a reception encipherment onset request is

received from the network or not; and instructing to start the deciphering step in accordance with a time when the reception encipherment onset request has been received on the basis of the determination.

33. A method for controlling a controller in a network communicating with a mobile station over the air, comprising the step of setting a time to start enciphering a transmission signal independently of a time to start deciphering an enciphered reception signal.

34. A method for controlling a controller in a network according to claim 33, further comprising the steps of

transmitting a transmission encipherment onset request to the mobile station over the air; and

enciphering the transmission signal so as to generate an enciphered transmission signal, the step of setting a time to start enciphering including the step of instructing to start the enciphering step in accordance with a time when the transmission encipherment onset request has been transmitted.

35. A method for controlling a system for mobile communication in which a mobile station and a network communicate with each other over the air, the method comprising the steps of:

transmitting an encipherment onset request from the network to the mobile station over the air;

enciphering a first transmission signal which should be transmitted from the network to the mobile station after the transmission of the encipherment onset request, thereby generating a first enciphered transmission signal;

transmitting the first enciphered transmission signal to the mobile station;

determining if an encipher onset response by the mobile station indicating that the encipherment onset request is acceptable is received or not;

starting to decipher a second enciphered transmission signal from the mobile station on the basis of the determination of the response determining step when the mobile station accepts the encipherment onset request;

determining if the encipherment onset request is received or not;

transmitting the encipherment onset response on the basis of the determination of the request determining step when the encipherment onset request is accepted;

starting to decipher the first enciphered transmission signal from the network when the encipherment onset request is accepted;

enciphering a second transmission signal which should be transmitted from the mobile station to the network after the transmission of the encipherment onset response, thereby generating a second enciphered transmission signal; and

transmitting the second enciphered transmission signal to the network.

36. A mobile station communicating with a network over the air, comprising encipherment-procedure-notifying-means for notifying the network about encipherment-procedure-specifying-information specifying one or more possible encipherment procedures of the mobile station.

37. A mobile station, wherein encipherment-procedure-notifying-means further including the enciphering-key-generation-procedure-notifying-means for notifying the network about enciphering-key-generation-procedure-specifying-information specifying one or more possible enciphering key generation procedures of the mobile station.

38. A mobile station communicating with a network over the air according to claim 36, comprising encipherment communication means for conducting an

encipherment procedure corresponding to an encipherment request given by the network and for communicating with the network.

39. A mobile station according to claim 38, wherein the encipherment communication means includes enciphering-key-generating-means for generating an enciphering key corresponding to enciphering-key-generation-procedure-specifying-means specifying an enciphering key generation procedure notified by the network; and enciphering means for conducting an encipherment procedure using the enciphering key generated by the enciphering-key-generating-means.

40. A controller in a network communicating with a mobile station over the air, comprising:

encipherment-procedure-selecting means for selecting an encipherment procedure for communication in accordance with encipherment-procedure-specifying-information, specifying one or more possible encipherment procedures of the mobile station, notified by the mobile station; and

encipherment requesting means for notifying the mobile station about an encipherment request requesting the mobile station to conduct an encipherment using the encipherment procedure selected by the encipherment-procedure-selecting means.

41. A controller in a network according to claim 40, further comprising:

enciphering-key-generation-procedure-selecting-means for selecting an enciphering key generation procedure in accordance with enciphering-key-generation-procedure-specifying-information, specifying one or more possible encipherment procedures of the mobile station, notified by the mobile station; and

enciphering-key-notifying means for notifying the base station about the enciphering key generation procedure selected by the enciphering-key-generation-procedure-selecting-means.

42. A method for controlling access links between a mobile station and a network, characterized in that a plurality of branches are established between the network and the mobile station upon a call attempt to or from the mobile station located at a position where the mobile station can communicate using diversity handover, the plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate using diversity handover, thereby enabling the mobile station to commence the diversity handover using the plurality of branches.

43. A method according to claim 42, wherein the branches are formed between the network and the mobile station via a single base station, thereby enabling the mobile station to commence intra-cell diversity handover.

44. A method according to claim 42, wherein the branches are formed between the network and the mobile station via a plurality of base stations, respectively, thereby enabling the mobile station to commence inter-cell diversity handover.

45. A method according to claim 42, wherein the mobile station measures the levels of receptions from circumferential base stations, selects candidate zones for the diversity handover on the basis of the measurement, and notifies the network about the candidate zones, and the network selects the branches in light of the notification from the mobile station,

46. A method according to claim 42, wherein the network transmits a message, including a request to establish the branches, to the mobile station and commences the diversity handover for communicating with the mobile station.

47. A mobile station characterized in that it establishes a plurality of branches between the network and the mobile station upon the reception of a message from the network when no access link is established between the network and the mobile station, the message including a request for establishing the branches, thereby commencing the diversity handover using the plurality of branches.

48. A mobile station according to claim 47, wherein if the request instructs to establish the branches between the mobile station and a single base station, the mobile station establishes the requested branches between the mobile station and the single base station, thereby commencing intra-cell diversity handover.

49. A mobile station according to claim 47, wherein if the request instructs to establish the branches between the mobile station and a plurality of base stations, the mobile station establishes the requested branches between the mobile station and the base stations, thereby commencing inter-cell diversity handover.

50. A base station controller characterized in that it establishes a plurality of branches between a network and a mobile station upon a call attempt to or from the mobile station at a location where the mobile station can communicate using diversity handover, the plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate using diversity handover.

51. A base station controller characterized in that it transmits a message to both of a base station and a mobile station upon a call attempt to or from the mobile station at a location where the mobile station can communicate by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using a plurality of branches, the message including a request for

establishing a plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate by means of intra-cell diversity handover.

52. A base station controller characterized in that it transmits a message to a plurality of base stations upon a call attempt to or from the mobile station at a location where the mobile station can communicate by means of inter-cell diversity handover wherein the mobile station communicates with the plurality of base stations, the message including a request for establishing a plurality of branches between the mobile station and the corresponding base stations.

53. A base station characterized in that it establishes a plurality of branches between the base station and the mobile station according to an instruction from a base station controller upon a call attempt to or from the mobile station at a location where the mobile station can communicate by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using the plurality of branches, the plurality of branches including a main branch and at least one auxiliary branch for additional use in order that the mobile station may communicate by means of intra-cell diversity handover, thereby enabling the mobile station to commence the intra-cell diversity handover.

54. A method for controlling a branch replacement characterized in that at least a current branch between a network and a mobile station are replaced with a plurality of branches necessary for communication using diversity handover when the branch replacement is necessary for the mobile station and when it is recognized that the mobile station can commence communicating using diversity handover if the branch replacement is carried out, thereby enabling the mobile station to commence diversity handover.

55. A method according to claim 54, wherein the network additionally establishes an auxiliary branch for the mobile station, and then releases the current branch, so as to complete the branch replacement for communicating using diversity handover.

56. A mobile station characterized in that it replaces at least a current branch between a network and the mobile station with a plurality of branches necessary for communication using diversity handover when a branch replacement is necessary for the mobile station and when the mobile station can commence communicating using the diversity handover branches if the branch replacement is carried out, thereby commencing diversity handover.

57. A base station controller characterized in that it replaces at least a current branch between a network and a mobile station with a plurality of branches necessary for communication using diversity handover when a branch replacement is necessary for the mobile station and when it is recognized that the mobile station can commence communicating using diversity handover if the branch replacement is carried out, thereby enabling the mobile station to commence diversity handover.

58. A base station controller characterized in that it transmits a message to a base station and a mobile station when a branch replacement is necessary for the mobile station and when it is recognized that, if the branch replacement is carried out, the mobile station can commence communicating by means of intra-cell diversity handover wherein the mobile station and the base station communicate with each other using a plurality of branches, the message including an instruction to carry out the branch replacement and an instruction to add at least one auxiliary branch for additional use in order to communicate using diversity handover.

59. A base station controller characterized in that it transmits an instruction to a plurality of base stations and a message to a mobile station when a branch replacement is necessary for the mobile station and when it is recognized that the mobile station can commence communicating by means of inter-cell diversity handover if the branch replacement is carried out, the instruction instructing the base stations to set branches necessary for the diversity handover, the message including an instruction to carry out the branch replacement and an instruction to add at least one auxiliary branch for additional use in order to communicate using diversity handover.

60. A base station characterized in that it replaces a branch for a mobile station and adds at least one auxiliary branch for the mobile station according to instructions of a message once the base station receives the message from a base station controller, the message including an instruction to carry out branch replacement and an instruction to add at least one auxiliary branch for additional use in order to communicate using diversity handover, thereby commencing the intra-cell diversity handover.

61. A branch controlling method for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, at least either of branch structures for both of the calls or at least either of communication frequency bands for both of the calls is controlled, so that the branch structures are the same as each other and the communication frequency bands are the same as each other.

62. A branch controlling method for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the a branch structure and a communication frequency band, being the same as those for the existent call, are assigned to the new

call.

63. A mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the mobile station uses a branch structure and a communication frequency band, being the same as those for the existent call, for the new call in accordance with an instruction from a network.

64. A base station controller adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the base station controller controls at least either of branch structures for both of the calls or at least either of communication frequency bands for both of the calls, so that the branch structures are the same as each other and the communication frequency bands are the same as each other.

65. A base station controller adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call, the base station controller assigns a branch structure and a communication frequency band, being the same as that for the existent call, to the new call.

66. A branch controlling method adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call and when it is impossible to assign a branch structure or a communication frequency band, being the same as the branch structure or the communication frequency band for the existent call, to the new call, another branch structure or another communication frequency band which can continue both of the existent and new calls is selected, and the selected branch structure or

communication frequency band is assigned to both of the existent and new calls.

67. A method according to claim 61, wherein the existent call is assigned to diversity handover branches and the new call is also assigned to the same diversity handover branches if possible.

68. A mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call and when it is impossible to assign a branch structure or a communication frequency band, being the same as the branch structure or the communication frequency band for the existent call, to the new call, the mobile station assigns another branch structure or another communication frequency band, which can continue both of the existent and new calls, to both of the existent and new calls in accordance with an instruction from a network.

69. A base station controller adapted for a mobile station capable of treating a plurality of calls simultaneously, characterized in that when a new call occurs while the mobile station treats an existent call and when it is impossible to assign a branch structure or a communication frequency band, being the same as the branch structure or the communication frequency band for the existent call, to the new call, the base station controller selects another branch structure or another communication frequency band which can continue both of the existent and new calls, and assigns the selected branch structure or communication frequency band to both of the existent and new calls.

70. A branch controlling method adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls, a branch structure or a communication frequency band which can continue all of the calls is selected, and the selected branch structure or

communication frequency band is assigned to all of the calls commonly.

71. A mobile station capable of treating a plurality of calls simultaneously, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls, the mobile station, according to an instruction from a network, alters a branch structure or a communication frequency band for all of the calls to a new branch structure or a new communication frequency band for all of the calls commonly.

72. A base station controller adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls, the base station controller selects a branch structure or a communication frequency band which can continue all of the calls, and assigns the selected branch structure or communication frequency band to all of the calls commonly.

73. A branch controlling method adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls and when there is not a branch structure which can continue all of the calls in relation to the mobile station or when there is not a communication frequency band which can continue all of the calls in relation to the mobile station, another branch structure or another communication frequency band which can continue a plurality of calls being high in priority among the calls are selected; the other call or calls are released; and the selected branch structure and communication frequency band are assigned to the priority calls.

74. A mobile station characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls and when there is not a branch structure which can continue all of the calls in relation to the mobile station or when

there is not a communication frequency band which can continue all of the calls in relation to the mobile station, the mobile station, according to an instruction from a network, releases a call or calls being low in priority; and assigns a branch structure and a communication frequency band selected by the network to a plurality of calls being high in priority.

75. A base station controller adapted for a mobile station, characterized in that when a trigger of handover occurs to the mobile station which is treating a plurality of calls and when there is not a branch structure which can continue all of the calls in relation to the mobile station or there is not a communication frequency band which can continue all of the calls in relation to the mobile station, the base station controller selects another branch structure and another communication frequency band which can continue a plurality of calls being high in priority among the calls; releases the other call or calls; and assigns the selected branch structure and communication frequency band to the priority calls.

76. A method for establishing a control channel in a mobile communication system wherein a mobile station treats a plurality of calls using a plurality of sets of wireless communication resources, characterized in that a single control channel is established between the mobile station and a network for transporting control information therebetween in a manner that the control channel is formed by one of the sets of wireless communication resources which are being used for a plurality of calls by the mobile station.

77. A method for controlling to replace a control channel, characterized in that while a mobile station treats a plurality of calls using a plurality of sets of wireless communication resources and transmits or receives control information to or from a network via a single control channel formed by one of the sets of the wireless

communication resources, and when a first call using the control channel formed by one of the sets of the wireless communication resources should be released and a second call should be continued, the control channel, which is formed by one of the sets of the wireless communication resources and should be released, is replaced with a new control channel formed by another set of the wireless communication resources, thereby continuing to control the second call.

78. A base station controller, characterized in that while a mobile station treats a plurality of calls using a plurality of sets of wireless communication resources and transmits or receives control information to or from a network via a control channel formed by one of the sets of the wireless communication resources, and when a first call using the control channel formed by one of the sets of the wireless communication resources should be released and a second call should be continued, the controller replaces the control channel, which is formed by one of the sets of the wireless communication resources and should be released, to a new control channel formed by another set of the wireless communication resources, thereby continuing to control the second call.

79. A method for determining a radio zone and an uplink transmission power, characterized in that

each of base stations transmits broadcast information indicating a perch channel transmission power level and an uplink interference level via a corresponding perch channel; and

a mobile station receives the broadcast information from near base stations around the mobile station;

detects respective reception levels of the perch channels for the near base stations;

calculates respective path losses between the mobile station and respective near base stations on the basis of the respective reception levels and the respective perch channel transmission power levels within the broadcast information;

calculates respective necessary uplink transmission power levels between the mobile station and respective near base stations on the basis of the calculated respective path losses, the respective uplink interference levels within the broadcast information, and required signal-to-interference ratios involved in reception by the near base stations;

selects a radio zone in which the necessary uplink transmission power level is minimum among the respective necessary uplink transmission power levels, the base station of the selected radio zone being ready for communication with the mobile station or being able to commence communication with the mobile station after handover; and

controls an uplink transmission power in the selected radio zone based on the necessary uplink transmission power level of the selected radio zone.

80. A base station comprising means for transmitting broadcast information indicating a perch channel transmission power level and an uplink interference level via a perch channel.

81. A mobile station characterized in that it

receives broadcast information from near base stations around the mobile station via respective perch channels, the broadcast information from each of the near base stations indicating a perch channel transmission power level and an uplink interference level;

detects respective reception levels of the perch channels for the near base stations;

calculates respective path losses between the mobile station and respective near base stations on the basis of the respective reception levels and the respective perch channel transmission power levels within the broadcast information;

calculates respective necessary uplink transmission power levels between the mobile station and respective near base stations on the basis of the calculated respective path losses, the respective uplink interference levels within the broadcast information, and respective signal-to-interference ratios involved in reception by the respective near base stations;

selects a radio zone of which the necessary uplink transmission power level is minimum among the respective necessary uplink transmission power levels, the base station of the selected radio zone being ready for communication with the mobile station or being able to commence communication with the mobile station after handover; and

controls an uplink transmission power in the selected radio zone based on the necessary uplink transmission power level of the selected radio zone.

82. A handover controlling method for additionally establishing a handover branch between a mobile station and a network, characterized in that a procedure for additional establishment of a branch is completed with a state transition to which the mobile station can commence communicating without waiting for a confirmation of synchronization for all branches.

83. A handover controlling method according to claim 82, wherein the procedure for additional branch establishment is completed with confirmation of synchronization for one branch among the branches established for the mobile station.

84. A mobile station characterized in that if the mobile station has received a request from a network to establish a new additional branch between the network and the mobile station, the mobile station establishes the new branch and then starts diversity reception upon reception of a signal through the new branch.

85. A base station characterized in that if the base station has received a request from a base station controller to establish a new additional branch between a mobile station and the base station for carrying out intra-cell diversity handover, the base station additionally establishes the new branch and then starts intra-cell diversity reception upon reception of a signal through the new branch.

86. A base station characterized in that if the base station has received a request from a base station controller to establish a new additional branch between a mobile station and the base station for carrying out inter-cell diversity handover, the base station establishes the new branch and then starts sending the received signals to the base station controller that executes inter-cell diversity reception upon reception of a signal through the new branch.

87. A base station controller characterized in that when the base station controller establishes a new additional branch between a mobile station and a network, the base station controller provides a request for establishing the new branch and then completes a procedure for additional establishment of the new branch without a confirmation of synchronization for all branches between the mobile station and the network.

88. A base station controller according to claim 87, wherein the base station controller provides the request for establishing the new branch being necessary for inter-cell diversity handover, and then starts inter-cell diversity reception upon reception of signals through the branches being necessary for inter-cell diversity handover.

89. A radio mobile communication system wherein a plurality of channels can be

established on a single carrier frequency by code division multiplex access, characterized in that the system comprises code-resource-assigning means for assigning at least a part of an assignable code resource to one of the channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

90. A radio mobile communication system according to claim 89, further comprising channel-assigning means for assigning one of the channels, to which a part of the assignable code resource is assigned, to a mobile station in accordance with a transmission rate necessary for the mobile station.

91. A radio mobile communication system wherein a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that the system comprises a plurality of assignable code resources, each of code resources corresponding to a certain bandwidth and being independent of the other code resources; and reassigning means for reassigning a part of an assignable code resource to one of the channels to which a part of another assignable code resource is already assigned if there is not an unused code resource corresponding to a bandwidth suitable for a necessary transmission rate when assigning an unused assignable code resource to one of the channels in accordance with the necessary transmission rate.

92. A radio mobile communication system according to claim 91, further comprising unused-code-resource determining means for determining if there is an unused code resource having a code resource length suitable for a necessary transmission rate or not when assigning an unused assignable code resource to one of the channels in accordance with the necessary transmission rate necessary.

93. A radio mobile communication system according to claim 91, wherein at least one standard code resource corresponding to a predetermined bandwidth is preselected and the system comprises assignment-possibility-determining means for determining at predetermined moments if there is at least one unused standard code resource or not, the reassigning means reassigning a part of an assignable code resource to one of the channels to which a part of another assignable code resource is already assigned until an unused standard code resource is reserved if the determination result by the assignment-possibility-determining means has been negative.

94. A radio base station for which a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that it comprises code-resource-assignment-possibility-determining means for determining whether or not it is possible to assign at least a part of an assignable code resource to one of channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

95. A base station controller for controlling the radio base station according to claim 94, further comprising channel-assigning means for assigning a channel, to which a part of assignable code resource is assigned, to a mobile station in accordance with a transmission rate necessary for the mobile station.

96. A method for controlling a radio mobile communication system wherein a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that the method comprises code-resource-assigning step for assigning at least a part of an assignable code resource to one of the channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

97. A method for controlling a radio mobile communication system including a plurality of assignable code resources, each of code resources corresponding to a certain bandwidth and being independent of the other code resources, a plurality of channels being capable ofbeing established on a single carrier frequency by code division multiplex access, characterized in that in order to assign an unused assignable code resource to one of the channels in accordance with a necessary transmission rate, the method comprises the steps of

determining whether or not there is an unused code resource having a code resource length in accordance with the necessary transmission rate; and

reassigning a part of an assignable code resource to one of the channels to which a part of another assignable code resource is already assigned if the determination indicates that there is not an unused code resource having a bandwidth suitable for the necessary transmission rate.

98. A method for controlling radio base station for which a plurality of channels can be established on a single carrier frequency by code division multiplex access, characterized in that it comprises a code-resource-assignment-possibility-determining step for determining whether or not it is possible to assign at least a part of an assignable code resource to one of channels in accordance with a transmission rate necessary for the corresponding channel, the part corresponding to a certain bandwidth corresponding to the transmission rate.

99. A method for controlling a radio base station according to claim 94, comprising a channel-assigning step for assigning a channel, to which a part of an assignable code resource is assigned to a mobile station in accordance with a transmission rate necessary for the mobile station.

DEMANDES OU BREVETS VOLUMINEUX

LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS COMPREND PLUS D'UN TOME.

CECI EST LE TOME 1 DE 2

NOTE: Pour les tomes additionels, veillez contacter le Bureau Canadien des Brevets.

JUMBO APPLICATIONS / PATENTS

THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE THAN ONE VOLUME.

THIS IS VOLUME 1 OF 2

NOTE: For additional volumes please contact the Canadian Patent Office.

FIG. 1

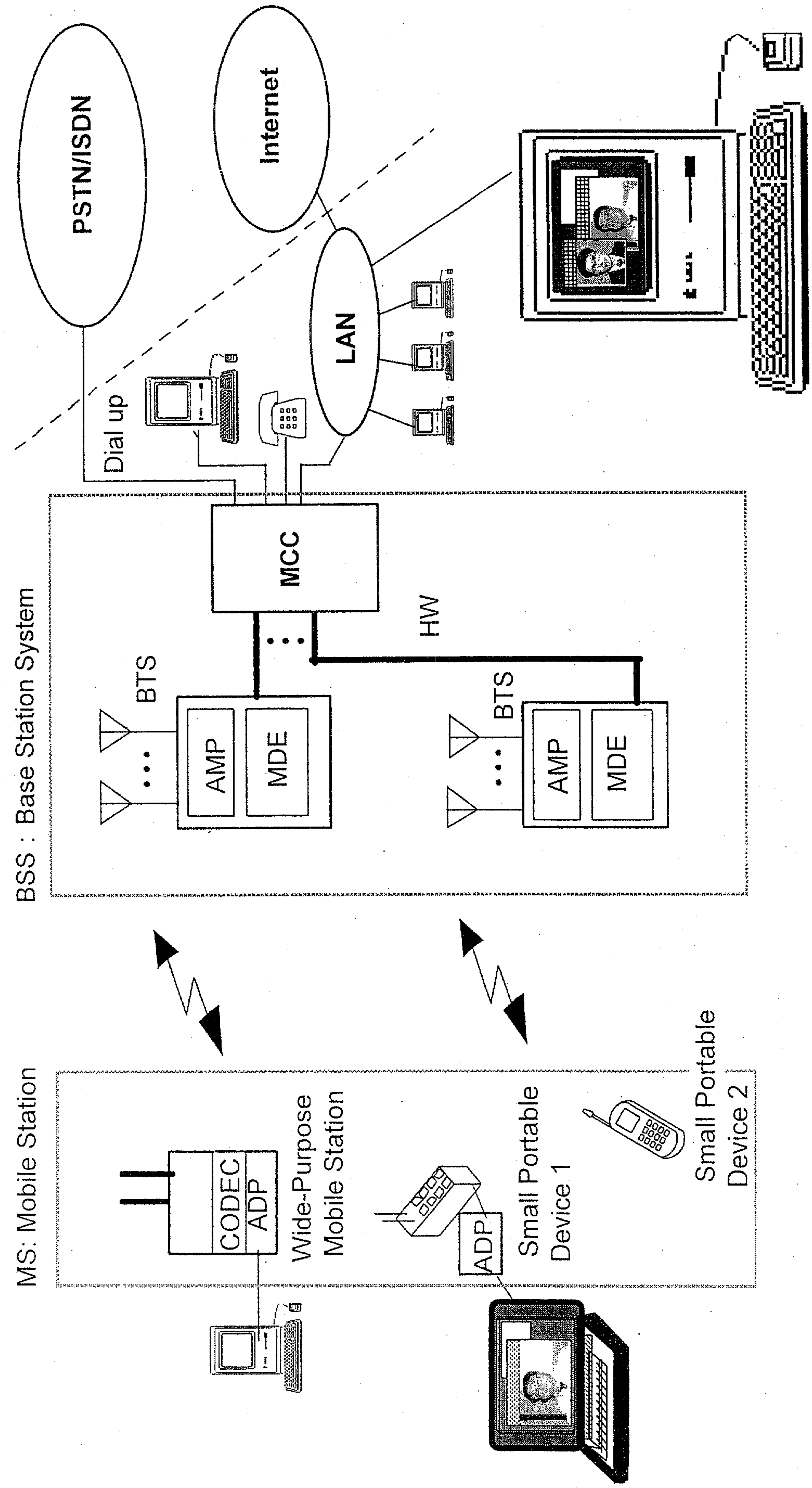
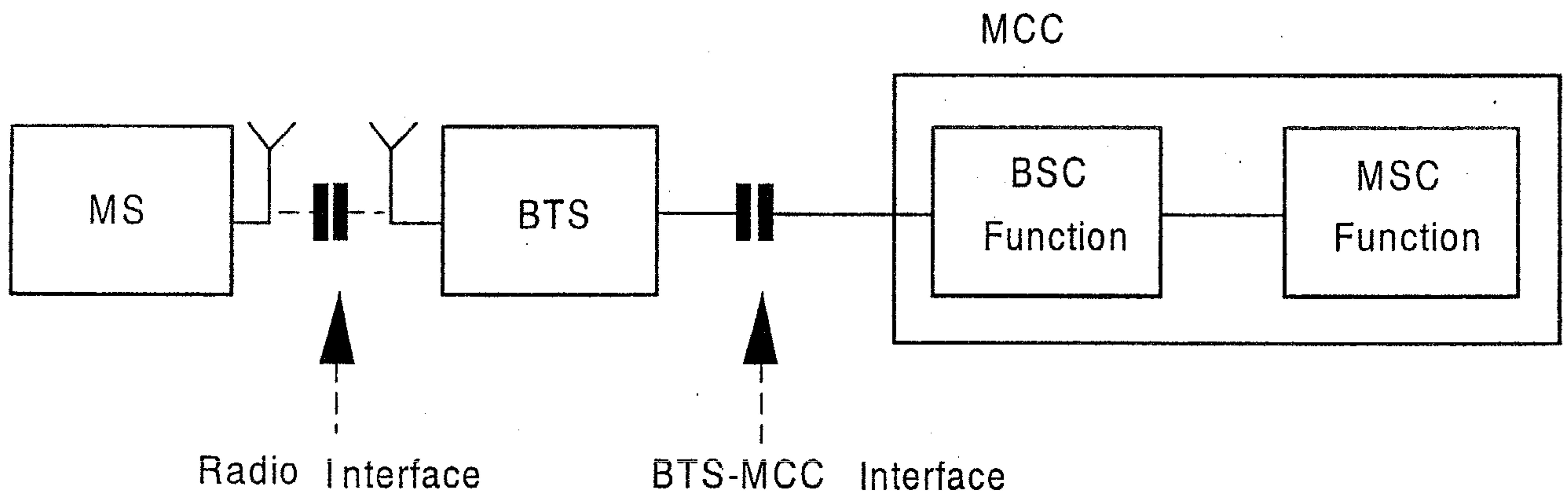
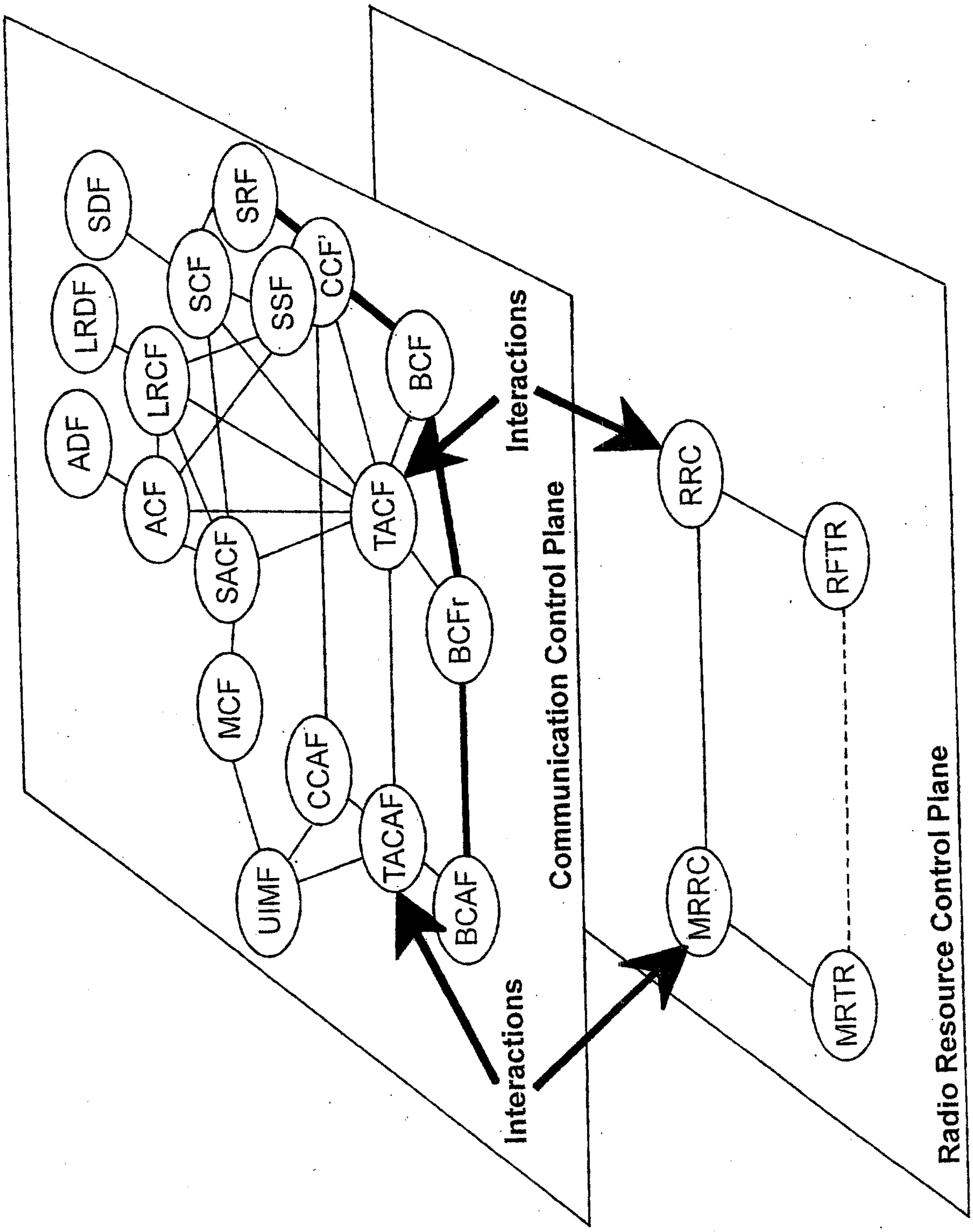

PSTN/ISDN
Internet
LAN
Dial up
MCC
HW
BSS : Base Station System
BTS
AMP
MDE
BTS
AMP
MDE
MS: Mobile Station
CODEC
ADP
Wide-Purpose
Mobile Station
ADP
Small Portable
Device 1
Small Portable
Device 2

FIG. 2



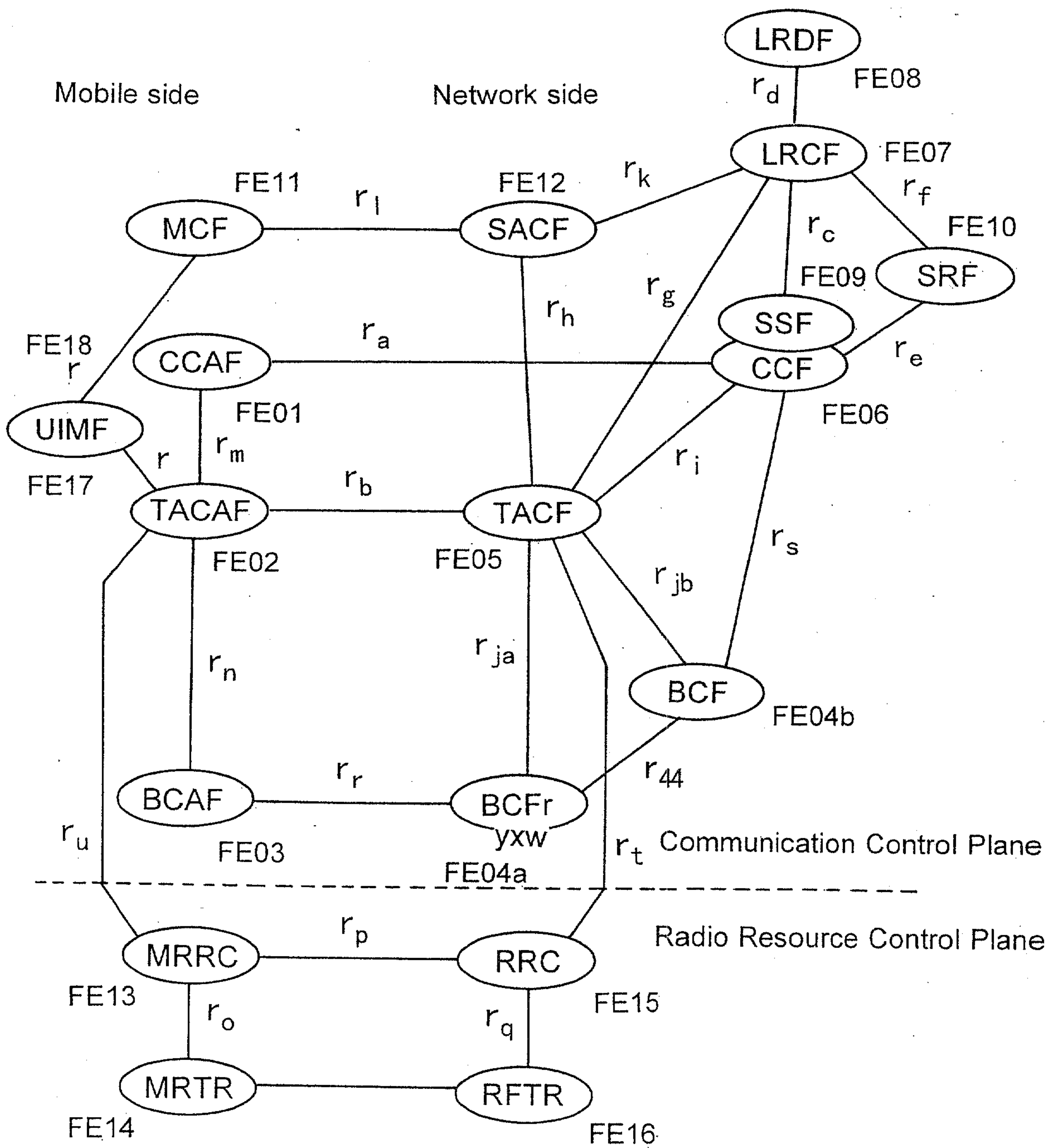
MS: Mobile Station
BTS: Base Transceiver System
MCC: Mobile Communications Control Center

FIG. 3



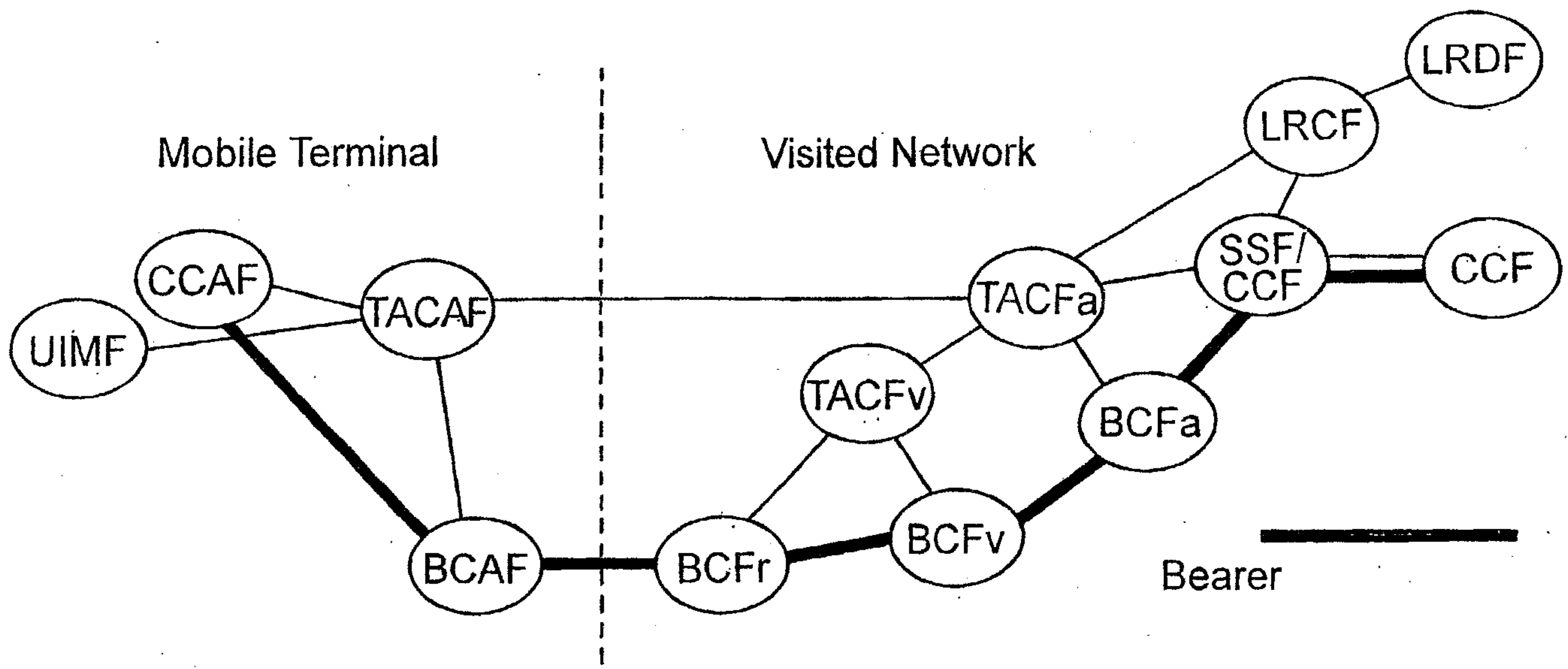
SDF
LRDF
ADF
SRF
SCF
SSF
CCF'
LRCF
ACF
BCF
SACF
TACF
BCFr
MCF
CCAF
TACAF
UIMF
BCAF
Interactions
Interactions
Communication Control Plane
RRC
RFTR
MRRC
MRTR
Radio Resource Control Plane

FIG. 4



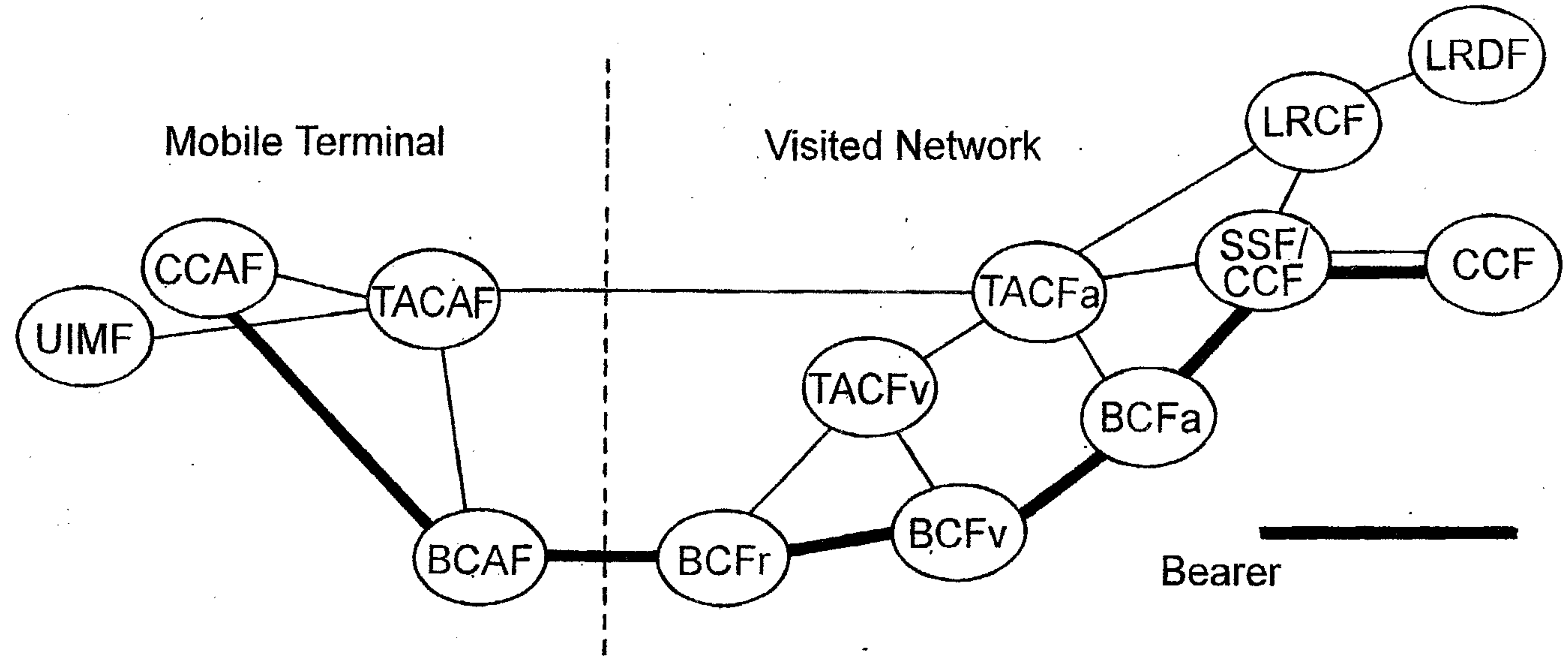
Mobile side
Network side
LRDF
FE08
r_d
LRCF
FE07
r_k
r_f
FE11
FE12
r_l
MCF
SACF
r_c
FE10
r_g
FE09
SRF
r_h
SSF
FE18
r
CCAF
r_a
CCF
r_e
FE01
FE06
UIMF
r
r_m
r_i
FE17
r_b
TACAF
TACF
FE02
FE05
r_s
r_{jb}
r_n
r_{ja}
BCF
FE04b
r_r
r_{44}
BCAF
BCFr
yxw
r_u
FE03
r_t
Communication Control Plane
FE04a
Radio Resource Control Plane
r_p
MRRC
RRC
FE13
r_o
r_q
FE15
MRTR
RFTR
FE14
FE16

FIG. 5



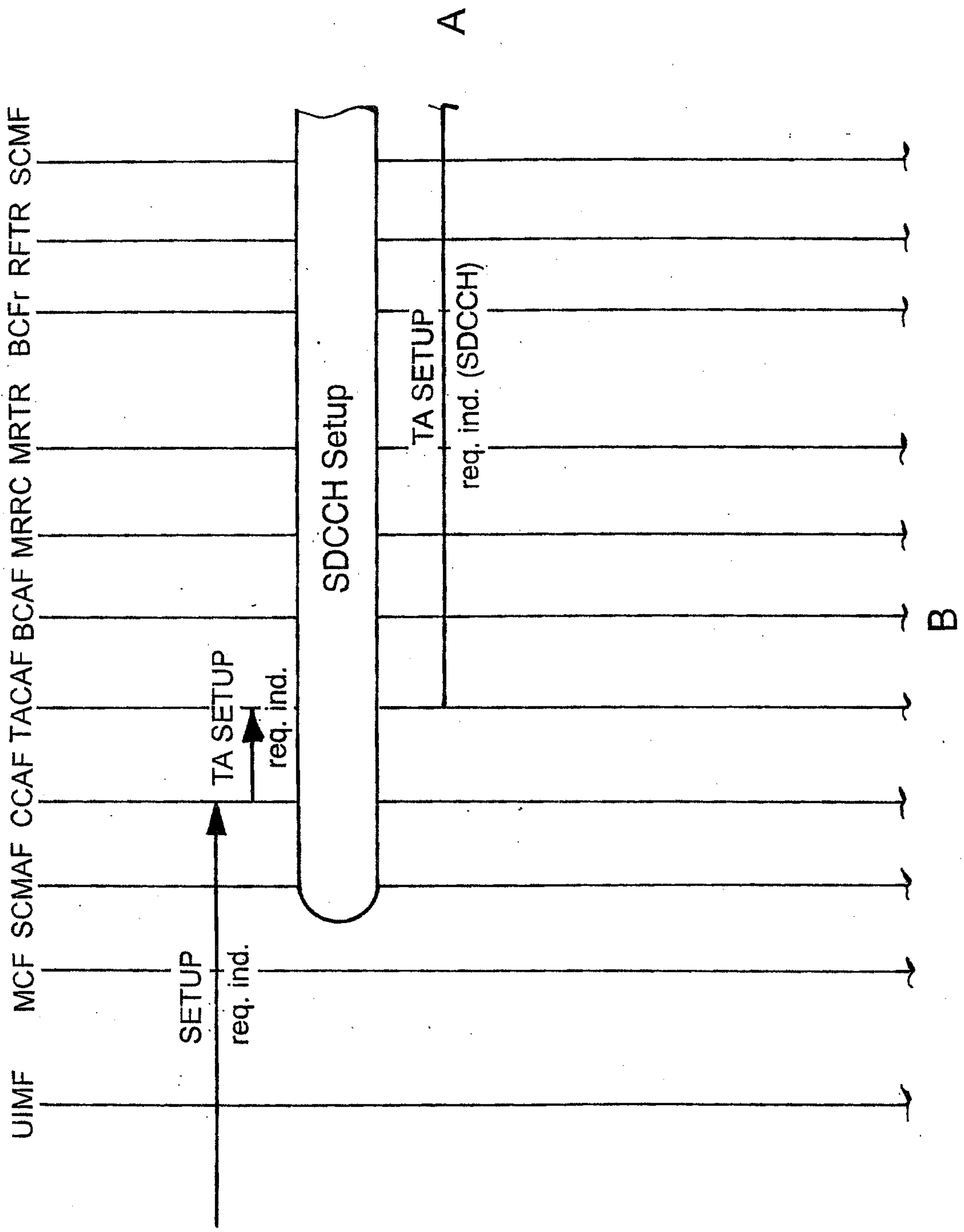
Note: Radio resources are selected under BCFr controlled by the same TACF that received call setup request.
According to the radio resource selection scenario, multiple FEs are involved.

FIG. 6

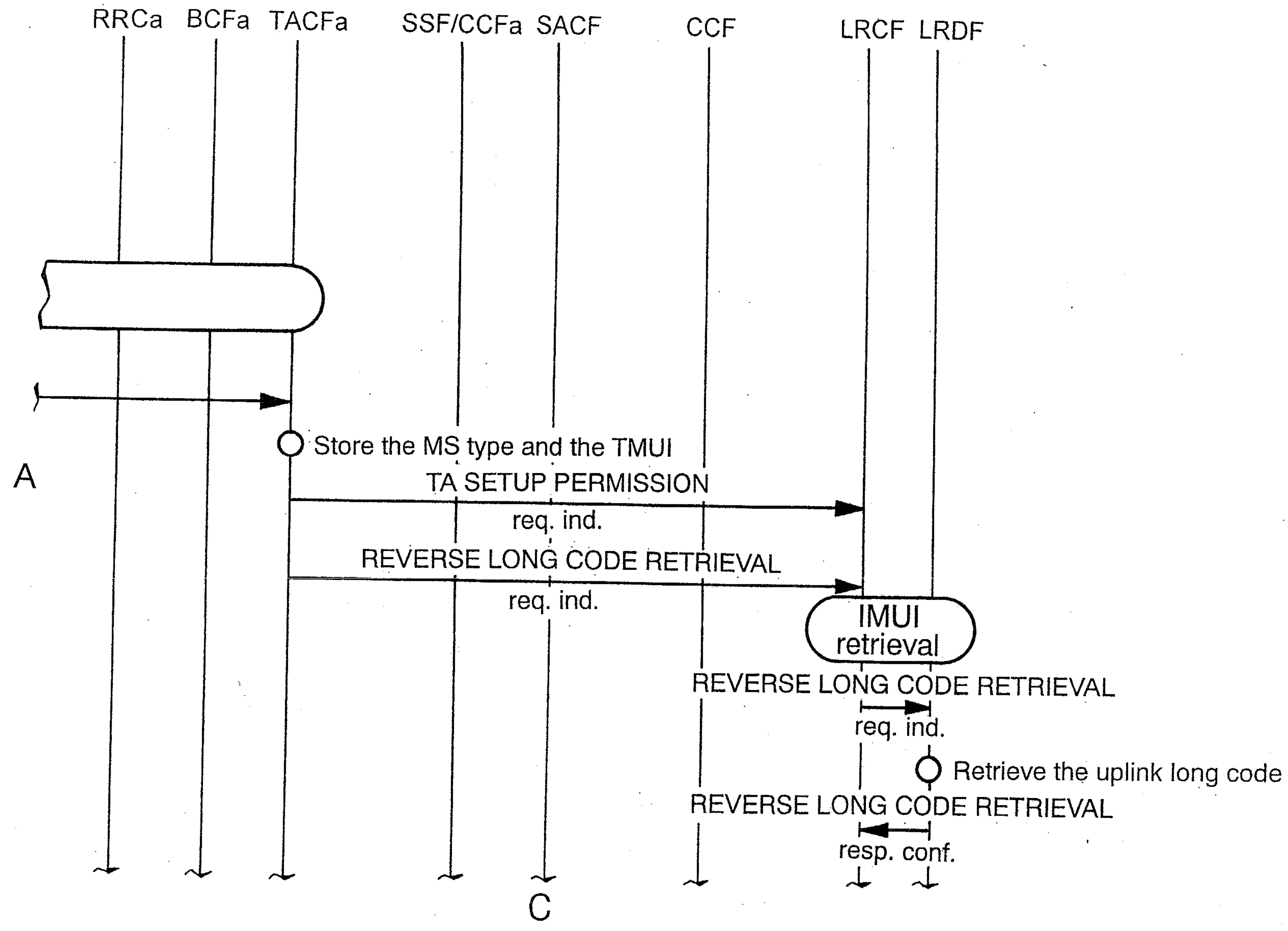


Note: Radio resources are selected under BCFr controlled by the same TACF that received call setup request.
According to the radio resource selection scenario, multiple FEs are involved.

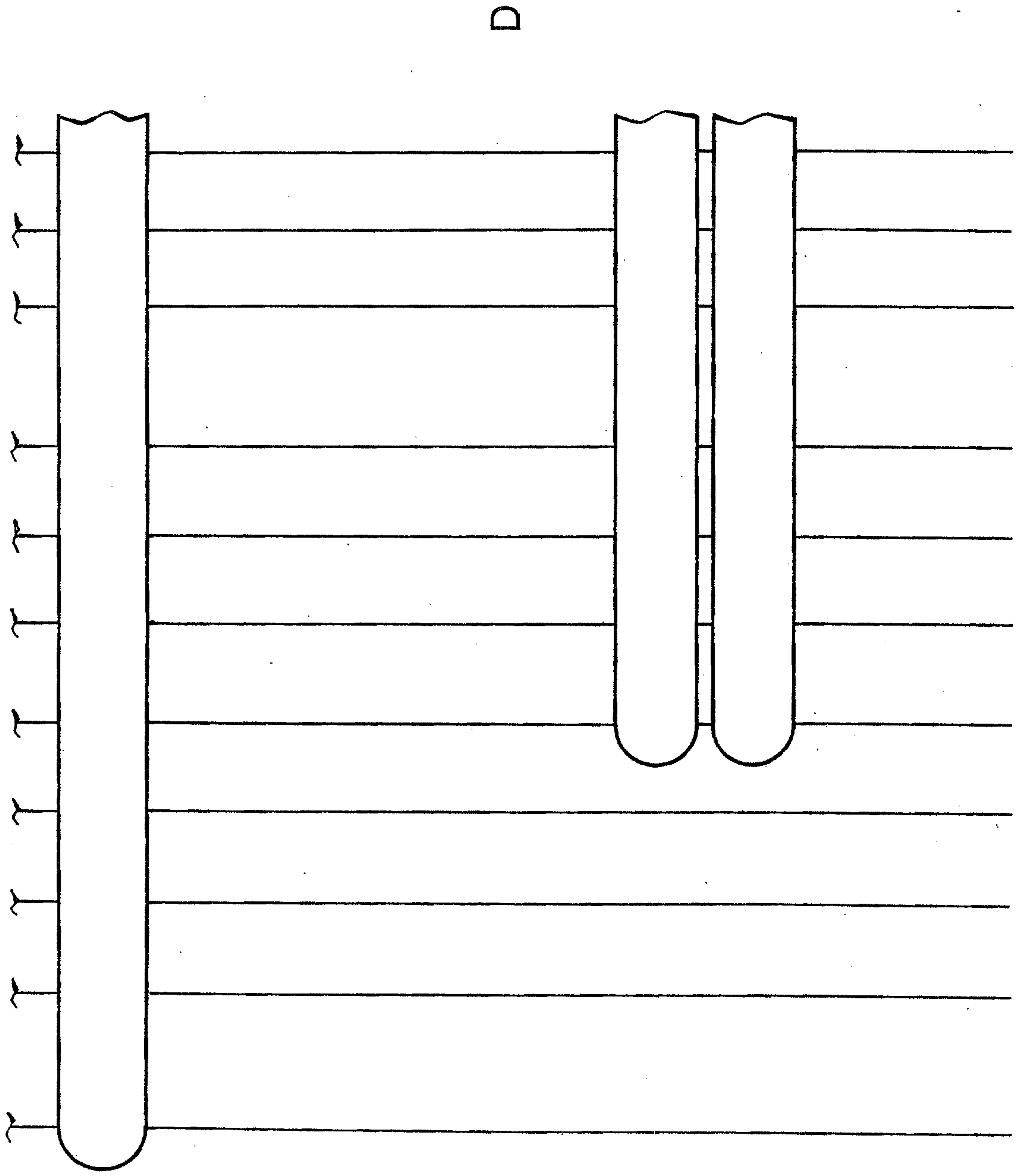
FIG. 7


UIMF
MCF
SCMAF
CCAF
TACAF
BCAF
MRRC
MRTR
BCFr
RFTR
SCMF
SETUP
req. ind.
TA SETUP
req. ind.
SDCCH Setup
TA SETUP
req. ind. (SDCCH)
A
B

CONTINUED FROM FIG. 7



CONTINUED FROM FIG. 7



CONTINUED FROM FIG. 7

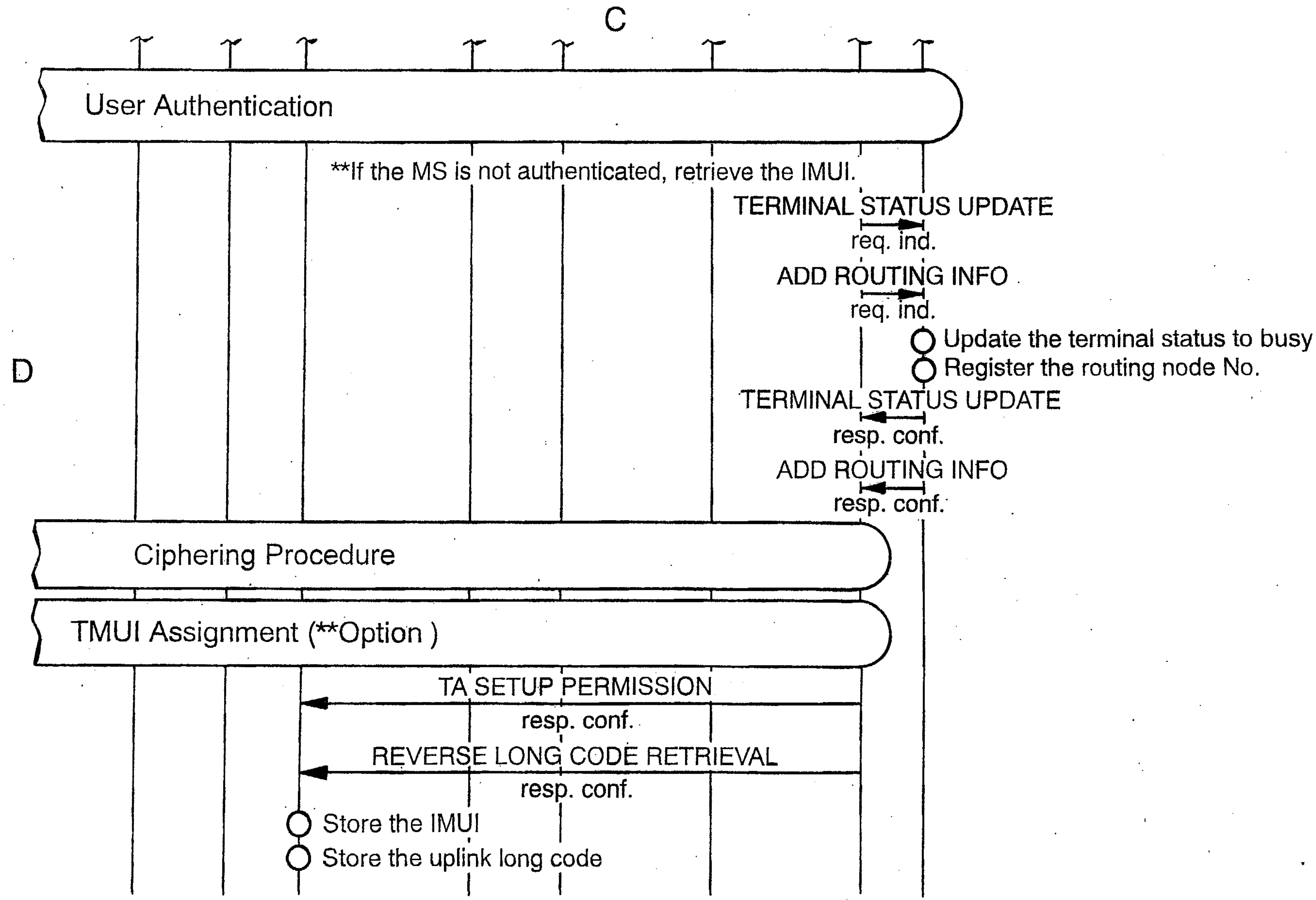
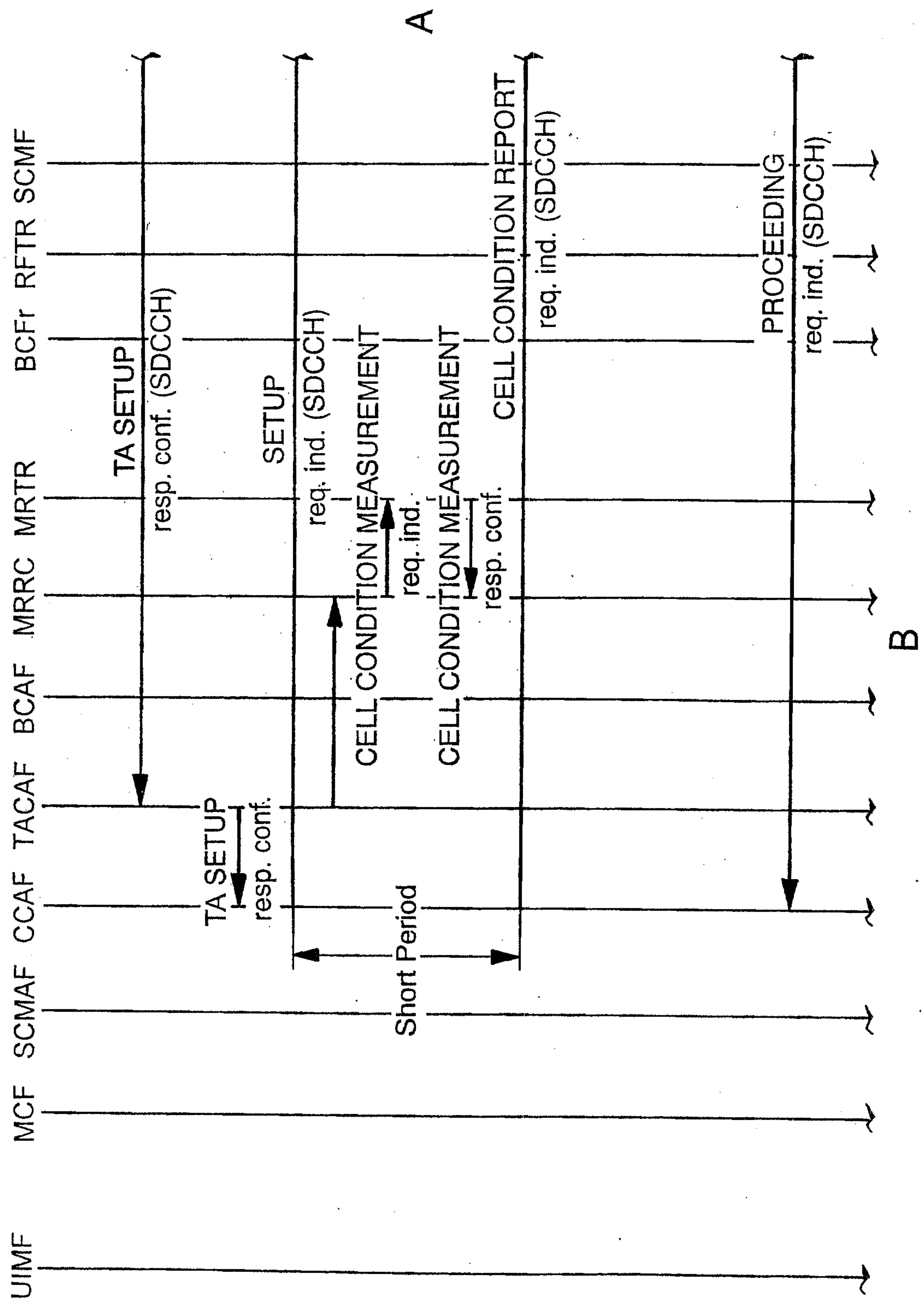
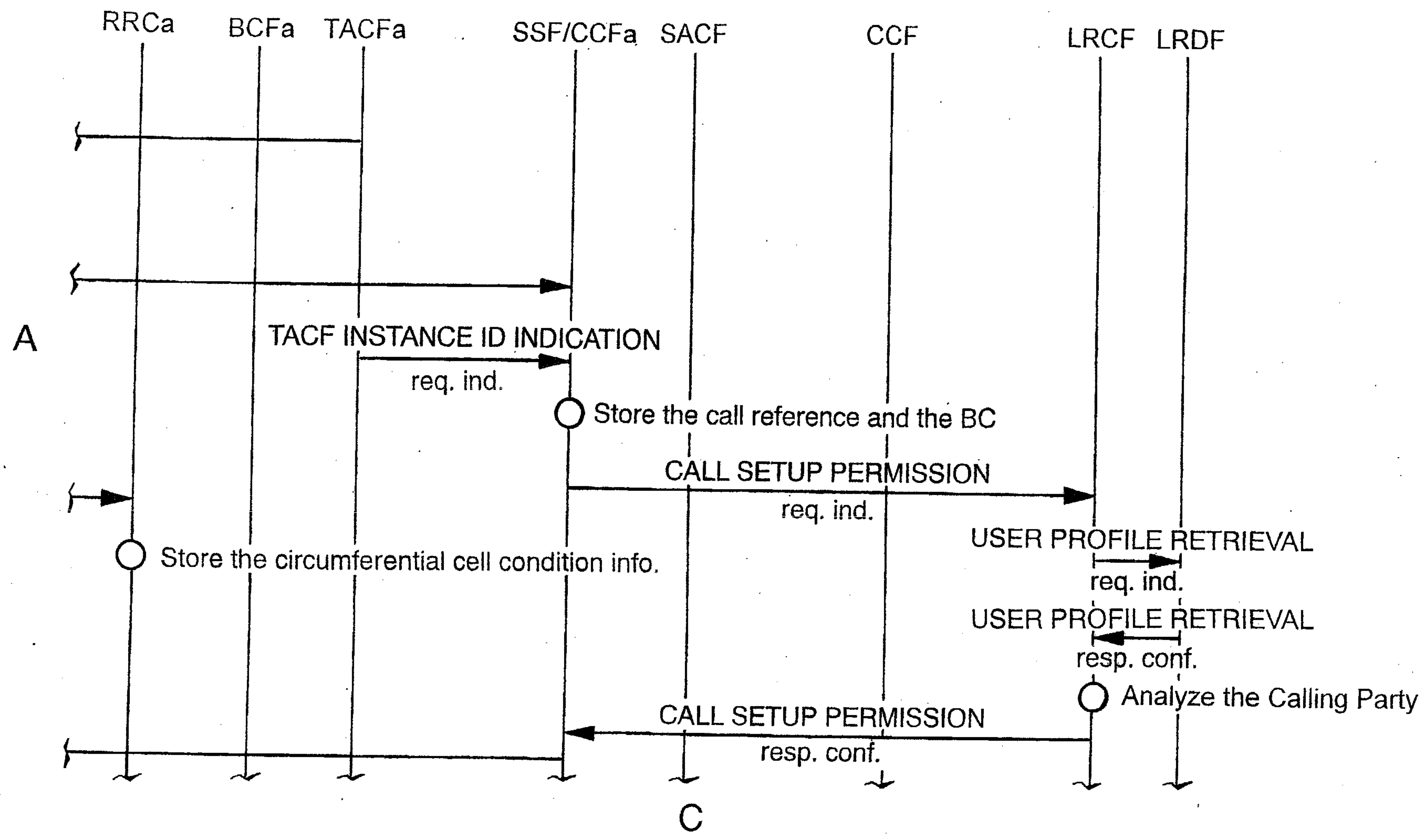


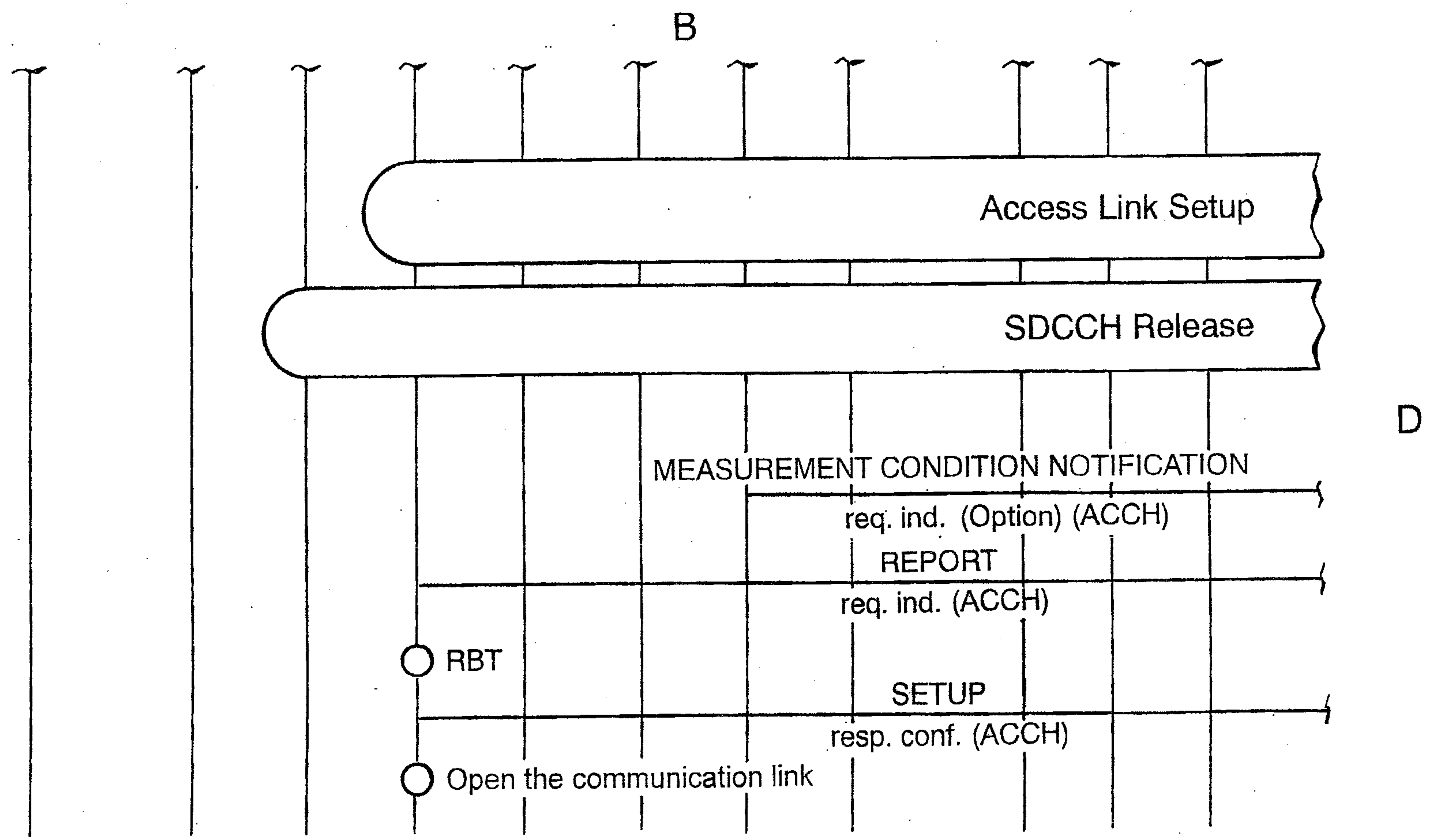
FIG. 8


UIMF
MCF
SCMAF
CCAF
TACAF
BCAF
MRRC
MRTR
BCFr
RFTR
SCMF
TA SETUP
resp. conf. (SDCCH)
TA SETUP
resp. conf.
SETUP
req. ind. (SDCCH)
CELL CONDITION MEASUREMENT
req. ind.
CELL CONDITION MEASUREMENT
resp. conf.
CELL CONDITION REPORT
req. ind. (SDCCH)
PROCEEDING
req. ind. (SDCCH)
Short Period
A
B

CONTINUED FROM FIG. 8



CONTINUED FROM FIG. 8



CONTINUED FROM FIG. 8

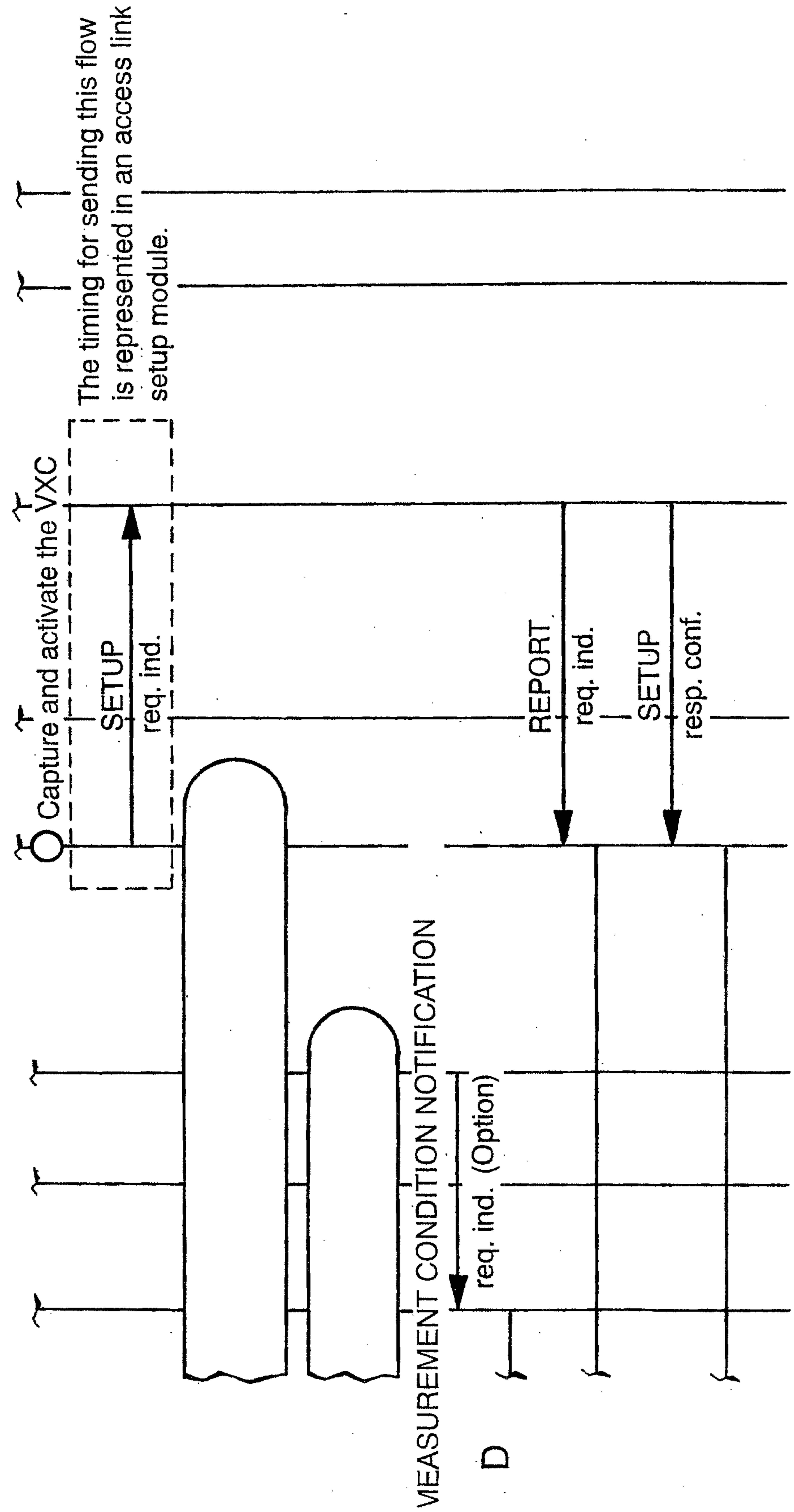
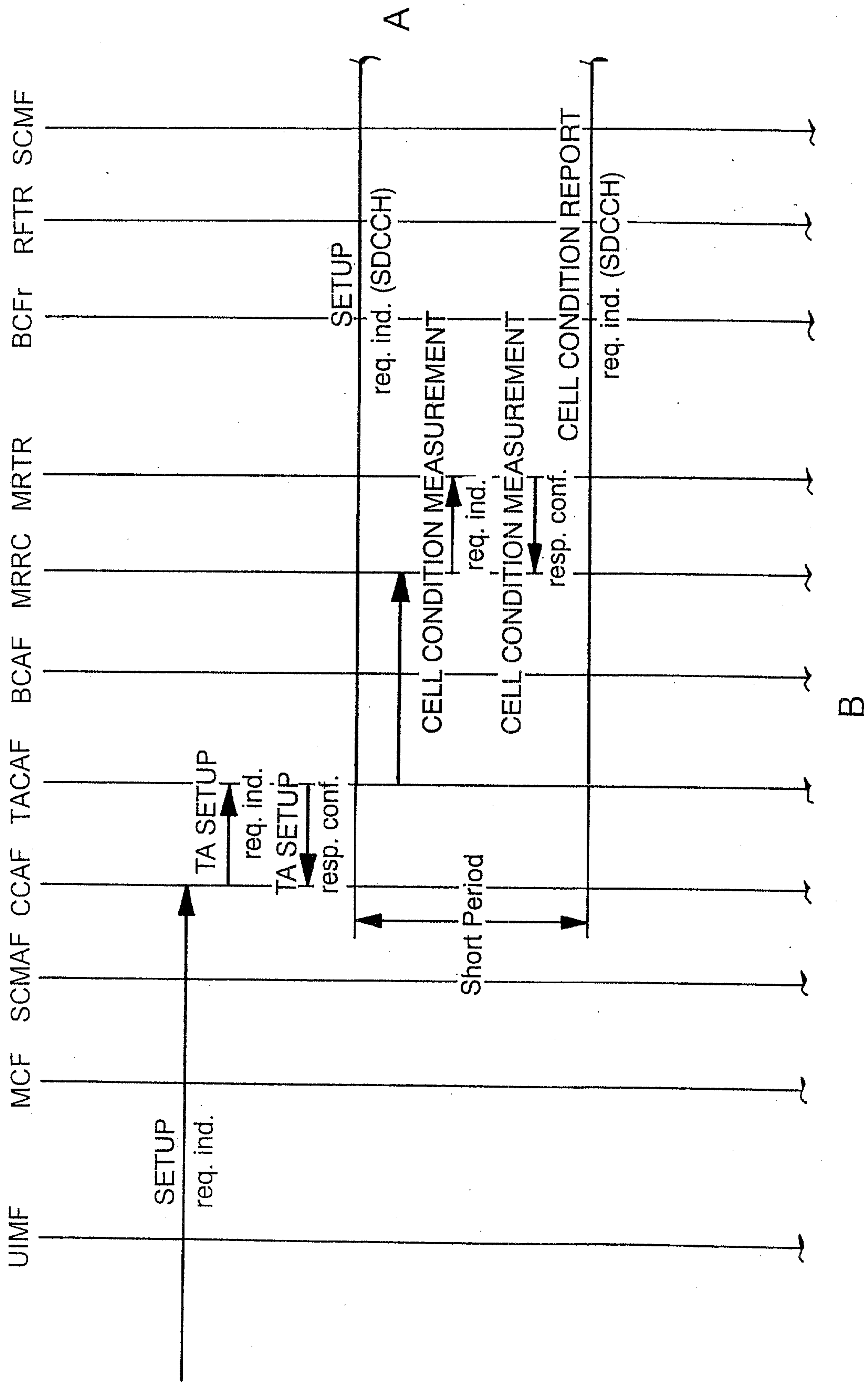
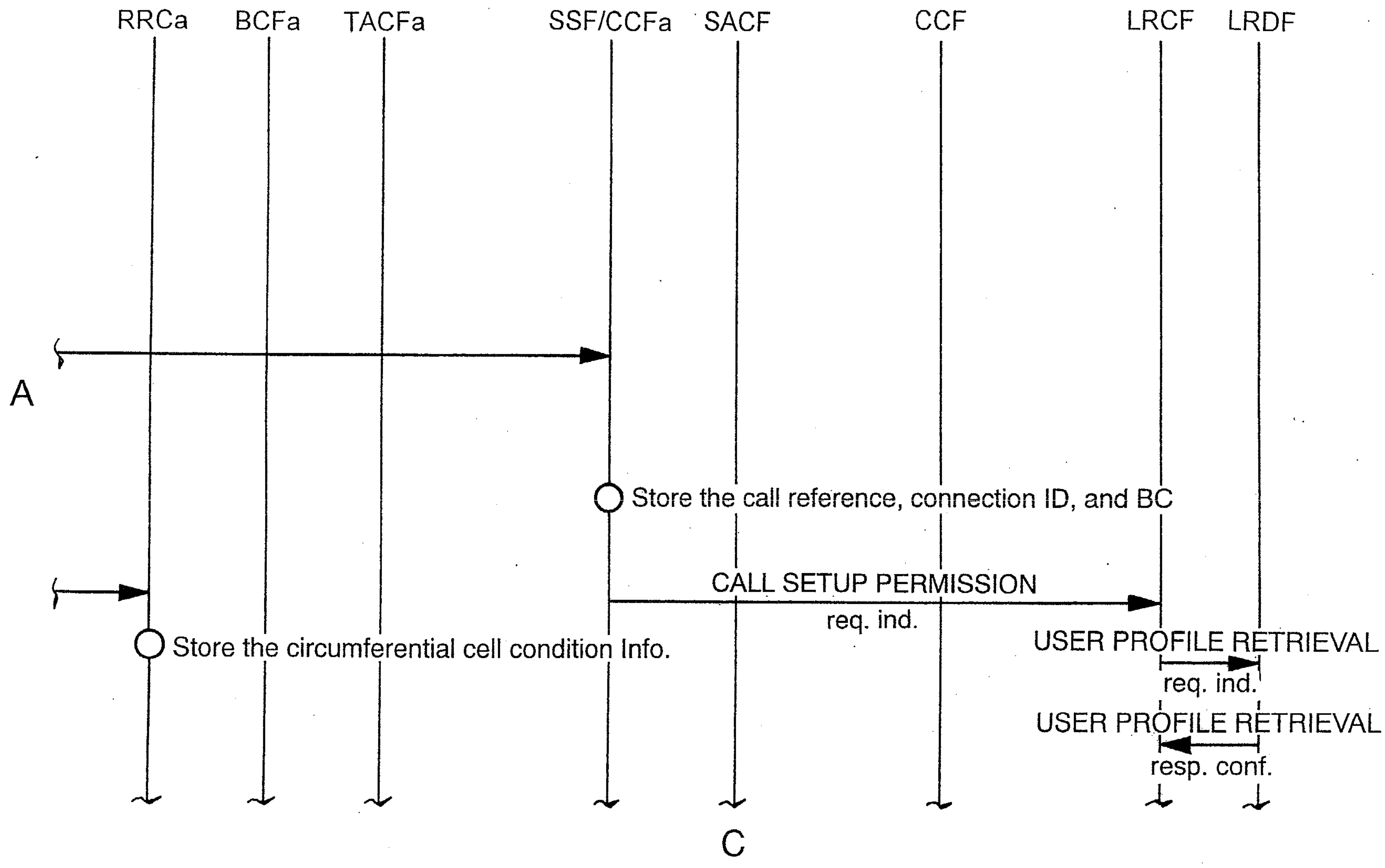


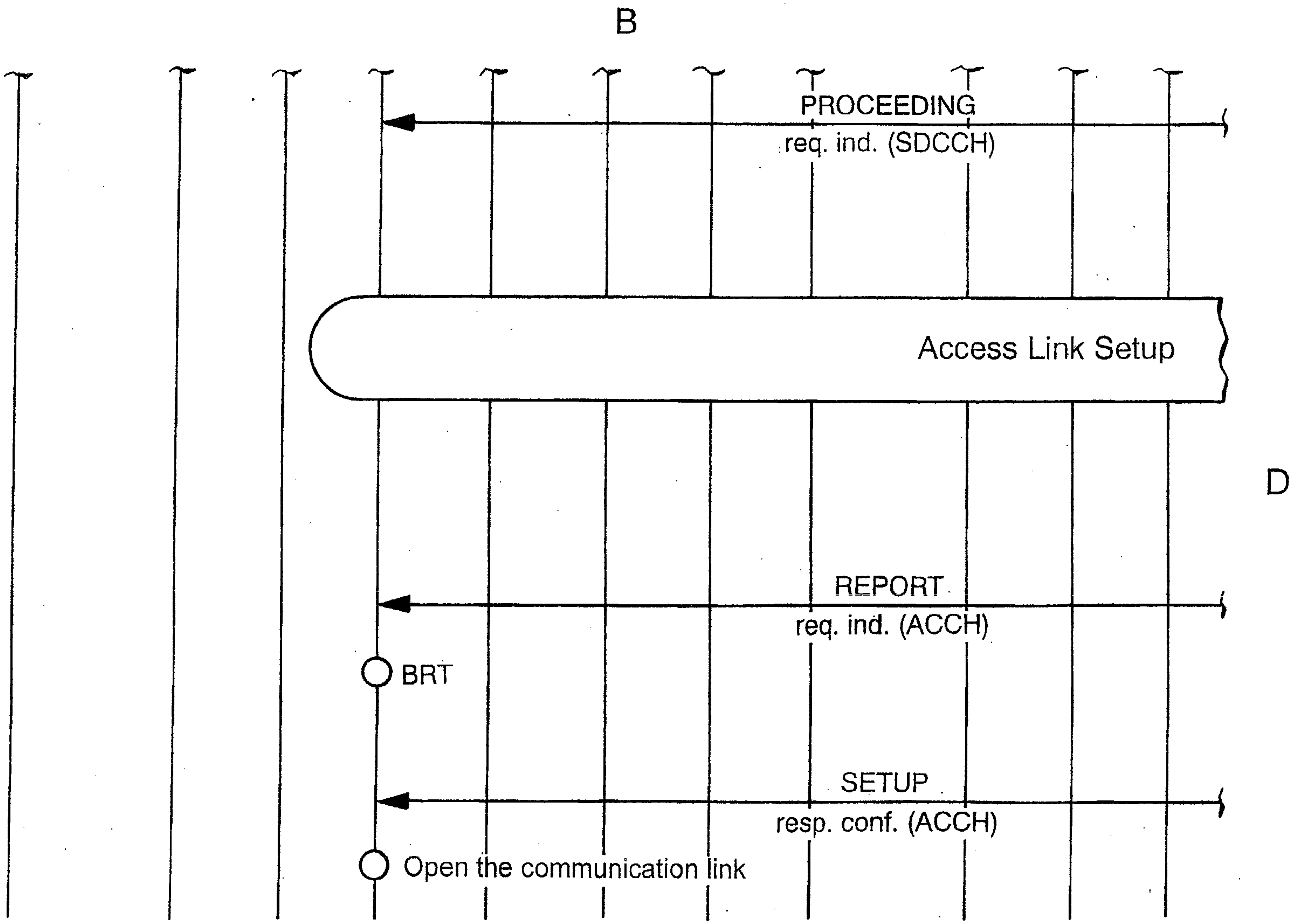
FIG. 9


UIMF
MCF
SCMAF
CCAF
TACAF
BCAF
MRRC
MRTR
BCFr
RFTR
SCMF
SETUP
req. ind.
TA SETUP
req. ind.
TA SETUP
resp. conf.
SETUP
req. ind. (SDCCH)
CELL CONDITION MEASUREMENT
req. ind.
CELL CONDITION MEASUREMENT
resp. conf.
CELL CONDITION REPORT
req. ind. (SDCCH)
Short Period
A
B

CONTINUED FROM FIG. 9



CONTINUED FROM FIG. 9



CONTINUED FROM FIG. 9

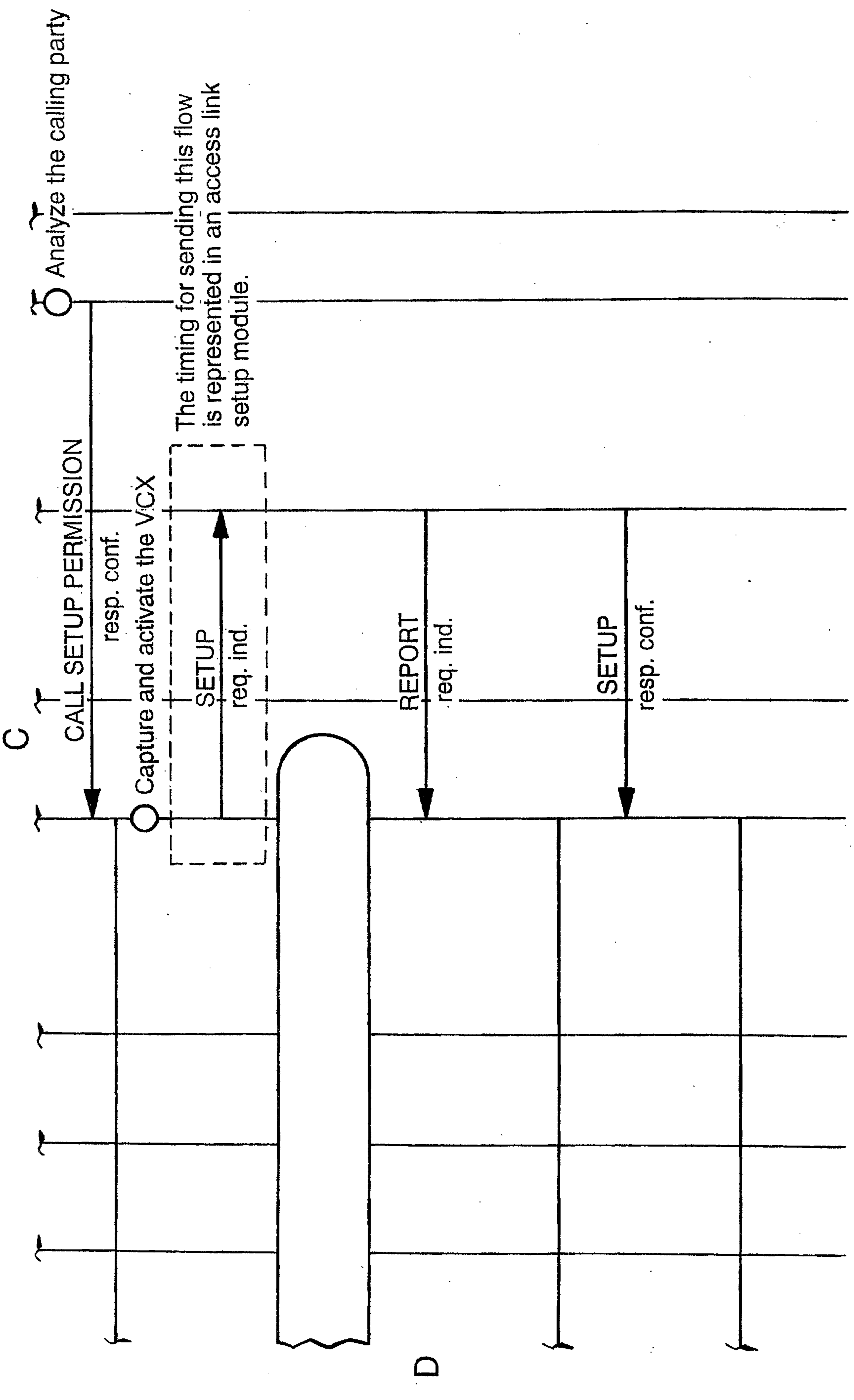


FIG. 10

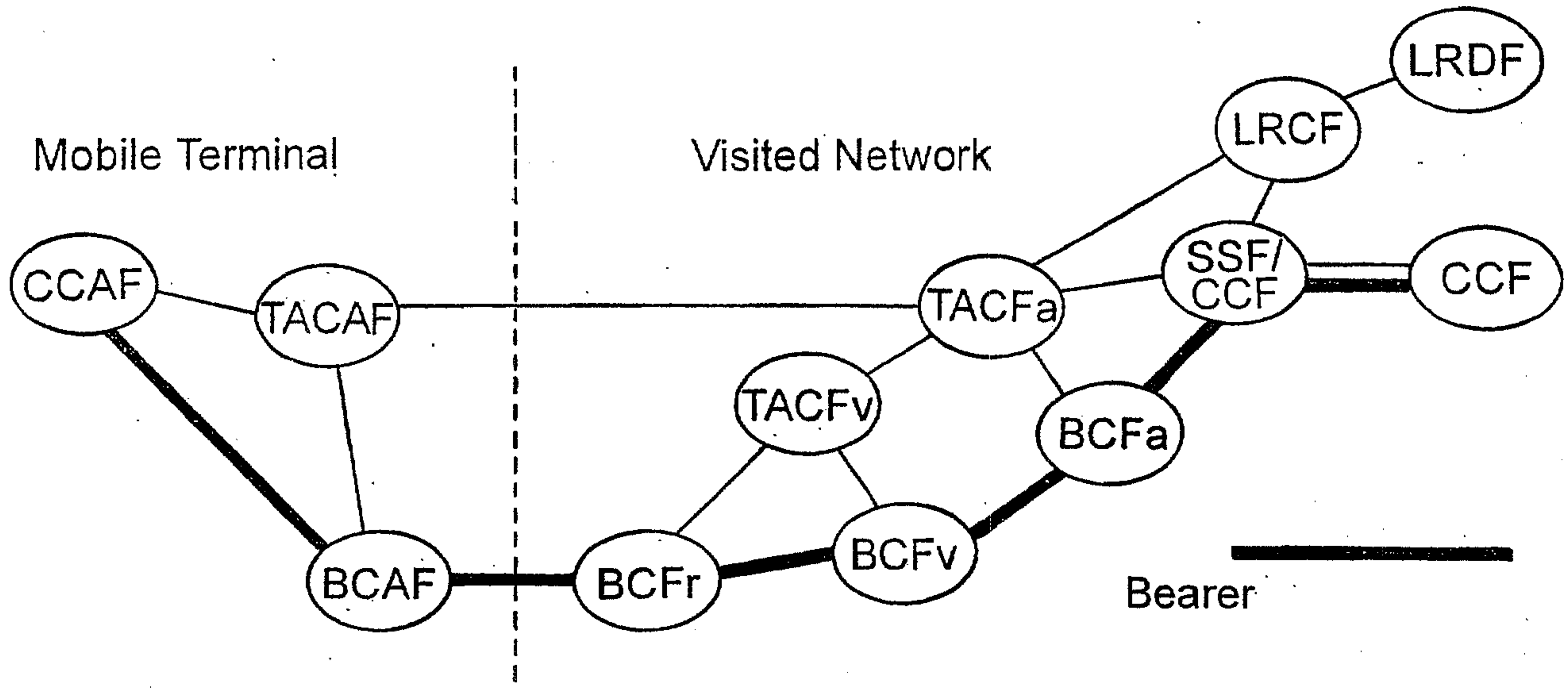

Mobile Terminal
Visited Network
CCAF
TACAF
BCAF
BCFr
BCFv
TACFv
TACFa
BCFa
SSF/
CCF
CCF
LRCF
LRDF
Bearer

FIG. 11

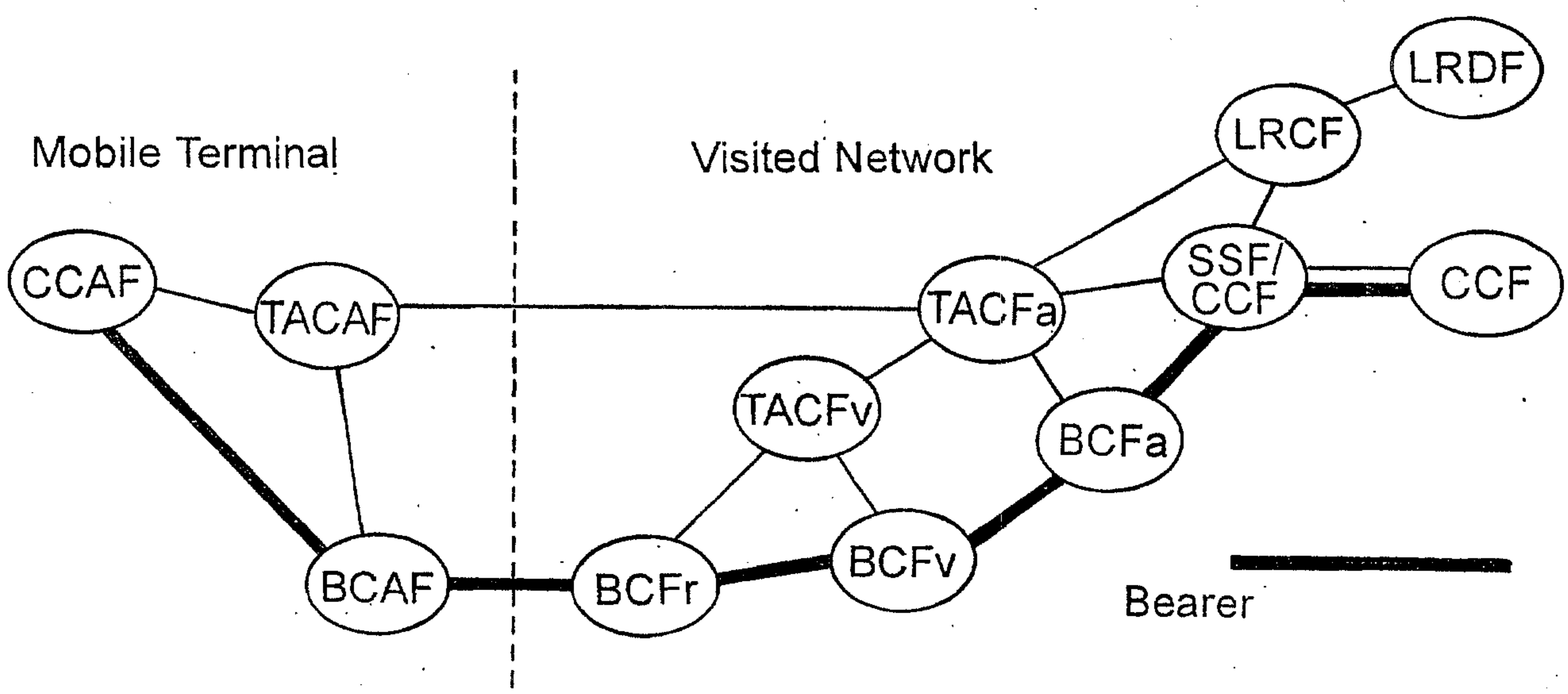
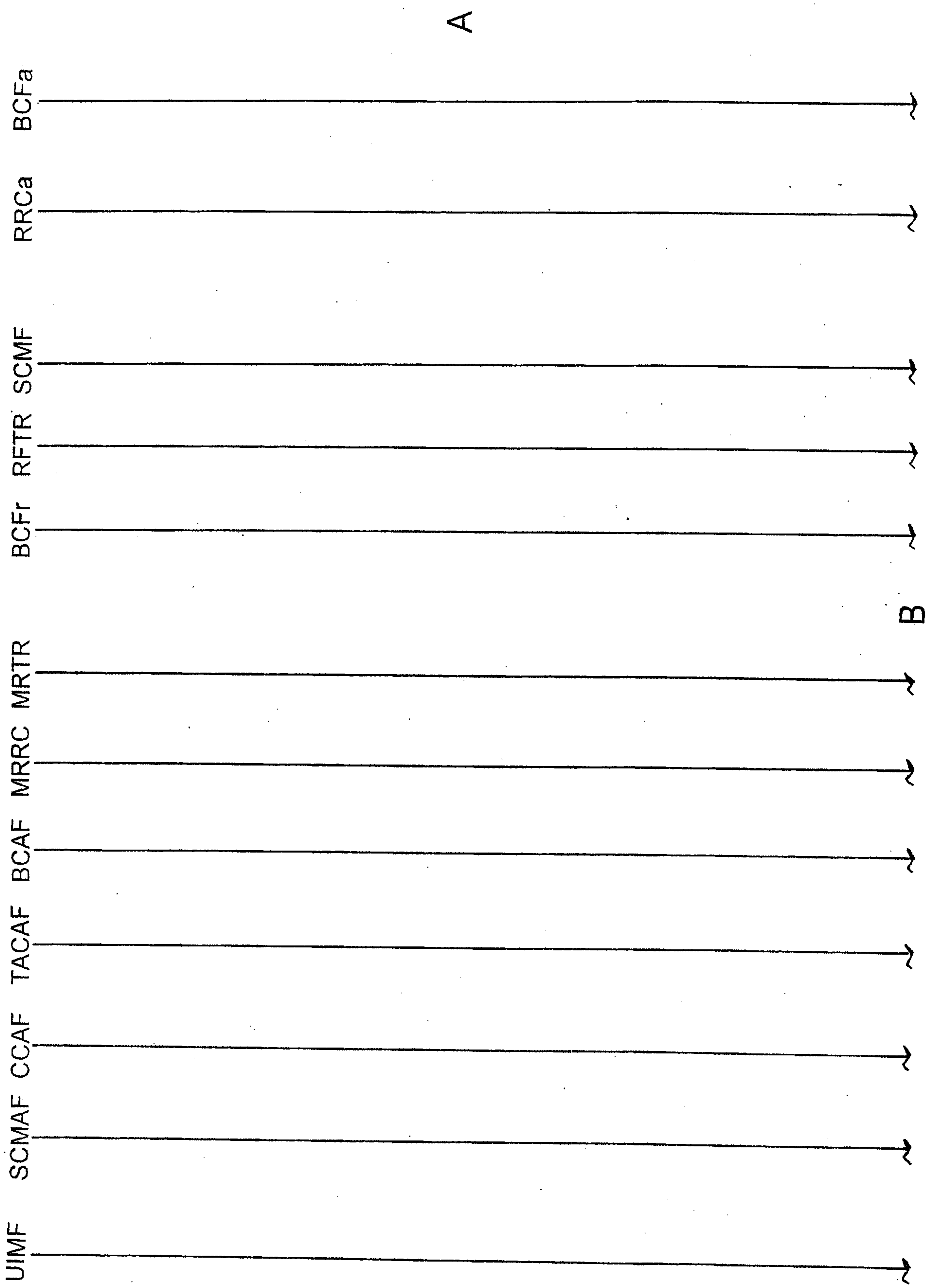
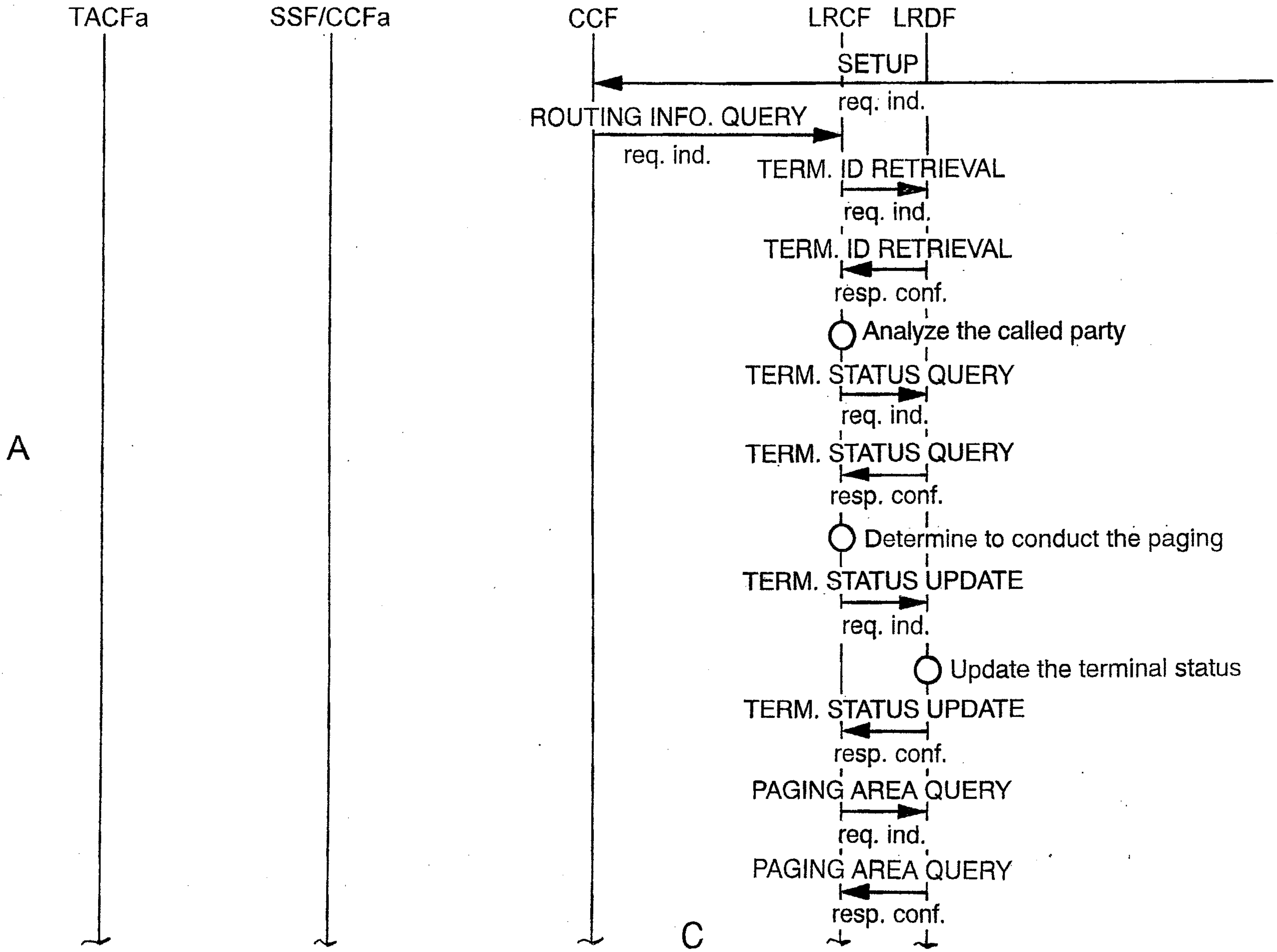

Mobile Terminal
Visited Network
CCAF
TACAF
BCAF
BCFr
BCFv
TACFv
TACFa
BCFa
SSF/
CCF
CCF
LRCF
LRDF
Bearer

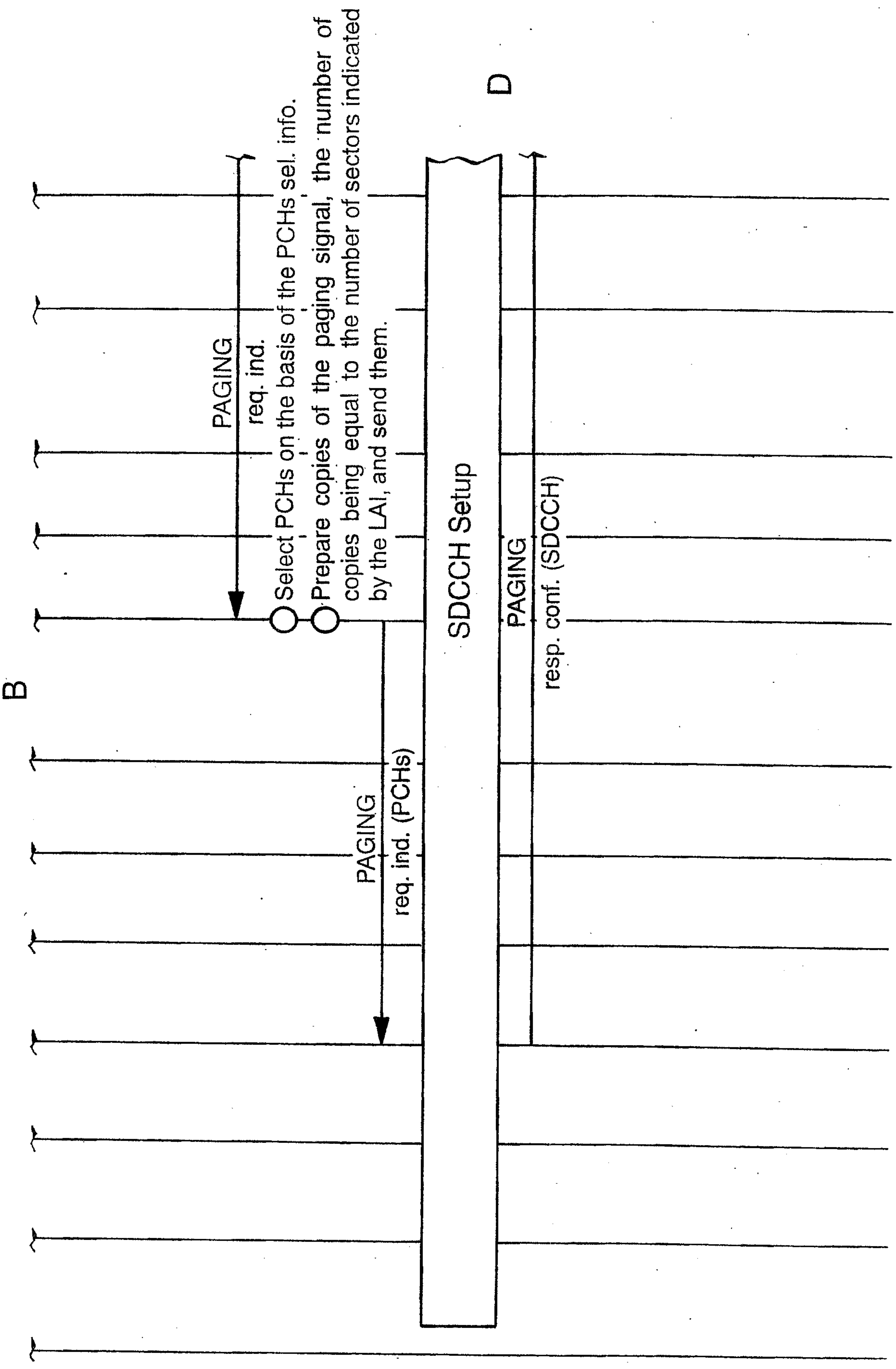
FIG. 12


A
BCFa
RRCa
SCMF
RFTR
BCFr
B
MRTR
MRRC
BCAF
TACAF
CCAF
SCMAF
UIMF

CONTINUED FROM FIG. 12



CONTINUED FROM FIG. 12



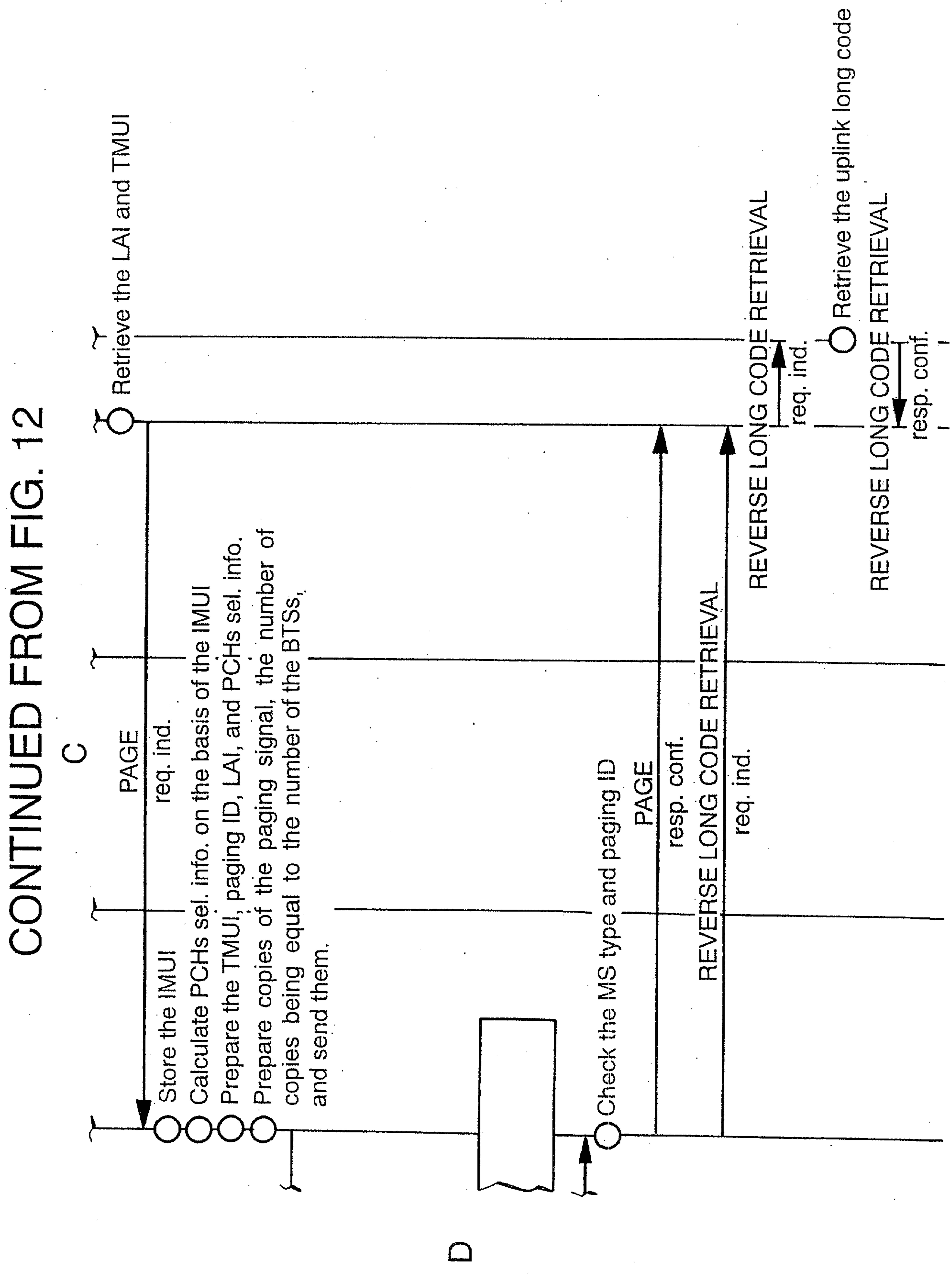
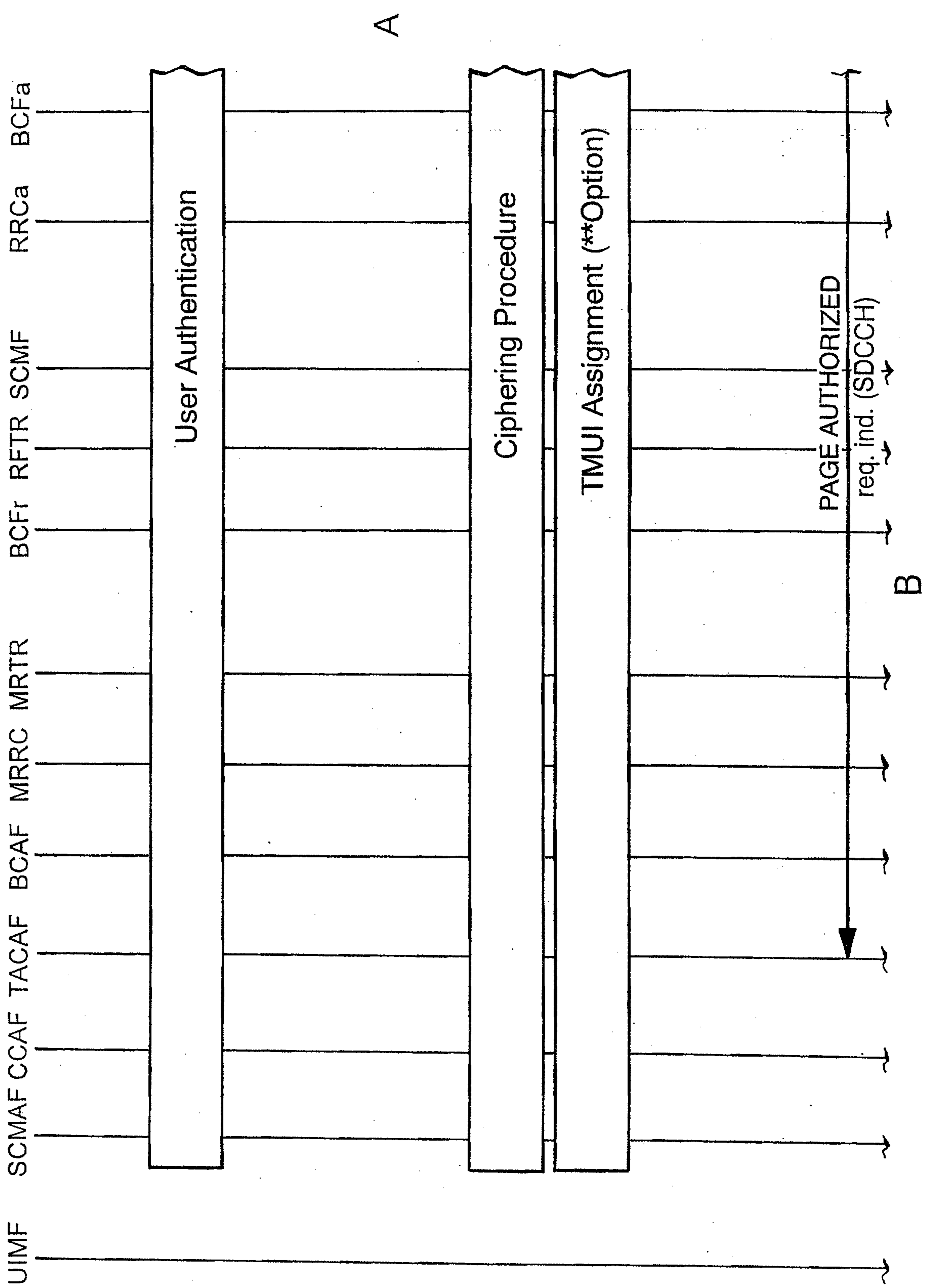
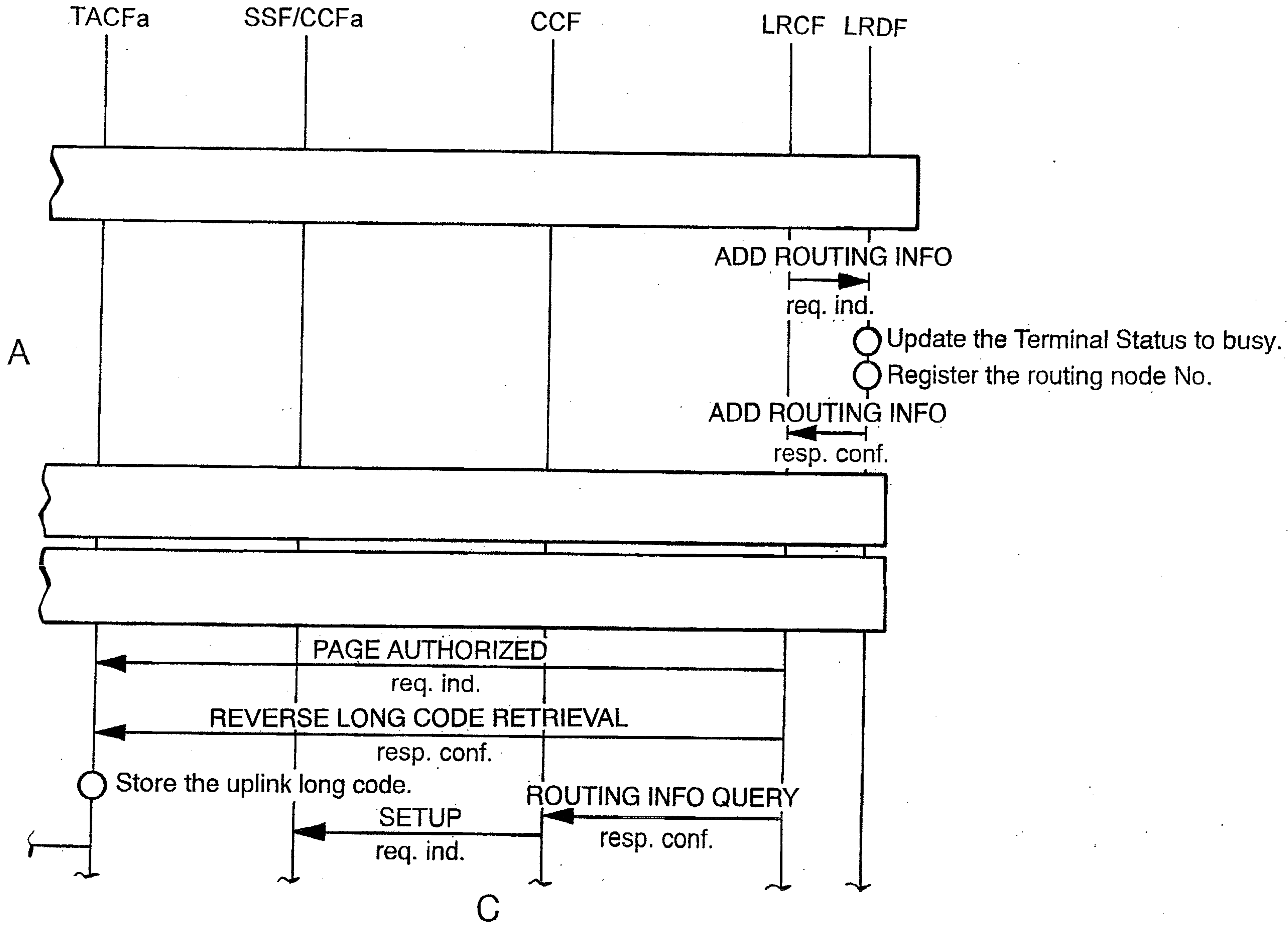

CONTINUED FROM FIG. 12
C
Retrieve the LAI and TMUI
PAGE
req. ind.
Store the IMUI
Calculate PCHs sel. info. on the basis of the IMUI
Prepare the TMUI, paging ID, LAI, and PCHs sel. info.
Prepare copies of the paging signal, the number of copies being equal to the number of the BTSs, and send them.
Check the MS type and paging ID
PAGE
resp. conf.
REVERSE LONG CODE RETRIEVAL
req. ind.
REVERSE LONG CODE RETRIEVAL
req. ind.
Retrieve the uplink long code
REVERSE LONG CODE RETRIEVAL
resp. conf.
D

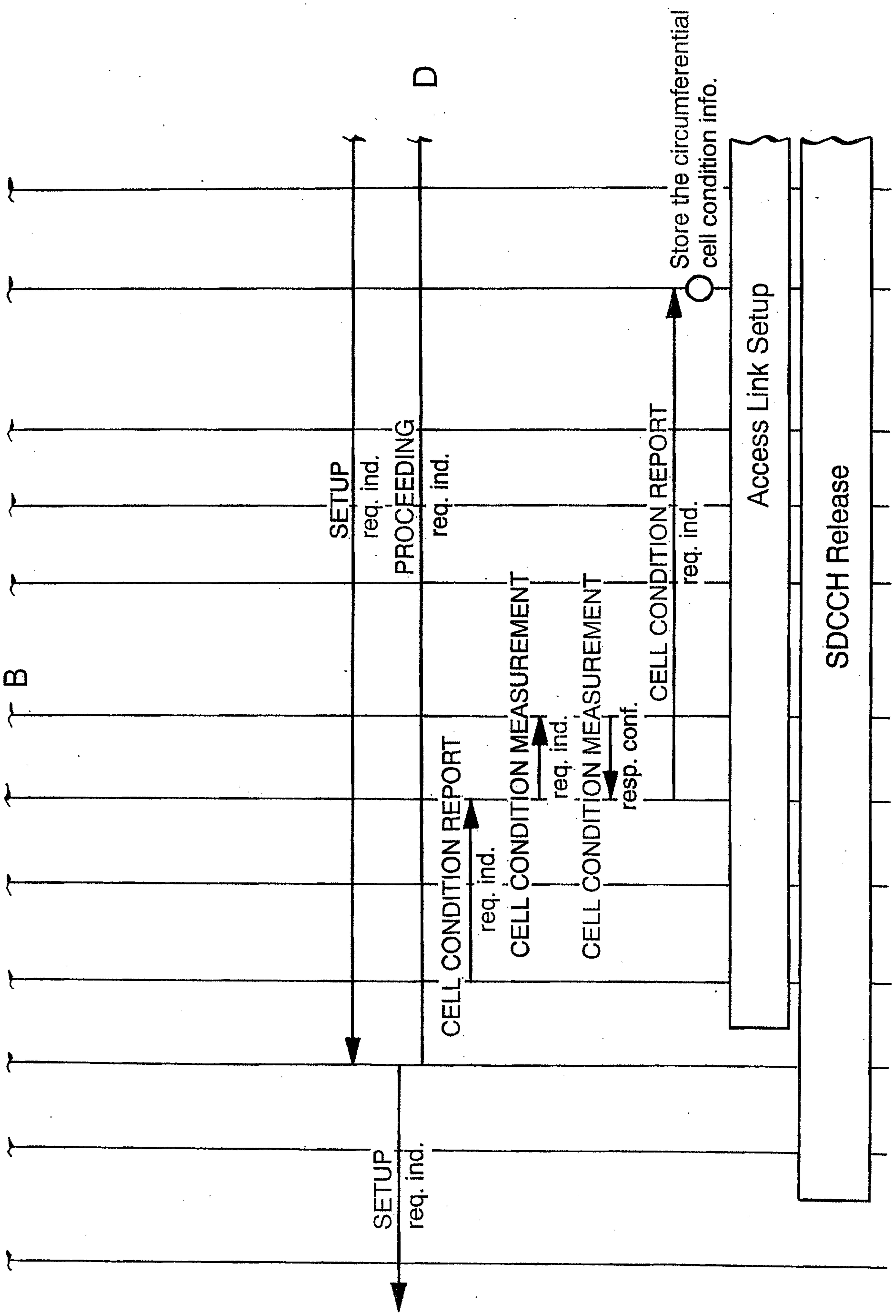
FIG. 13


A
BCFa
RRCa
SCMF
RFTR
BCFr
MRTR
MRRC
BCAF
TACAF
CCAF
SCMAF
UIMF
User Authentication
Ciphering Procedure
TMUI Assignment (**Option)
PAGE AUTHORIZED
req. ind. (SDCCH)
B

CONTINUED FROM FIG. 13



CONTINUED FROM FIG. 13



CONTINUED FROM FIG. 13

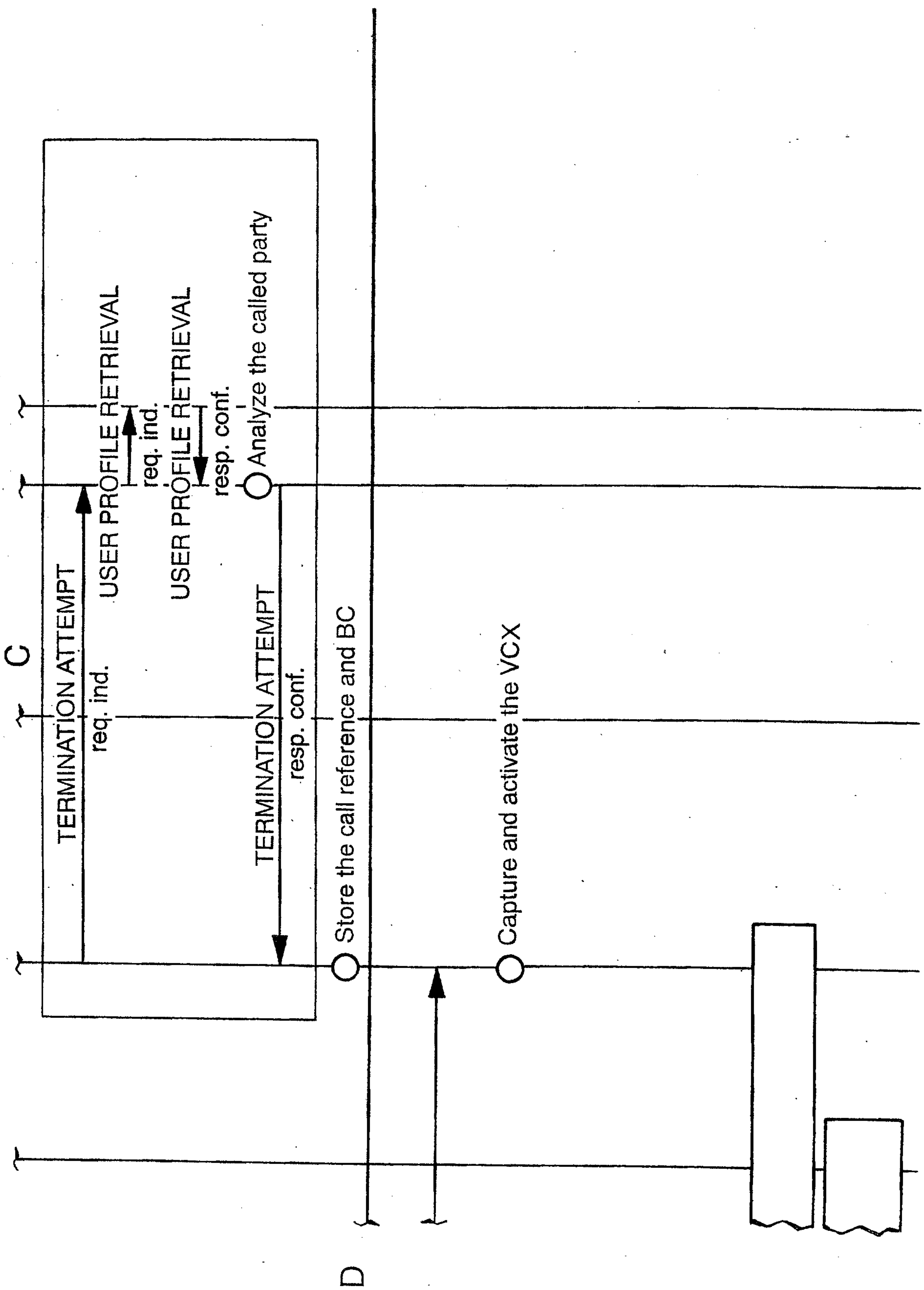
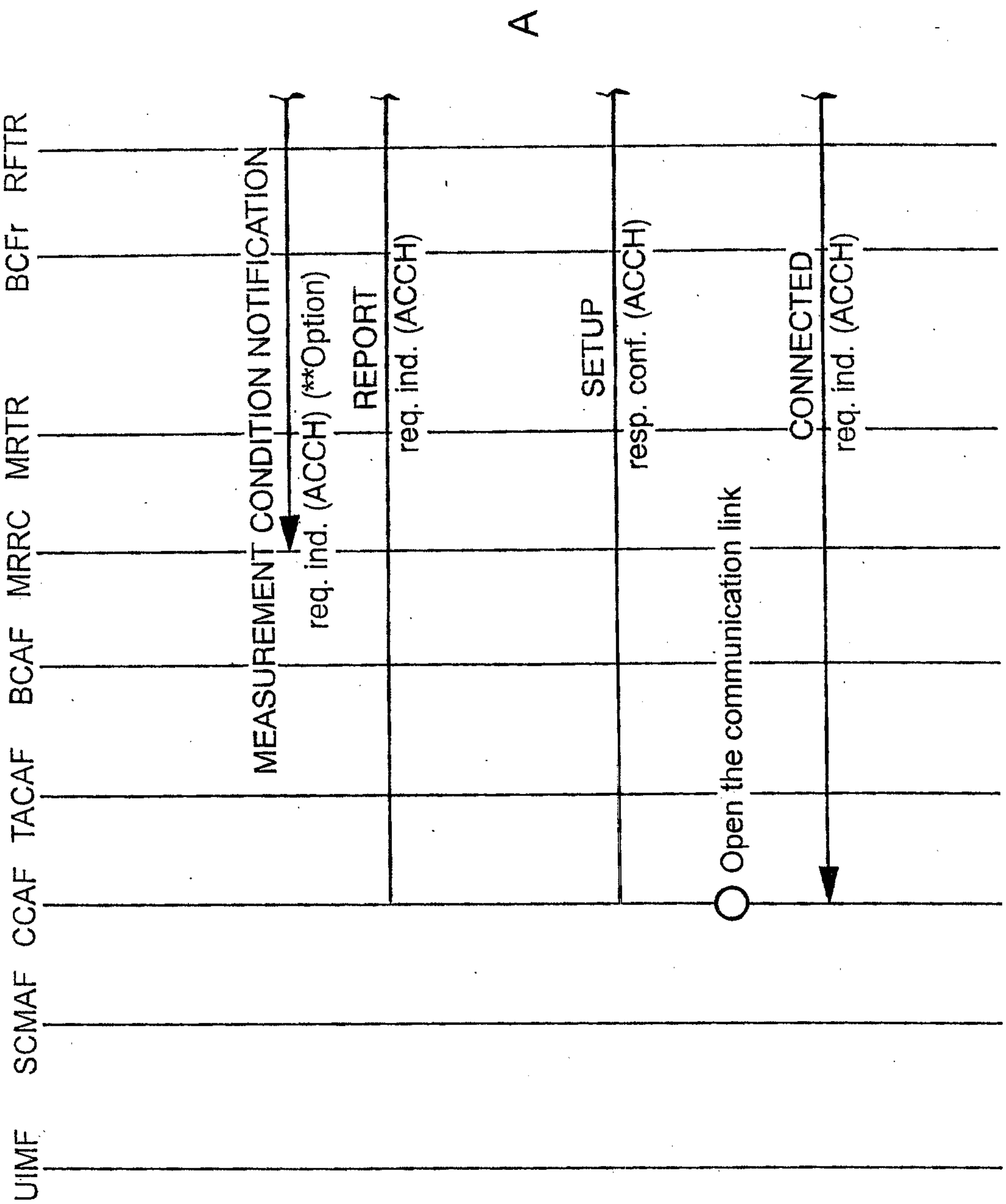


FIG. 14


A
RFTR
BCFr
MRTR
MRRC
BCAF
TACAF
CCAF
SCMAF
UIMF
MEASUREMENT CONDITION NOTIFICATION
req. ind. (ACCH) (**Option)
REPORT
req. ind. (ACCH)
SETUP
resp. conf. (ACCH)
Open the communication link
CONNECTED
req. ind. (ACCH)

CONTINUED FROM FIG. 14

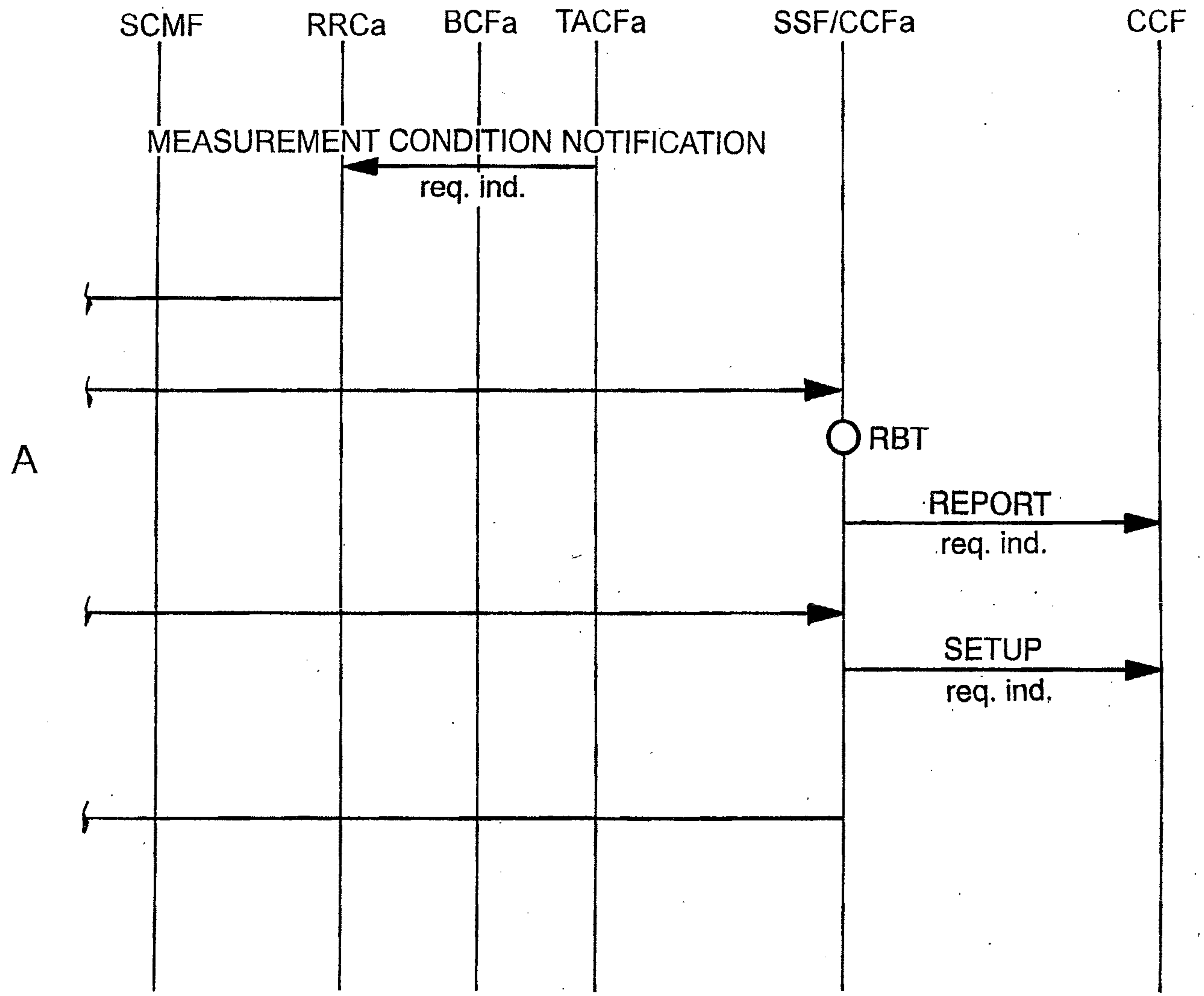
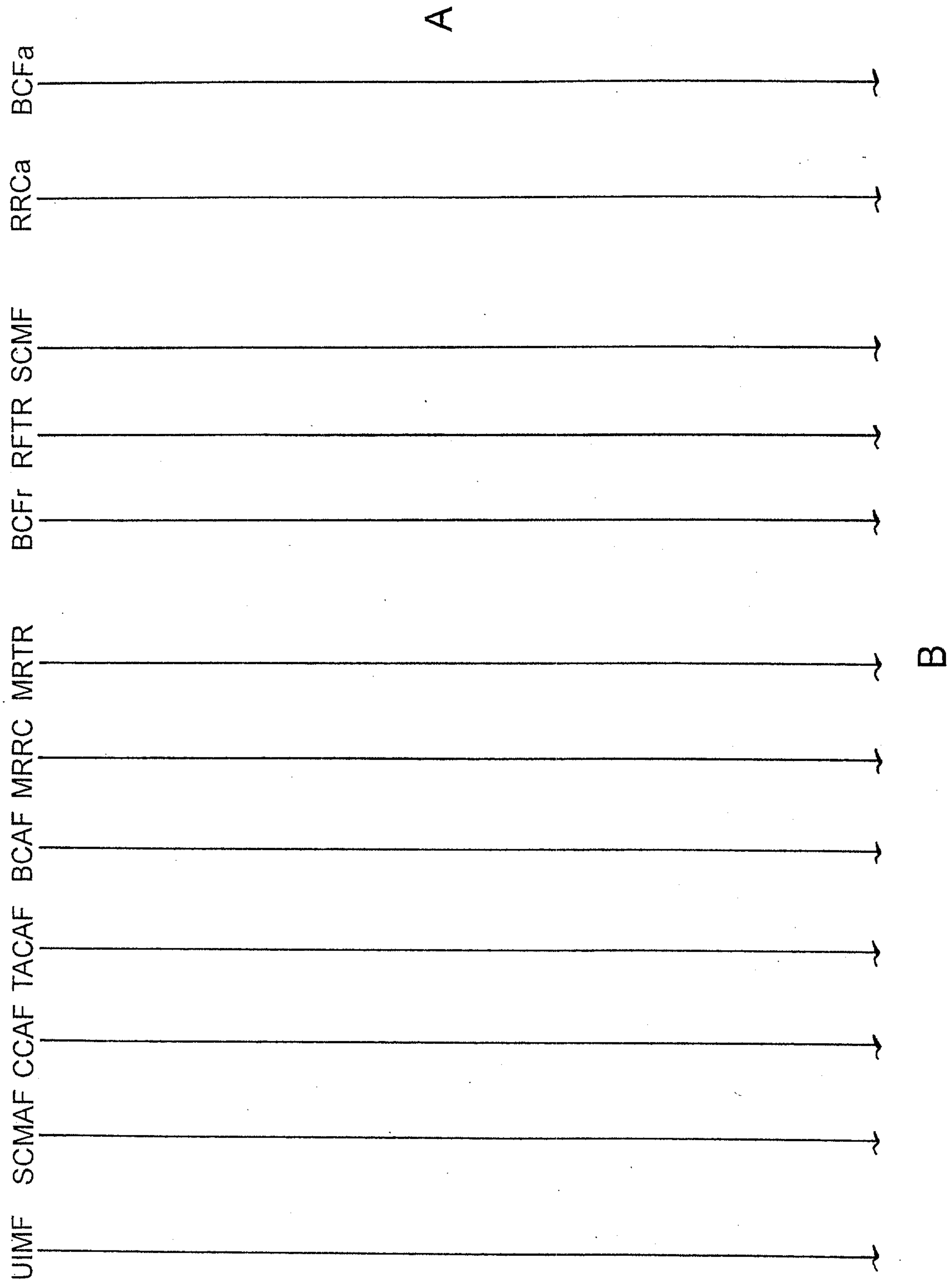
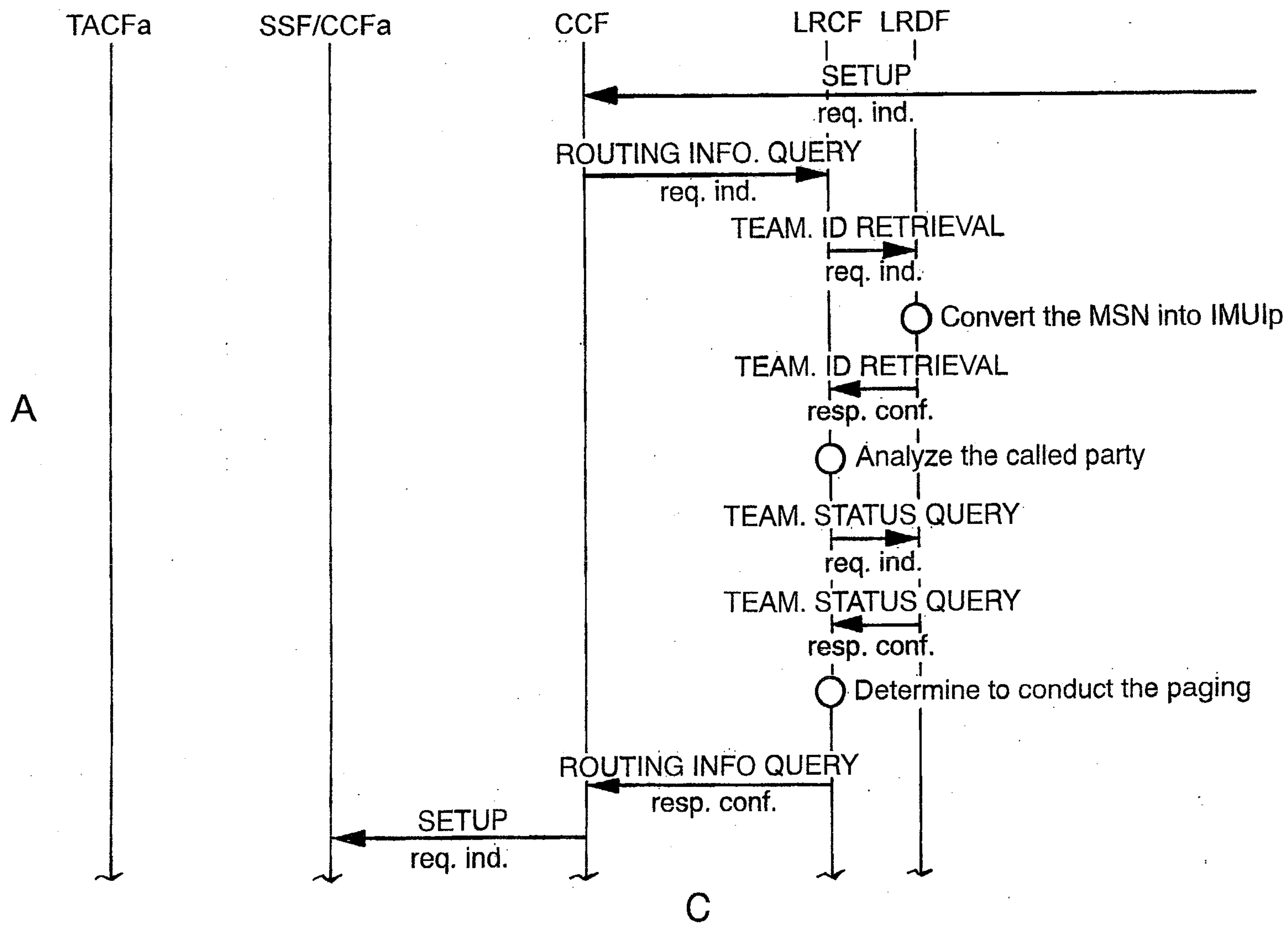


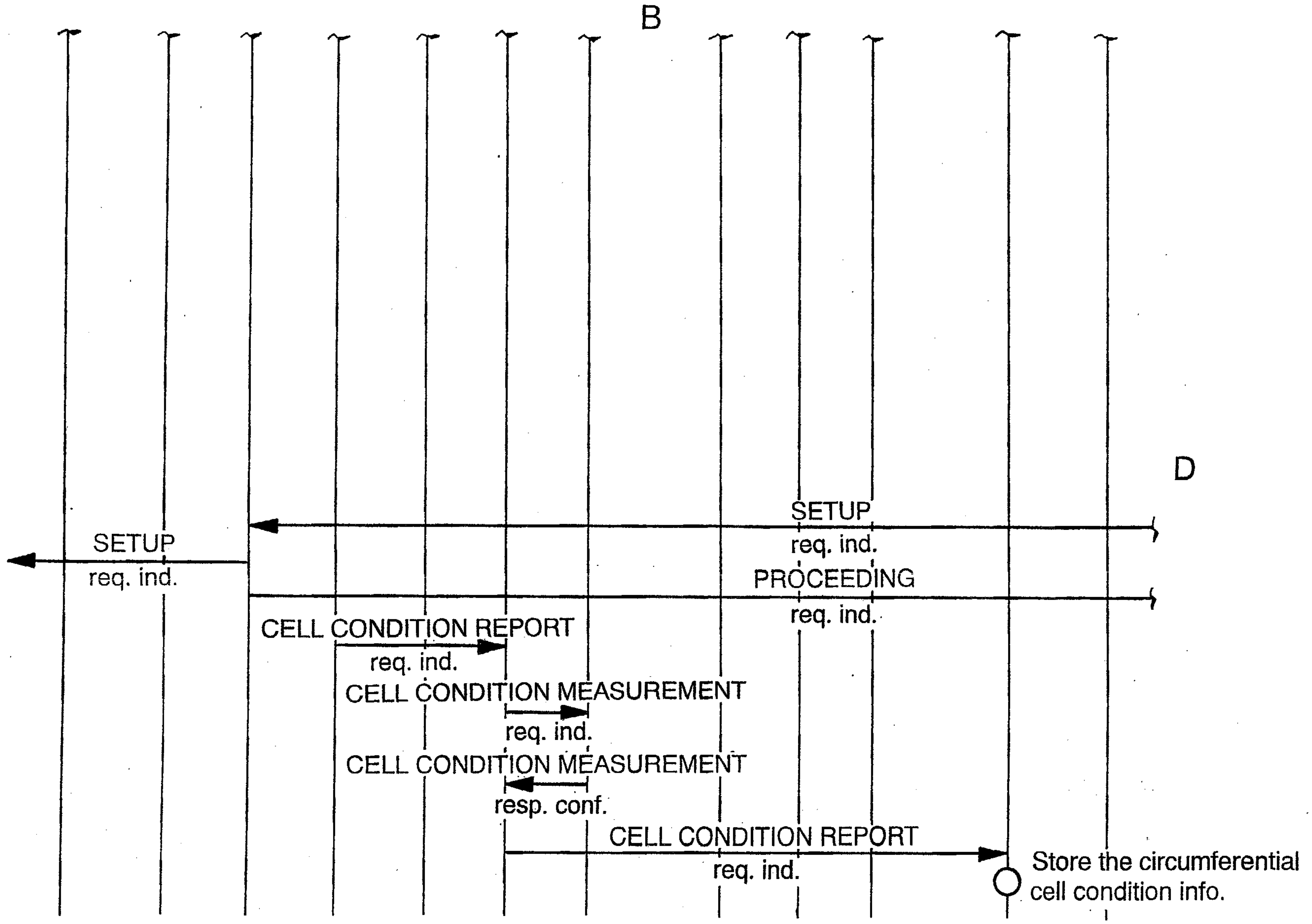
FIG. 15


A
BCFa
RRCa
SCMF
RFTR
BCFr
MRTR
MRRC
BCAF
TACAF
CCAF
SCMAF
UIMF
B

CONTINUED FROM FIG. 15



CONTINUED FROM FIG. 15



CONTINUED FROM FIG. 15

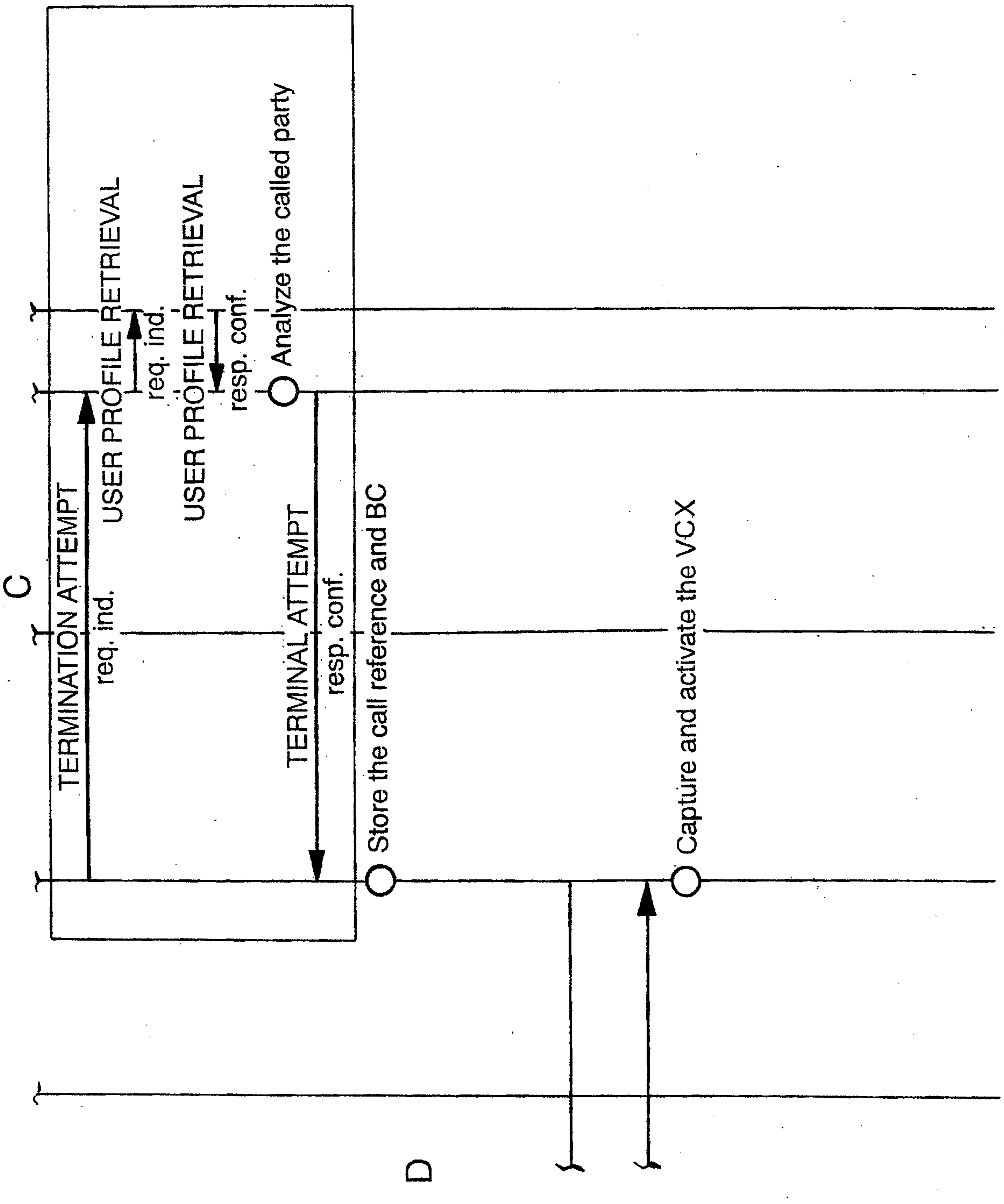
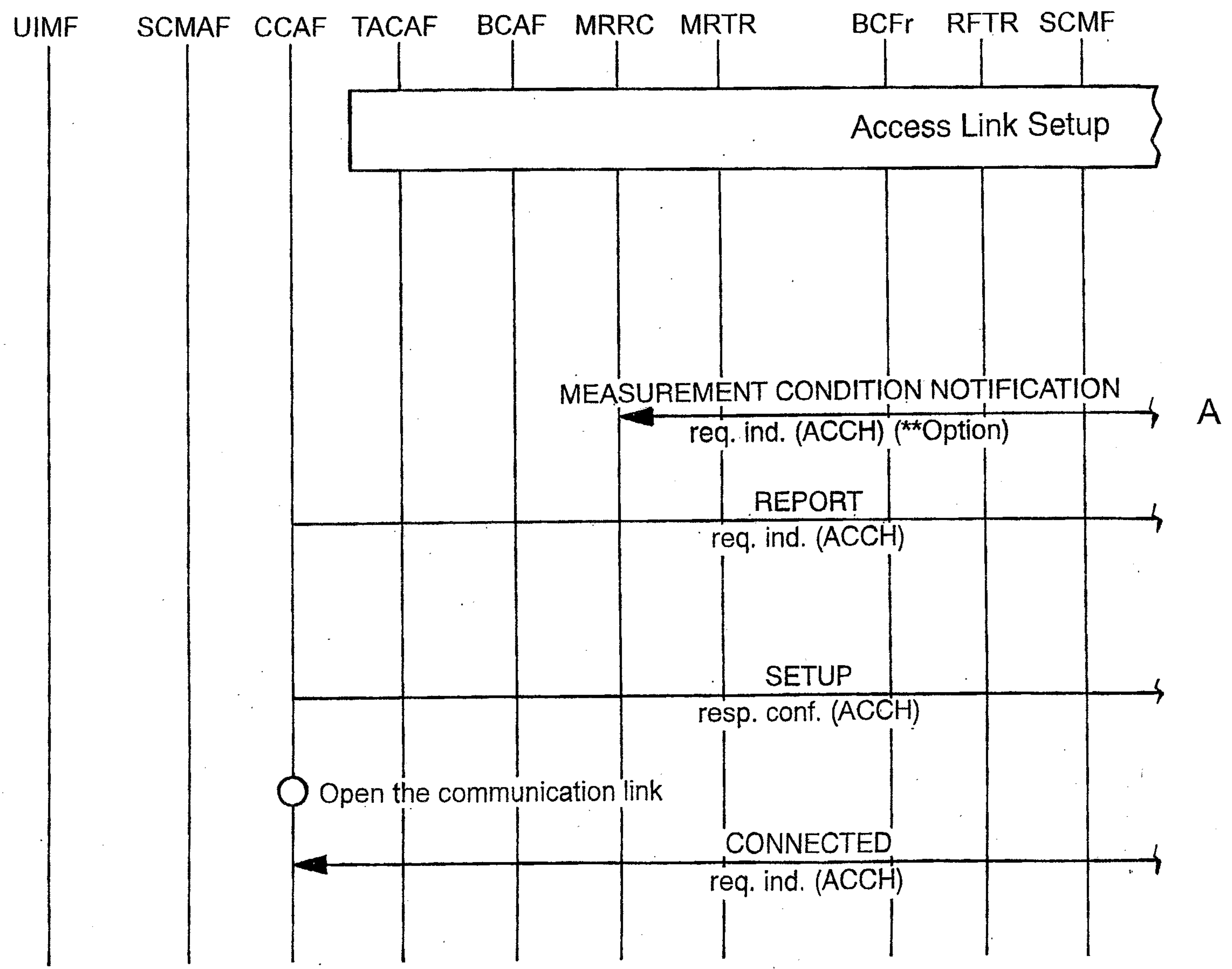


FIG. 16


UIMF
SCMAF
CCAF
TACAF
BCAF
MRRC
MRTR
BCFr
RFTR
SCMF
Access Link Setup
MEASUREMENT CONDITION NOTIFICATION
req. ind. (ACCH) (**Option)
A
REPORT
req. ind. (ACCH)
SETUP
resp. conf. (ACCH)
Open the communication link
CONNECTED
req. ind. (ACCH)

CONTINUED FROM FIG. 16

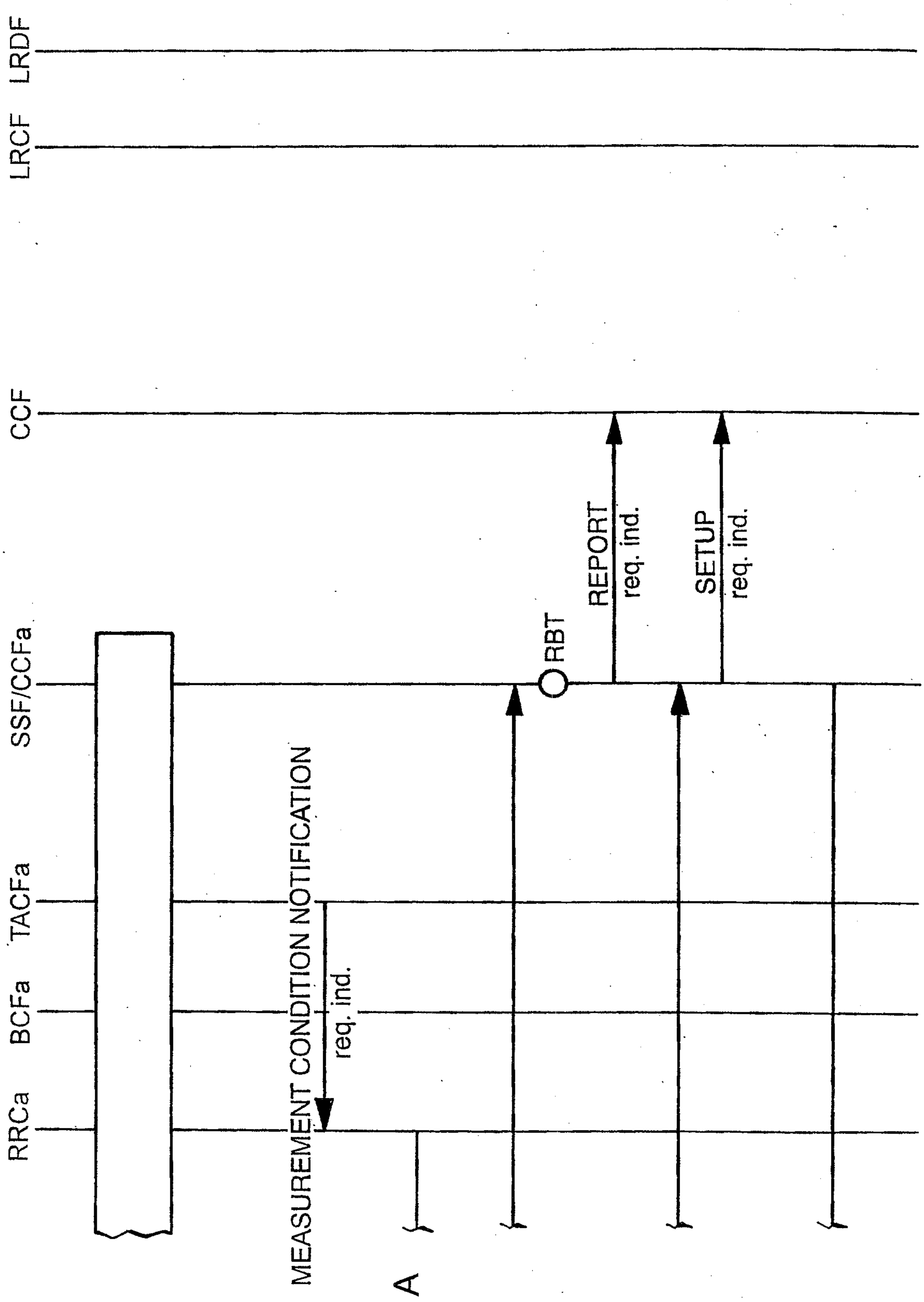


FIG. 17

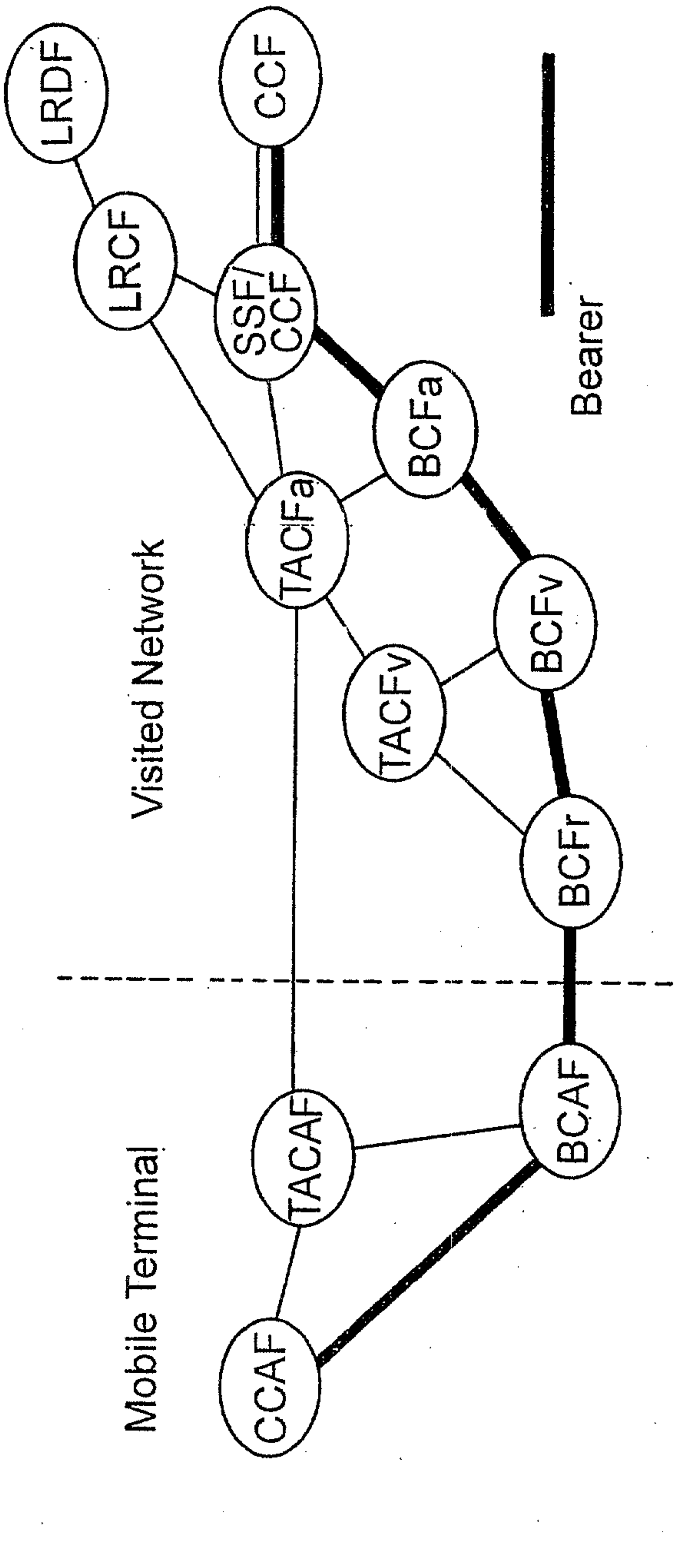
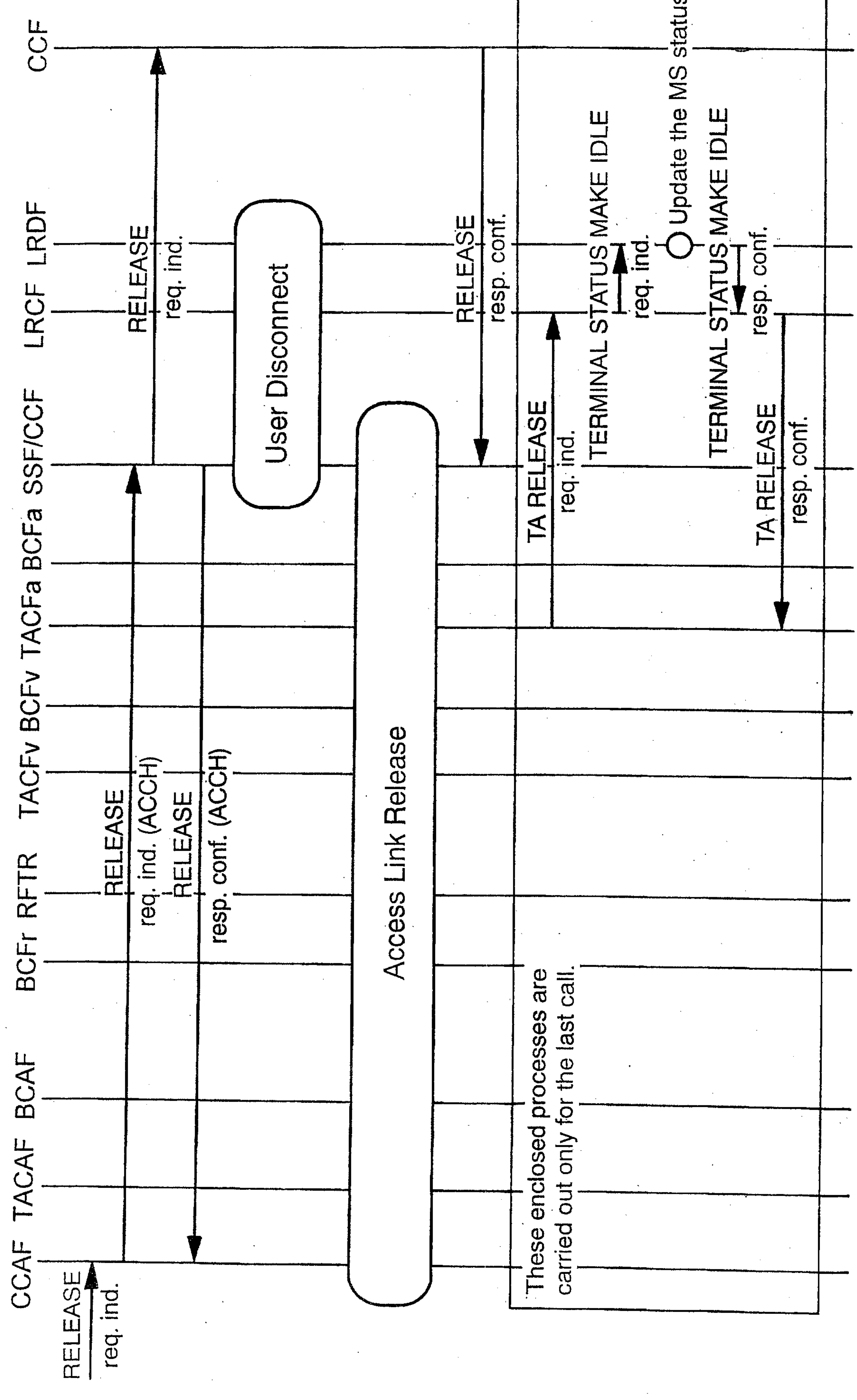

Mobile Terminal
Visited Network
CCAF
TACAF
BCAF
BCFr
TACFv
BCFv
TACFa
BCFa
SSF/
CCF
LRCF
LRDF
CCF
Bearer

FIG. 18



CCAF
TACAF
BCAF
BCFr
RFTR
TACFv
BCFv
TACFa
BCFa
SSF/CCF
LRCF
LRDF
CCF
RELEASE
req. ind.
RELEASE
req. ind. (ACCH)
RELEASE
resp. conf. (ACCH)
RELEASE
req. ind.
User Disconnect
Access Link Release
RELEASE
resp. conf.
TA RELEASE
req. ind.
TERMINAL STATUS MAKE IDLE
req. ind.
Update the MS status
TERMINAL STATUS MAKE IDLE
resp. conf.
TA RELEASE
resp. conf.
These enclosed processes are
carried out only for the last call.

FIG. 19

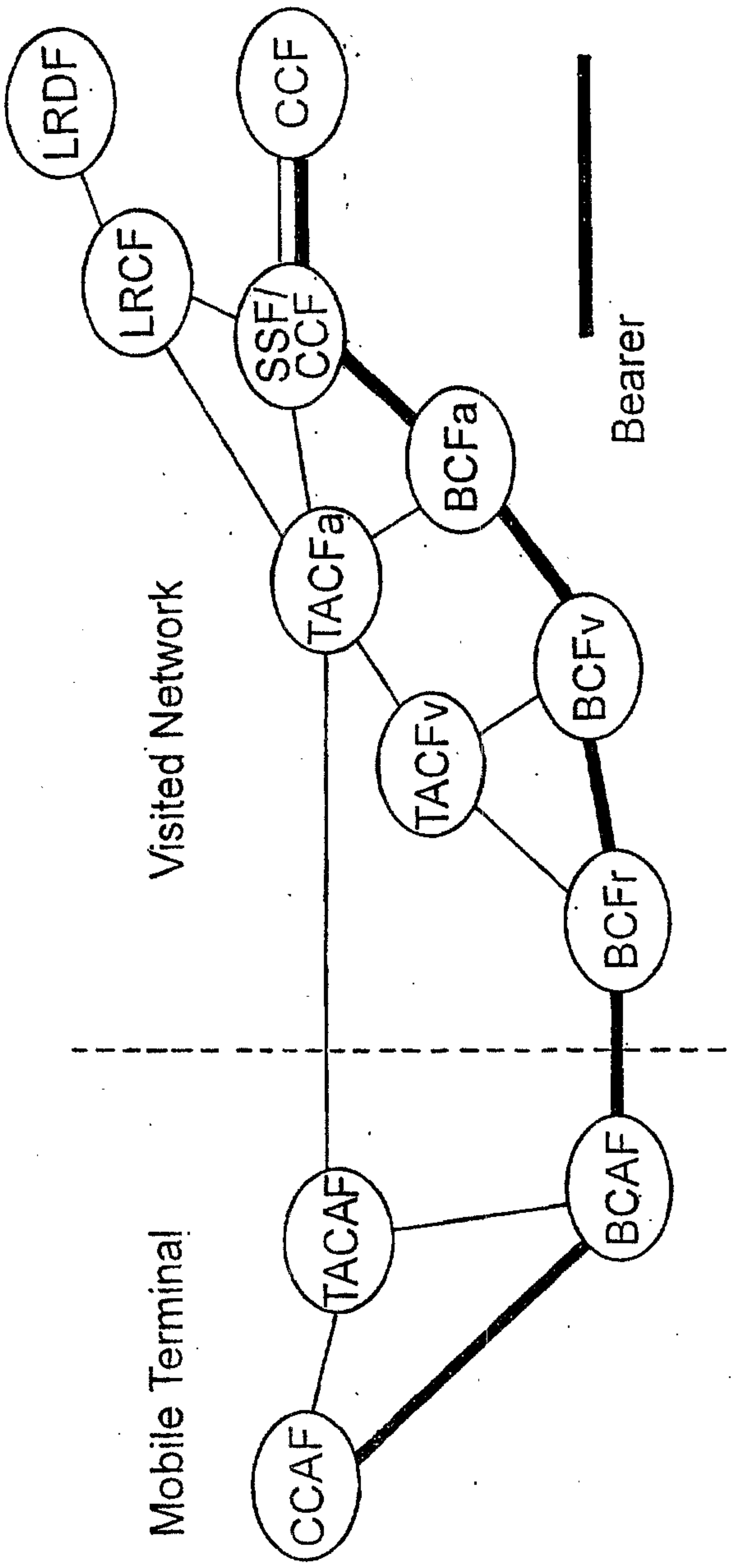

LRDF
CCF
LRCF
SSF/
CCF
Bearer
BCFa
TACFa
Visited Network
BCFv
TACFv
BCFr
BCAF
TACAF
Mobile Terminal
CCAF

FIG. 20

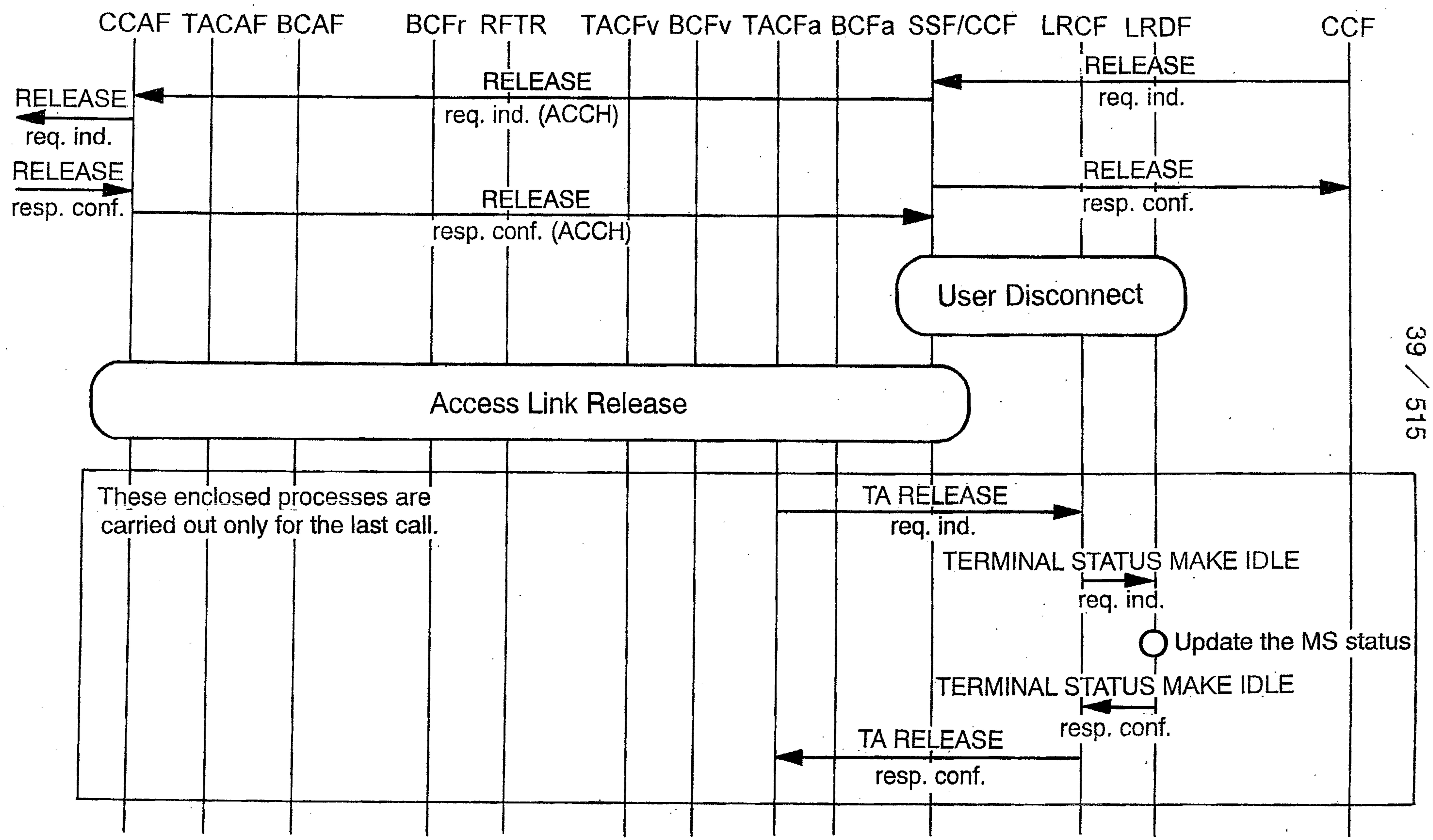

CCAF
TACAF
BCAF
BCFr
RFTR
TACFv
BCFv
TACFa
BCFa
SSF/CCF
LRCF
LRDF
CCF
RELEASE
req. ind.
RELEASE
resp. conf.
RELEASE
req. ind. (ACCH)
RELEASE
resp. conf. (ACCH)
RELEASE
req. ind.
RELEASE
resp. conf.
User Disconnect
Access Link Release
These enclosed processes are
carried out only for the last call.
TA RELEASE
req. ind.
TERMINAL STATUS MAKE IDLE
req. ind.
Update the MS status
TERMINAL STATUS MAKE IDLE
resp. conf.
TA RELEASE
resp. conf.

FIG. 21

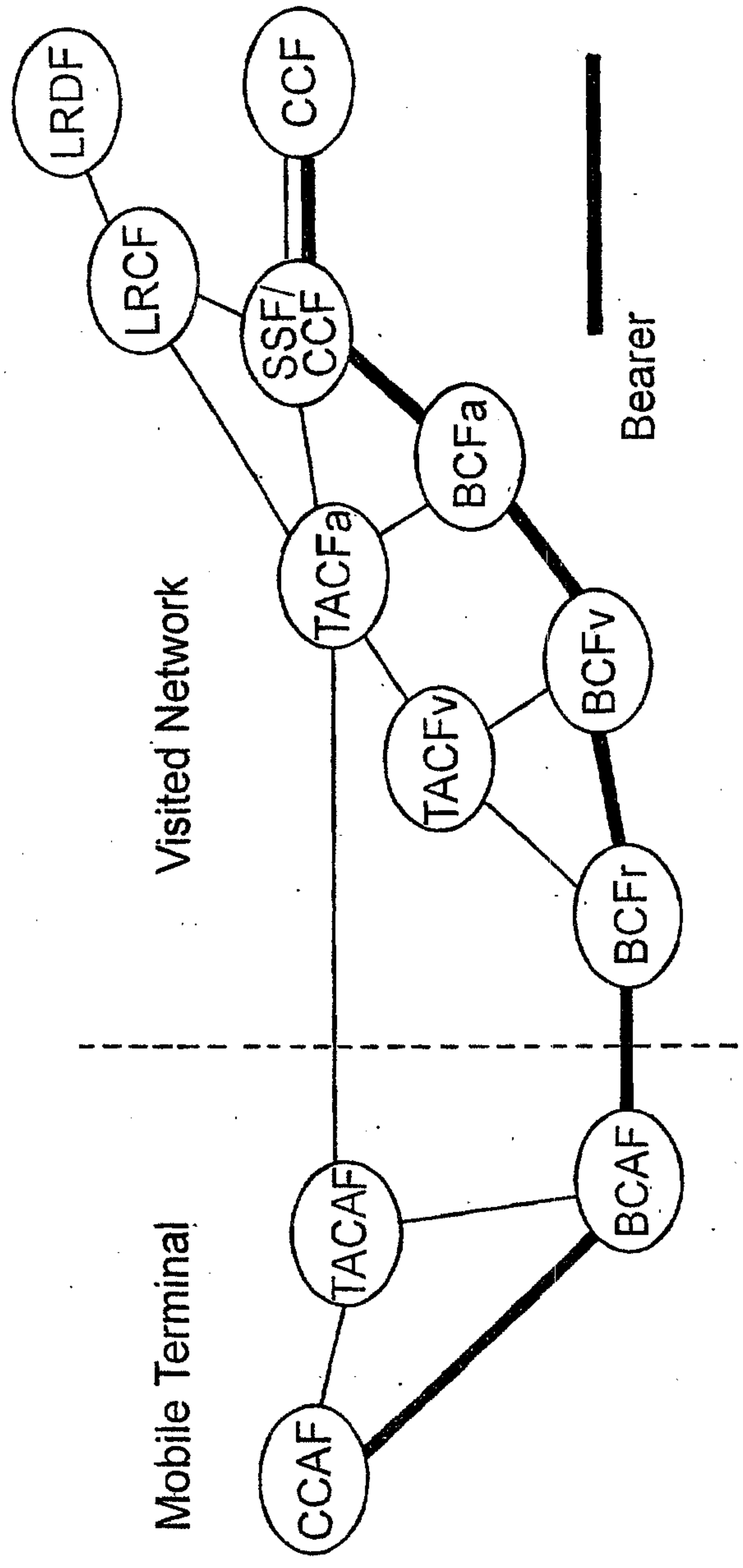
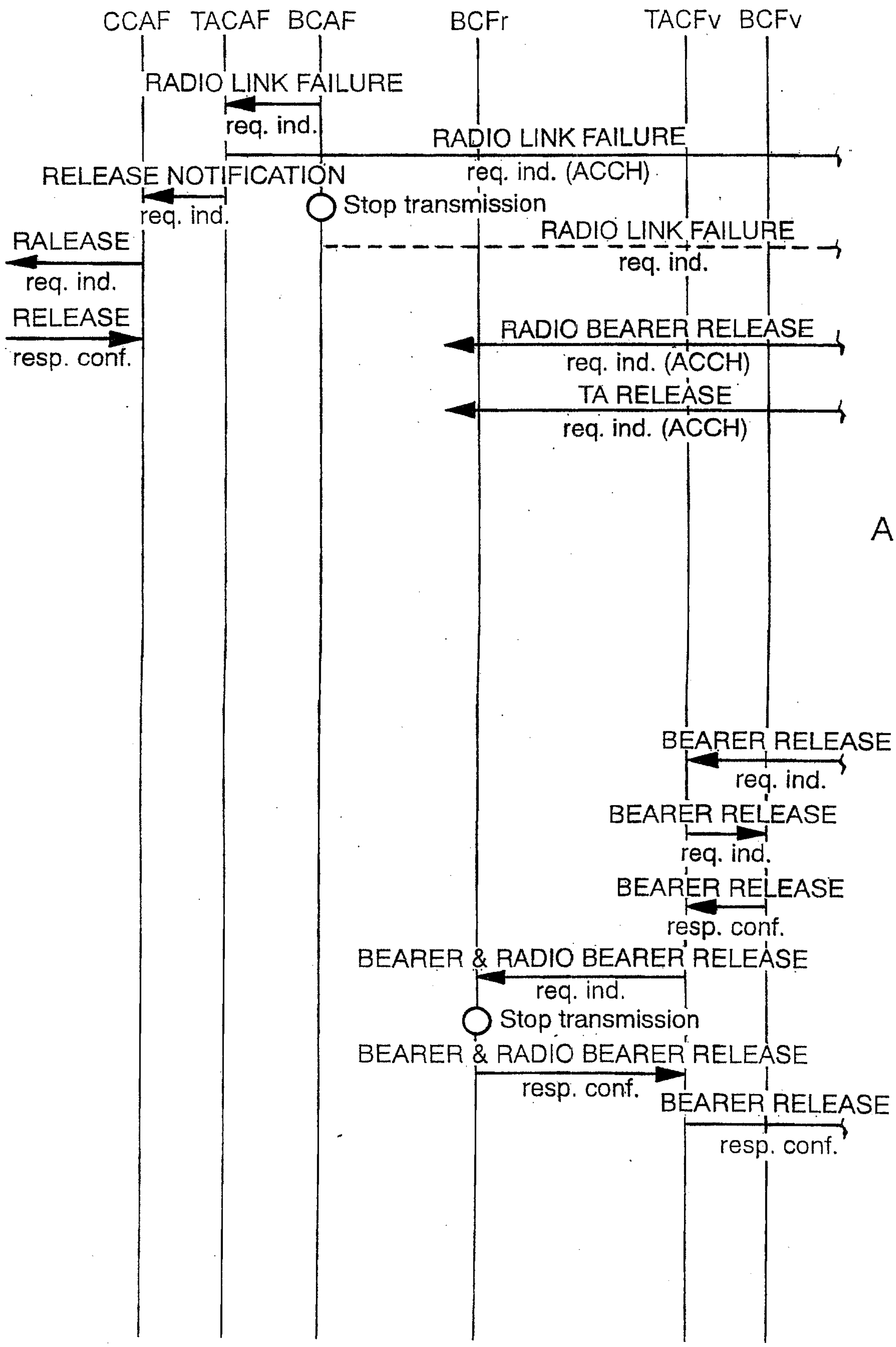

Mobile Terminal
Visited Network
CCAF
TACAF
BCAF
BCFr
TACFv
BCFv
TACFa
BCFa
SSF/CCF
LRCF
LRDF
CCF
Bearer

FIG. 22


CCAF
TACAF
BCAF
BCFr
TACFv
BCFv
RADIO LINK FAILURE
req. ind.
RADIO LINK FAILURE
req. ind. (ACCH)
RELEASE NOTIFICATION
req. ind.
Stop transmission
RADIO LINK FAILURE
req. ind.
RALEASE
req. ind.
RELEASE
resp. conf.
RADIO BEARER RELEASE
req. ind. (ACCH)
TA RELEASE
req. ind. (ACCH)
A
BEARER RELEASE
req. ind.
BEARER RELEASE
req. ind.
BEARER RELEASE
resp. conf.
BEARER & RADIO BEARER RELEASE
req. ind.
Stop transmission
BEARER & RADIO BEARER RELEASE
resp. conf.
BEARER RELEASE
resp. conf.

CONTINUED FROM FIG. 22

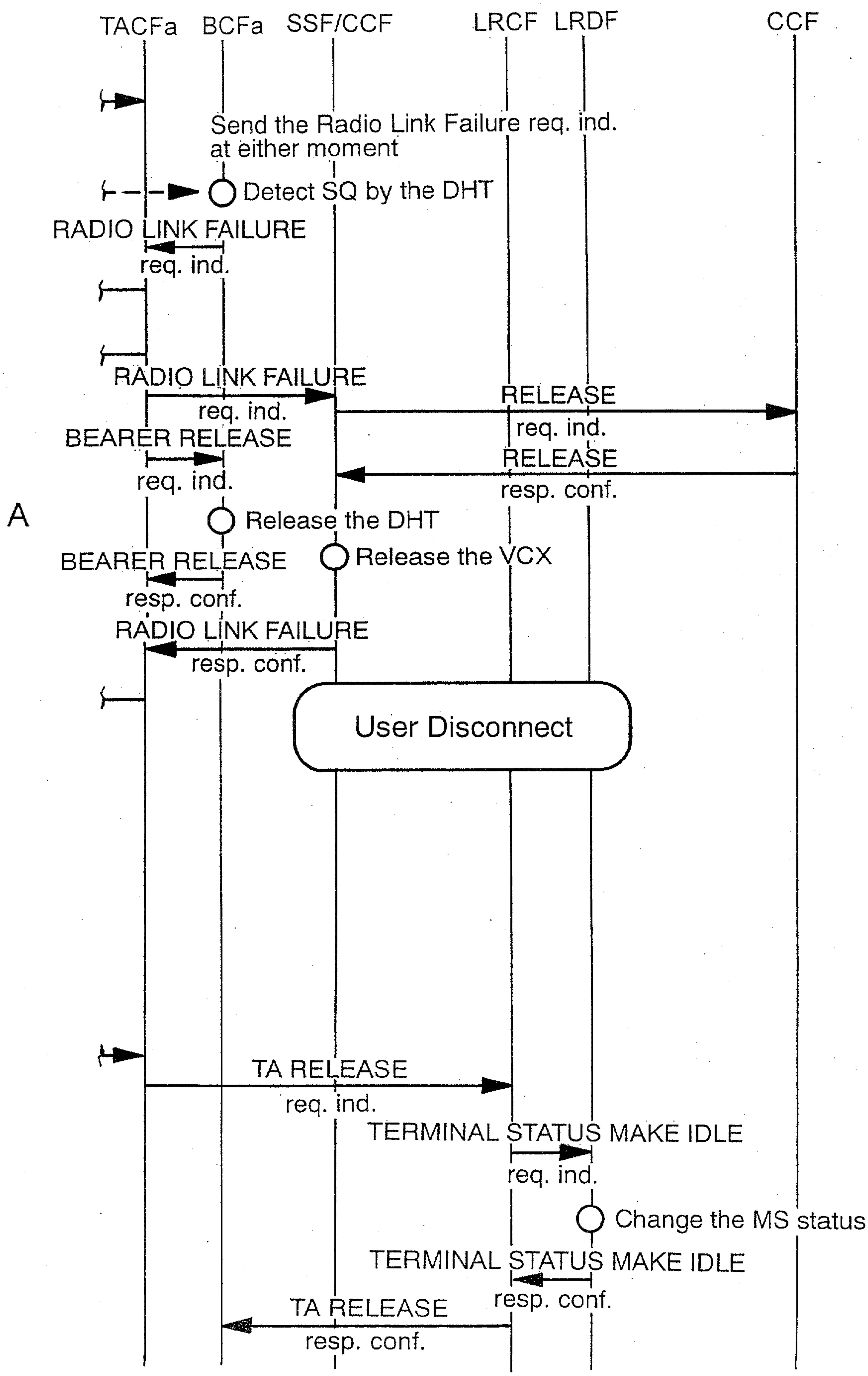


FIG. 23

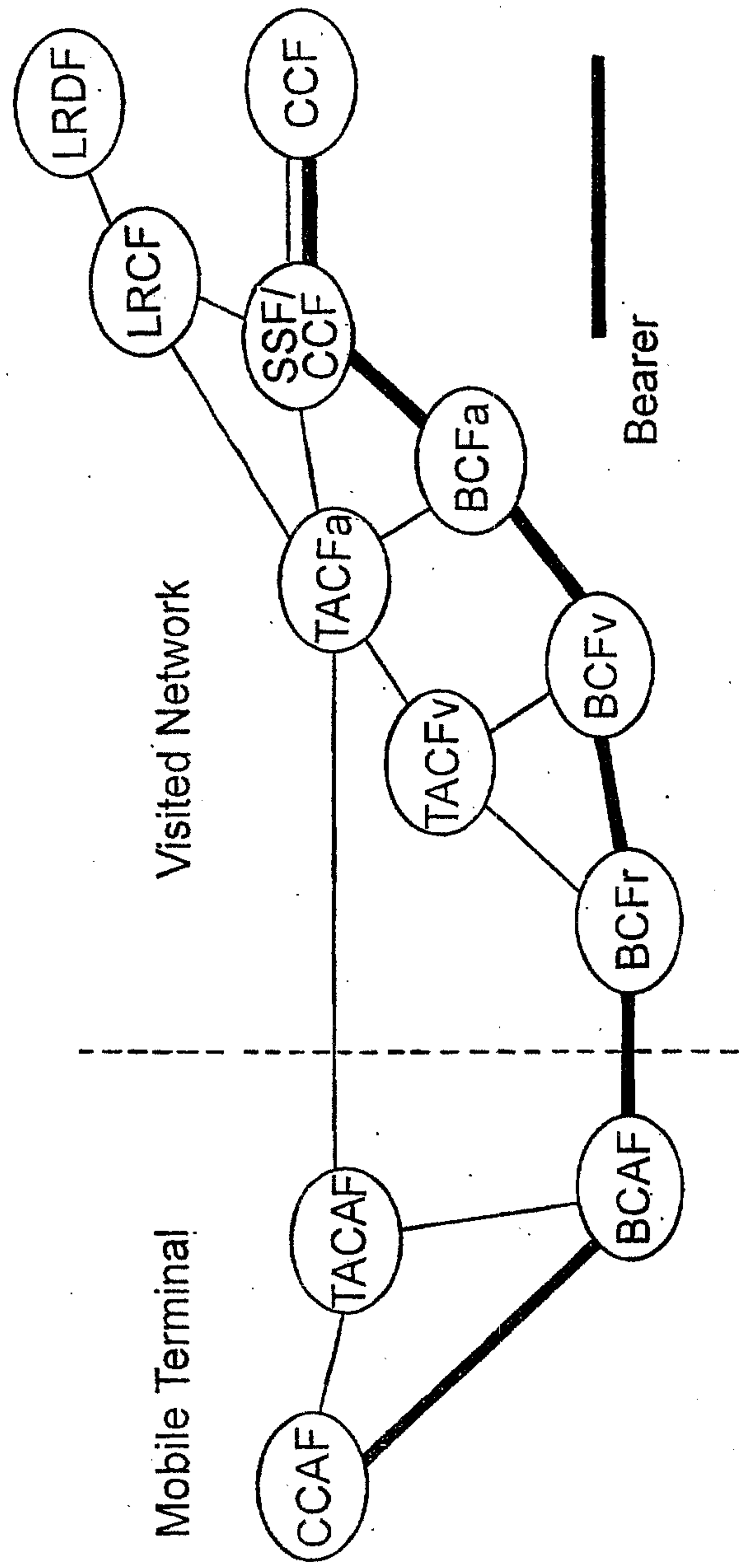
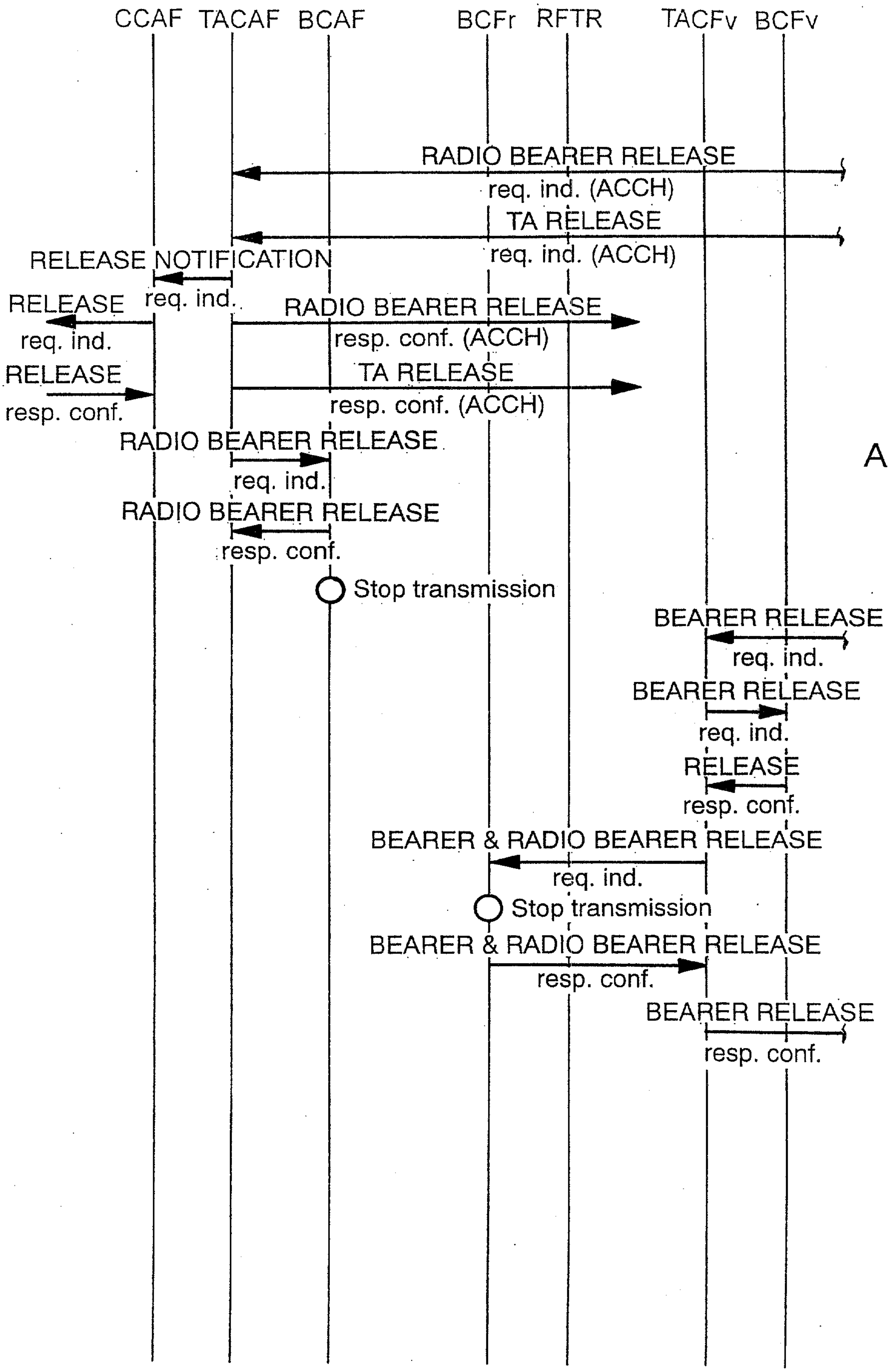

Mobile Terminal
Visited Network
CCAF
TACAF
BCAF
BCFr
TACFv
BCFv
TACFa
BCFa
SSF/
CCF
LRCF
LRDF
CCF
Bearer

FIG. 24


CCAF
TACAF
BCAF
BCFr
RFTR
TACFv
BCFv
RADIO BEARER RELEASE
req. ind. (ACCH)
TA RELEASE
req. ind. (ACCH)
RELEASE NOTIFICATION
req. ind.
RELEASE
req. ind.
RADIO BEARER RELEASE
resp. conf. (ACCH)
RELEASE
resp. conf.
TA RELEASE
resp. conf. (ACCH)
RADIO BEARER RELEASE
req. ind.
RADIO BEARER RELEASE
resp. conf.
Stop transmission
BEARER RELEASE
req. ind.
BEARER RELEASE
req. ind.
RELEASE
resp. conf.
BEARER & RADIO BEARER RELEASE
req. ind.
Stop transmission
BEARER & RADIO BEARER RELEASE
resp. conf.
BEARER RELEASE
resp. conf.
A

CONTINUED FROM FIG. 24

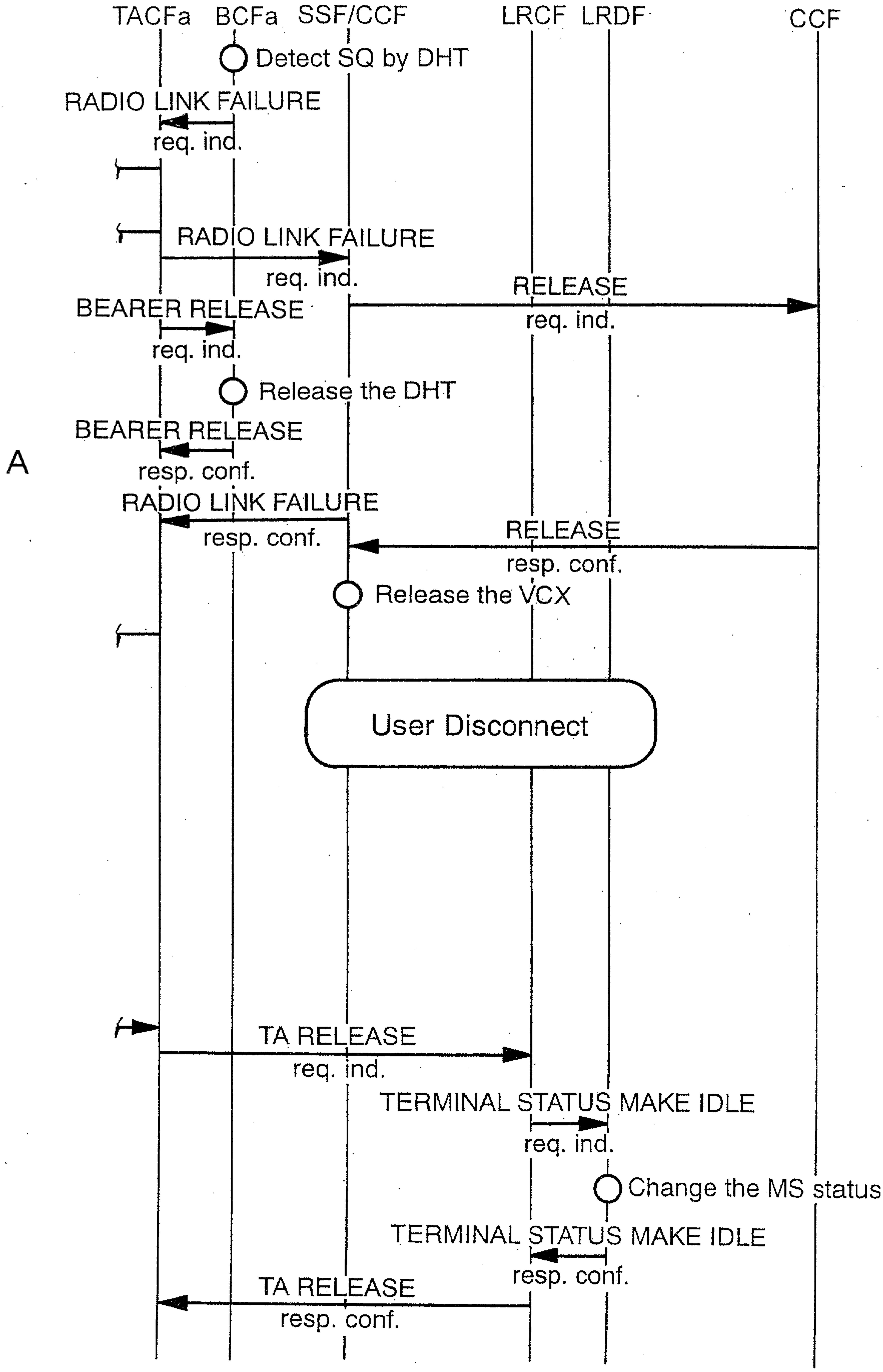


FIG. 25

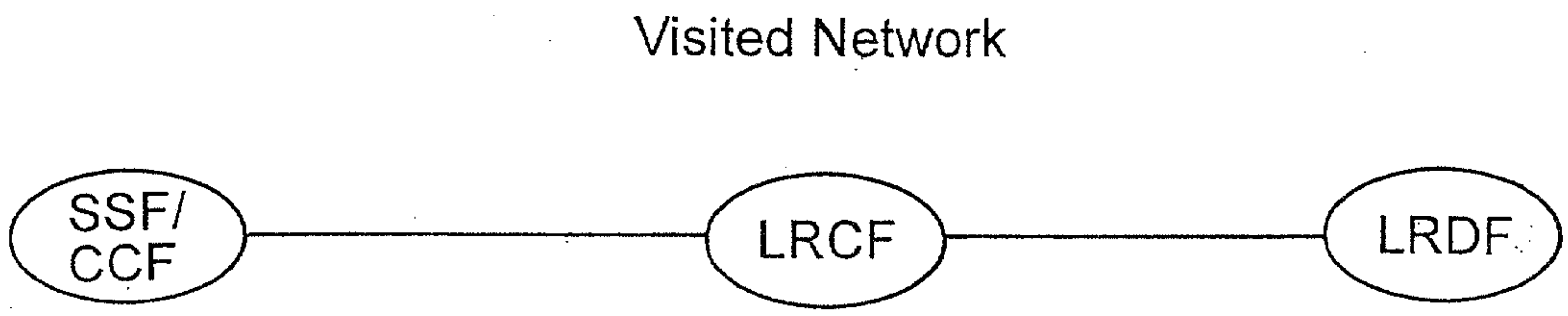


FIG. 26

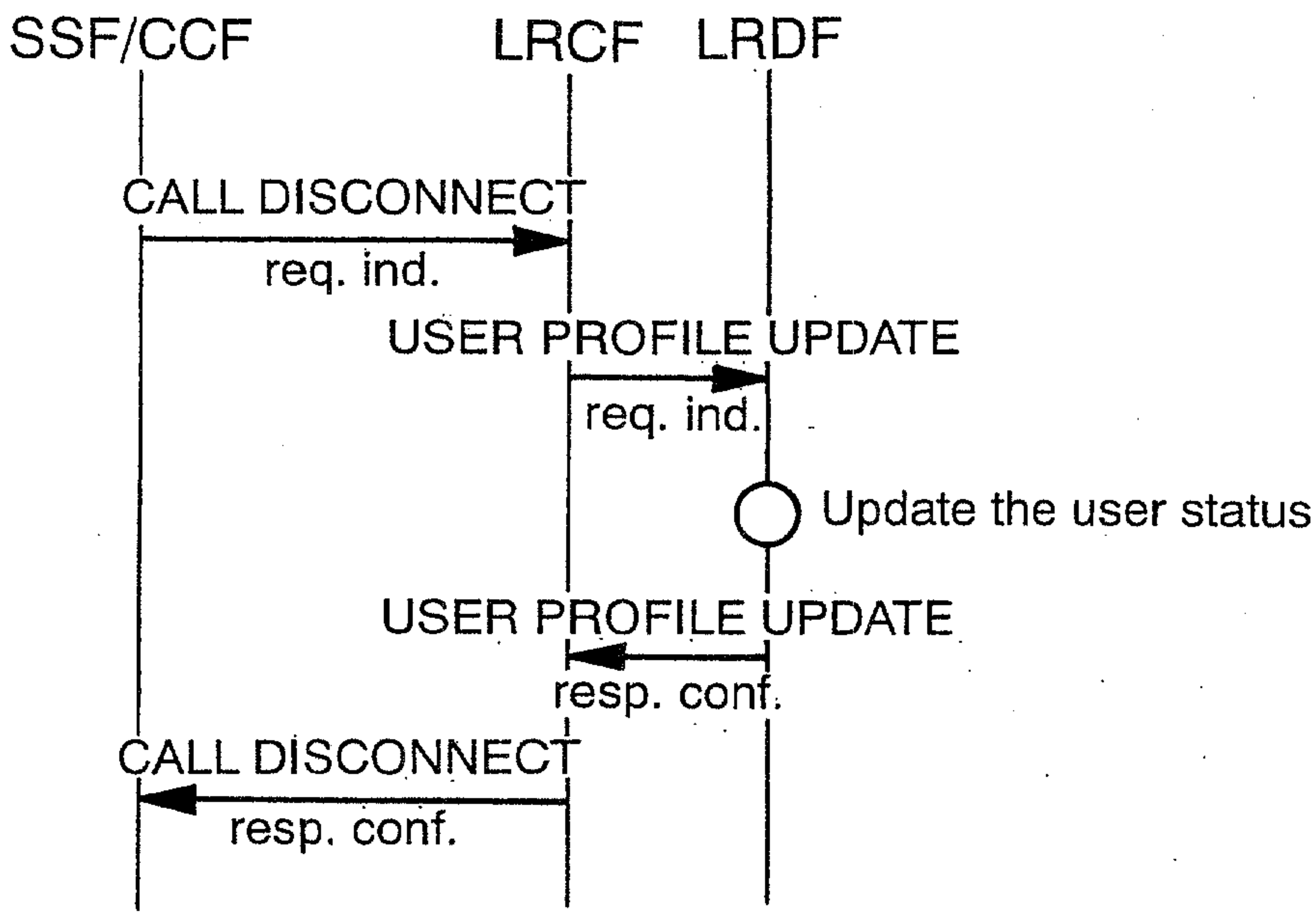


FIG. 27

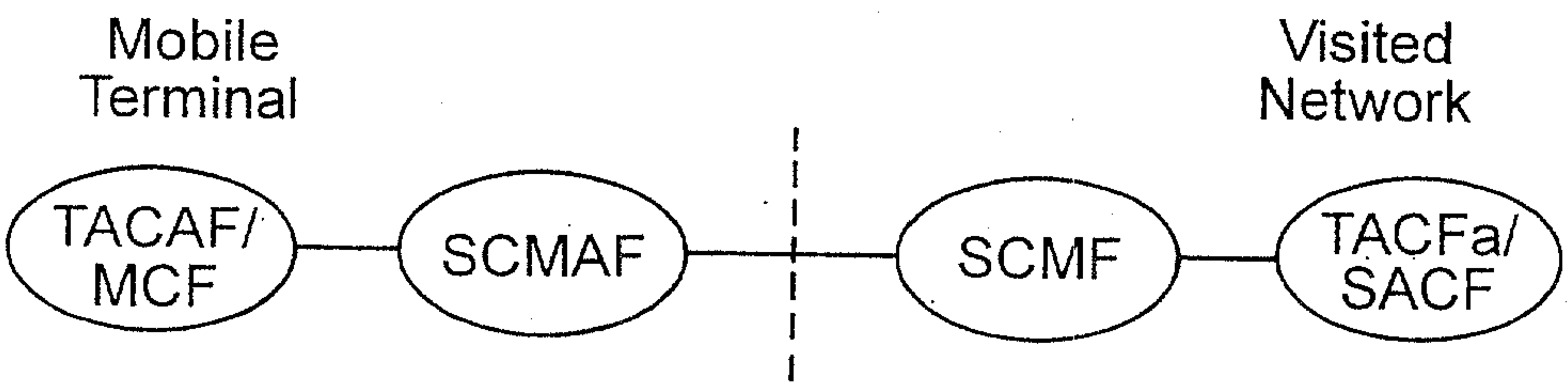
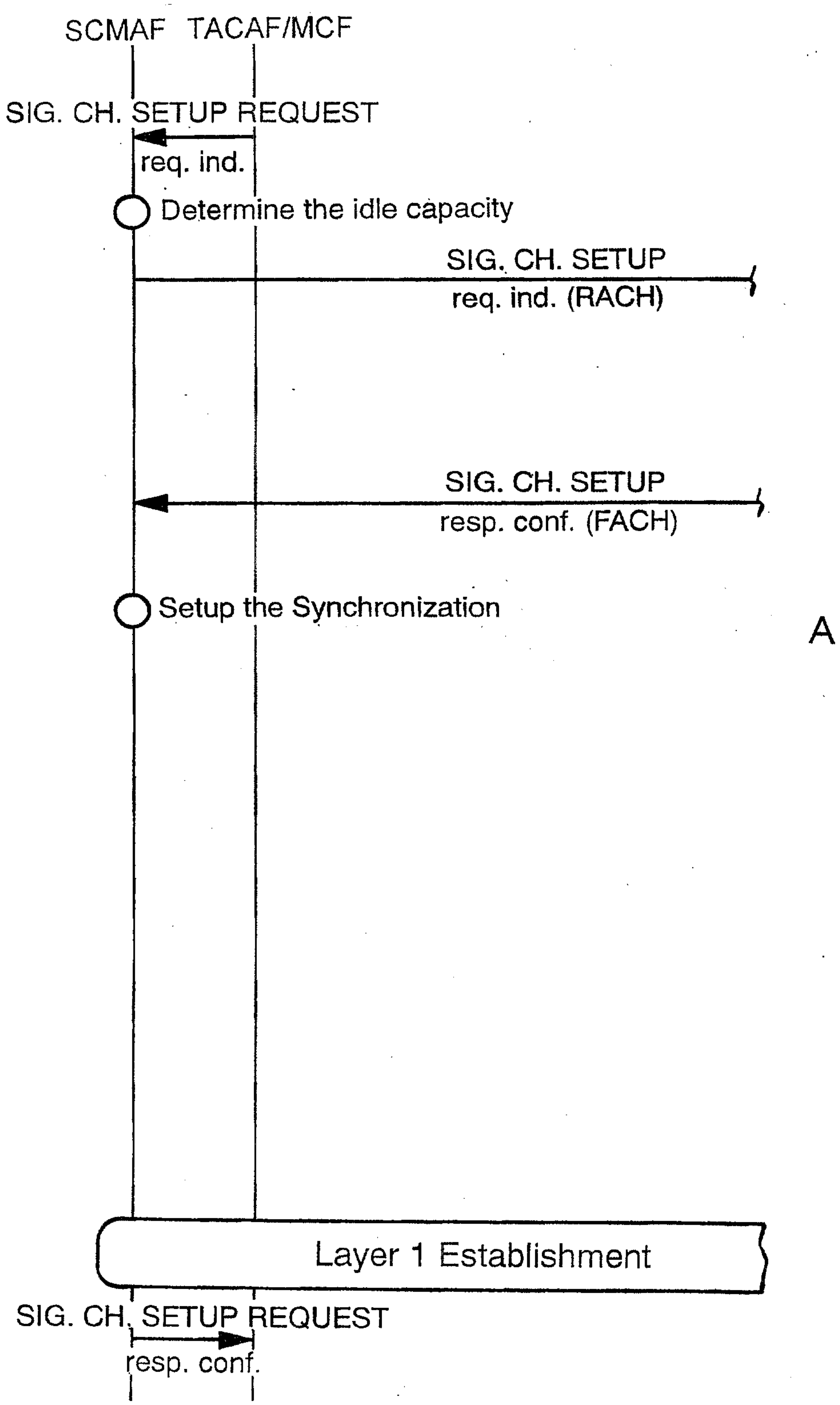


FIG. 28


SCMAF
TACAF/MCF
SIG. CH. SETUP REQUEST
req. ind.
Determine the idle capacity
SIG. CH. SETUP
req. ind. (RACH)
SIG. CH. SETUP
resp. conf. (FACH)
Setup the Synchronization
A
Layer 1 Establishment
SIG. CH. SETUP REQUEST
resp. conf.

CONTINUED FROM FIG. 28

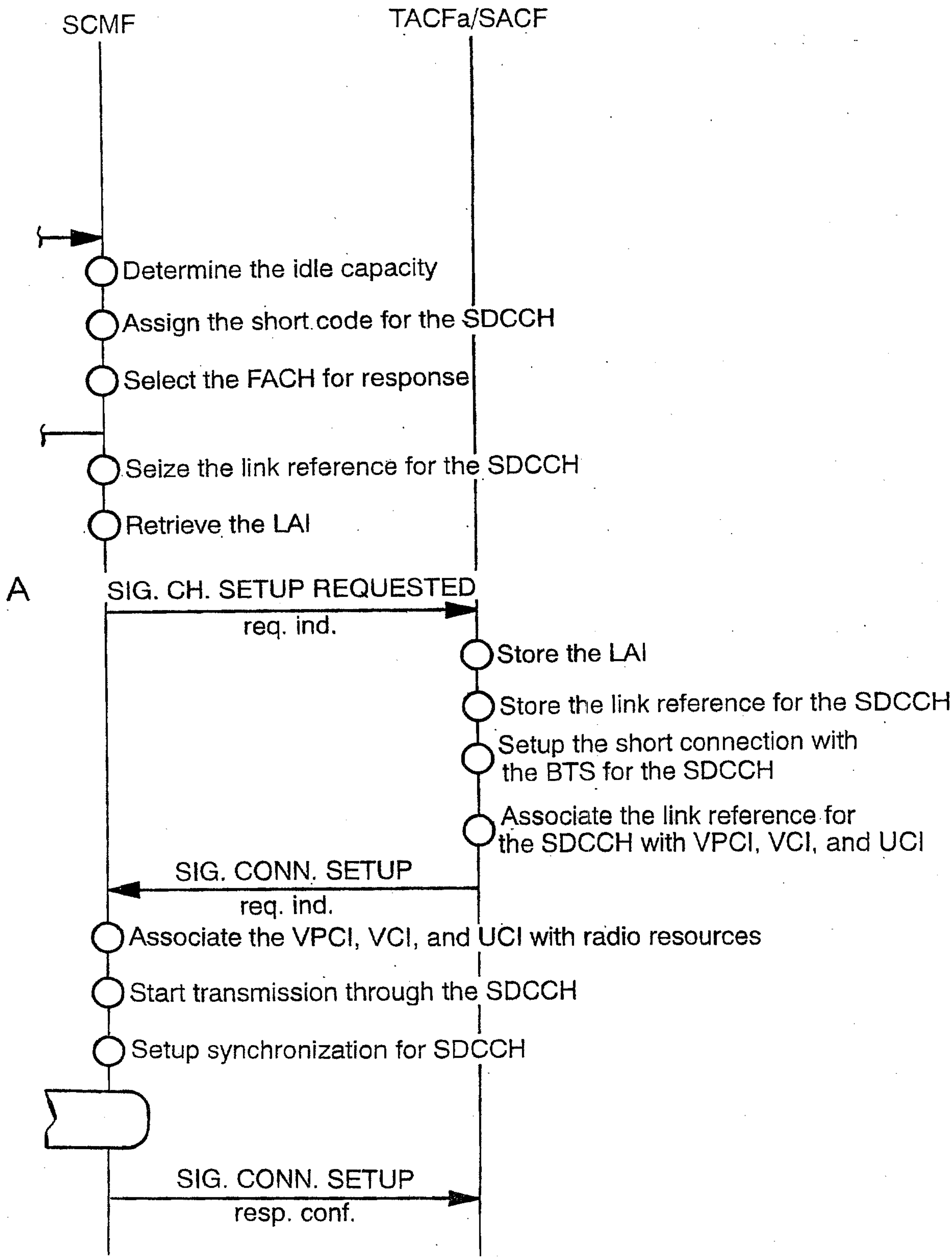
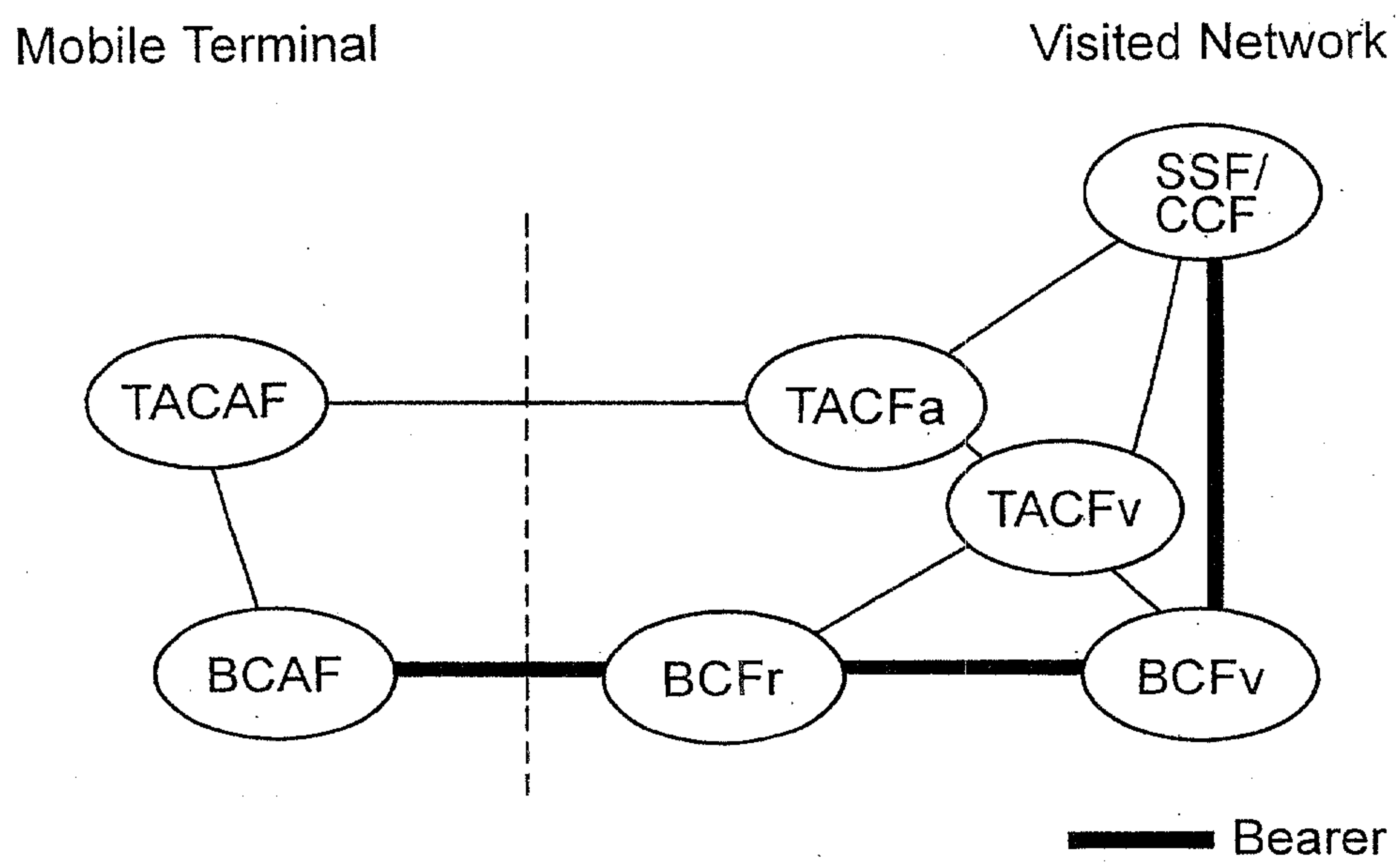
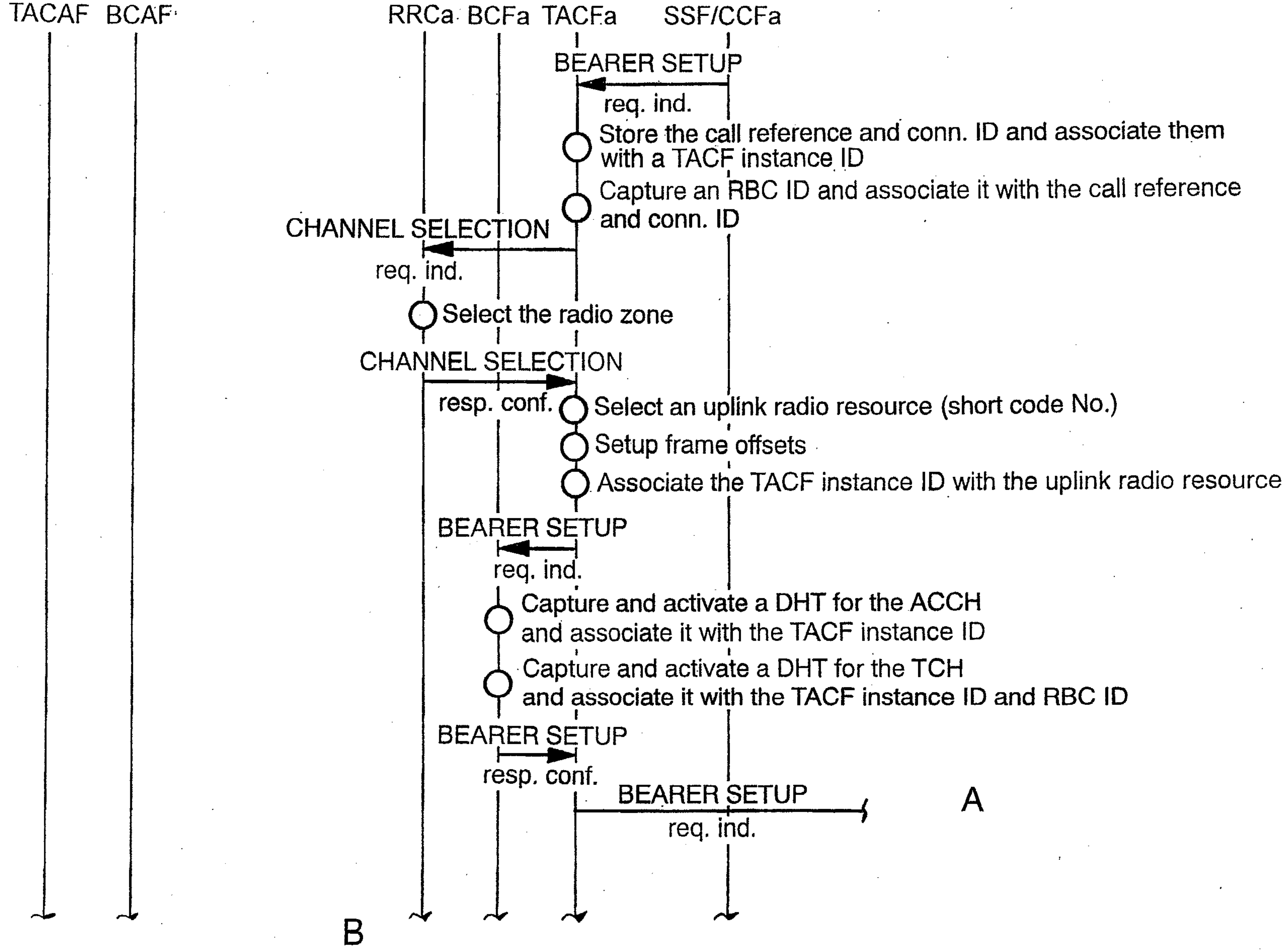


FIG. 29

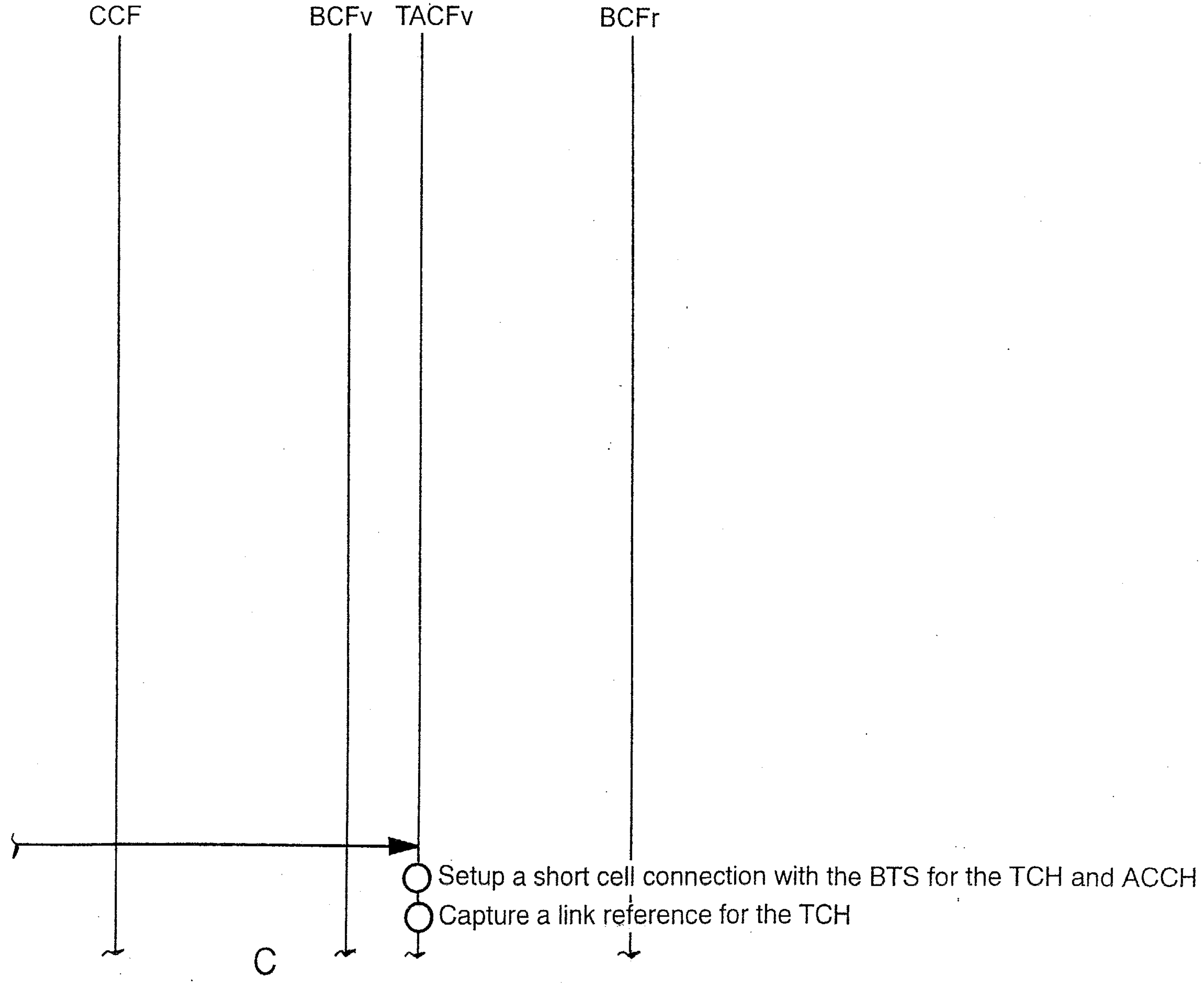


Note: Radio resources are selected under a BCFr controlled by a TACF which is different from that which received the call setup request (but which is under the control of a single CCF)

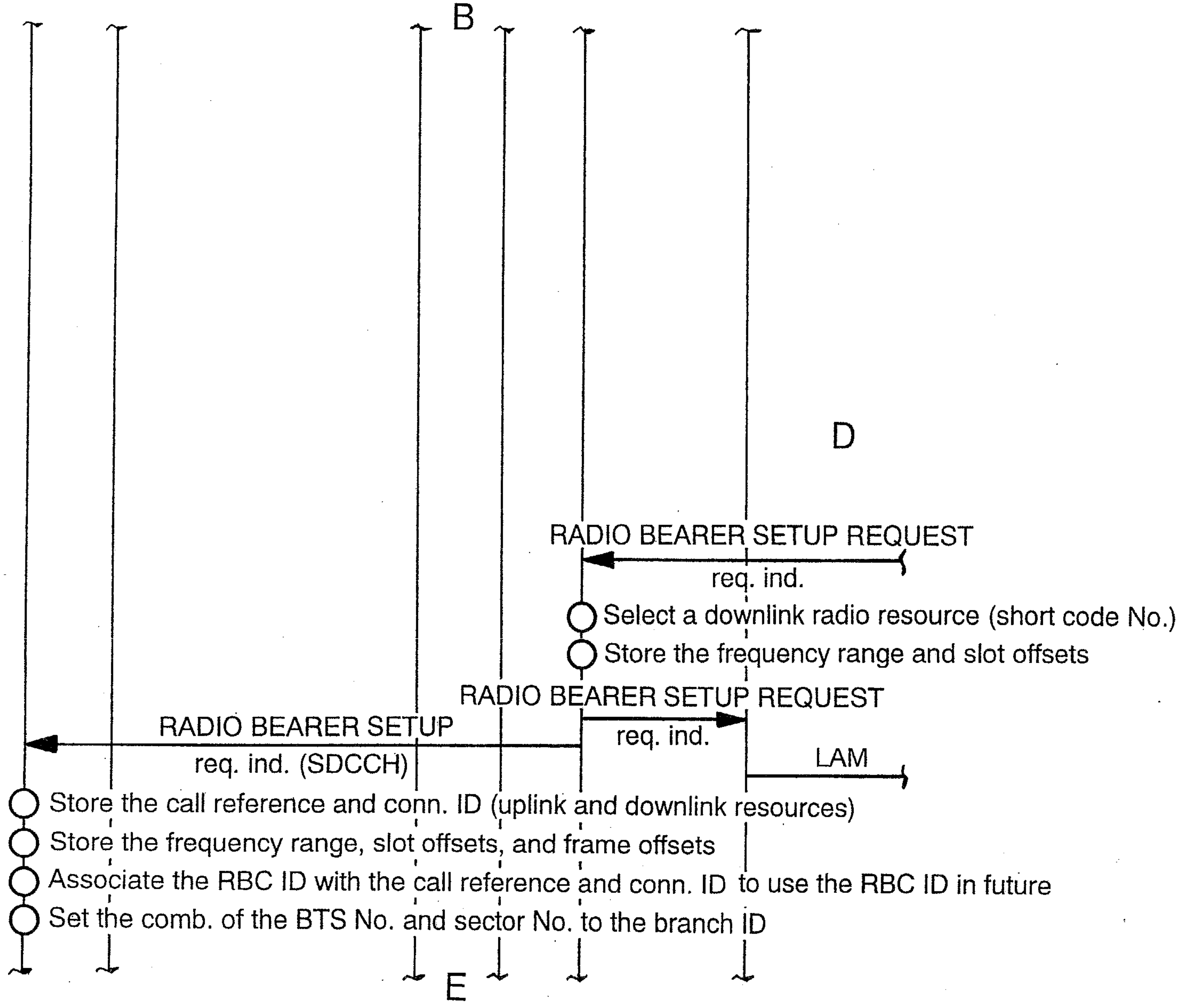
FIG. 30


TACAF
BCAF
RRCa
BCFa
TACFa
SSF/CCFa
BEARER SETUP
req. ind.
Store the call reference and conn. ID and associate them with a TACF instance ID
Capture an RBC ID and associate it with the call reference and conn. ID
CHANNEL SELECTION
req. ind.
Select the radio zone
CHANNEL SELECTION
resp. conf.
Select an uplink radio resource (short code No.)
Setup frame offsets
Associate the TACF instance ID with the uplink radio resource
BEARER SETUP
req. ind.
Capture and activate a DHT for the ACCH and associate it with the TACF instance ID
Capture and activate a DHT for the TCH and associate it with the TACF instance ID and RBC ID
BEARER SETUP
resp. conf.
BEARER SETUP
req. ind.
A
B

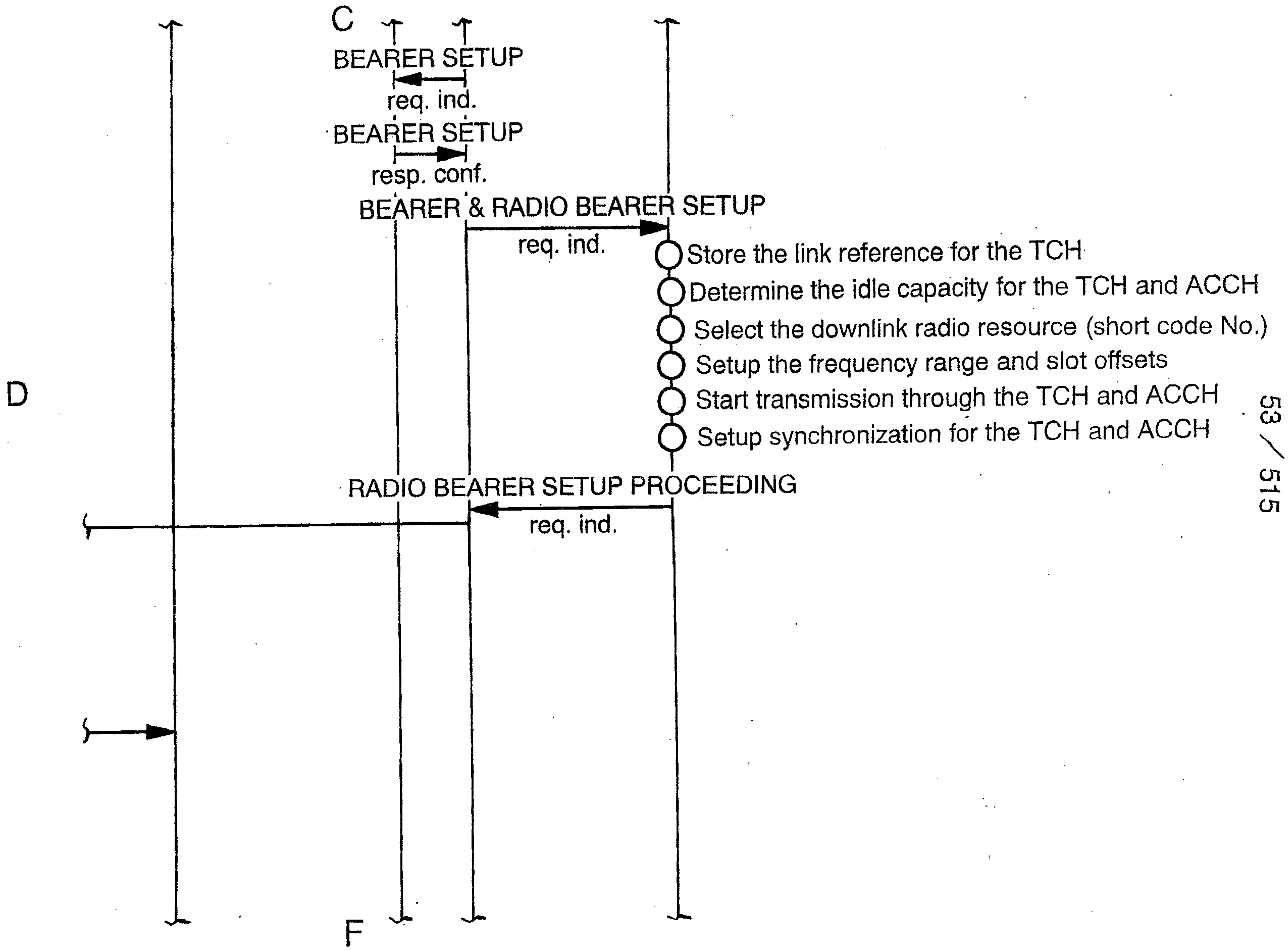
CONTINUED FROM FIG. 30



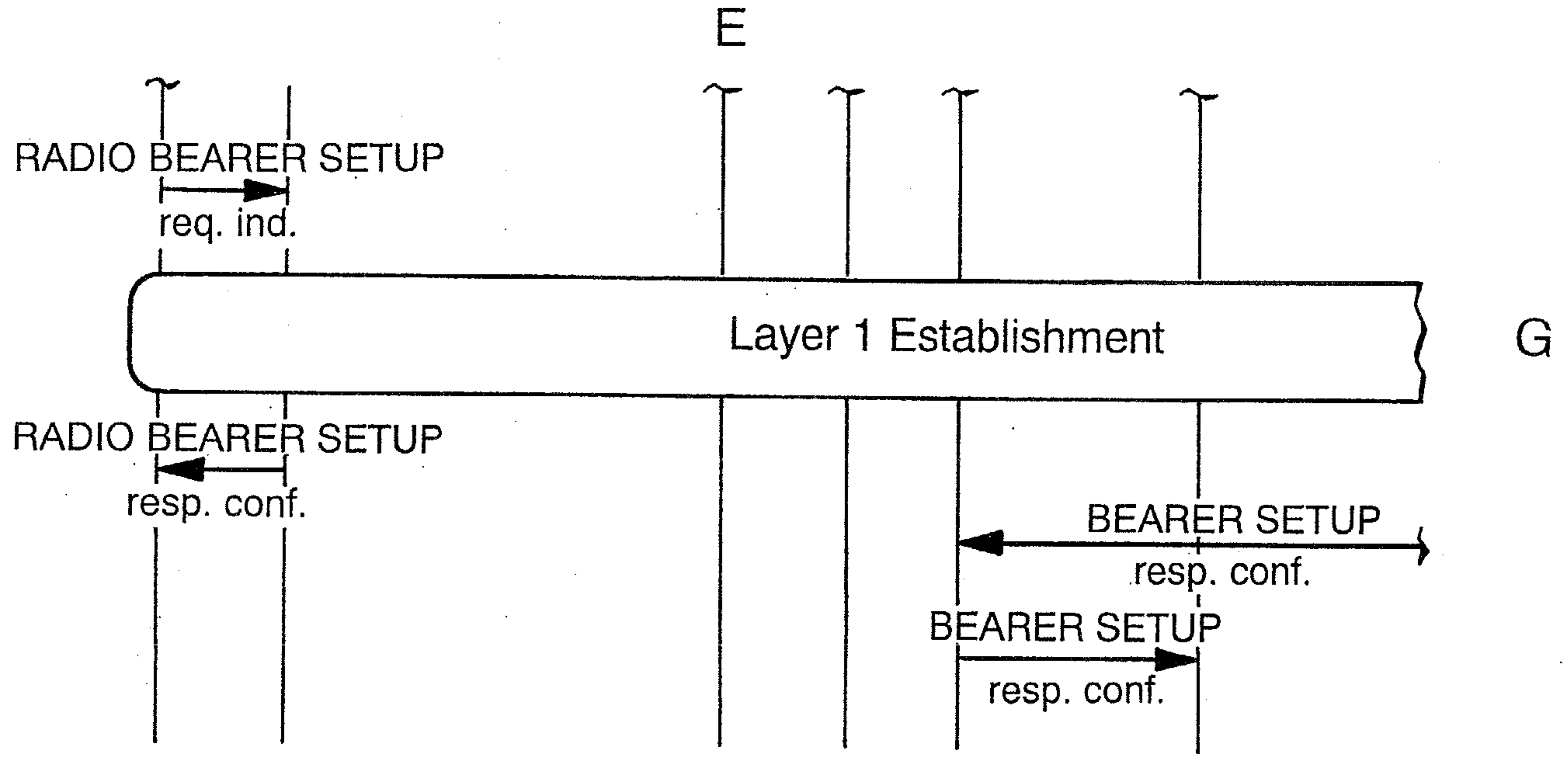
CONTINUED FROM FIG. 30



CONTINUED FROM FIG. 30



CONTINUED FROM FIG. 30



CONTINUED FROM FIG. 30

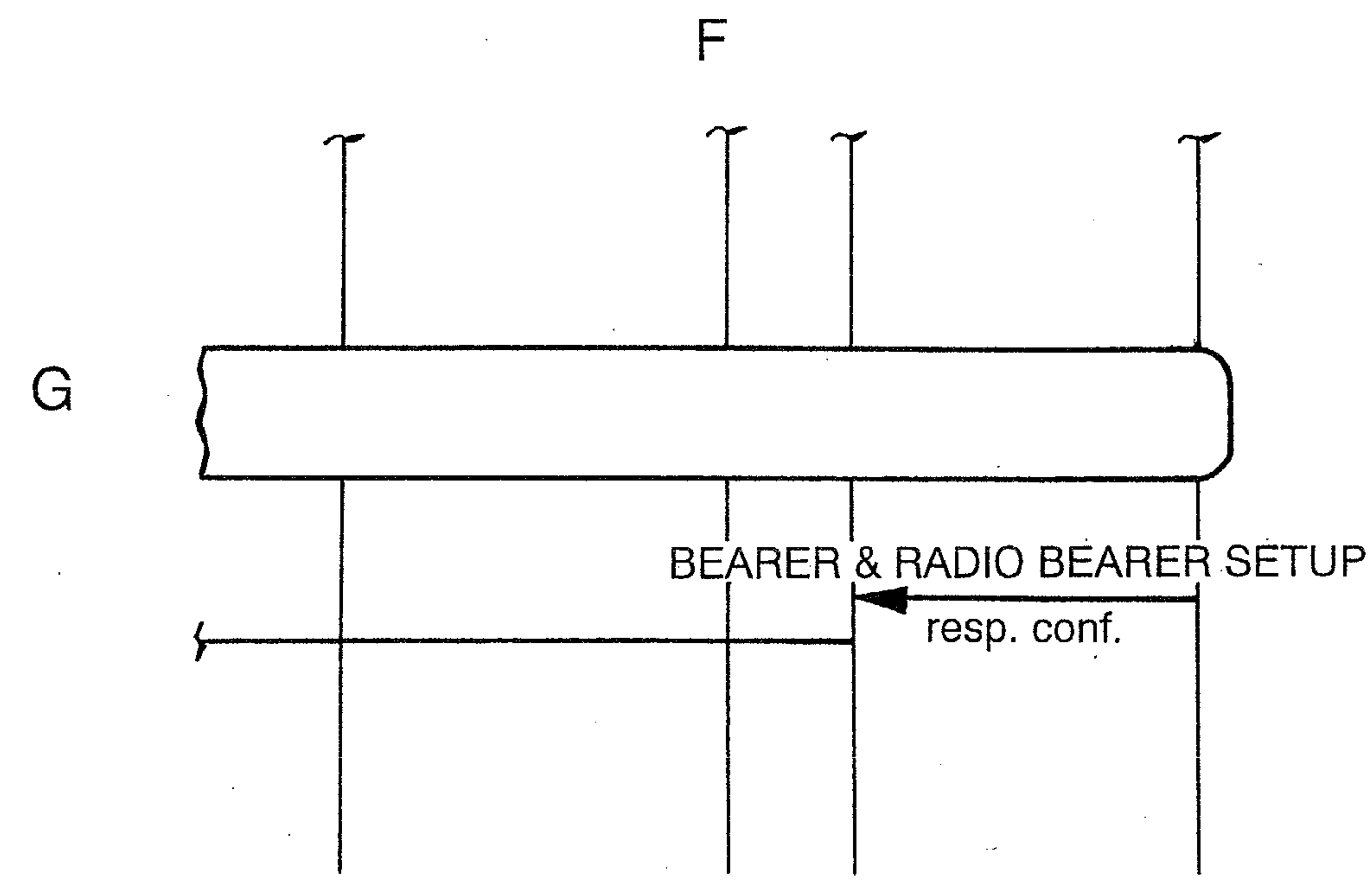


FIG. 31

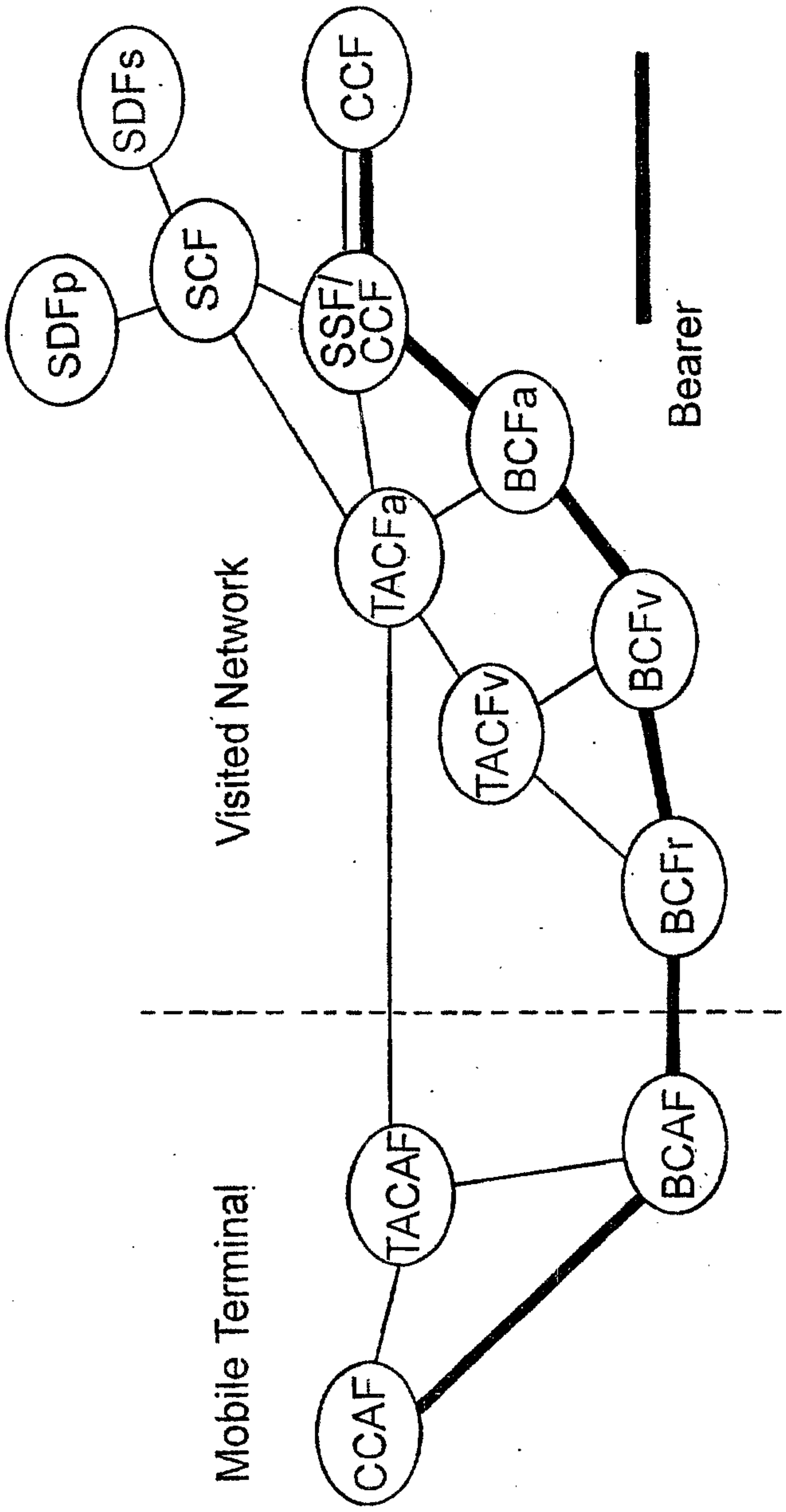
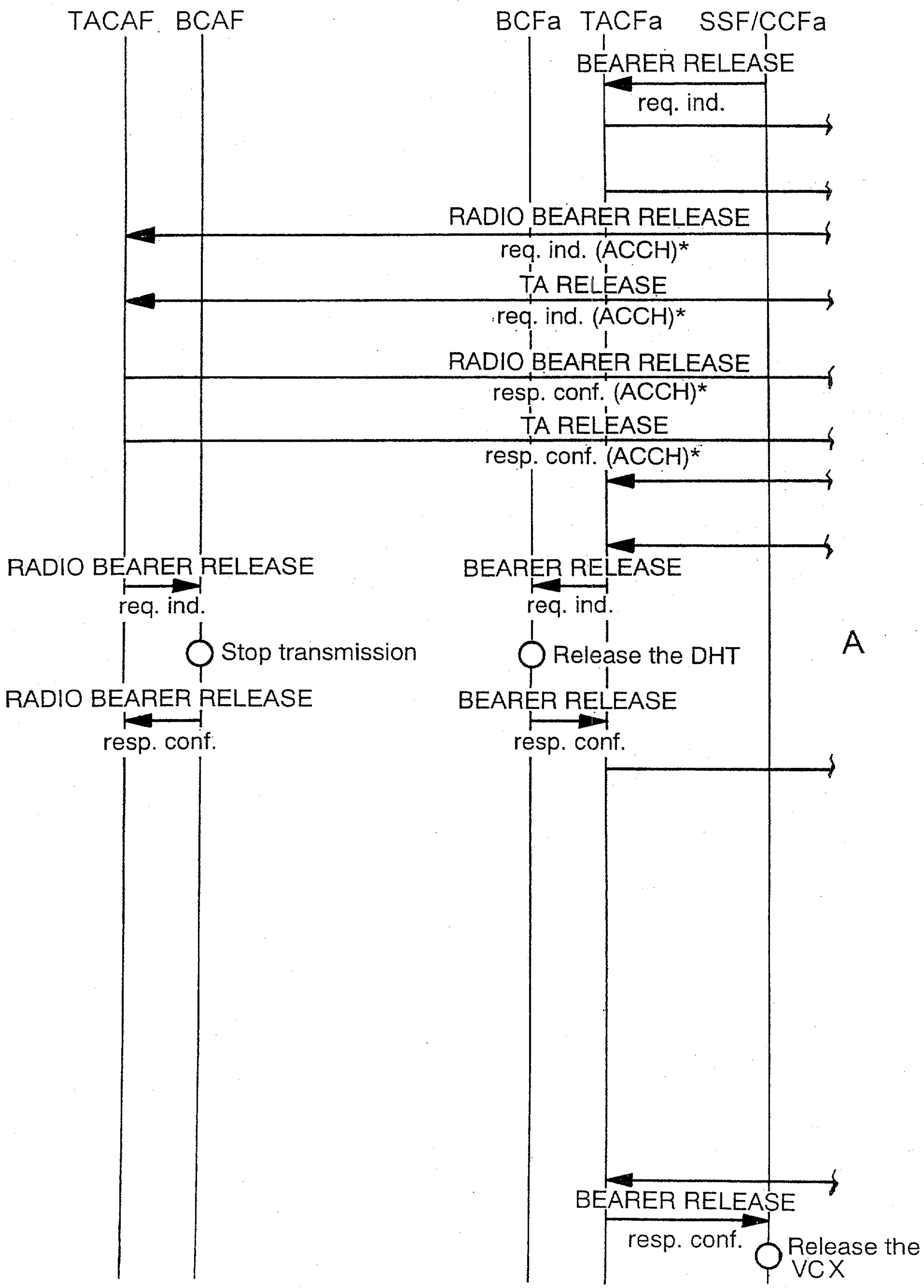

Mobile Terminal
Visited Network
CCAF
TACAF
BCAF
BCFr
TACFv
BCFv
TACFa
BCFa
SSF/CCF
CCF
SCF
SDFp
SDFs
Bearer

FIG. 32



* : TA Release is concatenated only when the association of the MS is released by the call release.

CONTINUED FROM FIG. 32

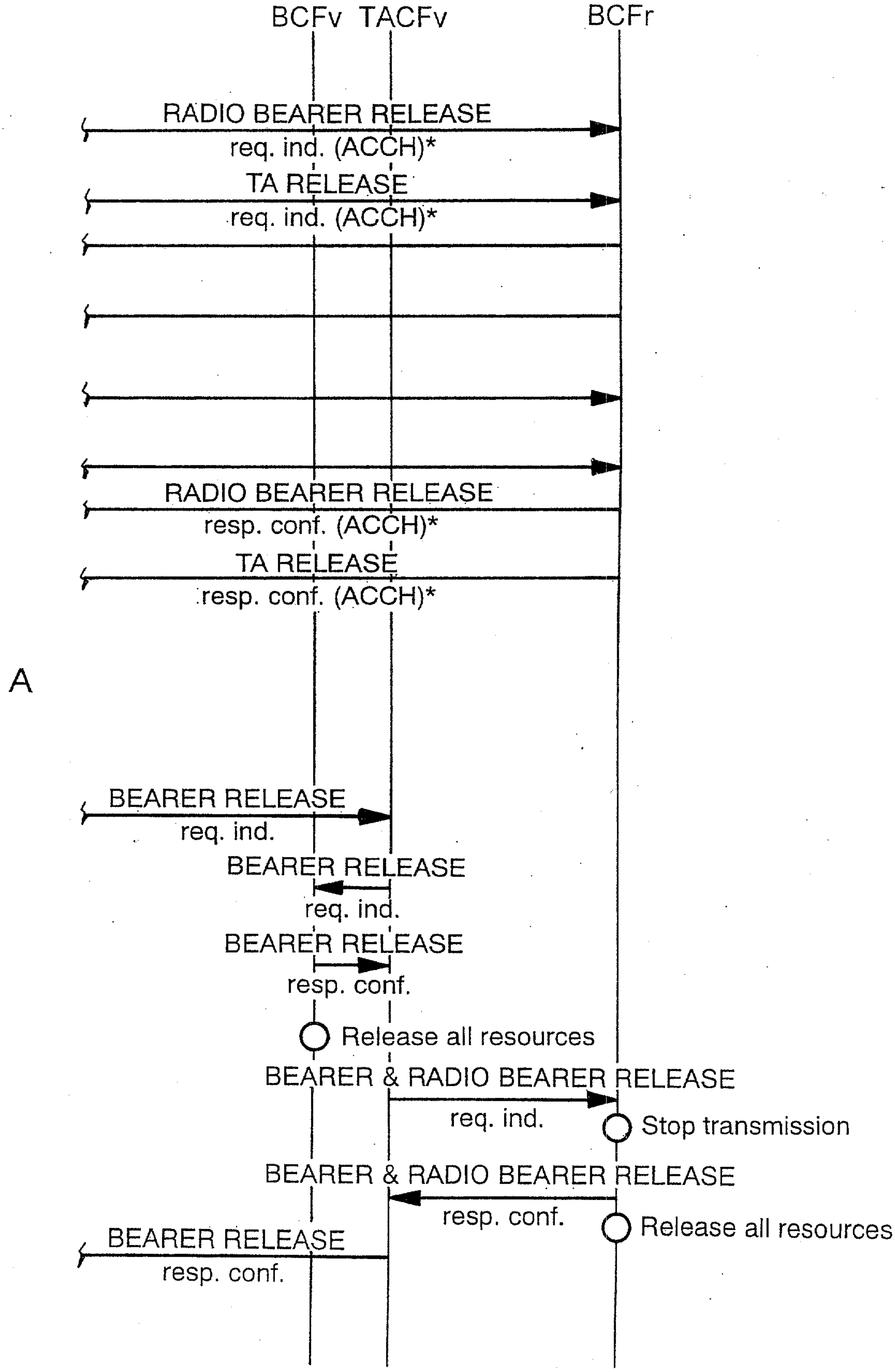


FIG. 33

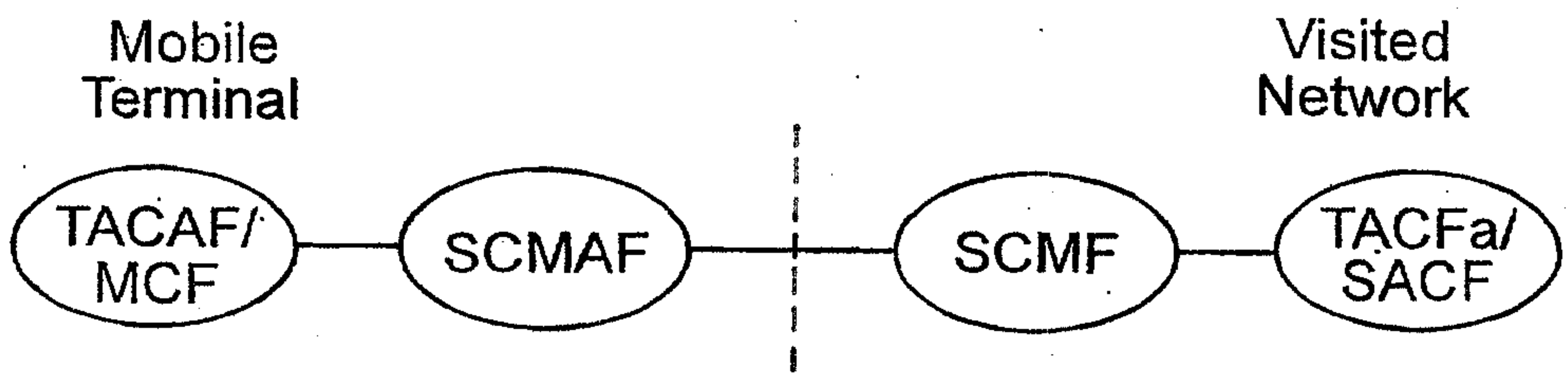

Mobile Terminal
Visited Network
TACAF/ MCF
SCMAF
SCMF
TACFa/ SACF

FIG. 34

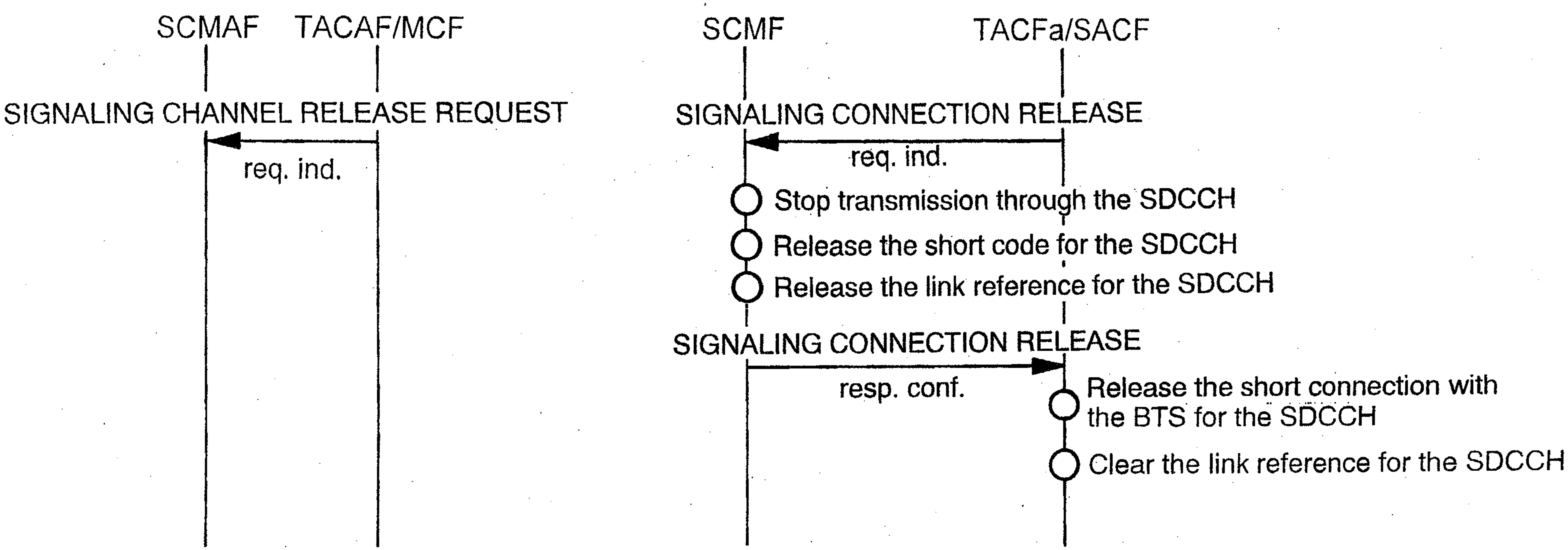

SCMAF
TACAF/MCF
SIGNALING CHANNEL RELEASE REQUEST
req. ind.
SCMF
TACFa/SACF
SIGNALING CONNECTION RELEASE
req. ind.
Stop transmission through the SDCCH
Release the short code for the SDCCH
Release the link reference for the SDCCH
SIGNALING CONNECTION RELEASE
resp. conf.
Release the short connection with the BTS for the SDCCH
Clear the link reference for the SDCCH

FIG. 35

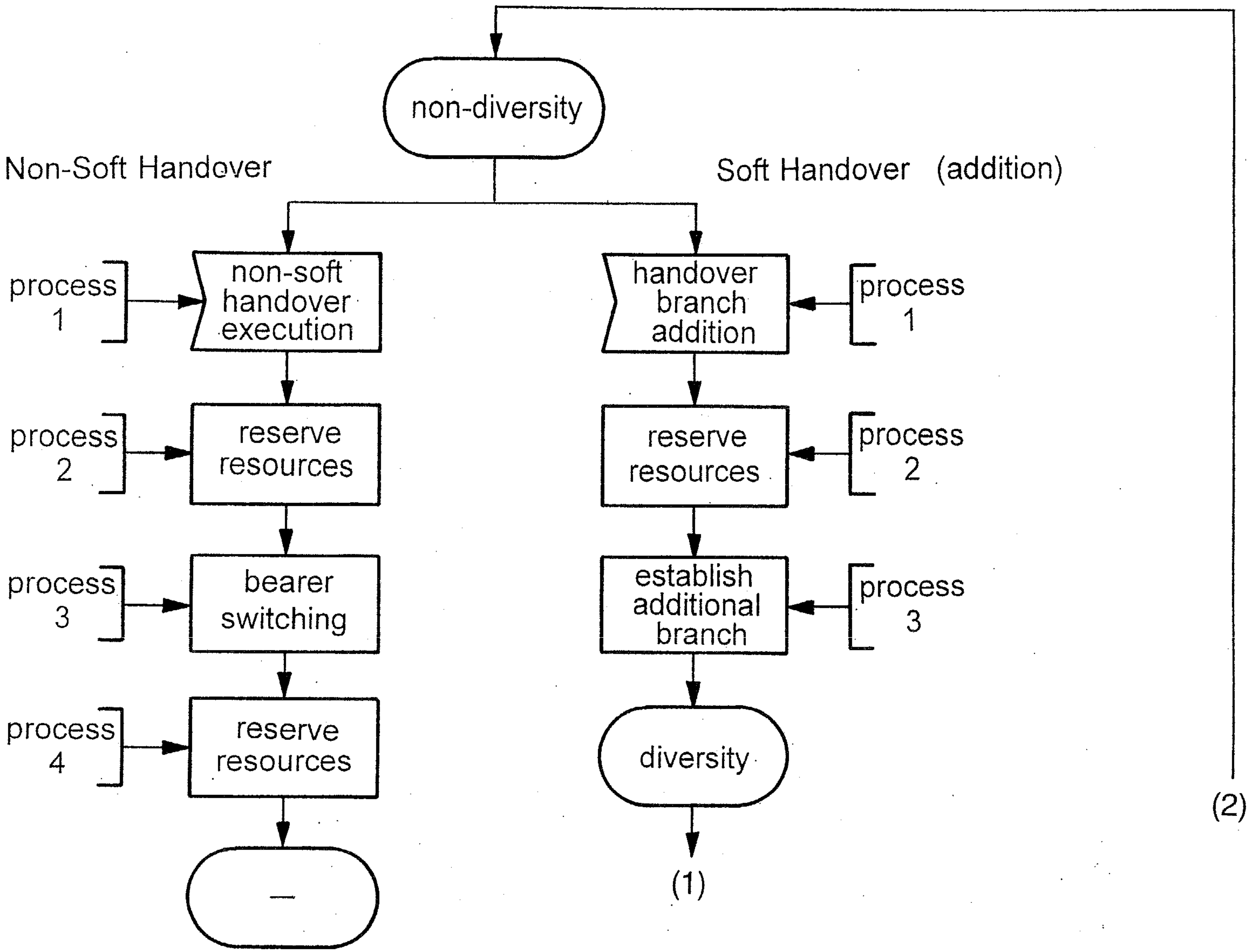
Process 1: Handover trigger
→ Detection of handover triggering

Process 2: Handover resource reservation
→ Reservation of radio resources for handover

Process 3: Handover execution
→ Preparing at network side, if any
→ Request the mobile terminal as indicated by trigger

Process 4: Handover completion
→ Release of unneeded radio bearer and resources

CONTINUED FROM FIG. 35



CONTINUED FROM FIG. 35

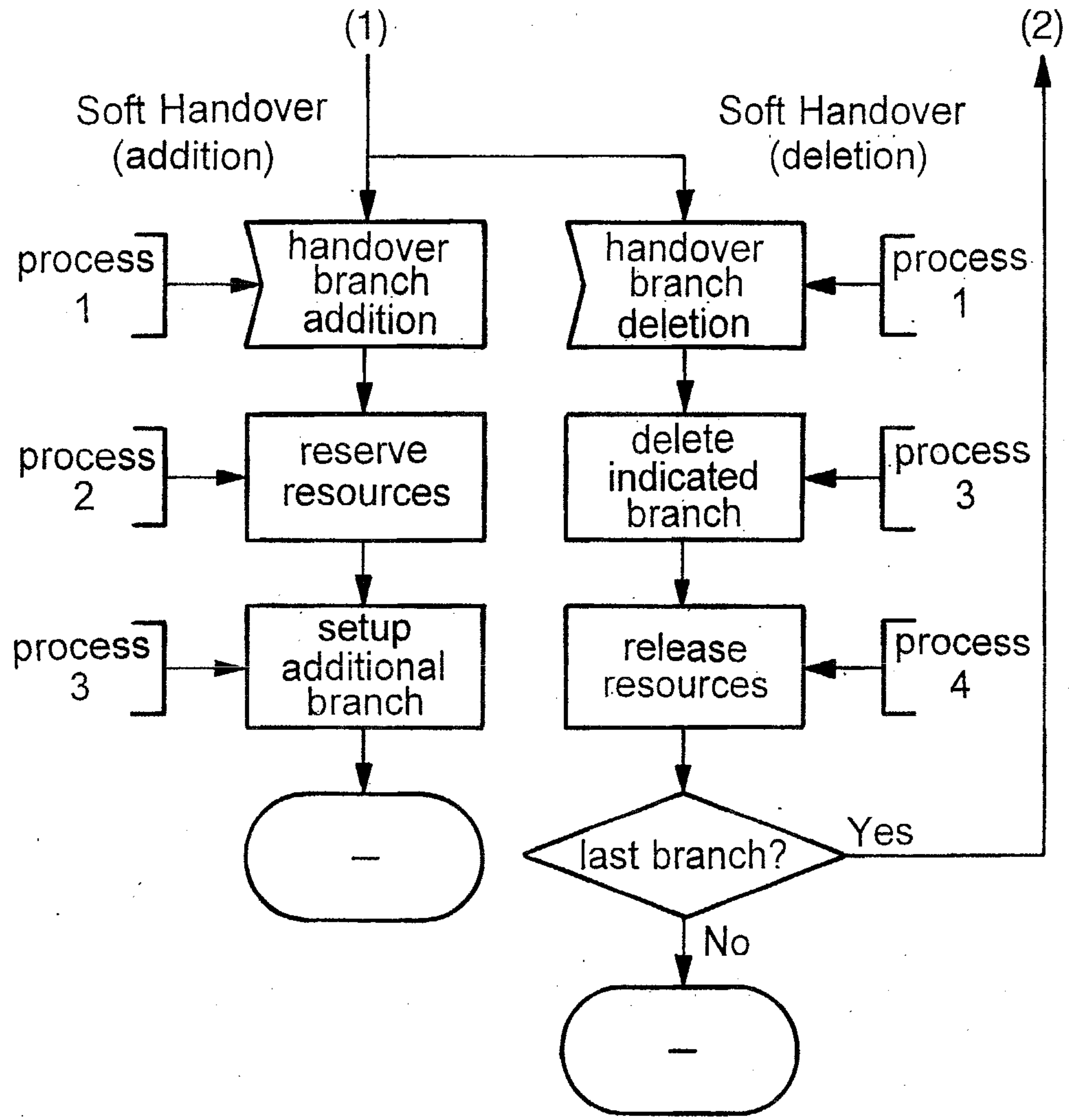
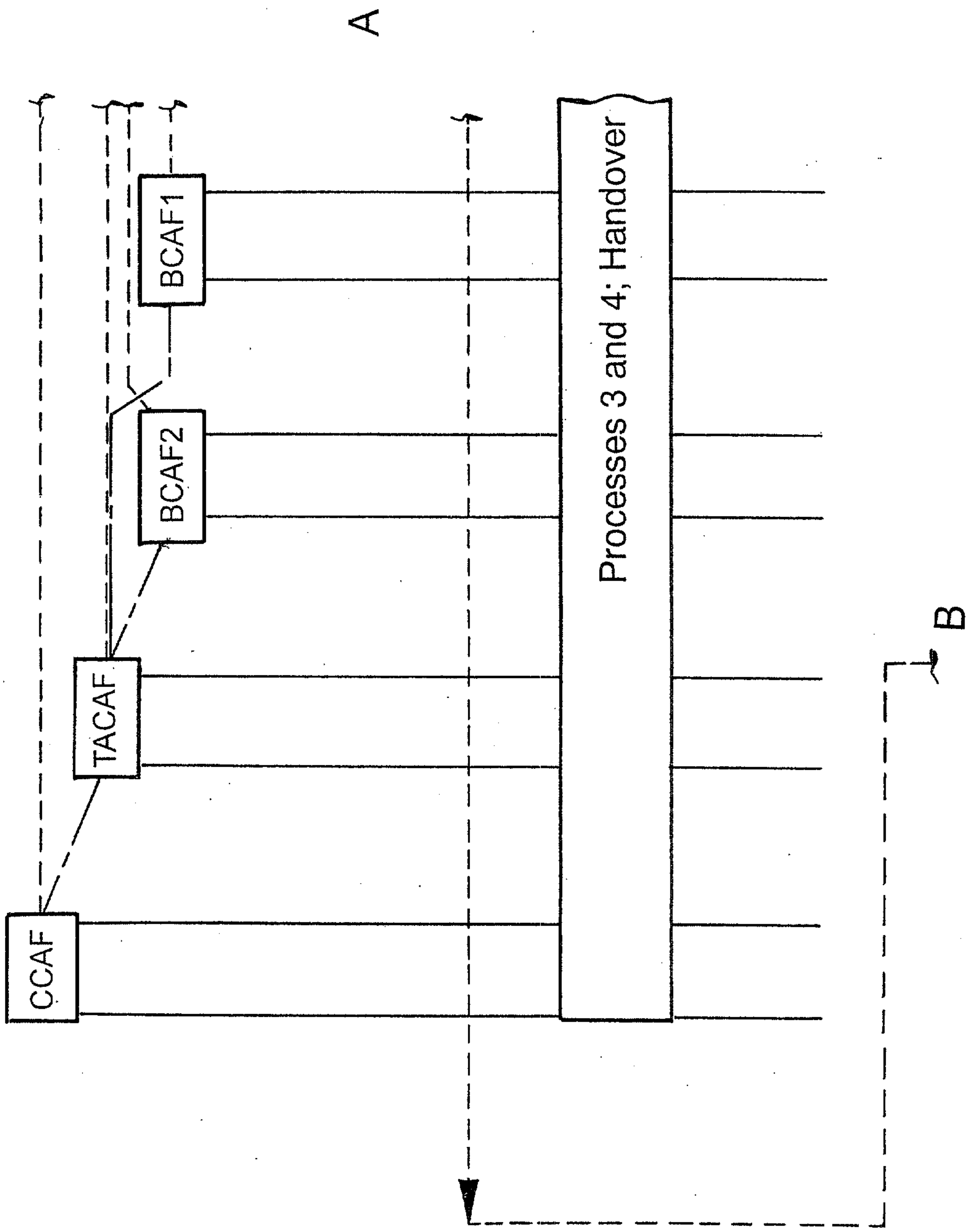
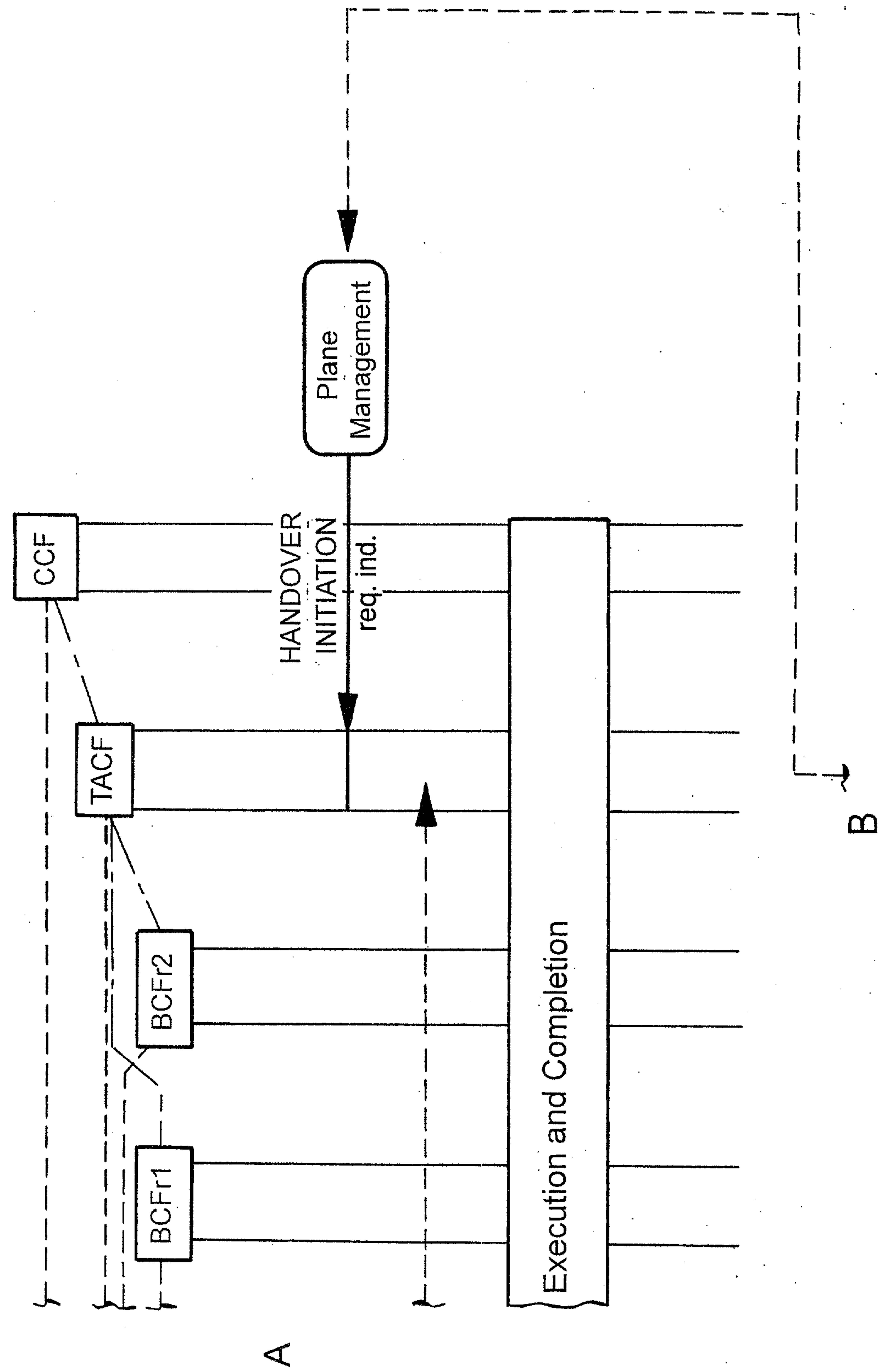


FIG. 36

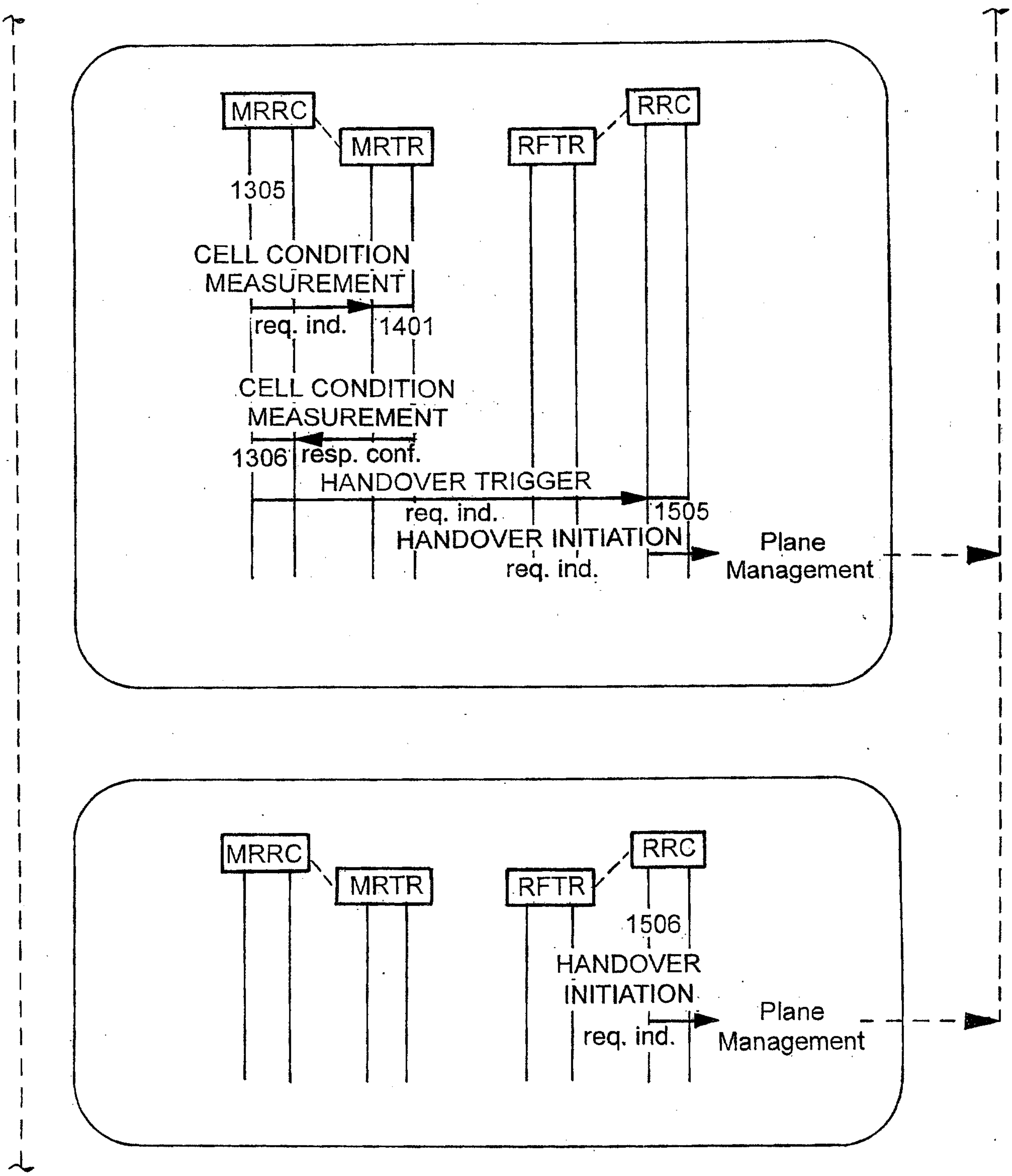


CONTINUED FROM FIG. 36



CONTINUED FROM FIG. 36

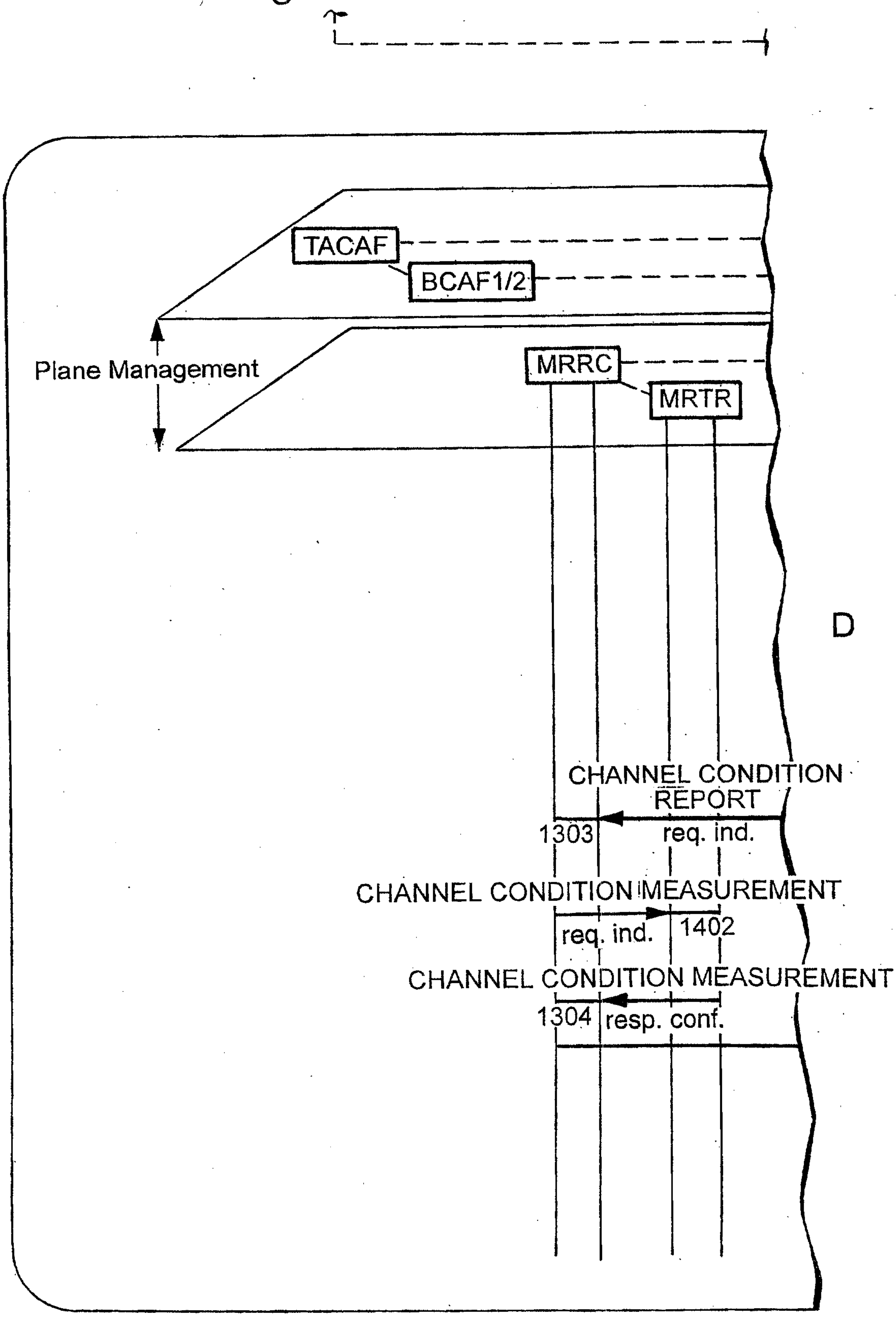
B



C

CONTINUED FROM FIG. 36

C



CONTINUED FROM FIG. 36

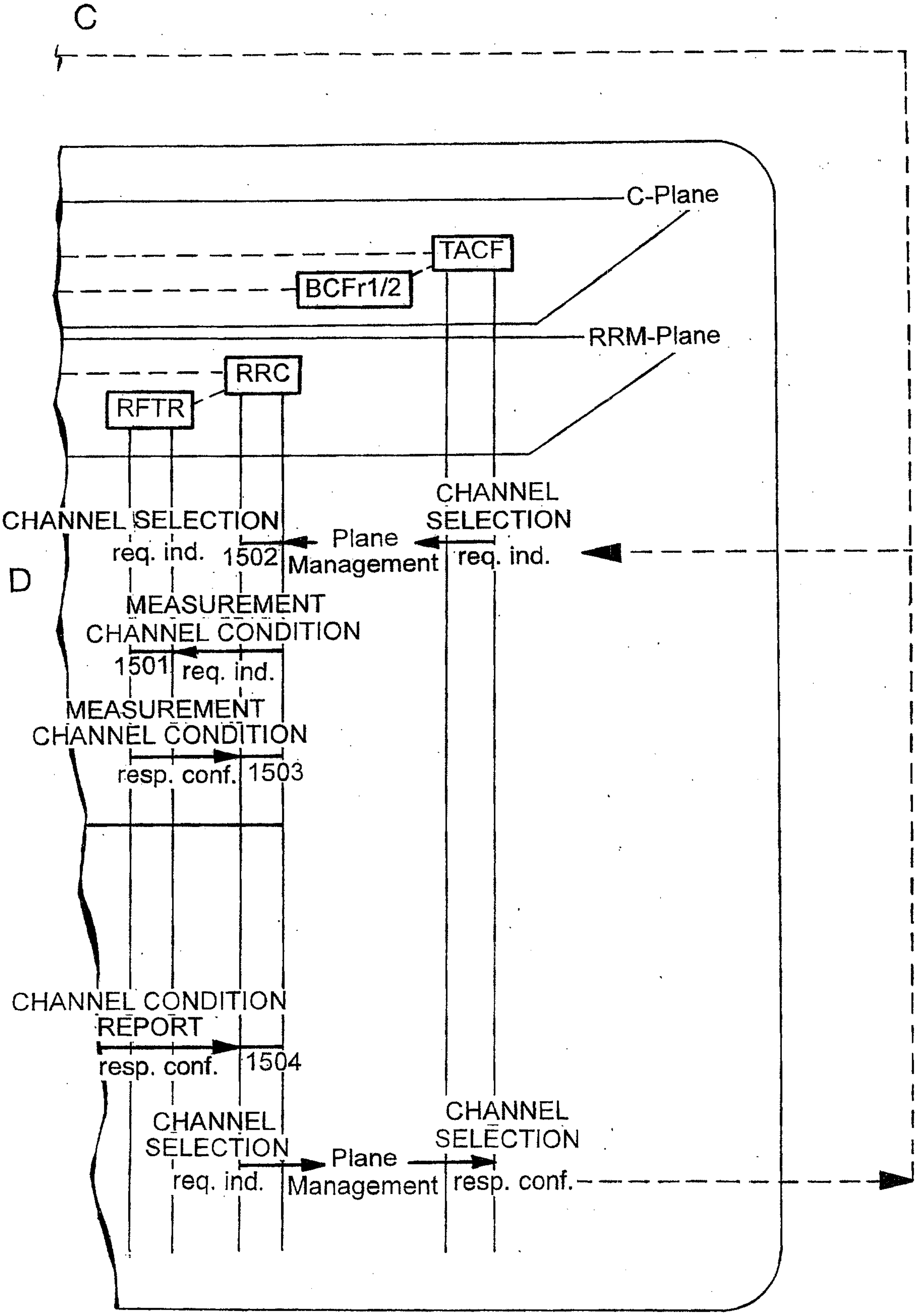


FIG. 37

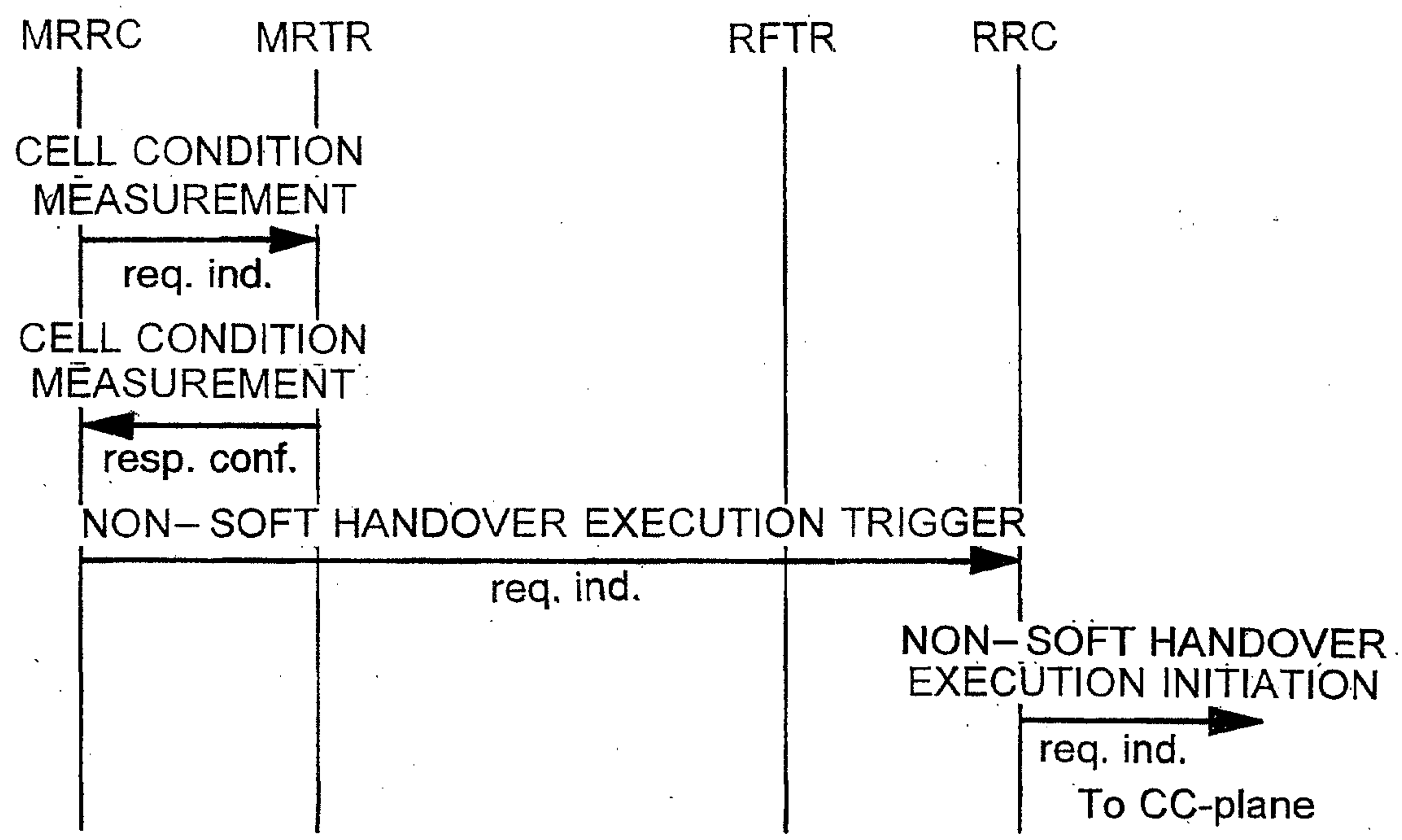

MRRC
MRTR
RFTR
RRC
CELL CONDITION MEASUREMENT
req. ind.
CELL CONDITION MEASUREMENT
resp. conf.
NON-SOFT HANDOVER EXECUTION TRIGGER
req. ind.
NON-SOFT HANDOVER EXECUTION INITIATION
req. ind.
To CC-plane

FIG. 38

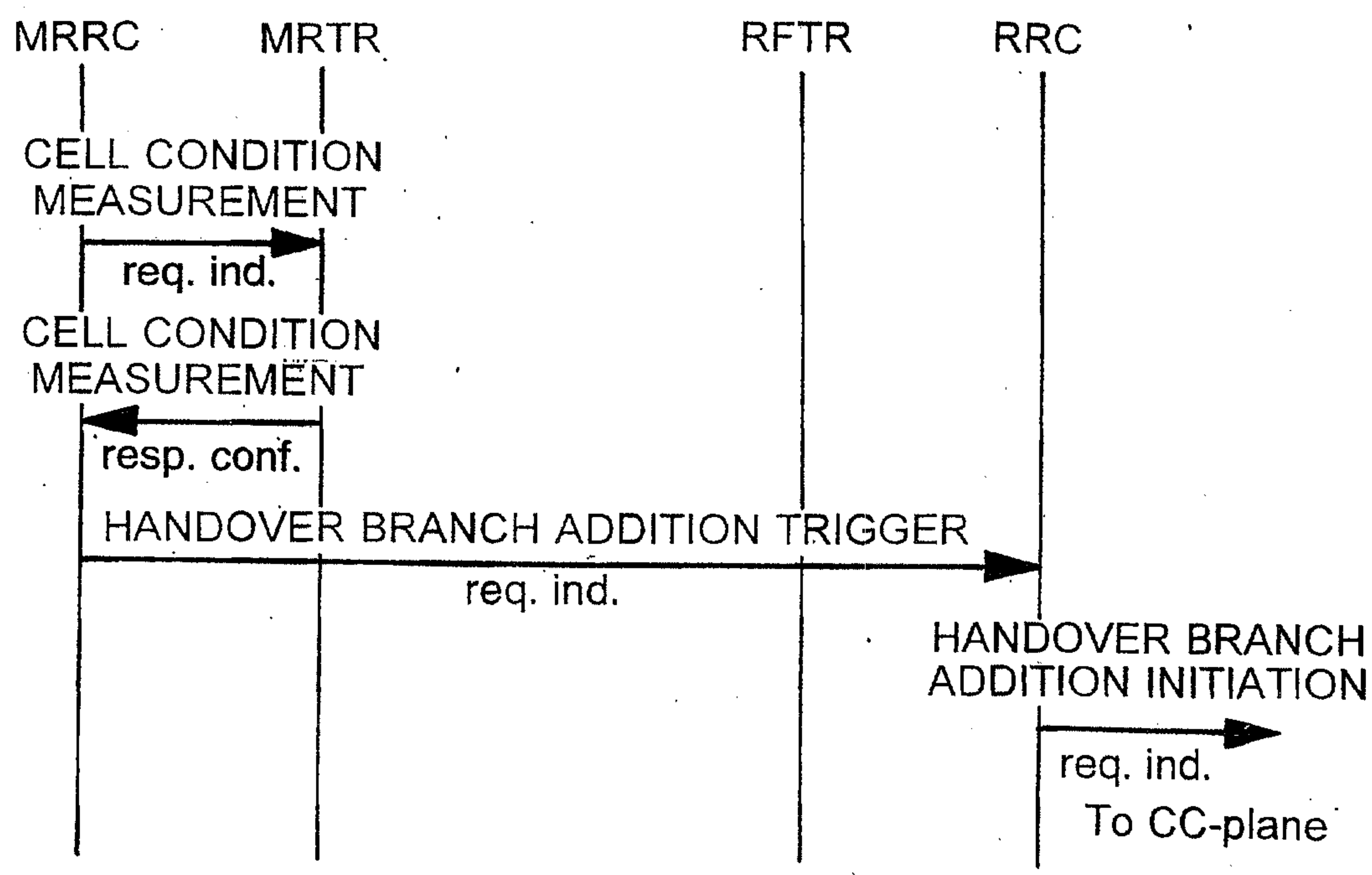

MRRC
MRTR
RFTR
RRC
CELL CONDITION MEASUREMENT
req. ind.
CELL CONDITION MEASUREMENT
resp. conf.
HANDOVER BRANCH ADDITION TRIGGER
req. ind.
HANDOVER BRANCH ADDITION INITIATION
req. ind.
To CC-plane

FIG. 39

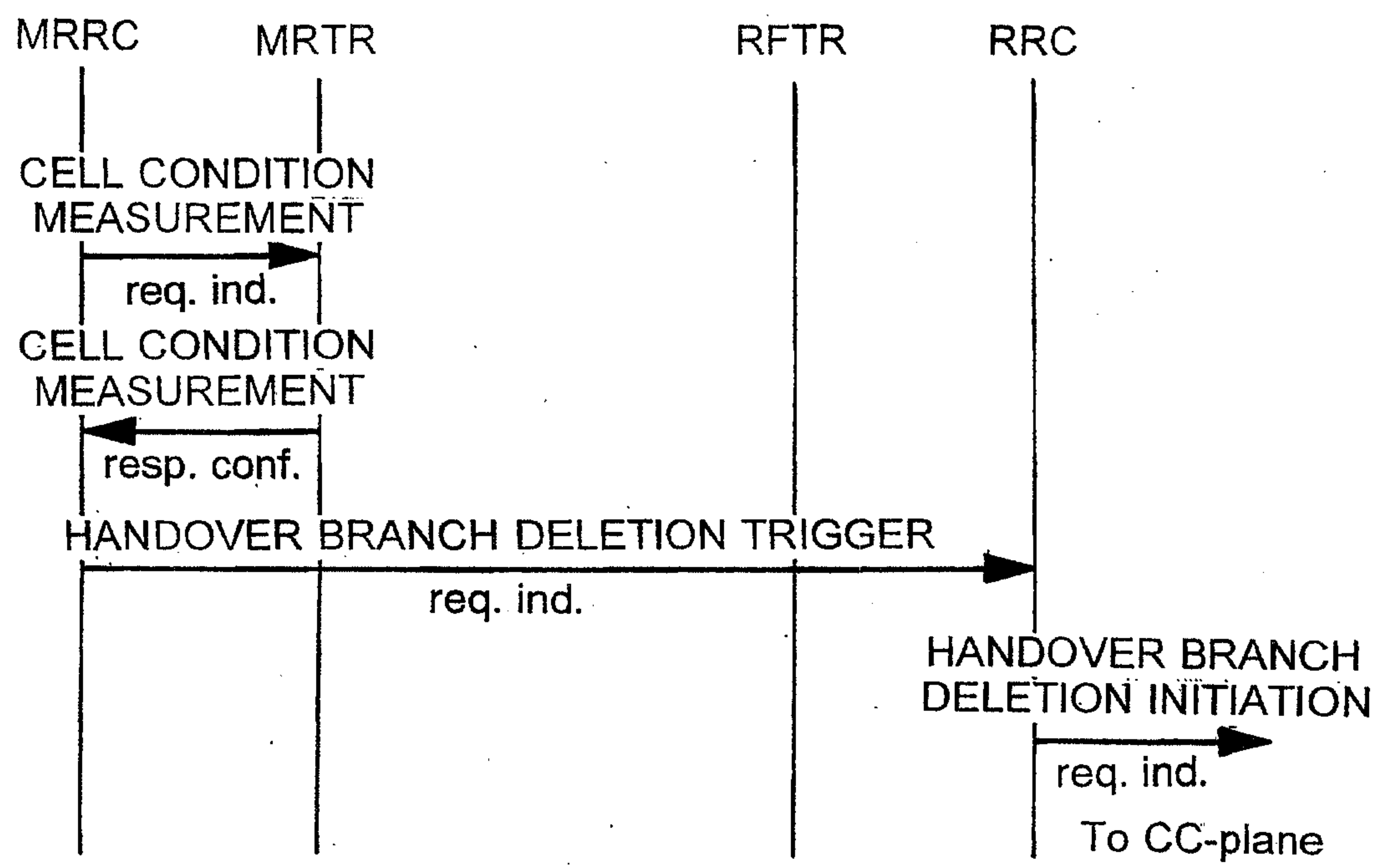

MRRC
MRTR
RFTR
RRC
CELL CONDITION MEASUREMENT
req. ind.
CELL CONDITION MEASUREMENT
resp. conf.
HANDOVER BRANCH DELETION TRIGGER
req. ind.
HANDOVER BRANCH DELETION INITIATION
req. ind.
To CC-plane

FIG. 40

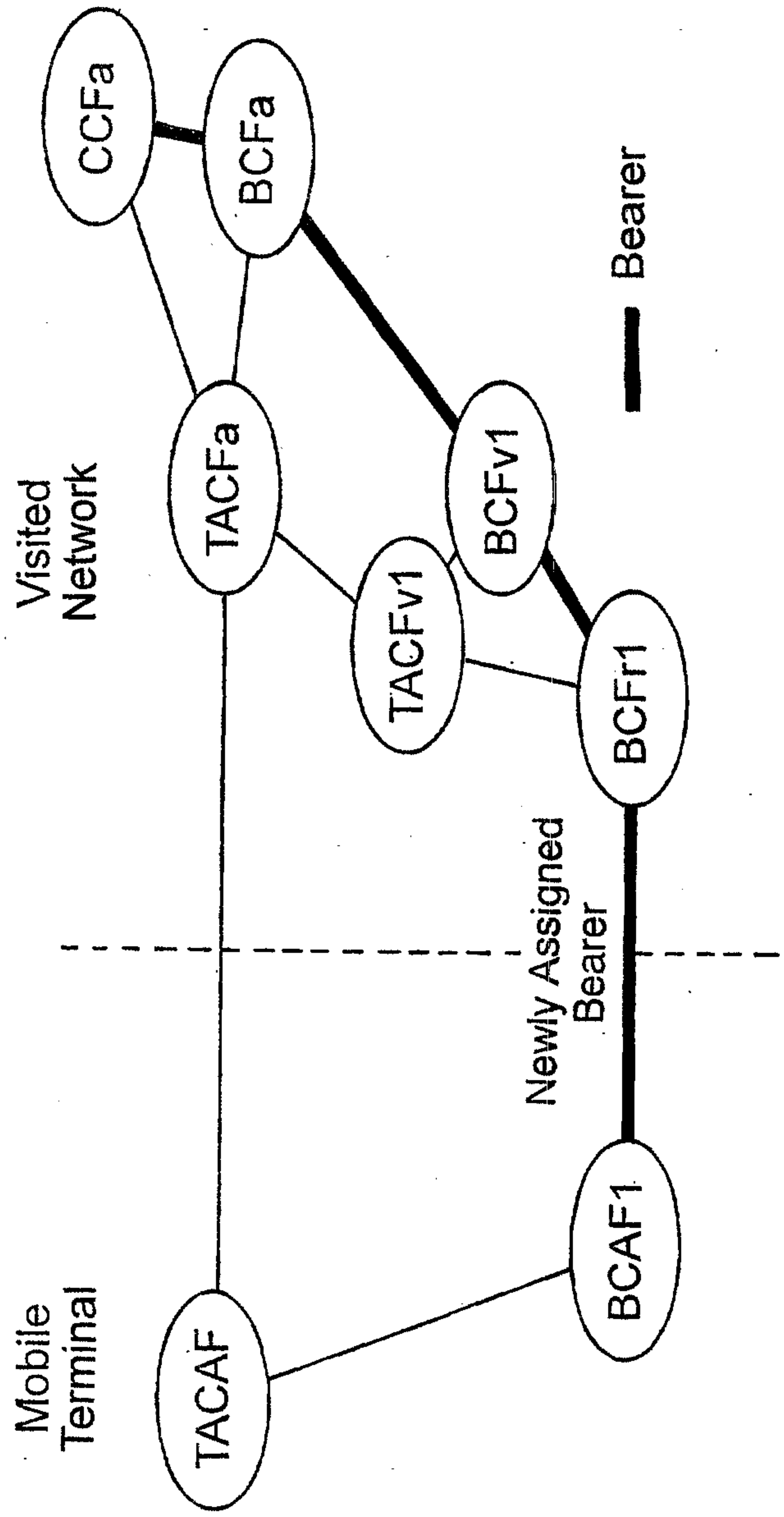
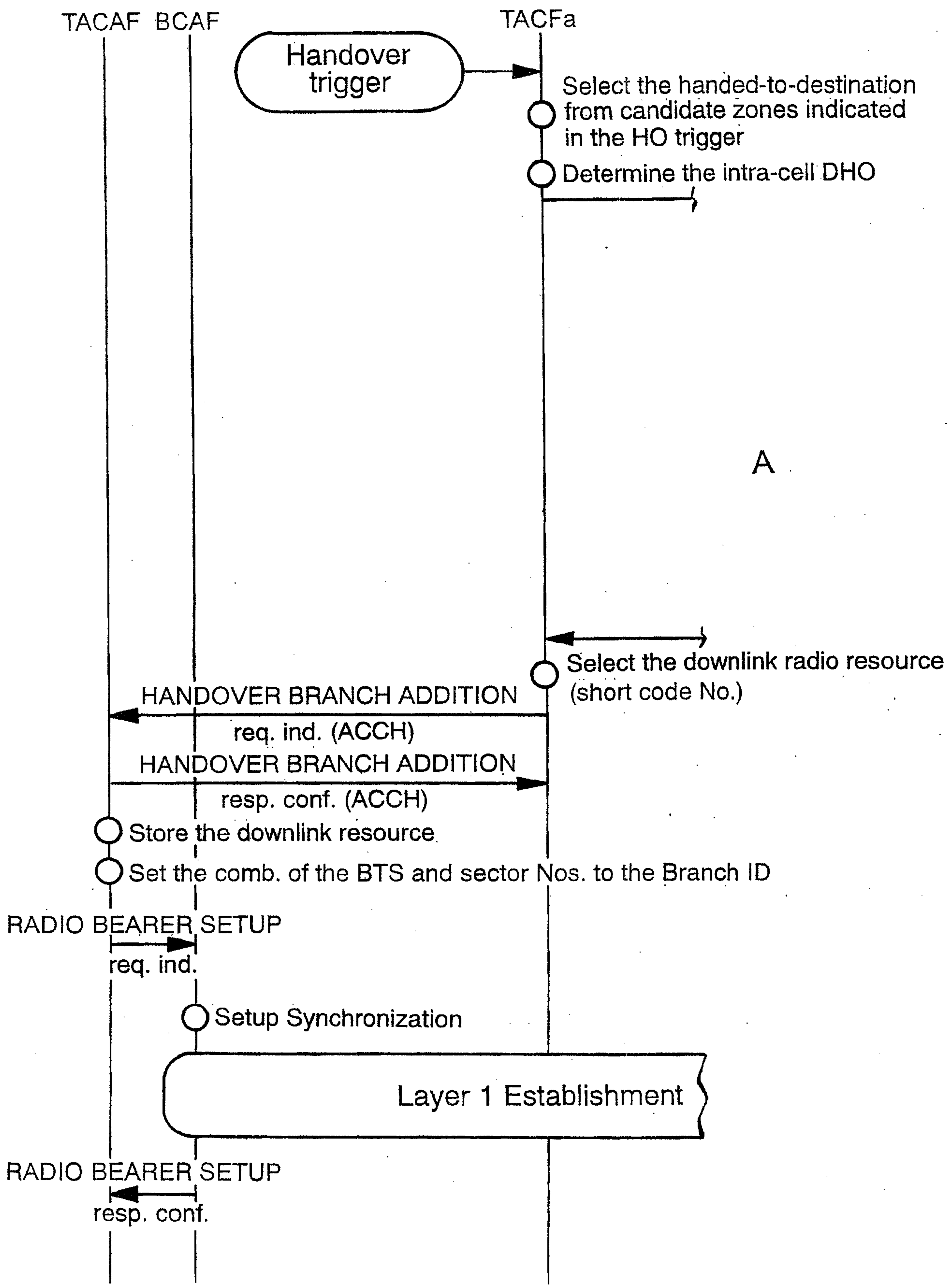

Mobile Terminal
Visited Network
TACAF
TACFa
CCFa
BCFa
TACFv1
BCFv1
BCFr1
BCAF1
Newly Assigned Bearer
Bearer

FIG. 41


TACAF
BCAF
TACFa
Handover trigger
Select the handed-to-destination from candidate zones indicated in the HO trigger
Determine the intra-cell DHO
A
Select the downlink radio resource (short code No.)
HANDOVER BRANCH ADDITION
req. ind. (ACCH)
HANDOVER BRANCH ADDITION
resp. conf. (ACCH)
Store the downlink resource
Set the comb. of the BTS and sector Nos. to the Branch ID
RADIO BEARER SETUP
req. ind.
Setup Synchronization
Layer 1 Establishment
RADIO BEARER SETUP
resp. conf.

CONTINUED FROM FIG. 41

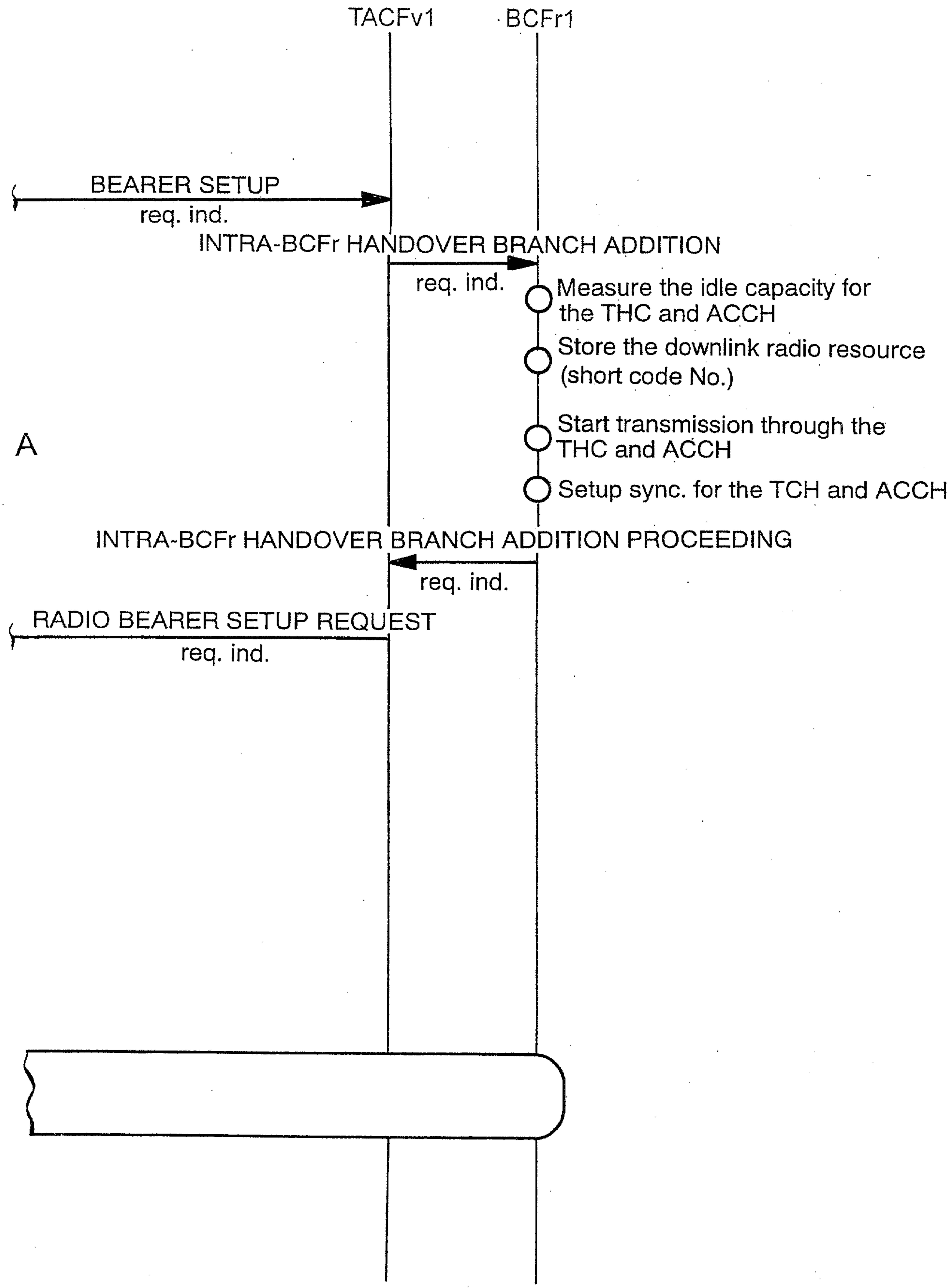


FIG. 42

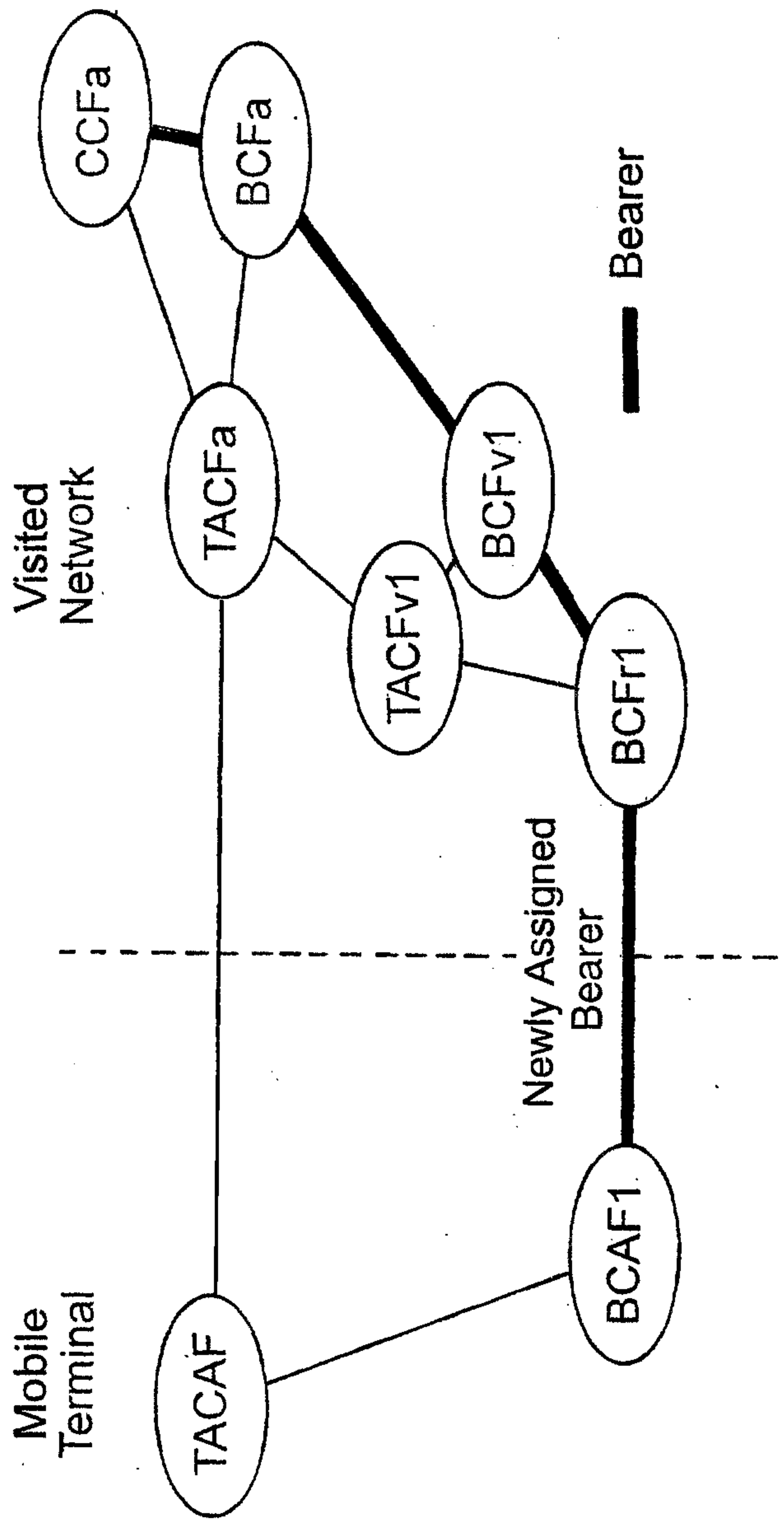
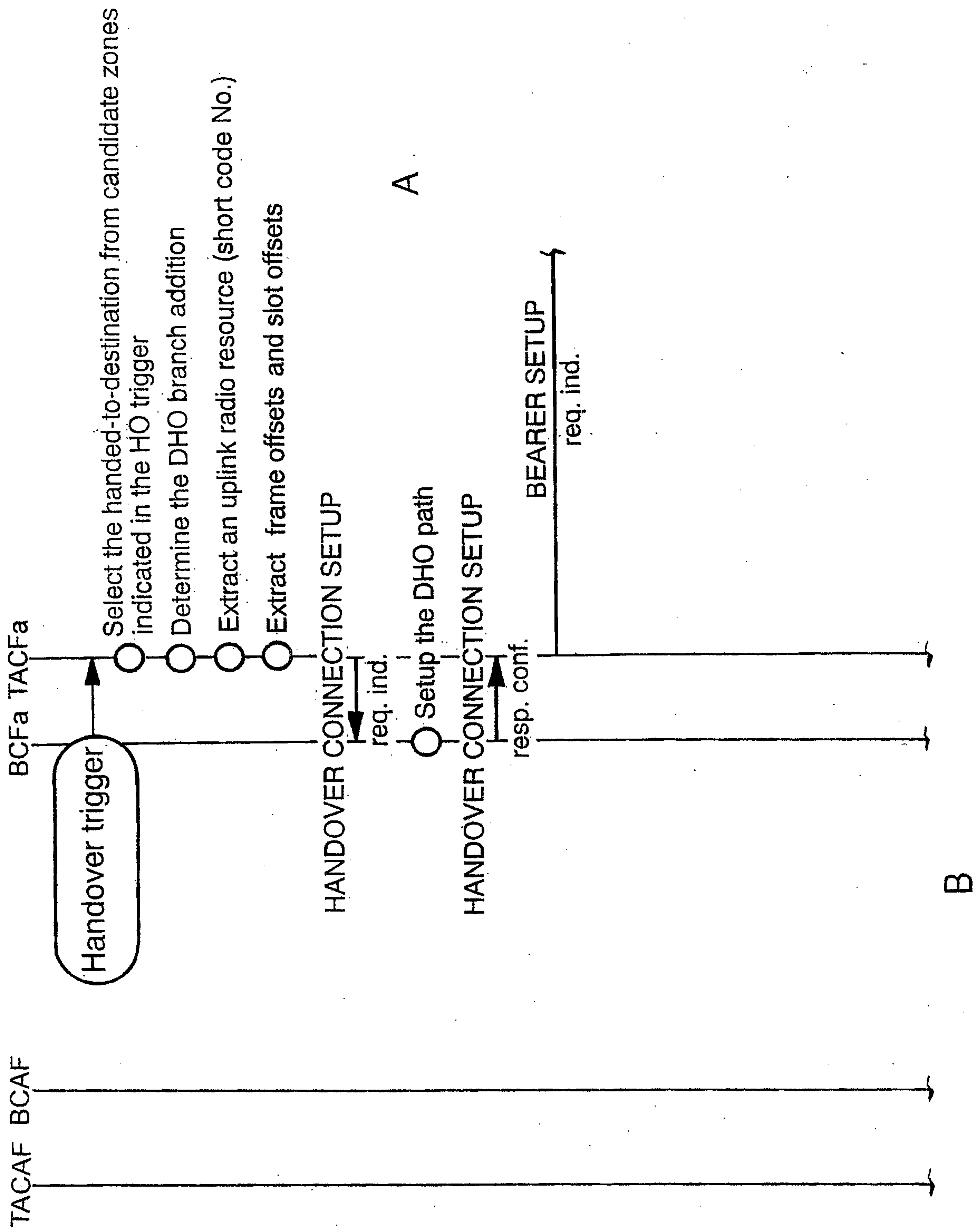
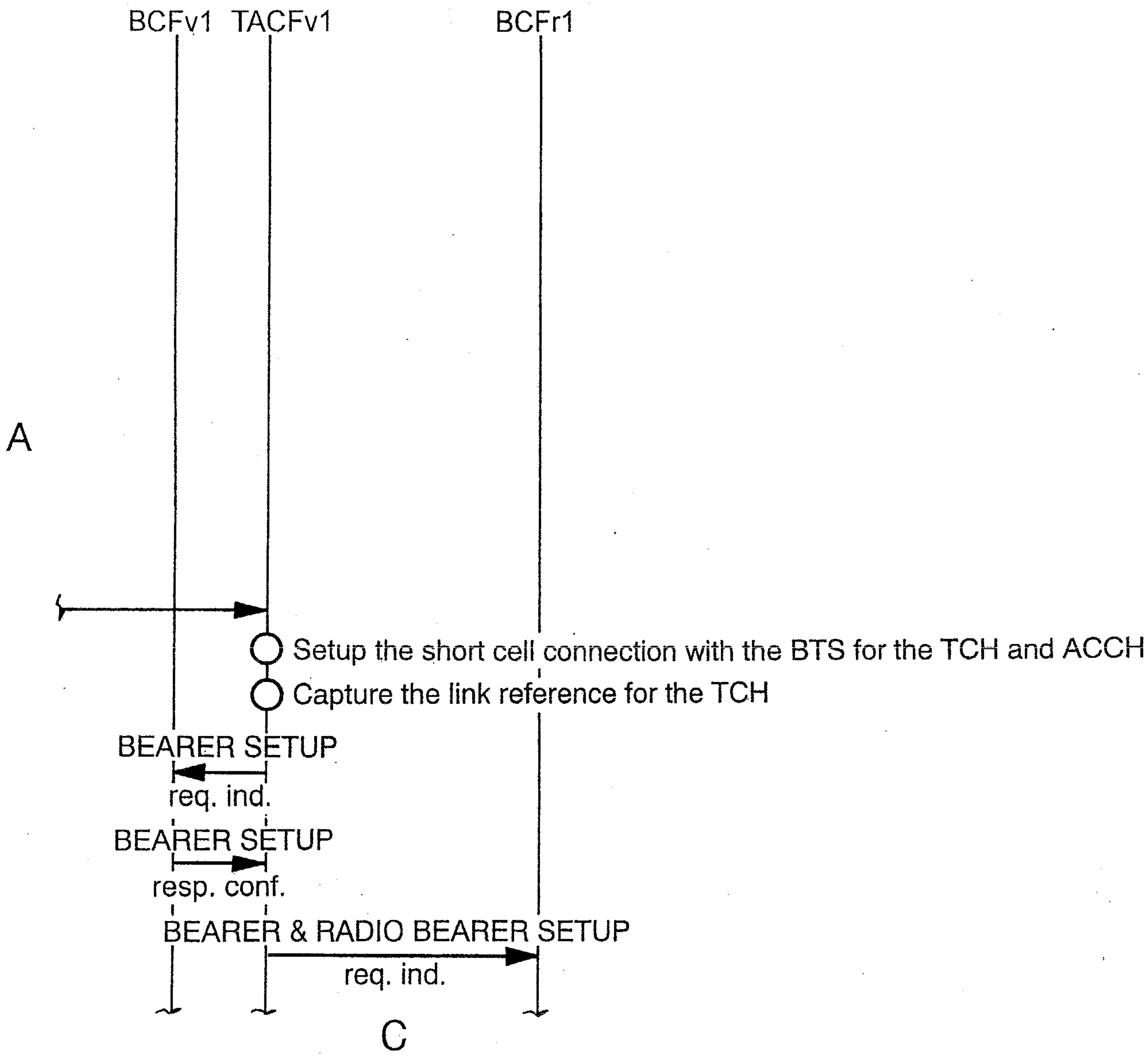

Visited Network
Mobile Terminal
CCFa
BCFa
TACFa
BCFv1
TACFv1
BCFr1
Newly Assigned Bearer
BCAF1
TACAF
Bearer

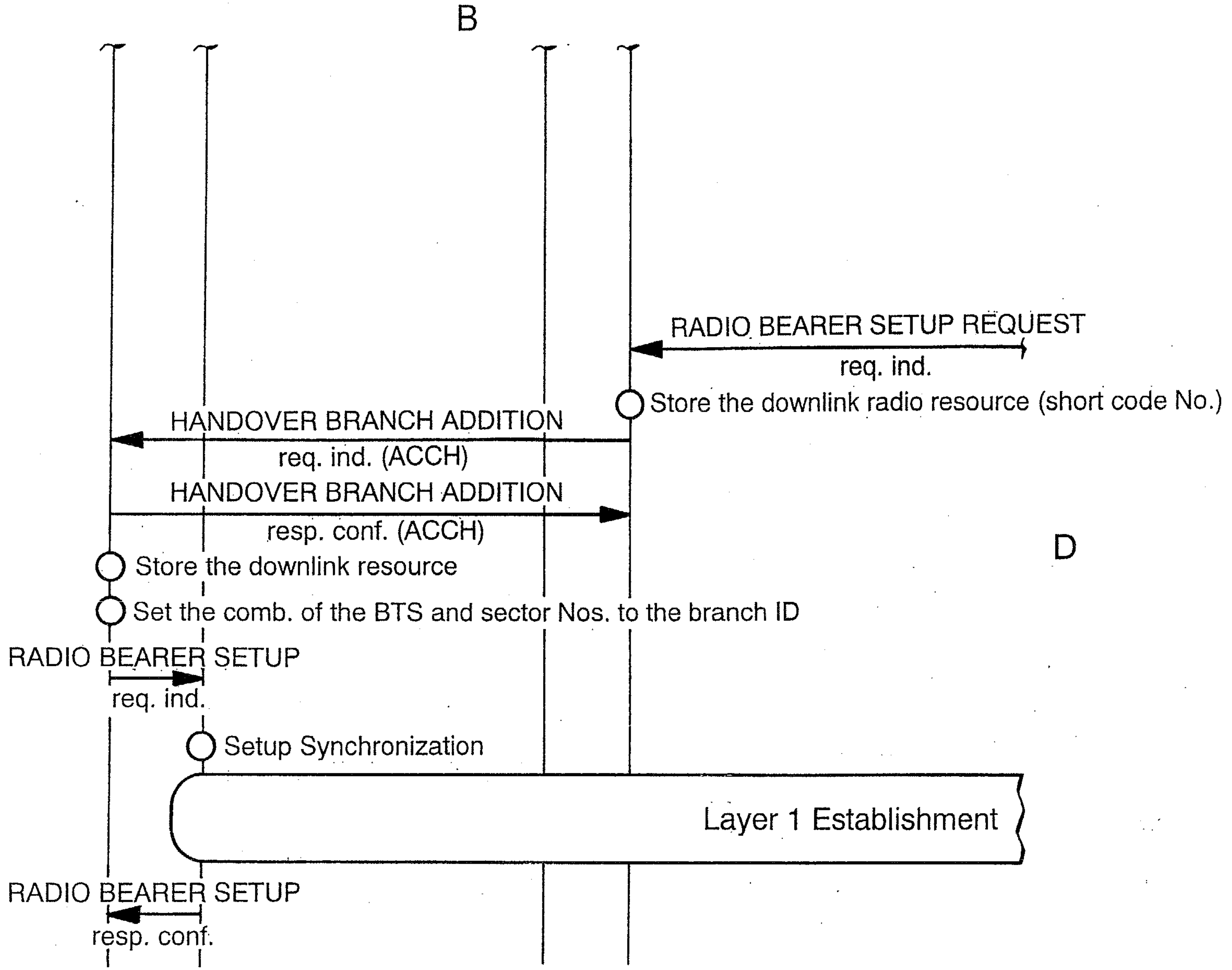
FIG. 43


BCFa
TACFa
TACAF
BCAF
Handover trigger
Select the handed-to-destination from candidate zones indicated in the HO trigger
Determine the DHO branch addition
Extract an uplink radio resource (short code No.)
Extract frame offsets and slot offsets
HANDOVER CONNECTION SETUP
req. ind.
Setup the DHO path
HANDOVER CONNECTION SETUP
resp. conf.
BEARER SETUP
req. ind.
A
B

CONTINUED FROM FIG. 43



CONTINUED FROM FIG. 43



CONTINUED FROM FIG. 43

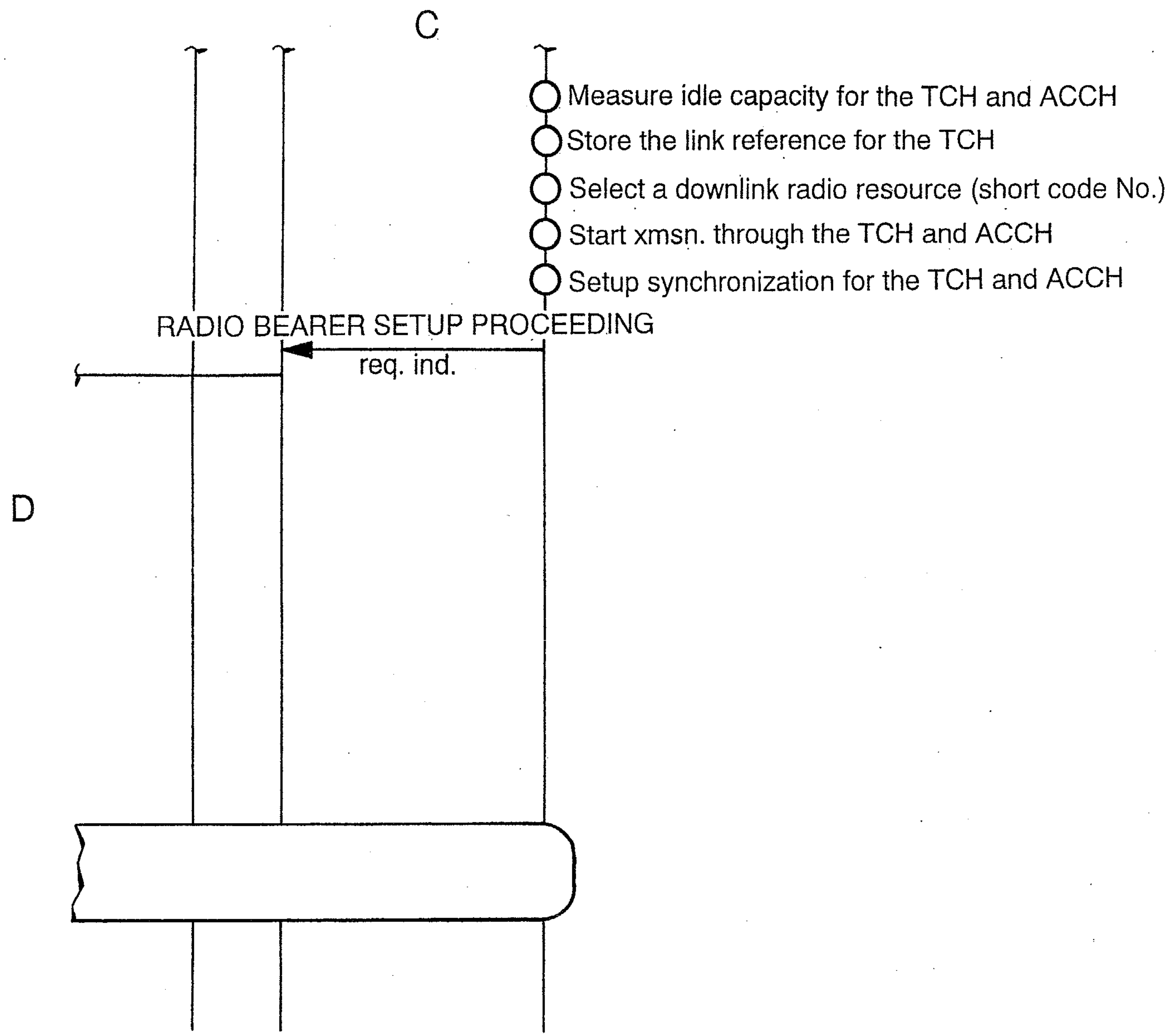


FIG. 44

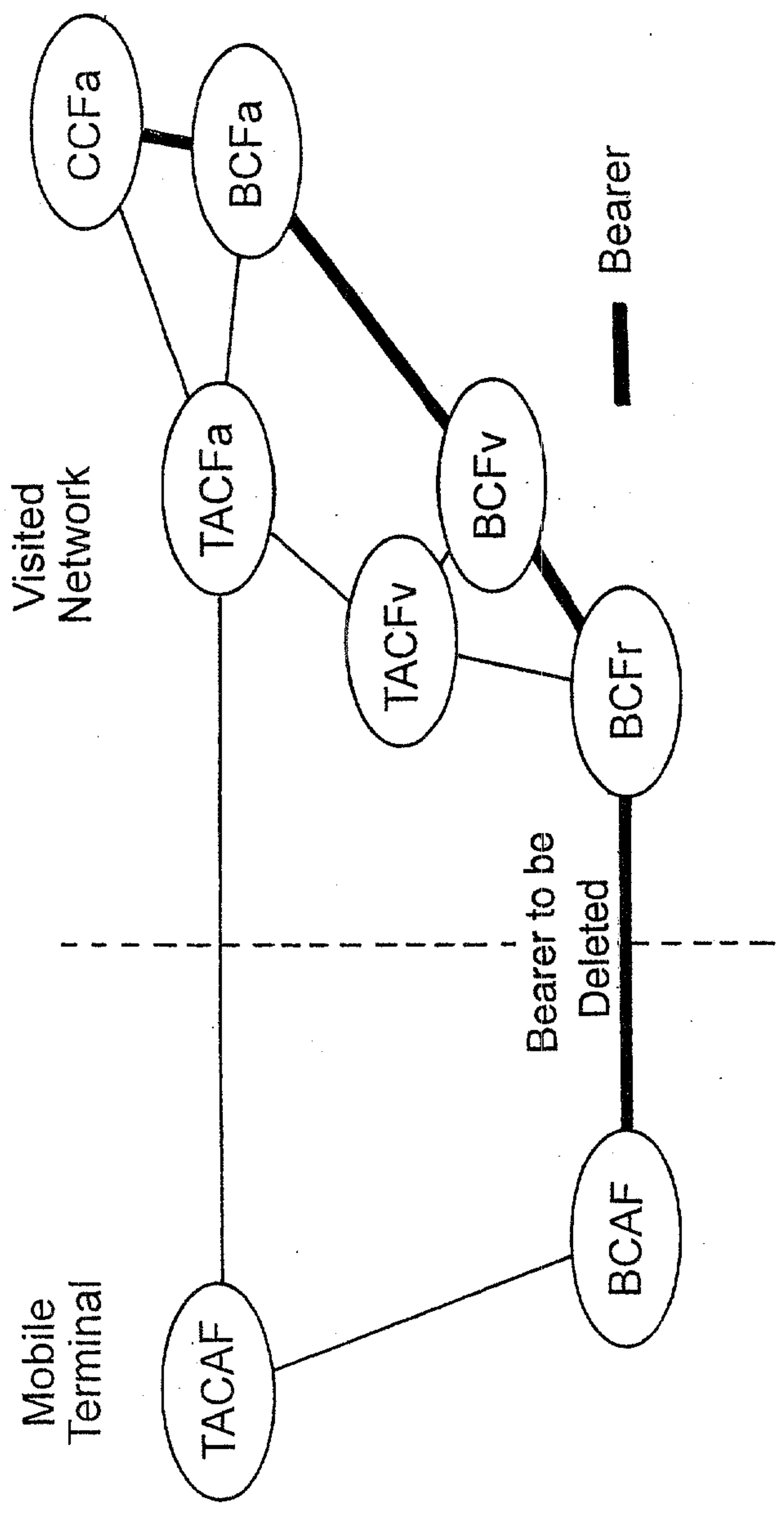
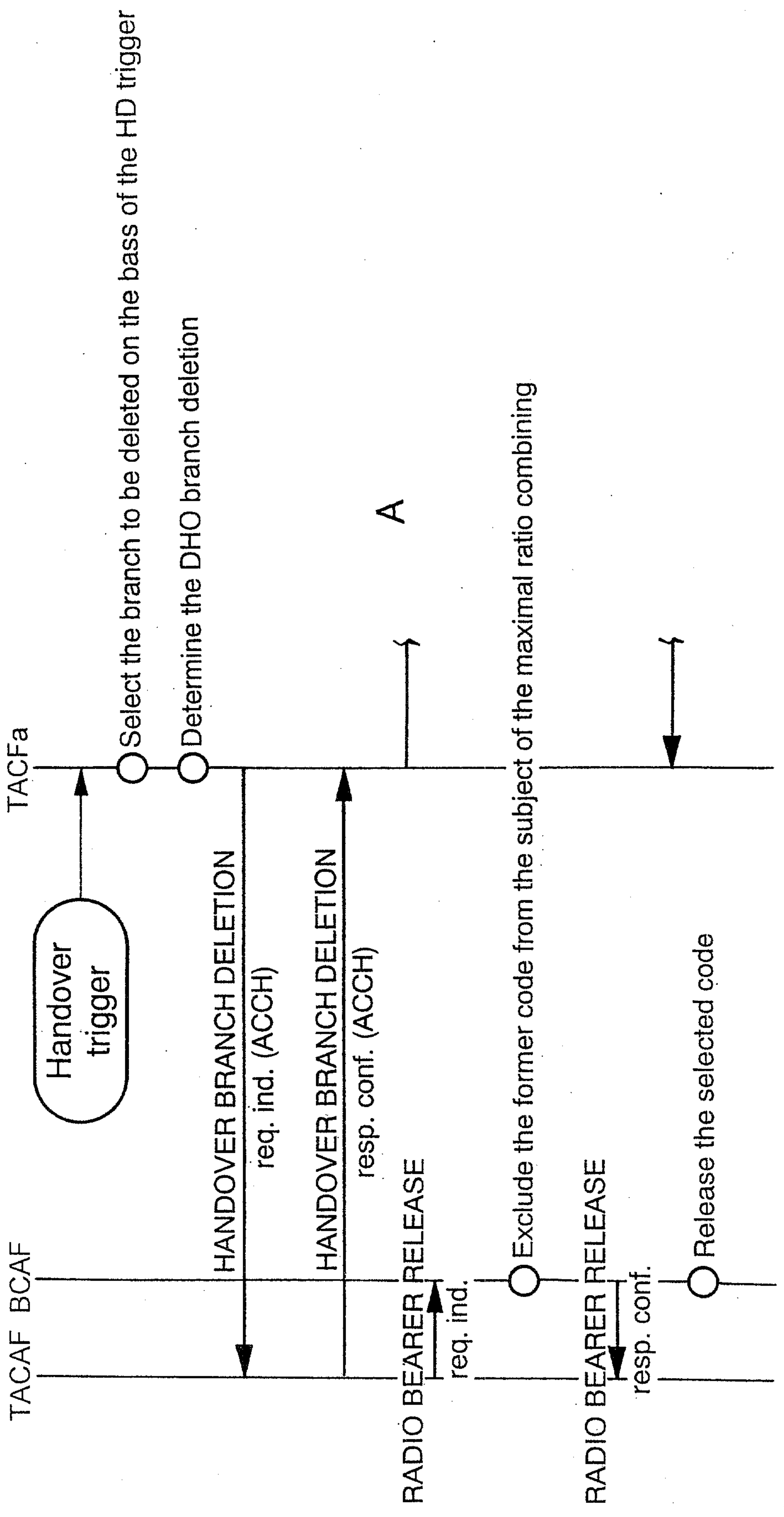

Mobile Terminal
Visited Network
TACAF
BCAF
TACFa
TACFv
BCFr
BCFv
BCFa
CCFa
Bearer to be Deleted
Bearer

FIG. 45


TACAF
BCAF
TACFa
Handover trigger
Select the branch to be deleted on the bass of the HD trigger
Determine the DHO branch deletion
HANDOVER BRANCH DELETION
req. ind. (ACCH)
HANDOVER BRANCH DELETION
resp. conf. (ACCH)
A
RADIO BEARER RELEASE
req. ind.
Exclude the former code from the subject of the maximal ratio combining
RADIO BEARER RELEASE
resp. conf.
Release the selected code

CONTINUED FROM FIG. 45

A

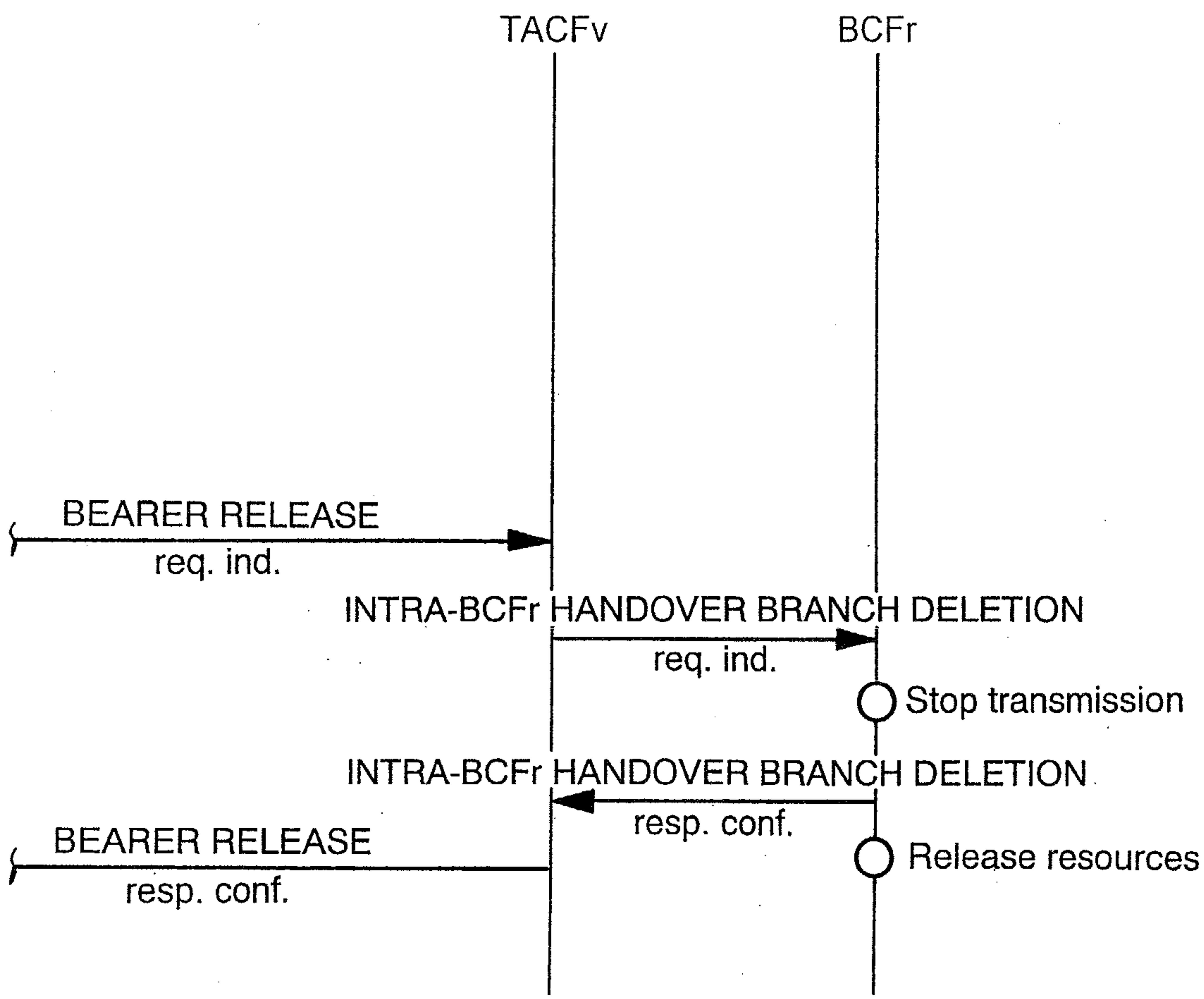


FIG. 46

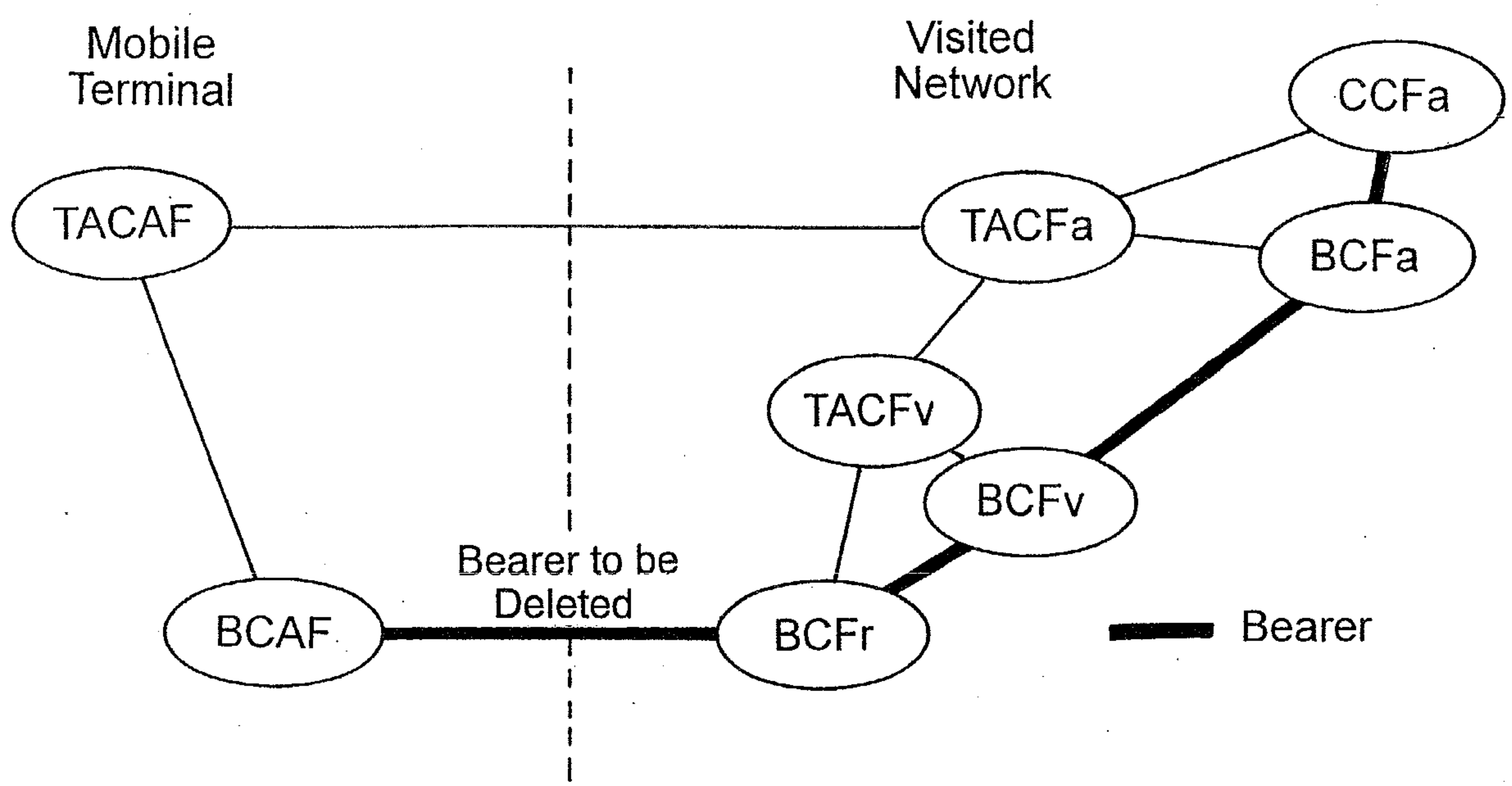
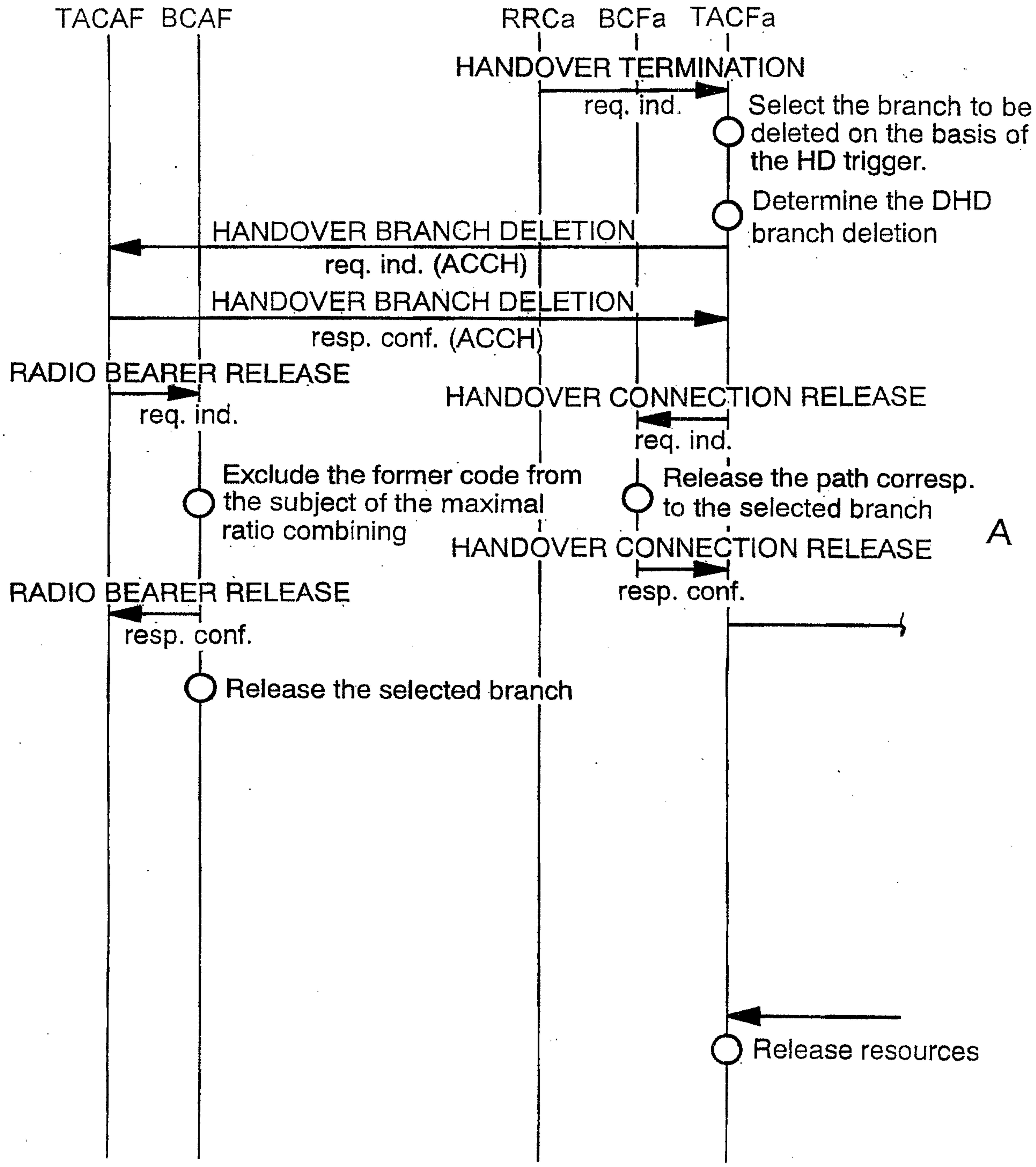

Mobile
Terminal
Visited
Network
TACAF
BCAF
TACFa
CCFa
BCFa
TACFv
BCFv
BCFr
Bearer to be
Deleted
Bearer

FIG. 47


TACAF
BCAF
RRCa
BCFa
TACFa
HANDOVER TERMINATION
req. ind.
Select the branch to be deleted on the basis of the HD trigger.
Determine the DHD branch deletion
HANDOVER BRANCH DELETION
req. ind. (ACCH)
HANDOVER BRANCH DELETION
resp. conf. (ACCH)
RADIO BEARER RELEASE
req. ind.
HANDOVER CONNECTION RELEASE
req. ind.
Exclude the former code from the subject of the maximal ratio combining
Release the path corresp. to the selected branch
A
HANDOVER CONNECTION RELEASE
resp. conf.
RADIO BEARER RELEASE
resp. conf.
Release the selected branch
Release resources

CONTINUED FROM FIG. 47

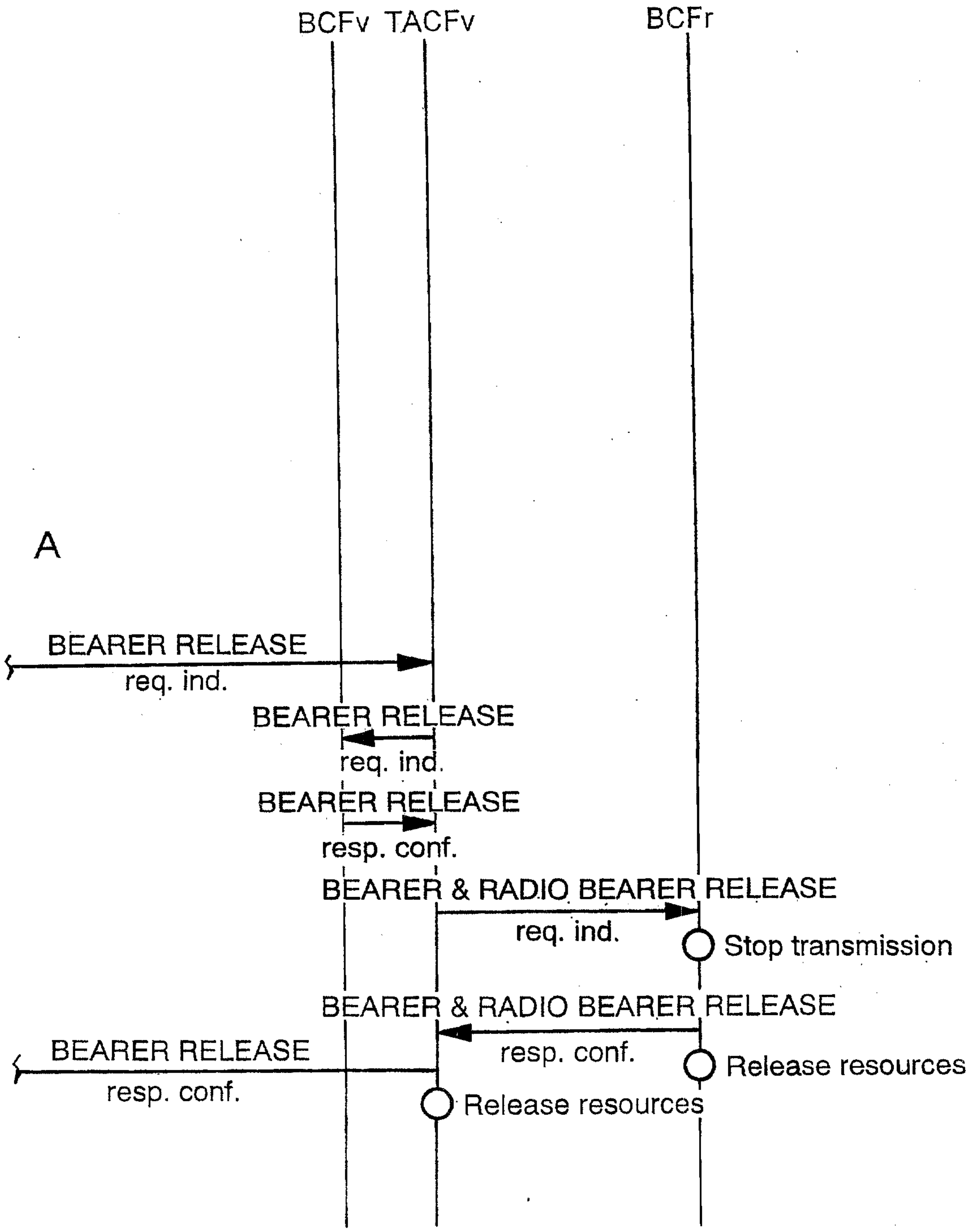


FIG. 48

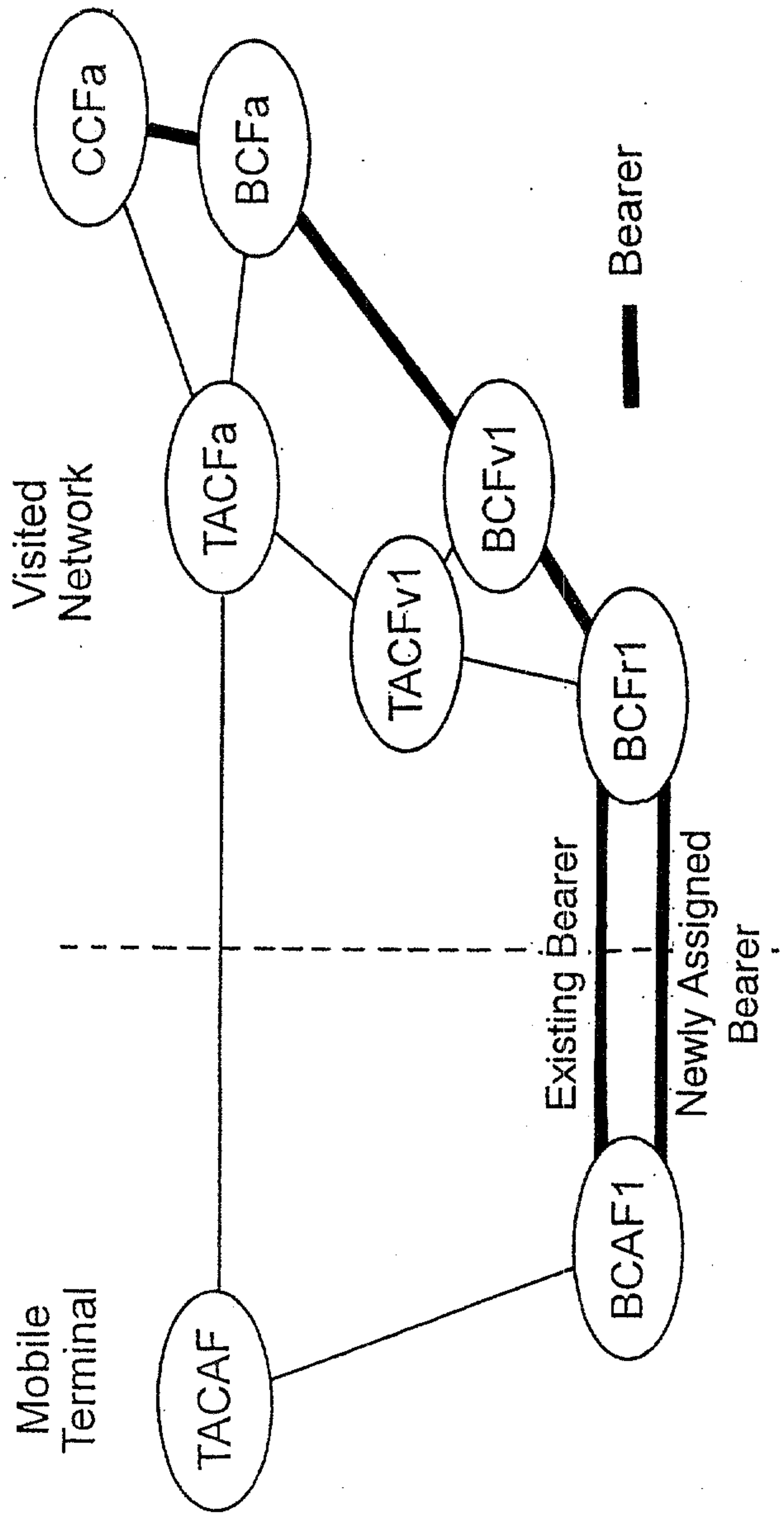
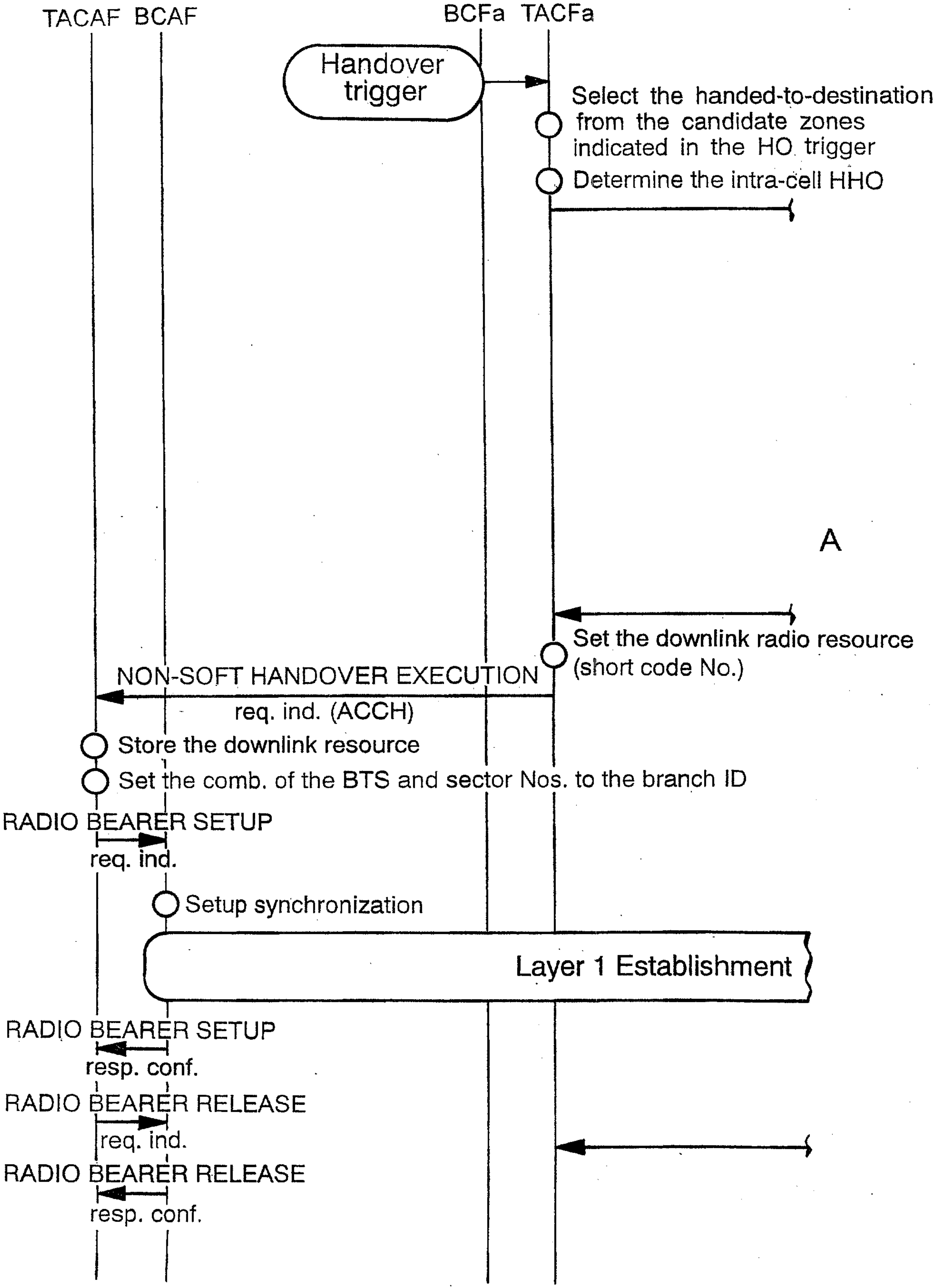

Mobile Terminal
Visited Network
TACAF
TACFa
CCFa
BCFa
BCFv1
TACFv1
BCFr1
BCAF1
Existing Bearer
Newly Assigned Bearer
Bearer

FIG. 49


TACAF
BCAF
BCFa
TACFa
Handover trigger
Select the handed-to-destination from the candidate zones indicated in the HO trigger
Determine the intra-cell HHO
A
Set the downlink radio resource (short code No.)
NON-SOFT HANDOVER EXECUTION
req. ind. (ACCH)
Store the downlink resource
Set the comb. of the BTS and sector Nos. to the branch ID
RADIO BEARER SETUP
req. ind.
Setup synchronization
Layer 1 Establishment
RADIO BEARER SETUP
resp. conf.
RADIO BEARER RELEASE
req. ind.
RADIO BEARER RELEASE
resp. conf.

CONTINUED FROM FIG. 49

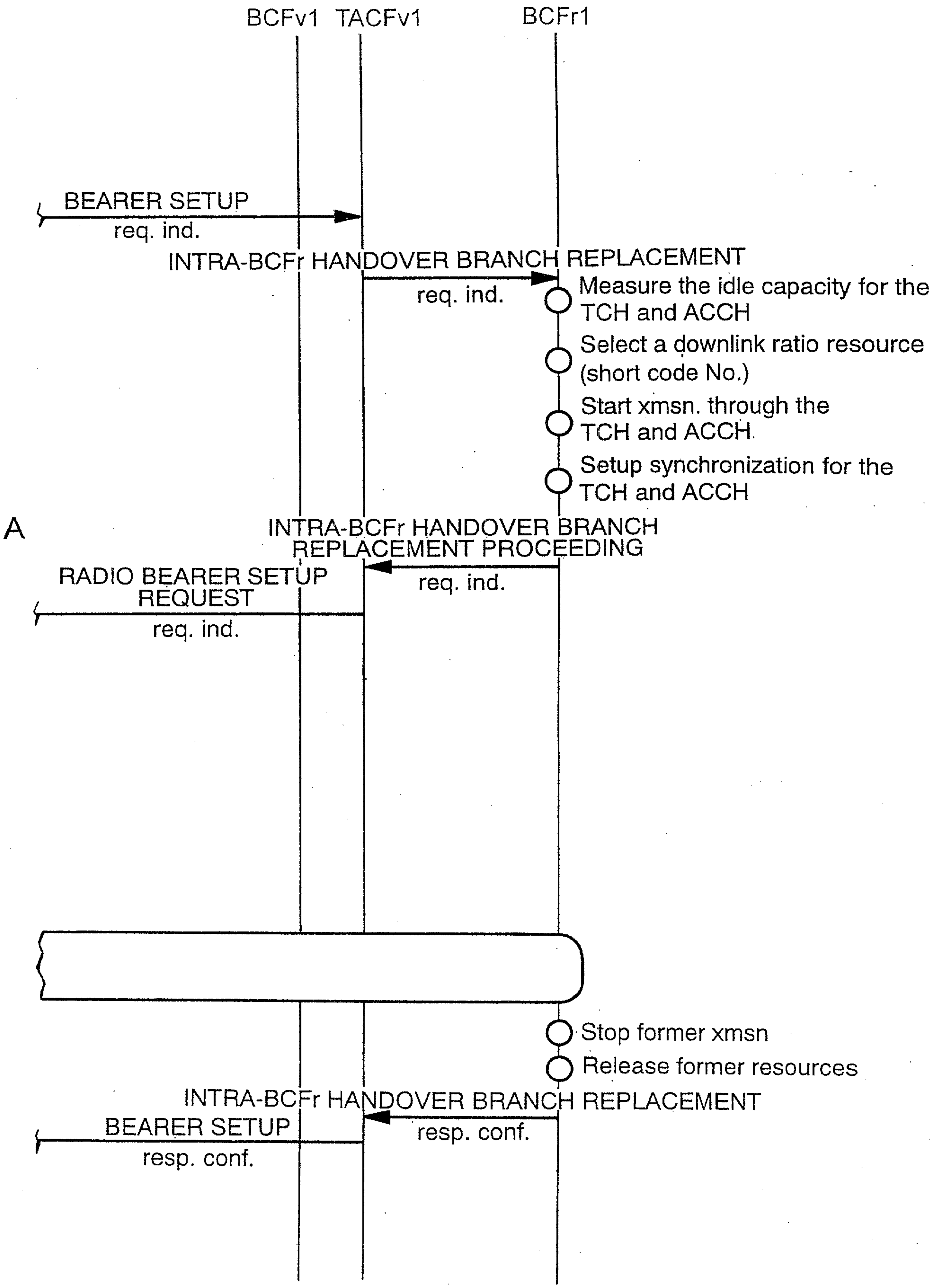


FIG. 50

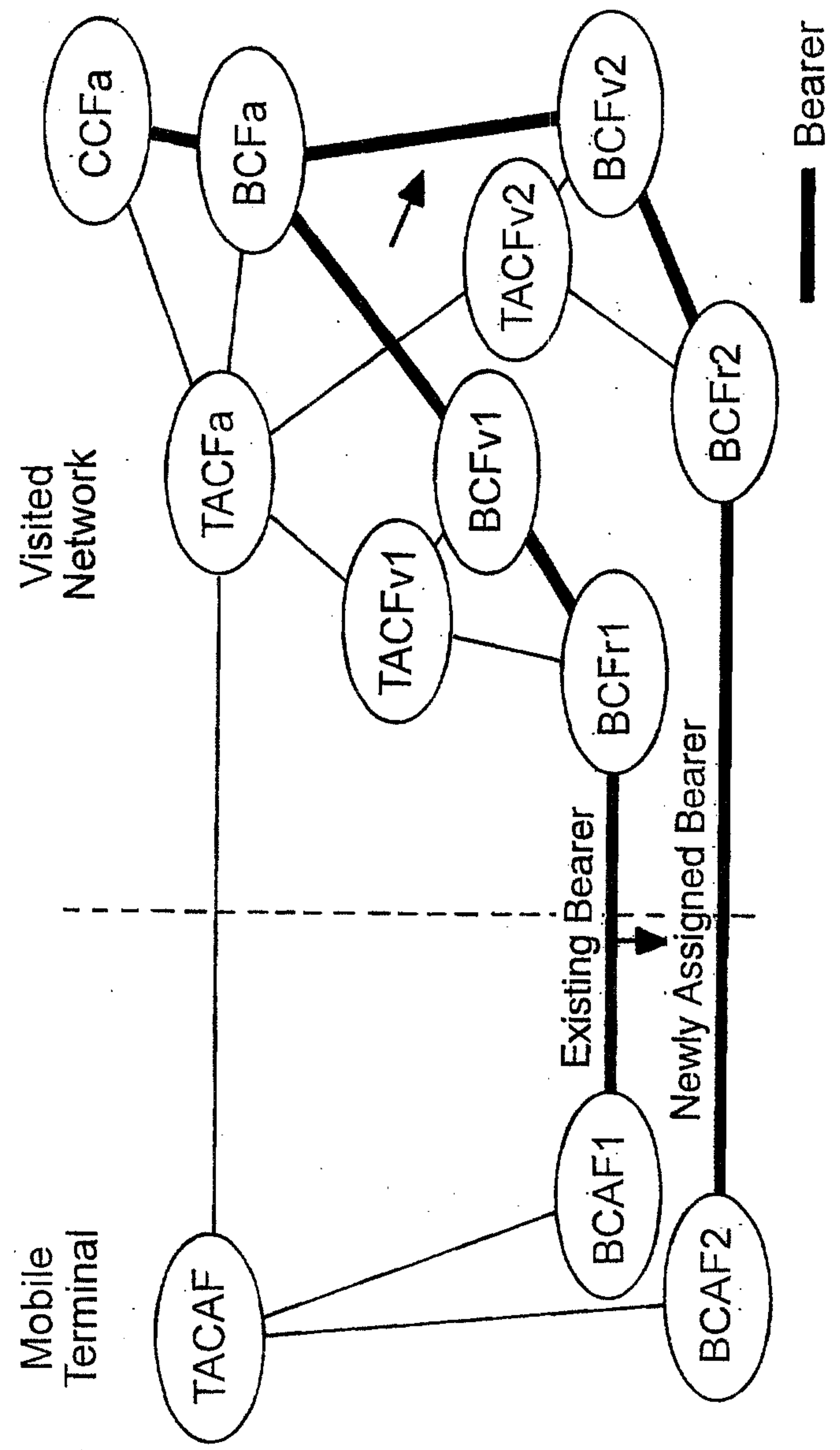
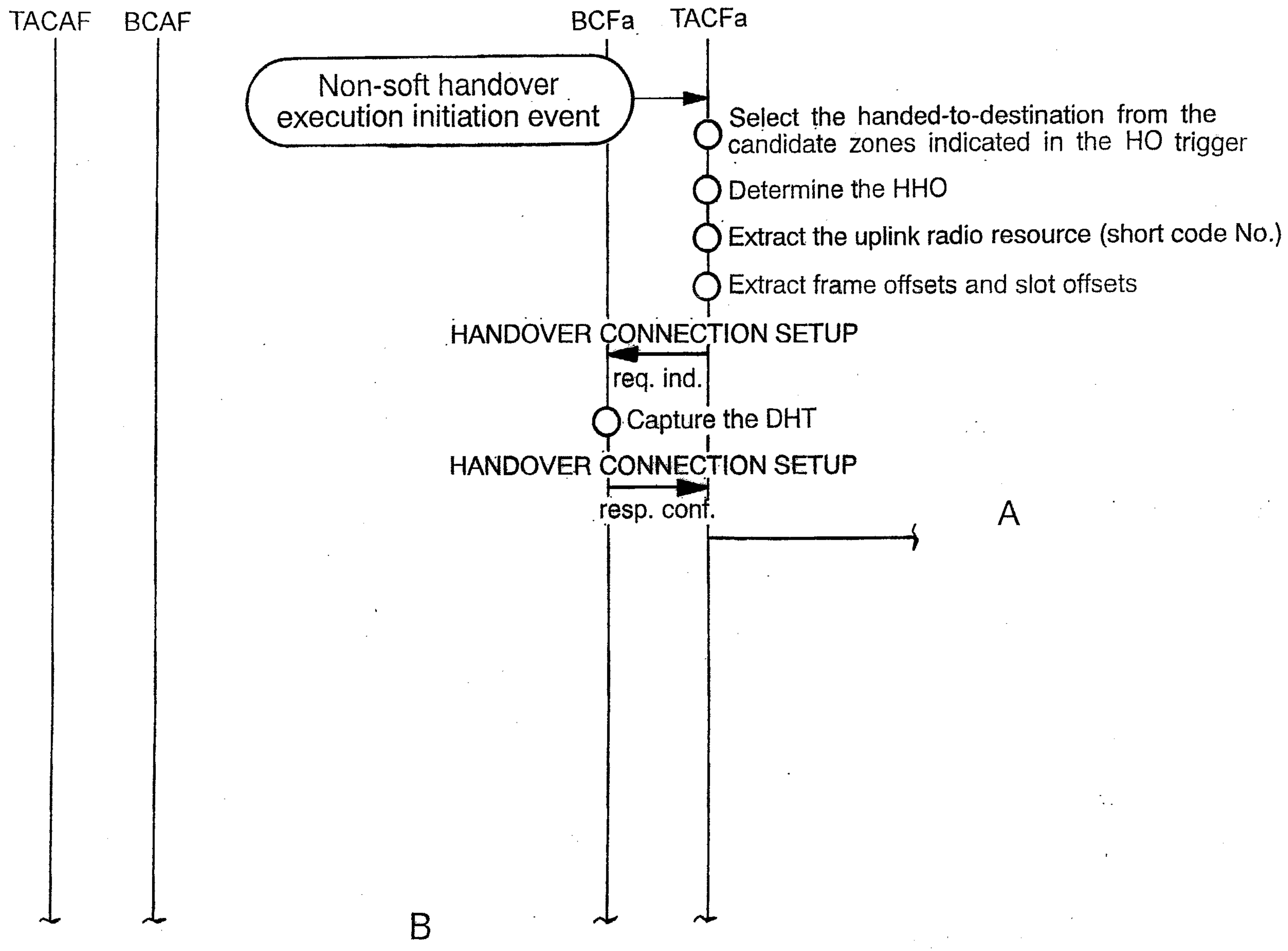
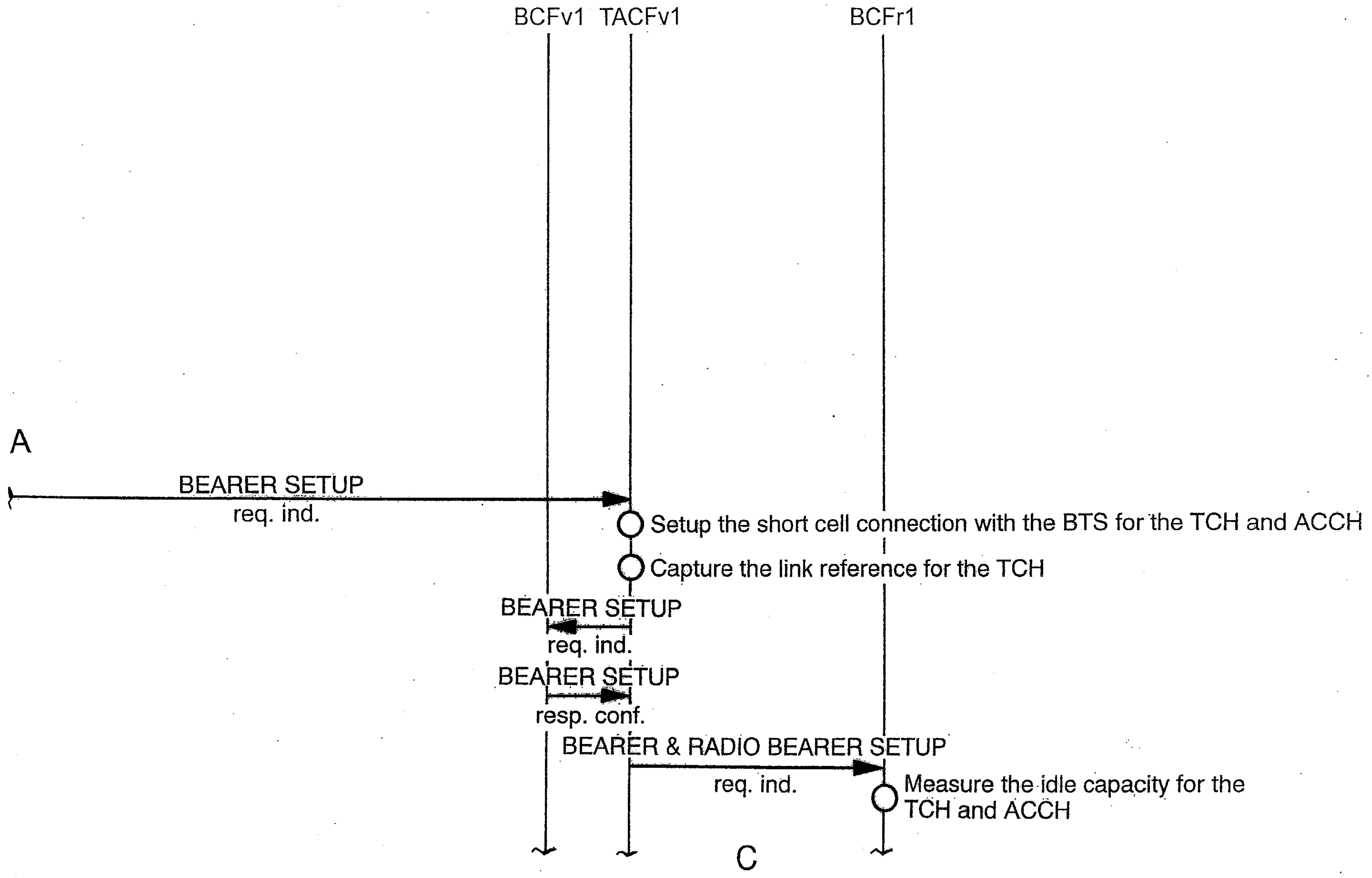

Mobile Terminal
Visited Network
TACAF
BCAF1
BCAF2
TACFa
TACFv1
TACFv2
BCFr1
BCFr2
BCFv1
BCFv2
BCFa
CCFa
Existing Bearer
Newly Assigned Bearer
Bearer

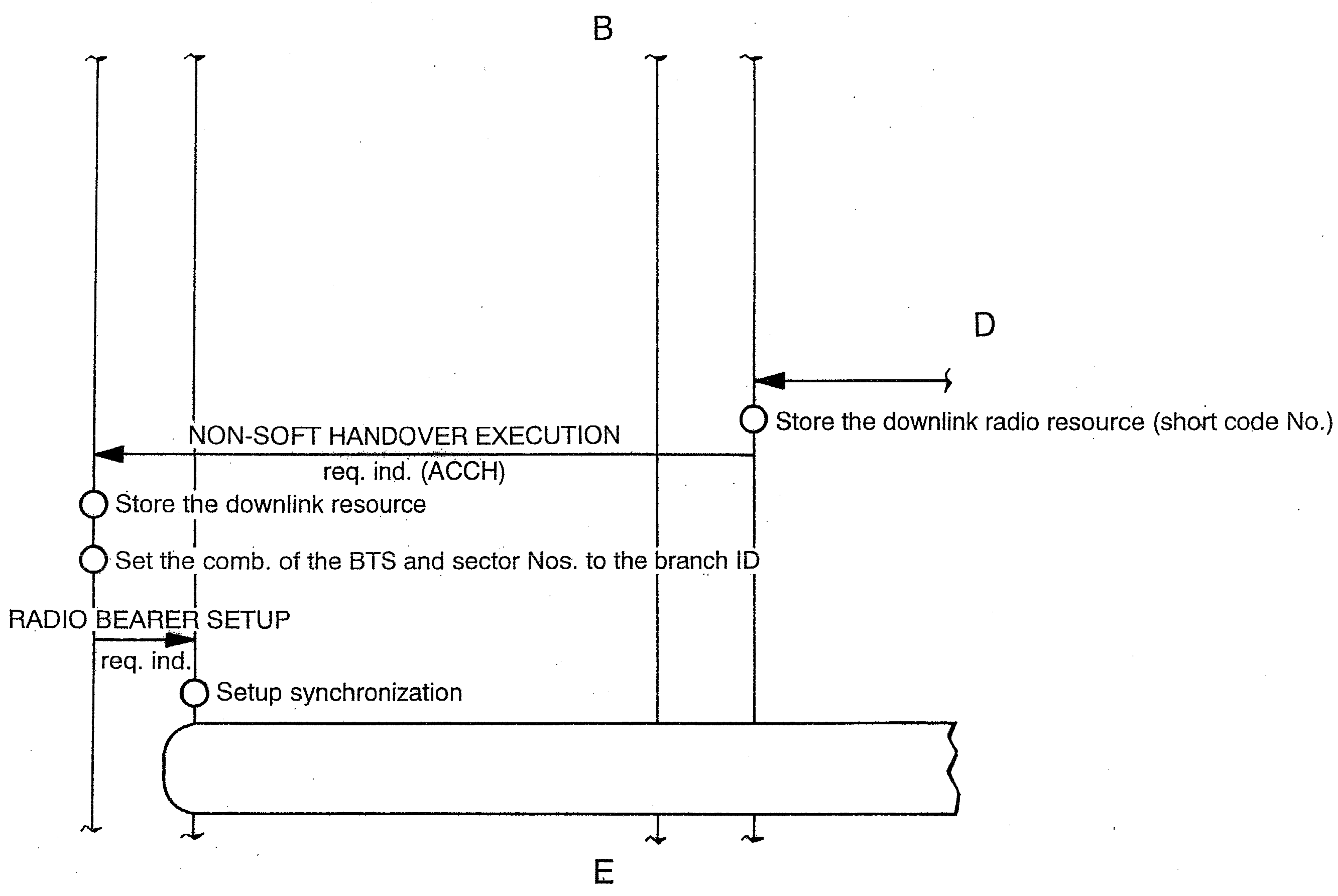
FIG. 51


TACAF
BCAF
BCFa
TACFa
Non-soft handover execution initiation event
Select the handed-to-destination from the candidate zones indicated in the HO trigger
Determine the HHO
Extract the uplink radio resource (short code No.)
Extract frame offsets and slot offsets
HANDOVER CONNECTION SETUP
req. ind.
Capture the DHT
HANDOVER CONNECTION SETUP
resp. conf.
A
B

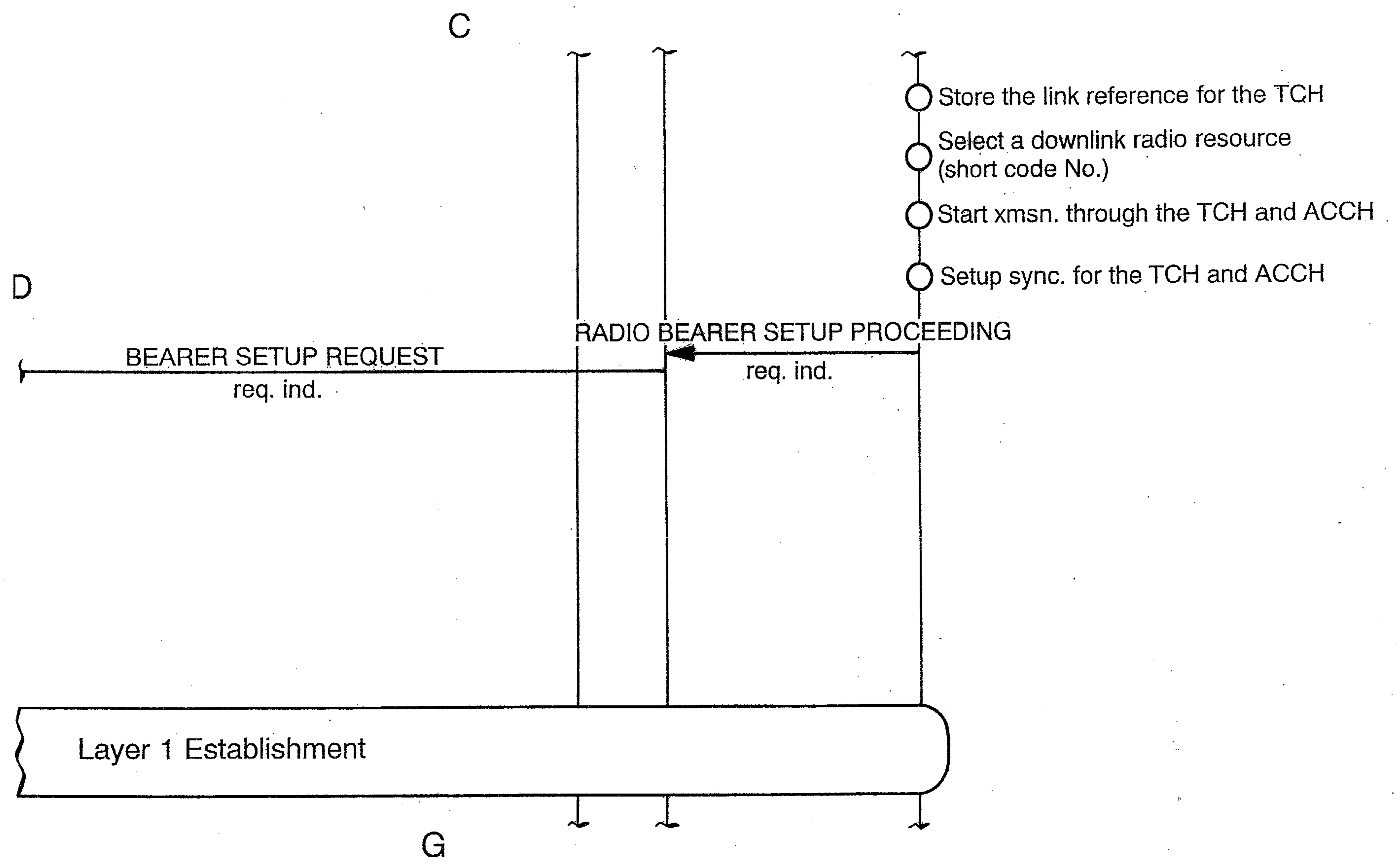
CONTINUED FROM FIG. 51



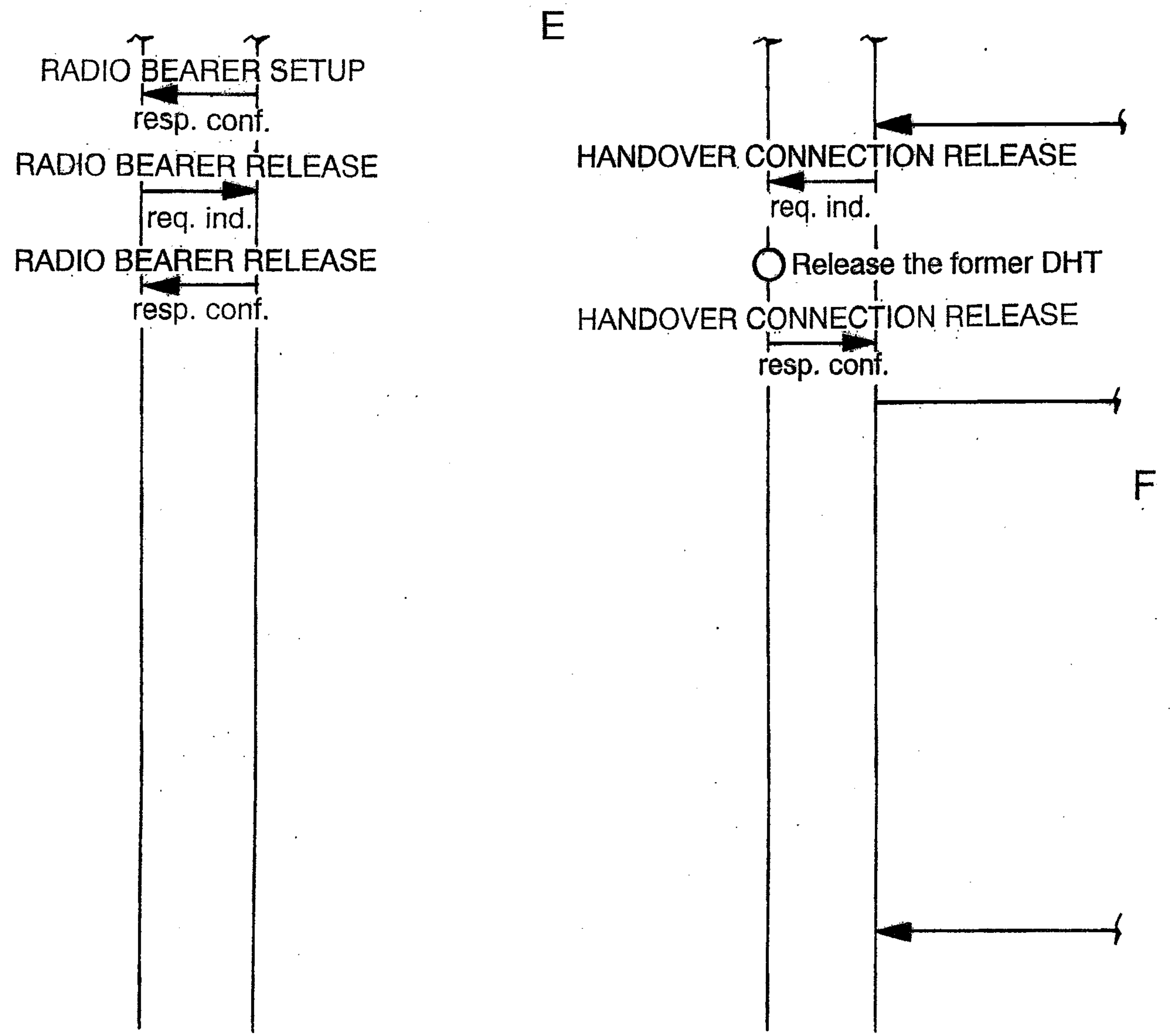
CONTINUED FROM FIG. 51



CONTINUED FROM FIG. 51



CONTINUED FROM FIG. 51



CONTINUED FROM FIG. 51

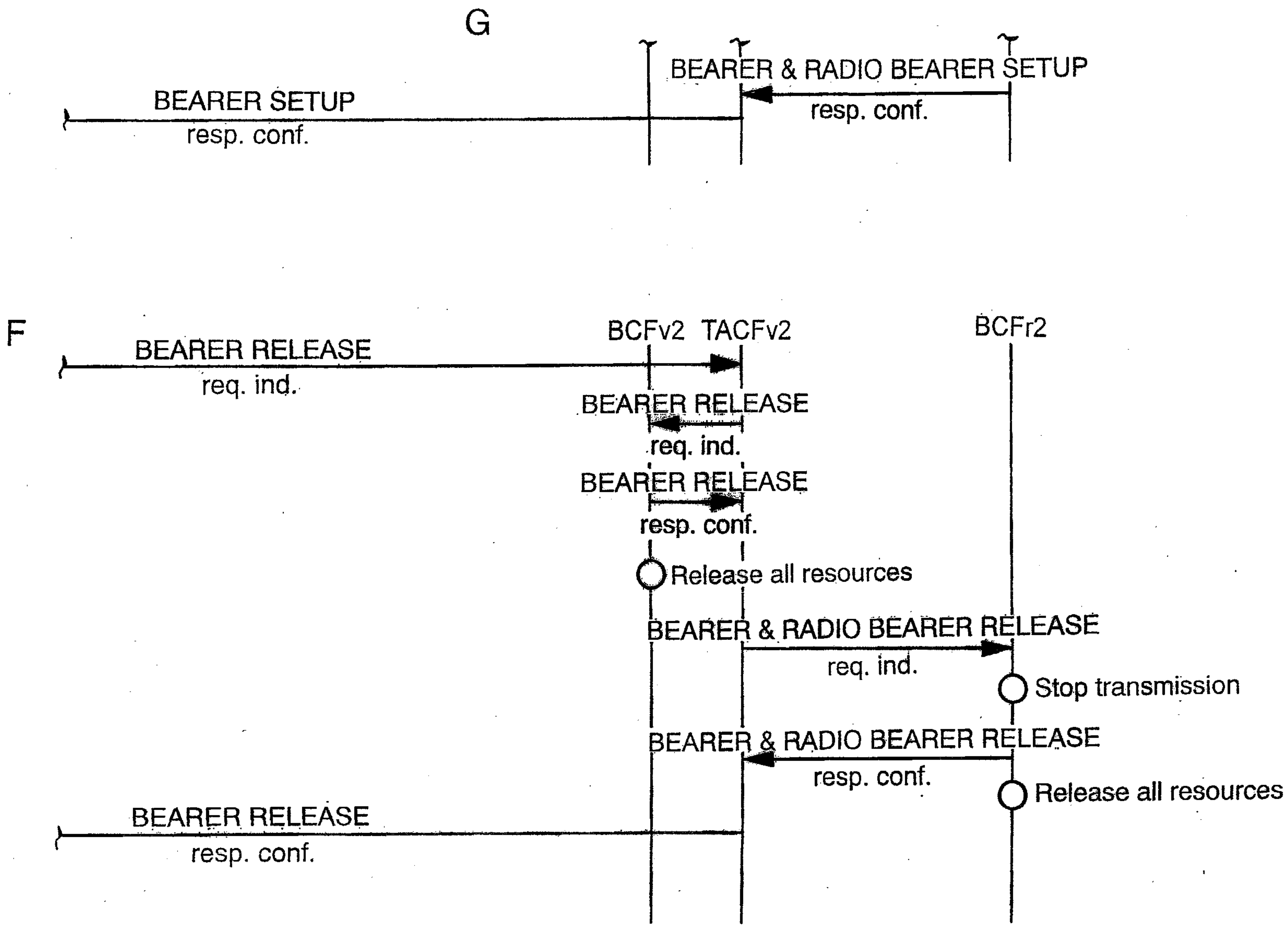


FIG. 52

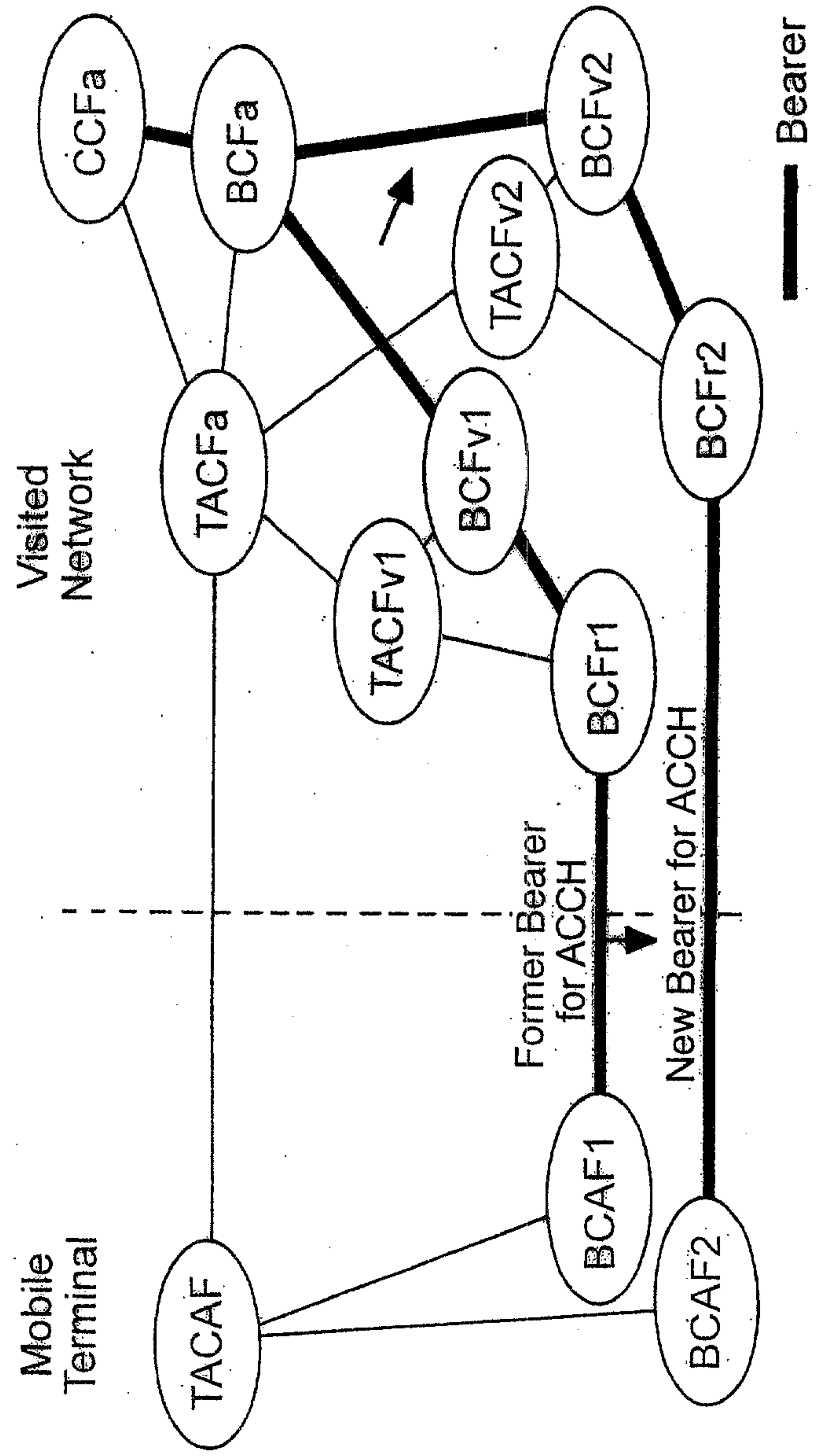
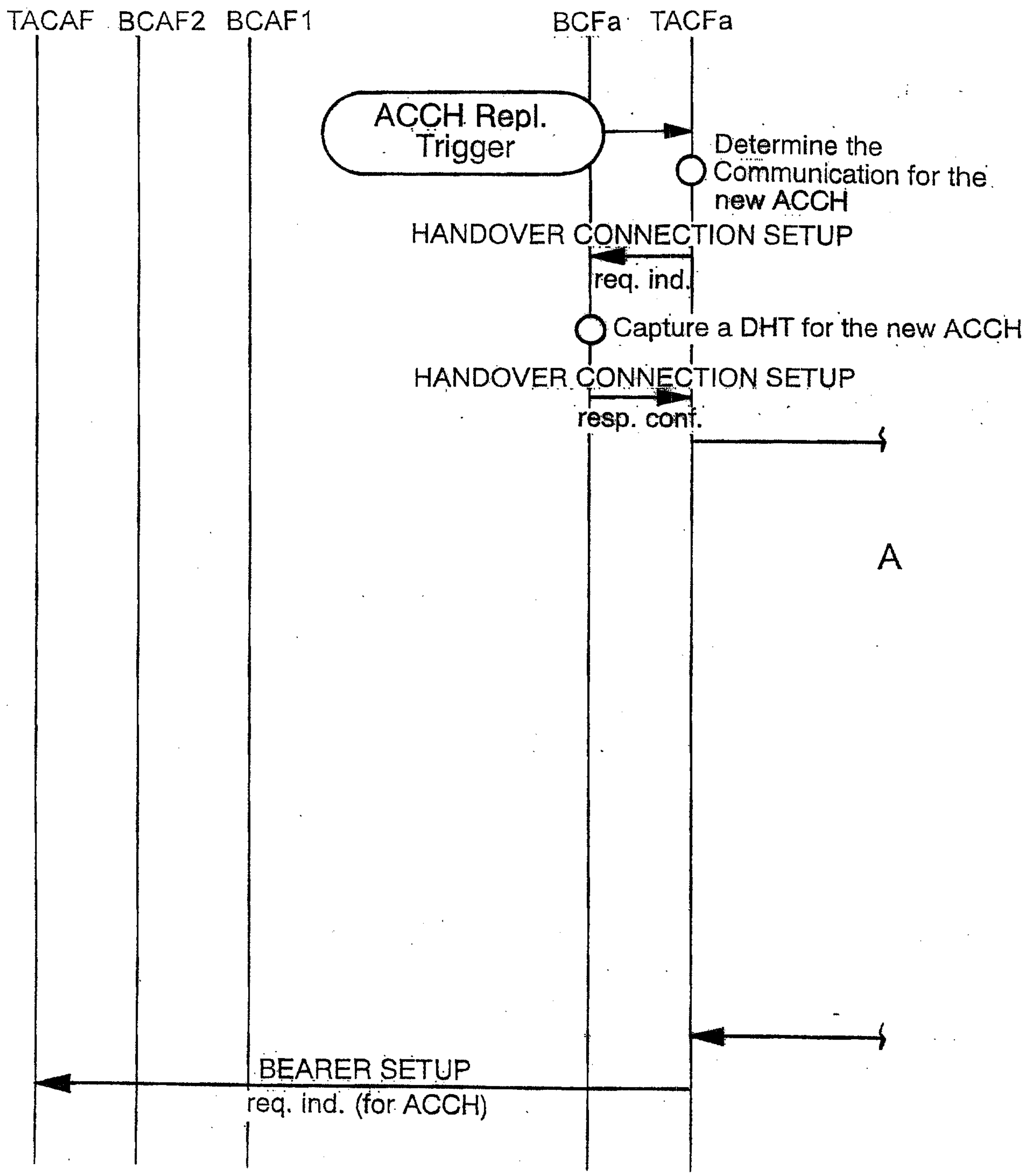

Mobile Terminal
Visited Network
TACAF
TACFa
CCFa
BCFa
TACFv1
BCFv1
TACFv2
BCFv2
BCFr1
BCFr2
BCAF1
BCAF2
Former Bearer for ACCH
New Bearer for ACCH
Bearer

FIG. 53


TACAF
BCAF2
BCAF1
BCFa
TACFa
ACCH Repl. Trigger
Determine the Communication for the new ACCH
HANDOVER CONNECTION SETUP
req. ind.
Capture a DHT for the new ACCH
HANDOVER CONNECTION SETUP
resp. conf.
A
BEARER SETUP
req. ind. (for ACCH)

CONTINUED FROM FIG. 53

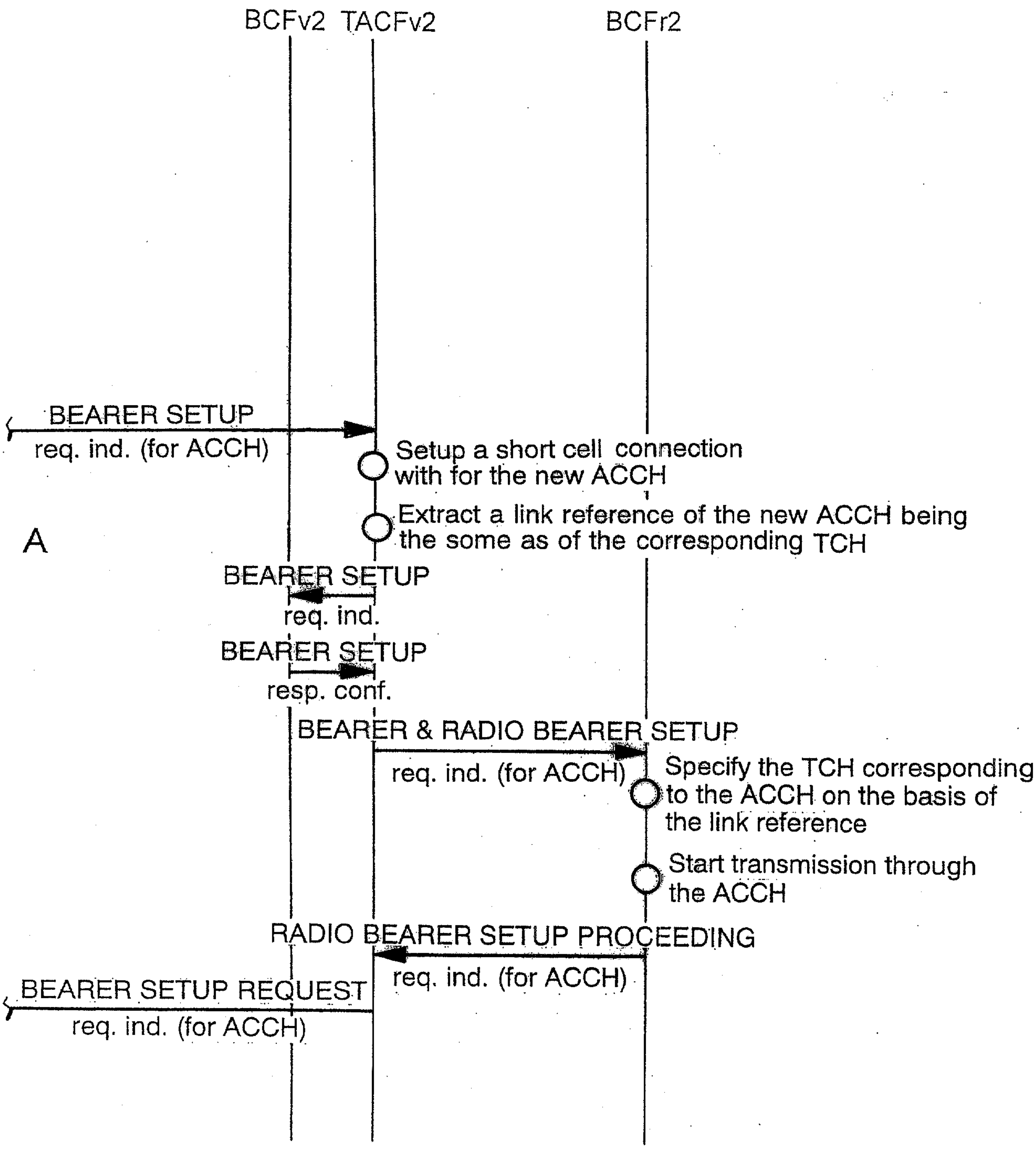
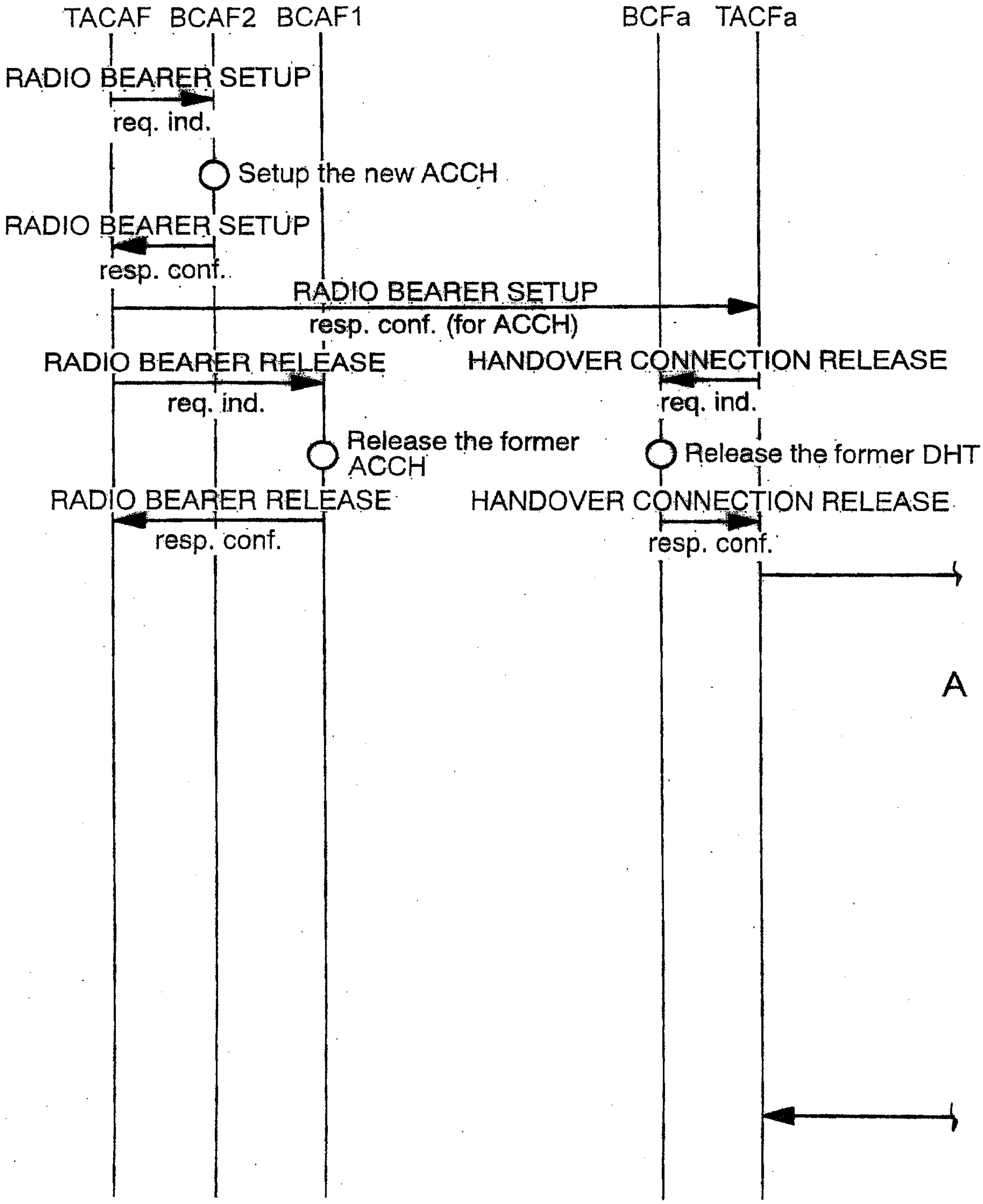


FIG. 54


TACAF
BCAF2
BCAF1
BCFa
TACFa
RADIO BEARER SETUP
req. ind.
Setup the new ACCH
RADIO BEARER SETUP
resp. conf.
RADIO BEARER SETUP
resp. conf. (for ACCH)
RADIO BEARER RELEASE
req. ind.
HANDOVER CONNECTION RELEASE
req. ind.
Release the former ACCH
Release the former DHT
RADIO BEARER RELEASE
resp. conf.
HANDOVER CONNECTION RELEASE
resp. conf.
A

CONTINUED FROM FIG. 54

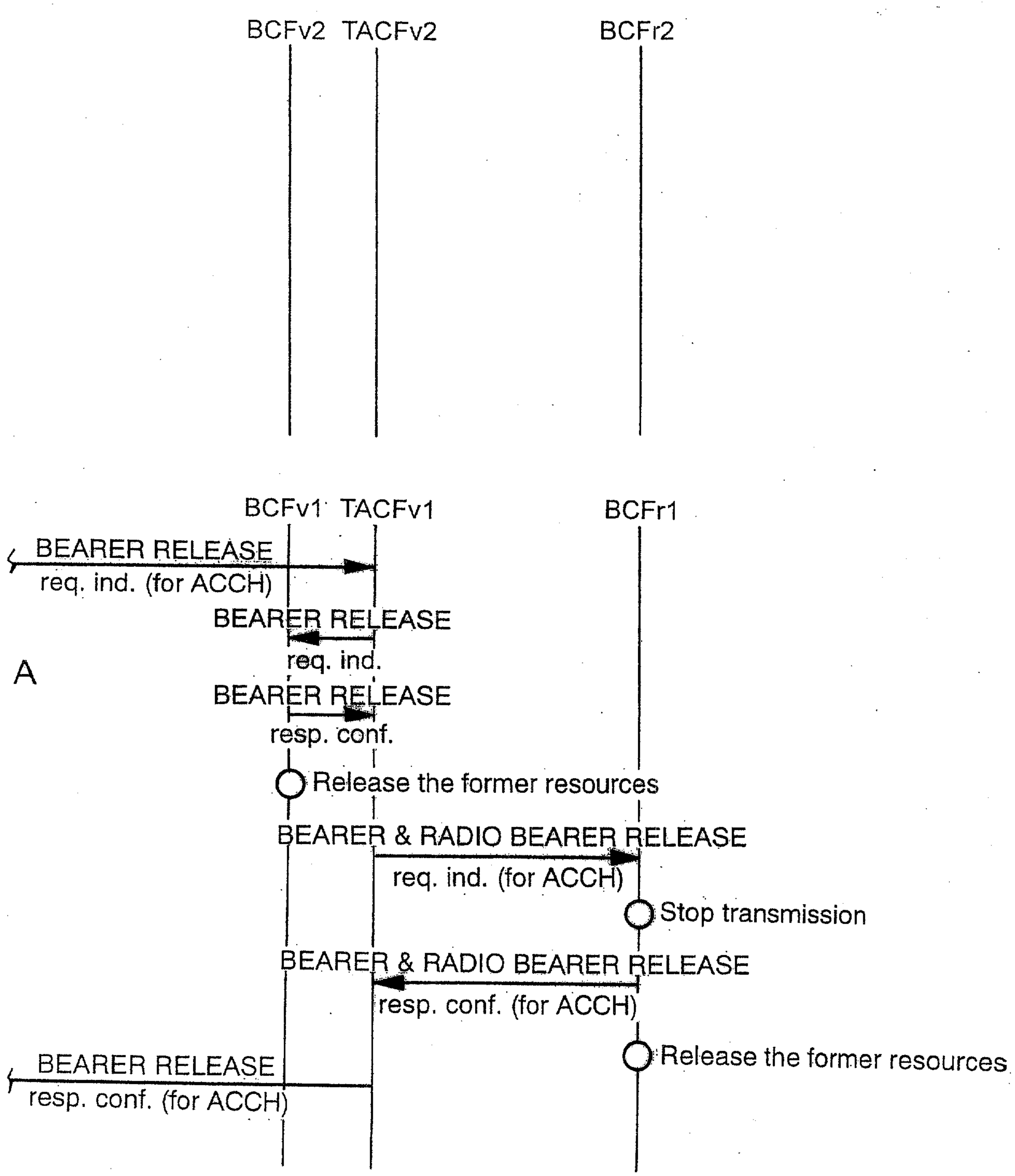


FIG. 55

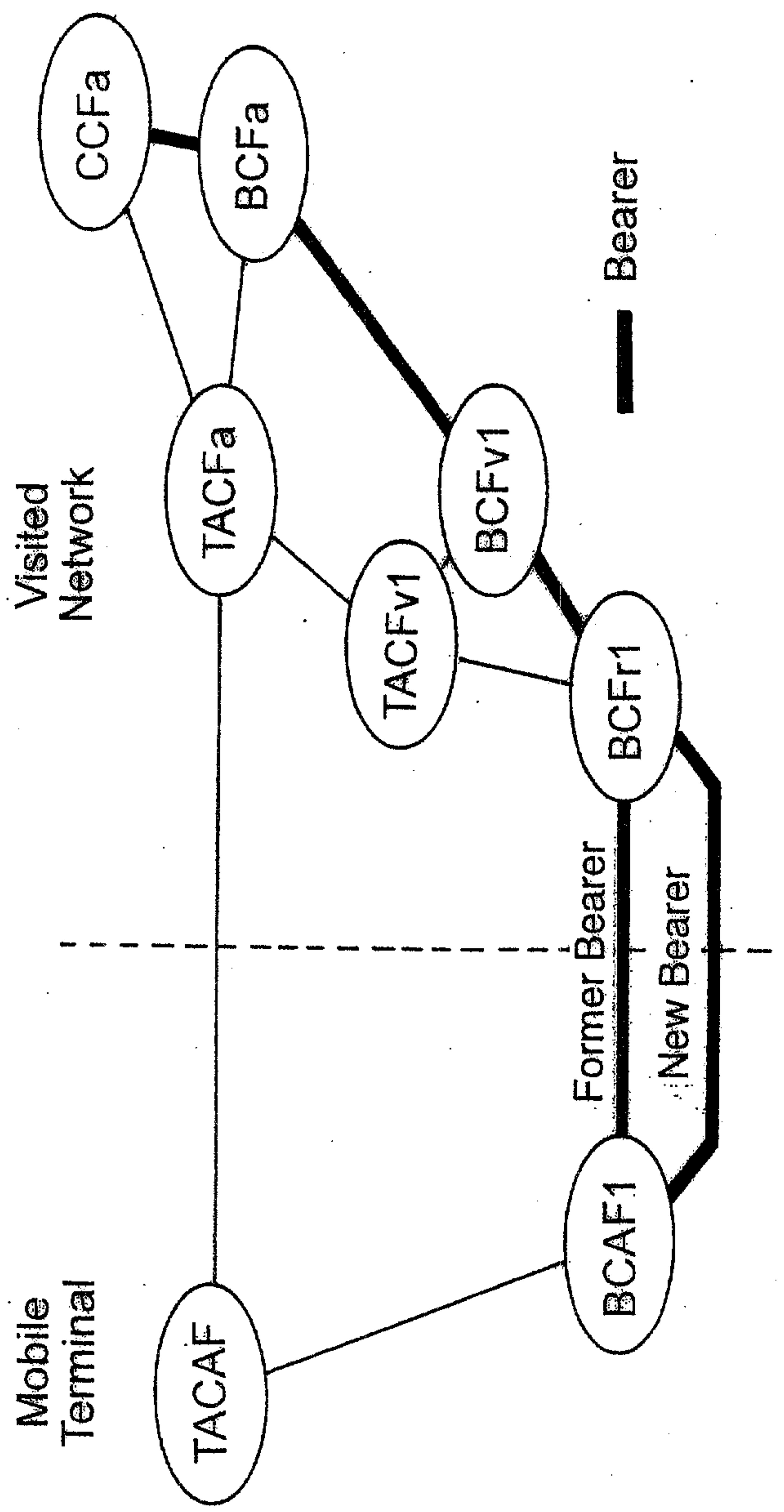

Mobile Terminal
Visited Network
TACAF
BCAF1
TACFa
TACFv1
BCFr1
BCFv1
BCFa
CCFa
Former Bearer
New Bearer
Bearer

FIG. 56

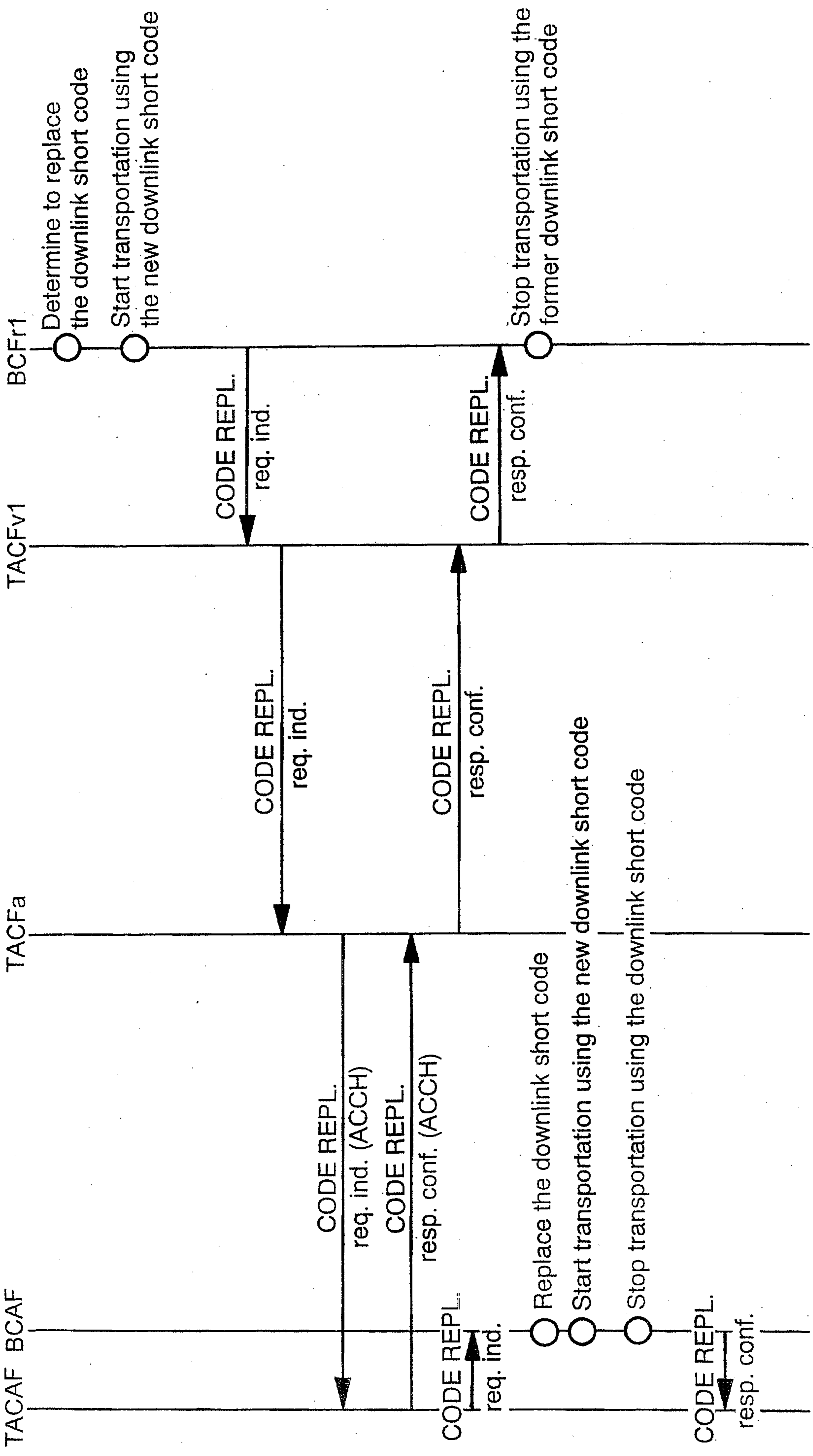

TACAF
BCAF
TACFa
TACFv1
BCFr1
Determine to replace the downlink short code
Start transportation using the new downlink short code
CODE REPL. req. ind.
CODE REPL. req. ind.
CODE REPL. req. ind. (ACCH)
CODE REPL. req. ind.
Replace the downlink short code
Start transportation using the new downlink short code
Stop transportation using the downlink short code
CODE REPL. resp. conf.
CODE REPL. resp. conf. (ACCH)
CODE REPL. resp. conf.
CODE REPL. resp. conf.
Stop transportation using the former downlink short code

FIG. 57

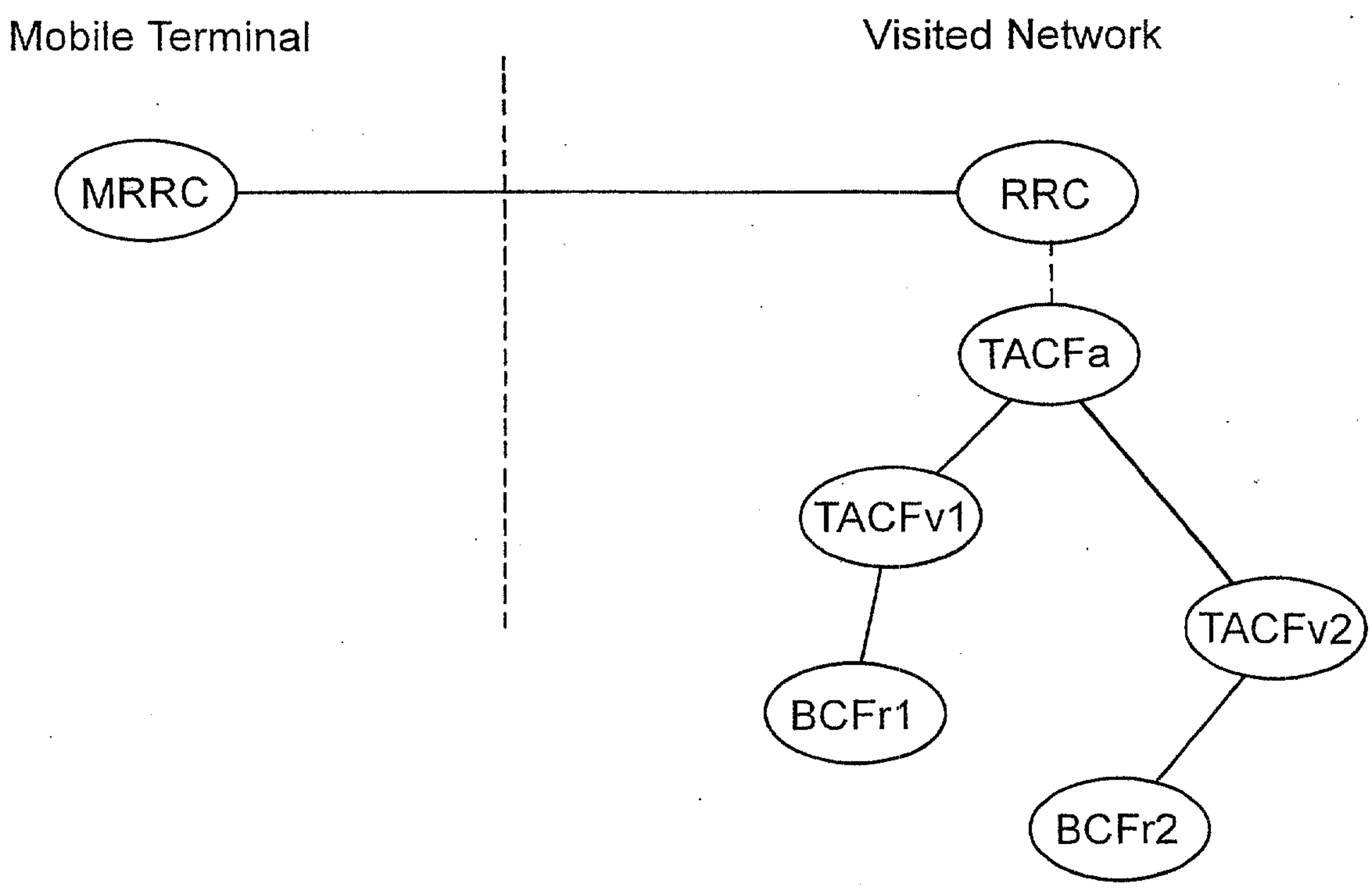

Mobile Terminal
Visited Network
MRRC
RRC
TACFa
TACFv1
TACFv2
BCFr1
BCFr2

FIG. 58

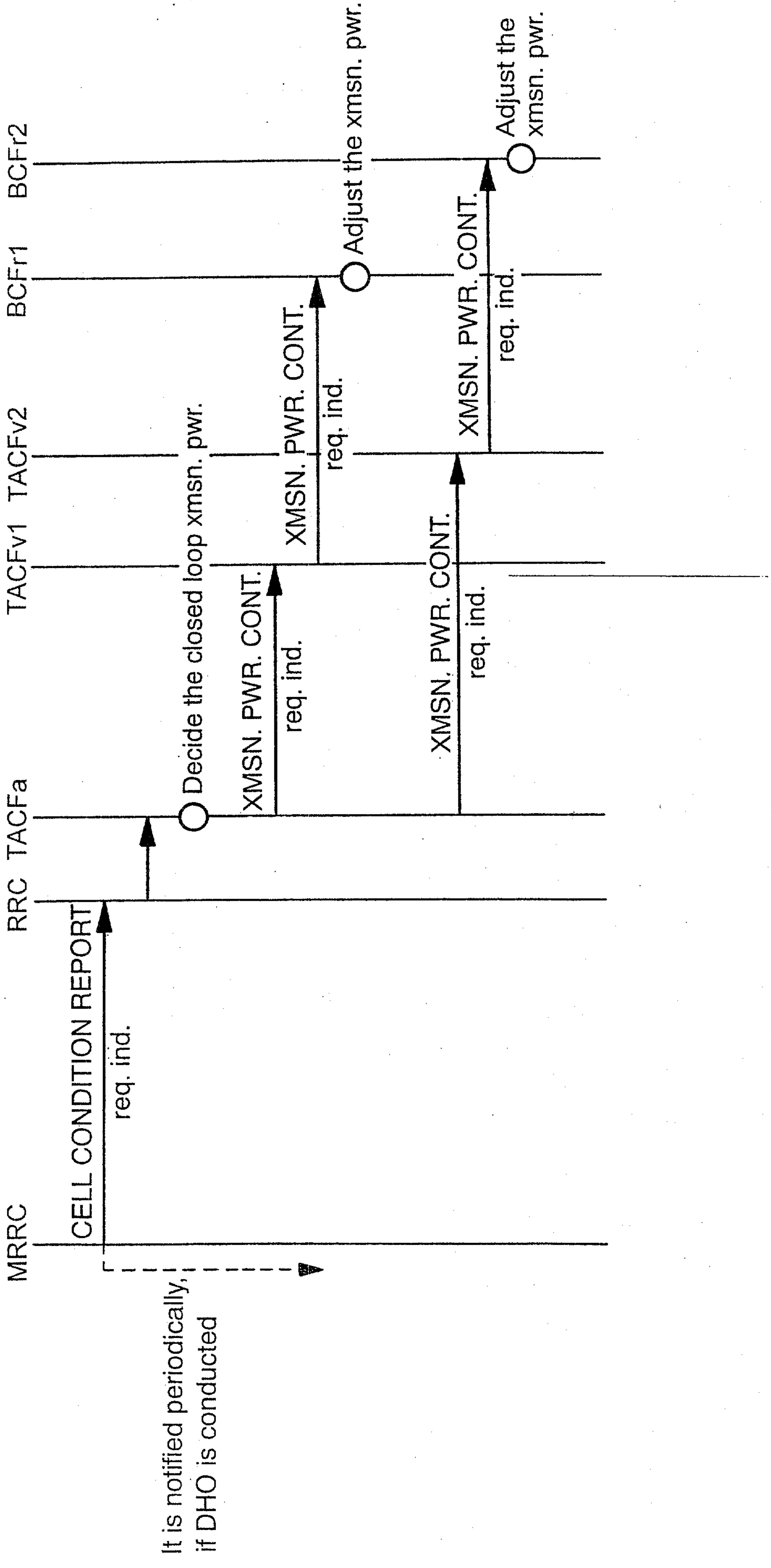

MRRC
RRC
TACFa
TACFv1
TACFv2
BCFr1
BCFr2
CELL CONDITION REPORT
req. ind.
Decide the closed loop xmsn. pwr.
XMSN. PWR. CONT.
req. ind.
XMSN. PWR. CONT.
req. ind.
Adjust the xmsn. pwr.
XMSN. PWR. CONT.
req. ind.
XMSN. PWR. CONT.
req. ind.
Adjust the xmsn. pwr.
It is notified periodically,
if DHO is conducted

FIG. 59

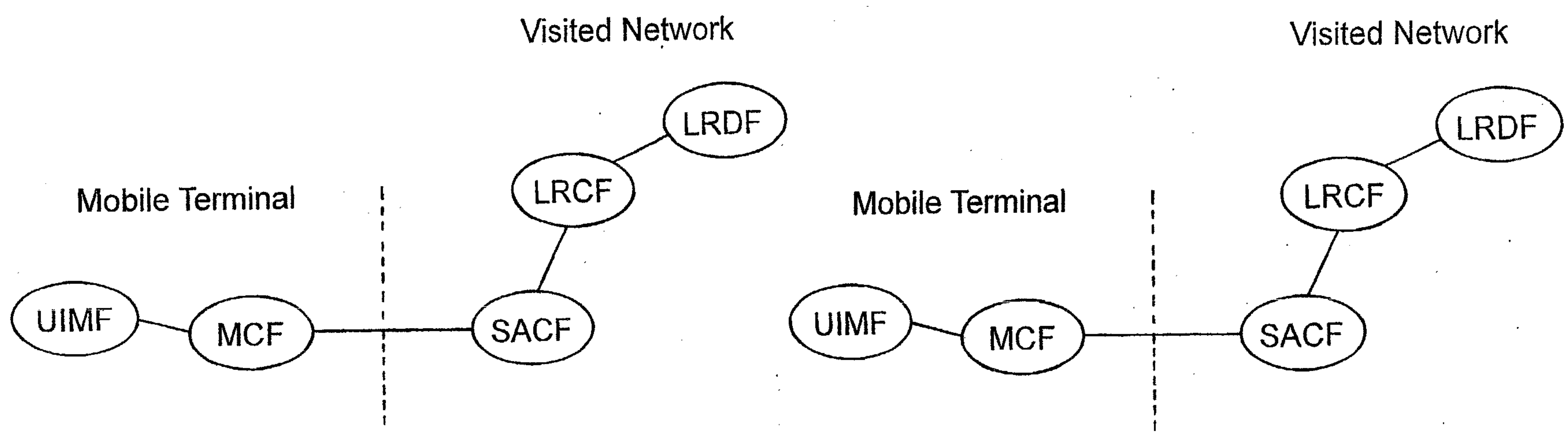
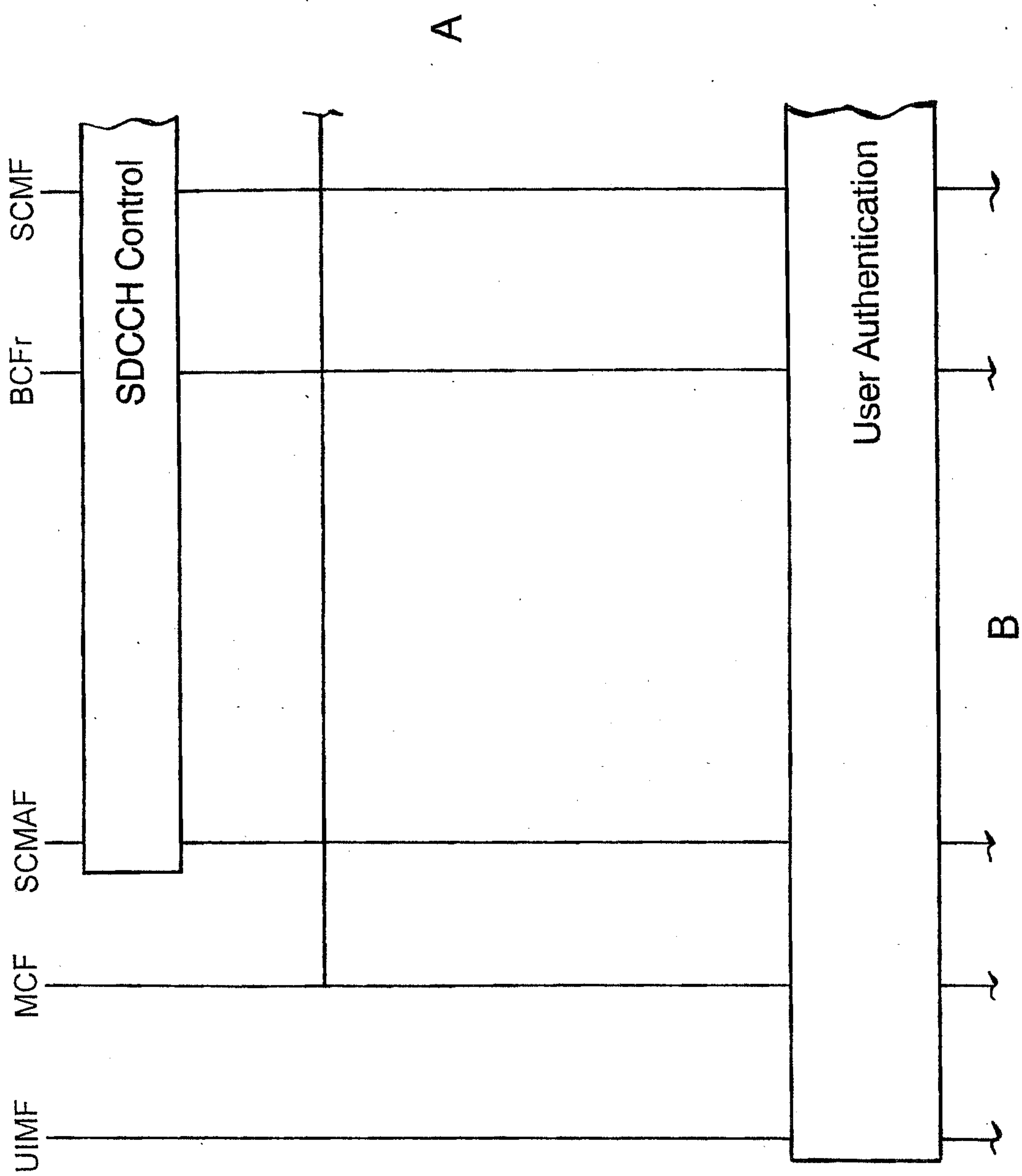
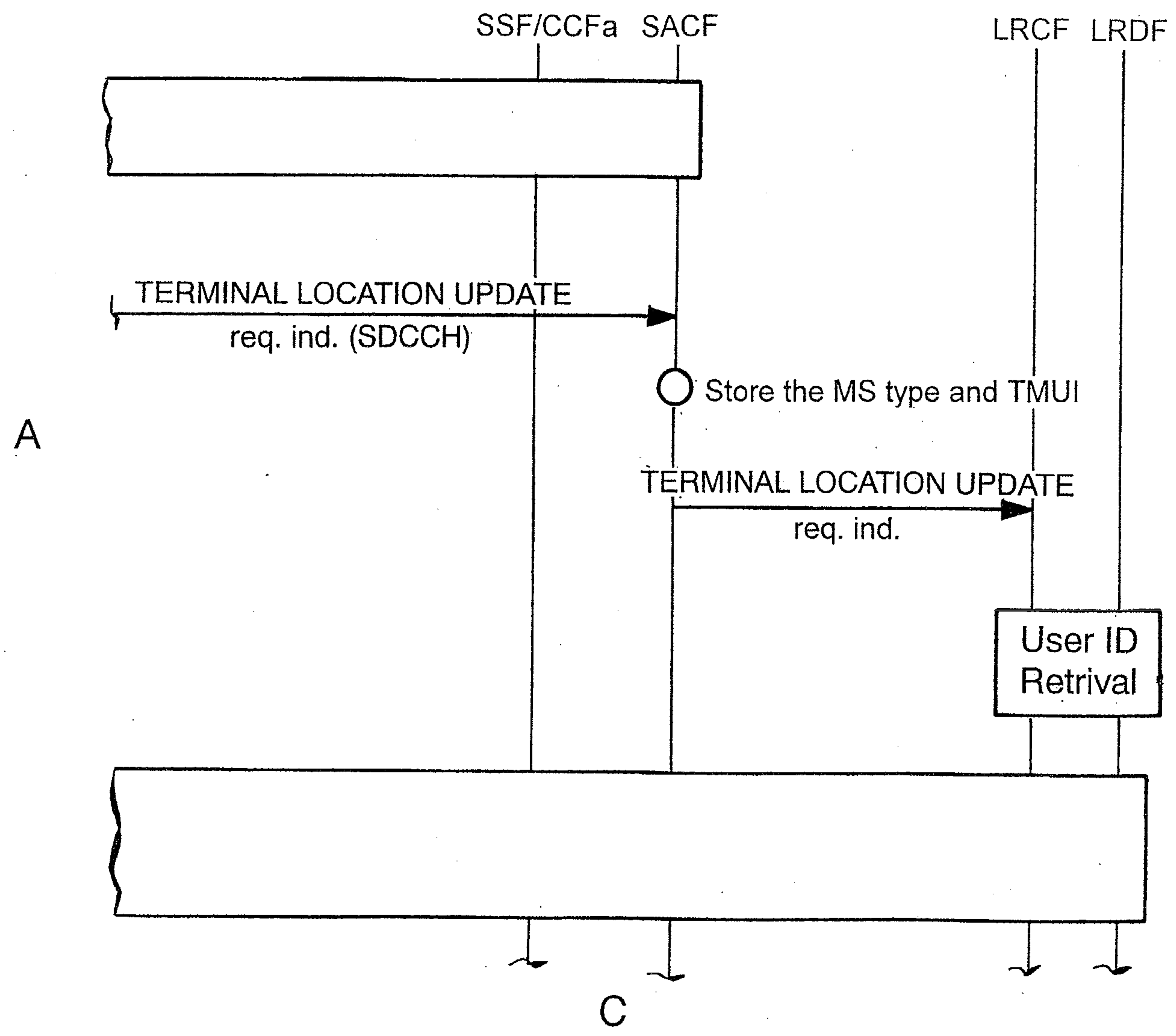

Visited Network
LRDF
LRCF
Mobile Terminal
UIMF
MCF
SACF
Visited Network
LRDF
LRCF
Mobile Terminal
UIMF
MCF
SACF

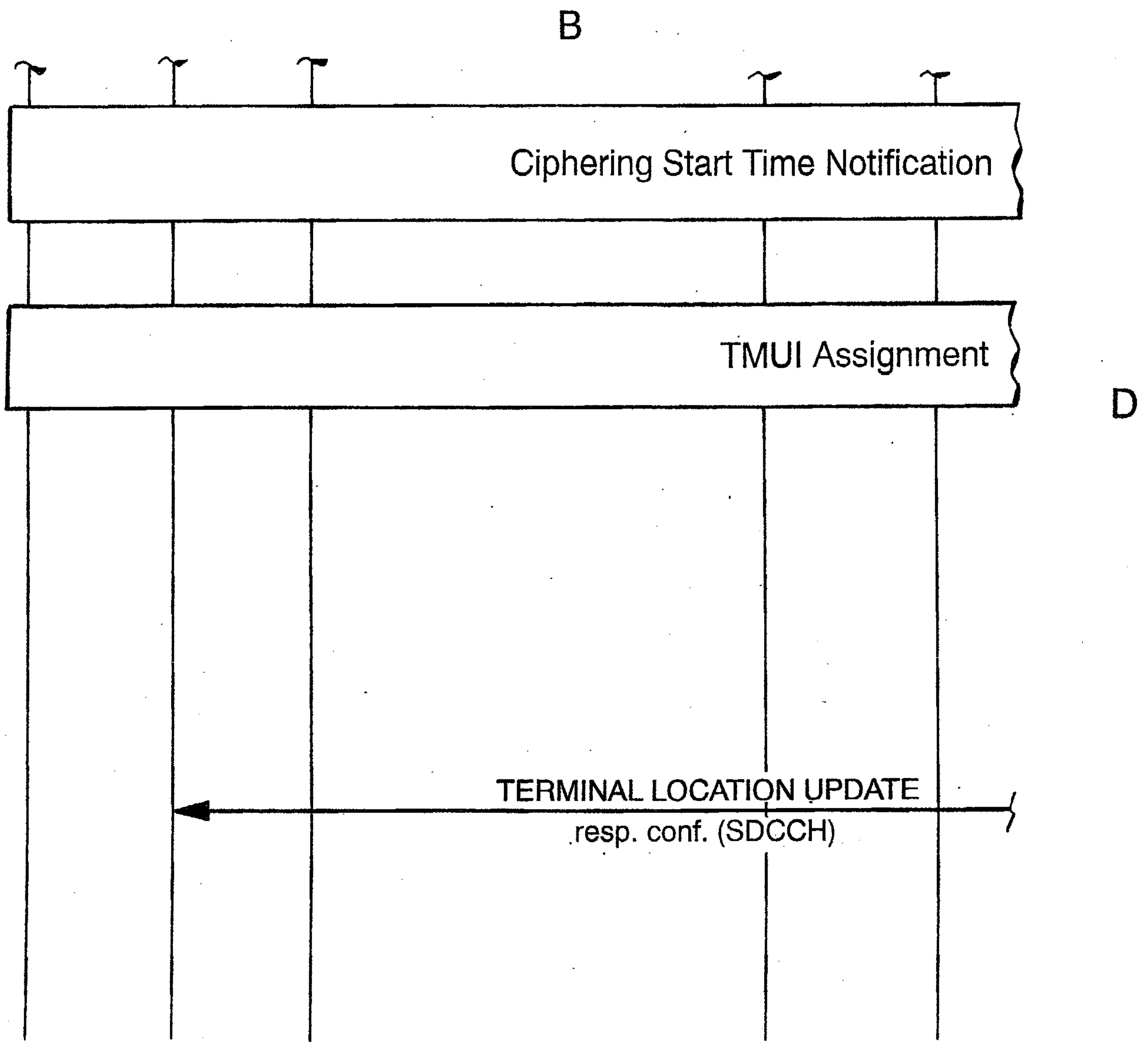
FIG. 60


A
SCMF
BCFr
SCMAF
MCF
UIMF
SDCCH Control
User Authentication
B

CONTINUED FROM FIG. 60



CONTINUED FROM FIG. 60



CONTINUED FROM FIG. 60

C

D

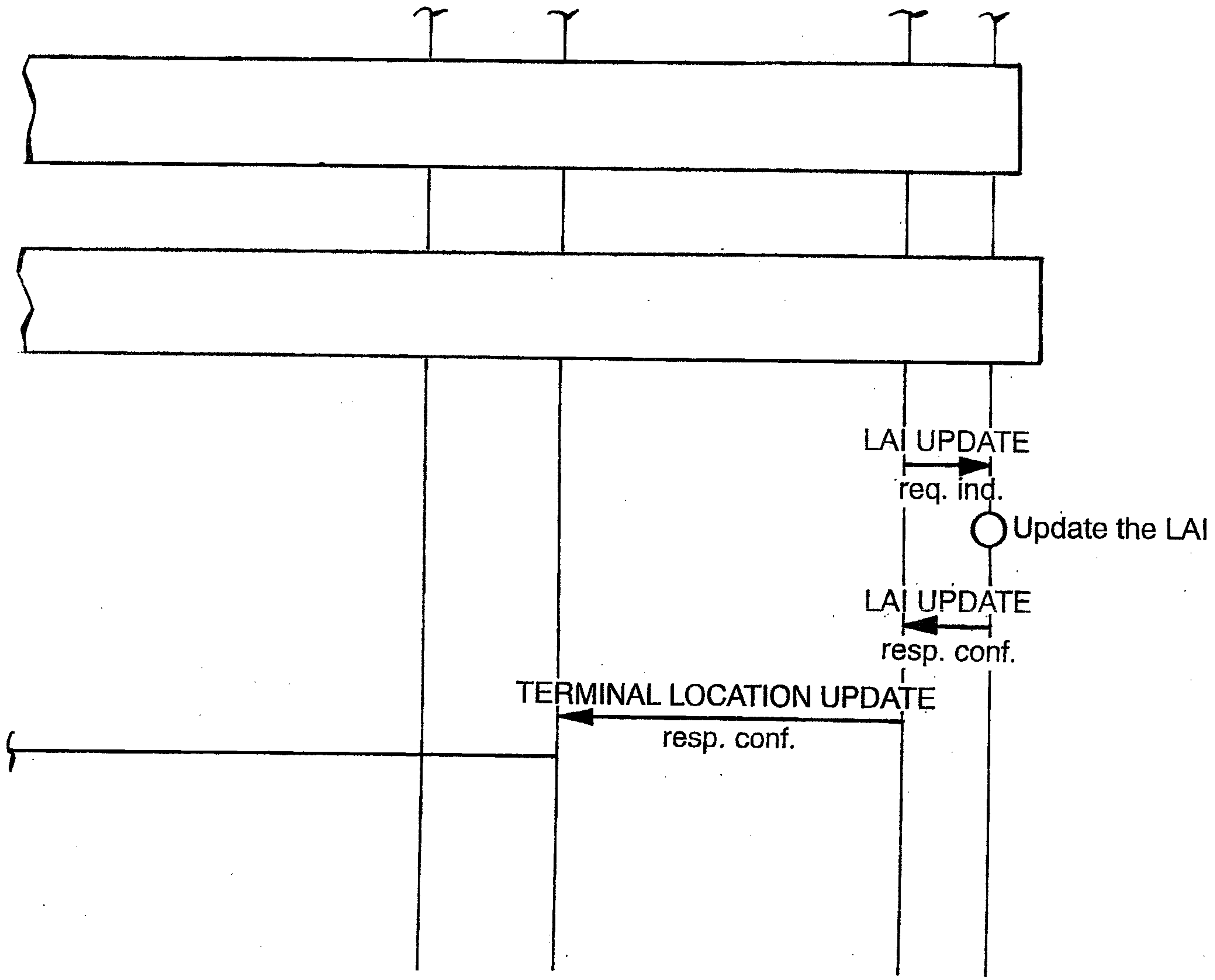
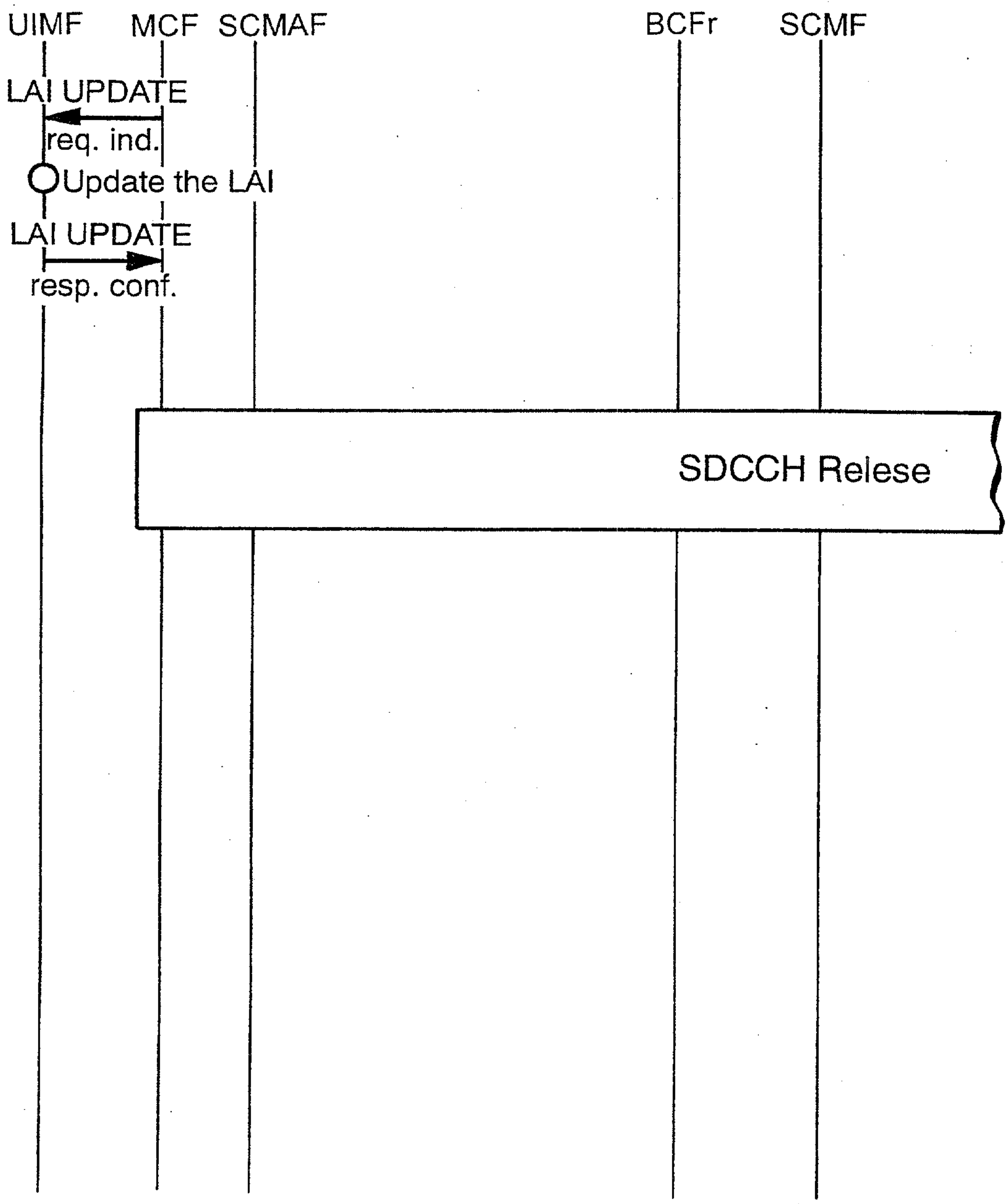


FIG. 61


UIMF
MCF
SCMAF
BCFr
SCMF
LAI UPDATE
req. ind.
Update the LAI
LAI UPDATE
resp. conf.
SDCCH Relese

CONTINUED FROM FIG. 61

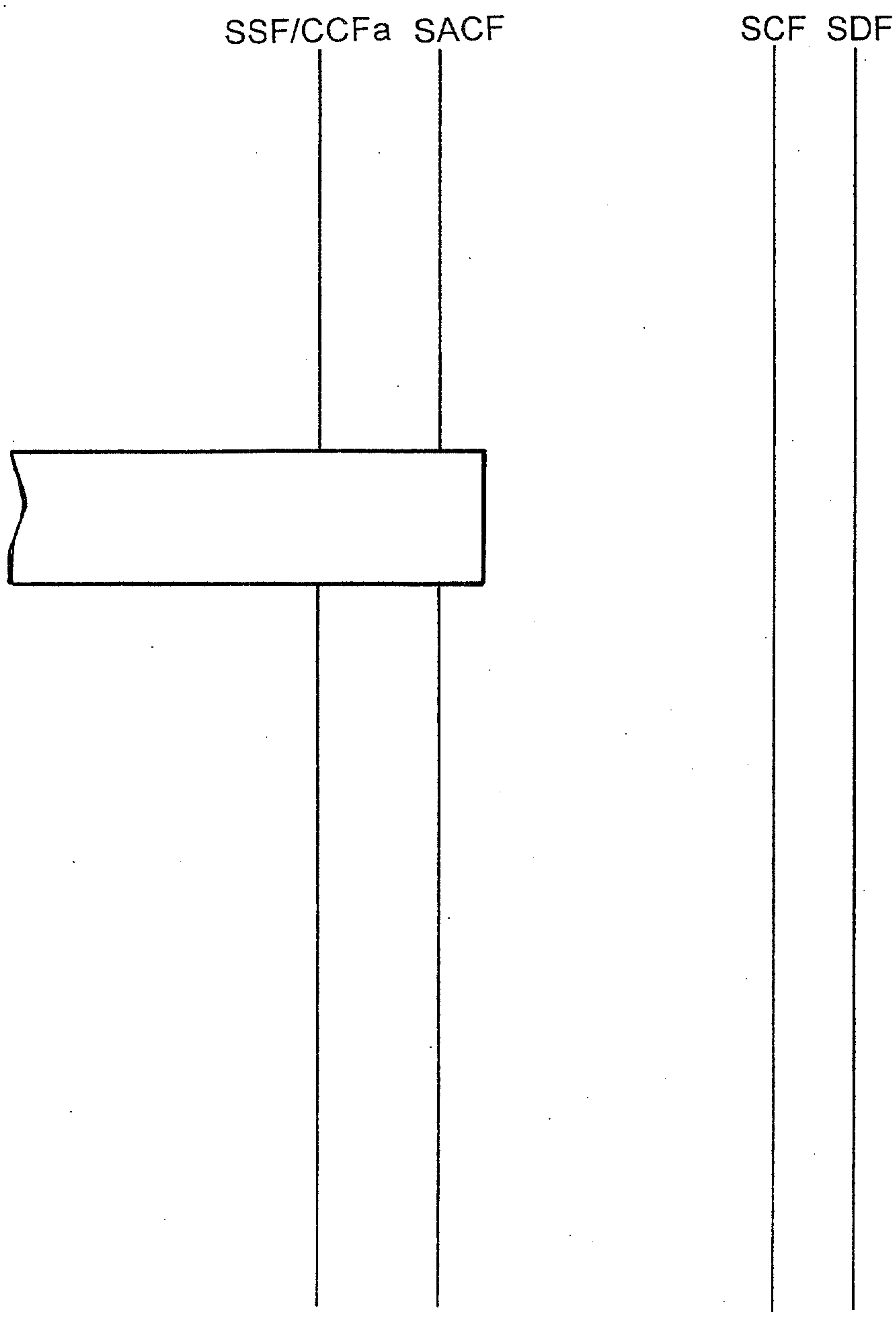


FIG. 62

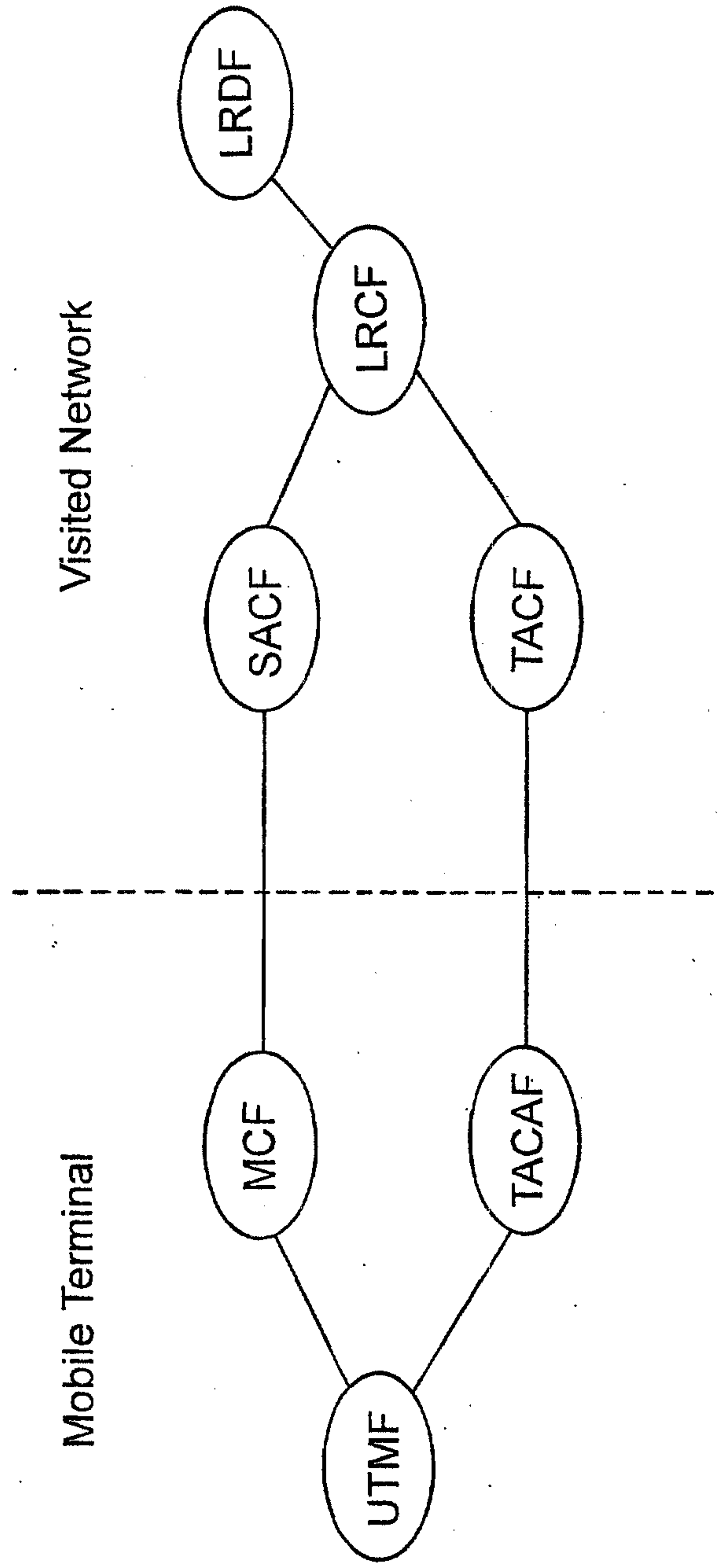

Visited Network
Mobile Terminal
LRDF
LRCF
SACF
TACF
MCF
TACAF
UTMF

FIG. 63

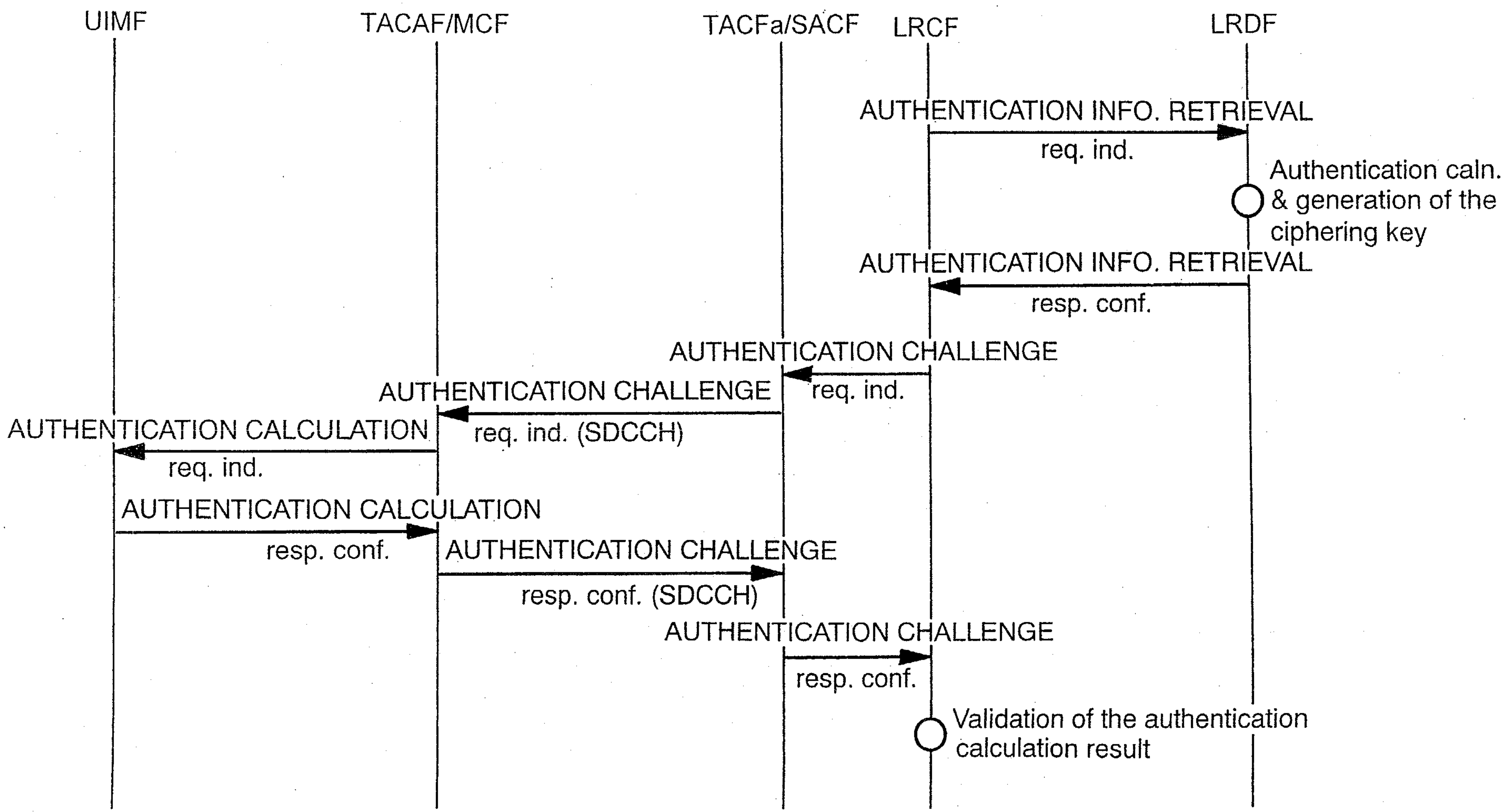

UIMF
TACAF/MCF
TACFa/SACF
LRCF
LRDF
AUTHENTICATION INFO. RETRIEVAL
req. ind.
Authentication caln. & generation of the ciphering key
AUTHENTICATION INFO. RETRIEVAL
resp. conf.
AUTHENTICATION CHALLENGE
req. ind.
AUTHENTICATION CHALLENGE
req. ind. (SDCCH)
AUTHENTICATION CALCULATION
req. ind.
AUTHENTICATION CALCULATION
resp. conf.
AUTHENTICATION CHALLENGE
resp. conf. (SDCCH)
AUTHENTICATION CHALLENGE
resp. conf.
Validation of the authentication calculation result

FIG. 64

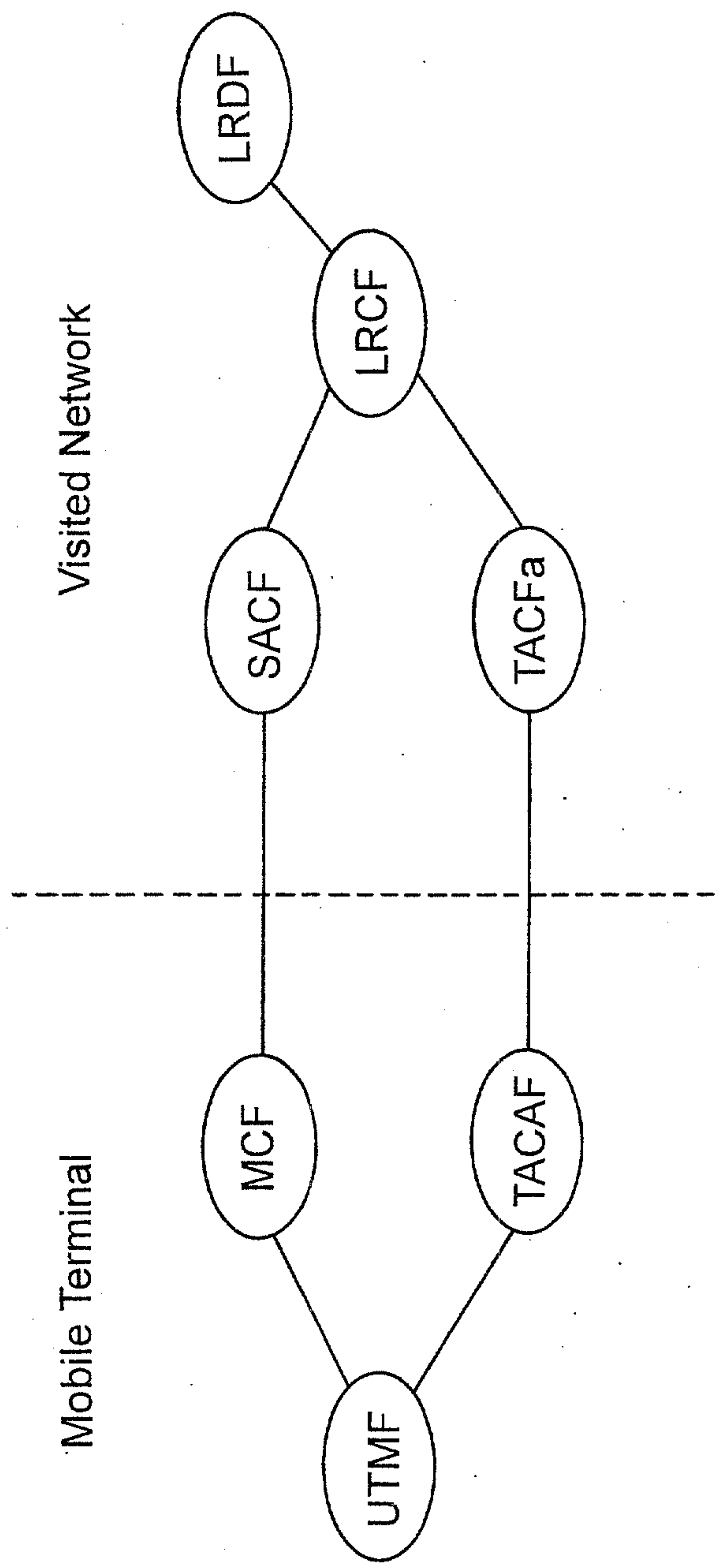
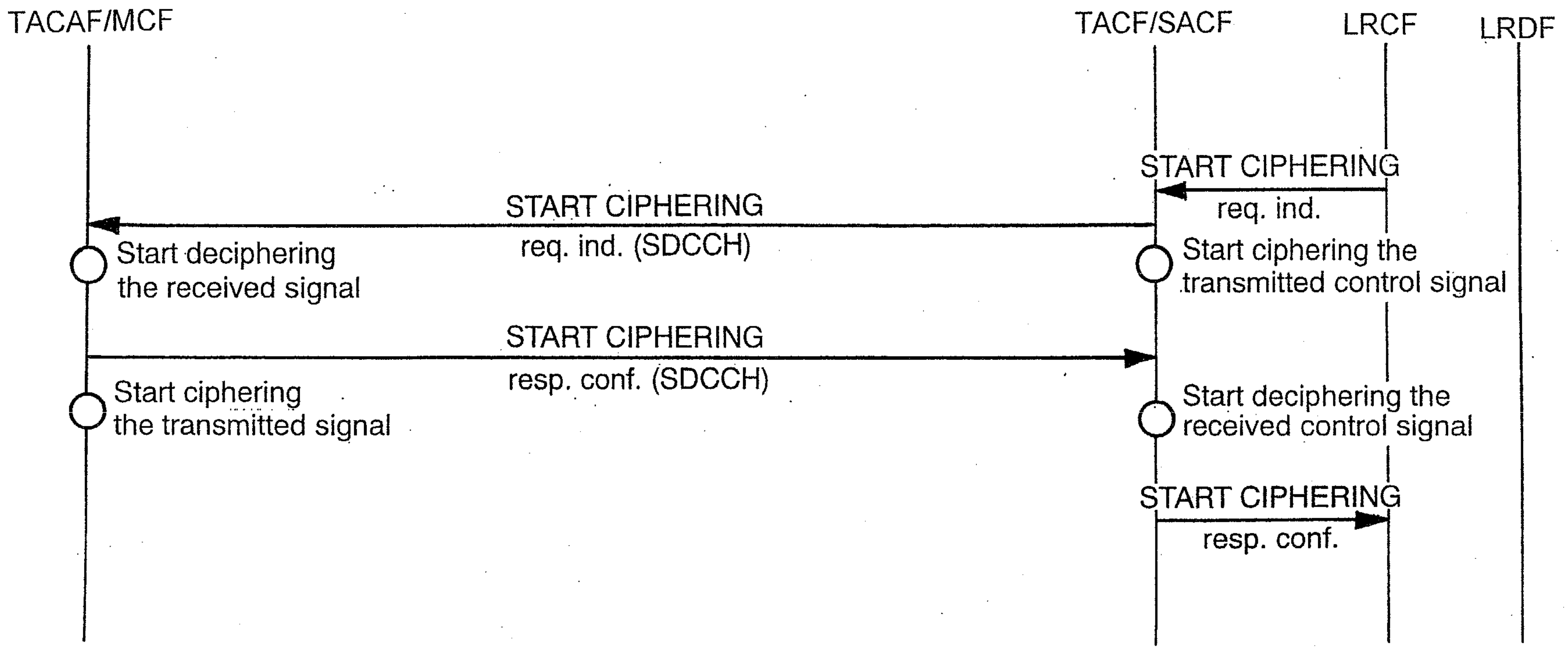

Visited Network
LRDF
LRCF
SACF
TACFa
Mobile Terminal
MCF
TACAF
UTMF

FIG. 65



The ciphering key is delivered from LRDF and UIMF during the user authentication.

FIG. 66

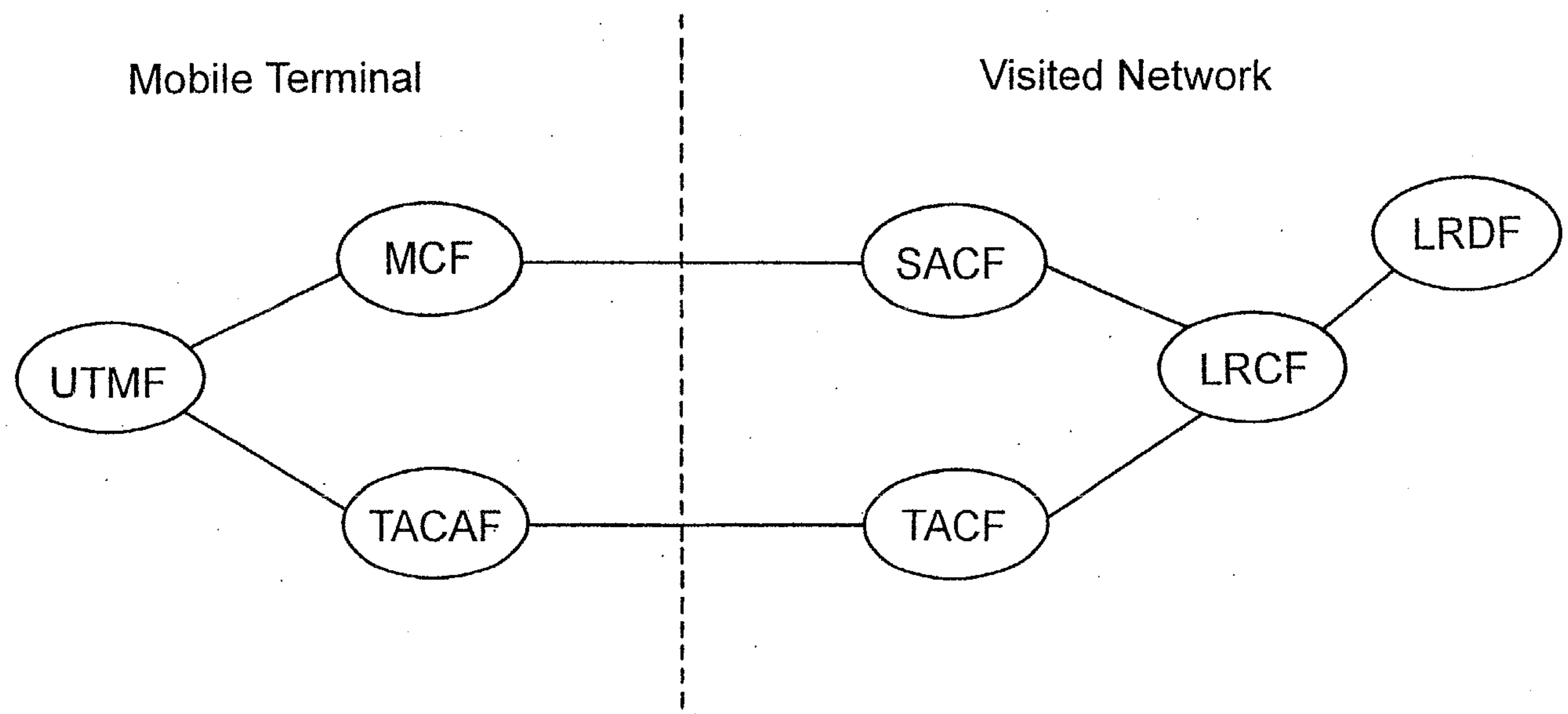
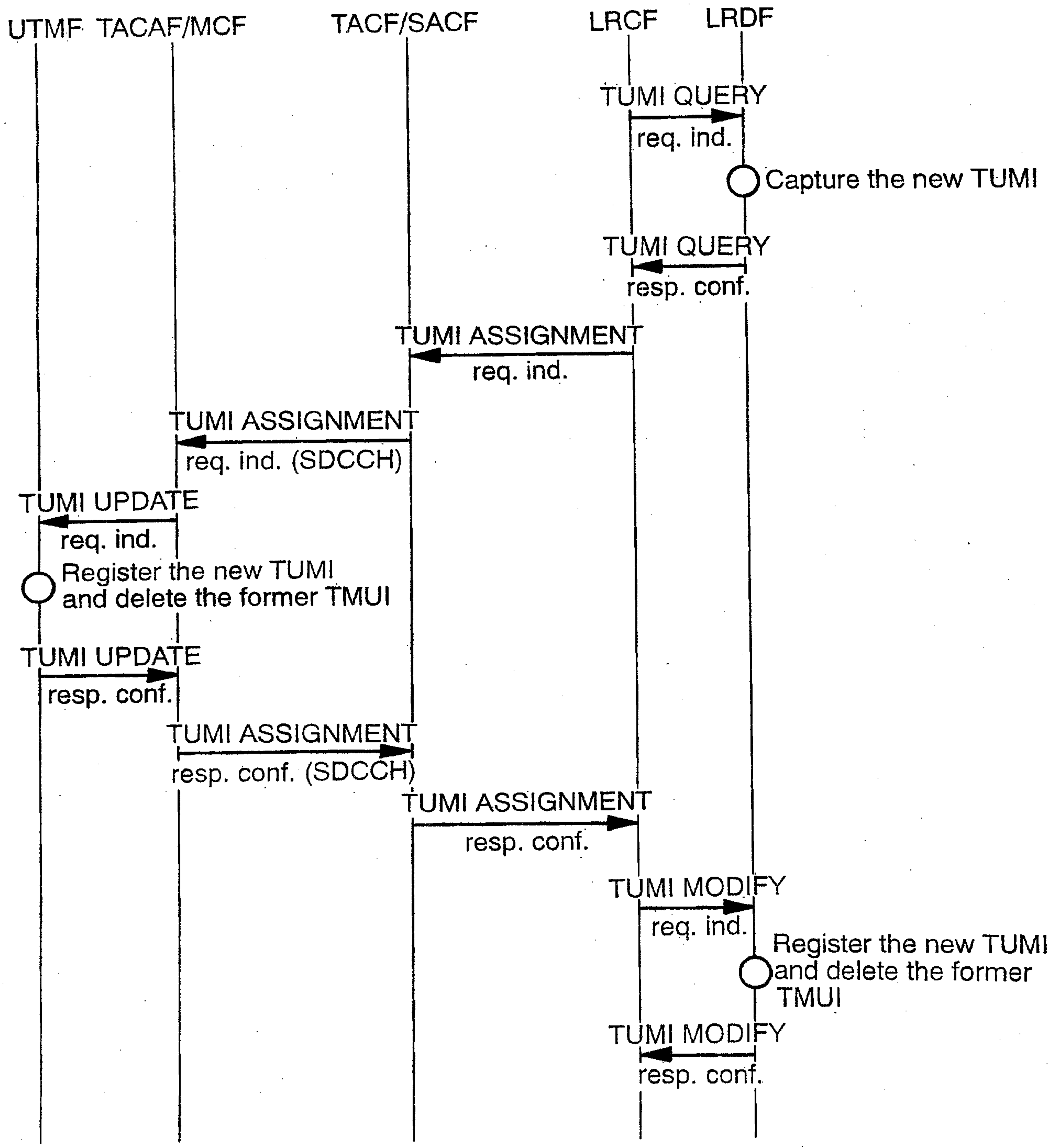

Mobile Terminal
Visited Network
UTMF
MCF
TACAF
SACF
TACF
LRCF
LRDF

FIG. 67



1) Transportation between MCF and SACF is for user authentication with non-call related case.
2) Transportation between TACAF and TACF is for user authentication with call related case.

FIG. 68

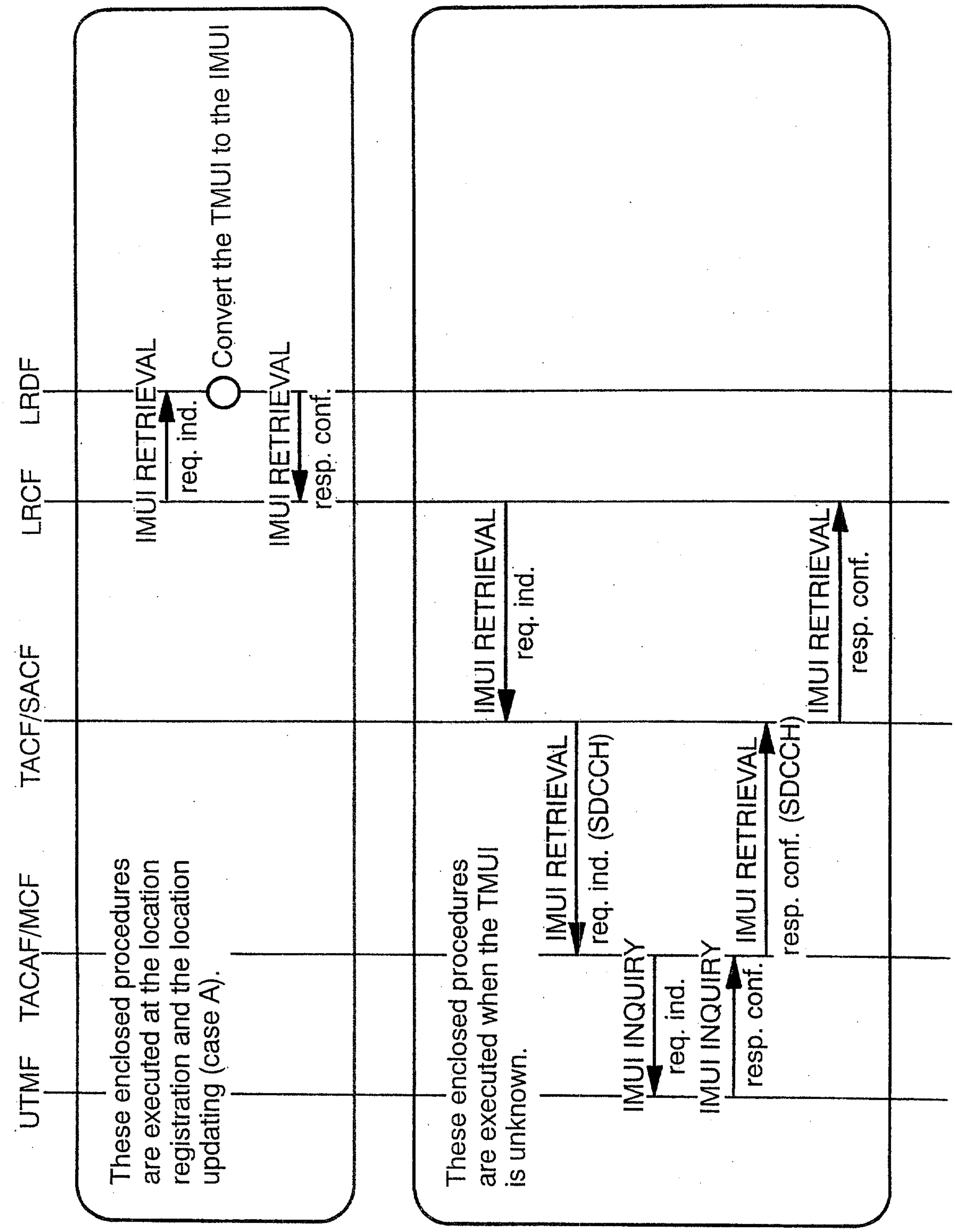
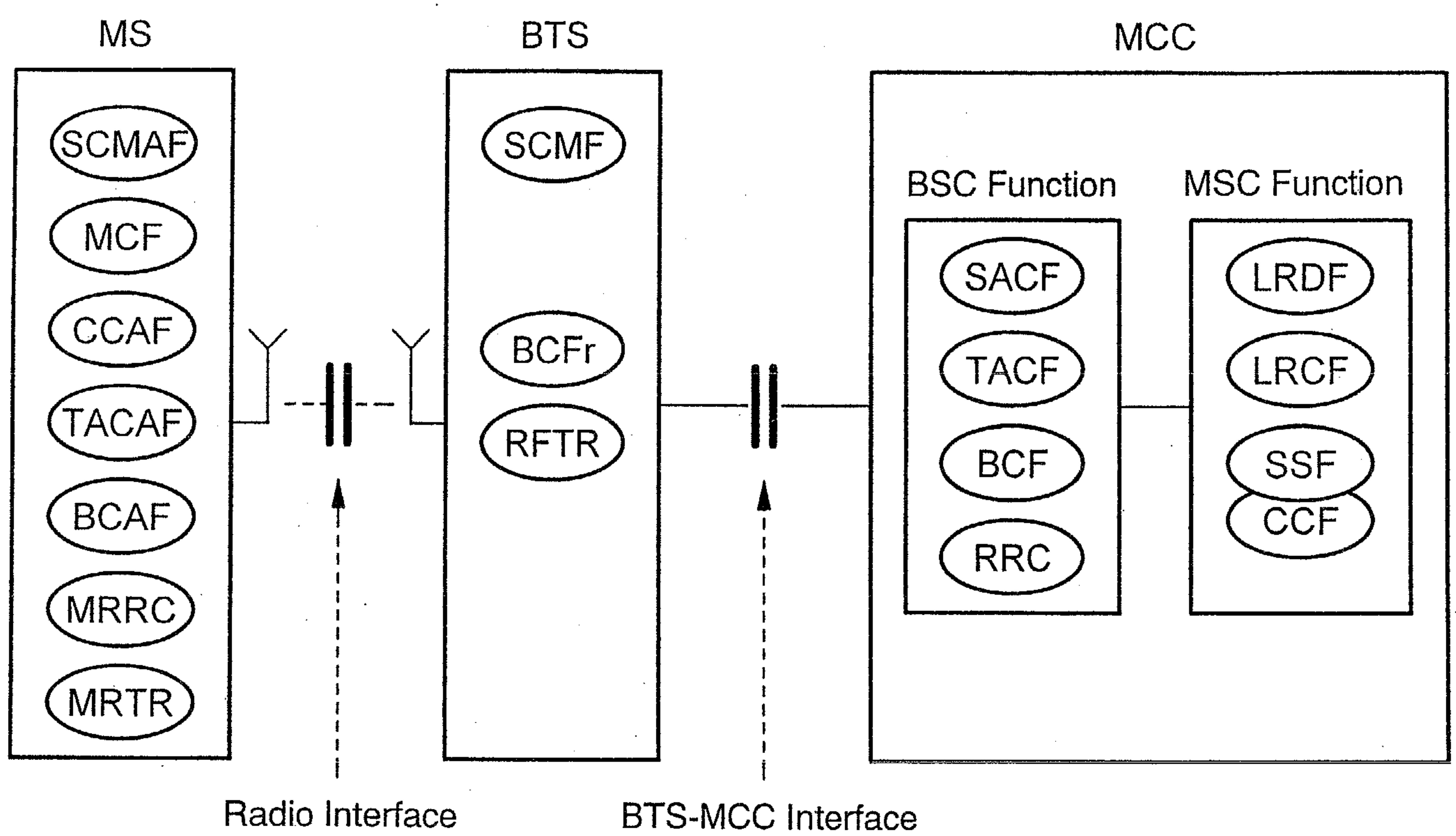

UTMF
TACAF/MCF
TACF/SACF
LRCF
LRDF
These enclosed procedures are executed at the location registration and the location updating (case A).
IMUI RETRIEVAL
req. ind.
Convert the TMUI to the IMUI
IMUI RETRIEVAL
resp. conf.
These enclosed procedures are executed when the TMUI is unknown.
IMUI RETRIEVAL
req. ind.
IMUI RETRIEVAL
req. ind. (SDCCH)
IMUI INQUIRY
req. ind.
IMUI INQUIRY
resp. conf.
IMUI RETRIEVAL
resp. conf. (SDCCH)
IMUI RETRIEVAL
resp. conf.

FIG. 69



MS: Mobile Station
BTS: Base Transceiver System
MCC: MOBILE Communications Control Center

FIG. 70

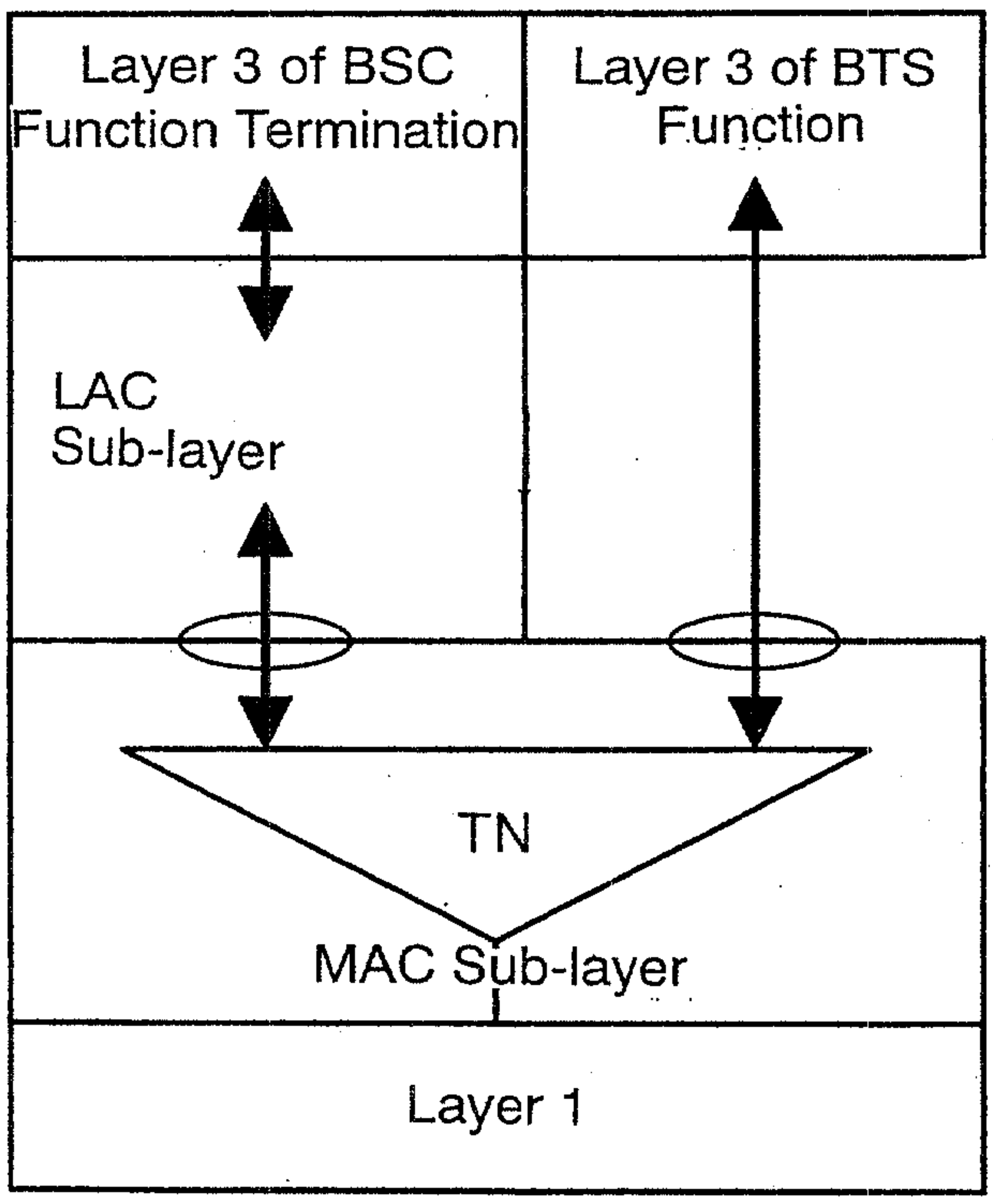
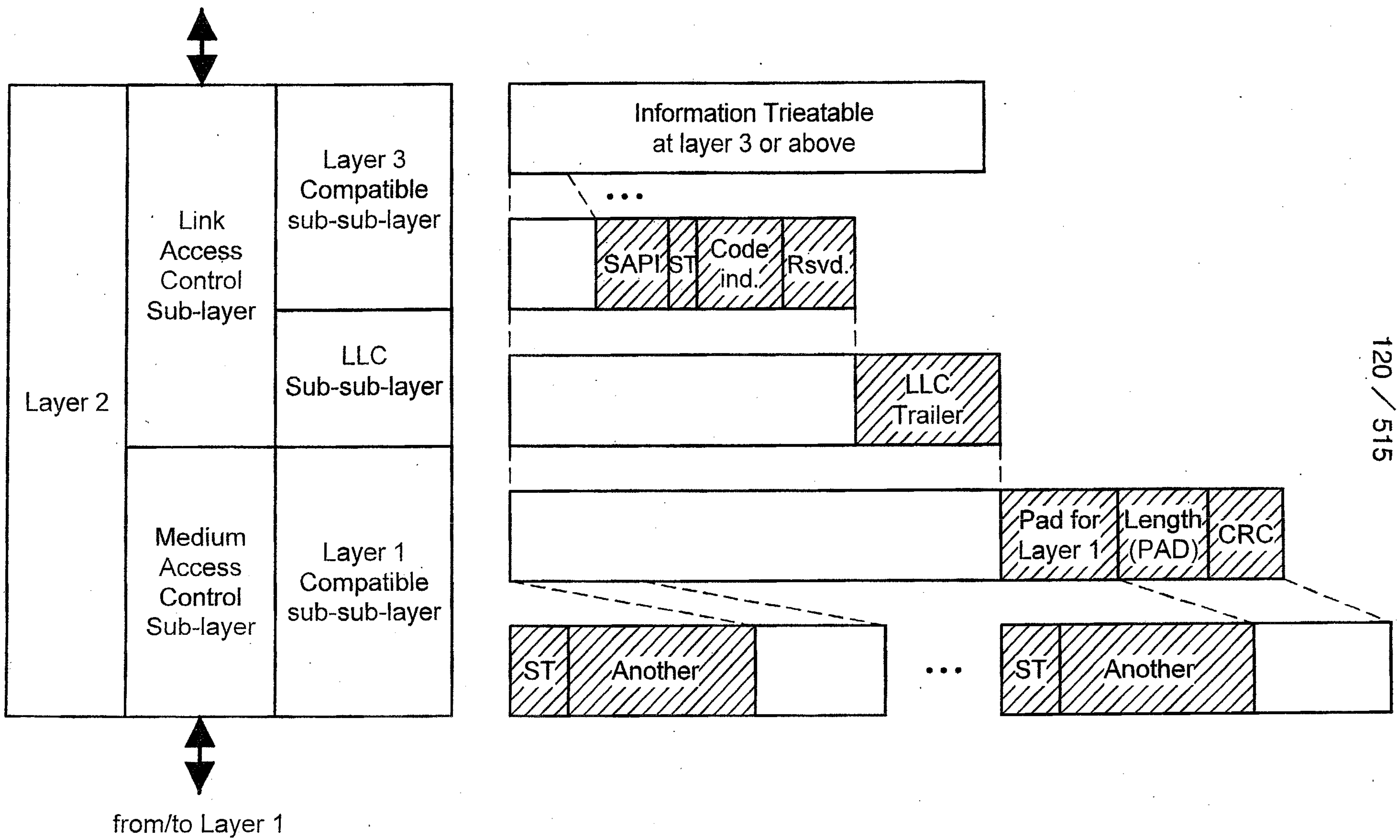

Layer 3 of BSC
Function Termination
Layer 3 of BTS
Function
LAC
Sub-layer
TN
MAC Sub-layer
Layer 1

FIG. 71



from/to Layer 3
Layer 2
Link Access Control Sub-layer
Layer 3 Compatible sub-sub-layer
LLC Sub-sub-layer
Medium Access Control Sub-layer
Layer 1 Compatible sub-sub-layer
from/to Layer 1
Information Trieatable at layer 3 or above
SAPI
ST
Code ind.
Rsvd.
LLC Trailer
Pad for Layer 1
Length (PAD)
CRC
ST
Another
ST
Another

FIG. 72

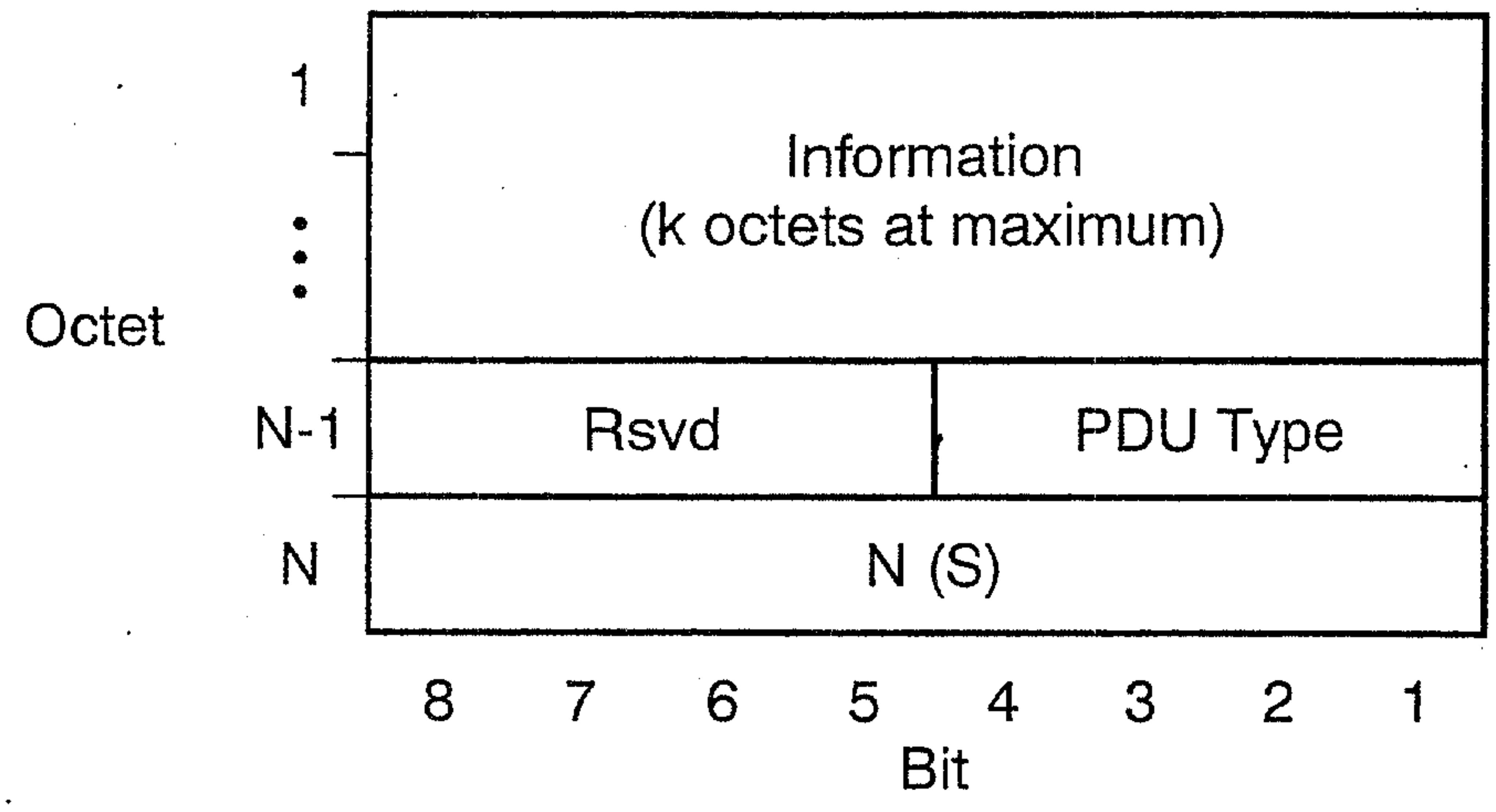


FIG. 73

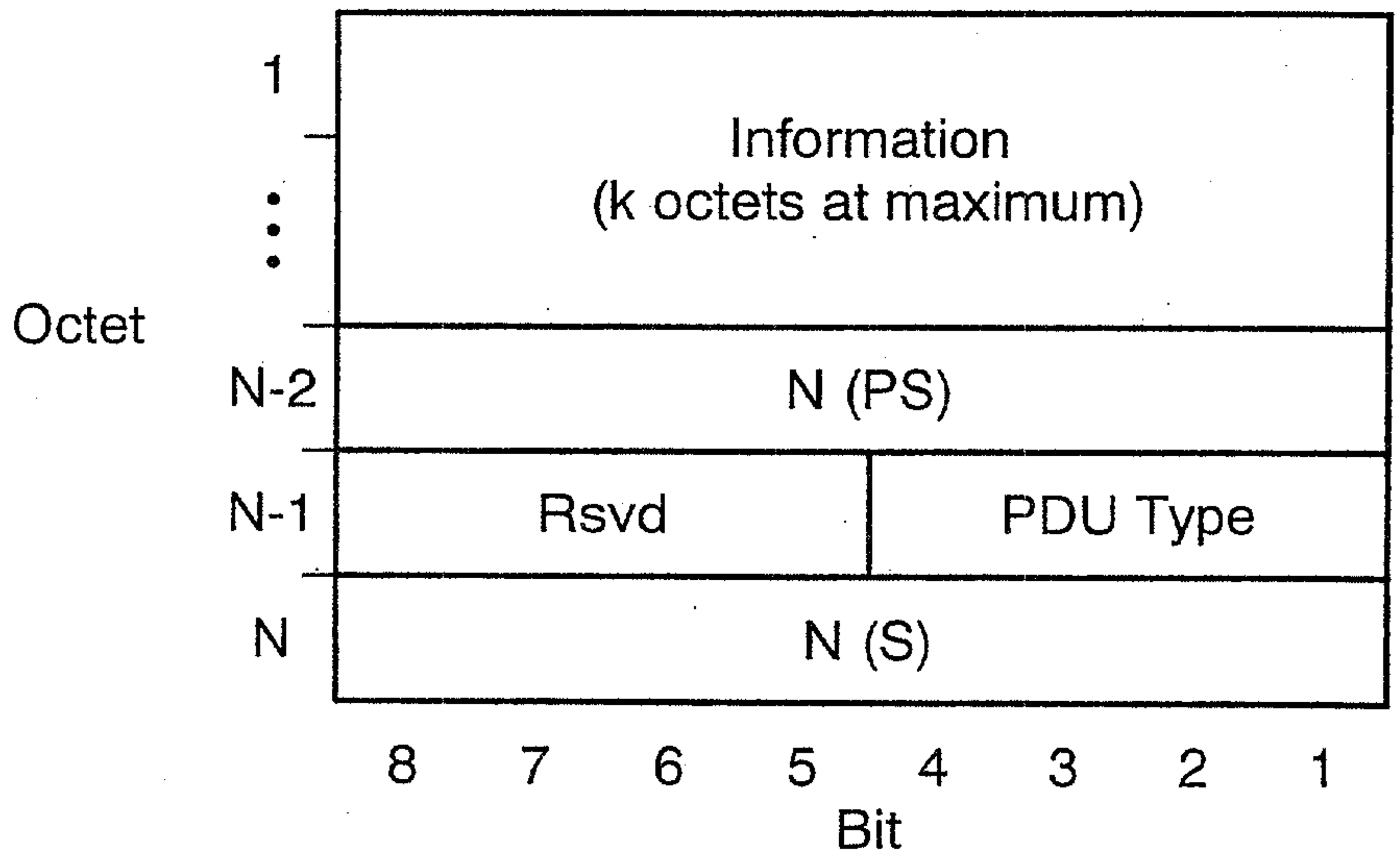


FIG. 74

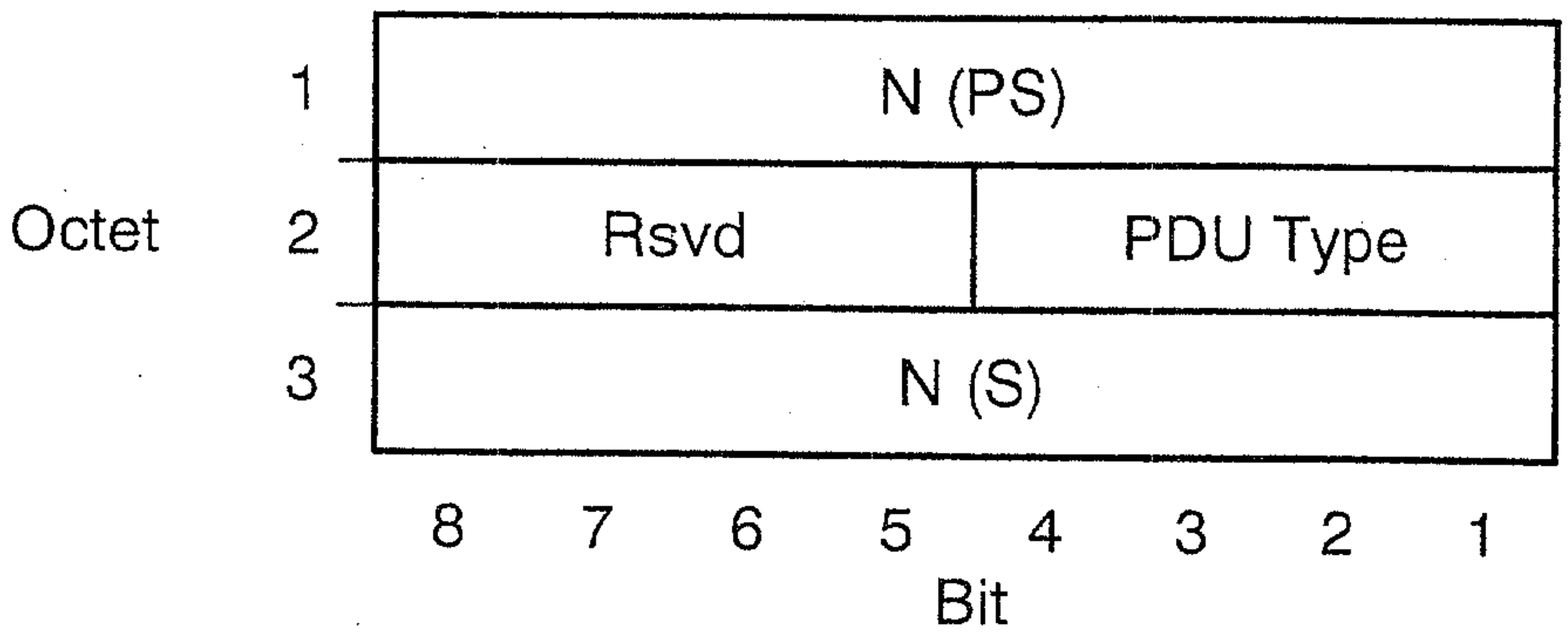


FIG. 75

Octet	Bit 8	7	6	5	4	3	2	1
1	List Element 1 (SD PDU N (S))							
2	List Element 2							
⋮	⋮							
L	List Element L							
L+1	N (PS)							
L+2	N (MR)							
L+3	Rsvd				PDU Type			
L+4	N (S)							

FIG. 76

Octet	Bit 8	7	6	5	4	3	2	1
1	List Element 1 (SD PDU N (S))							
2	List Element 2							
3	N (MR)							
4	Rsvd				PDU Type			
5	N (S)							

FIG. 77

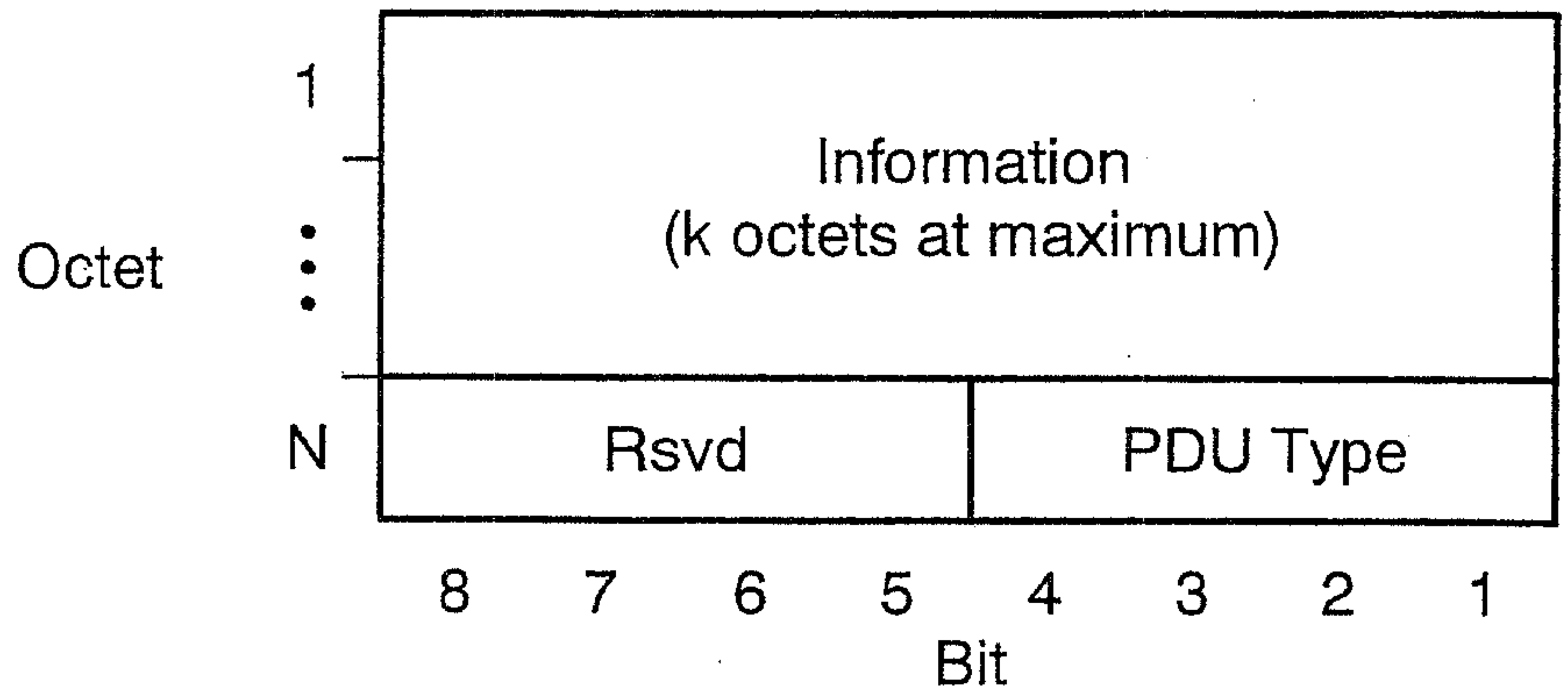


FIG. 78

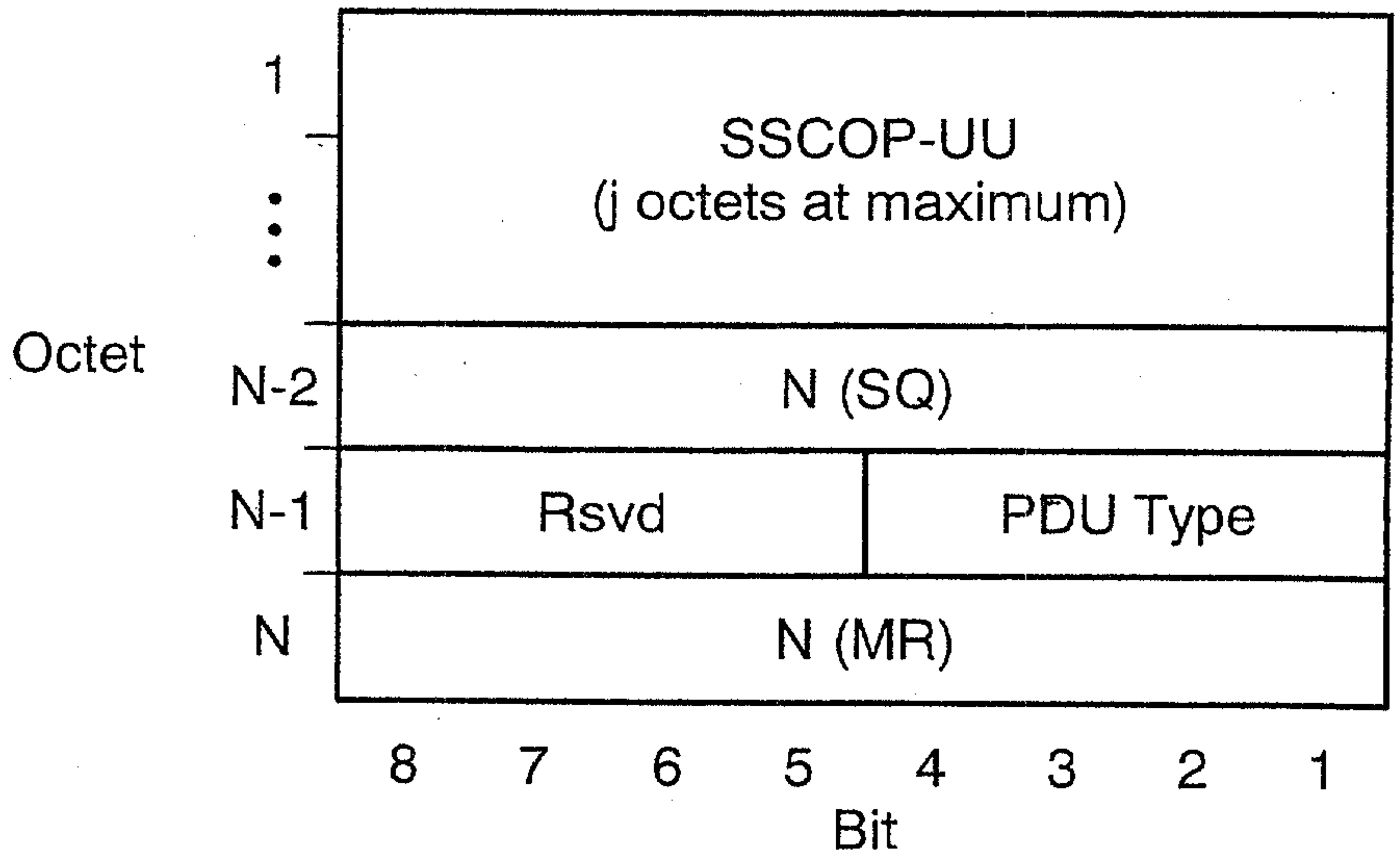


FIG. 79

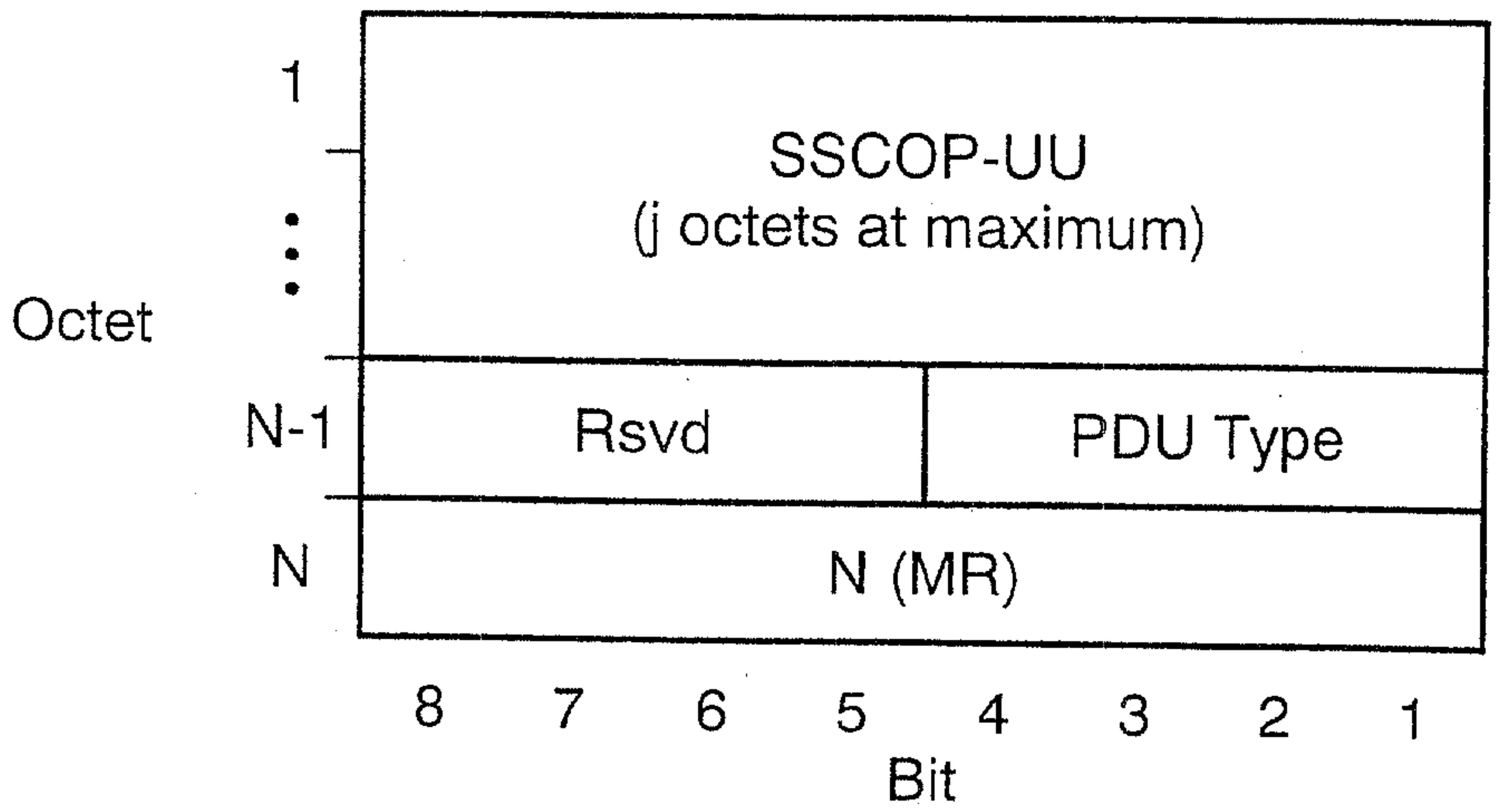


FIG. 80

Octet		Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
Octet	1 ⋮	SSCOP-UU (j octets at maximum)							
	N	Rsvd				PDU Type			

FIG. 81

Octet		Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
Octet	1 ⋮	SSCOP-UU (j octets at maximum)							
	N	R			S	PDU Type			

FIG. 82

Octet		Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
Octet	N	Reserved				PDU Type			

FIG. 83

Octet		
1 ⋮	SSCOP-UU (j octets at maximum)	
N-2	N (SQ)	
N-1	Rsvd	PDU Type
N	N (MR)	

8 7 6 5 4 3 2 1
Bit

FIG. 84

Octet		
1	Rsvd	PDU Type
2	N (MR)	

8 7 6 5 4 3 2 1
Bit

FIG. 85

Octet		
1	N (SQ)	
2	Rsvd	PDU Type
3	N (MR)	

8 7 6 5 4 3 2 1
Bit

FIG. 86

Octet	8	7	6	5	4	3	2	1
1	Rsvd				PDU Type			
2	N (MR)							

Bit

FIG. 87

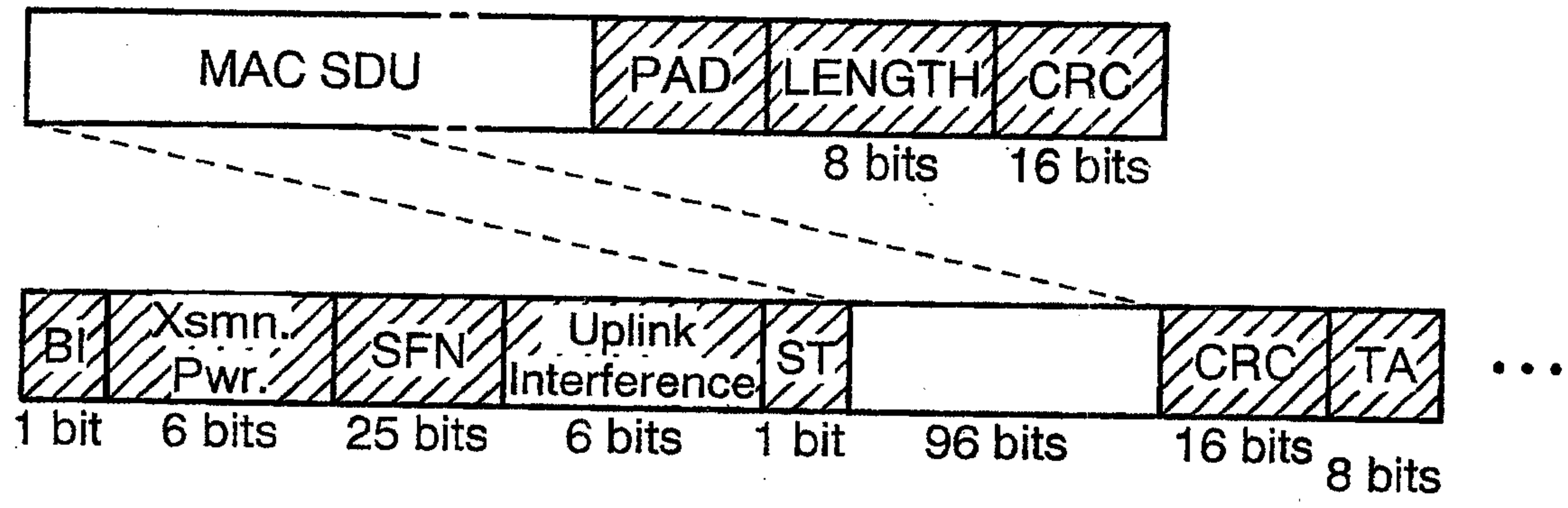


FIG. 88

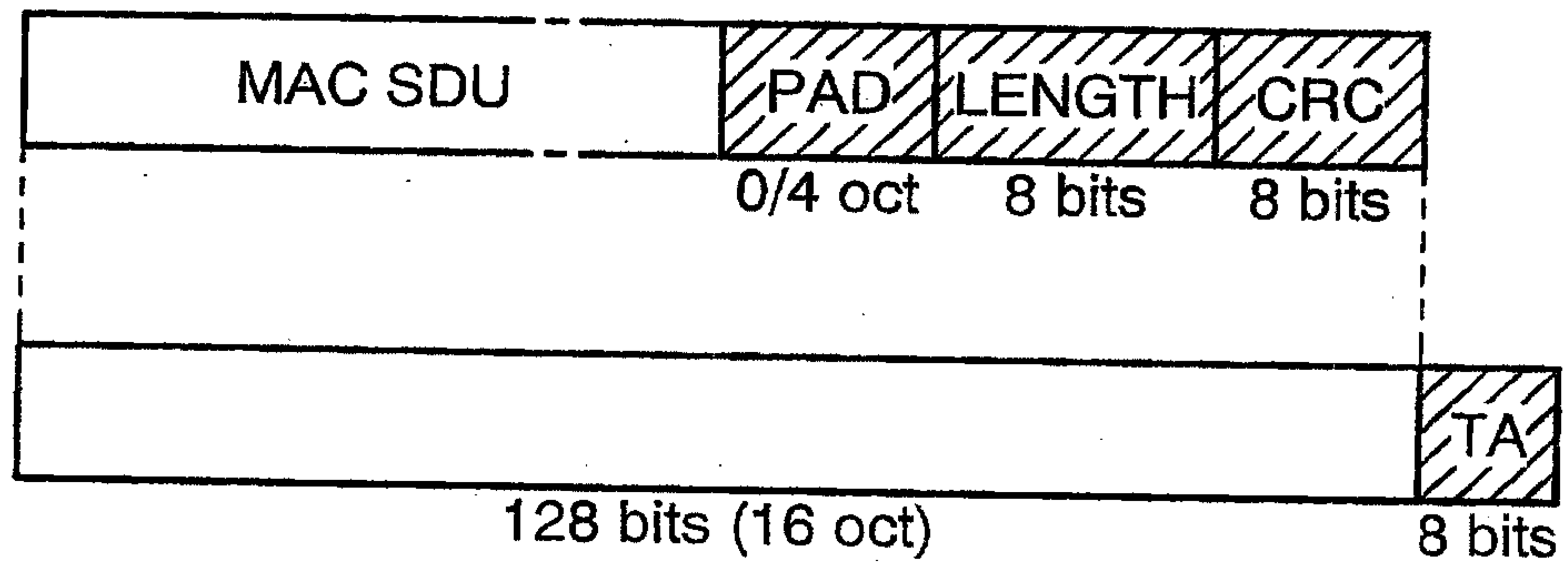


FIG. 89

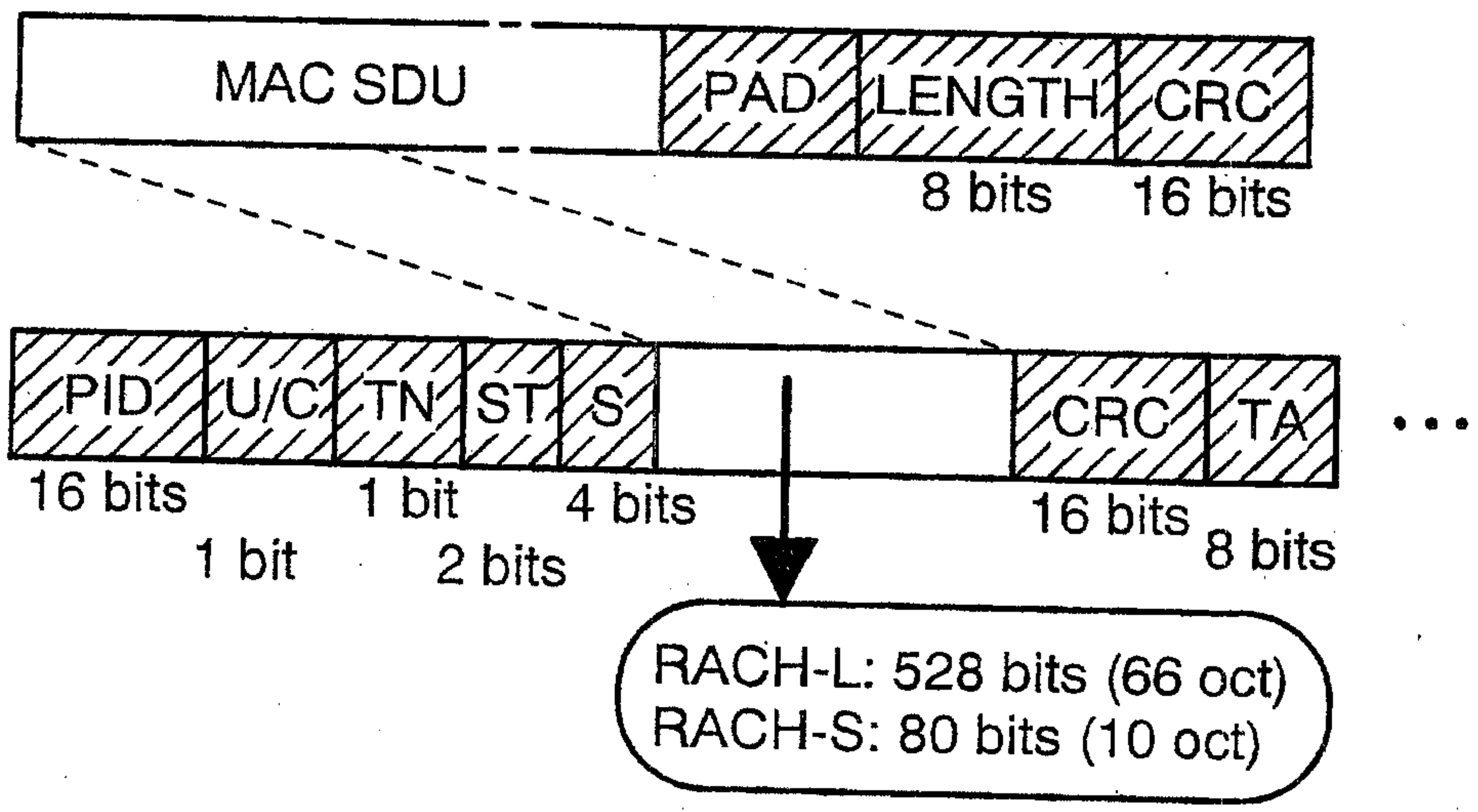


FIG. 90

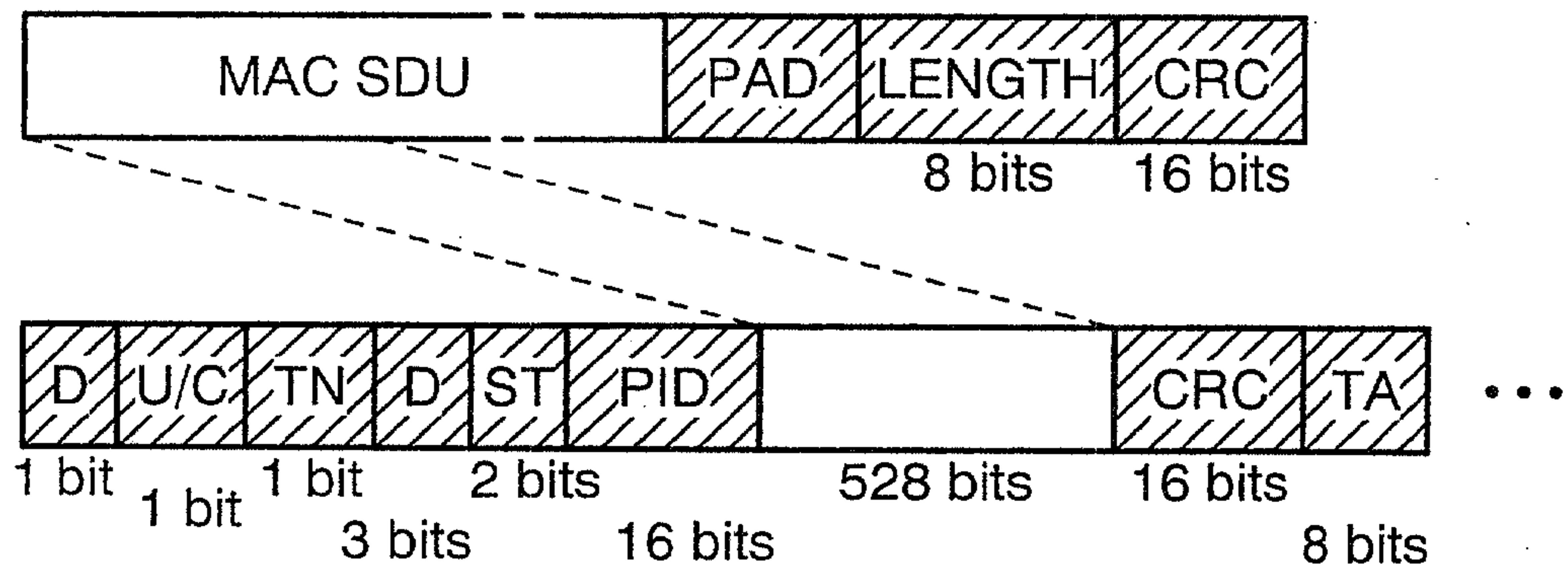


FIG. 91

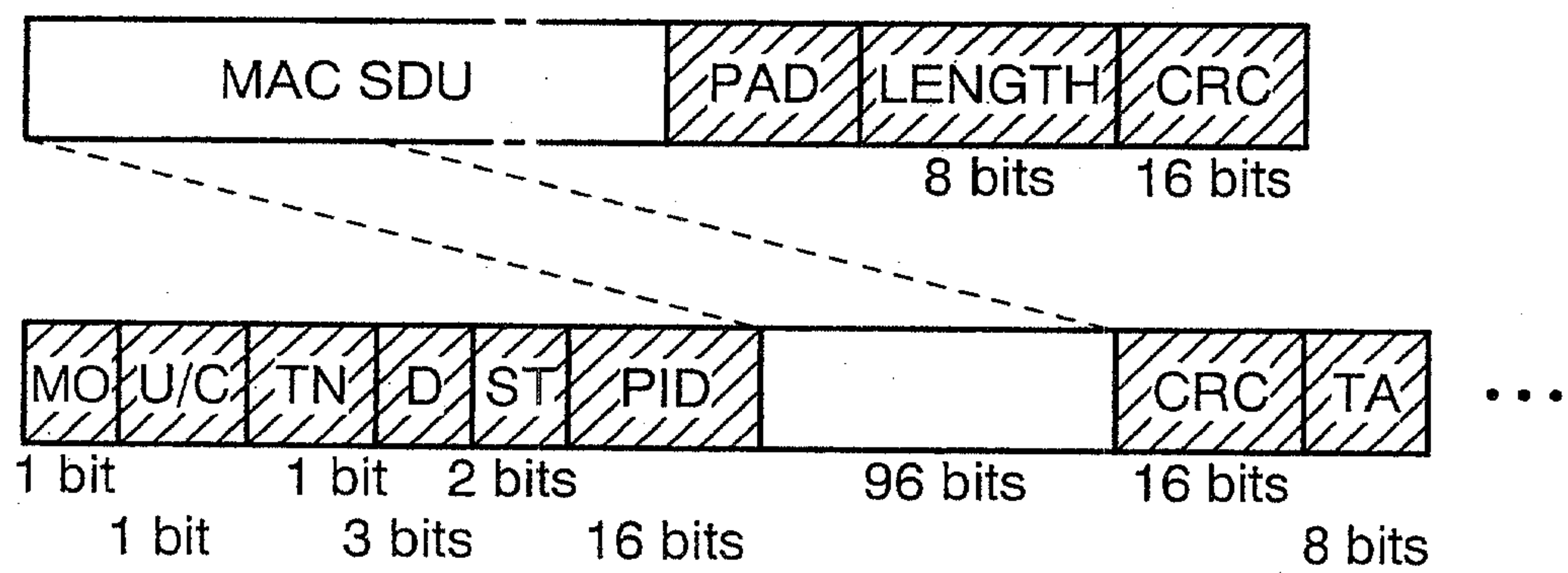


FIG. 92

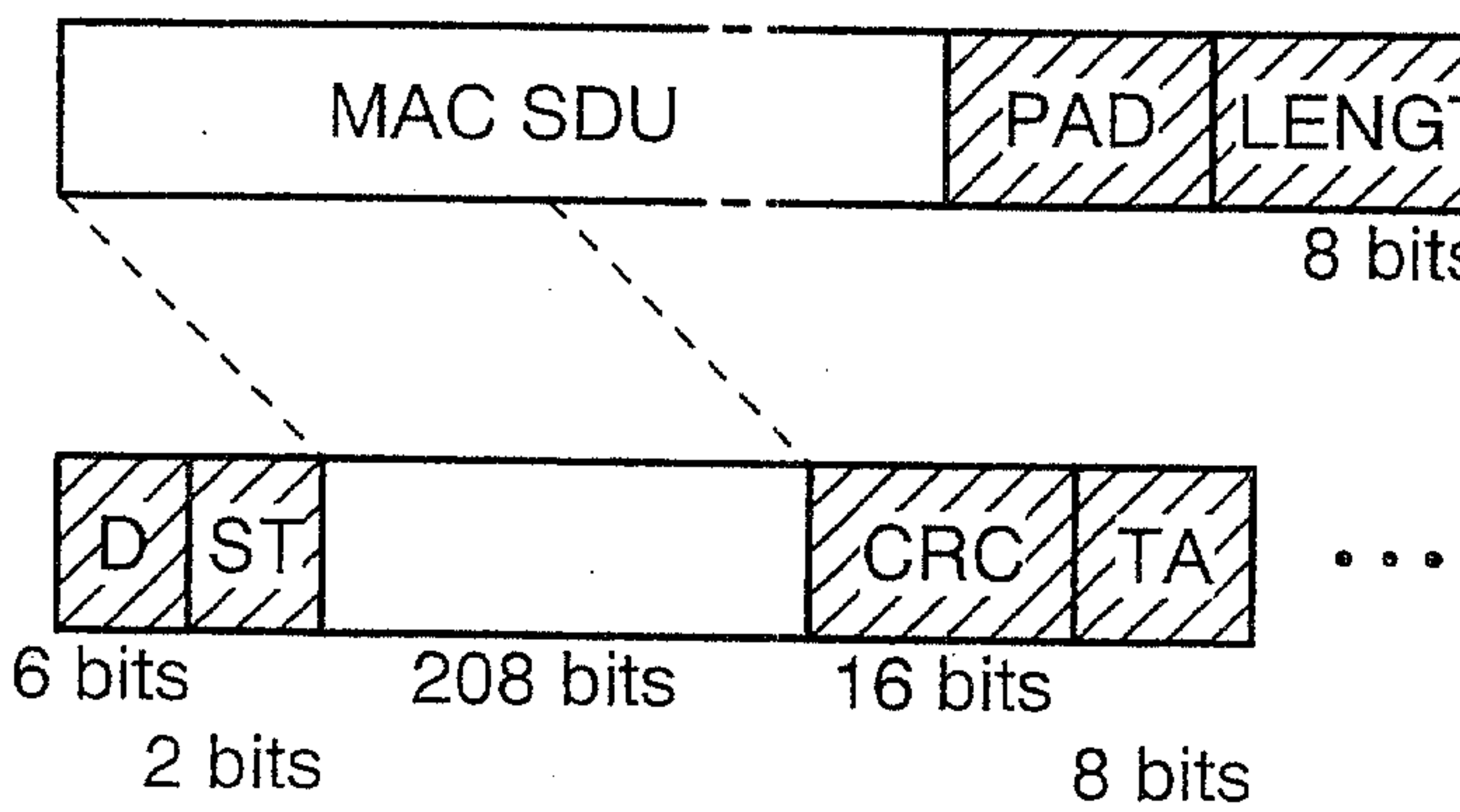


FIG. 93

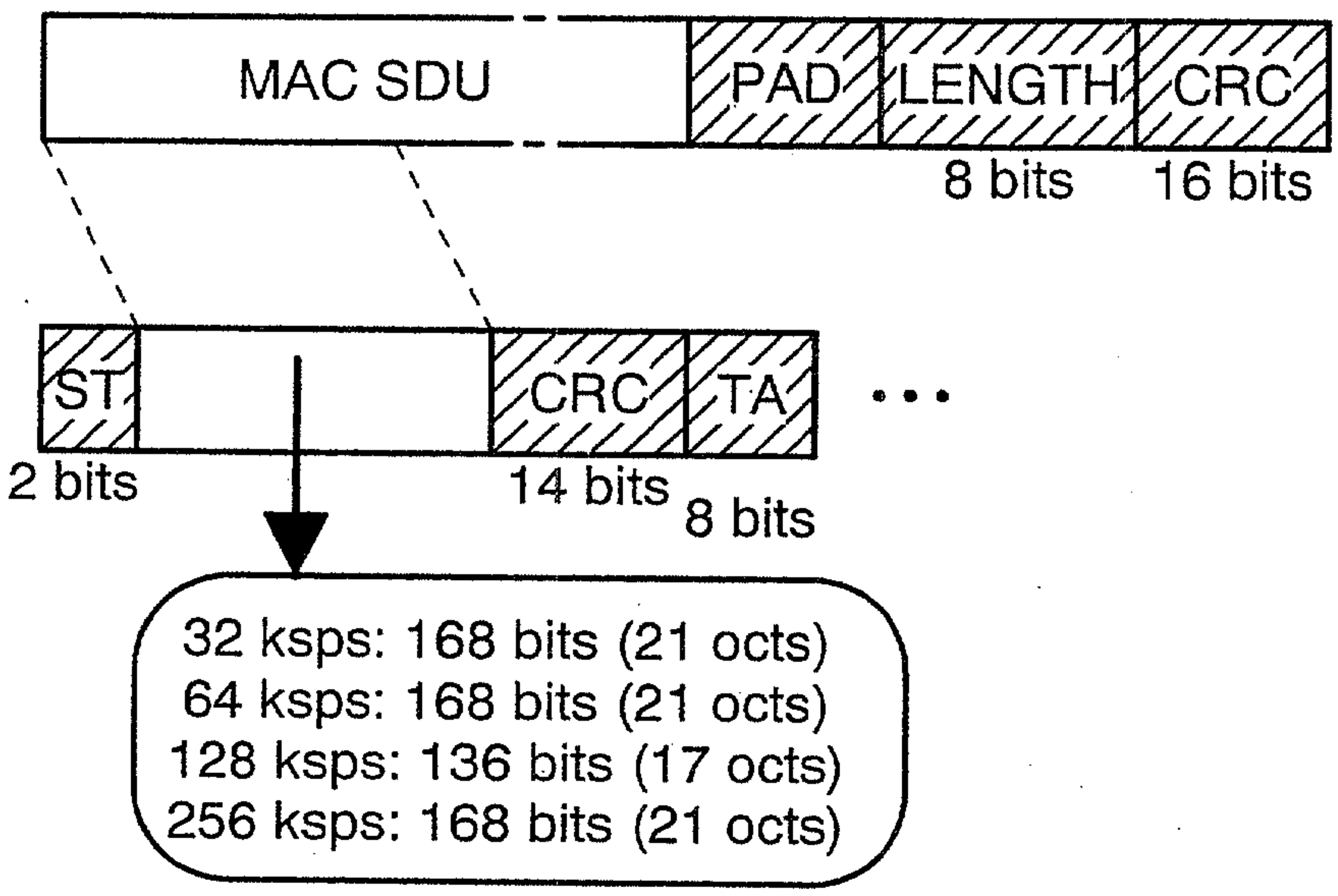

MAC SDU
PAD
LENGTH
CRC
8 bits
16 bits
ST
CRC
TA
• • •
2 bits
14 bits
8 bits
32 ksps: 168 bits (21 octs)
64 ksps: 168 bits (21 octs)
128 ksps: 136 bits (17 octs)
256 ksps: 168 bits (21 octs)

FIG. 94

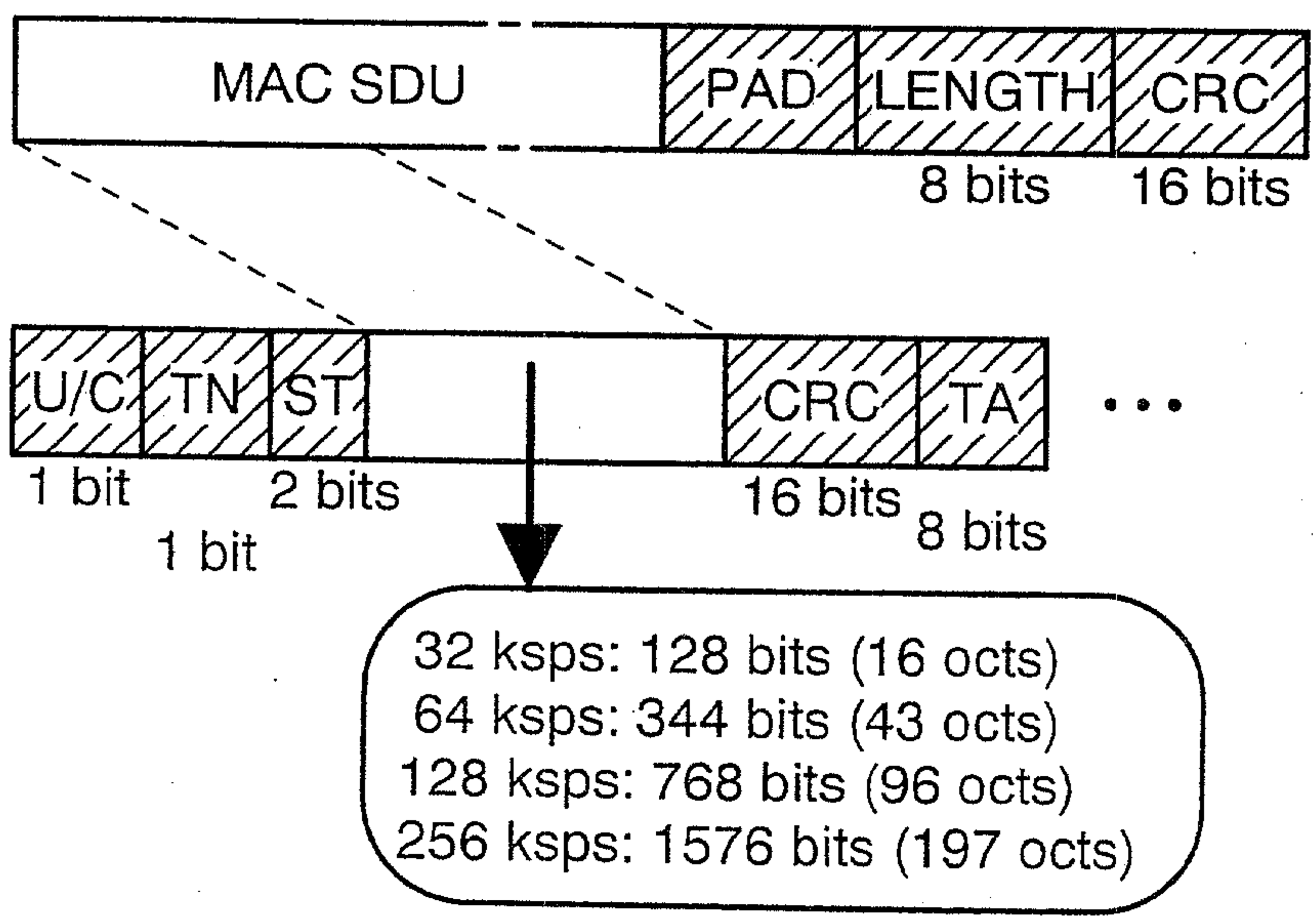

MAC SDU
PAD
LENGTH
CRC
8 bits
16 bits
U/C
TN
ST
CRC
TA
• • •
1 bit
2 bits
1 bit
16 bits
8 bits
32 ksps: 128 bits (16 octs)
64 ksps: 344 bits (43 octs)
128 ksps: 768 bits (96 octs)
256 ksps: 1576 bits (197 octs)

FIG. 95

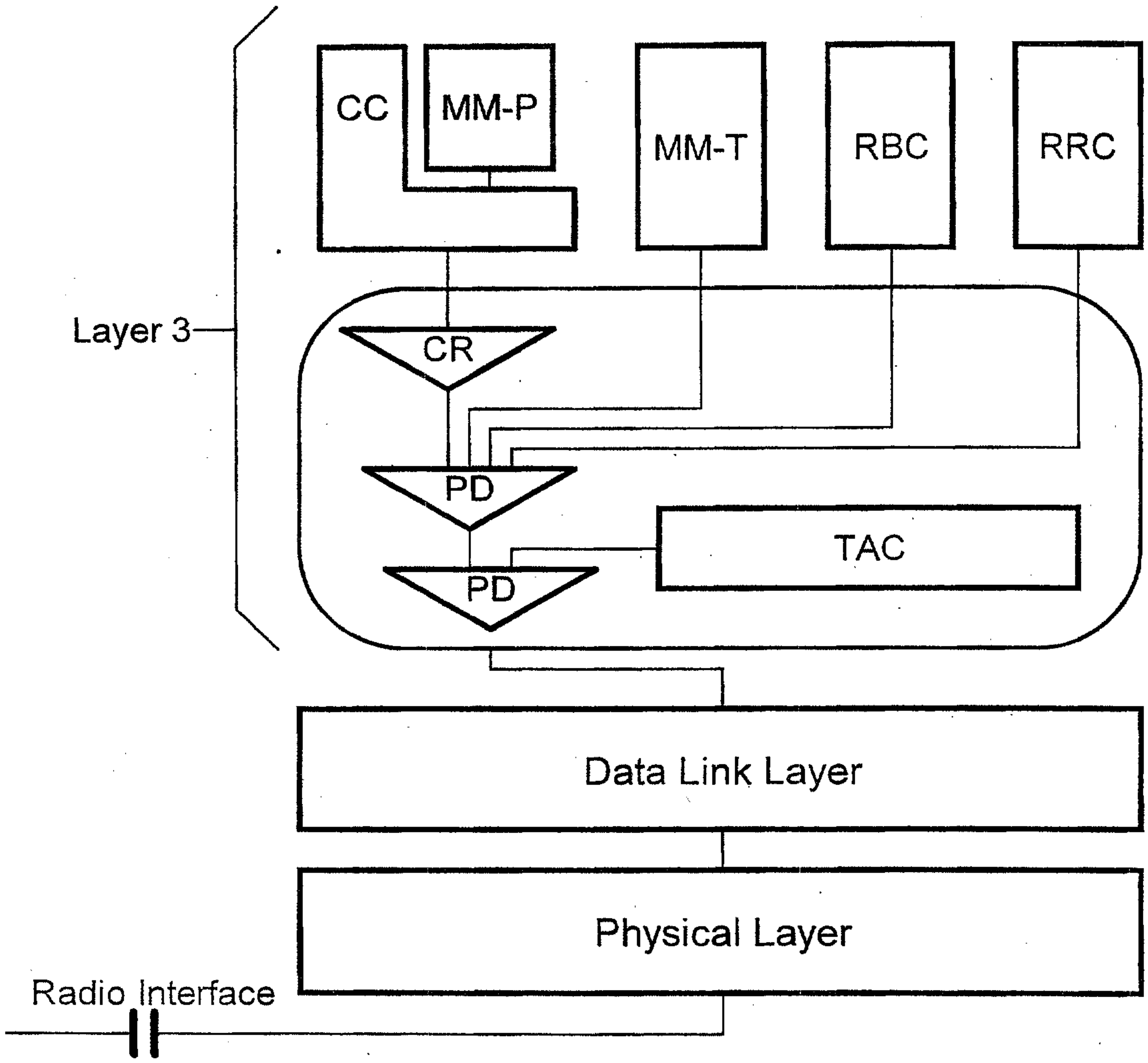

Layer 3
CC
MM-P
MM-T
RBC
RRC
CR
PD
PD
TAC
Data Link Layer
Physical Layer
Radio Interface

FIG. 96

BASIC FORMAT OF RBC ENTITY MESSAGE

Protocol Discriminator
Message Type
Operation Indicator*
Message-Specific-Parameter
Fundamental Information 1
⋮
Fundamental Information a
Extensional Information 1
⋮
Extensional Information b

Message-specific-parameter field contains at least one unique parameter of the message.

Each fundamental information field includes at least one parameter in conformance with the procedure that the message initiates. In other words, fundamental information elements in RBC entity messages vary with the necessary procedure. Fundamental information filed can be used without any design change of the invented system.

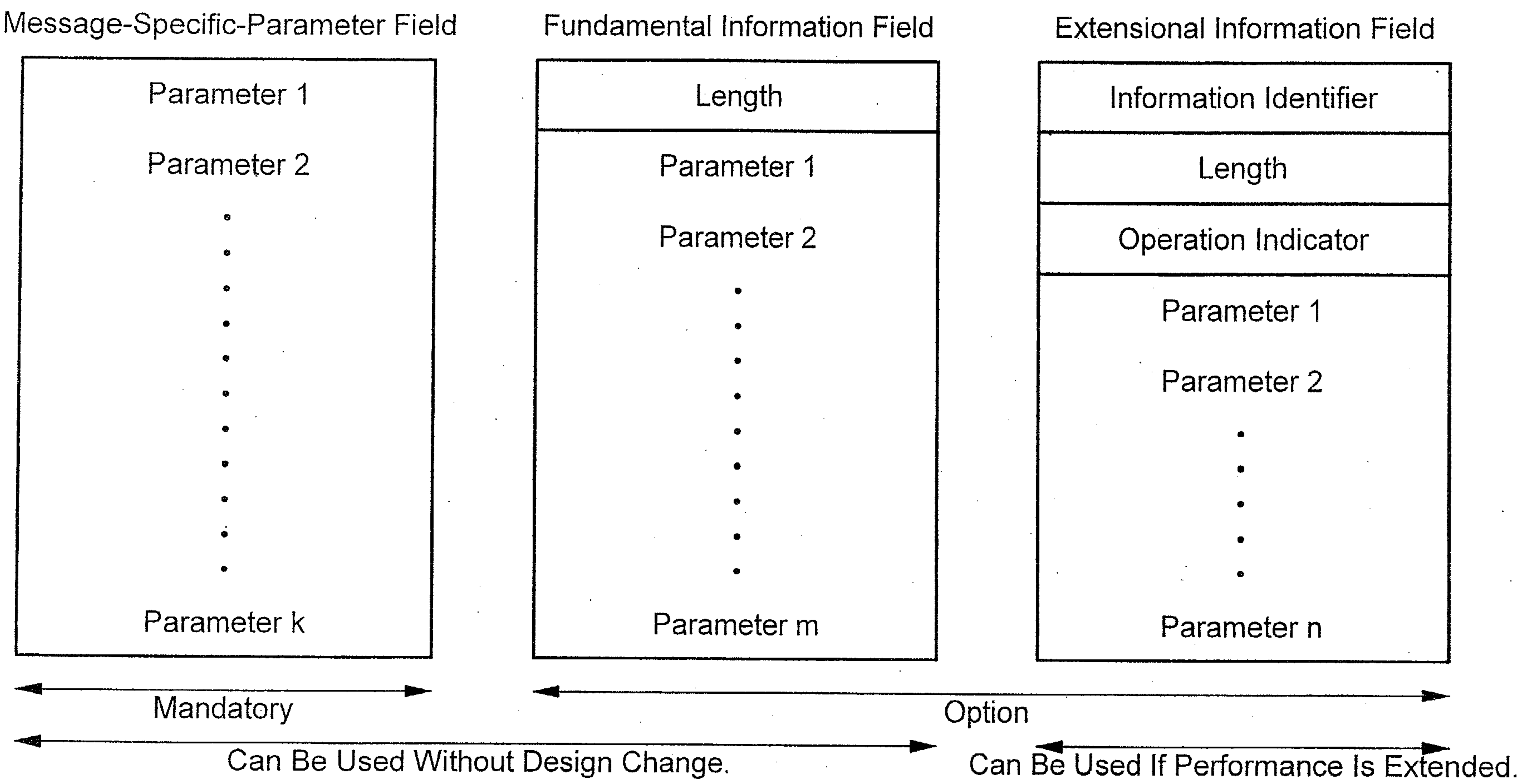
Extensional information field may be used when the performance of the invented system is extended.

Fundamental information fields can be arranged in random order and extensional information fields can be arranged in random order.

Operation indicator field asterisked is not included in the RBC entity message for the invented system. If a new type of message will be used in the system due to performance extension in the future, this field will be used.

FIG. 97

STRUCTURES OF FRAMES OF RBC ENTITY MESSAGE



Message-specific-parameter field is mandatory.

As to each parameter, if the length is variable, the length field indicates that there is no instruction.

As to each parameter, if there is not a parameter that may be used optionally, this fact is indicated by a bit or bits for indicating whether there is a parameter or not.

FIG. 98

Bit 8	7	6	5	4	3	2	1	Octet
Protocol Discriminator								1
Flag	Call Reference Value							2
Message Type								3
								4
Variable Length Information Elements								5

FIG. 99

Bit 8	7	6	5	4	3	2	1	
Protocol Discriminator								1 Octet

FIG. 100

Flag	Call Reference Value

Call Reference Flag Bit 8	
0	the message is sent from the side that originated the call reference.
1	the message is sent to the side that originated the call reference.

Bit 8	7	6	5	4	3	2	1	
0/1	0	0	0	0	0	0	0	1 Octet

FIG. 101

Bit

8	7	6	5	4	3	2	1	
0/1	1	1	1	1	1	1	1	1 Octet

FIG. 102

Bit

8	7	6	5	4	3	2	1	Octet
Massage Type								1
1 Ext.	0 Spare	0	Flag	0 Spare	0 Spare	Mag. Action Indicator		2

FIG. 103

Bit

8	7	6	5	4	3	2	1	Octet
Information Element Identifier								1
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2 (Note 1)
Length of Contents of Information Element								3
								4
Contents of Information Element								5 (Note 2) etc.

T1162620-94/d008

Notes

1 IE instruction field (bits 1 to 5 of octet 2) is interpreted only for unexpected or unrecognized information element or information element with unrecognized contents. With respect to some information elements according to ITU-T Recommendation Q.2931, the value allocated in the IE instruction field is restricted to a combination of limited values (Refer to descriptions of respective infotrmation elements).

2 Usage example of the subfield identifier will be described in Appendix L.

FIG. 104

Bit

8	7	6	5	4	3	2	1	Octet
Escape Code for Extension								
1	1	1	1	1	1	1	1	1
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of Information Element Contents								3
								4
Information Element Identifier								5
								6
Contents of Information Element								7
								etc.

T1162630-94/d009

FIG. 105

Bit

8	7	6	5	4	3	2	1	Octet
Broadband Locking Shift								
0	1	1	0	0	0	0	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of Broadband Locking Sift Content								3
								4
1 Ext.	Spare 0	0	0	0	New Code Set Identification			5

T1162640-94/d010

FIG. 106

Bit 8	7	6	5	4	3	2	1	Octet
Broadband Non-Locking Shift 0	1	1	0	0	0	0	1 Information Element Identifier	1
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Broadband Non-Locking Sift Contents								3
								4
1 Ext.	Spare 0	0	0	0	Temporary Code Set Identification			5

T1162650-94/d01

FIG. 107

Bit 8	7	6	5	4	3	2	1	Octet
AAL Parameters 0	1	0	1	1	0	0	0 Information Element Identifier	1
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of AAL Parameter Contents								3
								4
AAL Type								5

Further contents depend on AAL Type (See Figs. 108-110)

FIG. 108

(further contents for ALL type 1)

Bit

8	7	6	5	4	3	2	1	Octet
Subtype Identifier								
1	0	0	0	0	1	0	1	6
Subtype								6.1
CBR Rate Identifier								
1	0	0	0	0	1	1	0	7
CBR Rate								7.1
Multiplier Identifier								
1	0	0	0	0	1	1	1	8* (Note)
Multiplier								8.1*(Note)
								8.2*(Note)
Source Clock Frequency Recovery Method Identifier								
1	0	0	0	1	0	0	0	9*
Source Clock Frequency Recovery Method								9.1*
Error Correction Method Identifier								
1	0	0	0	1	0	0	1	10*
Error Correction Method								10.1*
Structured Data Transfer Block Size Identifier								
1	0	0	0	1	0	1	0	11*
Structured Data Transfer Block Size								11.1*
								11.2*
Partially Filled Cells Method Identifier								
1	0	0	0	1	0	1	1	12*
Partially Filled Cells Method								12.1*

Note
These asterisked octets are included only when octet 7.1 indicates n × 64 kbps or n × 8 kbps.

FIG. 109

(further contents for ALL type 3/4)

Bit 8	7	6	5	4	3	2	1	Octet
Forward Maximum CPCS-SDU Size Identifier								
1	0	0	0	1	1	0	0	6*
Forward Maximum CPCS-SDU Size								6.1* 6.2*
Backward Maximum CPCS-SDU Size Identifier								
1	0	0	0	0	1	1	1	7*
Backward Maximum CPCS-SDU Size								7.1* 7.2*
MID Range Identifier								
1	0	0	0	0	0	1	0	8*
MID Range (Lowest MID Value)								8.1* 8.2*
MID Range (Highest MID Value)								8.3* 8.4*
SSCS-Type Identifier								
1	0	0	0	0	1	0	0	9*
SSCS-Type								9.1*

Note
The indication of octet groups 6 through 8 used in connect message is designated in ITU-T Recommendation Q.2931.

FIG. 110

(further contents for ALL type 5)

Bit

8	7	6	5	4	3	2	1	Octet
Forward Maximum CPCS-SDU Size Identifier								
1	0	0	0	1	1	0	0	6*
Forward Maximum CPCS-SDU Size								6.1*
								6.2*
Backward Maximum CPCS-SDU Size Identifier								
1	0	0	0	0	0	0	1	7*
Backward Maximum CPCS-SDU Size								7.1*
								7.2*
SSCS-Type Identifier								
1	0	0	0	0	1	0	0	8*
SSCS-Type								8.1*

Note
The indication of octet groups 6 and 7 used in connect message is designated in ITU-T Recommendation Q.2931.

FIG. 111

(further contents for User-defined AAL)

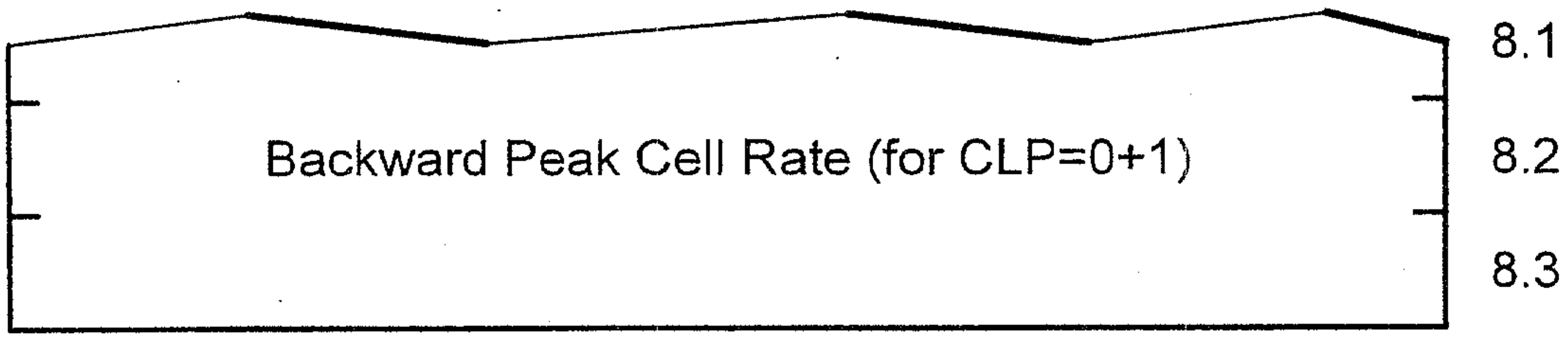
Bit

8	7	6	5	4	3	2	1	Octet
User Defined AAL Information								5.1*
User Defined AAL Information								5.2*
User Defined AAL Information								5.3*
User Defined AAL Information								5.4*

FIG. 112

Bit 8	7	6	5	4	3	2	1	Octet
ATM Traffic Descriptor								
0	1	0	1	1	0	0	1	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of ATM Traffic Descriptor Contents								3
								4
Forward Peak Cell Rate Identifier (CLP=0)								
1	0	0	0	0	0	1	0	5 (Note 1)
Forward Peak Cell Rate (for CLP=0)								5.1
								5.2
								5.3
Backward Peak Cell Rate Identifier (CLP=0)								
1	0	0	0	0	0	1	1	6 (Note 1)
Backward Peak Cell Rate (for CLP=0)								6.1
								6.2
								6.3
Forward Peak Cell Rate Identifier (CLP=0+1)								
1	0	0	0	0	1	0	0	7 (Note 2)
Forward Peak Cell Rate (for CLP=0+1)								7.1
								7.2
								7.3
Backward Peak Cell Rate Identifier (CLP=0+1)								
1	0	0	0	0	1	0	1	8 (Note 3)

CONTINUDE FROM FIG. 112



T1162710-94/d017

Notes

1 If the peak cell rate for which the CLP is zero is indicated, the difference between the peak cell rate for which the CLP is zero or one and the peak cell rate for which the CLP is zero should be used as the peak cell rate for which the CLP is one in the network resource allocation.

2 If only the peak cell rate for which the CLP is one or zero is indicated, a complete peak cell rate should be used by cells with which the CLP is zero.

FIG. 113

<table>
<tr><td colspan="8">Bit</td><td></td></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>Octet</td></tr>
<tr><td colspan="8">Broadband Bearer Capability</td><td rowspan="3">1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td colspan="8">Information Element Identifier</td></tr>
<tr><td rowspan="2">1
Ext.</td><td colspan="2" rowspan="2">Coding
Standard</td><td colspan="5">IE Instruction Field</td><td rowspan="2">2</td></tr>
<tr><td>Flag</td><td>Res.</td><td colspan="3">IE Action Ind.</td></tr>
<tr><td colspan="8">Length of the Broadband Bearer Capability Contents</td><td>3
4</td></tr>
<tr><td>0/1
Ext.</td><td>0</td><td>0
Spare</td><td colspan="5">Bearer Class</td><td>5</td></tr>
<tr><td>1
Ext.</td><td>0</td><td>0
Spare</td><td colspan="3">Traffic Type</td><td colspan="2">Timing
Requirements</td><td>5a* (Note)</td></tr>
<tr><td>1
Ext.</td><td colspan="2">Susceptibility
to Clipping</td><td>0</td><td>0
Spare</td><td>0</td><td colspan="2">User-Plane
Connection
Configuration</td><td>6</td></tr>
</table>

T1162720-94/d018

Note
The asterisked octet can be included when octet 5 indicates bearer class X.

FIG. 114

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>Octet</th></tr>
<tr><td colspan="8">Broadband High Layer Information</td><td rowspan="3">1</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td colspan="8">Information Element Identifier</td></tr>
<tr><td rowspan="2">1
Ext.</td><td colspan="2" rowspan="2">Coding
Standard</td><td colspan="5">IE Instruction Field</td><td rowspan="2">2</td></tr>
<tr><td>Flag</td><td>Res.</td><td colspan="3">IE Action Ind.</td></tr>
<tr><td colspan="8" rowspan="2">Length of the Broadband High Layer
Information Contents</td><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>1
Ext.</td><td colspan="7">High Layer Information Type</td><td>5</td></tr>
<tr><td colspan="8">High Layer Information</td><td>6-13*</td></tr>
</table>

T1162730-94/d019

FIG. 115

Bit

8	7	6	5	4	3	2	1	Octet
Broadband Low Layer Information								
0	1	0	1	1	1	1	1	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of the Broadband Low Layer Information Contents								3
								4
1 Ext.	0 Layer 1 Id.	1	User Information Layer 1 Protocol					5*
0/1 Ext.	1 Layer 2 Id.	0	User Information Layer 2 Protocol					6*
0/1 Ext.	Mode		0	0 Spare	0	Q.933 Use		6a* (Note 1)
1 Ext.	Window Size (k)							6b* (Note 1)
1 Ext.	User Specified Layer 2 Protocol Information							6a* (Note 2)
0/1 Ext.	1 Layer 3 Id.	1	User Information Layer 3 Protocol					7*
0/1 Ext.	Mode		0	0	0 Spare	0	0	7a* (Note 3)
0/1 Ext.	0	0 Spare	0	Default Packet Size				7b* (Note 3)
1 Ext.	Packet Window Size							7c* (Note 3)
1 Ext.	User Specified Layer 3 Protocol Information							7a* (Note 4)

FIG. 116

Additional Layer 3 Protocol Information	7.1* (Note 5)
(cont.)	7.2* (Note 5)
(cont.)	7.3* (Note 5)
(cont.)	7.4* (Note 5)
(cont.)	7.5* (Note 5)
(cont.)	7.6* (Note 5)
(cont.)	7.7* (Note 5)
(cont.)	7.8* (Note 5)

T1162750-94/d021

Notes

1 This octet is included only when octet 6 indicates the procedure of acknowledge type HDLC.

2 This octet exists only if octet 6 indicates the user-specific layer 2 protocol.

3 This octet exists only if octet 7 indicates the layer 3 protocol in accordance with the ITU-T Recommendation X.25, ISO/IEC 8208, ITU-T Recommendation X.223, or ISO/IEC 8878.

4 This octet exists only if octet 7 indicates the user-specific layer 3 protocol.

5 These octets exist only if octet 7 indicates ISO/IEC TR9577.

FIG. 117

Bit

8	7	6	5	4	3	2	1	Octet
Called Party Number								
0	1	1	1	0	0	0	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Called Party Number Contents								3 4
1 Ext.	Type of Number			Addressing / Numbering Plan Identification				5
2nd				1st				6 (Note 1)
⋮				⋮				
Filler (Note 3)				Mth				n
NSAP Address Octets								6 (Note 2)

Notes

1 The number digits appear in the same order as input, beginning from the inferior four bits in octet 6. The digits are coded with BCD.

2 When the use of NASP address is indicated in the address/numbering plan identification, the address shall be coded with the expression of ITU-T Recommendation X.213 or ISO/IEC8348.

3 Filler shall be "1111."

FIG. 118

Bit

8	7	6	5	4	3	2	1	Octet
Called Party Sub-Address								
0	1	1	1	0	0	0	1	1
Information Element Identifier								
1/0 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Called Party Sub -Address Contents								3 4
1/0 Ext.	Type of Sub-Address			Odd / Even Indicator	0	0 Spare	0	5
Sub-Address Information								6 etc.

FIG. 119

<table>
<tr><td colspan="8">Bit</td><td></td></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>Octet</td></tr>
<tr><td colspan="8">Calling Party Number</td><td rowspan="3">1</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td colspan="8">Information Element Identifier</td></tr>
<tr><td rowspan="2">1
Ext.</td><td colspan="2" rowspan="2">Coding
Standard</td><td colspan="5">IE Instruction Field</td><td rowspan="2">2</td></tr>
<tr><td>Flag</td><td>Res.</td><td colspan="3">IE Action Ind.</td></tr>
<tr><td colspan="8">Length of Calling Party Number Contents</td><td>3
4</td></tr>
<tr><td>0/1
Ext.</td><td colspan="3">Type of Number</td><td colspan="4">Addressing / Numbering
Plan Identification</td><td>5</td></tr>
<tr><td>1
Ext.</td><td colspan="2">Presentation
Indicator</td><td>0</td><td>0</td><td>0</td><td colspan="2">Screening
Indicator</td><td>5a*</td></tr>
<tr><td colspan="4">2nd Address / Number Digits</td><td colspan="4">1st Address / Number Digits</td><td>6* etc.
(Note 1)</td></tr>
<tr><td colspan="4">⋮</td><td colspan="4">⋮</td><td></td></tr>
<tr><td colspan="4">Filler (Note 3)</td><td colspan="4">Mth Address/Number Digits</td><td></td></tr>
<tr><td colspan="8">NSAP Address Octets</td><td>6* etc.
(Note 2)</td></tr>
</table>

Notes

1 The number digits appear in the same order as input, beginning from the inferior four bits in octet 6. The digits are coded with BCD.

2 When the use of NASP address is indicated in the address/numbering plan identification, the address shall be coded with the expression of ITU-T Recommendation X.213 or ISO/IEC8348.

3 Filler shall be "1111."

FIG. 120

Bit

8	7	6	5	4	3	2	1	Octet
Calling Party Sub-Address								
0	1	1	0	1	1	0	1	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Calling Party Sub-Address Contents								3 4
1 Ext.	Type of Number			Odd / Even Indicator	0	0 Spare	0	5
Sub-Address Information								6 etc.

FIG. 121

Bit 8	7	6	5	4	3	2	1	Octet
Connection Identifier								
0	1	0	1	1	0	1	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of Connection Identifier Contents								3
								4
1 Ext.	0 Spare	0 Spare	Vp-Assoc. Signaling		Preferred / Exclusive			5
VPCI								6 (Note 3)
								7
VCI								8 (Notes 1 and 2)
								9

Notes
1 If the change addition indicator field designates an "arbitrary VCI," the VCI field must be ignored.
2 If the restart class is "001" (see ITU-T Recommendation Q.2931), the VCI field should be ignored.
3 If VP-associated signaling is designated in octet 5, the VPCI field must be ignored.

FIG. 122

Bit 8	7	6	5	4	3	2	1	Octet
End-to-end Transit Delay								
0	1	0	0	0	0	1	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of End-to-end Transit Delay Contents								3, 4
Cumulative Transit Delay Identifier								
0	0	0	0	0	0	0	1	5
Cumulative Transit Delay Value								5.1, 5,2
Maximum End-to-end Transit Delay Identifier								
0	0	0	0	0	0	1	1	6*
Maximum End-to-end Transit Delay Value								6.1*, 6.2

FIG. 123

Bit 8	7	6	5	4	3	2	1	Octet
Quality Service Parameter								
0	1	0	1	1	1	0	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of QOS Parameter Contents								3, 4
QOS Class Forward								5
QOS Class Backward								6

FIG. 124

Bit

8	7	6	5	4	3	2	1	Octet
Broadband Repeat Indicator 0	1	1	0	0	0	1	1	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Broadband Repeat Indicator Contents								3
								4
1 Ext.	0 Spare	0	0	Broadband Repeat Indicator				5

FIG. 125

Bit

8	7	6	5	4	3	2	1	Octet
Broadband Sending Complete 0	1	1	0	0	0	1	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Broadband Sending Complete Contents								3
								4
1 Ext.	Broadband Sending Complete Indication 0	1	0	0	0	0	1	5

FIG. 126

Bit 8	7	6	5	4	3	2	1	Octet
Transit Network Selection 0	1	1	1	1	0	1	1 Information Element Identifier	1
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Transit Network Selection Contents								3
								4
1 Ext.	Type of Network Identification			Network Identification Plan				5
0	Network Identification (IA5 Characters)							6 etc.

FIG. 127

Bit 8	7	6	5	4	3	2	1	Octet
Notification Indicator 0	0	1	0	0	1	1	1 Information Element Identifier	1
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Notification Indicator Contents								3
								4
Further Contents as Defined in Other ITU-T Recommendations, e. g., Q.932								5

FIG. 128

Bit

8	7	6	5	4	3	2	1	Octet
OAM Traffic Descriptor								
0	1	0	1	1	0	1	1	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of OAM Traffic Descriptor Contents								3
								4
1 Ext.	Shaping Indicator		Cmpl. Ind.	0 Spare	User-Network Fault Mngt. Ind.			5
1 Ext.	Fwd. e.-to-e. OAM F5 Flow Indicator			0 Spare	Bwd. e.-to-e. OAM F5 Flow Indicator			6

FIG. 129

Bit

8	7	6	5	4	3	2	1	Octet
Narrow-band Bearer Capability								
0	0	0	0	0	1	0	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Narrow-band Bearer Capability Contents								3
								4
Further Contents as Described in Figure 4-11 and Table 4-6 of ITU-T Recommendation Q.931								

FIG. 130

Bit

8	7	6	5	4	3	2	1	Octet
Narrow-band High Layer Compatibility								
0	1	1	1	1	1	0	1	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of Narrow-band High Layer Compatibility Contents								3
								4
Further Contents as in Figure 4-23 and Table 4-15 of ITU-T Recommendation Q.931								

FIG. 131

Bit

8	7	6	5	4	3	2	1	Octet
Narrow-band Low Layer Compatibility								
0	1	1	1	1	1	0	0	1
Information Element Identifier								
1 Ext.	Coding Standard		IE Instruction Field: Flag	Res.	IE Action Ind.			2
Length of Narrow-band Low Layer Compatibility Contents								3
								4
Further Contents as in Figure 4-25 and Table 4-16 of ITU-T Recommendation Q.931								

FIG. 132

Bit

8	7	6	5	4	3	2	1	Octet
Progress Indicator 0	0	0	1	1	1	1	0 Information Element Identifier	1
1 Ext.	Coding Standard		IE Instruction Field Flag	Res.	IE Action Ind.			2
Length of Progress Indicator Contents								3
								4
Further Contents as in Figure 4-29 and Table 4-20 of ITU-T Recommendation Q.931								

FIG. 133

Bit

8	7	6	5	4	3	2	1	Octet
M-SCP Identification Number								1
		Unique Identification Number						2
Unique Identification Number								3
								4

M-SCP identification number is used to identify the M-SCP which has assigned the TMUI and takes a value between zero and 999.

Unique identification number is used to identify the mobile station in the node which has assigned the TMUI and takes a value between zero and 999999.

Double assignment evasion bits are used for evading double assignment of the same TMUI and takes a value between zero and three.

FIG. 134

Bit

8	7	6	5	4	3	2	1	Octet
MCC								1a, 1b
MNC								2a, 2b
LAI								3 etc.

FIG. 135

Bit

8	7	6	5	4	3	2	1	Octet
IMUI								1a, 1b, 1c, 1d, 1e, 1f, 1g, 1h

FIG. 136

Bit

8	7	6	5	4	3	2	1	Octet
Execution Authentication Type								1

FIG. 137

Bit

8	7	6	5	4	3	2	1	
Authentication Random Pattern								1 Octet

FIG. 138

Bit

8	7	6	5	4	3	2	1	
Authentication Ciphering Pattern								1 Octet

FIG. 139

Bit

8	7	6	5	4	3	2	1	
Execution Ciphering Type								1 Octet

FIG. 140

Bit

8	7	6	5	4	3	2	1	
TC Info.								1 Octet

FIG. 141

Bit 8	7	6	5	4	3	2	1	Octet
Message Type								1
Operation Instruction Indicator								2

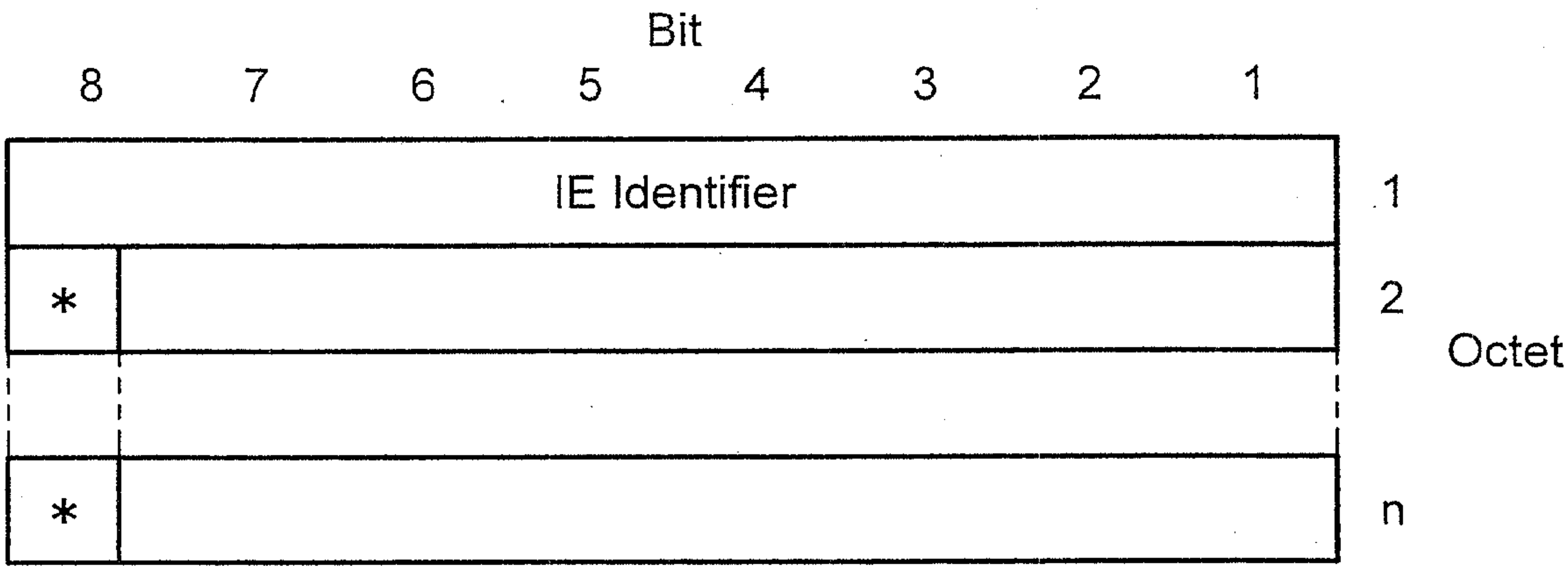
Message Type

Bit 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 1	RADIO BEARER SETUP
0 0 0 1 0 0 0 1	RADIO BEARER RELEASE
0 0 0 1 0 0 1 0	RADIO BEARER RELEASE COMPLETE
0 0 1 0 0 0 0 1	HANDOVER COMAND
0 0 1 0 0 0 1 0	HANDOVER RESPONSE

Operation Instruction Indicator

Operation Instruction Indicator is not included in the message type identifier

FIG. 142



*: Extension Flag

IE Identifier

Bit
8 7 6 5 4 3 2 1
* * * * * * * *

RADIO BEARER SETUP INFORMATION
DHO BRANCH ADDITION
DHO BRANCH DELETION
ACCH REPLACEMENT
BRANCH REPLACEMENT
USER RATE REPLACEMENT
CODE REPLACEMENT
CODE TYPE REPLACEMENT

Extension Flag

Bit
8
0 Not Extended
1 Extended

FIG. 143

Bit

8 7 6 5 4 3 2 1	Octet
RBC ID	1
CR	2
CONN ID	3

RBC ID (RBC identifier) is a number for identifying the RBC connection which uniquely corresponds to a connection which can be identified by a CR and CONN ID in the CC protocol. It takes a value between 1 and H.

CR (call reference) is a call identifier for the CC protocol (see section 2.5.2.4.3.1).

CONN ID is a connection identifier for the CC protocol (see section 2.5.2.4.3.1).

FIG. 144

Bit

8 7 6 5 4 3 2 1	Octet
RBC ID	1
Cause	2

RBC ID (RBC identifier) is a number for identifying the RBC connection which uniquely correspondsto a connection which can be identified by a CR and CONN ID in the CC protocol. It takes a value between 1 and H.

Cause Indicator

FIG. 145

Bit

8	7	6	5	4	3	2	1	
RBC ID								1 Octet

RBC ID (RBC identifier) is a number for identifying the RBC connection which uniquely corresponds to a connection which can be identified by a CR and CONN ID in the CC protocol.
It takes a value between 1 and H.

FIG. 146

Bit

8	7	6	5	4	3	2	1	
INVOKE ID								1 Octet

Invoke ID is an identifying number for associating a response signal with a handover command when the handover command has been initiated.

FIG. 147

Bit

8	7	6	5	4	3	2	1	
INVOKE ID								1 Octet

Invoke ID is an identifying number for associating a response signal with a handover command when the handover command has been initiated.

FIG. 148

Bit

8 7 6 5	4 3 2 1	Octet
Information Element Identifier		1
Length		2
		3
Frequency Band		4
BTS Number		5
		6
Sector Number		7
Uplink Short Code Type		8
Number of Uplink Codes		9
Uplink Short Code Number		10
	Reserved	11
⋮		
Uplink Short Code Number		10n (10+2(N-1))
	Reserved	11n (11+2(N-1))
Downlink Short Code Type		12
Number of Downlink Codes		13
Downlink Short Code Number		14
	Reserved	15
Frame Offset Group	Short Offset Group	16
⋮		
Downlink Short Code Number		14m (14+3(M-1))
	Reserved	15m (15+3(M-1))
Frame Offset Group	Short Offset Group	16m (16+3(M-1))

FIG. 149

"Information element identifier" indicates the radio bearer setup fundamental information element and has a length of 8 bits.

"Length" indicates the length of the information element.

"Frequency band" indicates the frequency band which should be indicated at the first call. 256 frequency bands can be indicated by eight bits in this field, i.e., frequency band f1 is indicated by "00000000" in the "frequency band" and frequency band f256 is indicated by "11111111."

"BTS number" indicates the BTS identifying number in the network which is one or more.

"Sector number" indicates the sector identifying number in the same BTS, i.e., sector 1 is indicated by "00000001" while sector 12 is indicated by "00001100."

FIG. 150

"Uplink short code type" indicates the information transfer rate for each uplink code.

Bit 8765	Bandwidth	Bit 4321	Code Type
0000	20.0 MHz	0000	1 chip/sym
0001	10.0 MHz	0001	2 chip/sym
0010	5.0 MHz	·	·
0011	1.25 MHz	·	·
Others	Reserved	1001	512 chip/sym
		1010	1024 chip/sym
		1011	2048 chip/sym
		Others	Reserved

"Number of uplink codes" indicates the number of uplink short codes between one and N when a plurality of uplink short codes are availed for a single connection.

"Uplink short code number" indicates the identifying number of uplink short code between zero and 2047.

"Downlink short code type" indicates the information transfer rate for each downlink code.

Bit 8765	Bandwidth	Bit 4321	Code Type
0000	20.0 MHz	0000	1 chip/sym
0001	10.0 MHz	0001	2 chip/sym
0010	5.0 MHz	·	·
0011	1.25 MHz	·	·
Others	Reserved	1001	512 chip/sym
		1010	1024 chip/sym
		1011	2048 chip/sym
		Others	Reserved

FIG. 151

"Number of downlink codes" indicates the number of downlink short codes between one and M when a plurality of downlink short codes are availed for a single connection.

"Downlink short code number" indicates the identifying number of downlink short code between zero and 2047.

"Frame offset group" indicates which time slot in a single radio frame should be the front end of the logical frame when the mobile station communicates. This is formulated to uniformize traffic in a single frame time unit within the wired path. It takes a value of 0-15.

Bit
8765
0000 0
· ·
· ·
· ·
1111 15

"Slot offset group" indicates an offset value of downlink transmission timing for a short code. The downlink transmission timing may be offset by, at most, three subslots within a single slot in order to reduce redundancy of pilot symbols. The indication by the "slot offset group" field at the first call should be contained until the release of all calls of the mobile station. It takes a value of 0-3.

Bit
4321
0000 0
0001 1
0010 2
0011 3

FIG. 152

Bit

8 7 6 5	4 3 2 1	Octet
Information Element Identifier		1
Length		2
		3
BTS Number		4
		5
Sector Number		6
Number of RBC IDs		7
RBC ID		8
Number of Downlink Codes		9
Downlink Short Code Number		10
	Reserved	11
Frame Offset Group	Slot Offset Group	12
⋮		
Downlink Short Code Number		10m (10+3(M-1))
	Reserved	11m (11+3(M-1))
Frame Offset Group	Slot Offset Group	12m (12+3(M-1))

"Information element identifier" indicates the DHO branch addition information element and has a length of 8 bits.

"Length" indicates the length of the information element.

"BTS number" indicates the BTS identifying number in the network which is one or more.

FIG. 153

"Sector number" indicates the sector identifying number in the same BTS. The number is of 1-12, i.e., sector 1 is indicated by "00000001" while sector 12 is indicated by "00001100."

Bit Pattern
87654321
00000001 1
. .
. .
. .
00001100 12

"Number of RBC IDs" indicates the number of connections established simultaneously. It takes a value between 1 and H.

"RBC ID" is a number for identifying the RBC connection which uniquely corresponds to a connection which can be identified by a CR and CONN ID in the CC protocol. It takes a value between 1 and H.

"Number of downlink codes" indicates the number of downlink short codes between one and M when a plurality of downlink short codes are availed for a single connection.

"Downlink short code number" indicates the identifying number of downlink short code between zero and 2047.

"Frame offset group" indicates which time slot in a single radio frame should be the front end of the logical frame when the mobile station communicates. This is formulated to uniformize traffic in a single frame time unit within the wired path. It takes a value of 0-15.

Bit Pattern
8765
0000 0
. .
. .
. .
1111 15

FIG. 154

"Slot offset group" indicates an offset value of downlink transmission timing for a short code. The downlink transmission timing may be offset by, at most, three subslots within a single slot in order to reduce redundancy of pilot symbols. The indication by the "slot offset group" field at the first call should be contained until the release of all calls of the mobile station. It takes a value of 0-3.

Bit Pattern	
4321	
0000	0
0001	1
0010	2
0011	3

FIG. 155

Bit

8 7 6 5 4 3 2 1

	Octet
Information Element Identifier	1
Length	2 3
BTS Number	4 5
Sector Number	6

"Information element identifier" indicates the DHO branch deletion information element and has a length of 8 bits.

"Length" indicates the length of the information element.

"BTS number" indicates the BTS identifying number in the network which is one or more.

"Sector number" indicates the sector identifying number in the same BTS. The number is of 1-12, i.e., sector 1 is indicated by "00000001" while sector 12 is indicated by "00001100."

Bit Pattern
87654321
00000001 0
. .
. .
. .
00001100 12

FIG. 156

Bit

8	7	6	5	4	3	2	1	Octet
Information Element Identifier								1
Length								2 3
RBC ID								4

"Information element identifier" indicates the ACCH replacement information element and has a length of 8 bits.

"Length" indicates the length of the information element.

"RBC ID" is a number for identifying the RBC connection to which the ACCH is handed. It takes a value between 1 and H.

FIG. 157

Bit

8 7 6 5	4 3 2 1	Octet
Information Element Identifier		1
Length		2
		3
Frequency Band		4
BTS Number		5
		6
Sector Number		7
Number of RBC IDs		8
RBC ID		9
Number of Downlink Codes		10
Downlink Short Code Number		11
	Reserved	12
Frame Offset Group	Slot Offset Group	13
⋮		
Downlink Short Code Number		11m (11+3(M-1))
	Reserved	12m (12+3(M-1))
Frame Offset Group	Slot Offset Group	13m (13+3(M-1))

"Information element identifier" indicates the branch replacement information element and has a length of 8 bits.

FIG. 158

"Length" indicates the length of the information element.

"Frequency band" indicates the frequency band, which is in the range between f1 and f256, established at the first call. 256 frequency bands can be indicated by eight bits in this field, i.e., frequency band f1 is indicated by "00000000" in the "frequency band" and frequency band f256 is indicated by "11111111."

Bit Pattern
87654321

00000000	f1
.	.
.	.
.	.
11111111	f256

"BTS number" indicates the BTS identifying number in the network which is one or more.

"Sector number" indicates the sector identifying number in the same BTS. The number is of 1-12, i.e., sector 1 is indicated by "00000001" while sector 12 is indicated by "00001100."

Bit Pattern
87654321

00000001	0
.	.
.	.
.	.
00001100	12

"Number of RBC IDs" indicates the number of connections established simultaneously. It takes a value between 1 and H.

"RBC ID" is a number for identifying the RBC connection which uniquely corresponds to a connection which can be identified by a CR and CONN ID in the CC protocol. It takes a value between 1 and H.

FIG. 159

"Number of downlink codes" indicates the number of downlink short codes between one and M when a plurality of downlink short codes are availed for a single connection.

"Downlink short code number" indicates the identifying number of downlink short code between zero and 2047.

"Frame offset group" indicates which time slot in a single radio frame should be the front end of the logical frame when the mobile station communicates. This is formulated to uniformize traffic in a single frame time unit within the wired path. It takes a value of 0-15.

Bit Pattern

8765	
0000	0
·	·
·	·
·	·
1111	15

"Slot offset group" indicates an offset value of downlink transmission timing for a short code. The downlink transmission timing may be offset by, at most, three subslots within a single slot in order to reduce redundancy of pilot symbols. The indication by the "slot offset group" field at the first call should be contained until the release of all calls of the mobile station. It takes a value of 0-3.

Bit Pattern

4321	
0000	0
0001	1
0010	2
0011	3

FIG. 160

Bit

8 7 6 5	4 3 2 1	Octet
Information Element Identifier		1
Length		2
		3
RBC ID		4
Frequency Band		5
BTS Number		6
		7
Sector Number		8
Uplink Short Code Type		9
Number of Uplink Codes		10
Uplink Short Code Number		11
	Reserved	12
⋮		
Uplink Short Code Number		11n (11+2(N-1))
	Reserved	12n (12+2(N-1))
Downlink Short Code Type		13
Number of Downlink Code		14
Downlink Short Code Number		15
	Reserved	16
Frame Offset Group	Slot Offset Group	17
⋮		
Downlink Short Code Number		15m (15+3(M-1))
	Reserved	16m (16+3(M-1))
Frame Offset Group	Slot Offset Group	17m (17+3(M-1))

FIG. 161

"Information element identifier" indicates the user rate replacement information element and has a length of 8 bits.

"Length" indicates the length of the information element.

"RBC ID" is a number for identifying the RBC connection to which the ACCH is handed. It takes a value between 1 and H.

"Frequency band" indicates the frequency band, which is in the range between f1 and f256, established at the first call. 256 frequency bands can be indicated by eight bits in this field, i.e., frequency band f1 is indicated by "00000000" in the "frequency band" and frequency band f256 is indicated by "11111111."

Bit Pattern
87654321
00000000 f1
. .
. .
. .
11111111 f256

"BTS number" indicates the BTS identifying number in the network which is one or more.

"Sector number" indicates the sector identifying number in the same BTS. The number is of 1-12, i.e., sector 1 is indicated by "00000001" while sector 12 is indicated by "00001100."

Bit Pattern
87654321
00000001 1
. .
. .
. .
00001100 12

FIG. 162

"Uplink short code type" indicates the information transfer rate for each uplink code.

Bit 8765	Bandwidth	Bit 4321	Code Type
0000	20.0 MHz	0000	1 chip/sym
0001	10.0 MHz	0001	2 chip/sym
0010	5.0 MHz	·	·
0011	1.25 MHz	·	·
Others	Reserved	1001	512 chip/sym
		1010	1024 chip/sym
		1011	2048 chip/sym
		Others	Reserved

"Number of uplink codes" indicates the number of uplink short codes between one and N when a plurality of uplink short codes are availed for a single connection.

"Uplink short code number" indicates the identifying number of uplink short code between zero and 2047.

"Downlink short code type" indicates the information transfer rate for each downlink code.

Bit 8765	Bandwidth	Bit 4321	Code Type
0000	20.0 MHz	0000	1 chip/sym
0001	10.0 MHz	0001	2 chip/sym
0010	5.0 MHz	·	·
0011	1.25 MHz	·	·
Others	Reserved	1001	512 chip/sym
		1010	1024 chip/sym
		1011	2048 chip/sym
		Others	Reserved

FIG. 163

"Number of downlink codes" indicates the number of downlink short codes between one and M when a plurality of downlink short codes are availed for a single connection.

"Downlink short code number" indicates the identifying number of downlink short code between zero and 2047.

"Frame offset group" indicates which time slot in a single radio frame should be the front end of the logical frame when the mobile station communicates. This is formulated to uniformize traffic in a single frame time unit within the wired path. It takes a value of 0-15.

Bit Pattern	
8765	
0000	0
•	•
•	•
•	•
1111	15

"Slot offset group" indicates an offset value of downlink transmission timing for a short code. The downlink transmission timing may be offset by, at most, three subslots within a single slot in order to reduce redundancy of pilot symbols. The indication by the "slot offset group" field at the first call should be contained until the release of all calls of the mobile station. It takes a value of 0-3.

Bit Pattern	
4321	
0000	0
0001	1
0010	2
0011	3

FIG.164

Bit: 8 7 6 5 4 3 2 1		Octet
Information Element Identifier		1
Length		2
		3
Number of RBC IDs		4
RBC ID		5
Short Code Type		6
Number of Former Short Codes		7
Former Short Code Number		8
	Reserved	9
⋮		
Former Short Code Number		8n (8+2(N-1))
	Reserved	9n (9+2(N-1))
Number of New Short Codes		10
New Short Code Number		11
	Reserved	12
⋮		
New Short Code Number		11m (11+2(M-1))
	Reserved	12m (12+2(M-1))

"Information element identifier" indicates the user rate replacement information element and has a length of 8 bits.

"Length" indicates the length of the information element.

FIG. 165

"Number of RBC IDs" indicates the number of connections established simultaneously. It takes a value between 1 and H.

"RBC ID" is a number for identifying the RBC connection to which the ACCH is handed. It takes a value between 1 and H.

"Short code type" indicates the information transfer rate for each code.

Bit 8765	Bandwidth	Bit 4321	Code Type
0000	20.0 MHz	0000	1 chip/sym
0001	10.0 MHz	0001	2 chip/sym
0010	5.0 MHz	•	•
0011	1.25 MHz	•	•
Others	Reserved	1001	512 chip/sym
		1010	1024 chip/sym
		1011	2048 chip/sym
		Others	Reserved

"Number of former short codes" indicates the number of former short codes, which will be replaced, between one and N.

"Former short code number" indicates the identifying number of former short code, which will be replaced, between zero and 2047.

"Number of new short codes" indicates the number of new short codes between one and M.

"New short code number" indicates the identifying number of new short code between zero and 2047.

FIG. 166

Bit									
8	7	6	5	4	3	2	1		
Message Type								1	Octet

Message Type

Bit Pattern
87654321
******** Radio resource facility

FIG. 167

Bit

8	7	6	5	4	3	2	1	Octet
Facility IE Identifier								1
Length of Facility IE								2
Extn.	Rsvd.		Profile					3
PDUs								4

"Profile" indicates the type of PDU (protocol data unit) which is contained in octet 4 and later octets

Bit Pattern
54321
10001 ROSE protocol data unit
10010 CMIP protocol data unit
10011 ACSE protocol data unit
In the invented system, ROSE protocol is used.

"PDUs" field includes one or more PDUs which are ASEs (application service elements) identified by the "profile" field.

FIG. 168

Bit

8 7 6 5 4 3 2 1	Octet
Component Type Tag	1
Component Length	2
Invoke Identifier Tag	3
Invoke Identifier Length	4
Invoke Identifier	5
Operation Value Tag	6
Operation Value	7
Operation Specific Parameter	8

"Component type tag" is mandatory for each of all components and indicates the type of component as in the following.

Bit Pattern 87654321	
10100001	Invoke
10100010	Result return (termination)
10100011	Error return
10100100	Rejection
10100101	(Reserved)
10100110	(Reserved)
10100111	Result return (proceeding)

"Component length" indicates the length of component excluding the lengths of component type tag field and component length field.

FIG. 169

"Invoke identifier tag" is used as a reference number for identifying the operation invoke, thereby associating a request with a response.

Bit Pattern	
87654321	
00000010	Invoke Identifier Tag
00000101	Null

"Invoke identifier length" indicates the length of the "invoke identifier" field.

"Invoke identifier" indicates the invoke identifier.

"Operation value tag" is included in the invoke component, and so on for indicating the type of operation.

Bit Pattern	
87654321	
00000010	Local Operation Code Tag
00000101	Global Operation Code Tag

"Operation value" indicates the type of information for defining the operation.

Bit Pattern	
87654321	
********	Candidate zone information for call attempt or acceptance n-use zone information Added zone information for DHO Deleted zone information for DHO HHO zone information Outer loop information Quality deterioration notification information

FIG. 170

Bit

8	7	6	5	4	3	2	1		
Number of Sectors								1	Octet

"Number of sectors" field contains a binary code representing a value between 1 and N.

FIG. 171

Bit

8	7	6	5	4	3	2	1		
BTS Identifier								1	Octet
								2	

"BTS identifier" is a number more than one for identifying the corresponding BTS in the network.

FIG. 172

Bit									
8	7	6	5	4	3	2	1		
Sector Number								1	Octet

"Sector number" is a value of 1-12 for identifying the corresponding sector in the BTS.

Bit Pattern
87654321
00000001 1
• •
• •
• •
00001100 12

FIG. 173

Bit									
8	7	6	5	4	3	2	1		
Perch Channel Reception SIR								1	Octet

"Perch channel reception SIR" indicates the perch channel reception SIR of the visited sector, circumferential sector, or in-use sector measured at the mobile station.

FIG. 174

Bit

8	7	6	5	4	3	2	1		
Perch Channel Transmission Power								1	Octet

FIG. 175

Bit

8	7	6	5	4	3	2	1		
Extn.	Long Code Phase Difference							1	
	⋮								Octet
Extn.								n	

"Long code phase difference" indicates the difference between the long code phase of the visited or in-use sector and that of a circumferential sector (to which the connection may be handed over). This is used when the execution of DHO and the zone selection at call attempt or acceptance. If the difference is in excess of 128 chips, the field of long code phase difference should be extended by setting the extension bit to 1.

FIG. 176

Bit

8	7	6	5	4	3	2	1	
Number of RBC IDs								1 Octet

"Number of RBC IDs" field contains a binary code representing a value between 1 and N.

FIG. 177

Bit

8	7	6	5	4	3	2	1	
RBC ID								1 Octet

"RBC ID" is a number for identifying the RBC connection which uniquely corresponds to a connection which can be identified by a CR and CONN ID in the CC protocol. It takes a value between 1 and H.

FIG. 178

Bit

8	7	6	5	4	3	2	1	
Necessary SIR								1 Octet

FIG. 179

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th></th></tr>
<tr><td colspan="8">FER Measurement</td><td>1 Octet</td></tr>
</table>

FIG. 180

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>Octet</th></tr>
<tr><td colspan="8">Protocol Discriminator</td><td>1</td></tr>
<tr><td rowspan="2">Extn.</td><td rowspan="2" colspan="4">Message Type</td><td colspan="3">Message Compatibility Instruction Indicator</td><td rowspan="2">2</td></tr>
<tr><td>Flag</td><td colspan="2">Message Action Indicator</td></tr>
<tr><td colspan="8">Message Specific Parameter (if any)</td><td></td></tr>
<tr><td colspan="8">Extensional Information Element (if any)</td><td></td></tr>
</table>

FIG. 181

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th></th></tr>
<tr><td colspan="8">Protocol Discriminator of TAC Entity Message</td><td rowspan="2">1 Octet</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table>

FIG. 182

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td rowspan="2">Extn.</td><td colspan="4" rowspan="2">Message Type</td><td colspan="3">Message Compatibility Instruction Indicator</td><td rowspan="3">1 Octet</td></tr>
<tr><td>Flag</td><td colspan="2">Message Action Indicator</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table>

FIG. 183

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td colspan="8">TMUI</td><td rowspan="2">Octet</td></tr>
<tr><td colspan="8">Mobile Station Type</td></tr>
</table>

FIG. 184

<table>
<tr><th colspan="8">Bit</th><th></th></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td></td></tr>
<tr><td colspan="8">Paged MS ID</td><td rowspan="3">Octet</td></tr>
<tr><td colspan="8">Mobile Station Type</td></tr>
<tr><td colspan="8">Paging ID</td></tr>
</table>

FIG. 185

Bit

8	7	6	5	4	3	2	1		
Cause								1	Octet

FIG. 186

Bit

8	7	6	5	4	3	2	1		
Extn.	Cause Value							1	Octet

FIG. 187

Bit

8	7	6	5	4	3	2	1		
Mobile Station Type (Particularities Are Not Decided)								1	Octet

FIG. 188

Bit

8	7	6	5	4	3	2	1		
Type of Number	Reserved			Length of Number				1	Octet
TMUI								2	
IMUI								2	

FIG. 189

Bit

8	7	6	5	4	3	2	1	Octet
Reserved		Paging ID						1

FIG. 190

Bit

8	7	6	5	4	3	2	1	Octet
Reserved								1
		Unique Identification						2
								3
								4

FIG. 191

Bit

8	7	6	5	4	3	2	1	Octet
Information Element Identifier								1
Extn.	Coding Standard		IE Instruction Field					2
			Flag	Res.	IE Action Ind.			
Length of Information Element Contents								3
Contents of Information Element								4

FIG. 192

Bit

8	7	6	5	4	3	2	1		
Message Type								1	Octet

FIG. 193

Bit

8	7	6	5	4	3	2	1		
Length								1	Octet

FIG. 194

Bit

8	7	6	5	4	3	2	1		
Perch Channel Reception SIR								1	Octet

FIG. 195

Bit

8	7	6	5	4	3	2	1		
Short Code Number								1	Octet
				Rsvd.					

FIG. 196

Bit

8	7	6	5	4	3	2	1		
Frame Offset Group				BTS Number				1	Octet

FIG. 197

Bit

8	7	6	5	4	3	2	1	
				Slot Offset Group				1 Octet

FIG. 198

Bit

8	7	6	5	4	3	2	1	
Network Number								1 Octet

FIG. 199

Bit

8	7	6	5	4	3	2	1	
Network Version								1 Octet

FIG. 200

Bit

8	7	6	5	4	3	2	1	
Mobile Station Common Parameter Version								1 Octet

FIG. 201

Bit

8	7	6	5	4	3	2	1	
BTS Number								1 Octet

FIG. 202

Bit

8	7	6	5	4	3	2	1	
Sector Number								1 Octet

FIG. 203

Bit

8	7	6	5	4	3	2	1	
Number (N) of Overlapped Registration Areas								1 Octet

Bit Pattern 4321	Number (N1) of Overlapped Areas about Each Group
0000	1
0001	2
0011	4
0111	8
1111	16

Bit Pattern	Number (N2) of Groups
Ditto	Ditto

$N = N1 \times N2$

FIG. 204

Bit

8	7	6	5	4	3	2	1	
Area Number								1 Octet

FIG. 205

Bit

8	7	6	5	4	3	2	1	
Area Registration Timer								1 Octet

FIG. 206

Bit

8	7	6	5	4	3	2	1	
Calibrated Power Level Necessary for Reception at the Base Station								1 Octet

FIG. 207

Bit

8	7	6	5	4	3	2	1	
Number (M) of Perch Channel LCs for Determination of Visited Zone								1 Octet

FIG. 208

Bit

8	7	6	5	4	3	2	1	
Number (K) of Frequency Bands Used by the Base Station								1 Octet

FIG. 209

Bit

8	7	6	5	4	3	2	1	
Frequency Band								1 Octet

FIG. 210

Bit

8	7	6	5	4	3	2	1	
			BCCH Reception Duration					1 Octet

FIG. 211

Bit

8	7	6	5	4	3	2	1	
						Number of Mobile Stations		1 Octet

FIG. 212

Bit

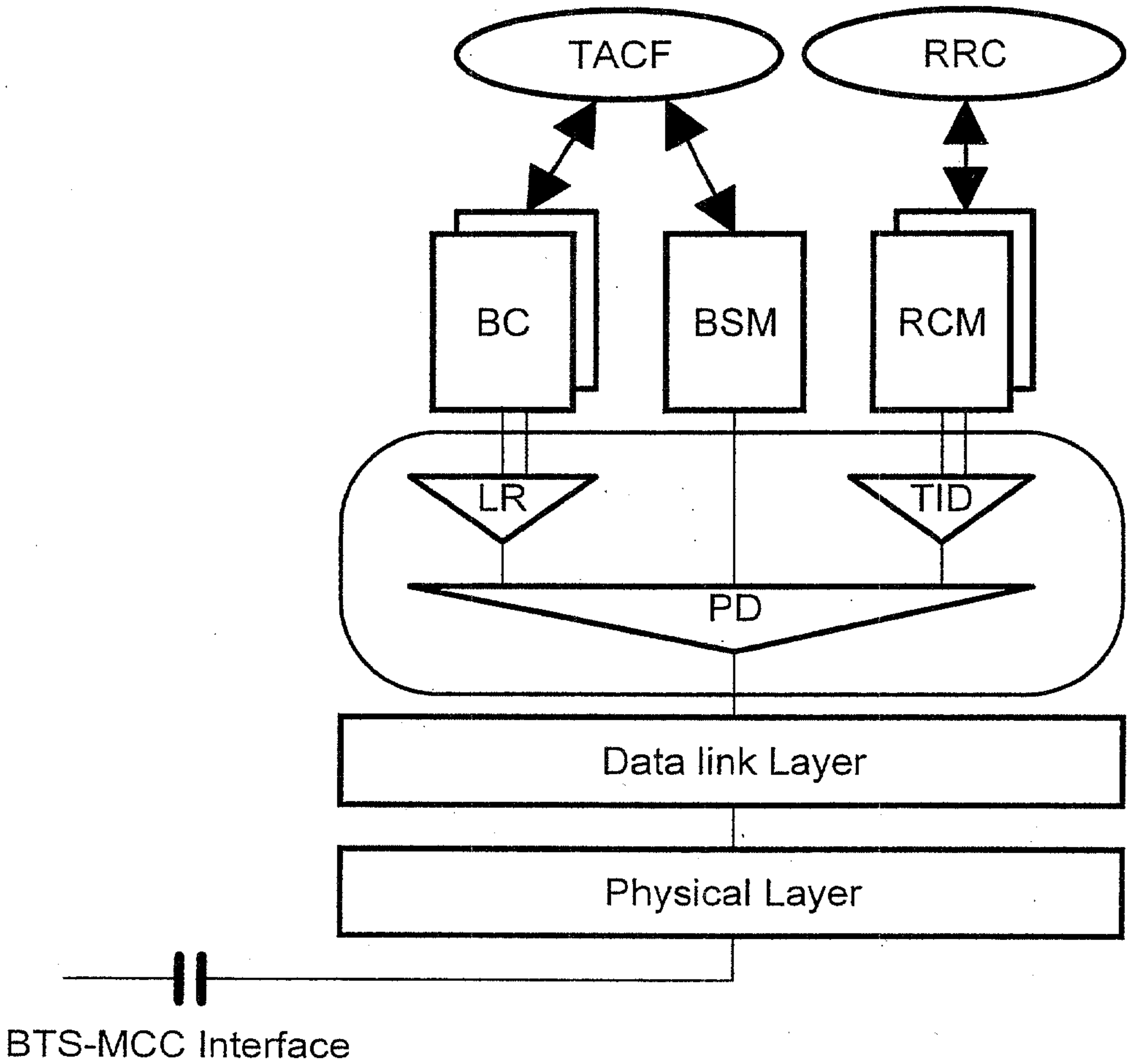
8	7	6	5	4	3	2	1	
I/T	Paged MS ID							1 Octet
								2
								13
								14

FIG. 213

Bit

8	7	6	5	4	3	2	1	
Paging ID								1 Octet

FIG. 214



BC: Bearer Control
BSM: Base Station Management
RCM: Radio Control Management
(Not Used in the Invented System)
LR: Link Reference
TID: Transaction ID
PD: Protocol Discriminator

FIG. 215

Protocol Discriminator
Link Reference
Message Type
Fundamental Information Element 1
⋮
Fundamental Information Element N

The fundamental information element includes a parameter according to the necessary procedure, so that the parameter depends on the procedure.

FIG. 216

Message Format

Protocol Discriminator
Message Type
Fundamental Information Element 1
⋮
Fundamental Information Element N

The fundamental information element includes a parameter which is specific to the type of message.

FIG. 217

Fundamental Information Element

Information Element Identifier 1
Length of Information Element 1
Parameter 1
Information Element Identifier 2
Length of Information Element 2
Parameter 2
⋮
Information Element Identifier n
Length of Information Element n
Parameter n

An information element identifier and a length identifier are provided before a parameter.

FIG. 218

Fundamental Information Element
Information Element Identifier
Parameter 1
Parameter 2
⋮
Parameter n

FIG. 219

Bit

8	7	6	5	4	3	2	1	
Protocol Discriminator								1 Octet

FIG. 220

Bit

8	7	6	5	4	3	2	1	
D.C.				Message Type				1 Octet

FIG. 221

Bit

8	7	6	5	4	3	2	1
E/A		Flag	LINK REFERENCE				
E/A							
		⋮					
E/A							

Octet 2 and later octets are extended according to the value of the used link reference.

FIG. 222

Bit

8	7	6	5	4	3	2	1	
INFORMATION ELEMENT IDENTIFIER								1 Octet

FIG. 223

Bit

8	7	6	5	4	3	2	1	Octet
LENGTH OF INFORMATION ELEMENT								1

FIG. 224

Bit

4	3	2	1	Octet
ALL TYPE				1/2

Bit Pattern
0010 ALL Type 2
0101 AAL Type 5

FIG. 225

VPCI: One type of VPCI indicating Zero is used in the invited system, but 16 or more types of VPCI of which the length is 4 or more bits may be used.
VCI: 256/VPCI
UCI: 256/VCI

Bit

8	7	6	5	4	3	2	1	Octet
VPCI								1
VCI								2
								3
UCI								4

FIG. 226

Bit

8	7	6	5	4	3	2	1	
TRANSMISSION QUALITY								1 Octet

FIG. 227

Bit

8	7	6	5	4	3	2	1	
SECTOR NUMBER								1 Octet

FIG. 228

Bit

8	7	6	5	4	3	2	1	
BEARER CAPABILITY								1 Octet

FIG. 229

Bit

8	7	6	5	4	3	2	1	
FREQUENCY SELECTION INFO.								1 Octet

FIG. 230

Bit

8	7	6	5	4	3	2	1	
FREQUENCY								1 Octet

FIG. 231

Bit

4	3	2	1	
FRAME OFFSET GROUP				1/2 Octet

FIG. 232

Bit

4	3	2	1	
SLOT OFFSET GROUP				1/2 Octet

FIG. 233

Bit

8	7	6	5	4	3	2	1	
E/A	LONG CODE PHASE DIFFERENCE							
	⋮							Octet
E/A								

When the long code phase difference is in excess of 128 chip time, the field should be extended with extension bits.

FIG. 234

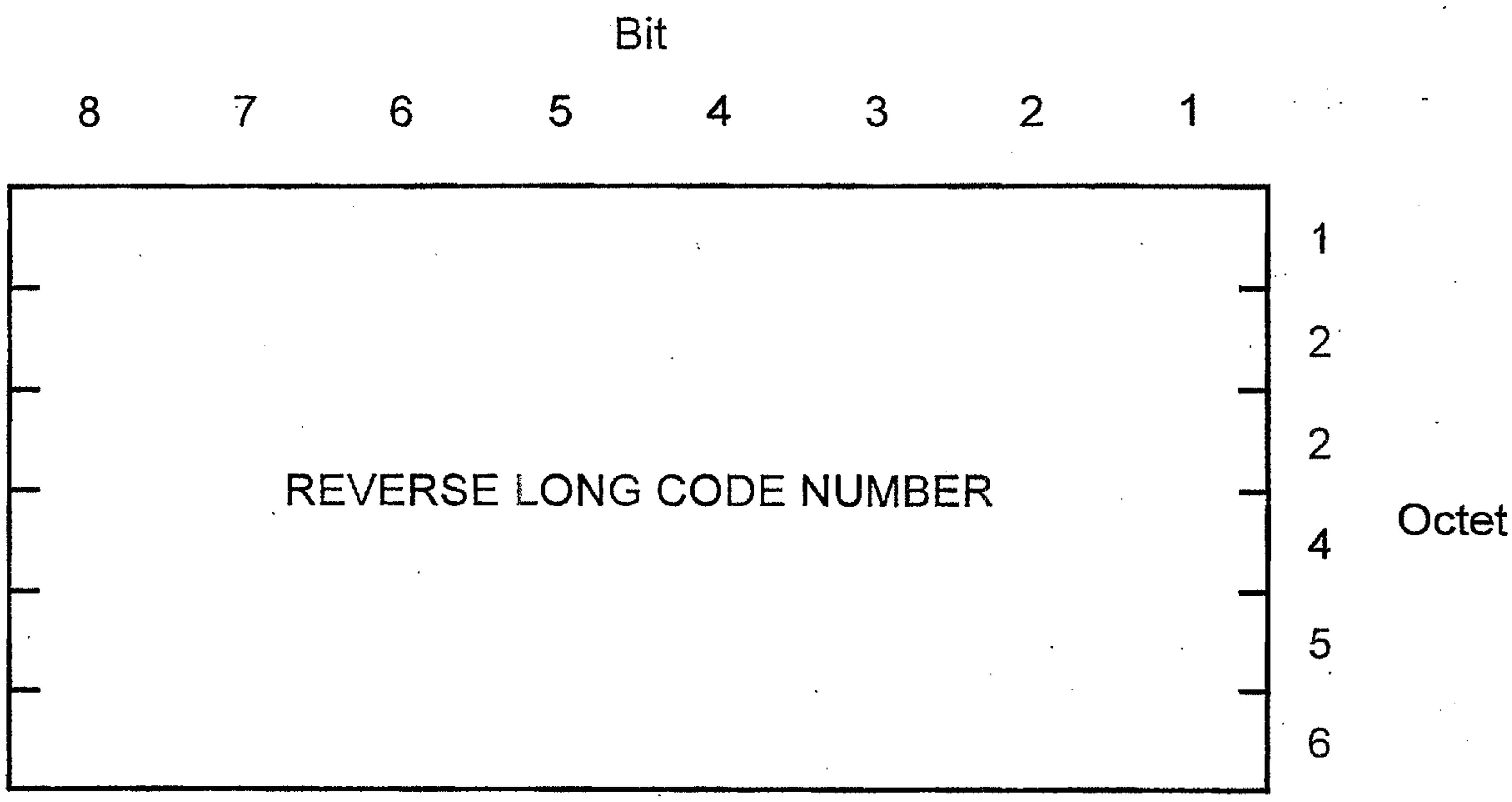
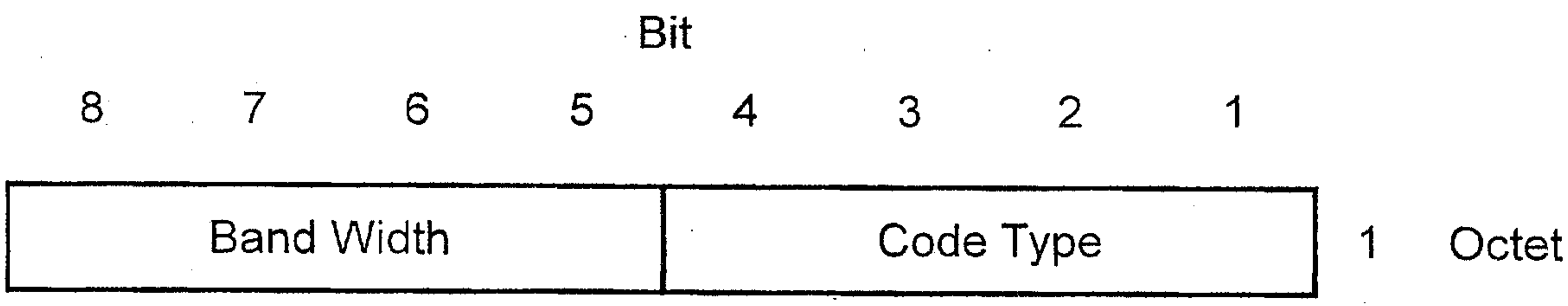


FIG. 235



Bit 8765	Bandwidth
0000	20.0 MHz
0001	10.0 MHz
0010	5.0 MHz
0011	1.25 MHz
Others	Reserved

Bit 4321	Code Type (Chip Time)
0000	1 chip/sym
0001	2 chip/sym
·	·
·	·
1001	512 chip/sym
1010	1024 chip/sym
1011	2048 chip/sym
Others	Reserved

FIG. 236

Bit 8	7	6	5	4	3	2	1	Octet
NUMBER OF REVERSE SHORT CODES								1

FIG. 237

Bit 8	7	6	5	4	3	2	1	Octet
Code Number								1
				Reserved				2

FIG. 238

Bit 8	7	6	5	4	3	2	1	Octet
Band Width				Code Type				1

Bit 8765	Bandwidth
0000	20.0 MHz
0001	10.0 MHz
0010	5.0 MHz
0011	1.25 MHz
Others	Reserved

Bit 4321	Code Type (Chip Time)
0000	1 chip/sym
0001	2 chip/sym
·	·
·	·
1001	512 chip/sym
1010	1024 chip/sym
1011	2048 chip/sym
Others	Reserved

FIG. 239

Bit

8	7	6	5	4	3	2	1	
NUMBER OF FORWARD SHORT CODES								1 Octet

FIG. 240

Bit

4	3	2	1	
ALL TYPE (for ACCH)				1/2 Octet

FIG. 241

Bit

8	7	6	5	4	3	2	1	Octet
VPCI								1
VCI								2
								3
UCI								4

FIG. 242

Bit

8	7	6	5	4	3	2	1	
TRANSMISSION QUALITY (for ACCH)								1 Octet

FIG. 243

Bit

8	7	6	5	4	3	2	1	Octet
Code Number								1
				Reserved				2

FIG. 244

Bit

8	7	6	5	4	3	2	1	Octet
OK/NG	CAUSE							1

OK/NG
Bit
8
0 OK
1 NG

CAUSE
Bit
7654321
⋮

FIG. 245

Bit

8	7	6	5	4	3	2	1	Octet
SOURCE	CAUSE							1

SOURCE
Bit
8
0: BTS
1: NW (BTS FUNCTION)

CAUSE
Bit
7654321
⋮

FIG. 246

Bit

8	7	6	5	4	3	2	1	
INITIAL TRANSMISSION POWER								1 Octet

FIG. 247

Bit

8	7	6	5	4	3	2	1	
Location Identity								1 Octet

FIG. 248

Bit

8	7	6	5	4	3	2	1	
Protocol Discriminator								1 Octet

FIG. 249

Bit

8	7	6	5	4	3	2	1	
D.C.				Message Type				1 Octet

FIG. 250

Bit

8 7 6 5 4 3 2 1	Octet
Information Element Identifier	1
Length of Information Element	2
PCHs Calculation Information	3
	4

FIG. 251

Bit

8 7 6 5 4 3 2 1	Octet
Information Element Identifier	1
Length of Information Element	2
Area Number	3

FIG. 252

Bit

8	7	6	5	4	3	2	1	Octet
Information Element Identifier								1
Length of Information Element								2
Number Type	Reserved				Number Length			3
TMUI								4
								5
								6
								7
Integer IMUI								4
								5
								6
								7
								8
								9
								10 [MAX]

FIG. 253

Bit

8	7	6	5	4	3	2	1	Octet
Information Element Identifier								1
Length of Information Element								2
D.C.		Paging ID						3

FIG. 254

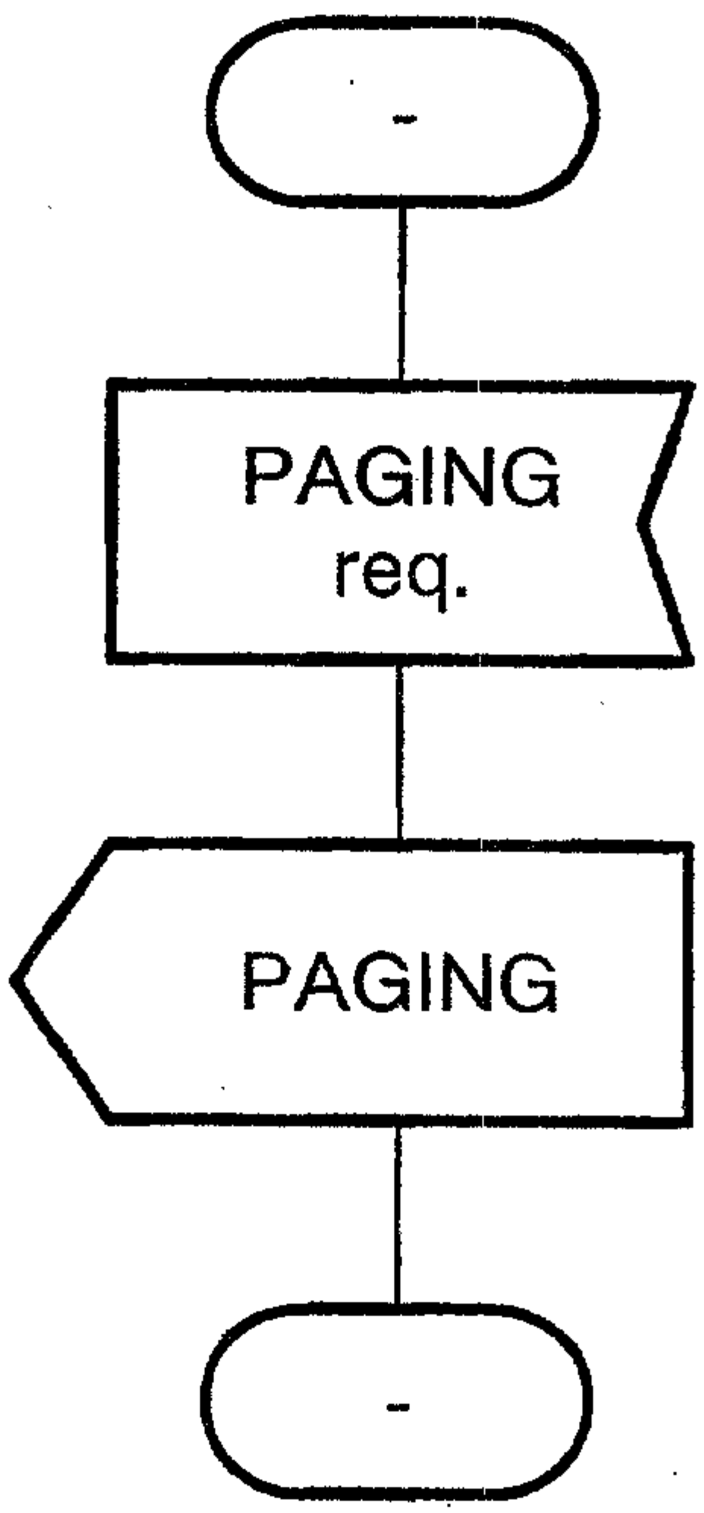
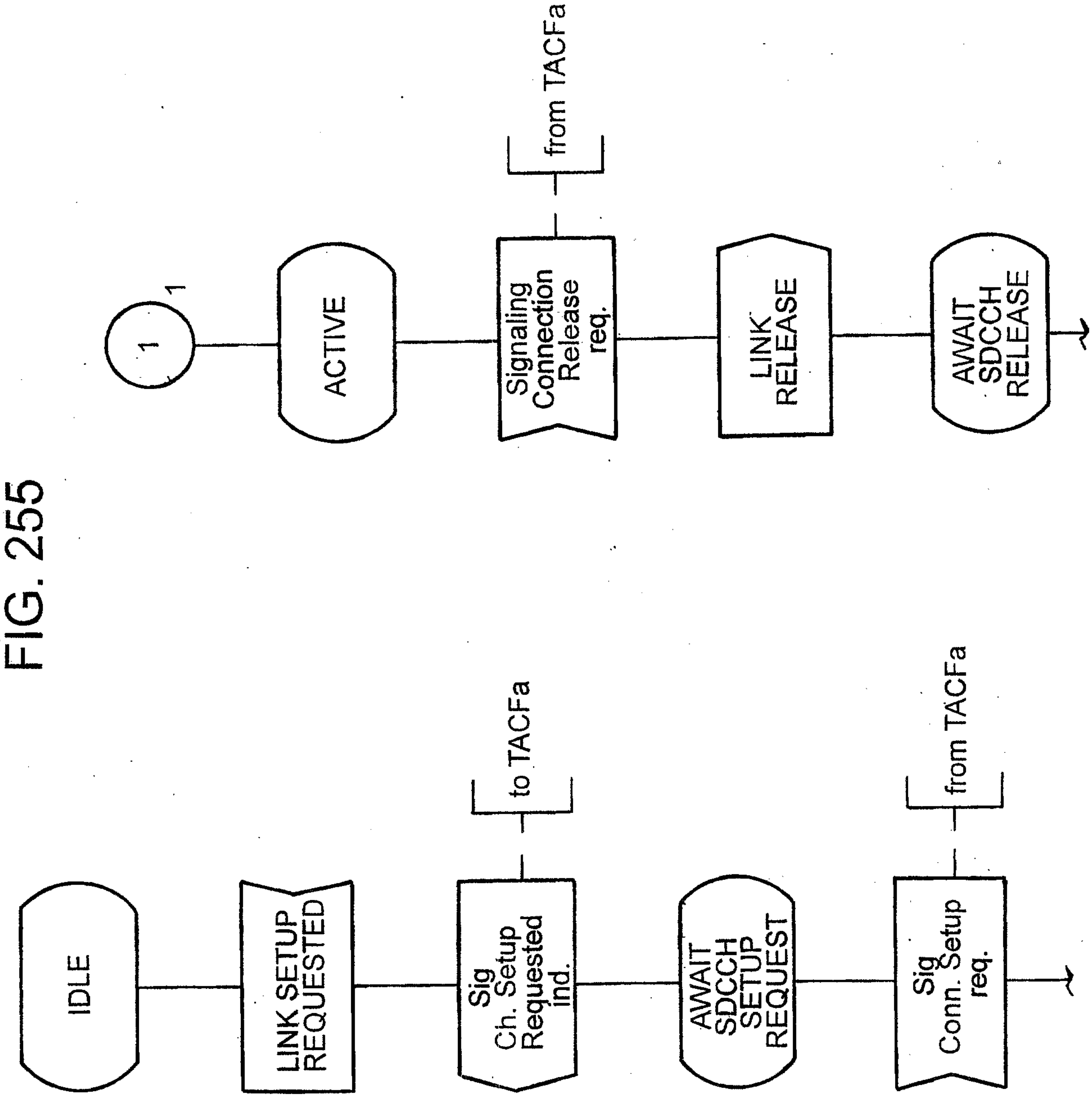
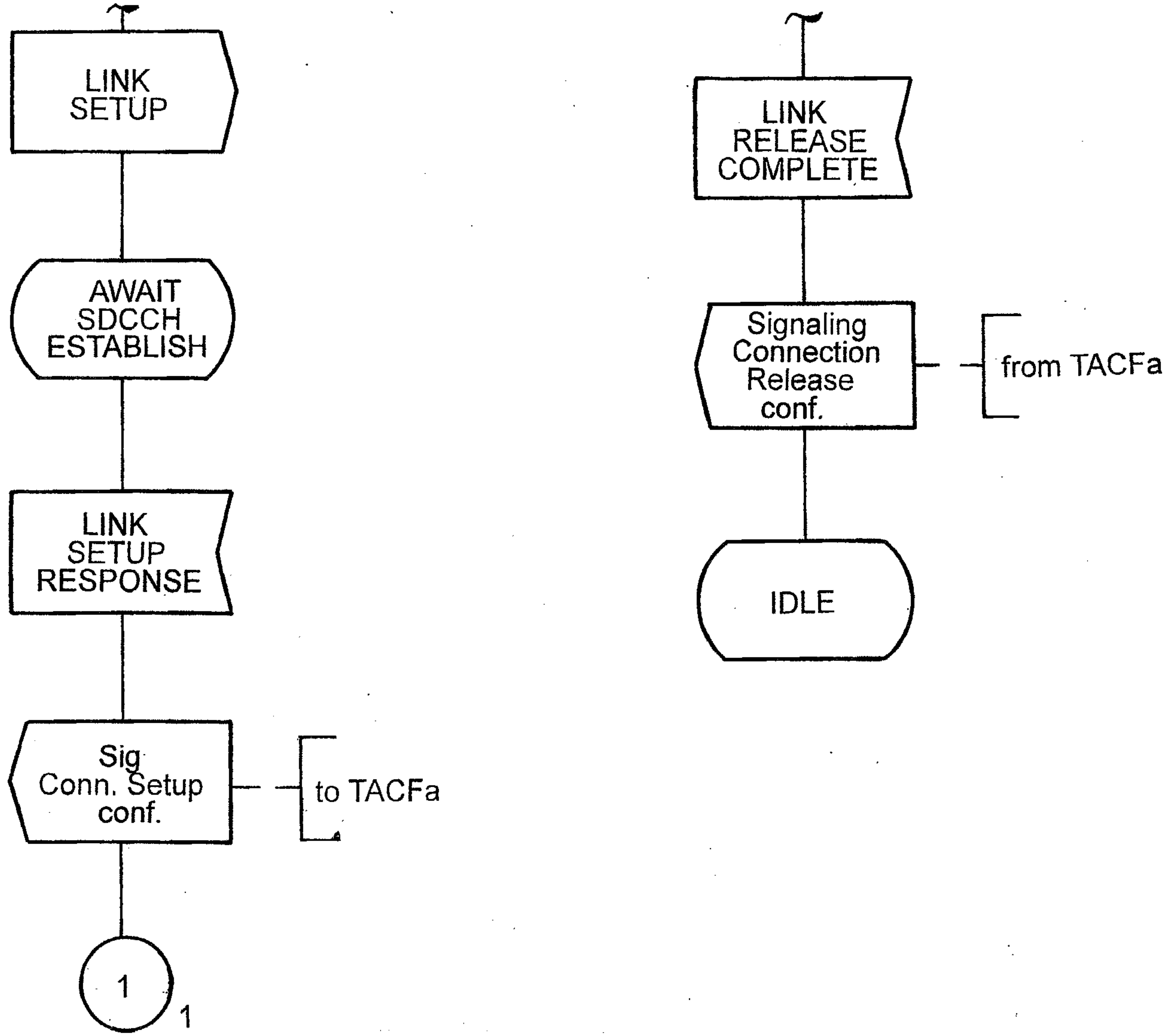


FIG. 255

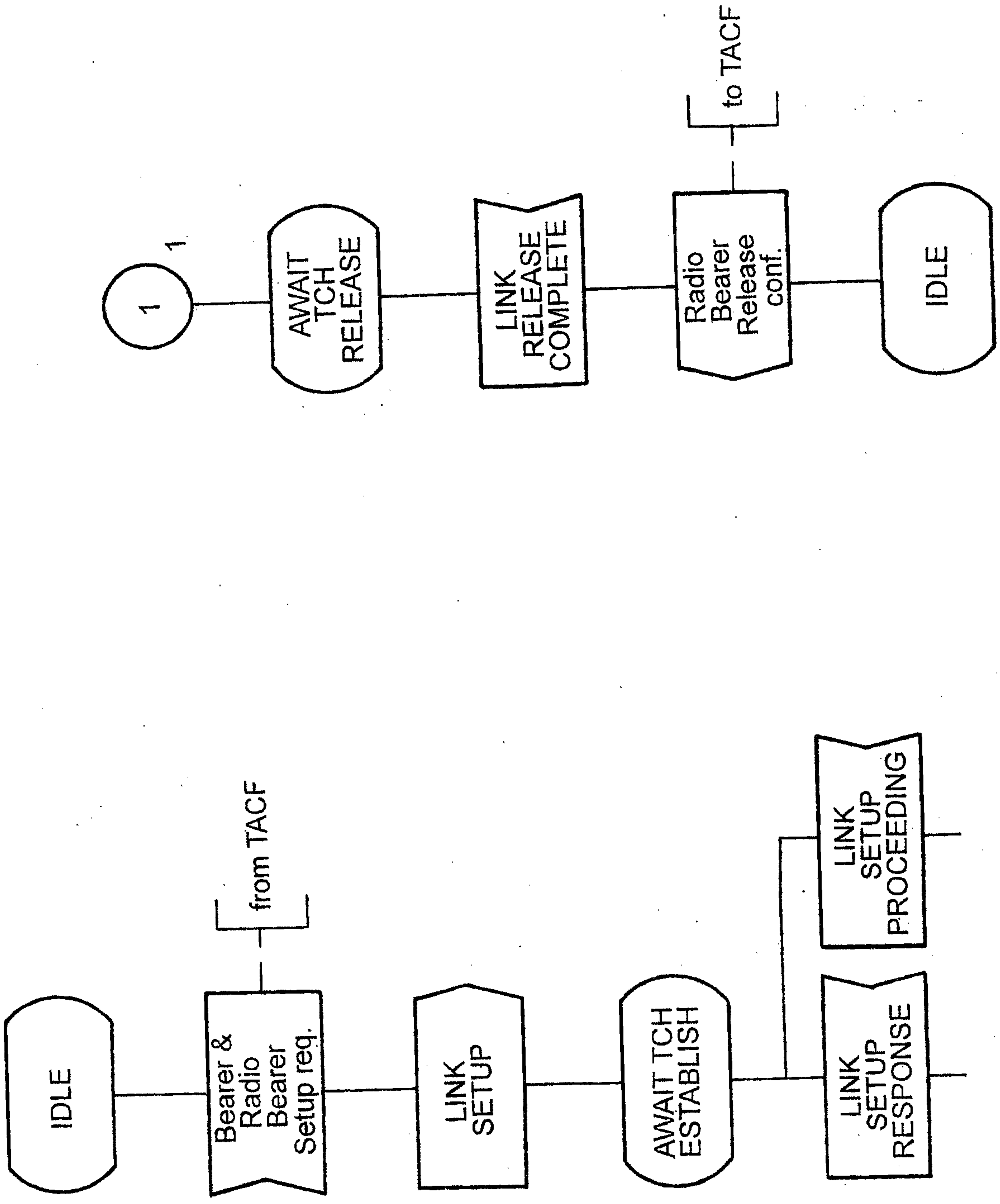

IDLE
LINK SETUP REQUESTED
Sig Ch. Setup Requested ind.
to TACFa
AWAIT SDCCH SETUP REQUEST
Sig Conn. Setup req.
from TACFa
1
ACTIVE
Signaling Connection Release req.
from TACFa
LINK RELEASE
AWAIT SDCCH RELEASE

CONTINUED FROM FIG. 255

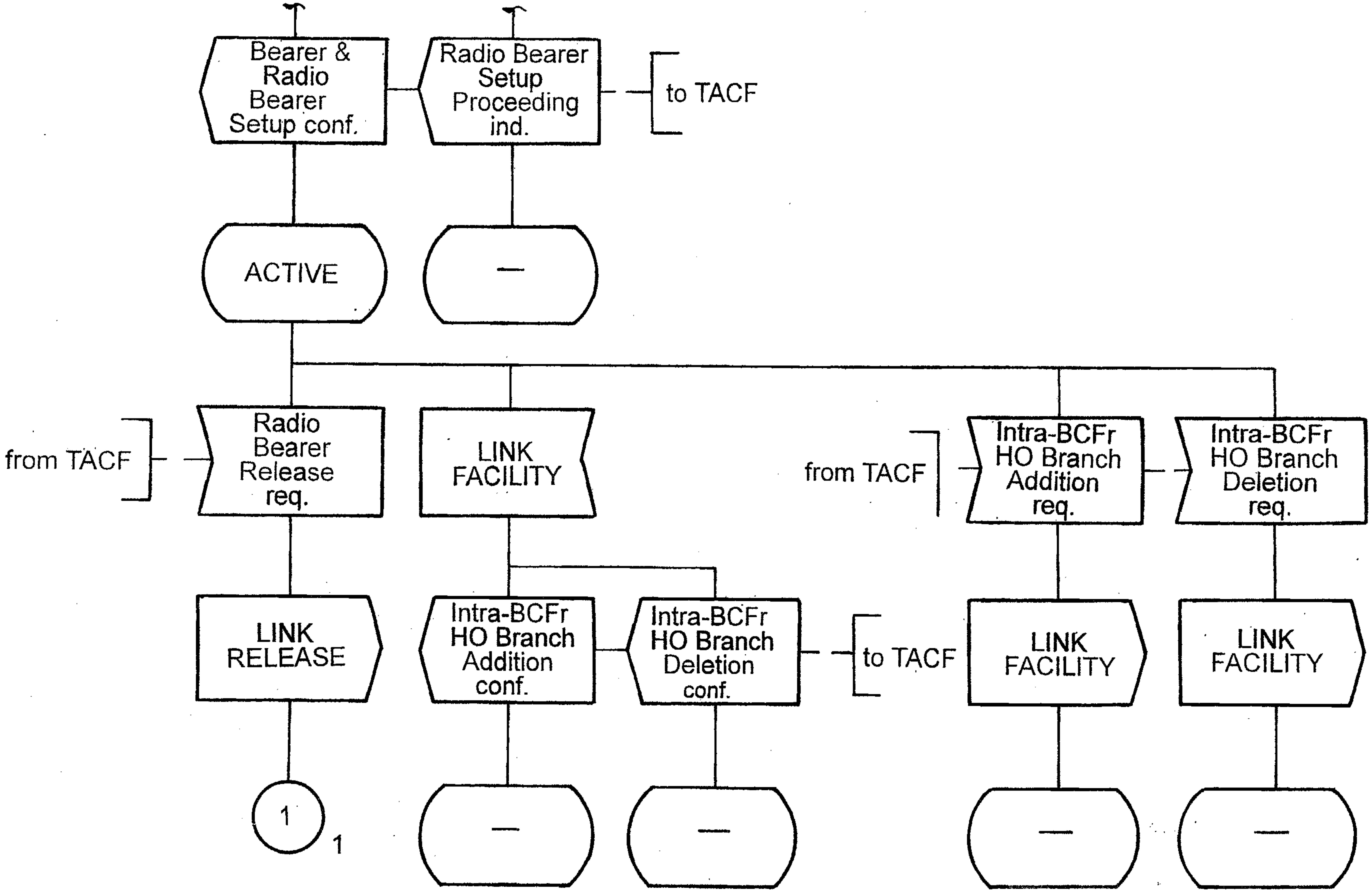


SDL DIAGRAM FOR BEARER CONTROL IN THE SDCCH EXECUTED IN THE BSC

FIG. 256

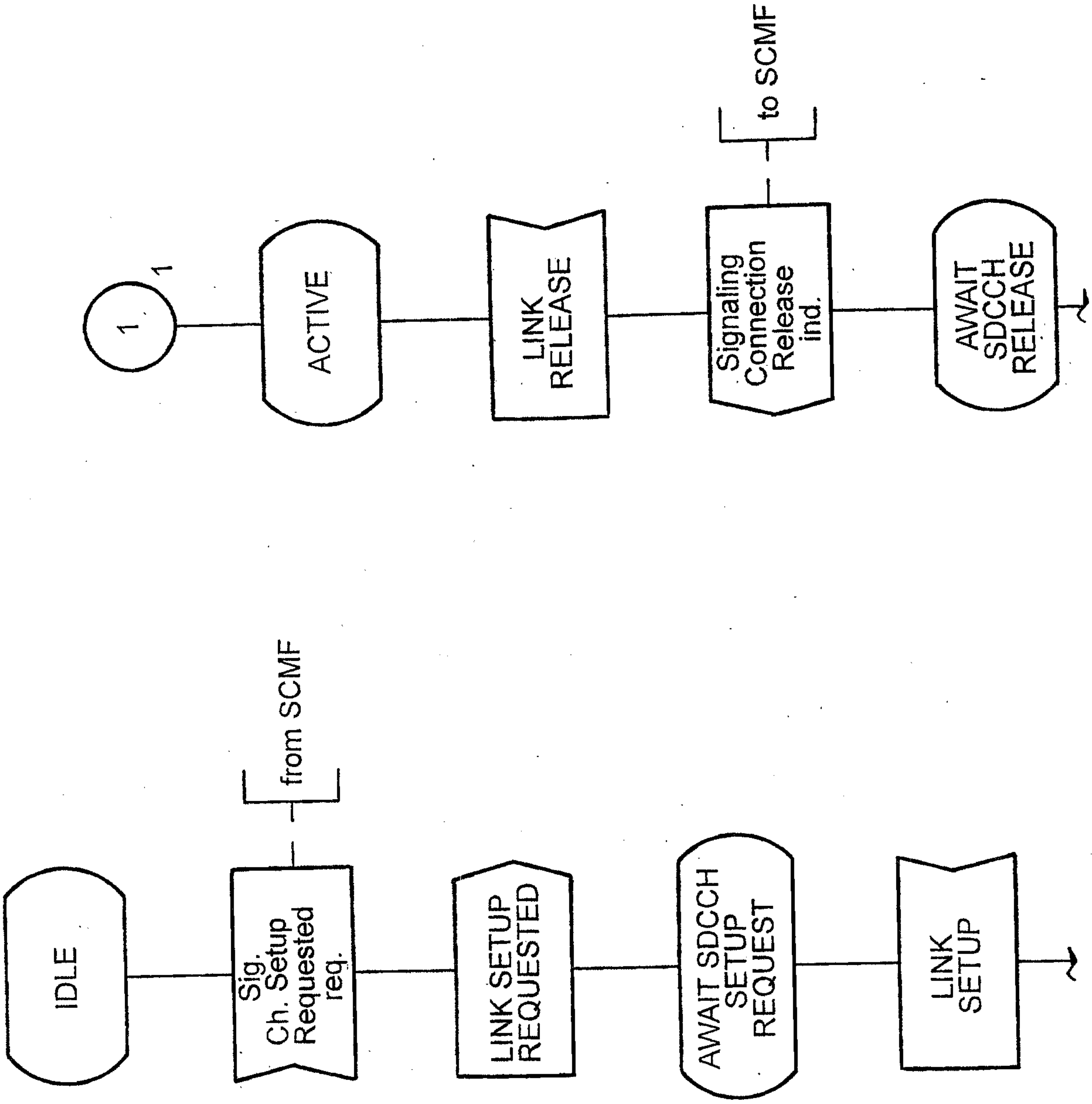

IDLE
from TACF
Bearer & Radio Bearer Setup req.
LINK SETUP
AWAIT TCH ESTABLISH
LINK SETUP RESPONSE
LINK SETUP PROCEEDING
1
1
AWAIT TCH RELEASE
LINK RELEASE COMPLETE
Radio Bearer Release conf.
to TACF
IDLE

CONTINUED FROM FIG. 256



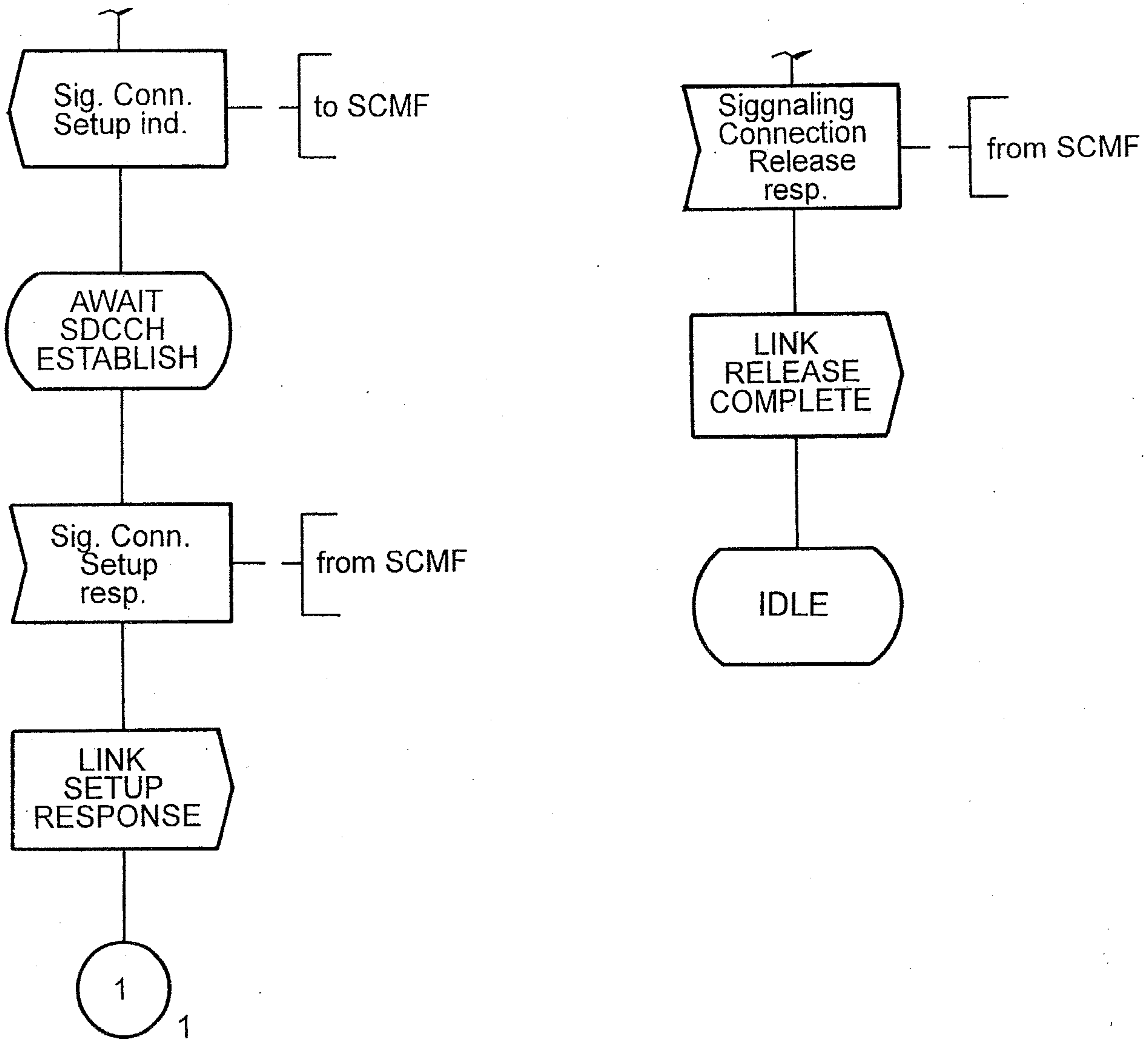
SDL DIAGRAM FOR BEARER CONTROL IN THE TCH/ACCH EXECUTED IN THE BSC FUNCTION OF THE NETWORK

FIG. 257



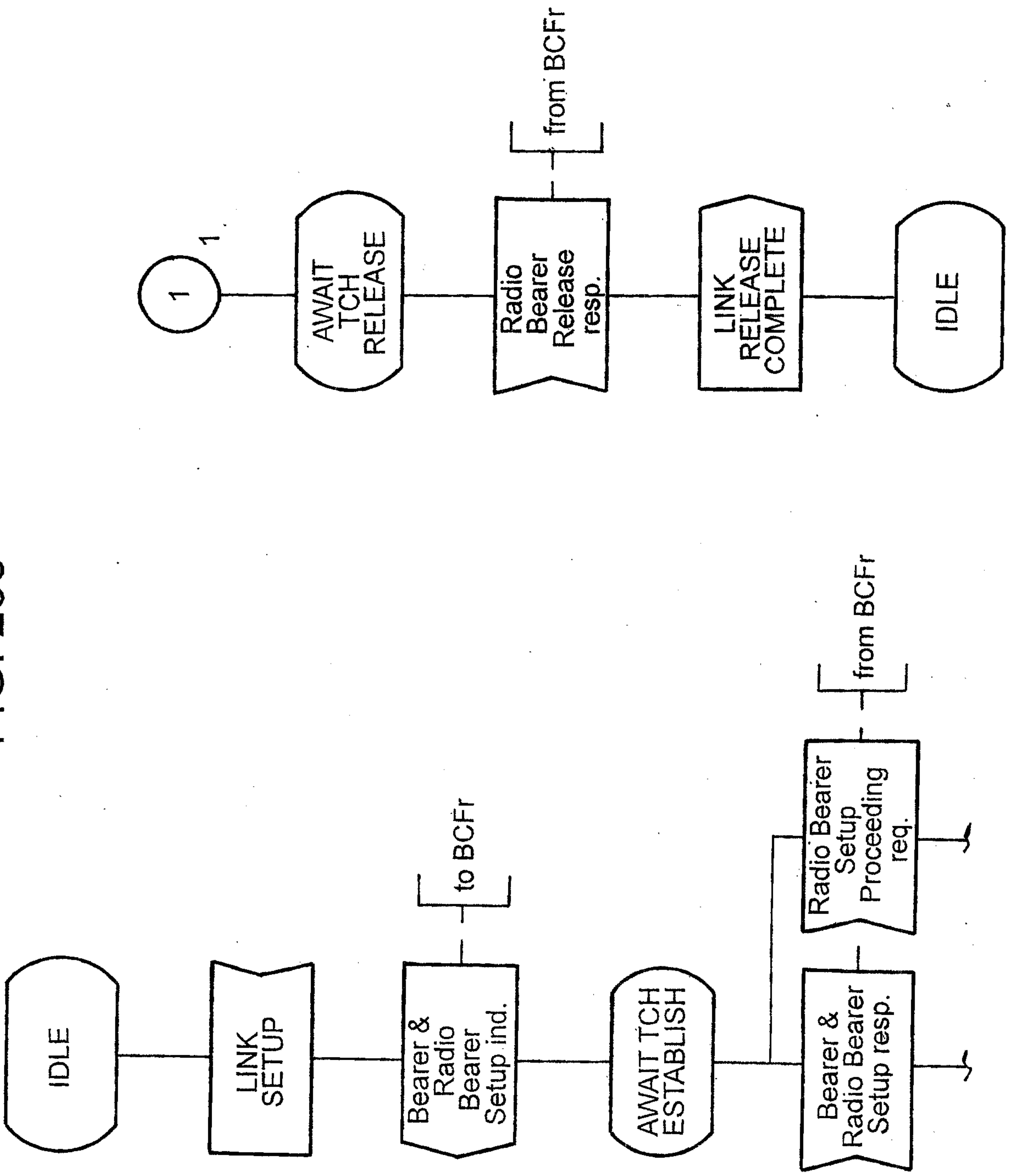
IDLE
Sig. Ch. Setup Requested req.
from SCMF
LINK SETUP REQUESTED
AWAIT SDCCH SETUP REQUEST
LINK SETUP
1
ACTIVE
LINK RELEASE
Signaling Connection Release ind.
to SCMF
AWAIT SDCCH RELEASE

CONTINUED FROM FIG. 257

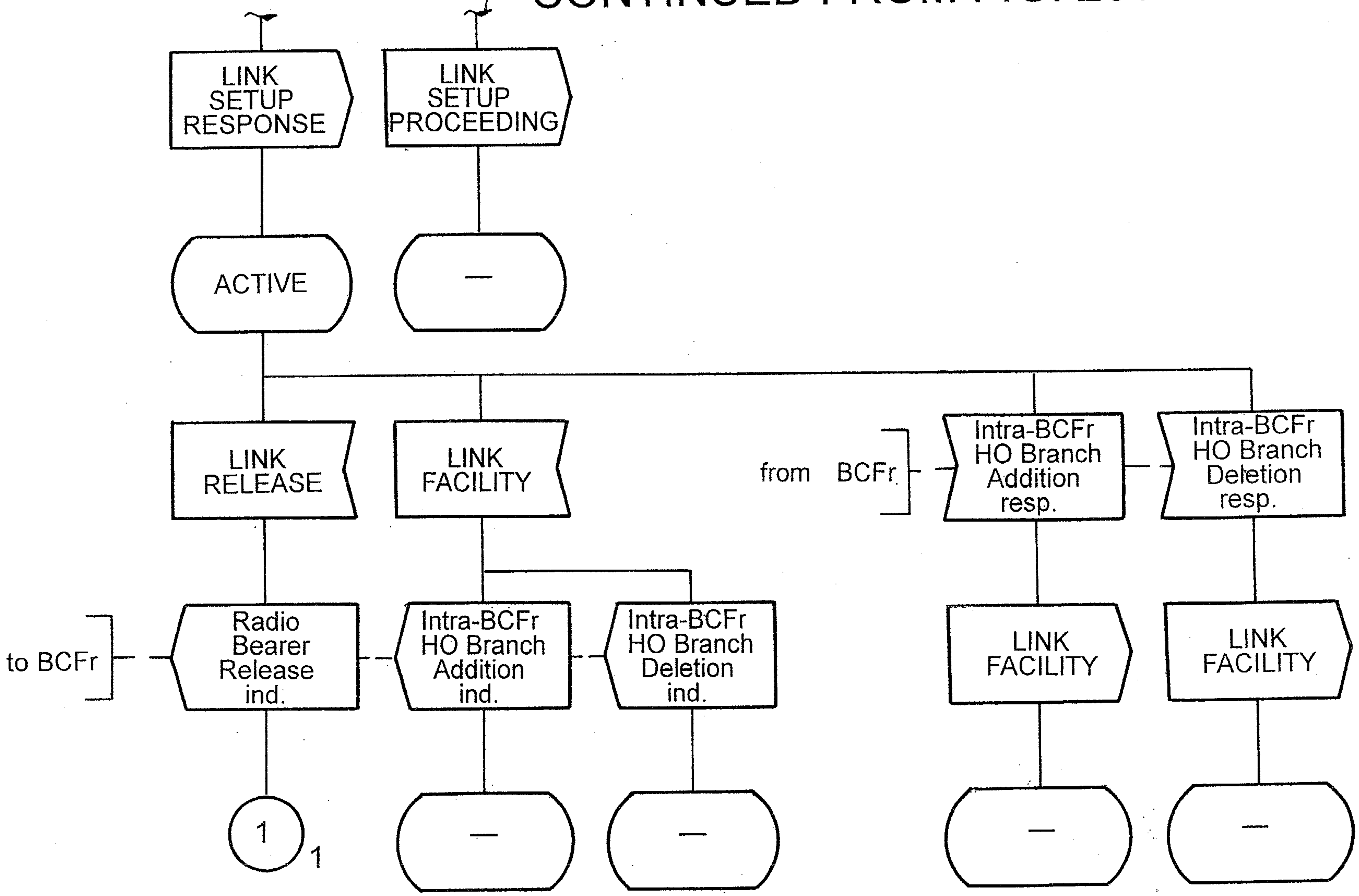


SDL DIAGRAM FOR BEARER CONTROL IN THE SDCCH
EXECUTED IN THE BTS

FIG. 258


IDLE
LINK SETUP
Bearer & Radio Bearer Setup ind.
to BCFr
AWAIT TCH ESTABLISH
Bearer & Radio Bearer Setup resp.
Radio Bearer Setup Proceeding req.
from BCFr
1
AWAIT TCH RELEASE
Radio Bearer Release resp.
from BCFr
LINK RELEASE COMPLETE
IDLE

CONTINUED FROM FIG. 258



SDL DIAGRAM FOR BEARER CONTROL IN THE TCH / ACCH EXECUTED IN THE BTS

FIG. 259

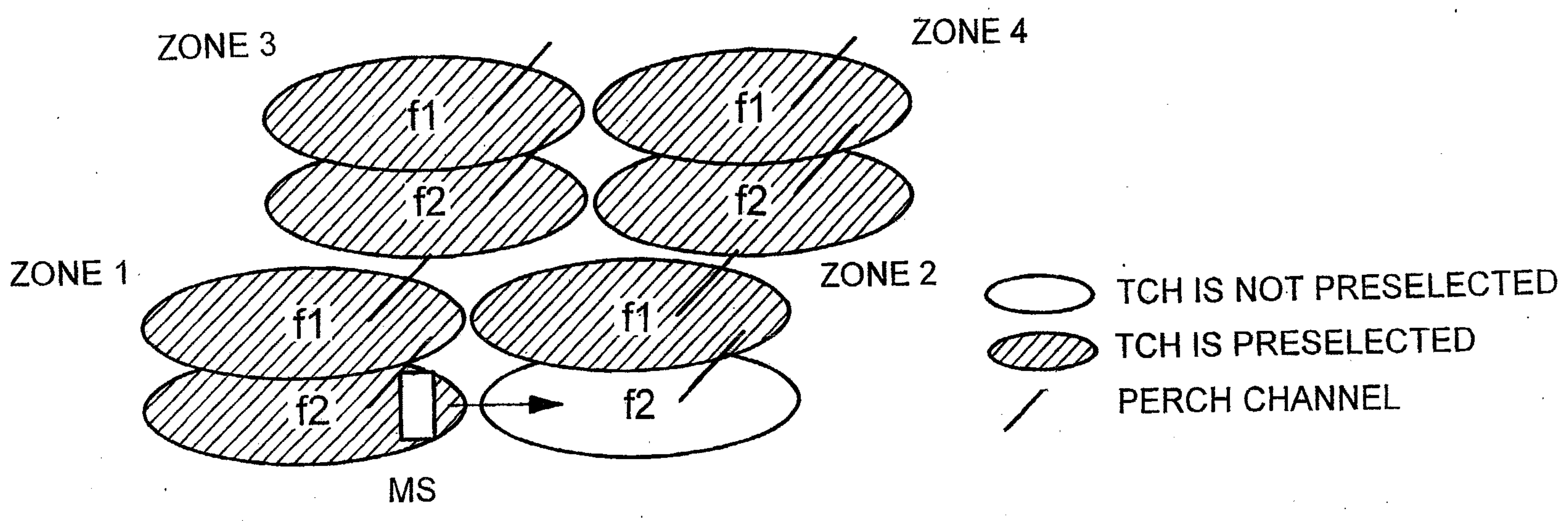

ZONE 3
ZONE 4
f1
f2
f1
f2
ZONE 1
ZONE 2
f1
f2
f1
f2
MS
TCH IS NOT PRESELECTED
TCH IS PRESELECTED
PERCH CHANNEL

FIG. 260

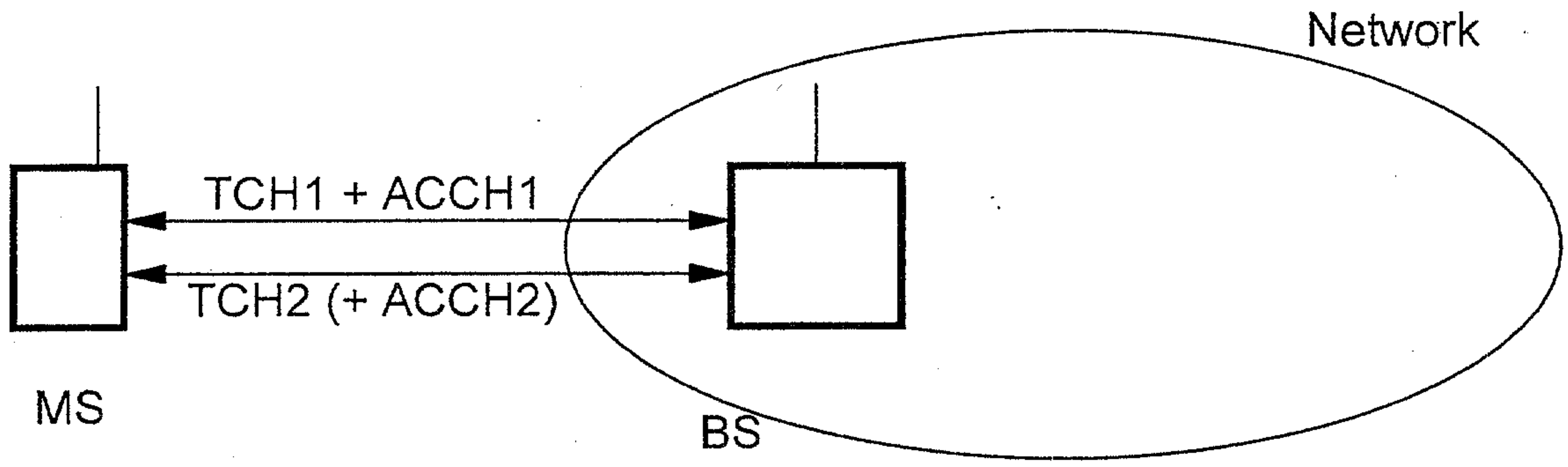


FIG. 261

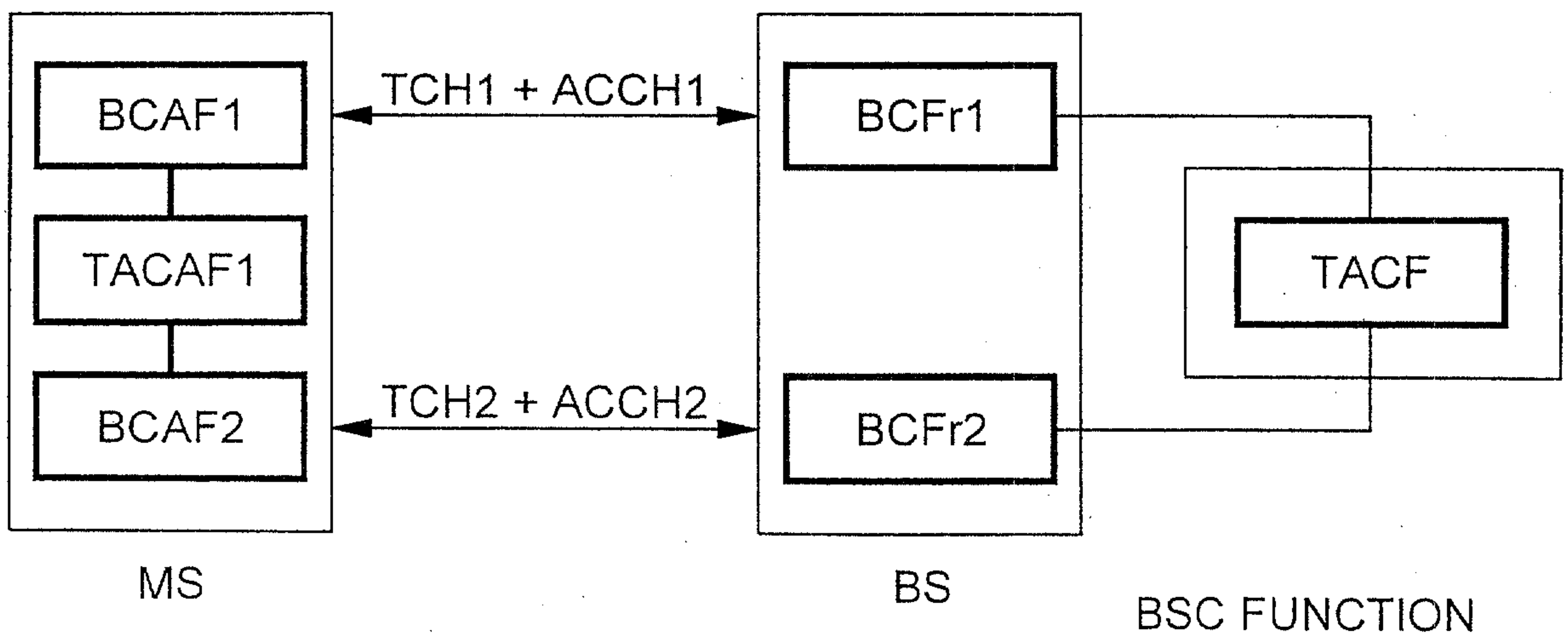


FIG. 262

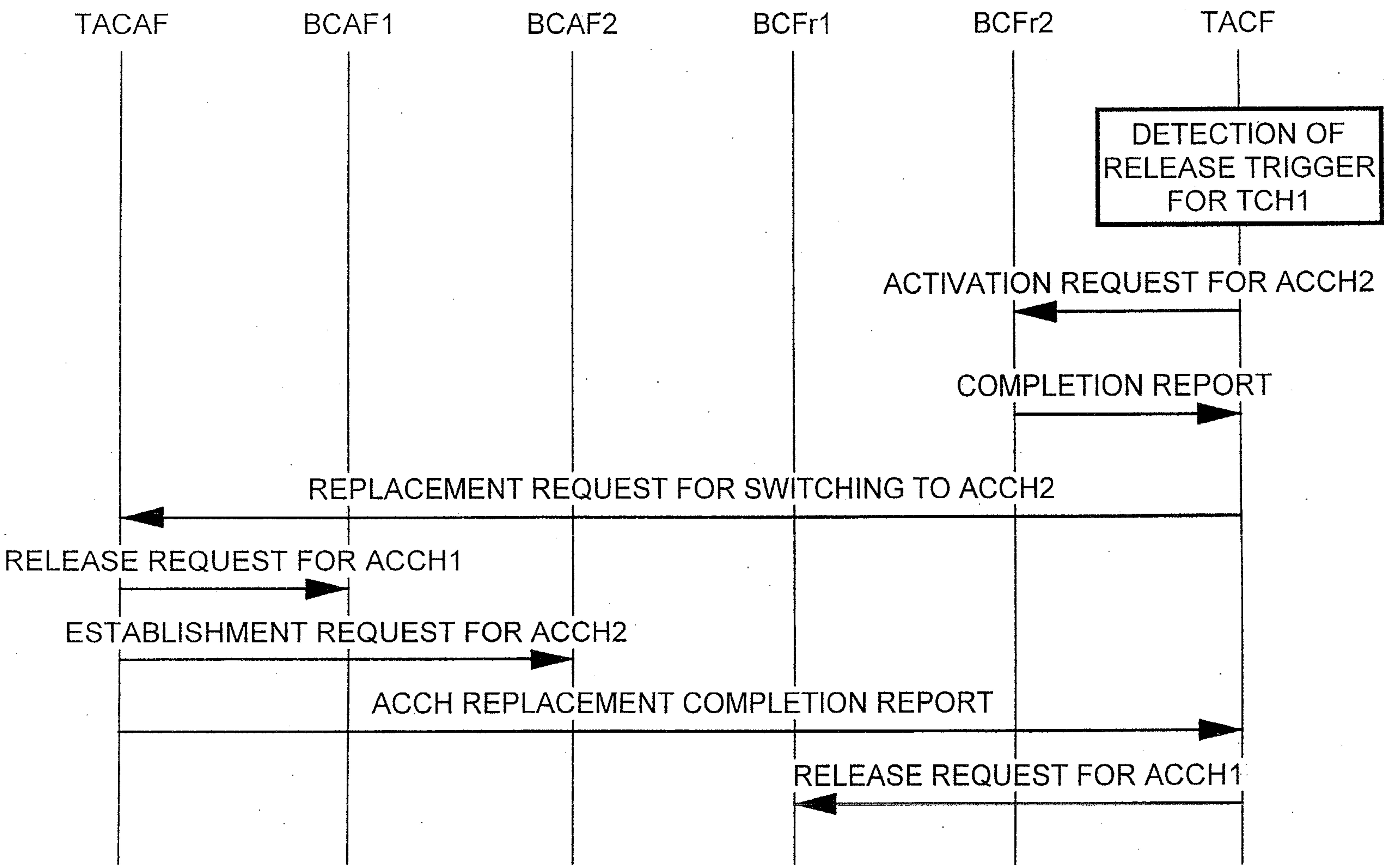

TACAF
BCAF1
BCAF2
BCFr1
BCFr2
TACF
DETECTION OF RELEASE TRIGGER FOR TCH1
ACTIVATION REQUEST FOR ACCH2
COMPLETION REPORT
REPLACEMENT REQUEST FOR SWITCHING TO ACCH2
RELEASE REQUEST FOR ACCH1
ESTABLISHMENT REQUEST FOR ACCH2
ACCH REPLACEMENT COMPLETION REPORT
RELEASE REQUEST FOR ACCH1

FIG. 263

OSI Layer Number	
7	Application Layer
6	Presentation Layer
5	Session Layer
4	Transport Layer
3	Network Layer
2	Datalink Layer
1	Physical Layer

FIG. 264

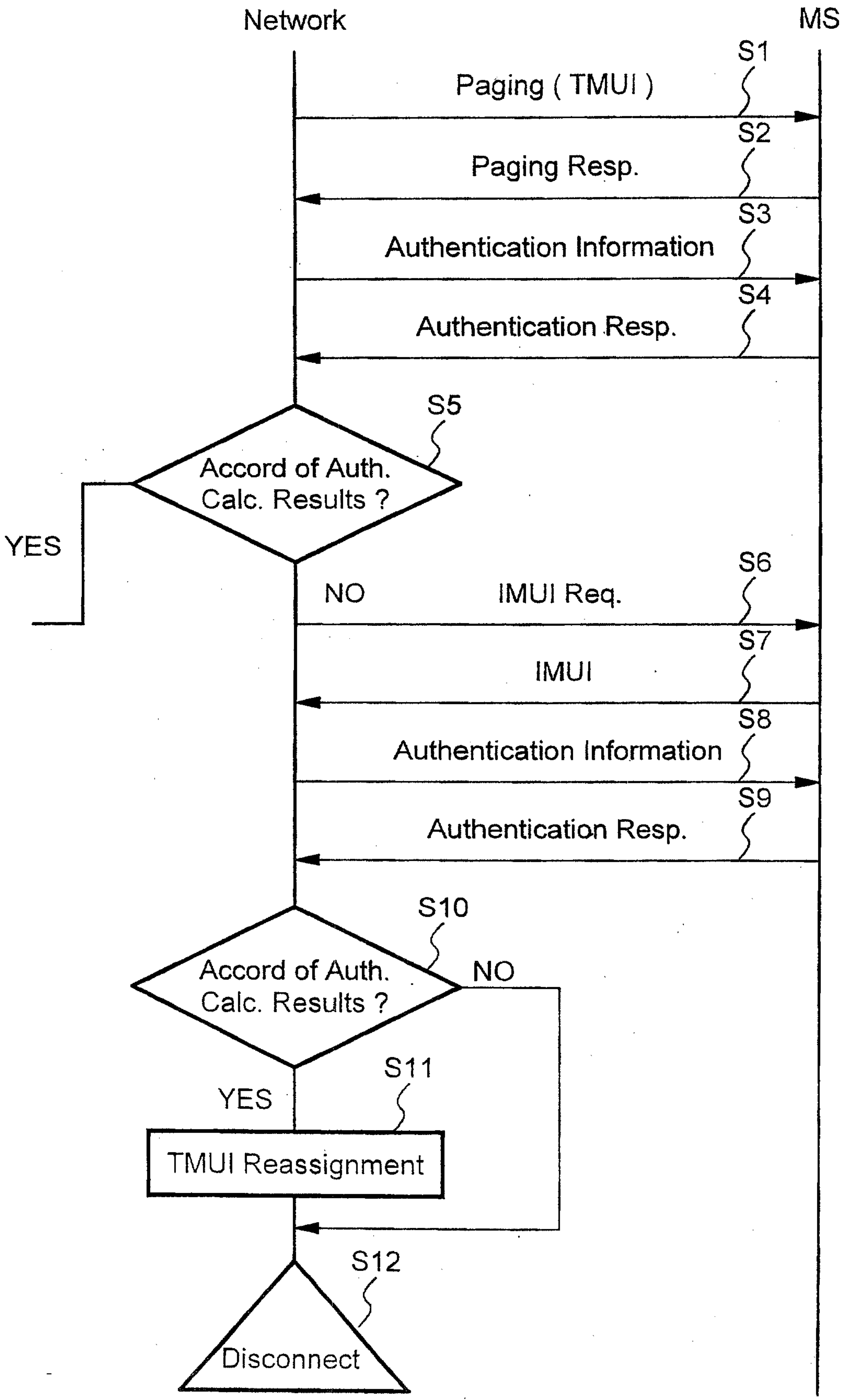

Network
MS
S1
Paging (TMUI)
S2
Paging Resp.
S3
Authentication Information
S4
Authentication Resp.
S5
Accord of Auth. Calc. Results ?
YES
NO
S6
IMUI Req.
S7
IMUI
S8
Authentication Information
S9
Authentication Resp.
S10
Accord of Auth. Calc. Results ?
NO
YES
S11
TMUI Reassignment
S12
Disconnect

FIG. 265

	ABBREVIATION	ORIGINAL FORM
1	BTS	Radio base terminal system
2	AMP	Transmission/reception amplifier function part
3	MDE	Base station modulation/demodulation function part
4	MS	Radio mobile station equipment
5	ANT	Antenna
6	HW	Cable transmission line
7	MCC-SIM	Radio control/switch simulator equipment
8	CODEC	Voice coding/decoding function unit
9	ADP	Adapter signal processor unit for data transmission

FIG. 266

Attribute	Content
Info. transfer capability	Voice/unrestricted digital
Transfer mode	Circuit switching/ packet switching (FFS)
Info. transfer rate	8, 64, or n x 64 kbps
Call setup	Immediate
Commun. format	Point-to-point
Symmetry	Bi-directional symmetric
Voice coding	CS-ACELP (ITU-T Recm. G.729)

FIG. 267

Information transfer capability	Voice
Traffic type	Circuit switching
User information transfer rate	8 kbps
Call setup	Immediate
Symmetry	Bi-directional symmetric
Communication format	Point-to-point
Interconnection	None

FIG. 268

Information transfer capability	Unrestricted
Traffic type	Circuit switching
User information transfer rate	64 kbps
Call setup	Immediate
Symmetry	Bi-directional symmetric
Communication format	Point-to-point
Interconnection	None

FIG. 269

Information transfer capability	Unrestricted
Traffic type	Circuit switching
User information transfer rate	384 kbps
Call setup	Immediate
Symmetry	Bi-directional symmetric
Communication format	Point-to-point
Interconnection	None

FIG. 270

FE Number	EE Name	FE Number	EE Name
EE01	CCAF'	EE10	SRF
EE02	TACAF	EE11	MCF
EE03	BCAF	EE12	SACF
EE04	BCF	EE13	MRRC
EE05	TACF	EE14	MRTR
EE06	CCF'	EE15	RRC
EE07	LRCF	EE16	RFTR
EE08	LRDF	EE17	TIMF
EE09	SSF	EE18	UIMF

FIG. 271

Relationship Designation	Related FEs	Relationship Designation	Related FEs
ra	FE01 and FE06 (CCAF'-CCF')	rp	FE13 and FE15 (MRRC-RRC)
rb	FE02 and FE05 (TACAF-TACF)	rq	FE15 and FE16 (RRC-RFTR)
rc	FE07 and FE09 (LRCF-SSF)	rr	FE03 and FE04 (BCAF-BCF)
rd	FE07 and FE08 (LRCF-LRDF)	rs	FE04 and FE06 (BCF-CCF')
re	FE09 and FE10 (SSF-SRF)	rt	FE05 and FE15 (TACF-RRC)
rf	FE07 and FE10 (LRCF-SRF)	ru	FE02 and FE13 (TACAF-MRRC)
rg	FE05 and FE07 (TACF-LRCF)	rv	FE02nd FE17 (TACAF-TIMF)
rh	FE05 and FE12 (TACF-SACF)	rw	FE11 and FE17 (MCF-TIMF)
ri	FE05 and FE06 (TACF-CCF')	rx	FE01 and FE18 (CCAF'-UIMF)
rj	FE05 and FE04 (TACF-BCF)	ry	FE11 and FE18 (MCF-UIMF)
rk	FE07 and FE12 (LRCF-SACF)	r44	FE04a and FE04b (BCFr-BCF)
rl	FE11 and FE12 (MCF-SACF)	r66	FE06 and FE06 (CCF'-CCF')
rm	FE01 and FE02 (CCAF-TACAF)	r77	FE07 and FE07 (LRCF-LRCF)
rn	FE02 and FE03 (TACAF-BCAF)	r55	FE05 and FE05 (TACF-TACF)
ro	FE13 and FE14 (MRRC-MRTR)	r88	FE08 and FE08 (LRDF-LRDF)

FIG. 272

IE	*Relationship*	*Mandatory/Optional*
Call ID	rm	M

FIG. 273

IE	*Relationship*	*Mandatory/Optional*
User ID	rb	M

FIG. 274

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
User ID	rg	M
Service Address Information	rg	M
Anchor Tacf Instance ID	rg	M
Routing Address	rg	M
LAI	rg	O

FIG. 275

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
User ID	rg	M

FIG. 276

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M

FIG. 277

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Reverse Long Code	rd	M
Result	rd	M

FIG. 278

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M
Terminal Status	rd	M

FIG. 279

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M

FIG. 280

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M
Routing Address	rd	M
Anchor TACF Instance ID	rd	M

FIG. 281

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M

FIG. 282

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
Result	rg	M

FIG. 283

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
Reverse Long Code	rg	M
Result	rg	M

FIG. 284

IE	*Relationship*	*Mandatory/Optional*
None	-	-

FIG. 285

IE	*Relationship*	*Mandatory/Optional*
Call ID	rm	M

FIG. 286

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M
Bearer Capability	ra	M
Called Number	ra	M
Calling User ID	ra	M
QOS	ra	O
Transit Network Selection	ra	O
Low Layer Compatibility	ra	O
High Layer Compatibility	ra	O

FIG. 287

IE	*Relationship*	*Mandatory/Optional*
TACF Instance ID	ri	M

FIG. 288

IE	*Relationship*	*Mandatory/Optional*
Cell ID + Pilot Channel Info.	ro	M
Measurement Condition	ro	M

FIG. 289

IE	*Relationship*	*Mandatory/Optional*
Pilot Channel Reception Level	ro	M
Interference Level	ro	M

FIG. 290

IE	*Relationship*	*Mandatory/Optional*
Cell IDs + Pilot Channel Reception Levels + Interference Levels	rp	M

FIG. 291

IE	*Relationship*	*Mandatory/Optional*
LRCF-SSF Relationship ID	rc	M
Service Address Information	rc	M
Bearer Capability	rc	O
Calling User ID	rc	M

FIG. 292

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Calling User ID	rd	M
Selection	rd	M

FIG. 293

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User Profile	rd	M

FIG. 294

IE	*Relationship*	*Mandatory/Optional*
LRCF-SSF Relationship ID	rc	M
Calling Number	rc	M
Result	rc	M

FIG. 295

IE	*Relationship*	*Mandatory/Optional*
Call ID	r66	M
Bearer Capability	r66	M
Called Number	r66	M
Calling Number	r66	M
QOS	r66	O
Transit Network Selection	r66	O
Low Layer Compatibility	r66	O
High Layer Compatibility	r66	O

FIG. 296

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M

FIG. 297

IE	*Relationship*	*Mandatory/Optional*
Number Of Measured Cells	rt	M
Cell IDs + Pilot Channels Info.	rt	M
Measurement Condition	rt	M

FIG. 298

IE	*Relationship*	*Mandatory/Optional*
Number of Measured Cells	rp	M
Cell IDs + Pilot Channels Info.	rp	M
Measurement Condition	rp	M

FIG. 299

IE	*Relationship*	*Mandatory/Optional*
Call ID	r66	M

FIG. 300

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M

FIG. 301

IE	*Relationship*	*Mandatory/Optional*
Call ID	r66	M
Called Number	r66	O
Connected Line ID	r66	O
High Layer Compatibility	r66	O
Low Layer Compatibility	r66	O

FIG. 302

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M
Called Number	ra	O
Connected Line ID	ra	O
High Layer Compatibility	ra	O
Low Layer Compatibility	ra	O

FIG. 303

IE	*Relationship*	*Mandatory/Optional*
Call ID	r66	M
Bearer Capability	r66	M
Called Number	r66	O
Roaming Number	r66	O
Calling User Number	r66	M
QOS	r66	O
Transit Network Selection	r66	O
Low Layer Compatibility	r66	O
High Layer Compatibility	r66	O

FIG. 304

IE	*Relationship*	*Mandatory/Optional*
LRCF-SSF Relationship ID	rc	M
Called User Number	rc	O
Roaming Number	rc	O
Service Address Information	rc	M

FIG. 305

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Called User ID	rd	O
Roaming Number	rd	O
Selection	rd	M

FIG. 306

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M

FIG. 307

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M
Selection	rd	M

FIG. 308

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Terminal Status	rd	M

FIG. 309

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M
Terminal Status	rd	M

FIG. 310

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M

FIG. 311

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M
Selection	rd	M

FIG. 312

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Paging Area	rd	M

FIG. 313

IE	*Relationship*	*Mandatory/Optional*
Paging Relationship ID	rg	M
User ID (TMUI)	rg	M
LAI (Paging Area)	rg	M

FIG. 314

IE	*Relationship*	*Mandatory/Optional*
Paging ID	rb	M
TMUI	rb	M

FIG. 315

IE	*Relationship*	*Mandatory/Optional*
Paging ID	rb	M

FIG. 316

IE	*Relationship*	*Mandatory/Optional*
Paging Relationship ID	rg	M
Radio Zone ID	rg	O
Anchor TACF Instance ID	rg	O
Routing Address	rg	O

FIG. 317

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
User ID	rg	M

FIG. 318

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M

FIG. 319

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Reverse Long Code	rd	M
Result	rd	M

FIG. 320

IE	*Relationship*	*Mandatory/Optional*
Cell ID + Pilot Channel Info.	ro	M
Measurement Condition	ro	M

FIG. 321

IE	*Relationship*	*Mandatory/Optional*
Pilot Channel Reception Level	ro	M
Interference Level	ro	M

FIG. 322

IE	*Relationship*	*Mandatory/Optional*
Cell ID + Pilot Channel Info.	rp	M
Levels + Interference Levels	rp	M

FIG. 323

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M
Routing Address	rd	M
TACF Instance ID	rd	M

FIG. 324

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M

FIG. 325

IE	*Relationship*	*Mandatory/Optional*
Paging Relationship ID	rg	M
Result	rg	M

FIG. 326

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
Reverse Long Code	rg	M
Result	rg	M

FIG. 327

IE	*Relationship*	*Mandatory/Optional*
LRCF-SSF Relationship ID	rc	M
Roaming Number	rc	O
Routing Address	rc	O
TACF Instance ID	rc	O

FIG. 328

IE	*Relationship*	*Mandatory/Optional*
Call ID	r66	M
Roaming Number	r66	M
Calling User ID	r66	M

FIG. 329

IE	*Relationship*	*Mandatory/Optional*
LRCF-SSF Relationship ID		M
Service Address Info.		M
Called User Number		M

FIG. 330

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
Called User ID	rd	M
Selection	rd	M

FIG. 331

IE	Relationship	Mandatory/Optional
LRCF-LRDF Relationship ID	rd	M
User Profile	rd	M

FIG. 332

IE	Relationship	Mandatory/Optional
LRCF-SSF Relationship ID		M
Result		M

FIG. 333

IE	Relationship	Mandatory/Optional
Call ID	ra	M
Bearer Capability	ra	M
Called Number	ra	M
Calling User ID	ra	M
QOS Parameter	ra	O
Transit Network Selection	ra	O
Low Layer Compatibility	ra	O
High Layer Compatibility	ra	O

FIG. 334

IE	Relationship	Mandatory/Optional
Call ID	ra	M

FIG. 335

IE	Relationship	Mandatory/Optional
Number Of Measured Cells	rp	M
Cell IDs + Pilot Channels Info.	rp	M
Measurement Condition	rp	M

FIG. 336

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M

FIG. 337

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M
Bearer Capability	ra	M
Called Number	ra	O
QOS Parameter	ra	O
Transmit Network Selection	ra	O
Connected Line ID	ra	O
Low Layer Compatibility	ra	O
High Layer Compatibility	ra	O

FIG. 338

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M

FIG. 339

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M
Cause	ra	M

FIG. 340

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M

FIG. 341

IE	*Relationship*	*Mandatory/Optional*
TACF-SCF Relationship ID	rg	M
User ID	rg	M
Service Address Info.	rg	M

FIG. 342

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M

FIG. 343

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M

FIG. 344

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M

FIG. 345

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M
Cause	ra	M

FIG. 346

IE	*Relationship*	*Mandatory/Optional*
Call ID	ra	M

FIG. 347

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M
User ID	rg	M
Service Address Info.	rg	M

FIG. 348

IE	*Relationship*	*Mandatory/Optional*
LRCF-LRDF Relationship ID	rd	M
User ID	rd	M

FIG. 349

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M

FIG. 350

IE	*Relationship*	*Mandatory/Optional*
TACF-LRCF Relationship ID	rg	M

FIG. 351

IE	*Relationship*	*Mandatory/Optional*
TACAF-BCAF Relationship ID	rn	M
Cause	rn	M

FIG. 352

IE	*Relationship*	*Mandatory/Optional*
Call ID	rm	M

FIG. 353

IE	*Relationship*	*Mandatory/Optional*
Call ID	rb	M
Cause	rb	M

FIG. 354

IE	*Relationship*	*Mandatory/Optional*
CCF-TACAF Relationship ID	ri	M
Call ID	ri	M
Cause	ri	M

FIG. 355

IE	*Relationship*	*Mandatory/Optional*
CCF-TACF Relationship ID	ri	M

FIG. 356

IE	*Relationship*	*Mandatory/Optional*
Call ID	rb	M
Cause	rb	M

FIG. 357

IE	*Relationship*	*Mandatory/Optional*
TACF-BCF Relationship ID	rjb	M

FIG. 358

IE	*Relationship*	*Mandatory/Optional*
TACF-BCF Relationship ID	rjb	M

DEMANDES OU BREVETS VOLUMINEUX

LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS COMPREND PLUS D'UN TOME.

CECI EST LE TOME 1 DE 2

NOTE: Pour les tomes additionels, veillez contacter le Bureau Canadien des Brevets.

JUMBO APPLICATIONS / PATENTS

THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE THAN ONE VOLUME.

THIS IS VOLUME 1 OF 2

NOTE: For additional volumes please contact the Canadian Patent Office.


MS: Mobile Station
BSS : Base Station System
PSTN/ISDN
Dial up
BTS
CODEC
ADP
AMP
MDE
MCC
Internet
Wide-Purpose
Mobile Station
LAN
HW
ADP
BTS
Small Portable
Device 1
AMP
MDE
Small Portable
Device 2