

Internet Routing

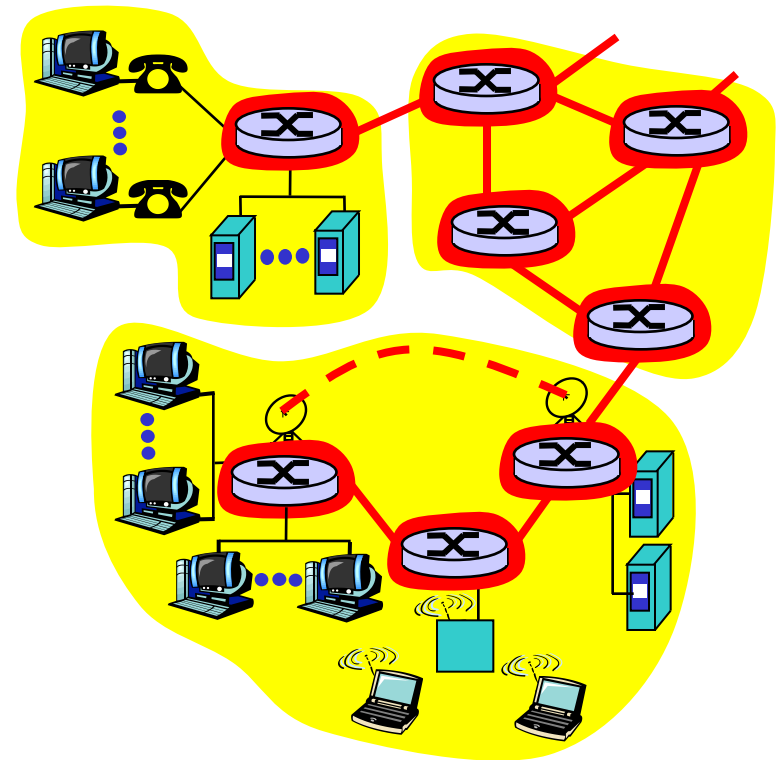
Review of Networking Principles

Principles of the Internet

- ❑ Edge vs. core (end-systems vs. routers)
 - Dumb network
 - Intelligence at the end-systems
- ❑ Different communication paradigms
 - Connection oriented vs. connection less
 - Packet vs. circuit switching
- ❑ Layered System
- ❑ Network of collaborating networks

The network core

- ❑ Mesh of interconnected routers
- ❑ ***The fundamental question:***
How is data transferred through net?
 - **Circuit switching:**
Dedicated circuit per call: telephone net
 - **Packet switching:** Data sent through net in discrete “chunks”



Routing

□ Goal

Move pkts among routers from src to dst

□ Datagram network

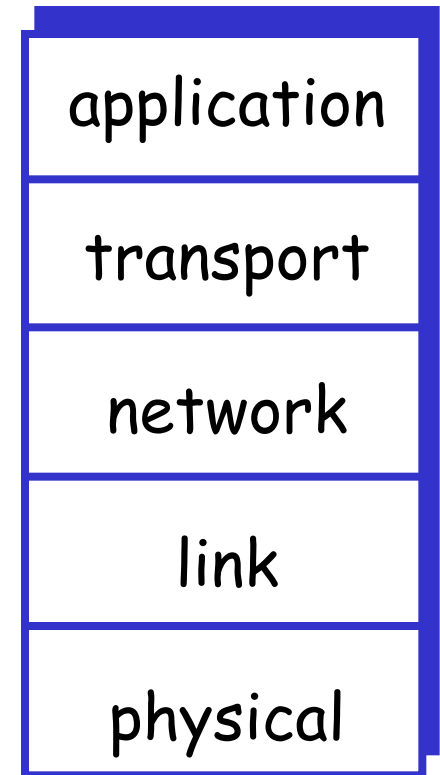
- *Destination address* determines next hop
- Routes may change during session

□ Virtual circuit network

- Each packet carries tag (virtual circuit ID), tag determines next hop
- Fixed path determined at *call setup time*, remains fixed through call
- Routers maintain per-call state

Internet protocol stack

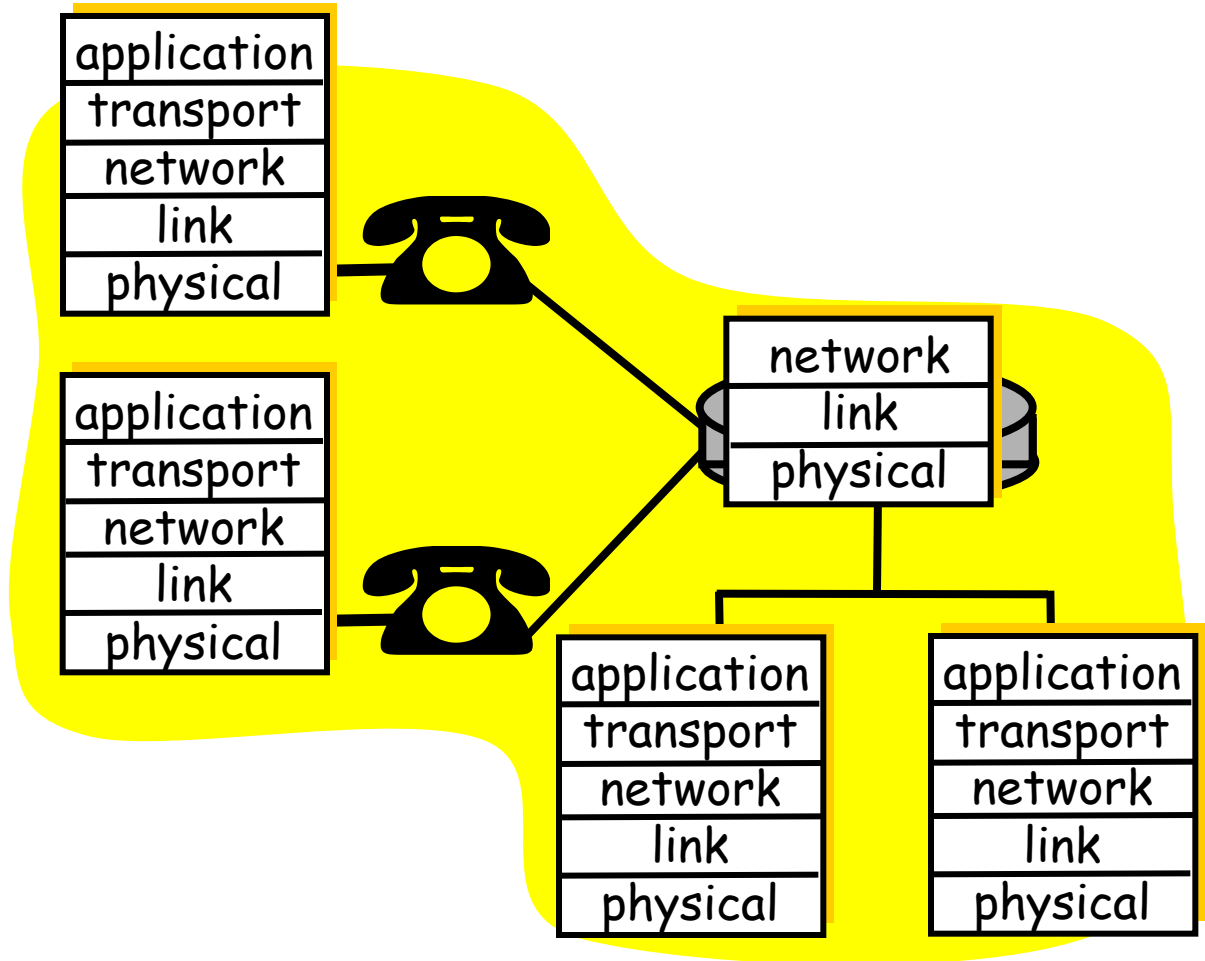
- ❑ **Application:** supporting network applications
- ❑ **Transport:** host-host data transfer
- ❑ **Network:** uniform format of packets, routing of datagrams from source to destination
- ❑ **Link:** data transfer between neighboring network elements
- ❑ **Physical:** bits “on the wire”



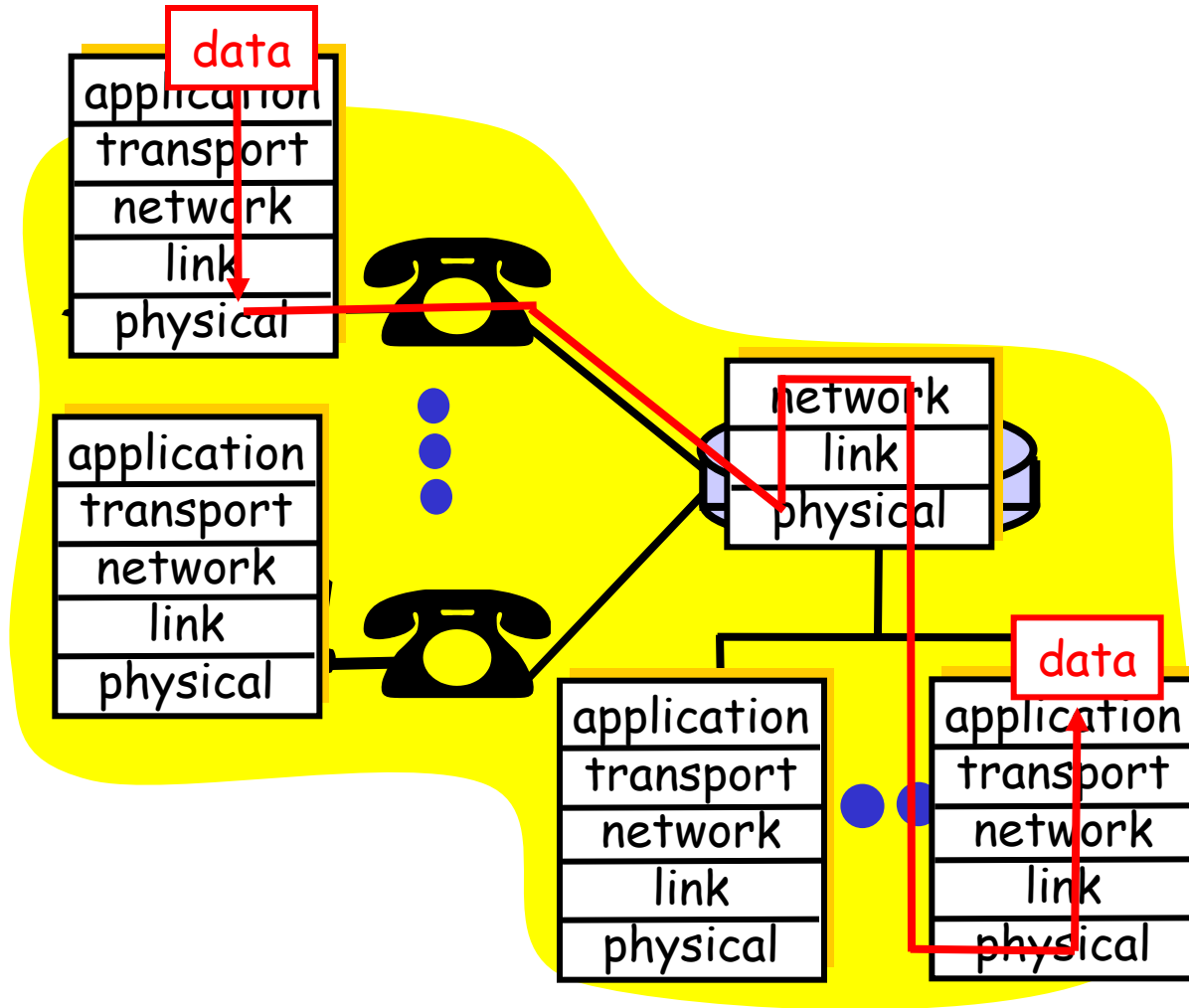
Layering: Logical communication

Each layer:

- Distributed
- "Entities" implement layer functions at each node
- Entities perform actions, exchange messages with peers



Layering: Physical communication



Internet structure: Network of networks

- ❑ Roughly hierarchical
- ❑ **National/international backbone providers (NBPs)**
 - E.g., BBN/GTE, Sprint, AT&T, IBM, UUNet
 - Interconnect (peer) with each other privately, or at public Network Access Point (NAPs)
- ❑ **Regional ISPs**
 - Connect into NBPs
- ❑ **Local ISP, company**
 - Connect into regional ISPs

