CS551
Watching the Waist of IP [Deering98a]

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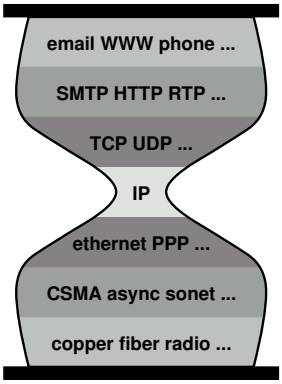
The Protocol Hour Glass



Key Ideas

- Discuss the role of the IP layer
  - should it grow or be replaced
- What does the IP layer need (according to deering)
  - minimal functionality
    - corollary: minimal functionality from link layer

Why A Single, Narrow Protocol?

- Why single:
  - maximize interoperability
  - minimize amount of work needed to support new protocols
- Why narrow:
  - minimize requirements from lower layers
  - end-to-end argument: don't want to weigh down IP with a bunch of things that are unnecessary by many of its users

What Are The Key IP Properties?

- Small and simple
  - connectionless datagram
- Global addressing
  - maximize connectivity
  - much harder to provide global addressability at higher layer
  - enable applications (e.g., peer-to-peer file sharing)
  - *but* addressability make security harder => NAT boxes, firewalls

Why Add To Or Change IP?

- More features are cooler
  - QoS, multicast, ...
- More features make more money
  - TCP "helpers", reliable multicast, packet-intercepting caches, "content-based routing", active networking
- Replacing it makes lots of money
  - and could do new things if everyone buys in
  - e.g., ATM
- Have short-term (?) problems that have to be solved (via work-arounds)
  - address space size: NAT

Other Questions/Observations?

- Active network: idea that end-users (or admins) should be able to reprogram the network
- Size of IP header: 40B (is this a problem?)
  - interactions with ATM or other link-layers with short MTUs
  - could be problem (high overhead) for telnet
- QoS and multicast
  - why not deployed? increase assumptions lower layers, we need to change all routers, not everyone needs services, difficult to transfer research into company, may be can do these things above IP