CS3200: Computer Networks

Lecture 23

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IMCP — The Internet Control Message Protocol

- The operation of the Internet is monitored closely by the routers. When something unexpected occurs during packet processing at a router, the event is reported to the sender by **ICMP**.
- ICMP is also used to test the Internet.

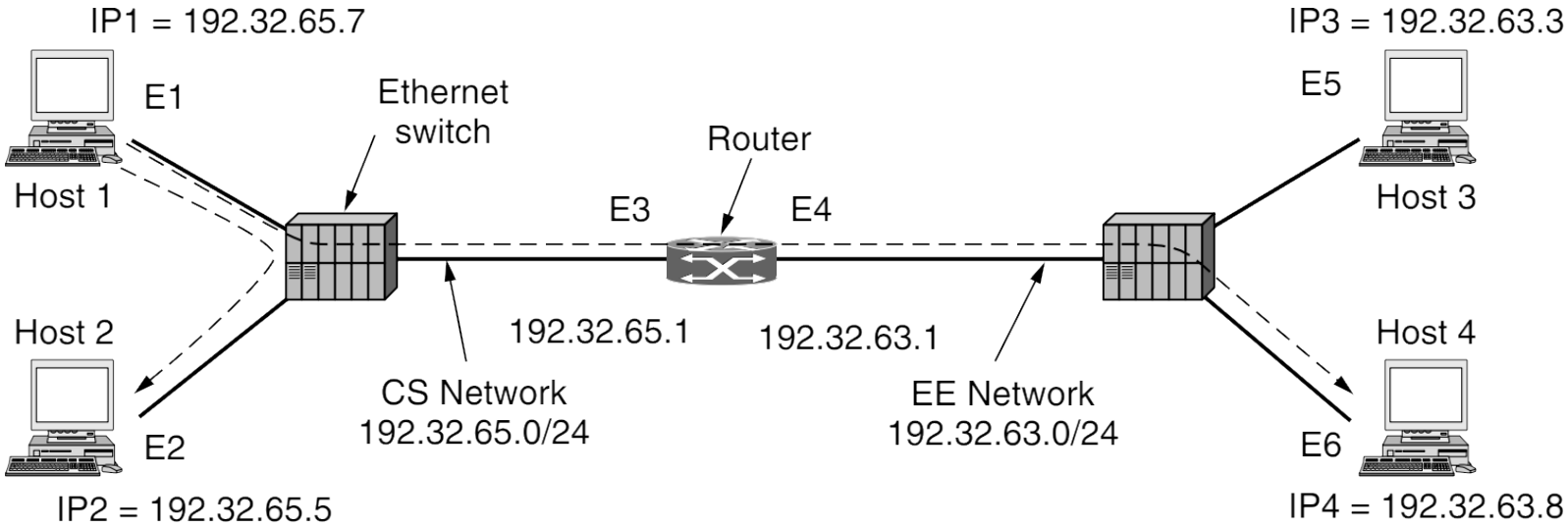
Message type	**Description**
Destination unreachable	Packet could not be delivered
Time exceeded	Time to live field hit 0
Parameter problem	Invalid header field
Source quench	Choke packet
Redirect	Teach a router about geography
Echo and echo reply	Check if a machine is alive
Timestamp request/reply	Same as Echo, but with timestamp
Router advertisement/solicitation	Find a nearby router

ARP — The Address Resolution Protocol

- Although every machine on the Internet has one or more IP addresses, these addresses are not sufficient for sending packets.
- Data link layer NICs (Network Interface Cards) such as Ethernet cards do not understand Internet addresses.
- In the case of Ethernet, every NIC ever manufactured comes equipped with a unique 48-bit Ethernet address.
- How do IP addresses get mapped onto data link layer addresses, such as Ethernet?

ARP — The Address Resolution Protocol

Now let us look at Fig. 5-61 again, only this time assume that host 1 wants to send a packet to host 4 (192.32.63.8) on the EE network.



Frame	Source IP	Source Eth.	Destination IP	Destination Eth.
Host 1 to 2, on CS net	IP1	E1	IP2	E2
Host 1 to 4, on CS net	IP1	E1	IP4	E3
Host 1 to 4, on EE net	IP1	E4	IP4	E6

getting destination IP is easy however, it still needs some way to find the destination's Ethernet address to send the frame. A better s

DHCP — The Dynamic Host Configuration Protocol

- ARP (as well as other Internet protocols) makes the assumption that hosts are configured with some basic information, such as their own IP addresses.
- How do hosts get this information? It is possible to manually configure each computer, but that is tedious and error-prone. There is a better way, and it is called **DHCP (Dynamic Host Configuration Protocol)**.
- With DHCP, every network must have a DHCP server that is responsible for configuration.

DHCP — The Dynamic Host Configuration Protocol

- Much like ARP, the computer broadcasts a request for an IP address on its network. It does this by using a DHCP DISCOVER packet. This packet must reach the DHCP server.
- If that server is not directly attached to the network, the router will be configured to receive DHCP broadcasts and relay them to the DHCP server, wherever it is located.
- When the server receives the request, it allocates a free IP address and sends it to the host in a DHCP OFFER packet (which again may be relayed via the router).
- Just before the lease expires, the host must ask for a DHCP renewal. If it fails to make a request or the request is denied, the host may no longer use the IP address it was given earlier.