(57) Claim

1. A process for collecting and processing communication records in a first communications network, the records concerning communication instances, wherein the network includes at least one point of connection to a second communications network, the process comprising the steps of:

i) collecting data at a data access point at said point of connection, said data concerning a communication instance arising in an originating network other than said first network, and creating a respective data record for each communication instance, each such record comprising route information identifying the originating network and at least one parameter measurement susceptible of billing, such as duration, with respect to said communication instance;

ii)   transmitting said records into a data processing system which includes a data analyser;

iii)   validating data in said records followed by analysing invalid data in,

iv)   the analysis of invalid data identifying data which can potentially be set to a default value;

v)   setting the data to a default value; and

vi)   processing each said record to generate billing information.

6.   A data processing arrangement, for processing data collected in a communications network but concerning call instances arising outside the network, the arrangement comprising:

i)   a data input for inputting said data, said data comprising at least one of a plurality of sort characteristics;

ii)   verifying means for checking the data received at the data input;

iii)   a data analyser for analysing data rejected by the verifying means, and for substituting amended or default data therefor;

iv)   pricing means for pricing data output by the verifying means or by the data analyser, in accordance with updatable reference information; and

v)   output means for outputting priced data from the pricing means into memory locations, each memory location being dedicated to data relevant to one or more of said sort characteristics.

15. A data collection and processing system, for use in collecting and processing communication records relevant to a plurality of networks, wherein said system comprises at least one input for receiving communication records generated at a point of connection between a first of said plurality of networks and at least one other of said plurality of networks, said records providing identification of the network in which an associated communication instance arose or from which it entered said first network and a parameter measurement susceptible of billing, such as duration, associated with the communication instance, the system further comprising validation means for validating format and routing information aspects of the records, data analysing means for analysing errored records rejected by said validation means, the analysing means being capable of categorising said errored records and applying default values to at least one category of the errored records, data sorting means, for sorting validated and defaulted records according to said network identification, and pricing means for receiving the sorted records and, based on the information contained therein, generating billing information for use in billing entities relevant to the identified networks.

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(54) Title: DATA PROCESSING SYSTEM FOR COMMUNICATIONS NETWORK

(57) Abstract

An inter-network call accounting system for use in a communication network such as the public switched telephone network (1) in Britain allows call records to be sorted according to the network operator to be charged in respect of the calls, prior to being priced and charged. A data analyser (7) incorporating an expert system is provided for call records which cannot be validated. The data analyser (7) can apply default or amended date, or can output invalid data to a suspended process awaiting updated reference information. Unfixable data is output to a sump for management purposes. A pricing and charging engine processes data already sorted according to billable entity and incorporates further data analysis means for dealing with data invalid by reason of pricing and charging related information.

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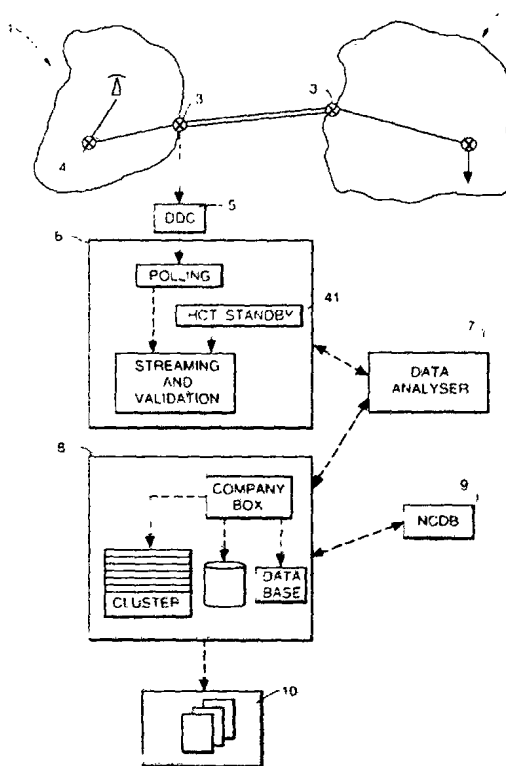
DATA PROCESSING SYSTEM FOR COMMUNICATIONS NETWORK

The present invention relates to a data system for data
collection and processing in multi network communications.

5   Where communication instances, for instance telephone
calls or data transfers, occur within a single network, it is
known to log and process data related to those communication
instances. Commonly, in a public switched telephone network
(PSTN), data will be collected concerning call duration, and
10   processed with respect to at least time of day and call type,
so that the network operator can generate an item on a bill
destined for the subscriber who initiated a call.

Over recent years, the data systems for PSTNs have
necessarily become increasingly complex as the choice of
15   service and call type available to subscribers has greatly
increased. For instance, with the introduction of 0800
numbers, it is no longer the initiating subscriber who will
be billed. Many more complicated services are already being
trialled, or available, on PSTNs, such as call forwarding
20   where a call initiated by a first subscriber to a selected
number is forwarded automatically by the network to a
different number, the difference in cost being borne by the
receiving subscriber.

Another aspect of communication networks which is in the
25   course of considerable change is the multiplicity of network
operators in existence. In the past, PSTNs have been run
primarily by government organisations as part of the national
infra structure. Nowadays and increasingly, privatisation of
the PSTNs and the relaxation of regulatory monopolies means
30   that there are many more network operators available to the
subscriber and these network operators must, for practical
reasons, provide inter network connection. This means that
a network operator must take into account not only
communication instances arising in their own network or in a
35   limited number of inter-connected networks of independent but
similar administrations, but also communication instances
arising in a theoretically very large number of competing

networks of different types and providing a wide variety of services to subscribers.

It is, therefore, of increasing importance that data be collected and processed in connection with communication
5 instances arising outside an operator's network but terminating in or simply crossing the operator's network.

In the paper "Access Charge and Revenue Architecture" AT&T Technical Journal, Vol 66, No.3, May 1987, New York US, pages 73-81, by Obuchowski, a data system for predicting
10 access charges and revenue is disclosed, for use by an inter exchange carrier in a PSTN of the US type after the separation of local and long distance carriers in the '80s (divestiture).

When calls pass through the network of more than one
15 operator, price and charging agreements between operators for the carriage of each other's calls come into play. Such arrangements can vary from the simple Sender Keeps All (SKA) arrangement to complex pricing formulae.

It has been an established practice between separate
20 network operators or administrations, in telecommunications, that call data would be collected by the administration responsible for the network in which a call arises. If that call then terminates in a second network, the administration concerned with the second network relies on the data
25 collected by the administration responsible for the first network, for instance for accounting purposes. In British patent application number GB 2254224, in the name of Fujitsu Limited, a system is described for avoiding double accounting of outgoing international calls based on intelligent network
30 technology.

However, the telecommunications environment is changing quickly, politically as well as technically. With the advent of greater competition, it is increasingly attractive to network administrations to monitor not only traffic arising
35 in their own network but also traffic arising elsewhere but crossing or terminating in their own network. If the network in which traffic arises belongs to a competing operator or

administration, it is desirable that it is at least possible
to cross check the competing operator's accounts.

5   In known arrangements, data collection points
concerning calls in a PSTN have been at local exchanges of a
network since the local exchange picks up traffic as it
arises. This arrangement, however, does not provide for data
collection with respect to inter-network traffic. Even were
10 there to be data collection points to collect data on calls
incoming to a network, the logistics involved in processing
such data to any level of detail are daunting. For instance,
it has been estimated that calls incoming to the PSTN

operated in Britain by British Telecommunications plc (BT) from other network administrations including the Isle of Man and the Cellnet cellular network totalled 15.4 million calls per day in the twelve months to March 1992. This figure is expected to increase to the order of 27 million calls a day in the year to March 1995. Taking all call instances into account, including those arising within the BT PSTN, 60 million call instances per day have been predicted for 1995.

10   In spite of the very large quantity of data involved, it has been found possible in making the present invention to design a process for collecting and processing data relating to calls incoming to a major telecommunications network, the British PSTN, which can produce an output in

15   sufficient detail to allow the associated network administration to generate account information which not only can be allocated to outside network administrations appropriately, but also supports itemised billing. That is, the account information can be broken down in

20   sufficient detail even to identify individual calls, so far as they fulfil preselected criteria, in the manner of itemised billing currently available in the national billing system for the British PSTN from British Telecommunications plc.

25   According to a first aspect of the present invention, there is provided a process for collecting and processing communication records in a first communications network, the records concerning communication instances, wherein the network includes at least one point of connection to a

second communications network, the process comprising the steps of:

    i)   collecting data at a data access point at said point of connection, said data concerning a communication instance arising in an originating network other than said first network, and creating a respective data record for each communication instance, each such record comprising route information identifying the originating network and at least one parameter measurement susceptible of billing, such as duration, with respect to said communication instance;

    ii)   transmitting said records into a data processing system which includes a data analyser;

    iii)   validating data in said records followed by analysing invalid data in,

    iv)   the analysis of invalid data identifying data which can potentially be set to a default value;

    v)   setting the data to a default value; and

    vi)   processing each said record to generate billing information.

By collecting the data at a point of connection between the first network and another network, it becomes available to the administration associated with the first network to obtain first hand information about communication instances incoming to the first network, and thus potentially to cross check data provided by other network operators or administrators.

According to a second aspect of the present invention, there is provided a data processing arrangement, for processing data collected in a communications network but

concerning call instances arising outside the network, the arrangement comprising:

i) a data input for inputting said data, said data comprising at least one of a plurality of sort

5 characteristics;

ii) verifying means for checking the data received at the data input;

iii) a data analyser for analysing data rejected by the verifying means, and for substituting amended or

10 default data therefor;

iv) pricing means for pricing data output by the verifying means or by the data analyser, in accordance with updatable reference information; and

v) output means for outputting priced data from the

15 pricing means into memory locations, each memory location being dedicated to data relevant to one or more of said sort characteristics.

Preferably, the pricing means can also validate data, and output errored data to a data analyser, which may be

20 the above data analyser or a different one, so that data which has been corrupted can potentially be reformatted, or
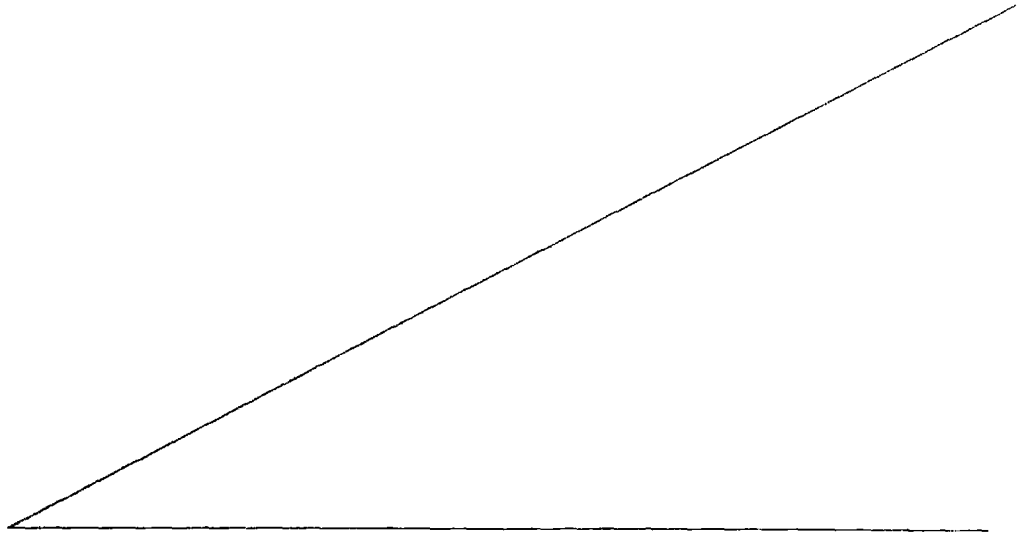
otherwise corrected, and, therefore, re-entered to the system
as a valid record of a communication instance.

It may also (or alternatively) be that this further data
analysis step is used to analyse the data with respect to a
5 different type of fault. For instance, data analysis carried
out on errored data which has been located by the verifying
means might be errored principally in respect of format and
routing information while the errored data from the pricing
means might be errored principally in respect of pricing
10 information.

The sort characteristics will typically be such that the
memory locations each hold data relevant to communication
instances which will be billable to a common accounting
entity, for instance, arising in a common respective
15 communications network.

The sort characteristics might be applied at any one of
several stages of the data processing arrangement described
above. However, in a PSTN for example, the nature of errored
data usually arising makes it preferable to provide sorting
20 means between (iii), the data analyser associated with the
verifying means, and (iv), the pricing means. The pricing
means therefore acts on data already sorted. If the sort
characteristics relate to the different entities who will be
billed in respect of the communication instances represented
25 by the data, then this arrangement can also have the
advantage that the pricing means can potentially be
simplified in applying constraints relevant to individual
entities.

It might be noted that a network such as the BT PSTN
30 comprises both local and trunk exchanges and provides not
only inter-exchange call transmission but also local call
delivery to the end user. This means that the data
collection and processing necessary to support billing or
bill verification has to be sufficiently complex to deal with
35 an extremely wide range of variables. This is in contrast to
the situation where a network provides only inter-trunk
exchange transmission, or only the local call delivery.