

# Interesting Activations

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- Network control and measurement
  - » flow and congestion control (self payment)
  - » measurement (at intermediate nodes)
  - » real-time self-expiring packets
- Security, e.g., SYN attack filter
- Sanity, e.g., Anti-spam filter
- Break “invisibility” of data link layer
- Inverse multicasting
- Stop thinking of routing as infrastructure!

# Questions for Active Networking

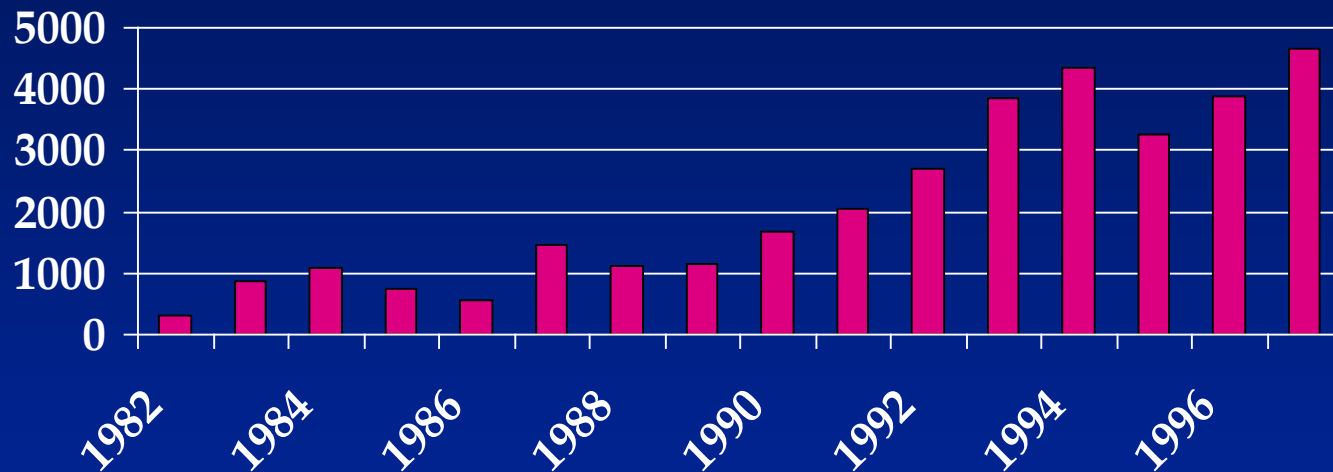
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- How to do it
- Where (not whether) to do it:
  - » under IP
  - » IP
  - » over IP
  - » management plane, applications, etc.
- Can it be deployed?
- Should we do research or just engineering?

# Internet: Rhetoric & Reality

Rhetoric	Reality
“Adding New Protocols is EASY”	RFC 1112, 1989 Ubiquitous Multicast, 2009? ☺
“End to End Mantra”	Omm..ummm..ISSLL...omm...
“Intelligence at the Hosts”	Why not source routing???
“IP can run over two cans and a string”	And TCP can't figure out if the string is congested or fraying...

# RFC Pages by Year 1982-1997



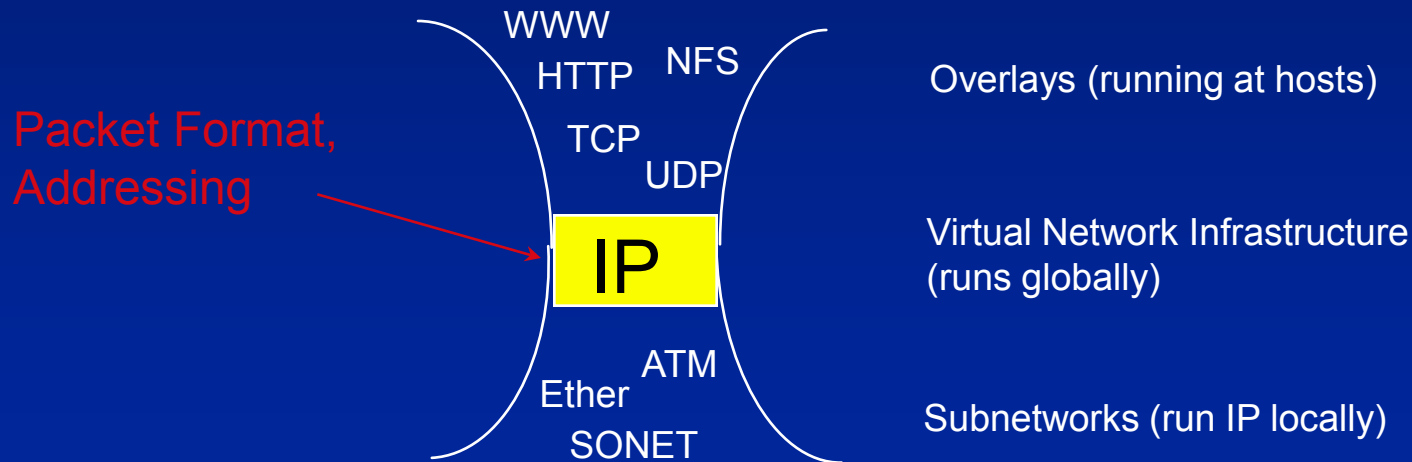
And 13797 pages draft in '97 (9/16/97)....

# Active Networks vs. Passive Networks...

Requirements of Network Infrastructure	Passive Network	Active Network
SECURITY	IPSEC, but Security is NOT == Cryptography	All Passive Notw., PLUS
INTERACTIVE	RSVP w/issl, perhaps by 21st century?	Define Real-time Services
VIRTUALIZED RESOURCES	Addresses, Packet Format, Link B/W	Arbitrary
TIME TO DEPLOY CHANGES	5-8 Years (viz MBONE, RSVP)	Propagation Delay...
STATUS	25 years work, deployed, tinkering...	Research, started Summer 1996

# Virtual Infrastructures, e.g., IP

- IP is a network interoperability layer
- Interoperable through minimality:



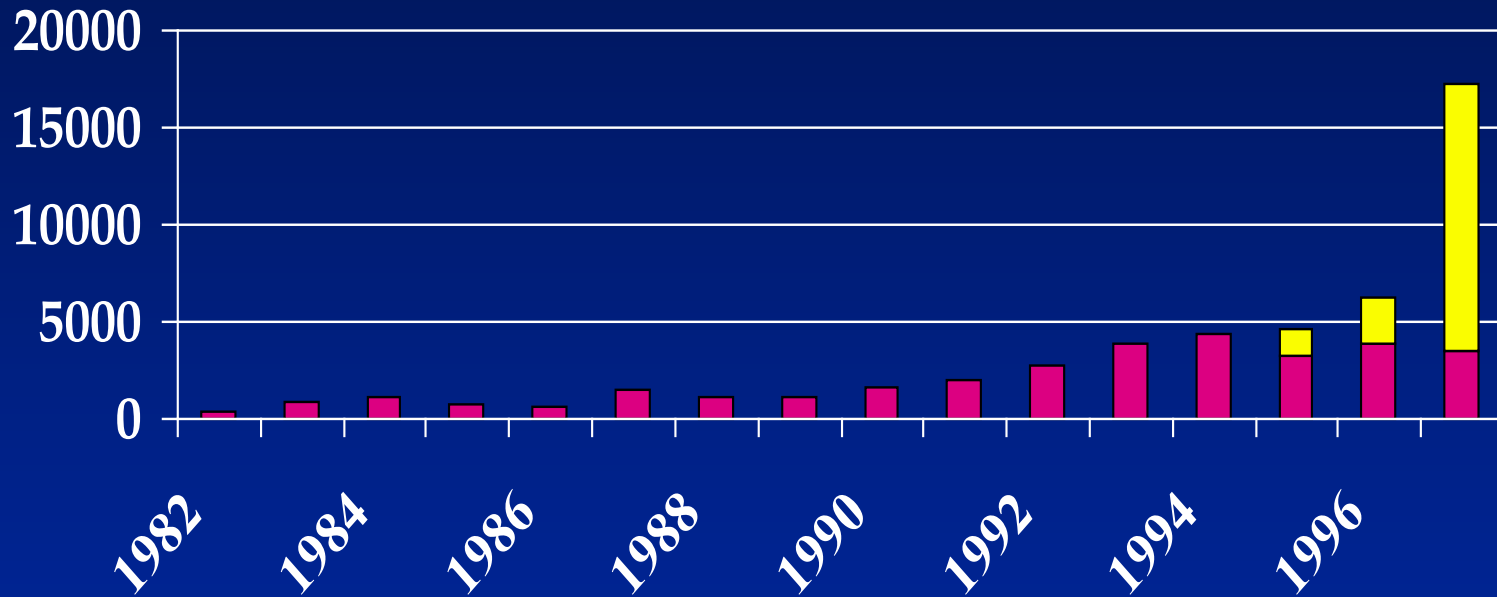
Why not a higher level of abstraction???

# SwitchWare Applications: And with the Internet???

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- Self-Paying Information Transport
  - » Routing by economics; policy with \$\$\$
- Use Multiple Routes other than failover
  - » Route BONDing (striping)
  - » Diversity routing
- Sensor fusion, DNS & WWW caches, etc.
  - » Address latency with *Architecture*

# RFC Pages 1982-Fall 1997



- Draft pages overlaid since 1995
- $\log(f(\text{pages}, \text{year})) > \log(f(\text{users}, \text{year}))$ ?