Problems and Realities of Internet Governance and Regulations (and a Role of the IEEE ComSoc)

Keynote talk

The First Mamoun Conference for
Computer Science, Communications Technology
and their Applications

Monday, September 10, 2007,
Mamoun University for Science & Technology,
Al-Qamishli, Syria

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OUTLINE

- **Internet Governance (or not?)**
  - **Origins**
  - **Architecture**
  - **The Internet Protocol Suite**
  - **Governance (and players)**
- **IEEE Communications Society**
  - **Relevant groups within ComSoc**
  - **Standardisation activities**
  - **Clusters of Technical Committees**
  - **IEEE ComSoc Chapters in the Middle East**
  - **IEEE ComSoc Sister Societies**
- **Other Societies**
  - **Internet Society**
  - **ACM**
- **Can/Shall it be governed?**
- **A few Observations**
- **Conclusions**

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Internet Governance: The Thesis

- Most lawyers, economists and policy-makers who pontificate on Internet governance lack an adequate understanding of:

  - the Internet's architecture and engineering

  - Internet mechanisms

  - institutions involved in Internet governance

  - the governance of those institutions

  - processes involved in Internet governance

- The concept **'international'** is very awkward in the context of the Internet

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Motivations Underlying The Internet

- Uni / Research Lab project c. 1969-1990, **to connect multiple remote computers**

- Funded by U.S. (Defense) Advanced Research Projects Agency - (D)ARPA

- During the Cold War era, military strategists were concerned about the devastating impact of neutron bomb explosions on electronic componentry

- Hence **robustness and resilience** (or, to use terms of that period, 'survivability' and 'fail-soft') **were uppermost in designers' minds**

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Brief history of the Internet ('61-'71)

- 1961
  - 1st paper on packet-switching theory
  - "Information Flow in Large Communication Nets" Leonard Kleinrock, MIT

- 1969
  - ARPANET created – 4 initial nodes

- 1972
  - Ray Tomlinson (BBN) modifies email program for ARPANET - becomes a quick hit. The @ sign is chosen to symbolise "at"

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Motivations for <u>Use</u> of the Internet

- "By the second year of operation, however [c. 1972], an odd fact became clear.

- "ARPANET's users had warped the computer-sharing network into a dedicated, high-speed, federally subsidized electronic post- office.

- "**The main traffic on ARPANET was not long-distance computing. Instead, it was news and personal messages. [Later, add information access]**

- "Researchers were using ARPANET to collaborate on projects, to trade notes on work, and eventually, to downright gossip and schmooze"

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Brief history of the Internet ('73-'84)

- 1973
  - First international connections to the ARPANET: University College of London (England) via NORSAR (Norway)

- 1974
  - Vint Cerf & Bob Kahn publishes "A protocol for Packet Network Interconnection" – Transmission Control Program (TCP)

- 1984
  - Domain Name System (DNS) introduced
  - Number of hosts breaks 1,000
  - The Internet converts en masse to use TCP/IP

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The Seeds of Popularisation

"As the '70s and '80s advanced, … and since:

- **software [that implemented] TCP/IP was public-domain**, and

- **the basic technology was decentralized and rather anarchic [i.e. not centrally coordinated]** …

it was difficult to stop people from barging in and linking up somewhere-or-other"

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Brief history of the Internet ('87-'92)

- 1987
  - 10,000 hosts connected to the Internet

- 1989
  - 100,000 hosts connected to the Internet

- 1991
  - The World Wide Web is released by CERN

- 1992
  - 1,000,000 hosts connect to the Internet

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IP allocation pre-1992

1981:

"The assignment of numbers is also handled by Jon. If you are developing a protocol or application that will require the use of a link, socket, port, protocol, or network number **please contact Jon to receive a number assignment**." (RFC 790)
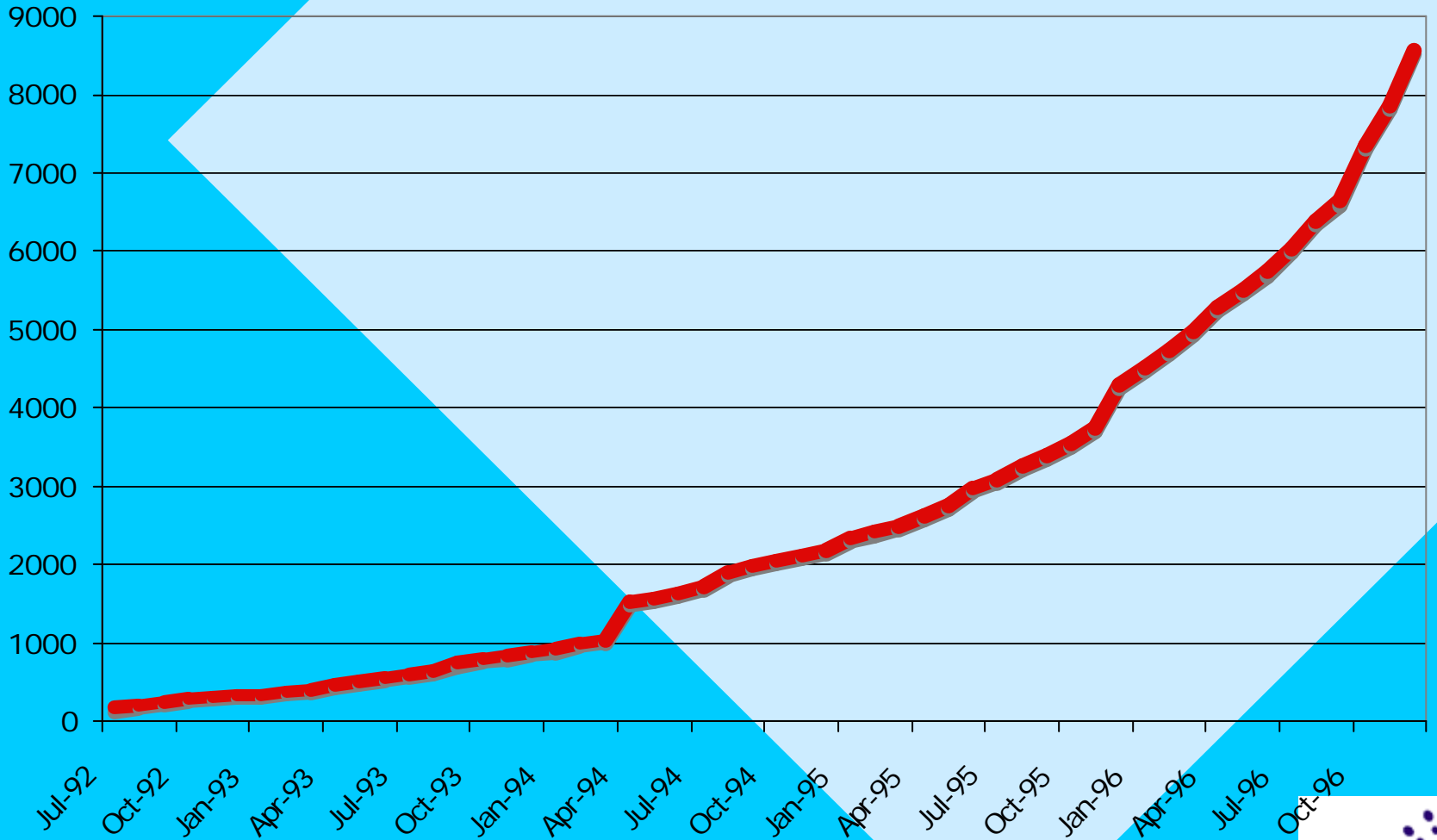
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Address challenges 1992

- Address space depletion
  - Wasteful, classful allocation (A, B, C)

- Routing chaos
  - Legacy routing structure, router overload
  - Lack of routing aggregation

- Inequitable management
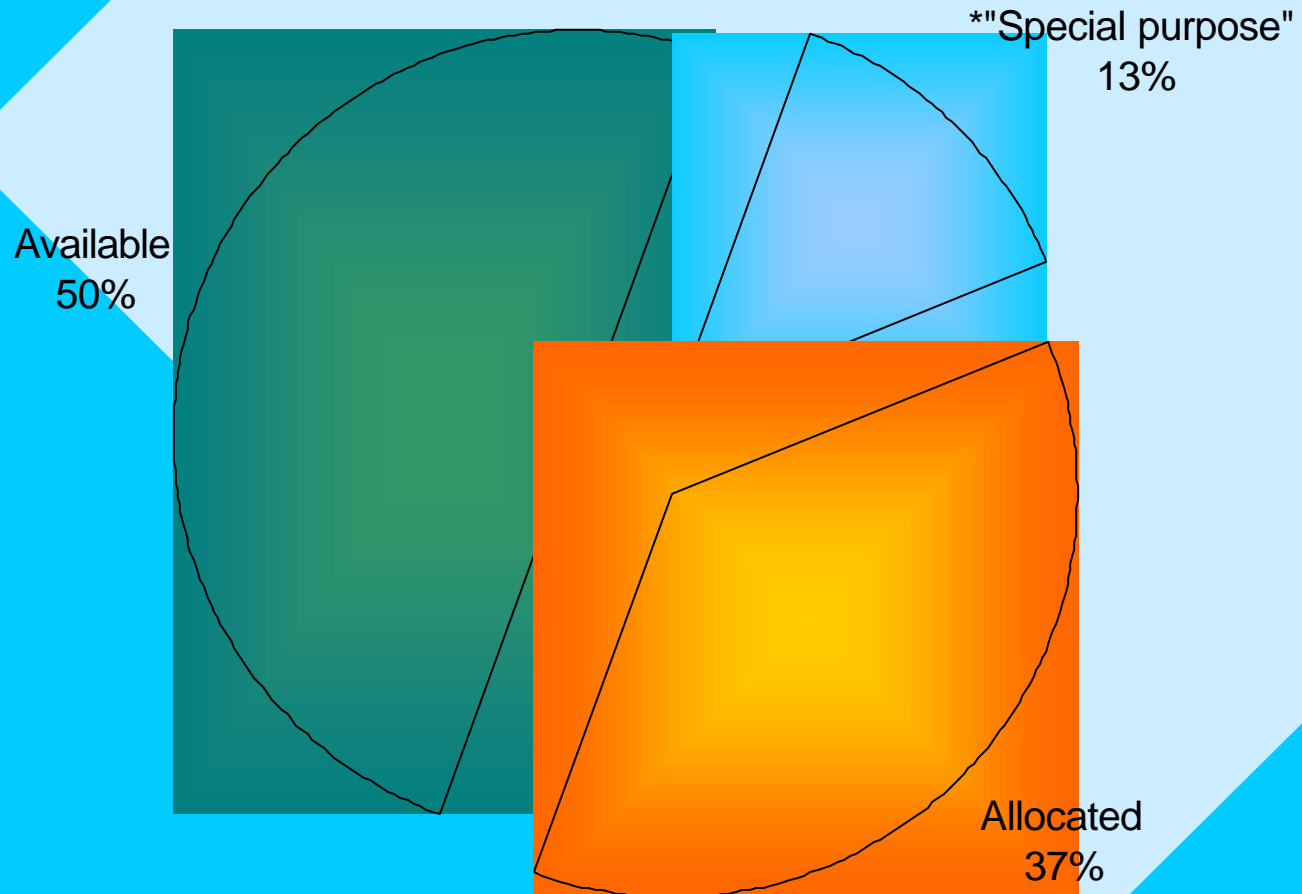 - Unstructured and wasteful address space distribution

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Global routing table 1992

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IPv4 Allocations 1992

*"Special purpose"
13%

Available
50%

Allocated
37%

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The Internet in 1992

- Internet widely projected to fail

  – Growth would stop by mid-'90s

  – Urgent measures required

  – Action taken by IETF / Internet community
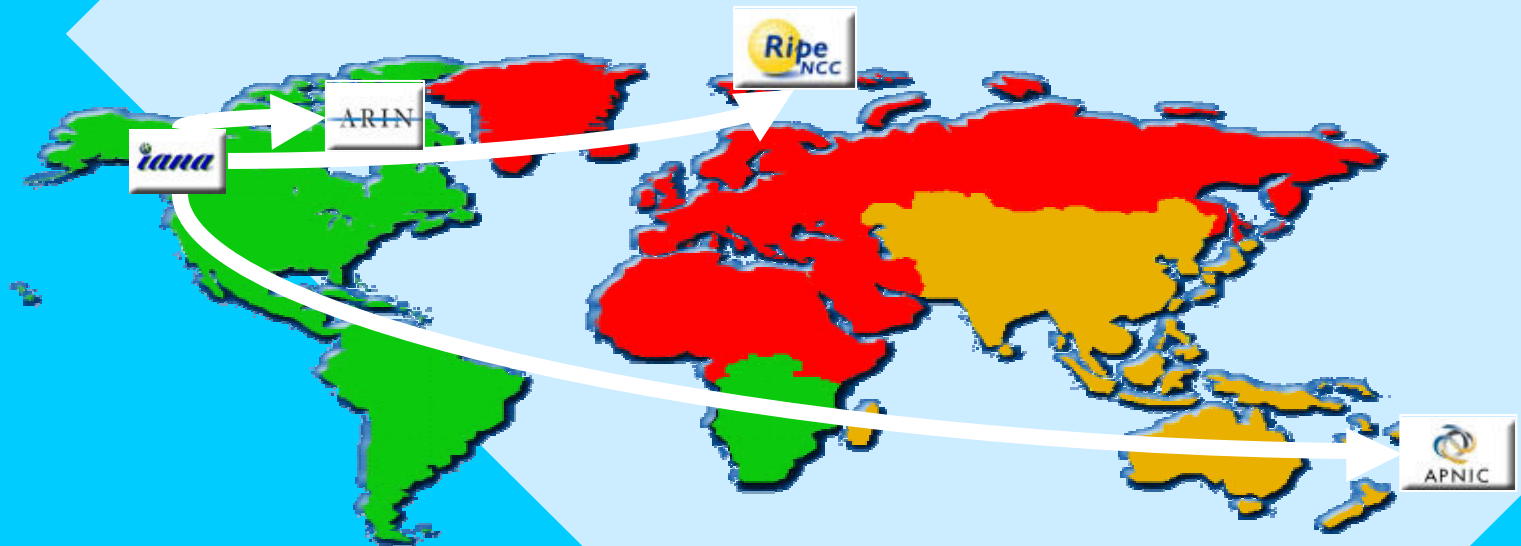
Important developments 1992-93

- 1992

  - RFC 1366: the "growth of the Internet and its increasing globalization"
    - Additional complexity of address management
    - Basis for a regionally distributed Internet registry system
  - The RIPE NCC is established

- 1993

  - Development of "CIDR" (Classless Inter-Domain Routing)
    - addressed both Address depletion & Routing table overload
  - APNIC is established

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The Seeds of Commercialisation

- ARPANet had an **'acceptable use policy'** that precluded use for commercial purposes

- In 1993 that was eased, and then abandoned

- The result was the **user-pays environment** that underlies the structure, process and politics of the Internet **from 1995 onwards**

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The boom years: 1992 – 2001

1992:

"It has become clear that … these problems are likely to become critical within the next one to three years." (RFC1366)

"…it is [now] desirable to consider delegating the registration function to an organization in each of those geographic areas." (RFC 1338)
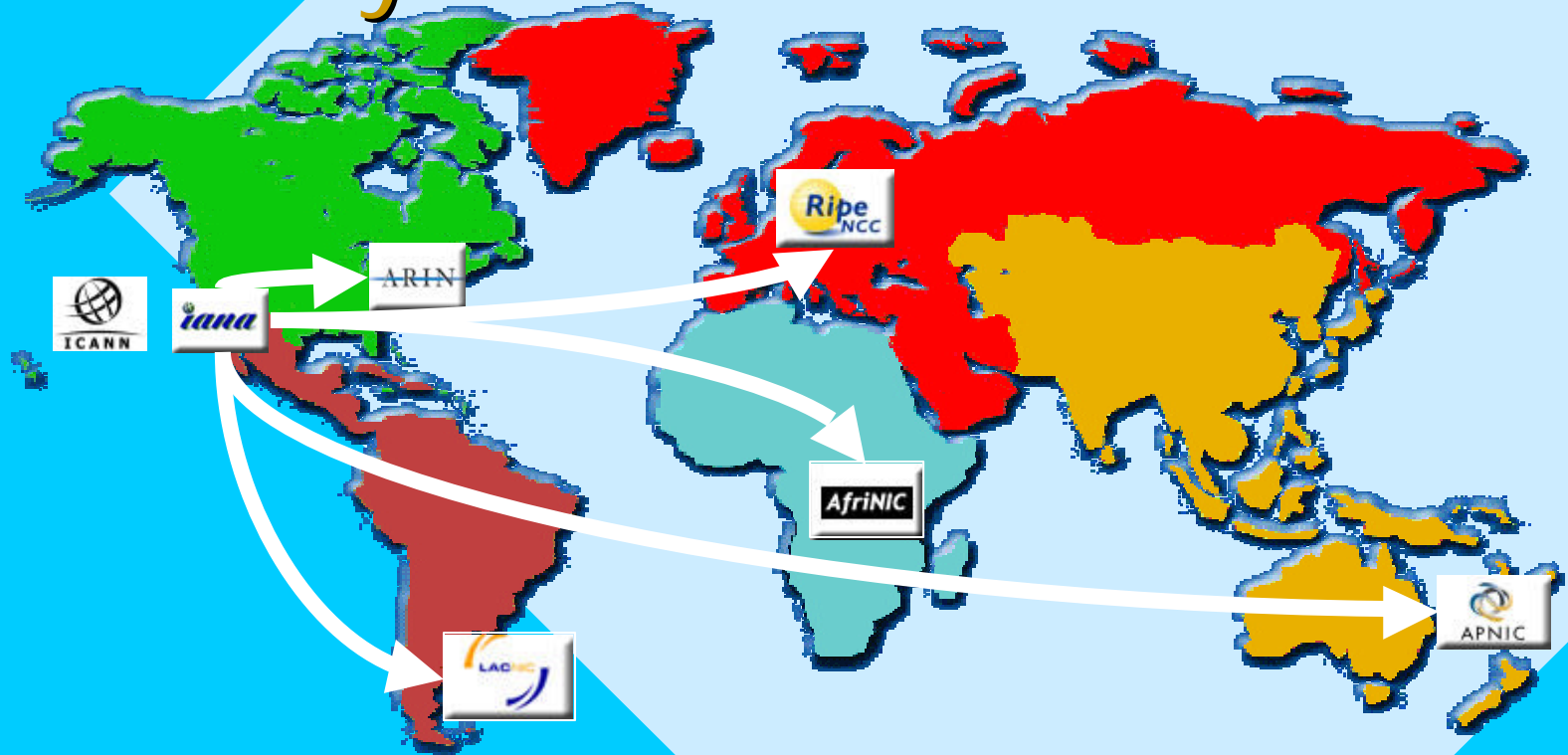
History of the Internet ('96-2000)

- 1996
  - 10M hosts connected to the Internet
  - Hotmail is born

- 1997
  - The American Registry for Internet Numbers (ARIN) is established

- 2001
  - The Code Red worm hits thousands of webservers and email accounts

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History of the Internet (2001-2006)

- 2002
  - LACNIC is established

- 2003
  - UN World Summit on the Information Society (WSIS) - 1st phase
  - The NRO is established

- 2005
  - AfriNIC is established
  - Second phase of WSIS

- 2006
  - Internet Governance Forum to be held

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Recent years: 2002 – 2006

2004:

Establishment of the
Number Resource Organisation

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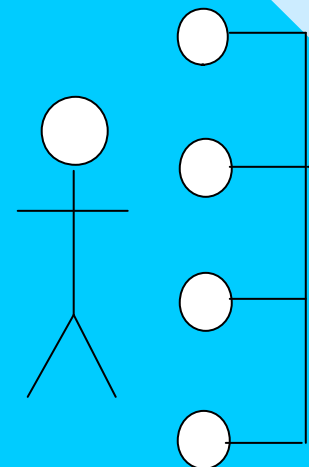
History of the Internet...

- **Initially**, research project (70-80s)
  - Open, cooperative, public domain
  - Highly collaborative environment
  - "Rough consensus and running code"

- **Then**, product of liberalisation (90s)
  - Also, catalyst for deregulation
  - Highly competitive environment
  - Still free to join and use

- **Now**, public utility & critical infrastructure (2000s)
  - Re-regulation (governance) is a recent afterthought

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Issues Arising From Internet History

- It just happened, and it continues to happen

- There was no 'grand plan'

- The main thing that's predictable about change on the Internet is its unpredictability

- The Internet is too complex an undertaking for any 'grand plan' to be imposed on it now

- But that won't stop the powerful from trying, including governments and major corporations

- Tension between **central-planners** and **freedom-lovers** is inherent, and control will ebb and flow

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The Internet

Local AreaNetwork (LAN)

THE INTERNET

Internet Services Provider

Internet Access Provider

Firewall

Router

Webserver

Corporate Workstations

Personal Work-and-Play Stations

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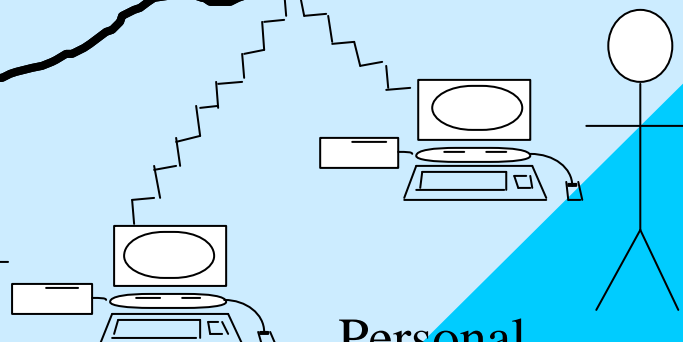
Internet & Architecture

- **I**nternet: "A collection of inter-connected computer networks"

- **I**nternet Architecture: "The elements, and relationships among them, and means for creating and maintaining them"

  - **Nodes** (workstations, hosts, intermediating computers and routers)

  - **Communications Links** between the nodes

  - **Protocols** defining the rules of engagement between nodes

  - **Software,** hosted by the computers (client and server), , and implementing the protocols

  - **Human Processes** to create and amend protocols

  - **Governance Mechanisms**, to control the processes

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Some Awkward Facts About the Internet

- Its operation is collaborative and multi-organisational (**there is little 'authority'**)

- It is supra-national (i.e. **no government has control**)

- Messages are 'packetised' (i.e. sent in pieces)

- It is **multi-path**, with paths computed in real time

- Its architecture and mechanism are defined by **'protocols'**, which **are negotiated supra-nationally**

- Changes are subject to slow, distributed **negotiation**

- There is **no register or directory** of Internet users

- The register of machine-identities is incomplete

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The Internet Protocol Suite
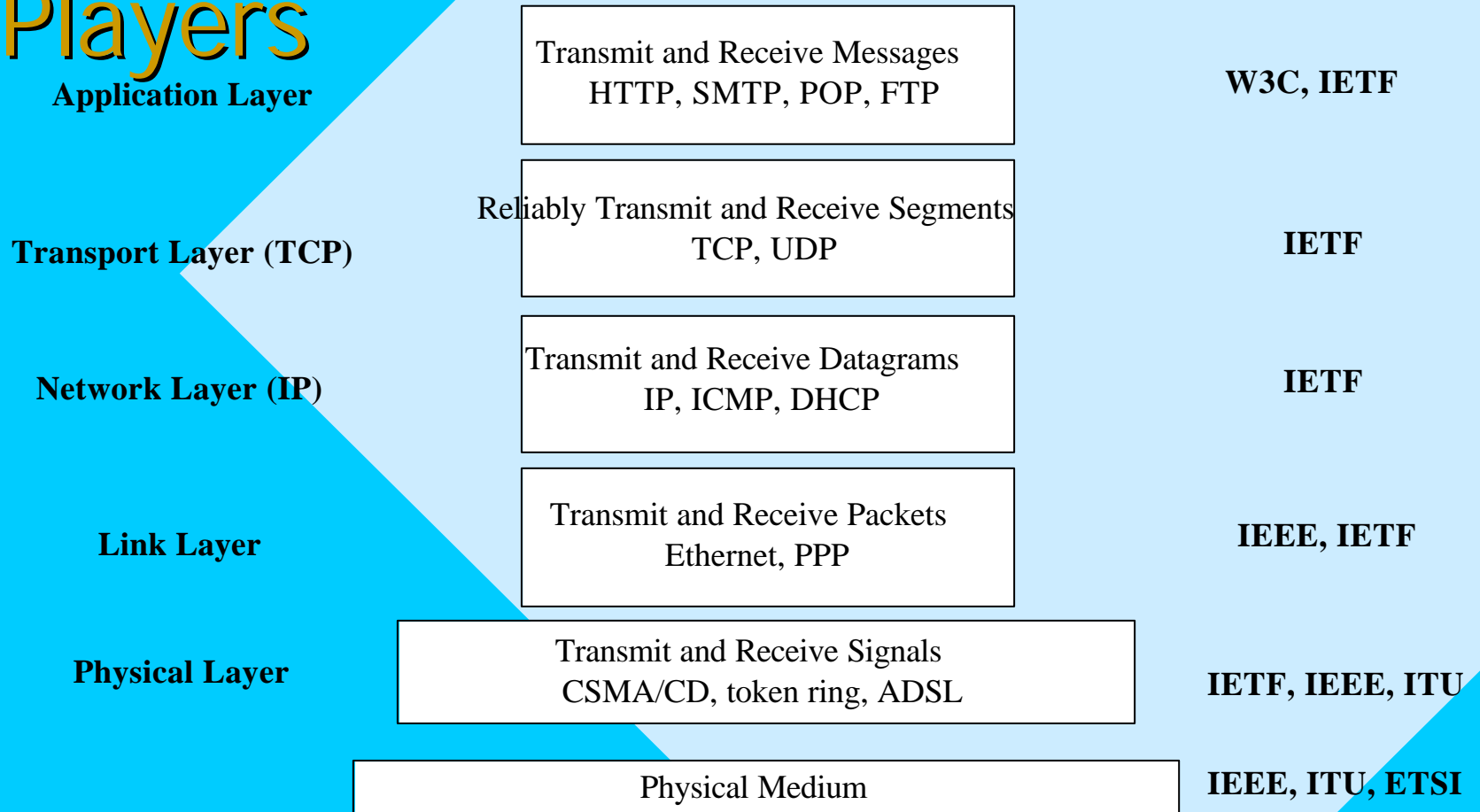
- Protocol: "A set of rules that governs the process of communication between two entities"

- TCP/IP:

  – The set of protocols which together define the Internet, and its architecture and process

  – In excess of 100 protocols

  – Commonly referred to by the names of two, central protocols, TCP and IP, hence 'TCP/IP'

  – Organised in a 'stack' of 'layers'

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Issues Arising re the Internet Protocol Suite

- Who owns it?

- What motivates organisations to use it?

- What process is used to adapt and enhance it?

- Whose interests does it embody?
  Whose interests does it harm?
  Whose interests does it ignore?

- Can it be hijacked by some players to the detriment of other players?

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Key Players

Architecture : ISOC, IAB, IETF, (ICANN)

Application Layer

Transmit and Receive Messages HTTP, SMTP, POP, FTP

W3C, IETF

Transport Layer (TCP)

Reliably Transmit and Receive Segments TCP, UDP

IETF

Network Layer (IP)

Transmit and Receive Datagrams IP, ICMP, DHCP

IETF

Link Layer

Transmit and Receive Packets Ethernet, PPP

IEEE, IETF

Physical Layer

Transmit and Receive Signals CSMA/CD, token ring, ADSL

IETF, IEEE, ITU

Physical Medium

IEEE, ITU, ETSI

IP-Addresses: (ICANN), ARIN/RIPE/APNIC   **Domain-Names** : ICANN, Registrars

Parameters : (ICANN), IANA, IETF

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The Real Powers in Engineering Standards

- **I**nstitute of Electrical and Electronic Engineers (**IEEE**), especially re the middle and lower layers

- **I**nternet Engineering Task Force (**IETF**), especially re the upper and middle layers

- **I**nternational Telecommunications Union (**ITU**), primarily re the lower layers; but also European Telecommunications Standards Institute (ETSI)

- World Wide Web Consortium (**W3C**), for all aspects of WWW matters (mainly upper layers)

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IEEE Governance

- Institute of Electrical and Electronics Engineers

- Since 1884/1963, **a professional association** of more than 377,000 individual members in 150 countries – http://www.ieee.org/organizations/

- 900 active standards plus 700 more coming

- Governed by **a Board and Executive Committee with delegates representing the 10 IEEE Regions and 10 technical divisions** (of the 37 Societies)

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IEEE Communications Society

- Non-governmental, individual member's organization

  – Currently about 45,000 members worldwide

- Has no obligations to "advise" any government on Communications Technology

- www.comsoc.org

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IEEE Communications Society

- Organisation:
  - Board of Governors (elected)
  - Office (New York City – small staff)
  - Technical Committees (about 20) – volunteers
    - TC Clusters (4-5 TCs in each cluster)
    - TC Cluster "Communications Software & Services
      - TC Communications & Information Security
      - TC Communications Software
      - TC Information Infrastructure
      - TC Multimedia Communications
      - TC Network Operations and Management
  - Conferences (a lot)
  - Publications (a lot)
  - Standardisation activities

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IEEE ComSoc Chapters around Syria
http://www.comsoc.org/socstr/org/chapters/region8.html

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Other Societies

- **Internet Society (ISOC)**
  - ISOC is **a DC Non-Profit Corporation**, with an international Board of Trustees, formed in 1992 http://www.isoc.org/isoc/general/trustees/incorp.shtml
  - **Relatively small (some 4000 members worldwide)**
  - **Annual INET Conference**
  - **Naturally interested in the Internet Governance (special sessions in the INET conferences)**

- **ACM (Association for Computing Machinery)**
  - **Also interested in Internet Governance issues**

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Internet Assigned Numbers Authority (IANA)

IANA is still the real information provider for:

- Country-Code Top-Level Domains (ccTLDs)

- Generic Top-Level Domains (gTLDs)

- 'General Assigned Numbers', of which there are scores, e.g. 'well-known Port Numbers'

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IANA Governance

- IANA has been since 1988 "[the organisation that] assigned values from several series of numbers used in network protocol implementations" www.iana.org, http://www.wia.org/pub/iana.html

- In 1997, IANA was stated not to be "a separate entity," but rather "a task performed by Dr. Postel under contract between USC and an agency of the [U.S.] federal government"

  - Jon Postel died in 1998, and in legal terms, IANA is **an unincorporated association**

- It is chartered by ISOC (the Internet Society)

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IETF Standards Development Processes

- Done in the Working Groups

- 136 IETF WGs alone, as at 22 October 2002

- In principle, IETF WGs are open to contributors, but are engineer-driven and highly esoteric

- In practice, IETF WGs are:
    - dominated by Driven Individuals employed and travel-funded by large corporations
    - not tightly controlled by corporations (because the Driven Individuals act as professionals rather than employees)
    - but social interests are rarely represented

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IETF's RFC (Request For Comments) Documents

RFC is a generic term that covers multiple categories of documents (breakdown of categories as on 22 Oct 2002, http://www.rfc-editor.org/rfcxx00.html):

- **technical specifications**, including:
  - **formally adopted Standards (STD – 60)**
  - **de facto standards (many vital RFCs – 70**)
  - **experimental proposals (160)**
  - historical (formally obsoleted) (70)
  - obsolescent and obsolete (c. 2,500)

- **Best Current Practices descriptions (BCP – 66)**

- **Informational Documents (FYI – 38)**

An RFC must first be an **Internet Draft (I-D – 1,750)**

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IETF Governance

- IETF has been since 1986 "a large open international community of network designers, operators, vendors, and researchers" – http://www.ietf.org/overview.html

- Its governance is loose

- In legal terms, it is **an unincorporated association**

- It recognises its reporting line as via IESG to IAB

- IAB/IESG (1979/84) is chartered by ISOC http://www.isoc.org/isoc/related/ietf/

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ITU Governance

- The International Telecommunications Union, "headquartered in Geneva, … **an international organization within the United Nations System** where governments and the private sector coordinate global telecom networks and services" – http://www.itu.ch

- Comprises representatives from U.N. States, but with participation from PTTs, telcos and technology suppliers http://www.itu.int/publications/cchtm/cns.html

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W3C Governance

- **The World Wide Web Consortium (*W3C*) - An Industry Association (or Consortium)**, based on principles of Vendor Neutrality, Coordination and Consensus – http://www.w3c.org/Consortium/

- **Governed by a Member Contract and the W3C Process Document**, which describes the W3C Organization, W3C Activities and Groups, how consensus governs W3C work, the W3C Recommendation Track, and the W3C Submission Process

- Permits Invited Experts to participate in Work Groups (WGs)

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Internet Corporation for Assigned Names and Numbers (ICANN)

A Californian nonprofit public benefit corporation "formed to assume responsibility for:

– the IP address space allocation

– protocol parameter assignment

– domain name system management, and

– root server system management functions

previously performed under U.S. Government contract by the Internet Assigned Numbers Authority (IANA) and other entities"

ICANN′s Web-Site

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ICANN – 1/3 Function
Domain Name Supporting Organization

- Advises the ICANN Board re **DNS (Domain Name Service) policy issues**

- This involves the registration of:

  - gTLDs (such as .com and .org)

  - ccTLDs (such as .hk, .au and .us)

- This is a complex moving target, in transition, involving a great deal of politics, handled badly

- Every sub-domain has a Registrar, but policies and practices vary enormously

- In this arena, ICANN has considerable authority

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What if alternatives to the DNS are created?

- **An application-specific name-based directory** of participating nodes, designed to cater for high volatility of name-to-IP-Address mapping (ICQ since 1996, also Groove, Napster, NetMeeting)

- **An application-specific directory of IP-addresses**, without names, dynamically managed in real-time (Gnutella, Freenet)

- **Authentication of names, and use of whatever IP-Address is advised each time they register (**SETI@Home, PopularPower)

- **A flexible, real-time DNS** (DDNS??)

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ICANN – 2/3 Function
Address Supporting Organization

- Advises the ICANN Board re **IP-Address policy**

- There are five Regional Internet Registries:
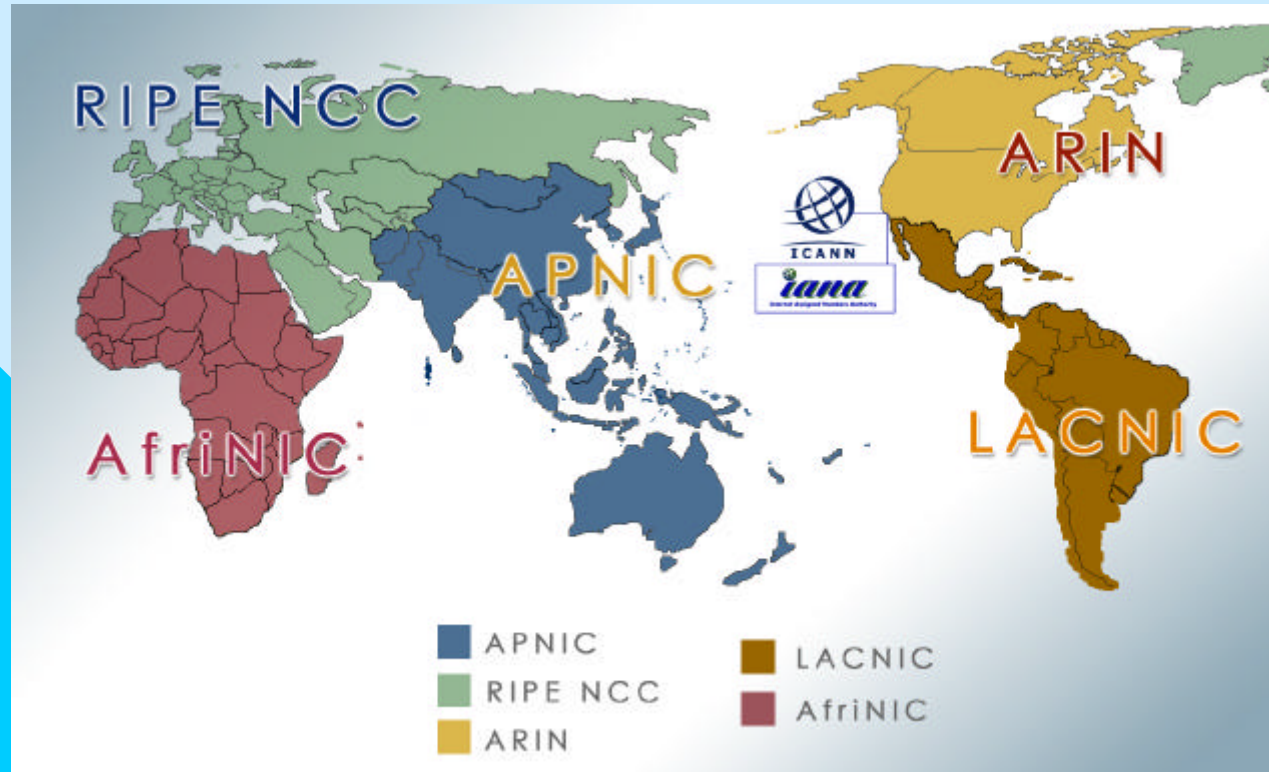
- These organisations long pre-date ICANN, and it is not clear how influential ICANN is in this arena

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ICANN – 3/3 Function
Protocol Supporting Organization

- Advises the ICANN Board re:

  - assignment of **Parameters** for Internet protocols

  - **Technical Standards** that enable computers to exchange information and manage communications over the Internet

- The organisations that actually do this (i.e. IANA, IETF, IEEE, ITU) long pre-date ICANN, and it is not clear how influential ICANN is in this arena

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What ICANN doesn't do

- Network security

- Financial transactions

- Data Privacy

- Internet Content
  - Pornography; hate speech
  - Copyright violations
  - Deceptive business practices / consumer protection

- Multi-national commercial disputes

- Definition of technical standards
  - Network surveillance and traceability

- Internet gambling

- Spam

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What ICANN is NOT

- Technical Standard-Setting Body

- Internet Police Force

- Consumer Protection Agency

- Economic Development Agency

- Legislature or Court

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What ICANN <u>does</u> do:

- Coordinate the Internet's systems of unique identifiers

  - And address **directly** related policy issues

- Plus: Set policies for the gTLD (**generic top-level domain)** registries

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Inadequacies of ICANN

- At best, it "lacks representativeness, openness, and accountability to the public"

- At worst, a case study in the abuse of power, used as a means for the US Government to exercise even more power over the Internet than it legally has available to it

- Unlikely to survive in its present form, and seriously detrimental to progress if it does

- Internet Architecture Board (IAB), home of IETF, is likely to be more effective and acceptable

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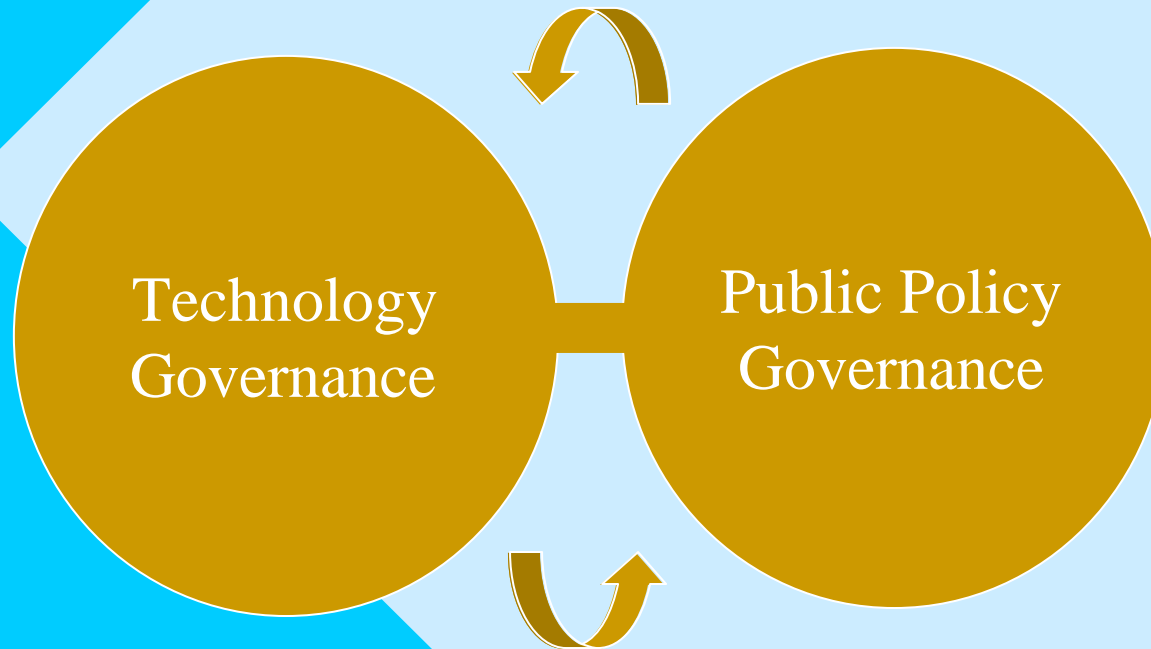metropolitan

What is Internet Governance?

- May include any aspect of the Internet which requires regulation, coordination or oversight
  - Cybercrime, security, spam, phishing, hacking
  - Content regulation
  - Commerce, trade and taxation
  - Intellectual property
  - Telecommunications regulation, competition policy
  - Development and facilitation, capacity building
  - Equity of access
  - **Technical standards and coordination**
- None of these are entirely new areas

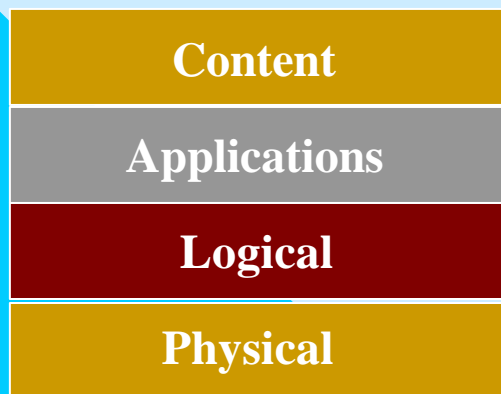LONDON
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Internet Governance: Observation 1

Debate is confused

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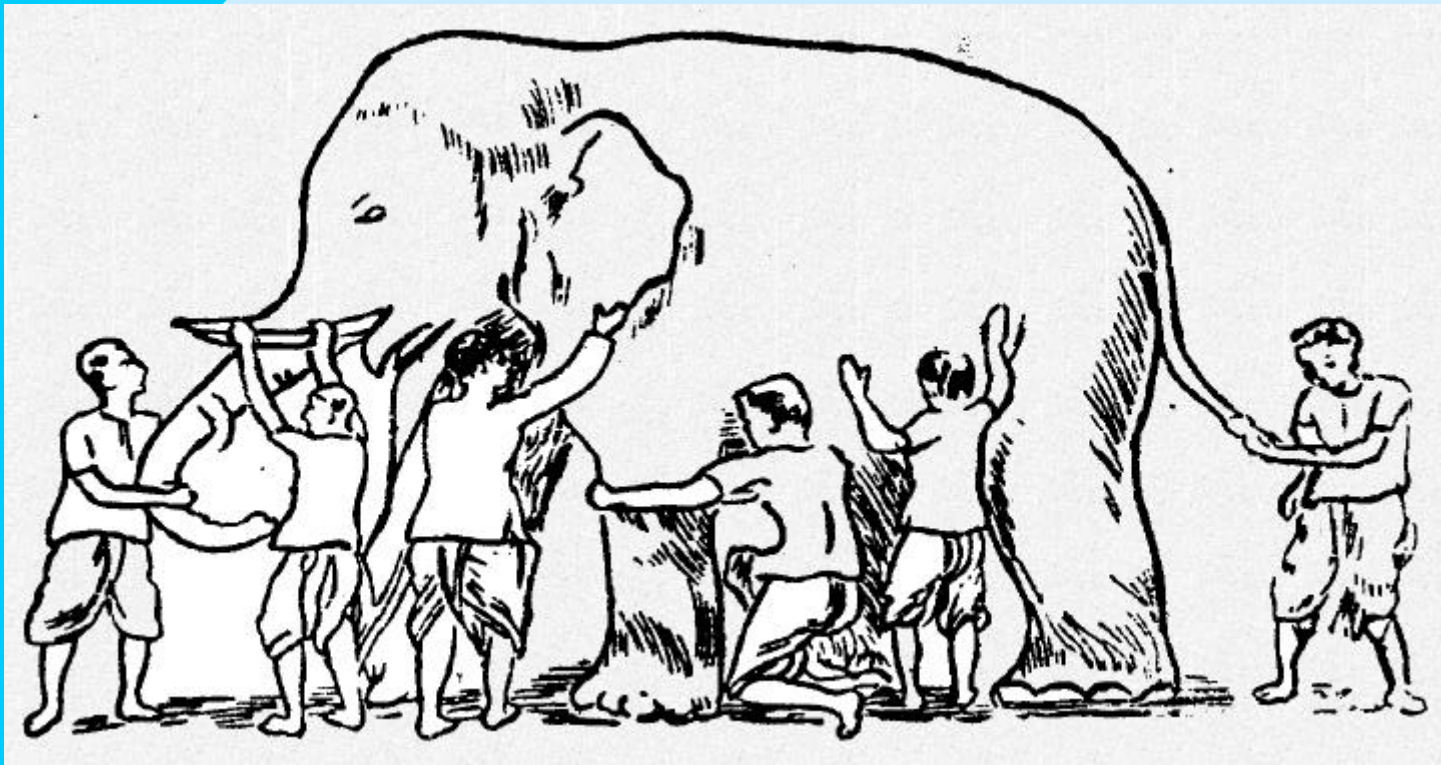
Internet Governance: Observation 2

Technology Governance

Public Policy Governance

Technology and policy governance differ

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Internet Governance: Observation 3

Technology

Content
Applications
Logical
Physical

Network
'Layers' Model

Public Policy

Voice—Wireline   Voice—Wireless   Broadcast—T.V.   Video—CATV
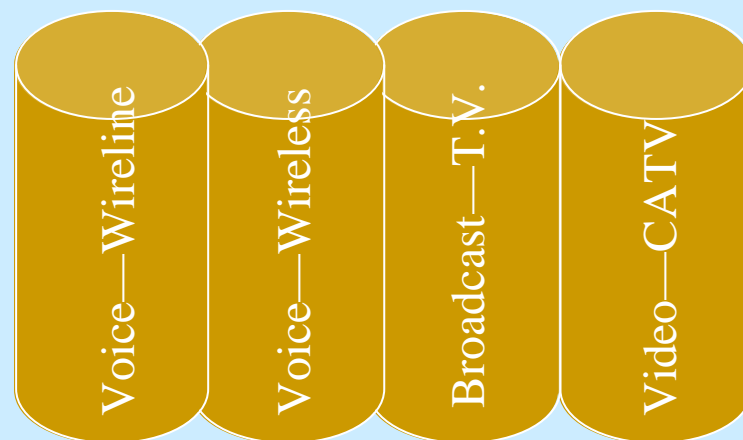
'Silos' Model of Regulation

Policy regimes should mirror technology realities.

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Internet Governance: Observation 4

ITU   IAB   RIRs   IETF   ISOC   ICANN   WIPO

COE   Tier 1 ISP Operator Groups   OECD   WTO   EU   W3C   G8

Human Rights Bodies   IANA   Government Ministries   UNCITRAL   APEC   Root Server Operators

Not-for-Profit Org's   CERT   NAFTA, Et al.   Specialized Bodies   Private Sector Assoc's

Overlap Must be Avoided

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Internet Governance: Observation 5

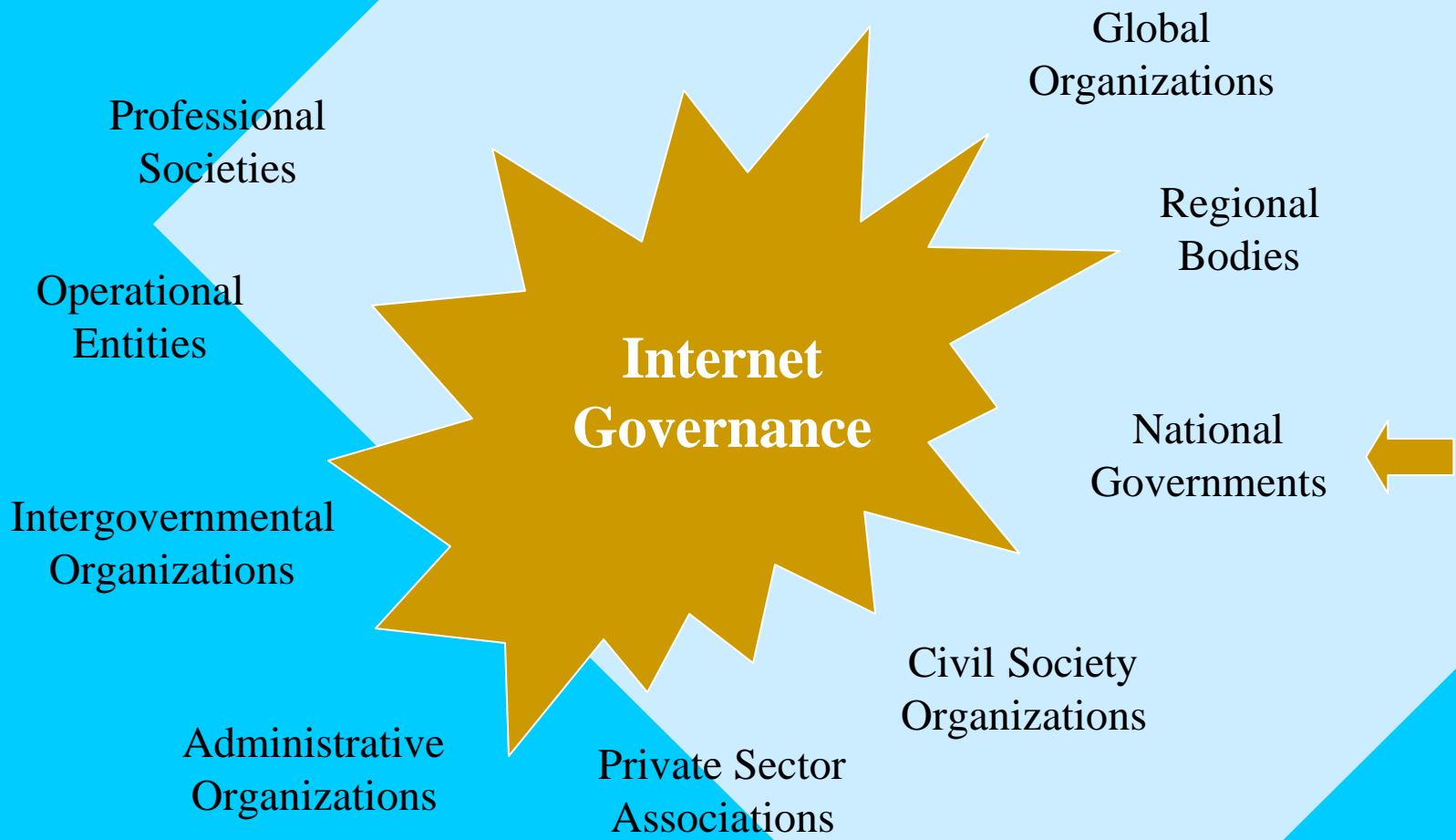| Internet Governance | Digital 'Bridges' | Information Society | ⟹ | MDGs |

Poverty Reduction
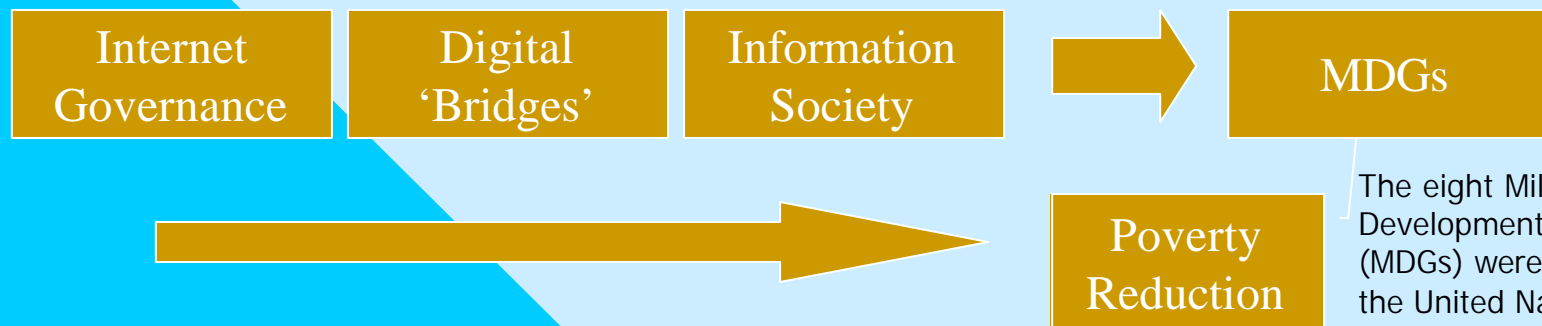
The eight Millennium Development Goals (MDGs) were agreed at the United Nations Millennium Summit in

September 2000 and nearly 190 countries have subsequently signed up to them

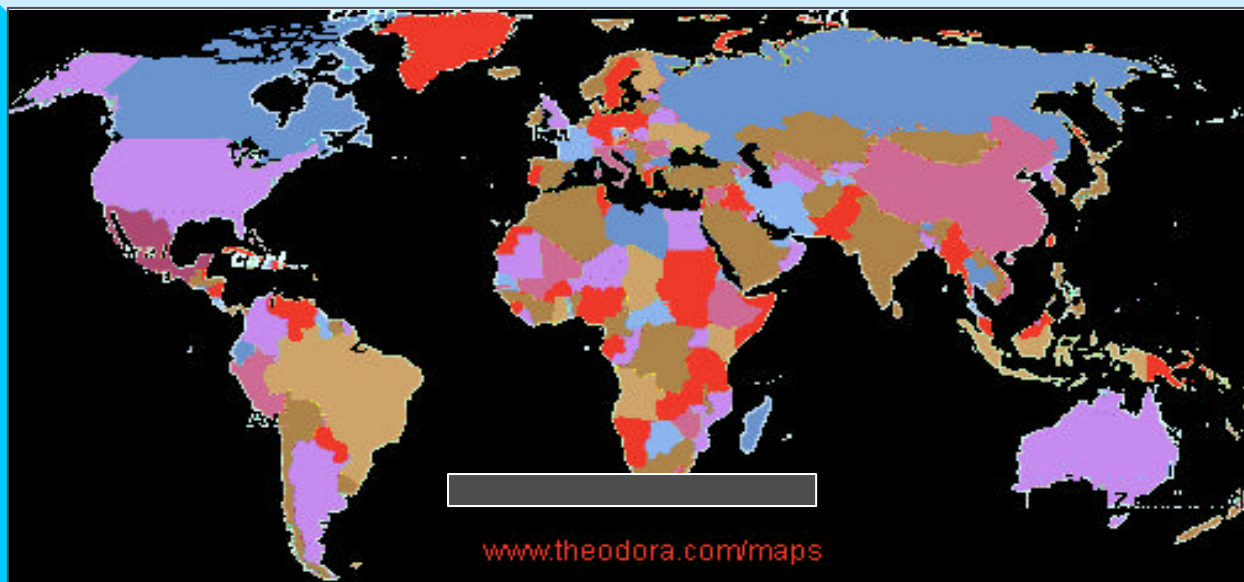## Internet governance is not an end onto itself

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Internet Governance: Observation 6

Global
Organizations

Professional
Societies

Regional
Bodies

Operational
Entities

**Internet
Governance**

National
Governments

Intergovernmental
Organizations

Civil Society
Organizations

Administrative
Organizations

Private Sector
Associations

Governments have roles

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Internet Governance: Observation 7

www.theodora.com/maps

Sovereignty still counts

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Current international setup for solving
inherently global issues (IGIs) is not up to the task…

- Treaties and conventions
  - Too slow for burning IGIs

- Intergovernmental conferences and summits
  - Long on talk, declarations
  - Short on follow-up

- G7/8, GX type meetings
  - Too exclusive + too distant from people + restrictive methodology

- Global multilateral institutions
  - Not able to handle IGIs alone

New tools are needed for global issues

Source: J.F. Rischard, "High Noon: 20 Global Problems, 20 Years to Solve Them," Basic Books (2002)

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Conclusions

1. Debate is confused.

2. Technology and policy governance differ.

3. Policy regimes should mirror technology realities.

4. Overlap must be avoided.

5. Internet governance is not an end.

6. Governments do have roles.

7. Sovereignty counts.

8. New tools are needed for global issues.

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Conclusions

- The Internet is complex

- Any simple prescription is wrong

- Almost any complex prescription is wrong

- Not 'International' but 'Universalist'

- Best conceived in terms of:

  - Self-organising systems / Biology / Ecology

  - Supra-nationality

- 'Don't regulate what you don't understand'

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