

What is the Internet?

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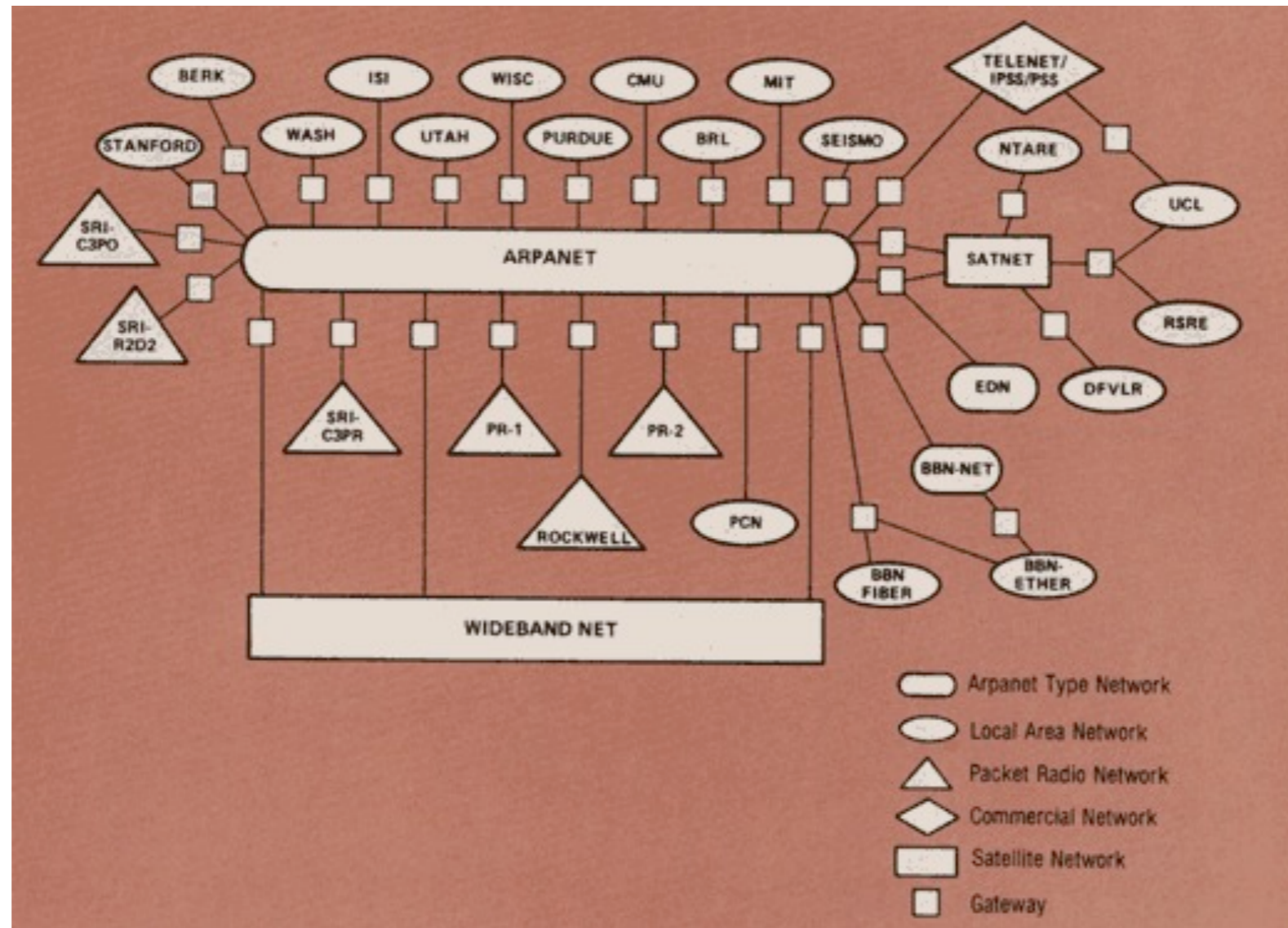
Questions? Just Raise Your Hand

History

- Theory of Packet Switching (early 1960's)
- ARPANET, Packet Radio Network and Packet Satellite Network
- Intelligent network or intelligent endpoints?
- End-to-end model

History

1970s/1980s - local networks, email, IM, chat, file sharing, MUDs, forums



MUD

```
Telnet british-legends.com
*~
Path.
You are standing on a path which leads off a road to the north, to a cottage
south of you. To the west and east are separate gardens.
*~
Flower garden.
You are in a well-kept garden. There is an unexpectedly sweet smell here and
you notice lots of flowers. To the east across a path there is more garden.
*~
Cliff.
You are standing on the edge of a cliff surrounded by forest to the north and
a river to the south. A chill wind blows up the unclimbable and unscaled
heights. At the base of the cliff you can just make out the shapes of jagged
rocks.
*~
As you approach the edge of the cliff the rock starts to crumble. Hurriedly
you retreat as you feel the ground begin to give way under your feet!
*leap
You are splattered over a very large area, or at least most of you
is. The rest of your remains are, even now, being eaten by the seagulls
(especially your eyes). If you'd have looked properly before you leaped you
might have decided not to jump!
Persona updated.
Would you like to play again?
:
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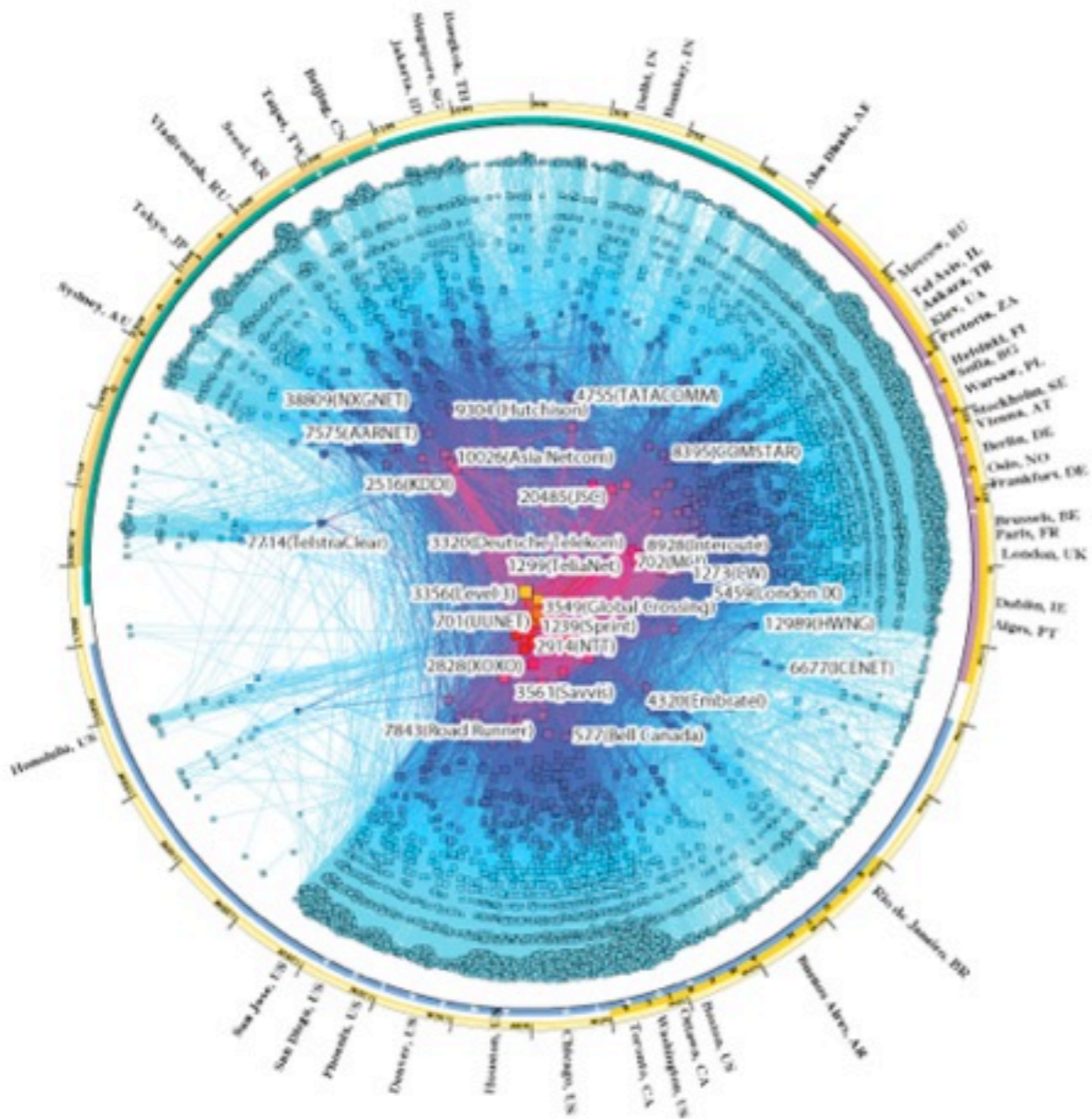
IP addresses

- Unique for every computer, 32 bits (IPv6 128 bits)
- Quad notation (dot notation) - 127.0.0.1
- Internet Assigned Number Authority (IANA)
- ~4 billion IPv4 addresses
- 2001:0db8:85a3:0000:0000:8a2e:0370:7334
- IPv6 - 2^{128} addresses (40 undecillion, 282 decillion, 366 nonillion, 920 octillion, 938 septillion, 463 sextillion, 463 quintillion, 374 quadrillion, 607 trillion, 431 billion, 768 million, 211 thousand and 456)

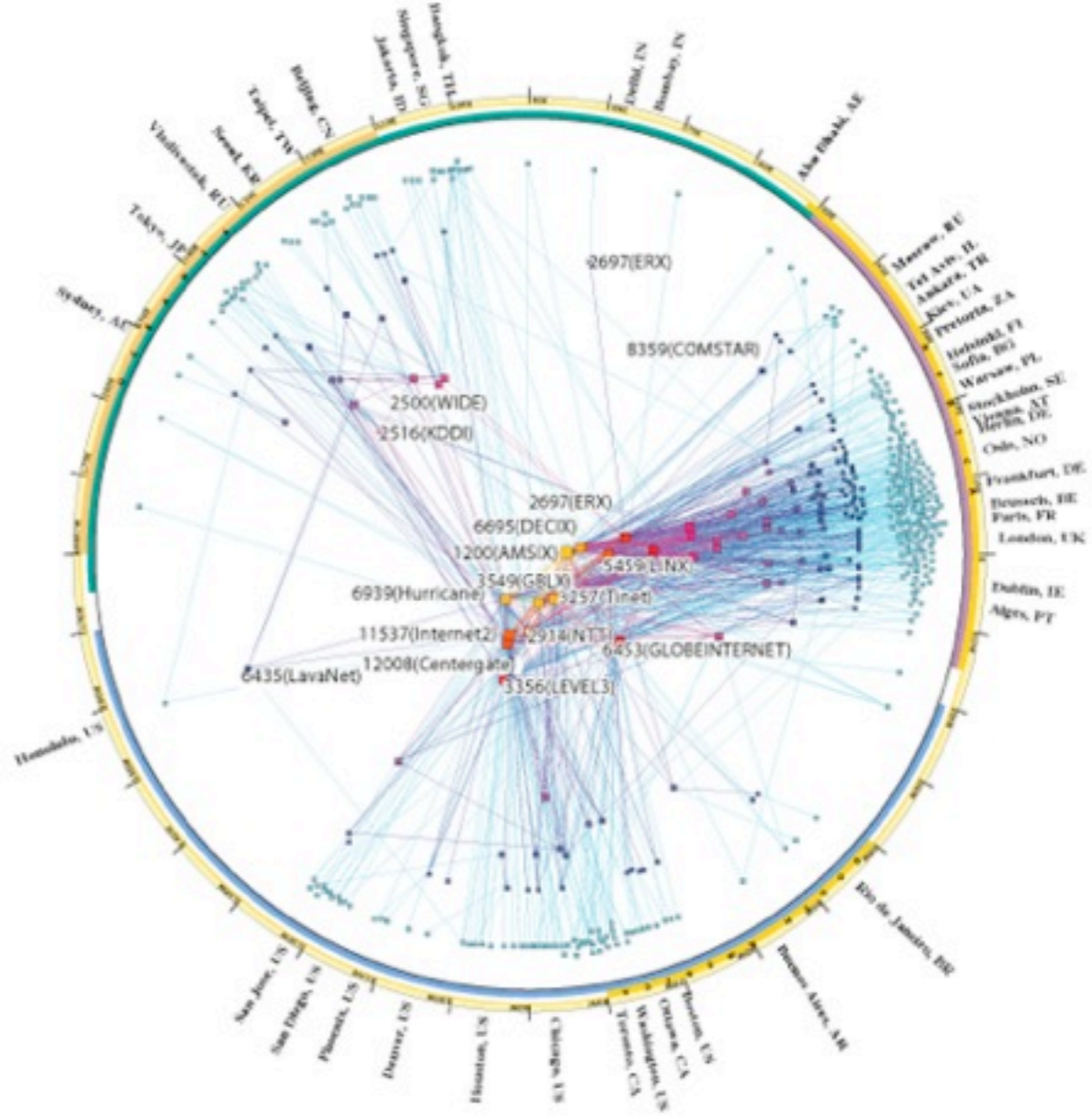
IPv4 & IPv6 INTERNET TOPOLOGY MAP JANUARY 2009

AS-level INTERNET GRAPH

IPv4



IPv6



Domain Names

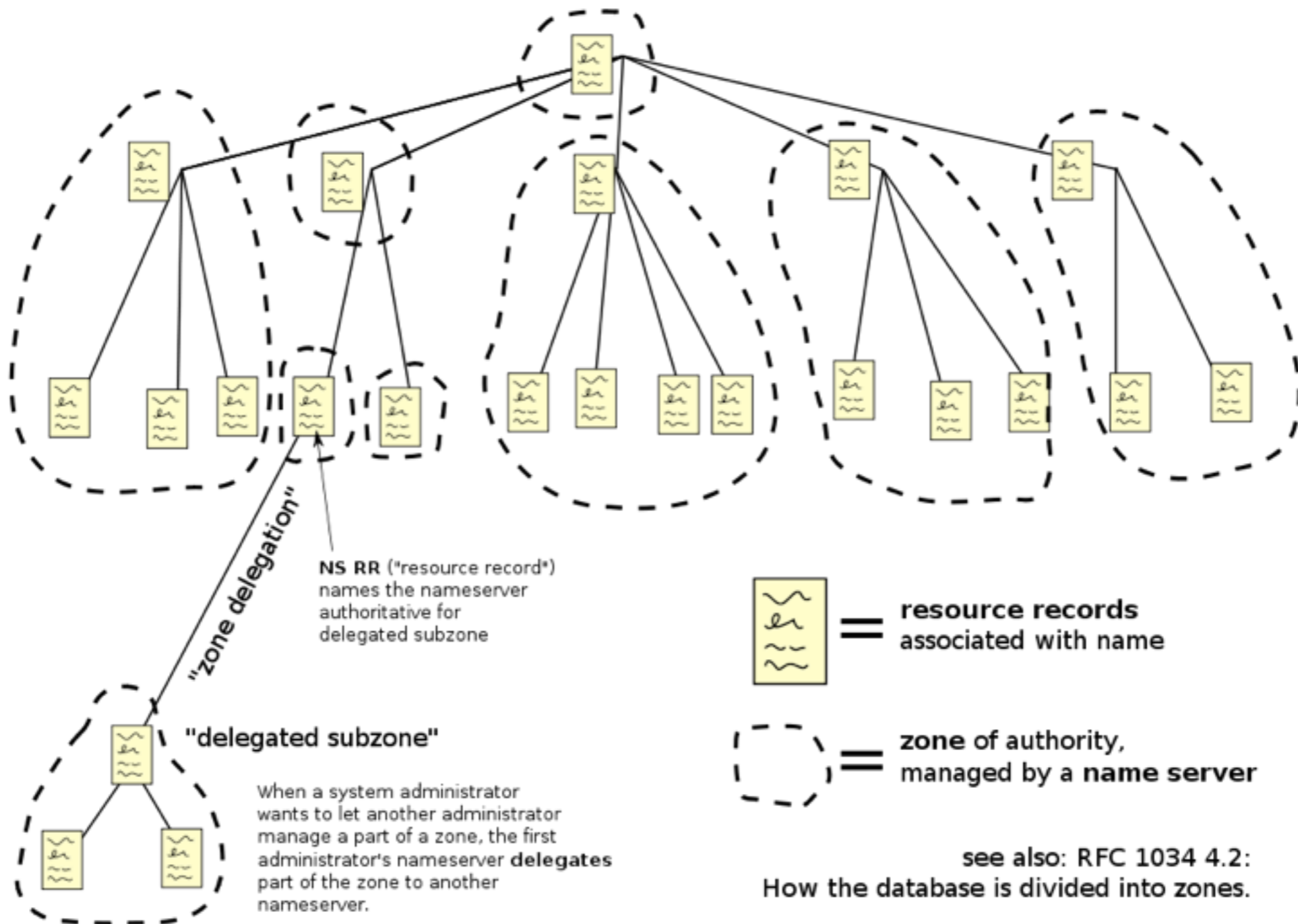
- TLD - Top-Level Domains (.com, .net, .ly)
- 21 Generic
(.com, .aero, .biz, .edu, .name, .pro, .xxx, etc.)
- ~250 Country code (always 2-letter)
(.tv, .vc, .uk, .at, .bi, .fm, .ca, .cc, .ly, .jp, etc.)
- 17 Internationalized (.pφ, .香港, .ไทย, .فلسطين.)
- Operated by IANA

Domain Name System

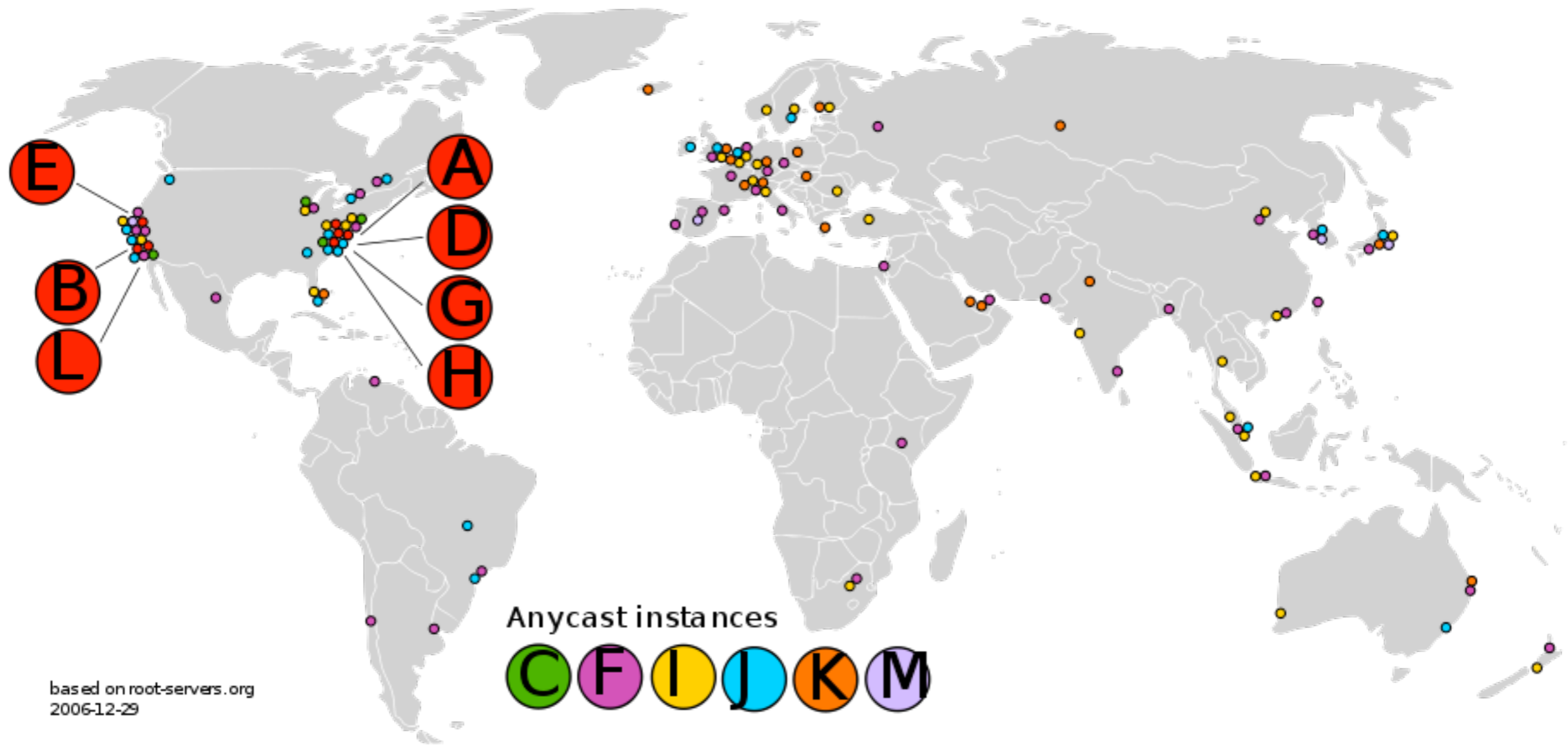
- Distributed database - Internet “phone book”
- Translation between IP addresses and domain names
- Invented in 1983, “hosts” file at SRI before
- BIND (Berkeley Internet Name Domain) Server

DNS Architecture

Domain Name Space

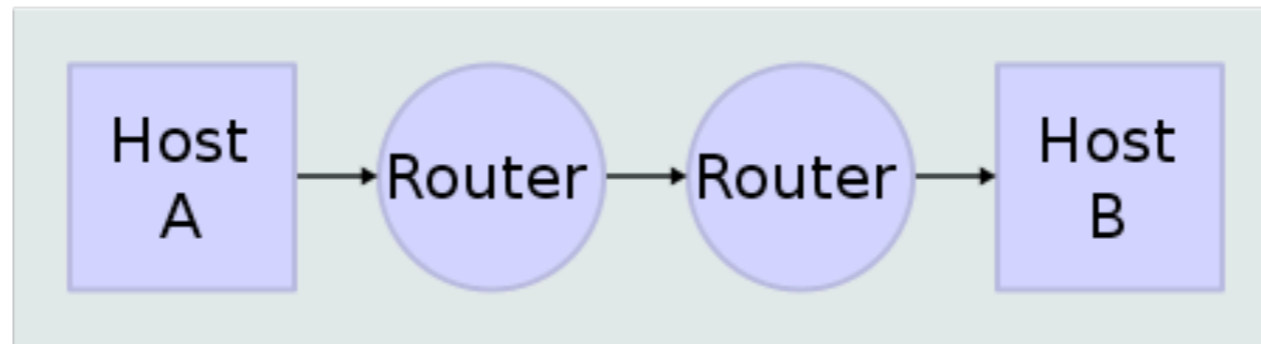


Root Server Geography

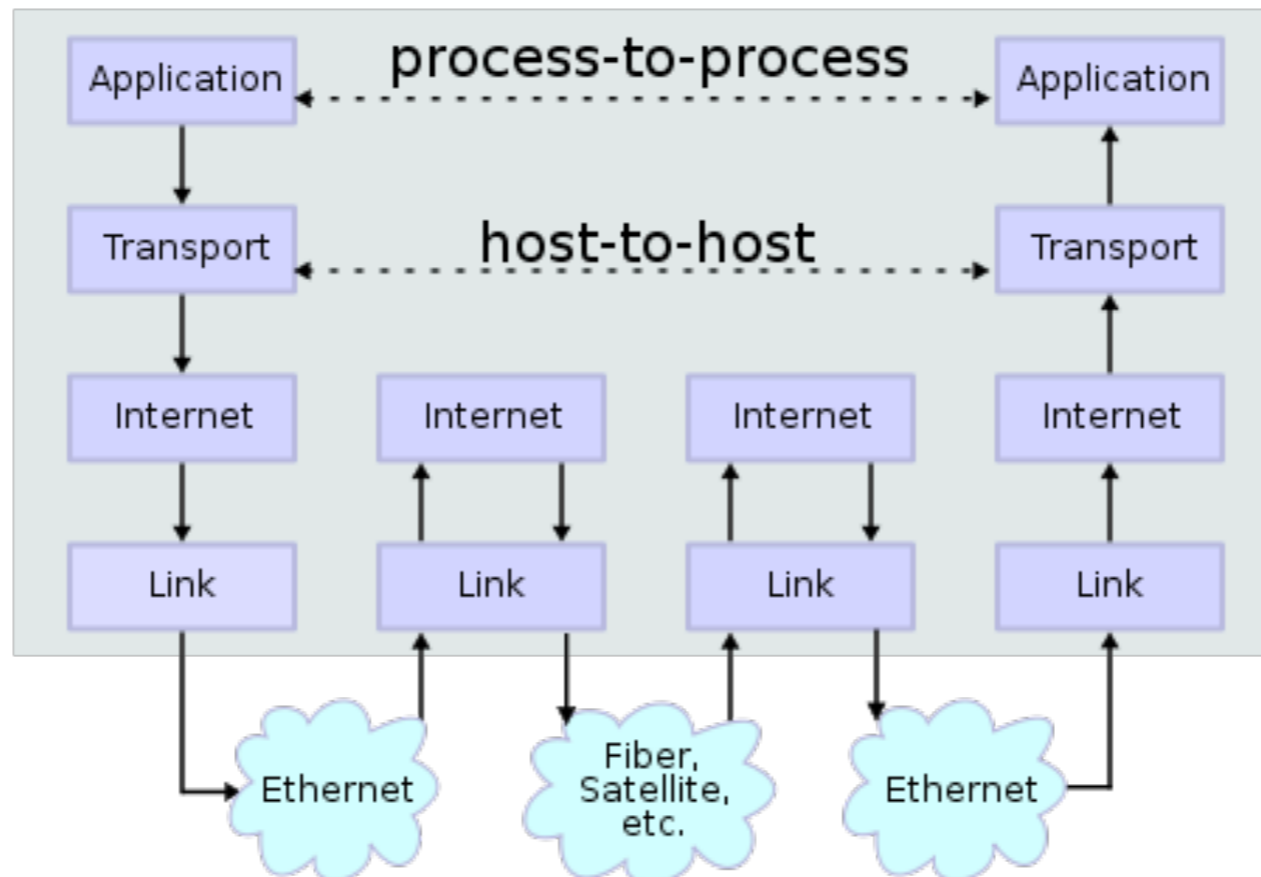


Internet Data Flow

Network Topology



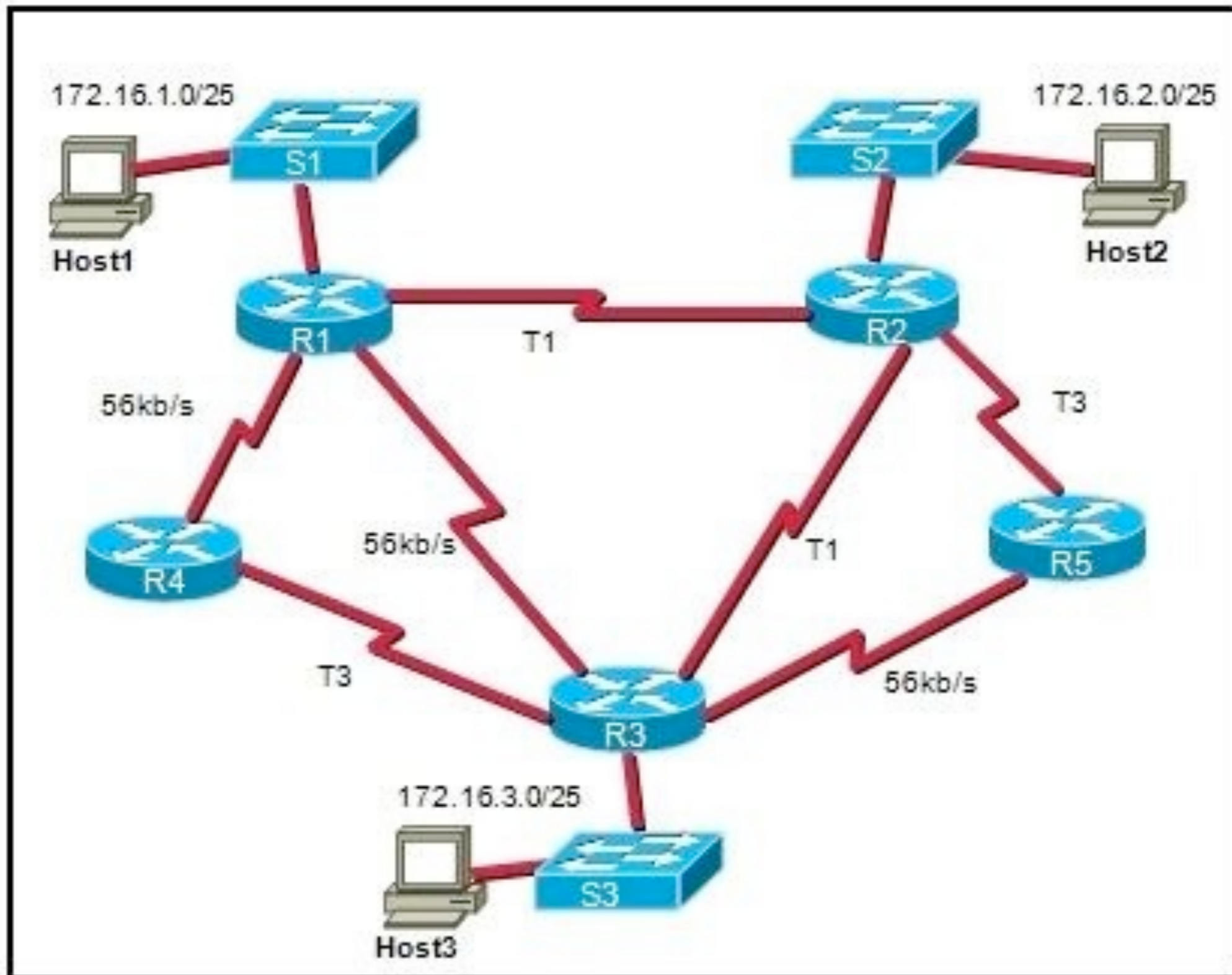
Data Flow



TCP/IP

- End-to-End Principle (smart ends, dumb network)
- Robustness Principle (send carefully, accept liberally)
- IP is “best effort” delivery
- TCP (on top of IP) is connection-oriented and reliable

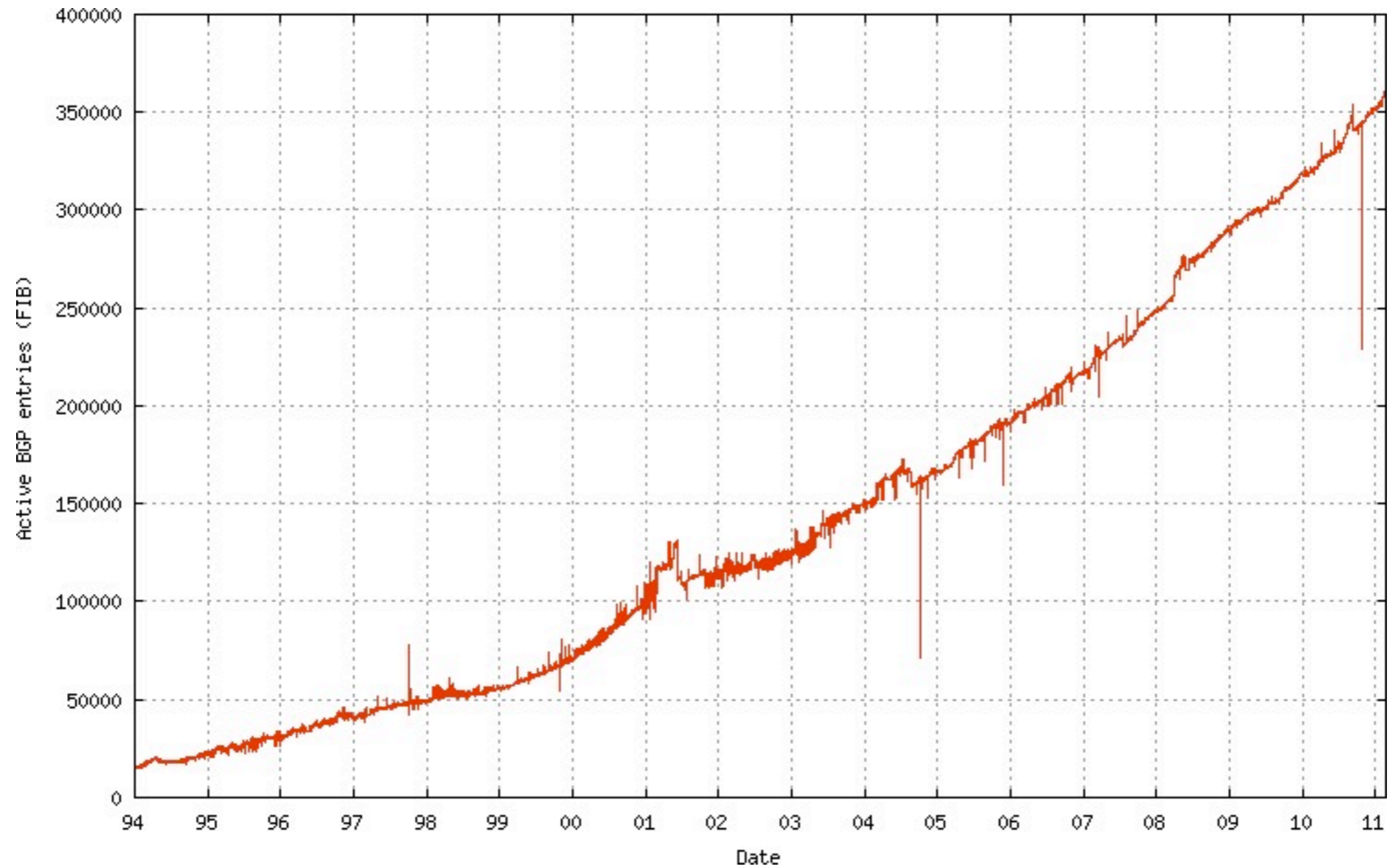
Routers / BGP



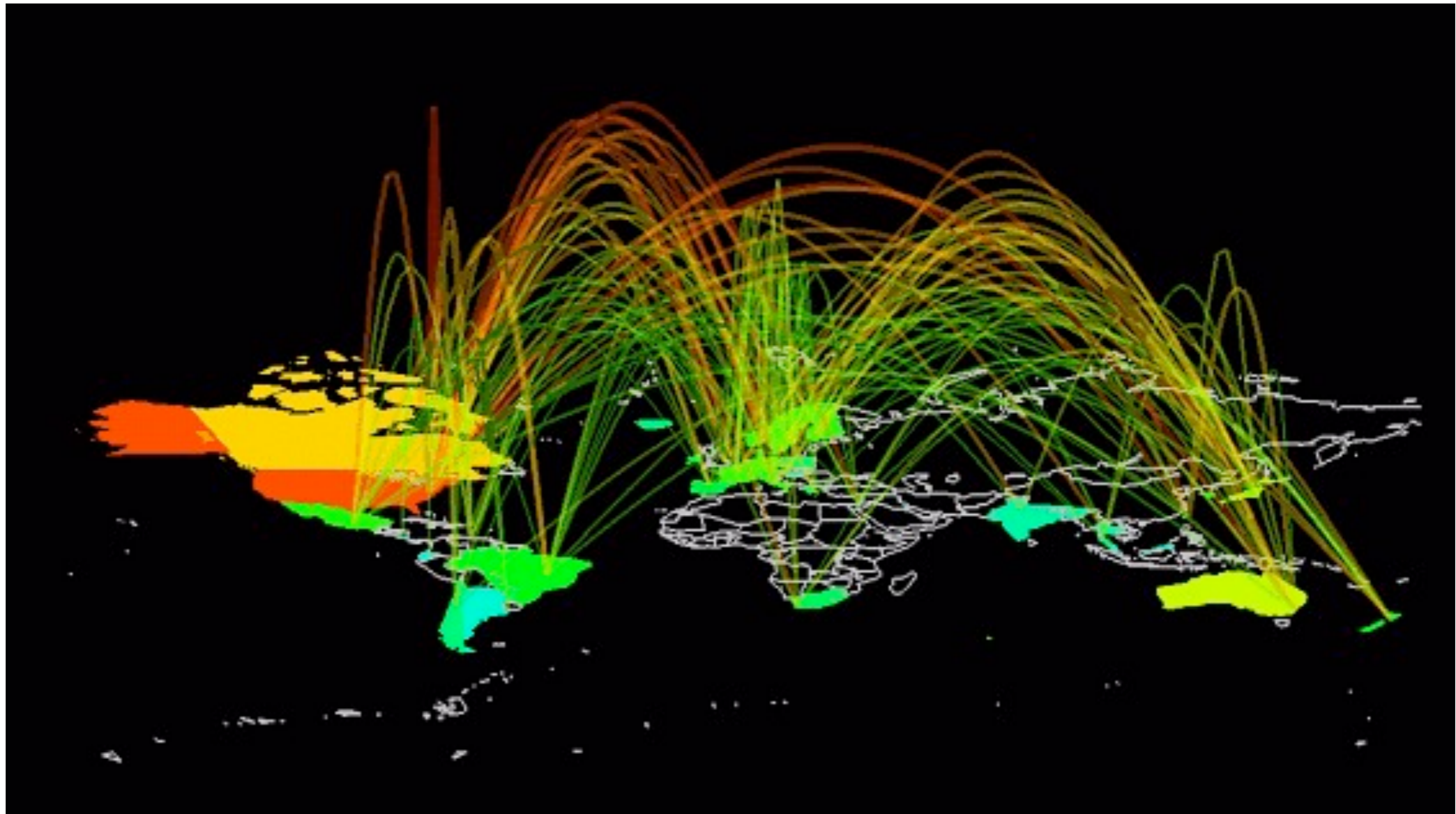
Border Gateway Protocol (BGP)

- Protocol backing the core routing decisions on the Internet
- Table of IP networks ('prefixes', e.g. 44.0.0.0/8)
- Fully decentralized routing
- Used by ISPs, not users

BGP tables



Internet Traffic



Source: Stephen Eick, Bell Labs / Visual Insight

Questions/Suggestions?

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