
Internet and Standards in the 21st Century

Vint Cerf

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Internet Evangelist at Work

22.5 Million Hosts

(Bellcore June 1997)

50 Million Users

(NUA Jul 1997)

542 Million Hosts

(www.isc.org, Jan 2008)

1,320 Million Users

(InternetWorldStats.com,
December 2007)

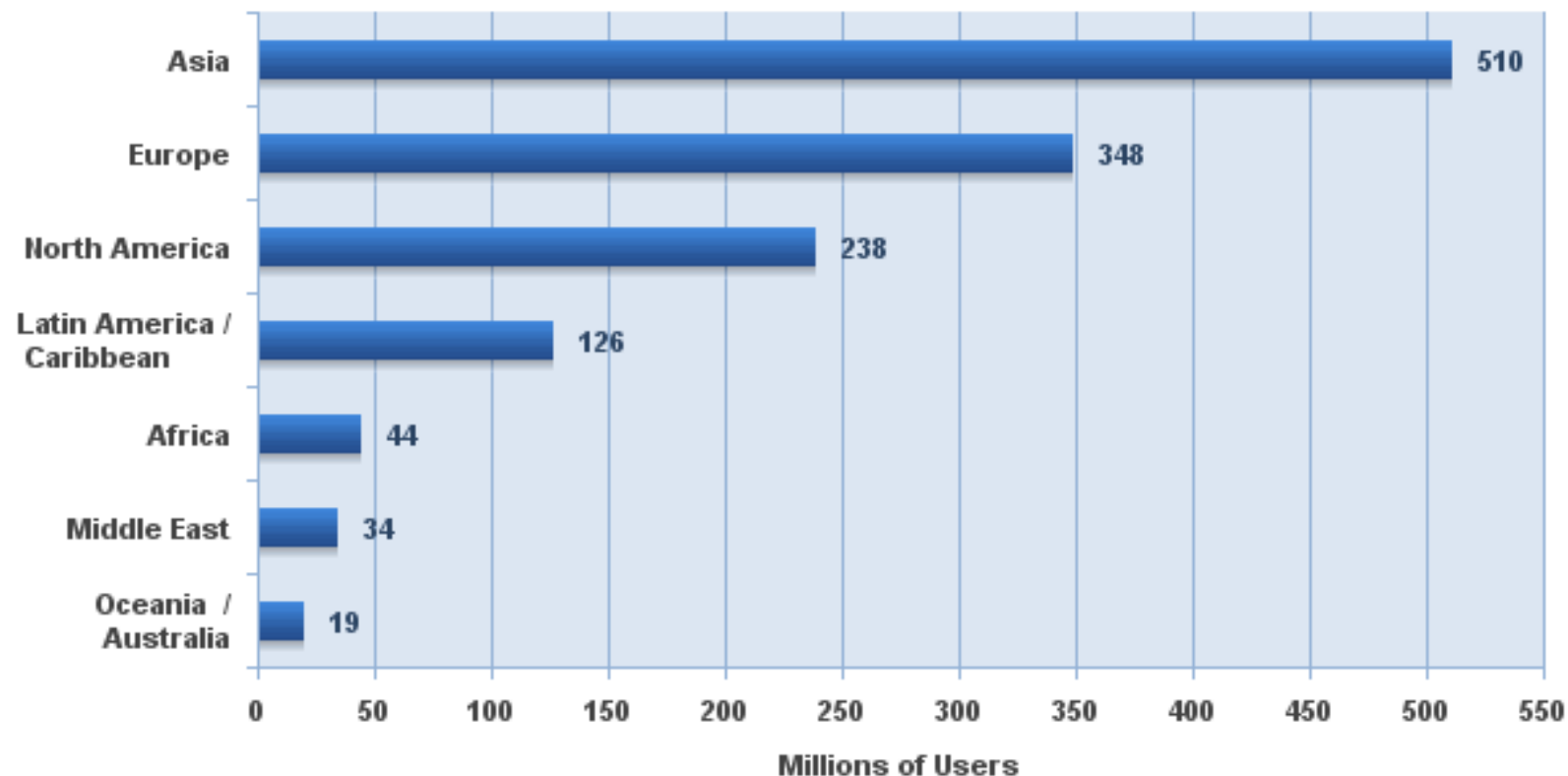
(approx. 4.1 Billion Telephone Terminations including 3.0 B mobiles
and >1 Billion PCs [Comp. Industries Assoc.]

WORLD INTERNET USAGE AND POPULATION STATISTICS

World Regions	Population (2007 Est.)	Population % of World	Internet Usage, Latest Data	% Population (Penetration)	Usage % of World	Usage Growth 2000-2007
Africa	941,249,130	14.2 %	44,361,940	4.7 %	3.4 %	882.7 %
Asia	3,733,783,474	56.5 %	510,478,743	13.7 %	38.7 %	346.6 %
Europe	801,821,187	12.1 %	348,125,847	43.4 %	26.4 %	231.2 %
Middle East	192,755,045	2.9 %	33,510,500	17.4 %	2.5 %	920.2 %
North America	334,659,631	5.1 %	238,015,529	71.1 %	18.0 %	120.2 %
Latin America/Caribbean	569,133,474	8.6 %	126,203,714	22.2 %	9.6 %	598.5 %
Oceania / Australia	33,569,718	0.5 %	19,175,836	57.1 %	1.5 %	151.6 %
WORLD TOTAL	6,606,971,659	100.0 %	1,319,872,109	20.0 %	100.0 %	265.6 %

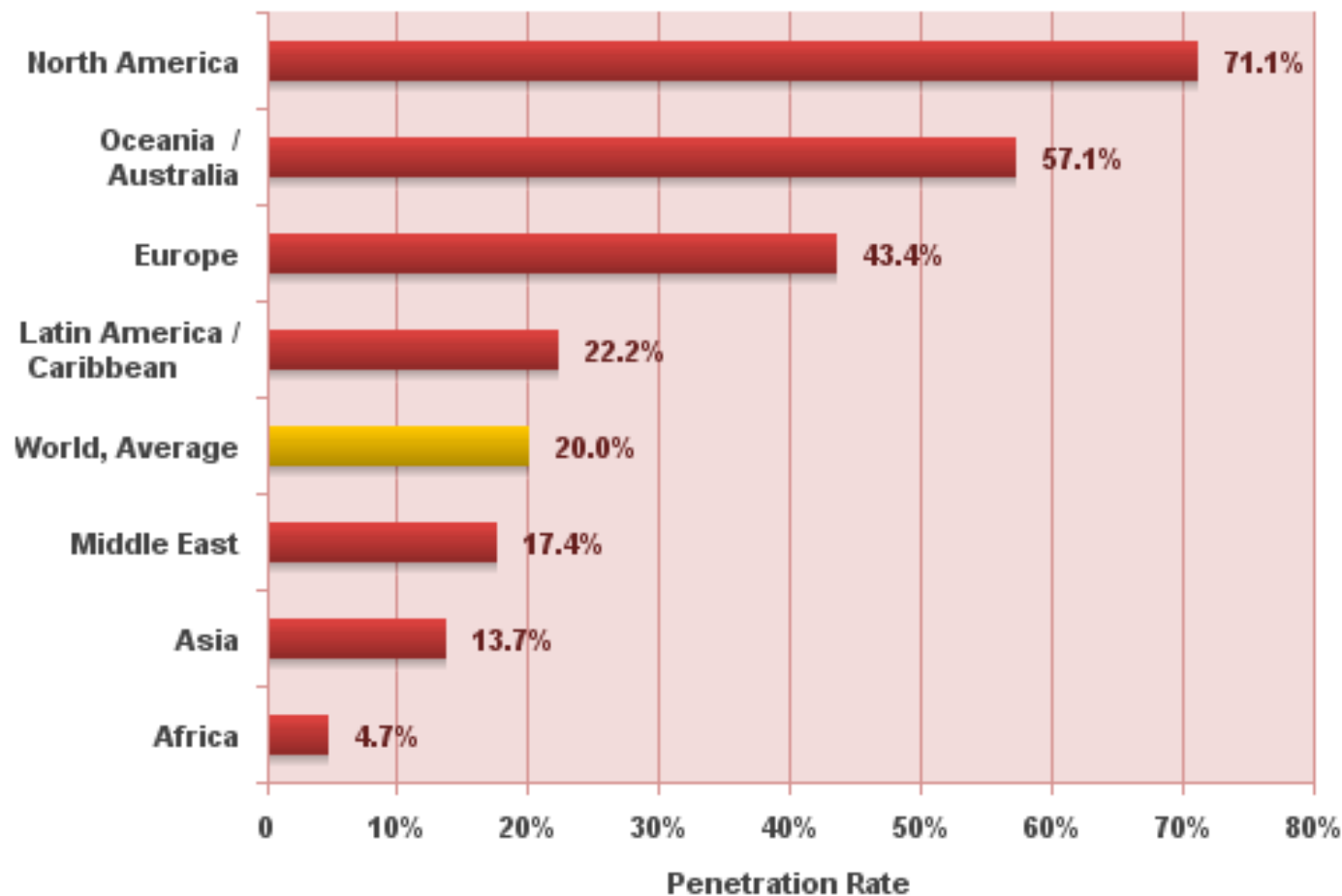
Internetworldstats.com (Dec 2007)

Internet Users in the World December 2007

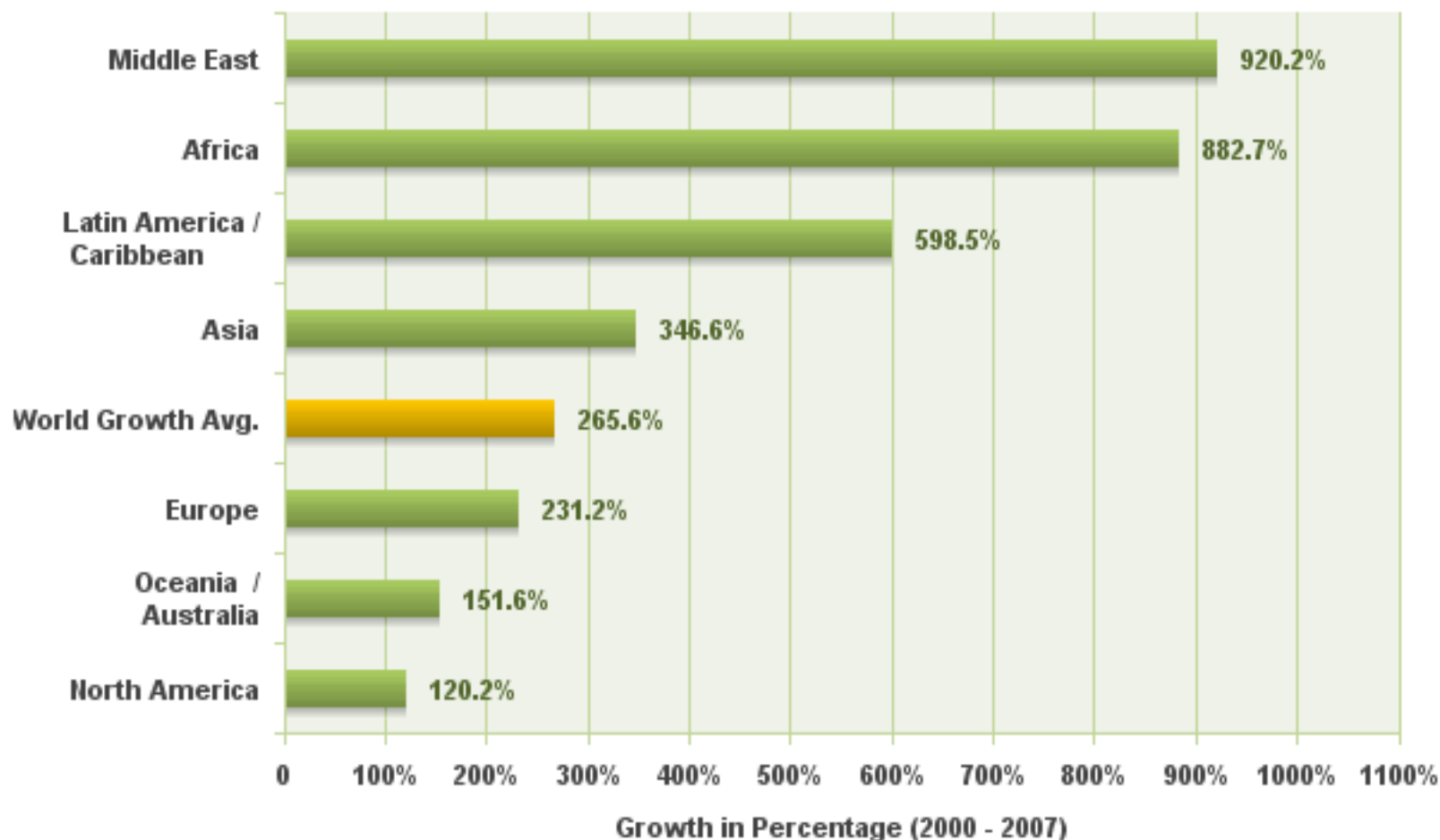


Note: Total World Internet Users estimate is 1,319,872,109 for year-end 2007
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World Internet Penetration Rates December 2007



Internet Users in the World Growth Between 2000 and 2007

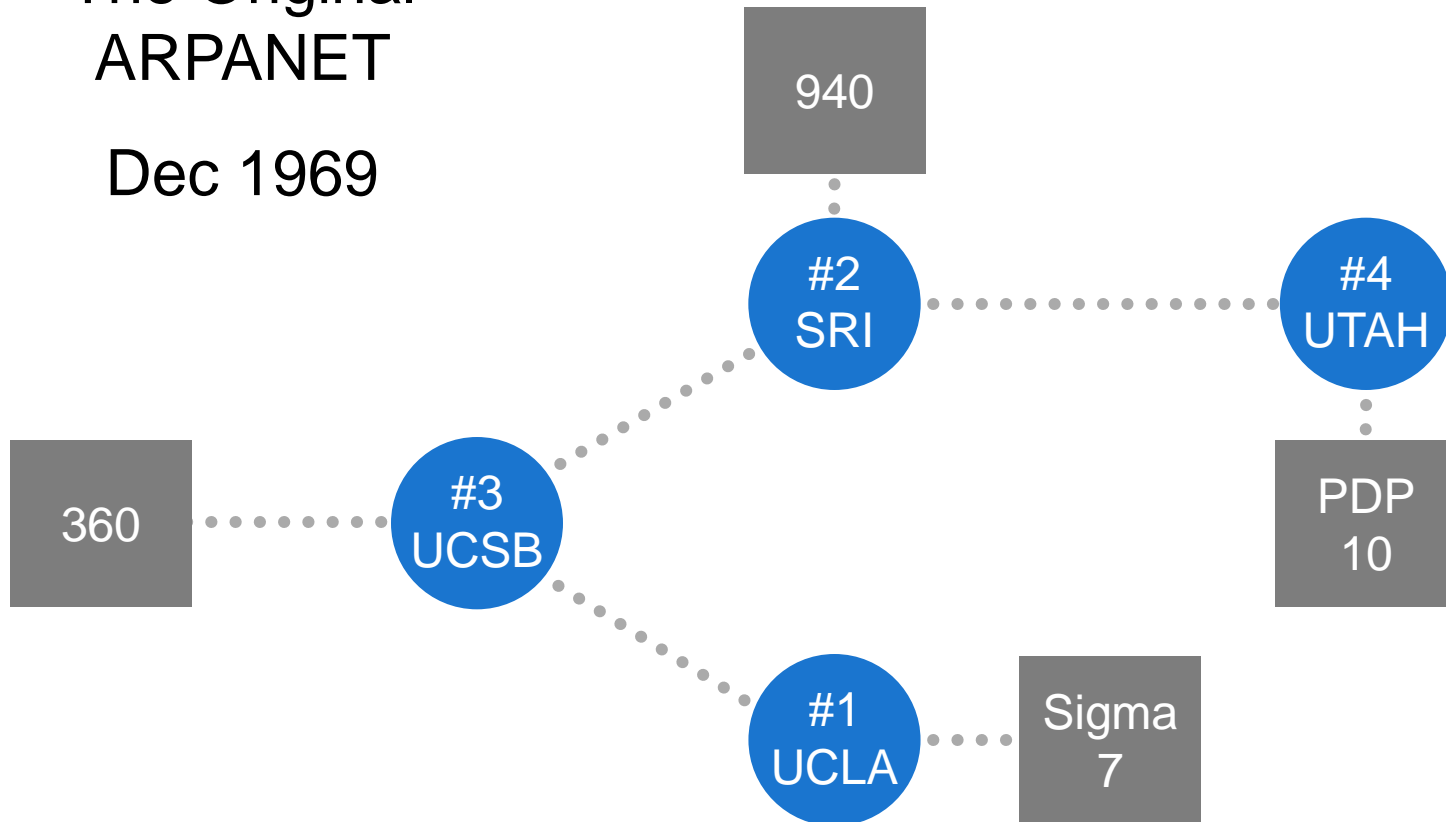


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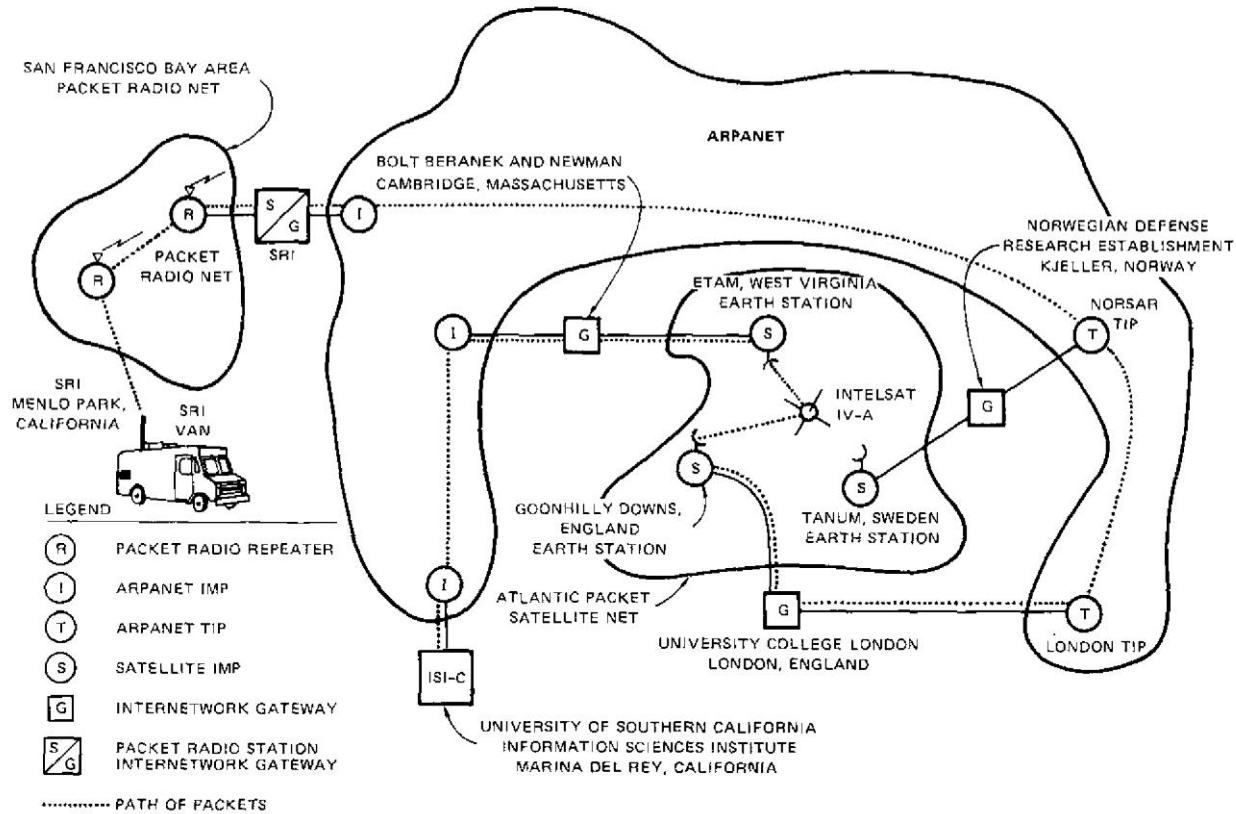
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The Original ARPANET

Dec 1969

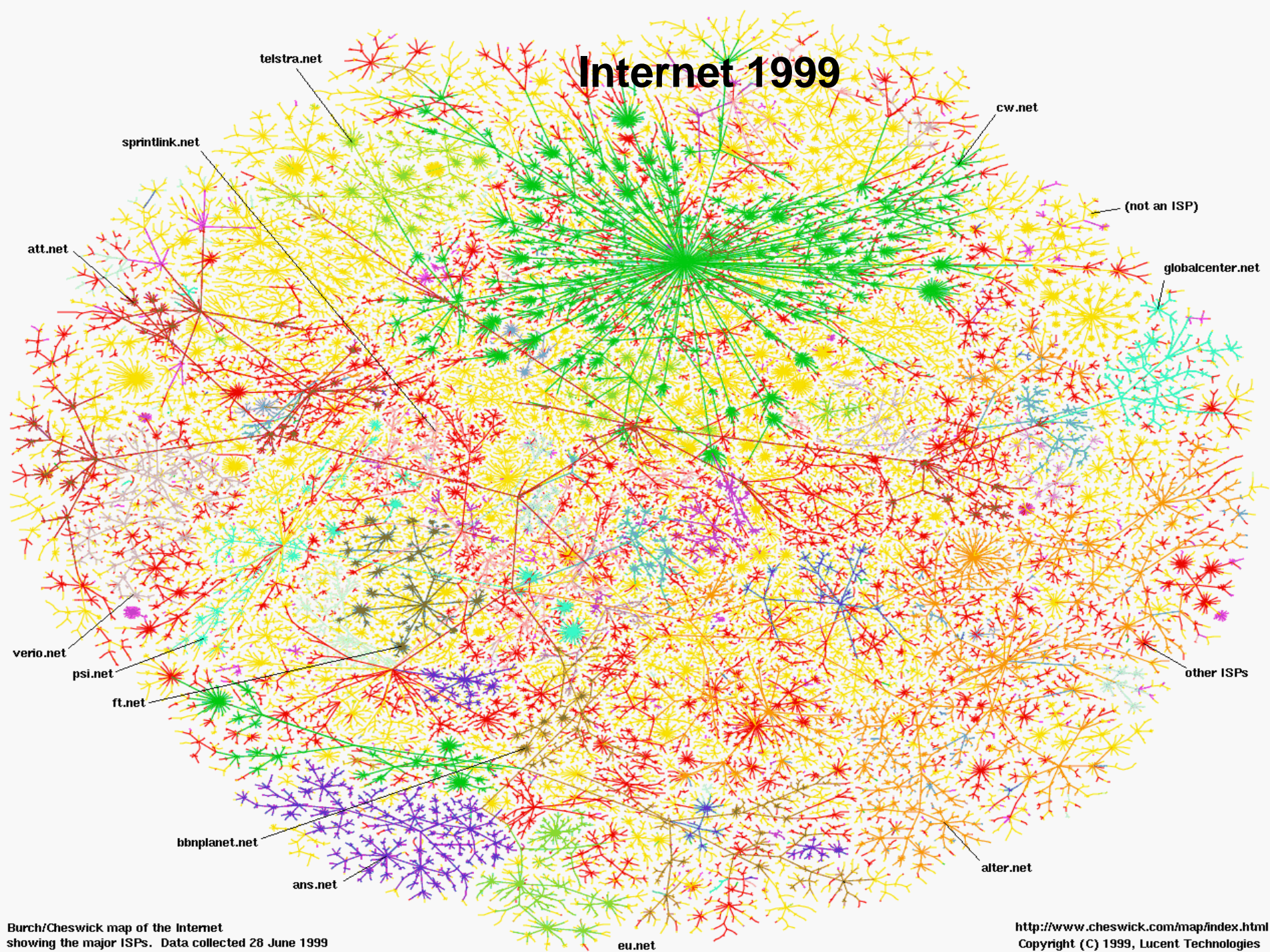


First Three-Network Test of Internet

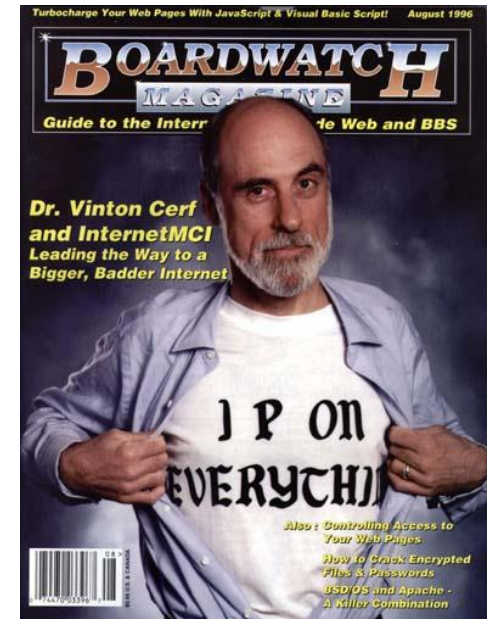


November 22, 1977

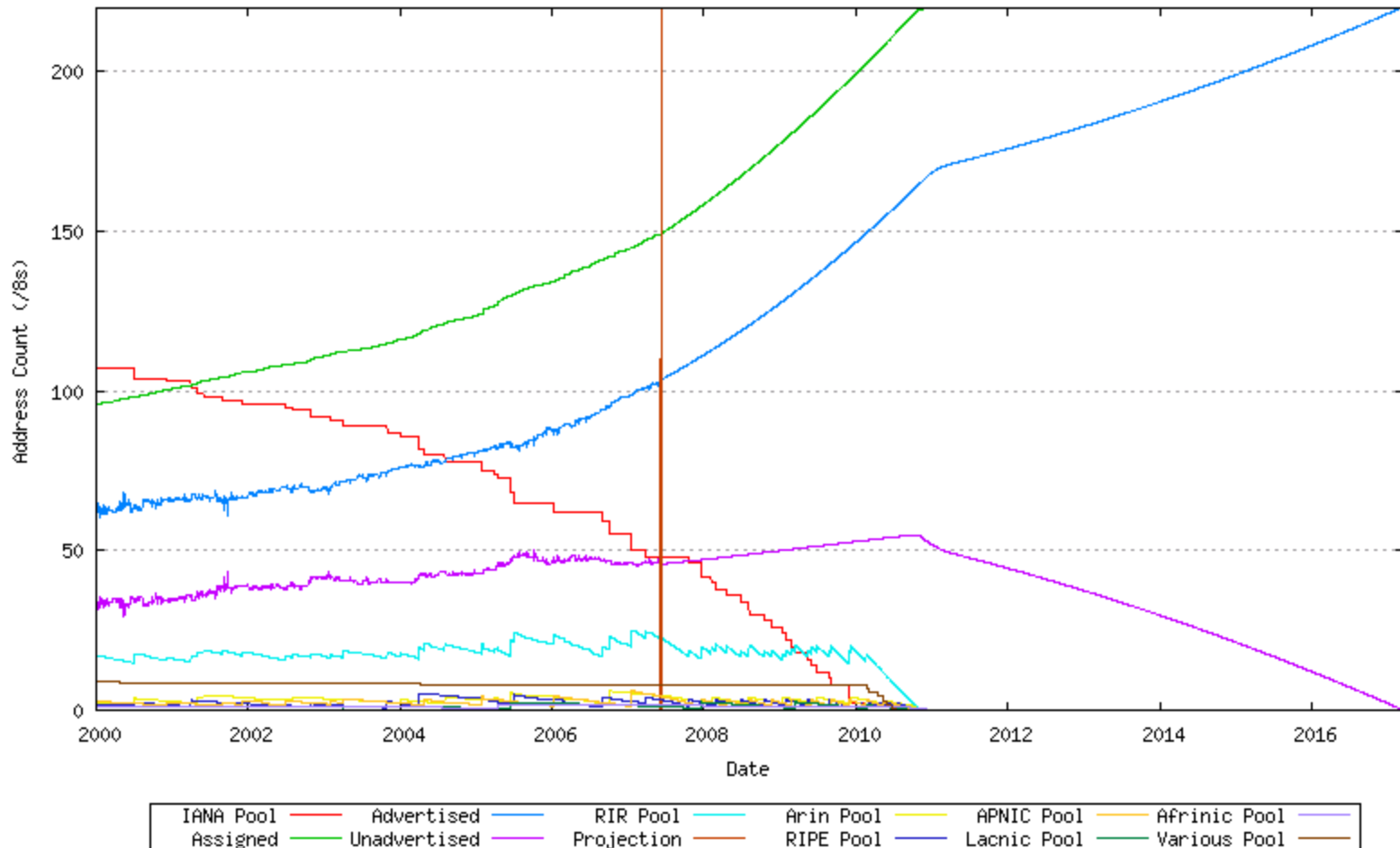
Internet 1999



- Internet uses any communication service (IP on everything!)
- IP carries anything digital
- End/End Principle (neutrality and user freedom)
- Radio supplies mobility
- Fiber/Cable/DSL supplies speed
- Broadband (choice, symmetry)
- IPv6 supplies address space
 - (IPv4 runout in 2011)



IPv4 runout diagram (Geoff Huston)



<http://www.potaroo.net/tools/ipv4/index.html>

Security at all levels

Internet “Erlang” formulas

QOS debates (smart routers?)

Internationalized Domain Names (ccTLDs & GTLDs)

Distributed Algorithms

Presence (multi-level)

Mobility, persistence (processes, connections, references)

Multihoming

Multipath routing

Broadcast utilization

Mesh and Sensor networks

Virtualization (net, storage, processing)

Authentication, Identity,
Authorization

Multi-core Processor Algorithms

Delay and Disruption Tolerance

Integration of Applications (e.g.
drag/drop gadgets in calendar)

Intellectual Property Protection
(tracking rights, enforcement)

Role of Layering

Governance

- Law Enforcement
- Policy Development
- Homologation
- Facilitation of electronic commerce
- Privacy and confidentiality

Mobile operation

Dynamic joining (new IP address?, Authentication?)

Dynamic Routing (Dynamic Topology)

Persistent connection (ID at TCP/UDP/RTP layer?)

Interplanetary Long-Haul Architecture (RFC 4838)

Licklider Transport Protocol (LTP)

Bundle Protocol (RFC 5050)

Delayed Binding of Identifiers

Email-like behavior

- Information Consumers are becoming Producers
 - Blogging, YouTube/Google Video, Personal Web Pages
- Innovation at the edge (e.g. wikipedia)
- Social Networking (Linked in, My Space, Facebook, Orkut...)
- Gameplaying (Second Life, World of Warcraft...)
- New Business Models
 - eBay, Amazon, Dell, Google, Yahoo!,MSN, AOL, iTunes, VOIP...
- Internet can transport and display print, video, audio media
- Internet permits group interaction (not only mass one-way medium)

- Standards confer interoperability (pick one way to do a particular thing, not two!)
- Standards spur competition (user choice of suppliers)
- Standards spur innovation (standards create common platforms on top of which new inventions can operate. TCP/IP led to HTTP (WWW) and to Java-based applications, cloud computing, etc.)
- Standards enable global communication, information exchange and preservation of information for future generations.
- Standards foster global economic growth

Traffic by type on the Internet (Source: Sandvine)



- Streaming and Downloading
 - iPOD and vPOD behaviors?
- Mixing of all media as IP packets
- Ancillary information access
 - Downloaded texts, programs, videos, audio, captions
 - Advertising material
- Screen Control (icons, widgets)
- Multiple streams to multiple displays (beauty of packet switching)
- Online interaction while viewing
 - Group commentary
 - Advertising and product information

- 3 Billion Mobiles and counting
- Text/Web Access
- Payment systems
- Innovative interfaces (challenges!)
- Navigation systems
 - GPS, Galileo, Google Earth/Maps,...
- Geo-location based services
- Access to Web searching

Internet-enabled Devices



Programmable – Java, Python, etc.

Examples:

- WebTV, Personal Digital Assistants, Mobiles, Video games, Picture Frames, Washing Machines, Surf Board!
- Refrigerator (and the bathroom scales)
- Automobiles (Japan, Germany)
- Internet-enabled wine corks (also note new quantum theory of wine: Schrödinger's wine bottle)
- Internet-enabled socks (clothing)
- Universal Remote Controls

- Introduction of Internationalized Top Level Domains
 - See idn.icann.org for current testing
- Introduction of new generic TLDs in 2008
- Introduction of IPv6 (root zone, elsewhere)
- Introduction of DNSSEC (.se, .bg, .br, .pr, ...)

- Intellectual property treatment
 - Digital material is easy to copy and distribute
- Semantic Web
- Complex objects that can only be rendered via computer
 - 3D interactive objects
 - Complex spreadsheets
 - Interactive environments
- BIT ROT!
 - Preserving interpretive programs (Windows 3000 and PPT 1997)
 - And the operating systems that run them
 - And the hardware that run the operating systems
 - For thousands of years!!