Open Standards and processes on the Internet

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So, what is the Internet?

"The Internet, or simply the Net, is the publicly accessible worldwide system of interconnected computer networks that transmit data by packet switching using a standardized Internet Protocol (IP) and many other protocols."

- Wikipedia http://en.wikipedia.org/wiki/Internet

What is the Internet?

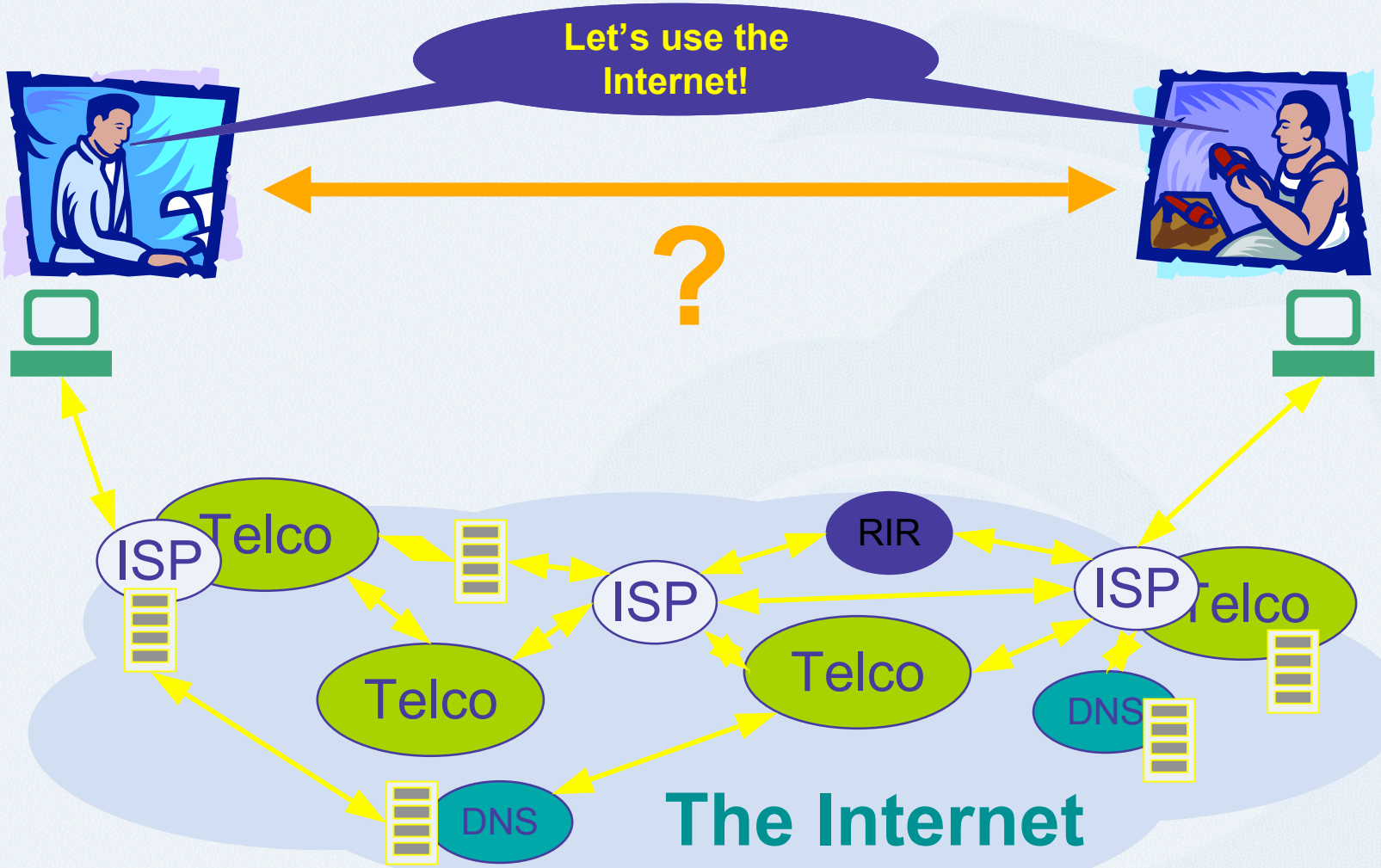
"No single entity… administers the Internet. It exists and functions as a result of the fact that hundreds of thousands of separate operators of computers and computer networks independently decided to use common data transfer protocols ..."

– US District Court for the Eastern District of Pennsylvania (1996)

And what is a standard?

- A standard is simply an agreement
  - among members of a community,
  - on a set of guidelines or rules,
  - which allow cooperation (interoperability),
  - for mutual benefit,
  - and often, coordinated by a recognised standards body such as ISO, ITU, W3C or IETF.
- An open standard is a standard which is freely accessible, implementable and usable, without barriers.
  - Openness is variable, not absolute

Communications standards



Communications standards

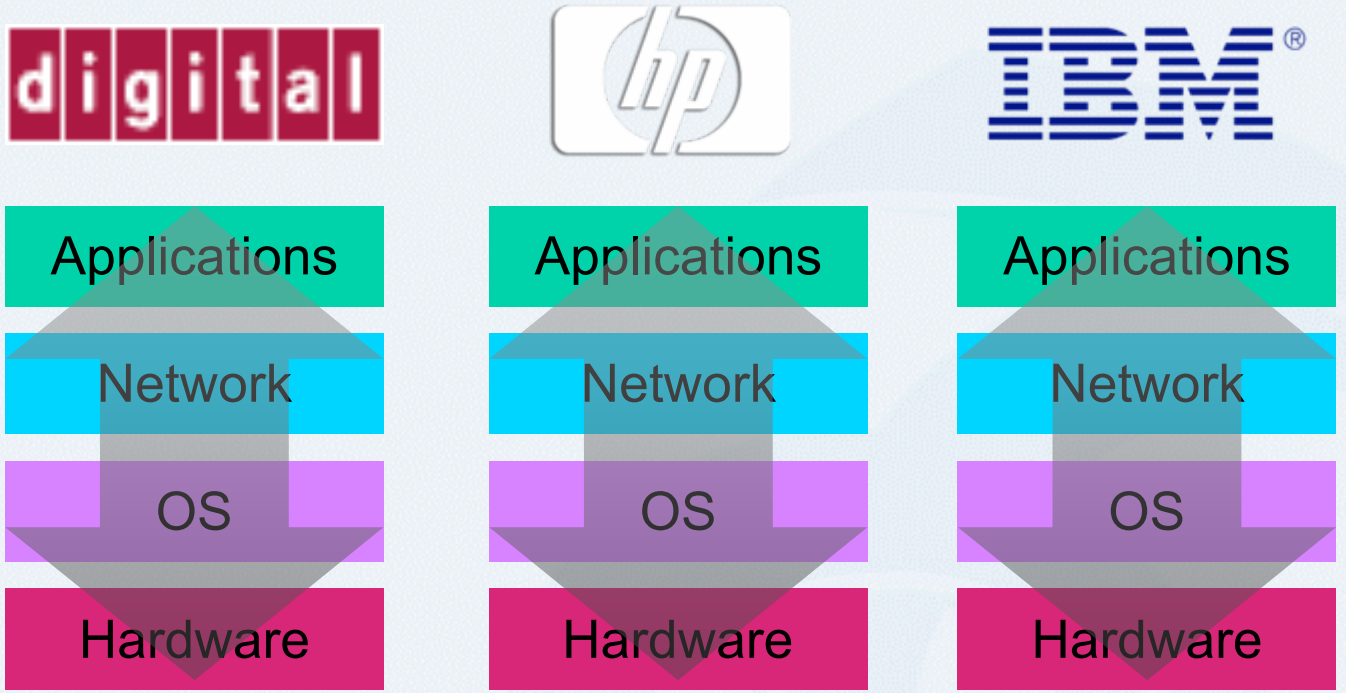
- Let's try it…

```
traceroute to www.ietf.org (132.151.6.75), 30 hops max, 38 byte packets

 1  fxp1-basil (202.12.29.254)  0.242 ms  0.164 ms  0.146 ms
 2  fe0-0.gw1.apnic.net (202.12.29.114)  0.335 ms  0.287 ms  0.275 ms
 3  fe1-1.gw2.apnic.net (202.12.29.125)  0.556 ms  0.410 ms  0.433 ms
 4  FastEthernet3-30.cha23.Brisbane.telstra.net (139.130.97.61)  0.856 ms  0.846 ms  0.866 ms
 5  GigabitEthernet1-2.woo-core1.Brisbane.telstra.net (203.50.50.129)  1.045 ms 0.956 ms  1.006 ms
 6  Pos5-0.ken-core4.Sydney.telstra.net (203.50.6.221)  12.020 ms  12.279 ms  11.923 ms
 7  10GigabitEthernet3-0.pad-core4.Sydney.telstra.net (203.50.6.86)  12.176 ms13.834 ms  12.073 ms
 8  GigabitEthernet0-0.syd-core01.Sydney.net.reach.com (203.50.13.242)  13.631 ms  13.503 ms  13.592
 9  i-12-1.wil-core02.net.reach.com (202.84.144.65)  163.275 ms  163.446 ms  163.384 ms
10  i-2-0.dal-core01.net.reach.com (202.84.143.66)  196.954 ms  196.791 ms  196.939 ms
11  POS1-3.GW1.DFW13.ALTER.NET (65.208.15.89)  197.036 ms  197.198 ms  197.424 ms
12  0.so-0-0-0.CL1.DFW13.ALTER.NET (152.63.103.86)  196.717 ms  196.558 ms  196.715 ms
13  0.so-0-0-0.TL1.DFW9.ALTER.NET (152.63.0.193)  196.251 ms  196.193 ms  196.067 ms
14  0.so-4-2-0.TL1.DCA6.ALTER.NET (152.63.38.145)  240.699 ms  241.416 ms  240.802 ms
15  189.at-5-0-0.XR1.TCO1.ALTER.NET (152.63.39.226)  243.266 ms  243.411 ms  243.204 ms
16  193.ATM7-0.GW5.TCO1.ALTER.NET (152.63.39.85)  242.898 ms  241.967 ms  242.296 ms
17  cnrl-gw.customer.alter.net (157.130.44.142)  245.964 ms  246.573 ms  246.391 ms
18  www.ietf.org (132.151.6.75)  251.321 ms !<10>  250.003 ms !<10>  244.306 ms!<10>
```

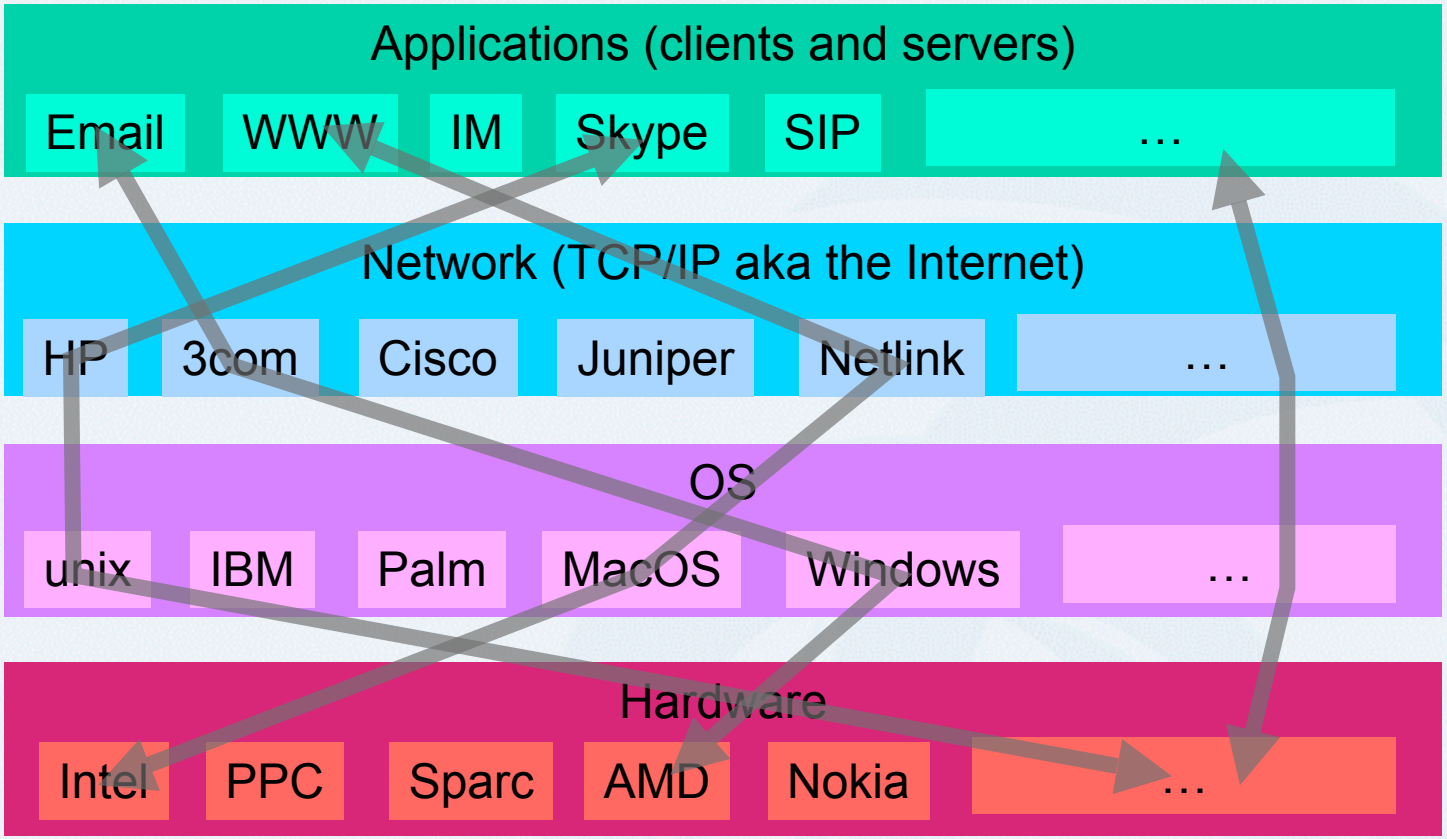
- Each "hop" could be a different carrier network, hardware vendor and underlying protocol
- But it works!

Before the Internet…



  - and many more: NCR, Data General, Novell, Microsoft etc etc
- Choice of standards and applications determined by vendor

Today…



- Choice of vendors, standards (de facto or “official”) and applications at every level
- Common denominator is TCP/IP

How did this come about?

- Initially, a networking research project (70-80s)
  - Cooperative open standards development
  - Highly collaborative community environment
  - One of many available network platforms
- Then, product of liberalisation (90s)
  - And a catalyst for liberalisation
  - Competitive, market-based environment
  - Commercial success, but free to join and use
  - By mid-1990s, the dominant network platform
- Now, public utility and critical infrastructure (2000s)
  - The only network platform
  - Overseen by the Internet Engineering Task Force

The IETF…

- Internet Engineering Task Force, since 1986
  - development of open standards in support of the Internet
- Unlike other standards bodies…
  - Open industry-based effort involving groups and individuals
  - Use of individual contributions and a process of development of consensus on standards decisions
  - Emphasis on relevant (demonstrated) specifications
  - Philosophically distinct…

"We reject kings, presidents and voting. We believe in rough consensus and running code."

– Attributed to Dave Clark, IETF, 1992

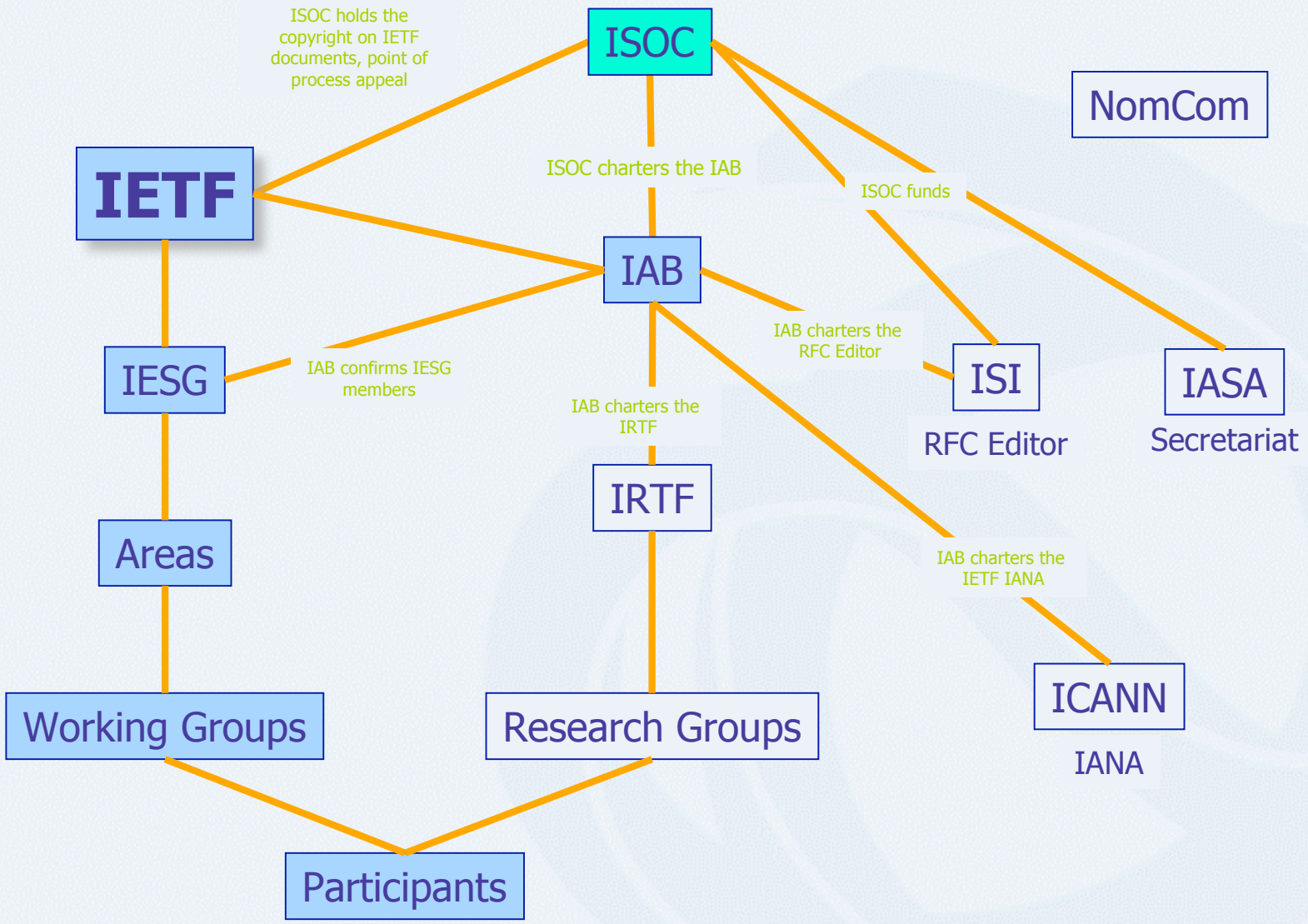
The IETF – Role and Scope

- "Above the wire and below the application"
  - IP, TCP, email, routing, IPsec, HTTP, FTP, ssh, LDAP, SIP, mobile IP, ppp, RADIUS, Kerberos, secure email, streaming video & audio, ...
- Hard to clearly define IETF scope
  - The "wires" and "applications" can be fuzzy
  - So there is constant exploration of edges
  - Other SDOs help in this regard
- See…
  - http://www.ietf.org
  - http://ietfjournal.isoc.org

IETF Roles and Responsibilities

- IETF Chair
  - Chief spokesperson, Area Director for General Area
- Area Directors
  - 13 in total, managing 7 individual areas
  - Set direction, review WGs and documents
- Internet Engineering Steering Group (IESG)
  - Area Directors sitting as a body
  - Multi-disciplinary technical review group
- Internet Architecture Board
  - Overall architectural advice
  - External liaison
- IETF Chair, ADs & IAB members selected by nomcom
  - two year terms

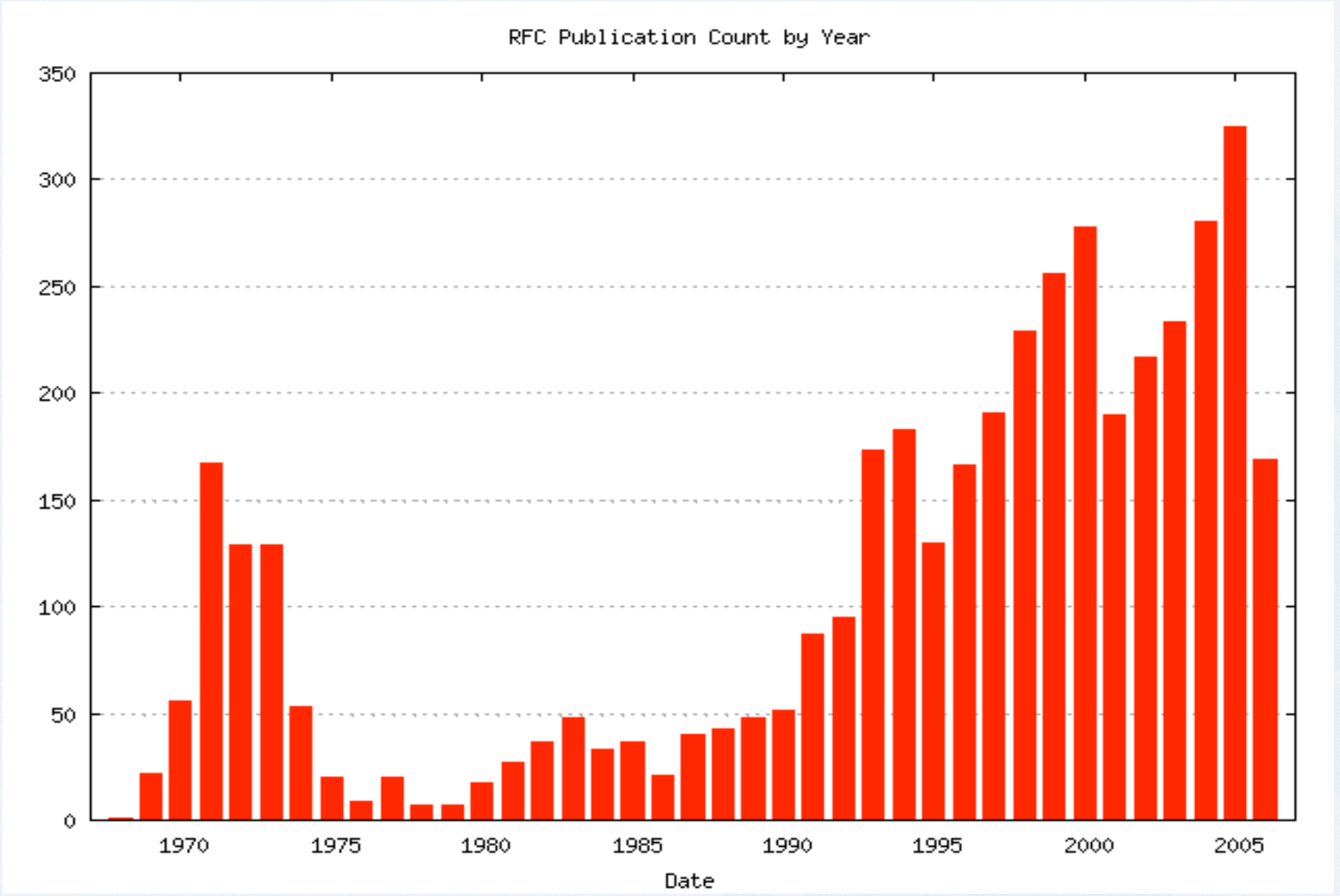
IETF Roles and Relationships



IETF by numbers, 1 May 2006

- IETF meetings
  - Normally, 1000-2000 participants
  - 3 times per year, 65 meetings to date
  - 5 full days, 4 sessions per day, 9am to 10pm
  - aside from plenaries, 6-8 parallel working group meetings in each session, also BOFs and other
  - 120+ separate sessions
  - 150+ working groups in 7 defined areas
- Documents – RFCs and Internet-Drafts
  - RFCs: 4,489 so far
  - I-Ds current: 2,245 (under 6 months old)
  - I-Ds distinct: 16,588
  - I-Ds total versions: 54,403
  - http://www.potaroo.net/ietf/html/rfcstats.html

IETF by numbers



RFC 1149 – 1 April 1990

Network Working Group
Request for Comments: 1149

D. Waitzman
BBN STC
1 April 1990

A Standard for the Transmission of IP Datagrams on Avian Carriers

Status of this Memo

This memo describes an experimental method for the encapsulation of IP datagrams in avian carriers. This specification is primarily useful in Metropolitan Area Networks. This is an experimental, not recommended standard. Distribution of this memo is unlimited.

Overview and Rational

Avian carriers can provide high delay, low throughput, and low altitude service. The connection topology is limited to a single point-to-point path for each carrier, used with standard carriers, but many carriers can be used without significant interference with each other, outside of early spring.

RFC 1149 - implementation

```
Script started on Sat Apr 28 11:24:09 2001
vegard@gyversalen:~$ /sbin/ifconfig tun0
tun0      Link encap:Point-to-Point Protocol
          inet addr:10.0.3.2  P-t-P:10.0.3.1  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:150  Metric:1
          RX packets:1 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0
          RX bytes:88 (88.0 b)  TX bytes:168 (168.0 b)

vegard@gyversalen:~$ ping -i 900 10.0.3.1
PING 10.0.3.1 (10.0.3.1): 56 data bytes
64 bytes from 10.0.3.1: icmp_seq=0 ttl=255 time=6165731.1 ms
64 bytes from 10.0.3.1: icmp_seq=4 ttl=255 time=3211900.8 ms
64 bytes from 10.0.3.1: icmp_seq=2 ttl=255 time=5124922.8 ms
64 bytes from 10.0.3.1: icmp_seq=1 ttl=255 time=6388671.9 ms

--- 10.0.3.1 ping statistics ---
9 packets transmitted, 4 packets received, 55% packet loss
round-trip min/avg/max = 3211900.8/5222806.6/6388671.9 ms
vegard@gyversalen:~$ exit

Script done on Sat Apr 28 14:14:28 2001
```

http://www.blug.linux.no/rfc1149/

Its not just the IETF…

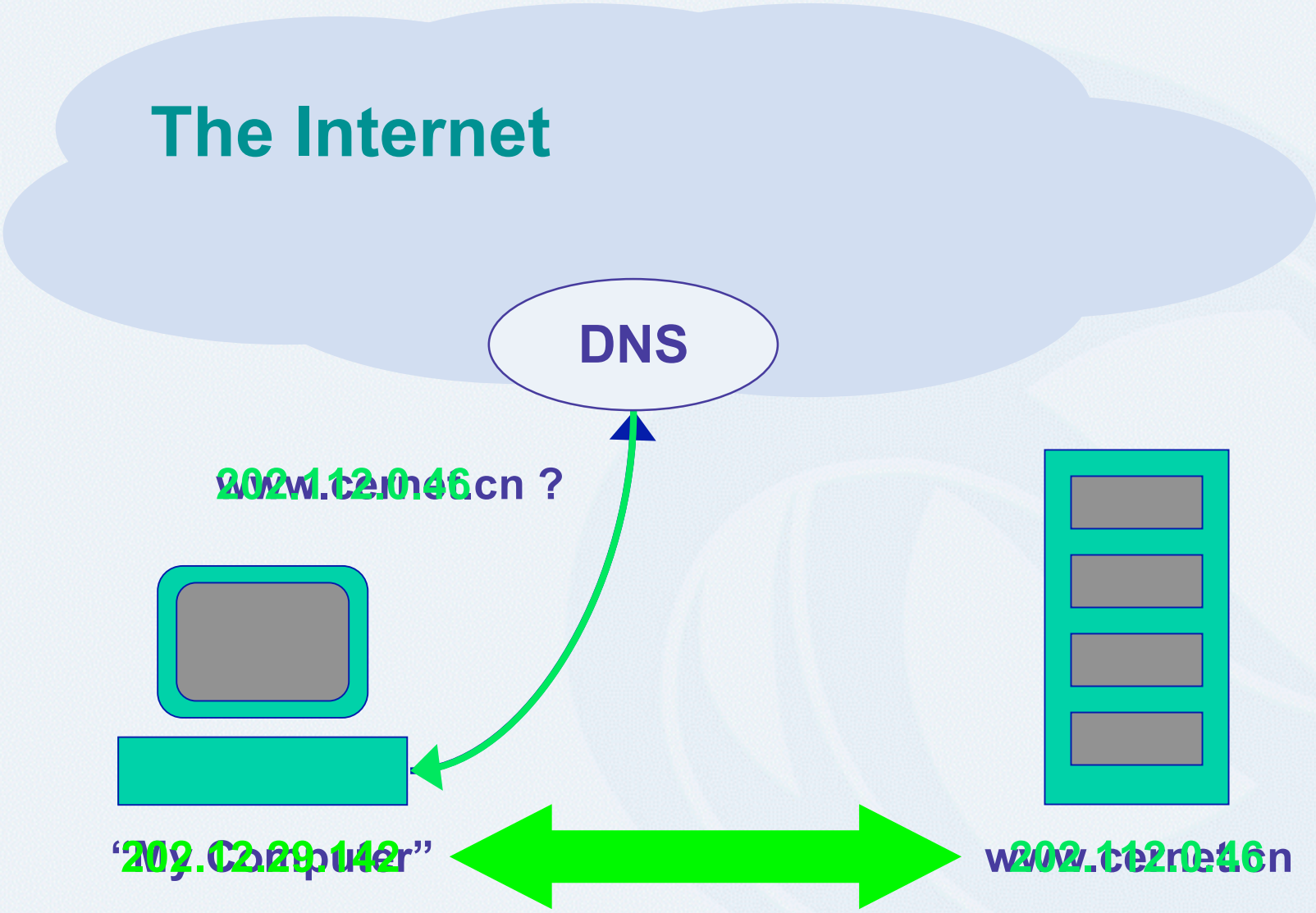
- World Wide Web Consortium (W3C)
  - HTML, XML etc
- Institute of Electrical and Electronics Engineers (IEEE)
  - 802 committee: ethernet and wifi
- European Telecommunications Standards Institute (ETSI)
  - GSM, WAP etc
- International Organization for Standardization and International Electrotechnical Committee (ISO/IEC)
  - OSI model (RIP 1996)
  - Moving Picture Experts Group (MPEG)
- ITU-T
  - Telephony-related standards (incl xDSL, H.323/H.248)
- American National Standards Institute (ANSI)
- Etc etc etc

Open processes – Internet number management

What are RIRs?

- Regional Internet address Registries
  - Providing resources allocation services
- Industry self-regulatory structures
  - Representative of ISPs globally
  - Non-profit, neutral and independent
  - Open membership-based bodies
- First established in early 1990's
  - In response to RFC1338 (1992)
  - Voluntarily by consensus of community
  - To satisfy emerging technical/admin needs
- In the "Internet Tradition"
  - Consensus-based, open and transparent

BTW, IP addresses are not domain names…



What is an IP address?

- Internet infrastructure address
  - Critical Internet identifier
  - Globally unique
  - Distinct from DNS names
- A finite Common Resource
  - IPv4: 32-bit number
    - 4 billion addresses available
  - IPv6: 128-bit number
    - 340 billion billion billion billion available
- Managed under the RIR System
  - According to agreed technical policies
- Not ‘owned’ by address users
- *‘IP’ does not mean ‘Intellectual Property’*

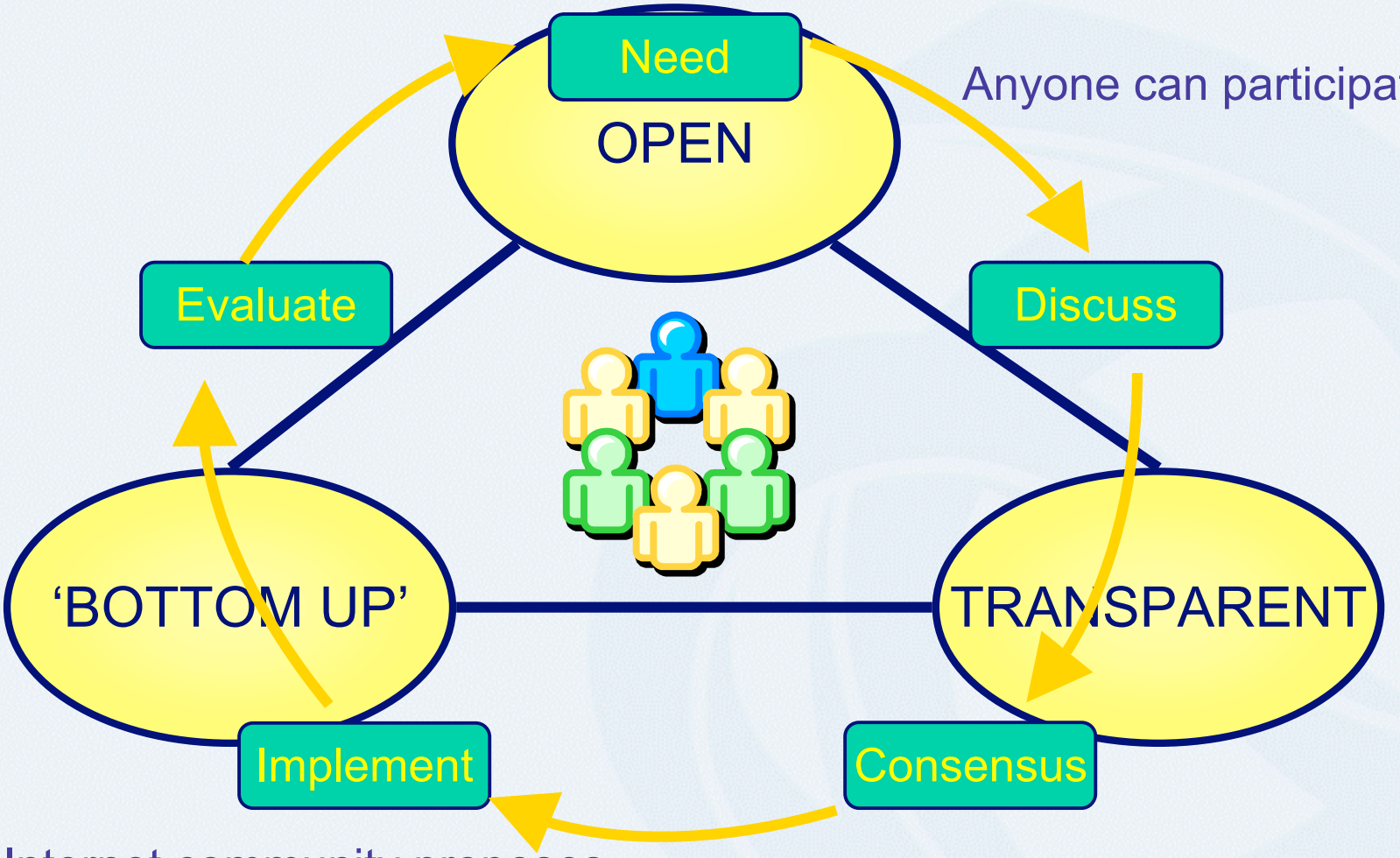
What do RIRs do?

- Internet resource allocation
  - Primarily, IP addresses – IPv4 and IPv6
  - Receive resources from IANA/ICANN, and redistribute to ISPs on a regional basis
  - Registration services (“whois”)
- Policy development and coordination
  - Open Policy Meetings and processes
- Training and outreach
  - Training courses, seminars, conferences…
  - Liaison: IETF, ITU, APT, PITA, APEC…
- Publications
  - Newsletters, reports, web site…

How do RIRs do it?

- Open and transparent processes
  - Decision-making
  - Policy development
- Open participation
  - Democratic, bottom-up processes
- Membership structure
  - 100% Self-funded through membership fees
  - National Internet Registries (APNIC)
- Community support (APNIC)
  - HRD
  - R&D fund
  - Fellowships – received and given
  - Open source software development

RIR Policy Process



In conclusion

Conclusions

- The strength of the Internet depends on open standards and open processes
  - Allowing the community to agree on how the network should work
  - Open to all members of the community
  - Competitive market-based not centrally planned
- Benefits for all
  - Expertise provided by those who create the Internet
  - Vendors know that products will perform as customers want
  - Customers (carriers and end users) are able to buy devices from various competing providers
  - Innovators have enormous opportunities to provide new products and services

Thank You

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