

# **Inter-networking**

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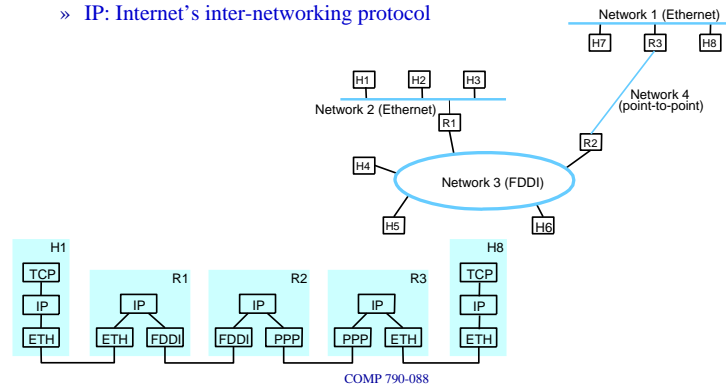
### **What Issues Will We Focus On?**

- ◆ We've seen single-network technologies so far:
  - » Point-to-point links, shared media, switches
  
- ◆ But Internet is a conglomeration of different networks
  - » Heterogeneity:
    - ❖ Different networks use different link-layer protocols
    - ❖ *How to interconnect these?*
  - » Scale:
    - ❖ Internet composed of hundreds of thousands of networks
    - ❖ *How do achieve global scale in routing and addressing?*
  
- ◆ Basic approach:
  - » Define a layer with a simple service model
  - » Use hierarchy in addressing and routing

## IP: The Internet Protocol

### Internet's Network Layer

- ◆ Internet: largest working example of an internetwork
  - » Inter-networks: inter-connection of networks with different technologies
  - » Routers: nodes that connect different networks
  - » IP: Internet's inter-networking protocol



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## IP Service Model

### The Hour-glass Design

- ◆ Observation:
  - » The internetworking layer can provide a service only if service supported by *each* underlying physical network
- ◆ Approach:
  - » For supporting heterogeneity in underlying technologies, make the IP service model extremely simple
- ◆ Best-effort datagram delivery:
  - » Packets may be lost
  - » Packets may be delivered out of order
  - » Duplicate copies may be delivered
  - » Packets can be delayed for a long time

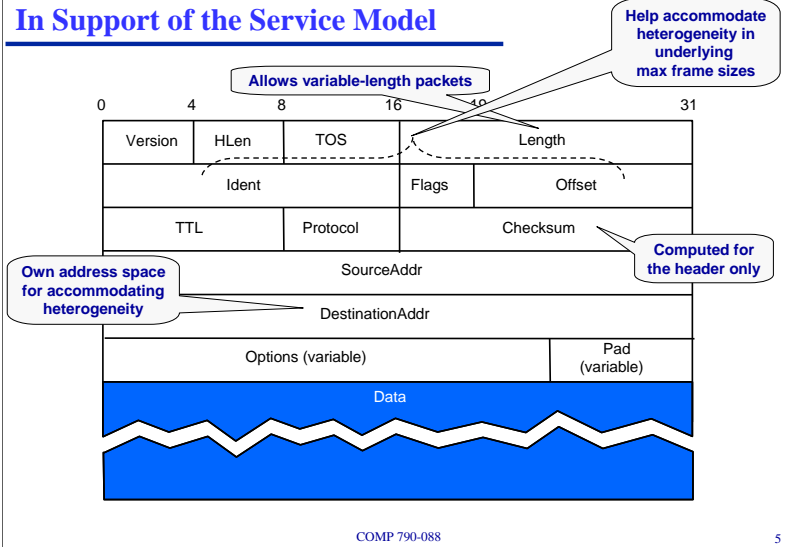
**Ability of IP to run over anything is its greatest strength !**

COMP 790-088

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# IP Datagram

## In Support of the Service Model



# Fragmentation and Reassembly

## Dealing with Heterogeneous MTUs

- ◆ Each network has a maximum transmission unit (MTU)
  - » Largest IP datagram it can carry
- ◆ IP fragments when necessary (MTU < Datagram length)
  - » All fragments assigned same unique *Ident* value
    - ❖ Fragments are self-contained datagrams
    - ❖ Re-fragmentation is possible
  - » Delays reassembly until destination host
  - » Attempts to avoid fragmentation at source host

