CS 640 Introduction to Computer Networks

Lecture 21

Today's lecture

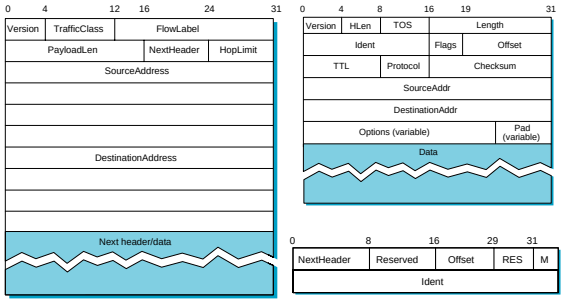
- IPv6
- Source routing
- Connection oriented networks
  - ATM

IP version 6

- Proposed successor of IPv4
- Uses 128 bit addresses

  - IP address includes 48 bit MAC address
  - Renumbering still necessary when network moves to different provider
- Simplifies header to allow more efficient packet processing at routers

IPv6 header



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Source routing

- Source puts in each packet all routers on the path to destination
  - Much control for source
  - Source needs to know topology
  - Forwarding is simple
- Loose source routing
  - Only specify some routers the packet has to go through
- Part of IP protocol
  - Implemented with options
  - Usually turned off at routers – easily misused

Forwarding architectures

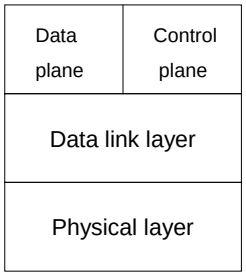
- Datagram
  - Based on globally unique destination address
    - Longest prefix match
- Source routing
  - Source specifies full path in each packet
- Virtual circuits
  - Based on locally unique (link local) virtual circuit identifier
    - Exact match

Sharing in data networks

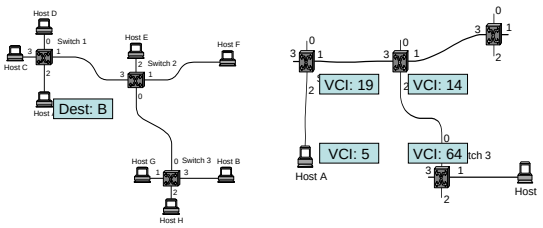
Network	Internet	Phone network
Network service	IP datagrams	Calls
Multiplexing ex.	Statistical multiplexing	TDM
Good for voice	Yes	Yes
Good for data	Yes	No
Forwarding	Complex	Simple

Control plane versus data plane

- Datagram model
  - Data plane – forwarding
  - Control plane – routing
- Virtual circuits
  - Data plane – switching
  - Control plane – circuit setup (and teardown)
- Control and data plane present in higher layers also (e.g. TCP)



Datagram vs. virtual circuit



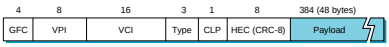
Virtual circuit forwarding

- Very simple (in hardware)
- Virtual circuit identifier smaller than globally unique endhost addresses
- If any switch on the path fails, circuit is gone
  - Can "reboot" control plane only
- Easier to provide *quality of service* (QoS)

Forwarding table for switch 1

Incoming		Outgoing	
Interface	VCI	Interface	VCI
2	5	1	19
…			

ATM (Asynchronous Transfer Mode)



- Technology used since late 80s for telephony
  - Used for data (layer 2 for IP backbones)
- Uses small fixed size "cells" – 48 bytes of payload
- Identifier divided into two:
  - Virtual path identifier (a path bundles many circuits)
  - Virtual circuit identifier
  - Some switches only look at VPI
- Segmentation and reassembly done at ends of VCI
- ATM switches were faster and cheaper than IP routers