



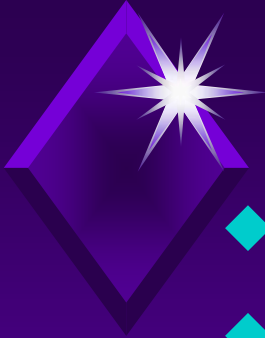
IANA and ICANN

Vint Cerf

MCI WorldCom

July 1999

Some Major Milestones

- 
- ◆ 1969 - 1985 Basic Packet Net Research
 - ◆ 1974 - Internet design first published
 - ◆ 1983 - first major deployment
 - ◆ 1986 - first router companies
 - ◆ 1989 - WWW; MCI Mail/Internet link
 - ◆ 1990 - ARPANET retired; first comm'l services (UUNet, PSINet)
 - ◆ 1994 - commercial WWW (Netscape)
 - ◆ 1995 - NSFNet retired, competitive backbone
 - ◆ 1998 - New IANA/ICANN

**How does
Internet work?**



Protocols and Identifiers

- ◆ Protocols are procedures and formats that are used to enable computer to computer communication.
- ◆ To support this, computers share common knowledge of identifiers to make clear which protocols are being used. For example, Internet Protocol version 4 is in use today; IPv6 is coming

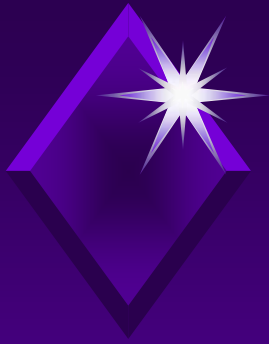
What is the Internet?

The largest network
of networks in the world.
Uses TCP/IP protocols and
packet switching .
Runs on any communi-
cations substrate.



Packet vs Circuit Switching

- ◆ Circuit (telephony) like reserving bicycle lanes from LA to NY!
- ◆ Packet (Internet) like sharing of the highway among high speed cars.



Internet Packet Formats

<i>"from" address</i>	<i>"to" address</i>	<i>Version number</i>	<i>CONTENTS</i>
<i>166.45.18.99</i>	<i>204.146.165.100</i>	<i>"4"</i>	<i>"hello"</i>

An Internet Packet

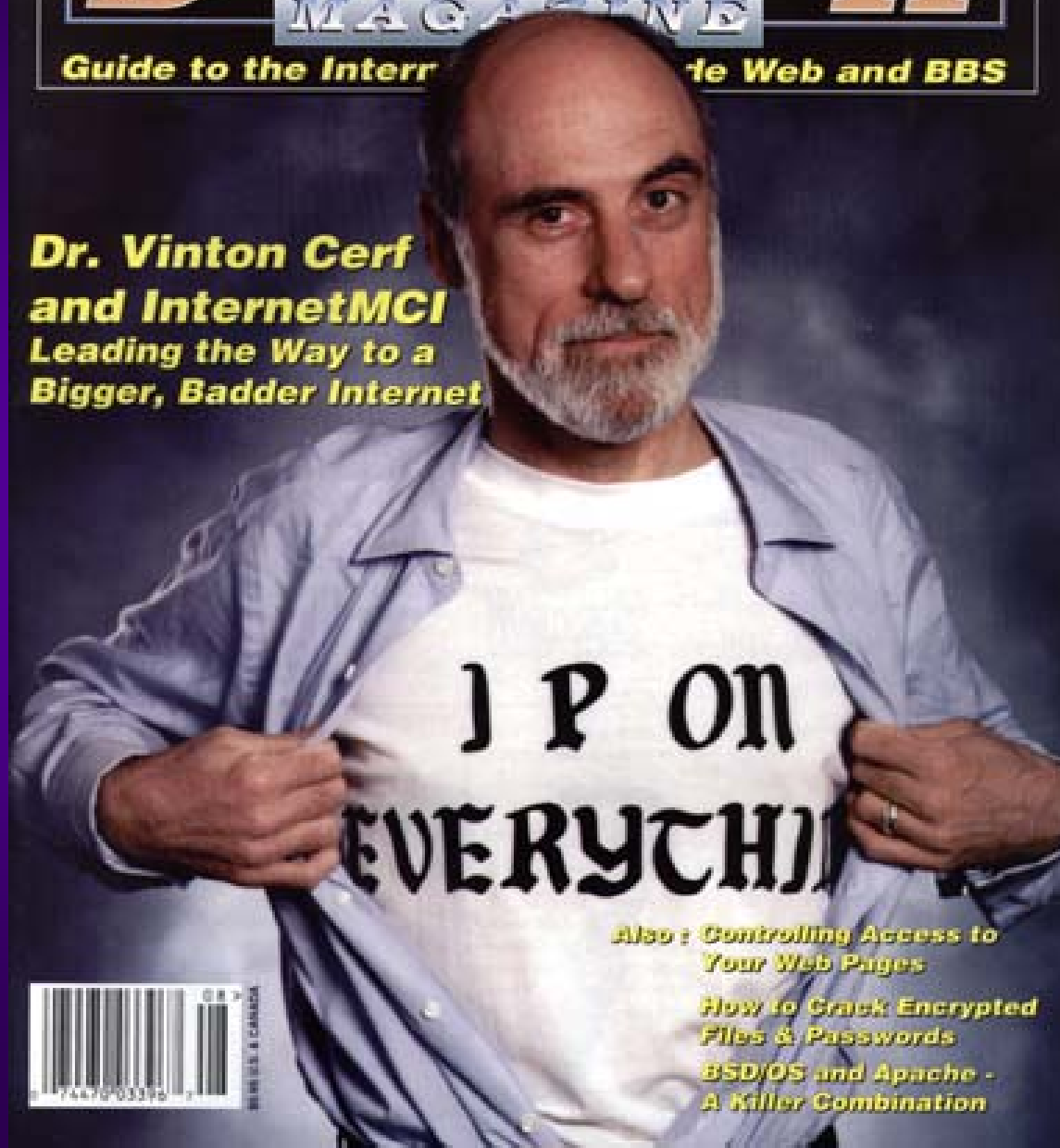
How Does Internet Protocol work?

- ◆ Internet Packets are like electronic Postcards (100M X faster)
- ◆ To/From Addresses
- ◆ Finite Content
- ◆ Best Efforts (QOS coming!)

BOARDWATCH MAGAZINE

Guide to the Internet • The Web and BBS

**Dr. Vinton Cerf
and InternetMCI**
Leading the Way to a
Bigger, Badder Internet



**Also: Controlling Access to
Your Web Pages**

**How to Crack Encrypted
Files & Passwords**

**BSD/OS and Apache -
A Killer Combination**



How Does TCP Work?

- ◆ Like Sending a Novel on Postcards
 - ◆ Page numbering (ordering, duplicate detection)
 - ◆ Positive Acknowledgement
 - ◆ Retransmission on Timeout
 - ◆ Finite Mailbox



Ye Olde ARPANET

- ◆ 1969 - First “IMP” (packet switch) installed at UCLA in Len Kleinrock’s Lab
- ◆ Steve Crocker leads the Network Working Group
- ◆ Jon Postel becomes “numbers Czar” and RFC editor
- ◆ Vint Cerf programs network measurement center



Jon Postel
1943-1998



Naming in ye Olde Days

- ◆ To: vcerf@ucla, From: Kahn@arpa
- ◆ “Host.txt” table translated “ucla” into a network address (kind of like a telephone number)
- ◆ packets were sent between computers using addresses derived from the tables. Every computer had a copy of host.txt. SRI International updated table



Name and Number management

- ◆ Postel served as “czar”
- ◆ SRI International, under contract to DARPA, managed day to day assignment of names/addresses initially for ARPANET and later (after 1983 deployment of TCP/IP) for Internet



The Domain Name System

- ◆ Internet started to grow after 1983
- ◆ Host.Txt table was unwieldy and hard to keep up to date in all hosts
- ◆ in 1984/5, Paul Mockapetris and Jon Postel developed a distributed database system call the Domain Name System to accommodate much larger scale



Domain Names

- ◆ Kahn@arpa became Kahn@arpa.mil
- ◆ Cerf@ucla became Cerf@ucla.edu
- ◆ Tomlinson@bbn became Tomlinson@bbn.com
- ◆ Other top level domains:
 - ◆ .GOV, .ORG, .NET (“generic”)
 - ◆ and country codes: .US, .UK, .FR, .DE...
- ◆ The system is hierarchical and each name is unique: www.reston.mci.com



Domain Name Management

- ◆ Internet Assigned Numbers Authority (Postel's group at USC/ISI) managed top level assignments
- ◆ **Volunteers** were found to manage next levels.
- ◆ Postel managed .edu, .US
- ◆ SRI managed .com, .org, .net, .mil, .gov and .int



Domain Name System Mgmt (Cerf's Estimates of dates)

- ◆ 1969 -1974 SRI manages day to day name space under direction of Postel as “numbers czar”, both under contract to DARPA
- ◆ 1975 - DCA picks up SRI Contract
- ◆ 1987 - NSF picks up .int, .com, .org, .net, and .edu, contracts w/SRI



DNS timeline (continued)

- ◆ 1991 - DCA competes .mil, .gov and awards to Network Solutions
- ◆ 1993 - NSF creates “InterNIC” and awards to AT&T, CERFNet, and NSI (doing domain name registration for .org, .net, .com, .edu, .int - the latter two subcontracted to IANA)



DNS Timeline (cont.)

- ◆ 1995 - NSF contract cannot cover costs of exploding .com registrations and allows NSI to recover costs by charging \$100 for 2 year registration [note, NSF is a RESEARCH agency]
- ◆ 1998 - NSF transfers DNS responsibility to Dept of Commerce
- ◆ 1998 - DOC extends contract with NSI for two years (Sept 30, 2000)



IANA and ICANN

- ◆ 1996 - Postel initiates Internet Ad Hoc Committee with support from Internet Society to institutionalize the IANA functions and open top level domains to competitive registration
- ◆ This proves to be very difficult with many people with differing views and interests. The debate doesn't come to closure...



This is all about Money

- ◆ \$\$\$\$.COM - Washington Post, 7/15/99
- ◆ Many entrepreneurs see NSI's cash flow as a model for Internet business opportunities. Some want to create new "top level domains" (like .com), but the trademark community has reservations...



US Government steps in

- ◆ 1998 - Ira Magaziner, at the request of President Clinton, initiates an effort to facilitate formation of a neutral, industry-sponsored oversight organization to continue the IANA functions performed in the past under US Government contract in a global, consensus building setting.
- ◆ Green and White Papers developed



Creation of ICANN

- ◆ Nov 1998 - the USG recognizes the Internet Corporation for Assigned Names and Numbers (ICANN)
- ◆ 1999 - ICANN organizes the many components specified in the White Paper (Board, Supporting Organizations, Membership, Advisory committees...)



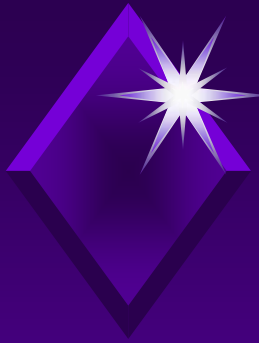
Why do we need ICANN?

- ◆ IANA acted for 30 years to mediate disputes and to assure proper technical function of all parts of the domain name system.
- ◆ These functions are still critical to the successful operation of Internet which is now a GLOBAL and rapidly growing medium.



What are the remaining Challenges?

- ◆ Making ICANN Work
 - ◆ funding
 - ◆ mechanisms for global consensus building
- ◆ Managing the transition from monopoly to competition
- ◆ Resolving the Trademark/Domain Name conflict



Trademark and Domain Name Conflict

- ◆ Trademarks are NOT unique (MCI is trademarked by MCI WorldCom but also by a bus manufacturing company)
- ◆ Domain Names MUST BE UNIQUE in order for the Internet to work just like 800 numbers



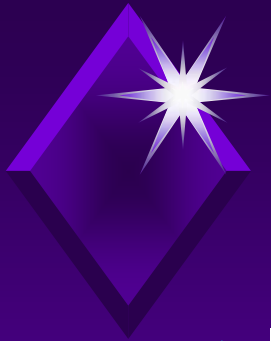
An Unnatural Monopoly

- ◆ When the Internet was mostly an R&D environment, generic top level domains were managed under contract and ccTLDs were managed by volunteers sought by IANA.
- ◆ Today, .com, .org, .net, and all other top level domains are managed and registered as monopolies.



An Unnecessary Monopoly

- ◆ There is no technical requirement that domain name registrations be provided by a monopoly registrar.
- ◆ It IS desirable to have a common REGISTRY of names within a given domain to assure uniqueness but this could be done under a cost-based contract.



Internet Addressing

- ◆ IPv4 - 32 bits
- ◆ initially, 256 networks ... then mix of:
 - ◆ Class A (128 with 16 M hosts)
 - ◆ Class B (16,384 with 65K hosts)
 - ◆ Class C (2M with 256 hosts)
- ◆ Now, Classless Inter-domain addresses
 - ◆ up to 4 Billion hosts, hundreds of thousands of networks



Next Generation Internet

- ◆ IPv6 - 128 bits of addressing
- ◆ Theoretically 10^{38} hosts
- ◆ Significant transition effort needed (sort of like changing engines on aircraft while in flight)
- ◆ IANA officially announced allocations this week (July 14, 1999)



ICANN's IP Addressing Role

- ◆ ICANN oversees Regional Internet Registries (RIRs) for allocation and assignment of IP addresses
- ◆ ICANN just released guidance for IPv6 and allocated the first blocks

