Watching the Waist of IP [Deering98a]

CSci551: Computer Networks
SP2006 Thursday Section
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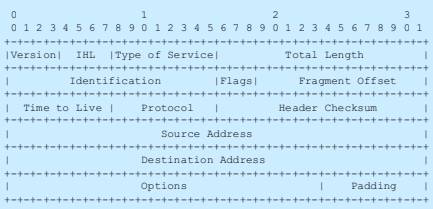
Key ideas

- why IP?
  - what are the problems with it
  - or the challenges facing it
- argues for a *simple* protocol
  - hourglass and narrow waist
- consider alternatives to IP

IP (v4)



[Postel81a, figure 4]

Why a single, narrow protocol?

- Deering wants IP to be the single, narrow waist of the hourglass
- Why single:
  - for interoperability: to allow people to talk, they must use the same language
- Why narrow:
  - imposes few constraints on what link layers you build over
- what is the downside of narrow?
  - may not get functionality (ex. reliability)

What are the key IP properties?

- small and simple
  - connectionless datagram
- (single and narrow)
- global addressing
  - all hosts have an IP address
  - unform addresses (32-bits)
  - routing is easy (just route on address, to the destination)
  - optimization: subnetting (hidden hierarchy in the IP address)
  - in principle, you can send to anyone

Why does global addressing matter?

- (or what was enabled by global addressing?)
- world wide web
  - URLs map to servers anywhere
- peer-to-peer
  - only possible because everyone can talk to everyone else

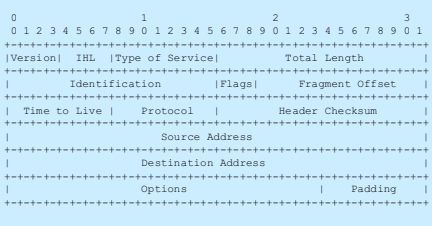
What breaks global addressing?

- new protocols (like IPv6, or better: ATM)
- Network Address Translation (NAT)
  - outside (1 address) -- BOX– inside (several computes)
  - can't easily contact computes behind the NAT box
- Deering's point
  - breaks some applications
  - changes the fundamental design of the internet

Why add to or change IP?

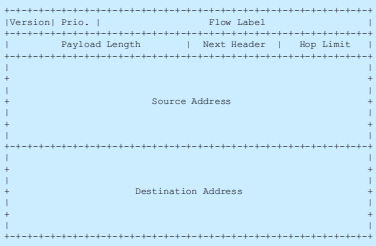
- lack of addresses
  - look at IPv6 AND NAT to fix
- do new stuff
  - QoS, multicast, reliability, performance

IP (v4)



[Postel81a, figure 4]

IPv6



from [Deering95a]

IPv6

from [Deering95a]

What about Other Networks?

- examples of other nets
  - sensor nets
  - optical networks
  - wireless
  - cell phones
- use IP or not?
  - yes of course--- one viewpoint
    - ex: cell phone world going IP in every handset
  - or maybe not:
    - ex: optical may prefer circuit switching0

Other questions/observations?

- some of the strange terms don't matter (today)
  - like LANE, NHRP, etc.\