IPv6 and Overlays

EE122
Introduction to Communication Networks
Discussion Section

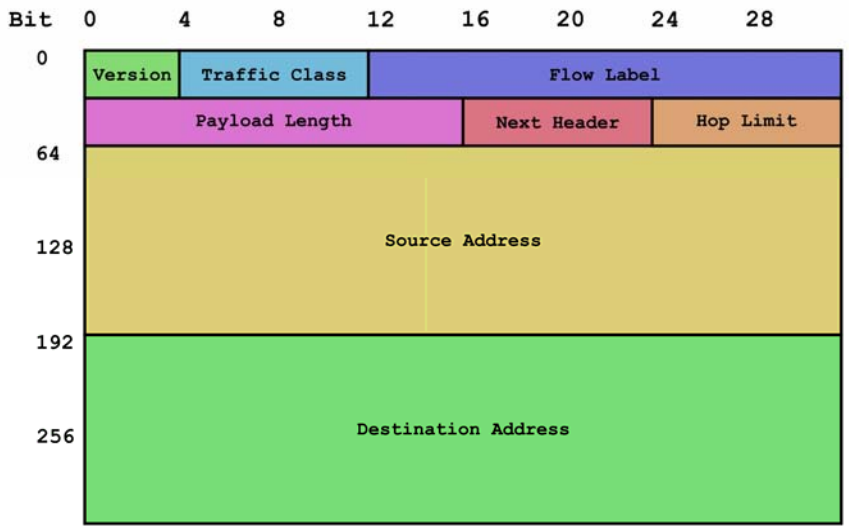
IPv6: Motivation

- Need for a larger address space
  - Explosive growth
  - Under-utilization by class A/B/C addresses

- Minus
CIDR, NAT increase usable address space

+ Plus
Wireless sensor networks, ubiquitous computing require small devices have IP addresses

Packet Format



From wikipedia

Larger address is not everything

- Headers structure is made to improve the performance of routing (from wikipedia)
- No fragmentation
  - PMTU discovery is needed
- No checksum
- Flow label – QoS management
- IPsec
- Multicast

Comparison of IPv4 and IPv6

	IPv4	IPv6
Address Size	32 bits	128 bits
Fragmentation	Supported	Not supported
Checksum	Yes	No
QoS	No	Yes
IPsec	No	Yes
Multicast	No	Yes

Limitation of IP layer services

- QoS
  - Payment issue
- IPsec
  - End-to-End argument
- Multicast

Internet Today

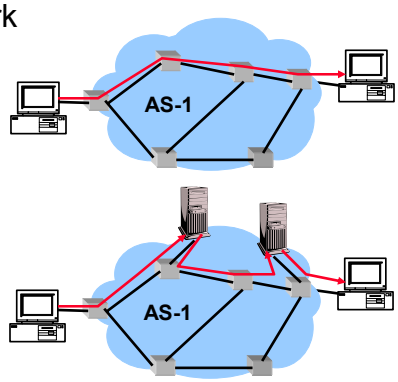
- Changes in the network happen very slowly
  - IPv6 not deployed widely yet
  - Other examples: IPSEC (93), IP Multicast (90)
- Why?
  - Internet network is a shared infrastructure; need to achieve consensus (IETF)
  - Many of proposals require to change a large number of routers (e.g., IP Multicast, QoS); otherwise end-users won't benefit
  - One size does not fit all
    - Different applications have different requirements

Goals

- Make it easy to deploy new functionalities in the network → accelerate the pace of innovation
- Allow users to customize their service

One Solution

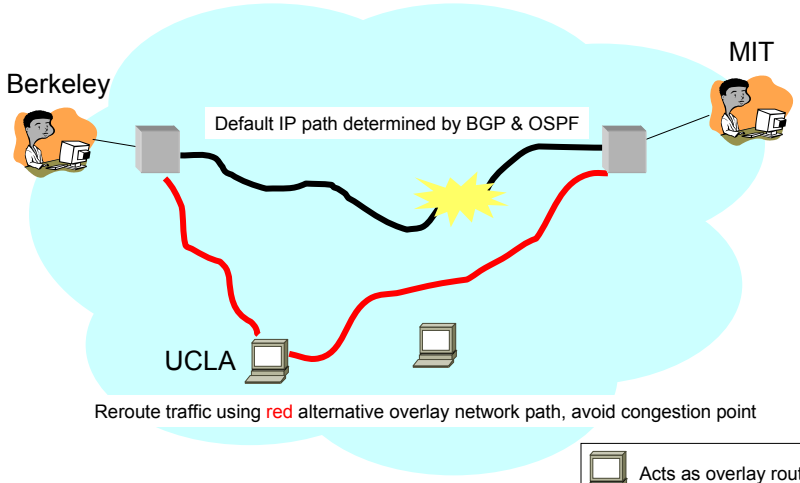
- Deploy processing in the network
- Have packets processed as they traverse the network



IP

Overlay Network
(over IP)

Example



Reroute traffic using red alternative overlay network path, avoid congestion point

Acts as overlay router

Resilient Overlay Network (RON)

- Premise: by building application overlay network, can increase performance and reliability of routing
- Install N computers at different Internet locations
- Each computer acts as an overlay network router
  - Between each overlay router is an IP tunnel (logical link)
  - Logical overlay topology is all-to-all (N^2)
- Computers actively measure each logical link in real time for
  - Packet loss rate, latency, throughput, etc
- Route overlay network traffic based on measured characteristics

What about P2P networks?

- Some overlays are p2p networks
- Some p2p networks are overlays