ROSE-HULMAN
INSTITUTE OF TECHNOLOGY

CSSE 490
Network Security

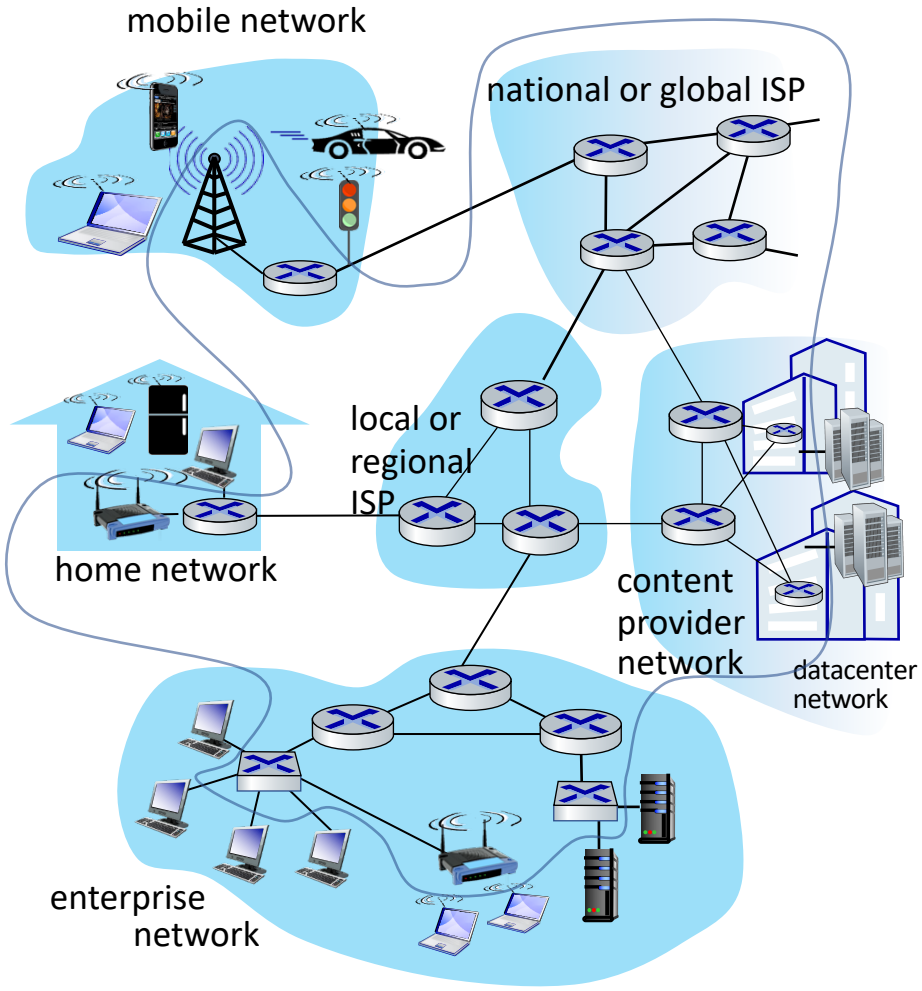
Day 3

Today's Goals

- What are networks
- What is security
- Why network security
- Internetworking primer
- The TCP/IP protocol stack
- ARP

What is a Network?

- Any two connected nodes form a network
- Internet
  - Network of networks
  - Billions of connected devices
- Hosts: end systems or devices
- Packet switches: forwarding devices



What is Security?

A system's ability to

- maintain proper operation

- in the presence of malicious inputs

The CIA Triad

- Confidentiality
- Integrity
- Availability

Why Study Network Security?

- Protection of the underlying infrastructure
- Everything is connected today
- Networks were not designed with security in mind

Why Study Network Security

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Egypt Cuts Off Most Internet and Cell Service

By Matt Richtel

Jan. 28, 2011

Sept. 12, 2013 2:19 p.m. PT

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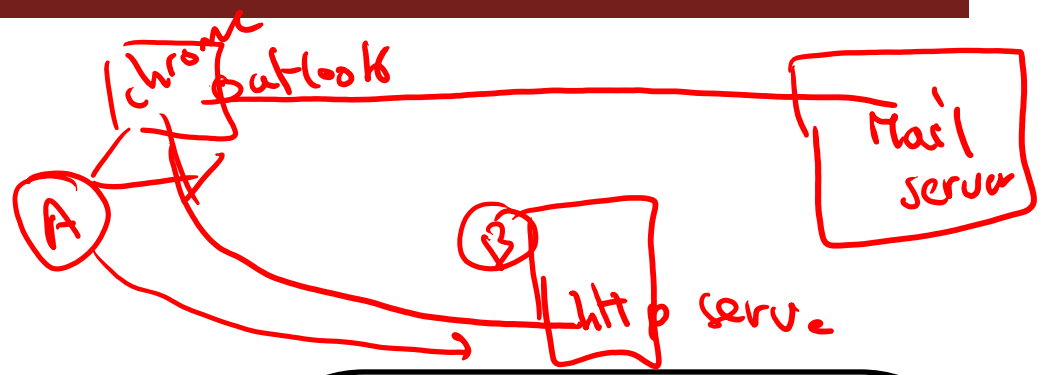
What Network Security is NOT?

- Buffer overflow attacks
- XSS scripting
- SQL injection
- Spectre and Meltdown
- Password cracking
- CSSE 340

Internetworking primer

- What do you need to communicate with another person?
- A protocol is a language that network devices use to talk
  - E.g., IP, TCP, UDP, HTTP
- Different protocols are needed to communicate effectively
  - Layered approach

Internet Protocol Stack



Layer 5:

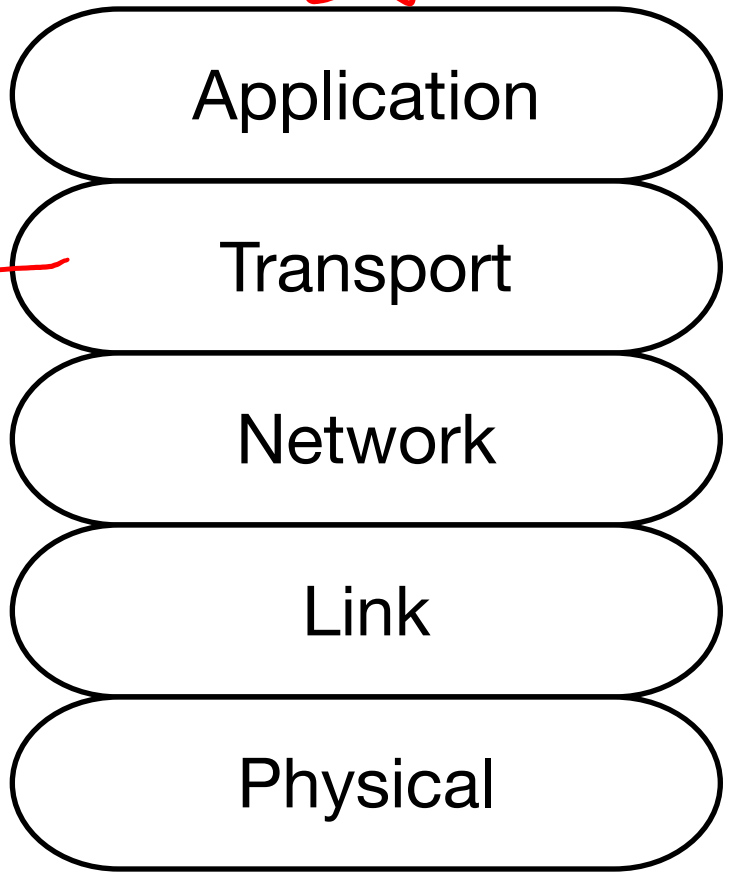
- Support networks applications

Layer 4:

- Program-Program data transfer

Layer 3:

- Source to destination routing



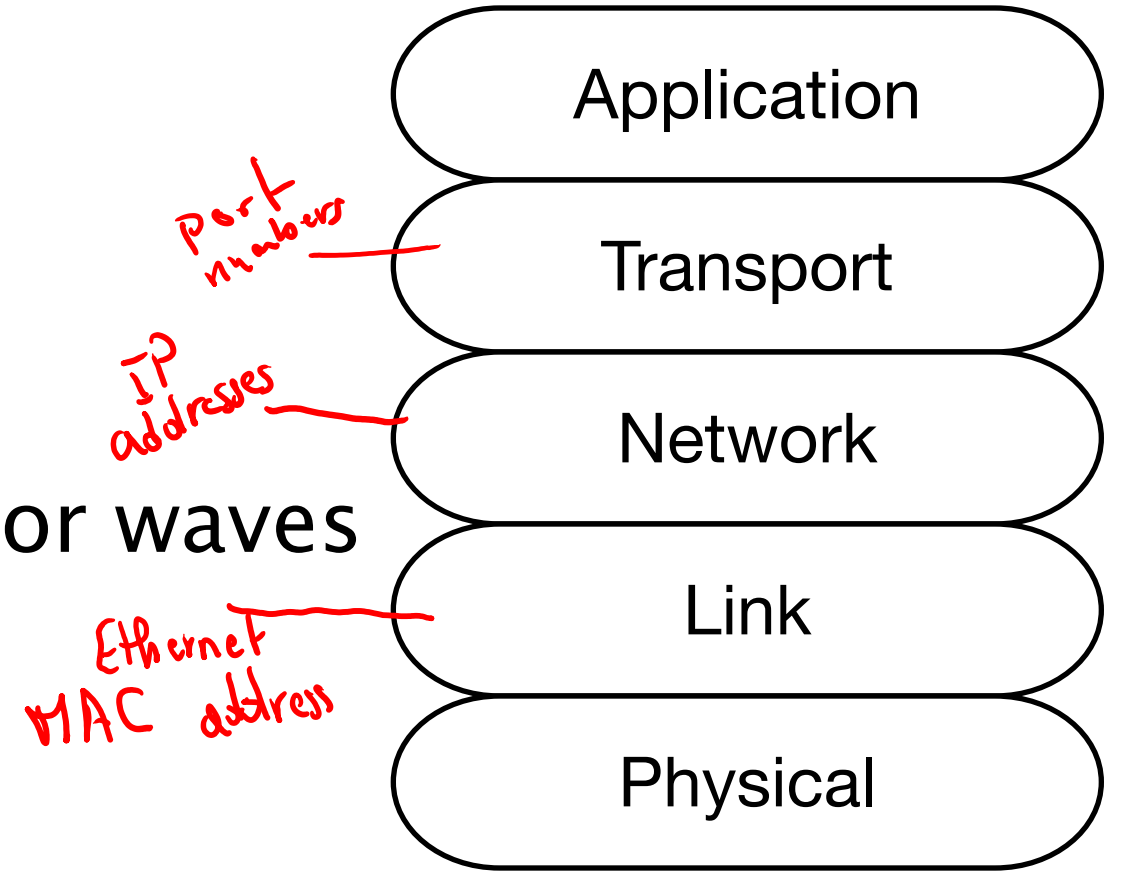
Internet Protocol Stack (continued)

Layer 2:

- Data transfer between neighbors

Layer 1:

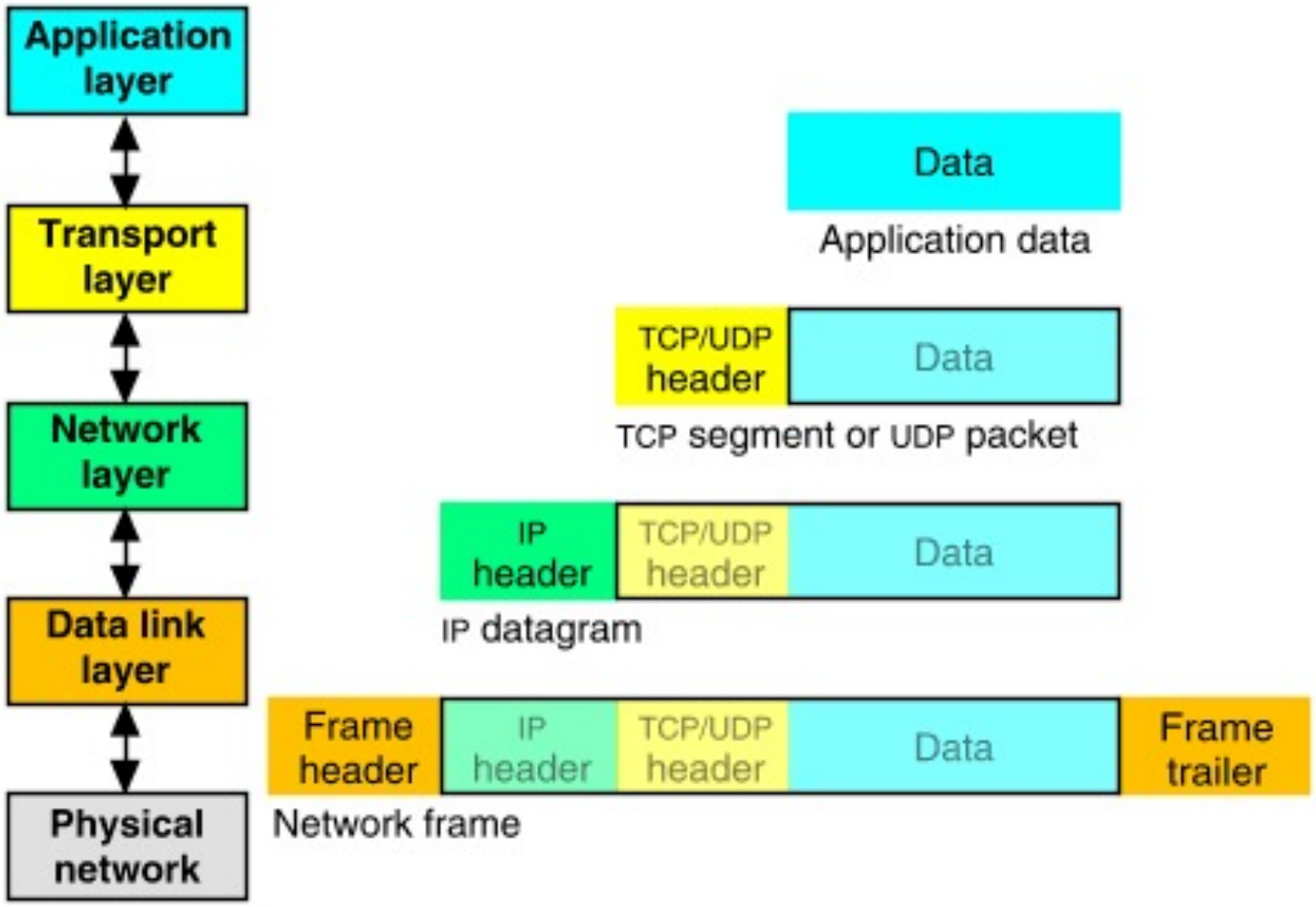
- Actual bits on the wire (or waves in the ether, etc.)



Encapsulation

- Data traversal ***down*** the network stack
- Every layer prepends a header to the data
- Each layer's data is encapsulated in the layer below's data

Encapsulation



Example: Data transmission

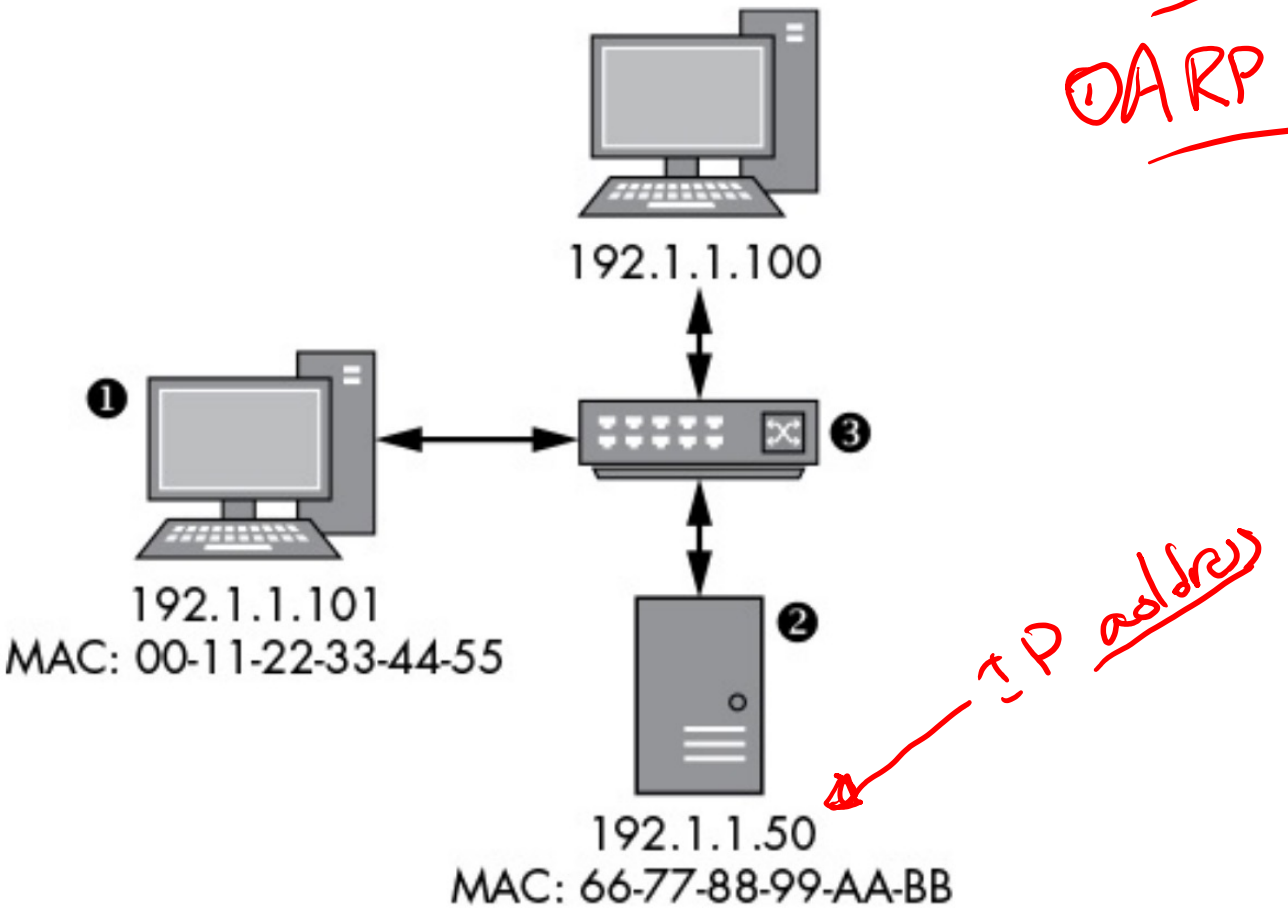
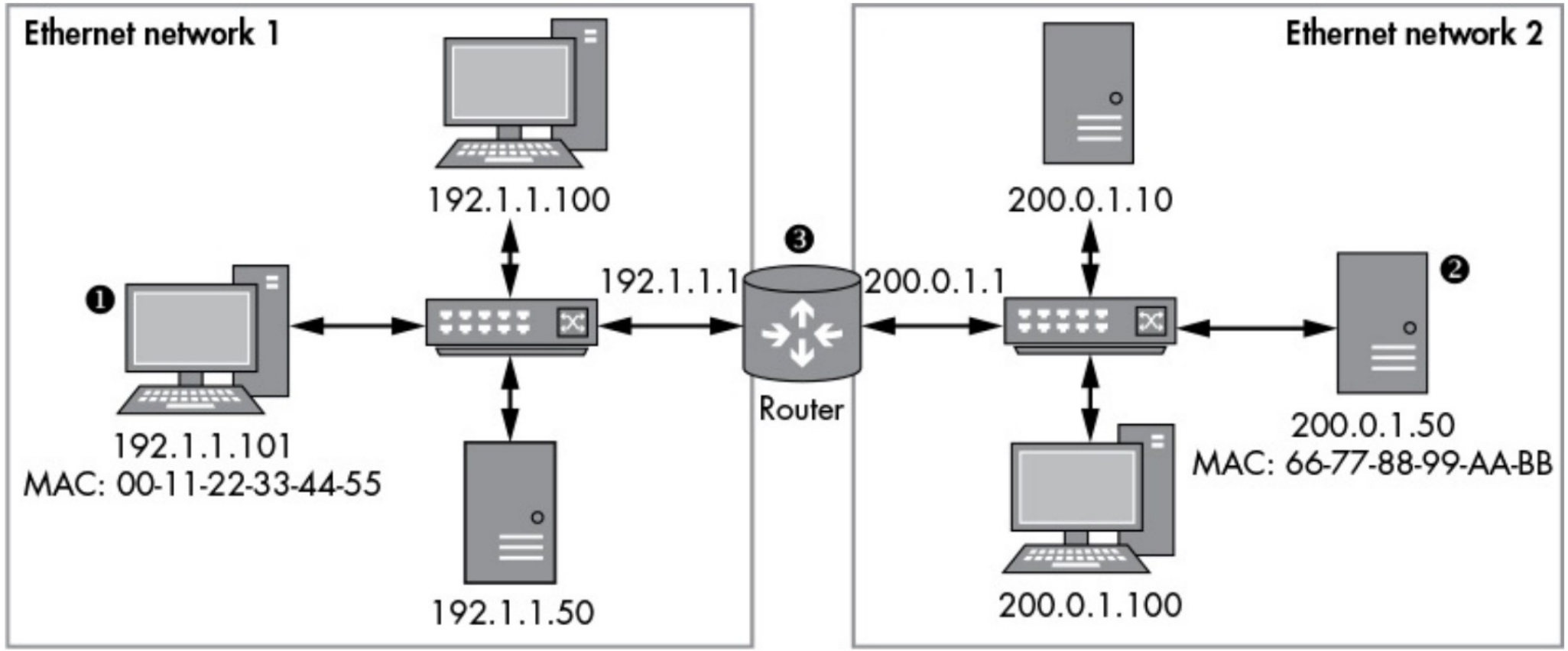


Figure from: *Attacking Network Protocols: A hacker's guide to capture, analysis, and exploitation,* James Forshaw, no starch press, 2018

Example: Network Routing



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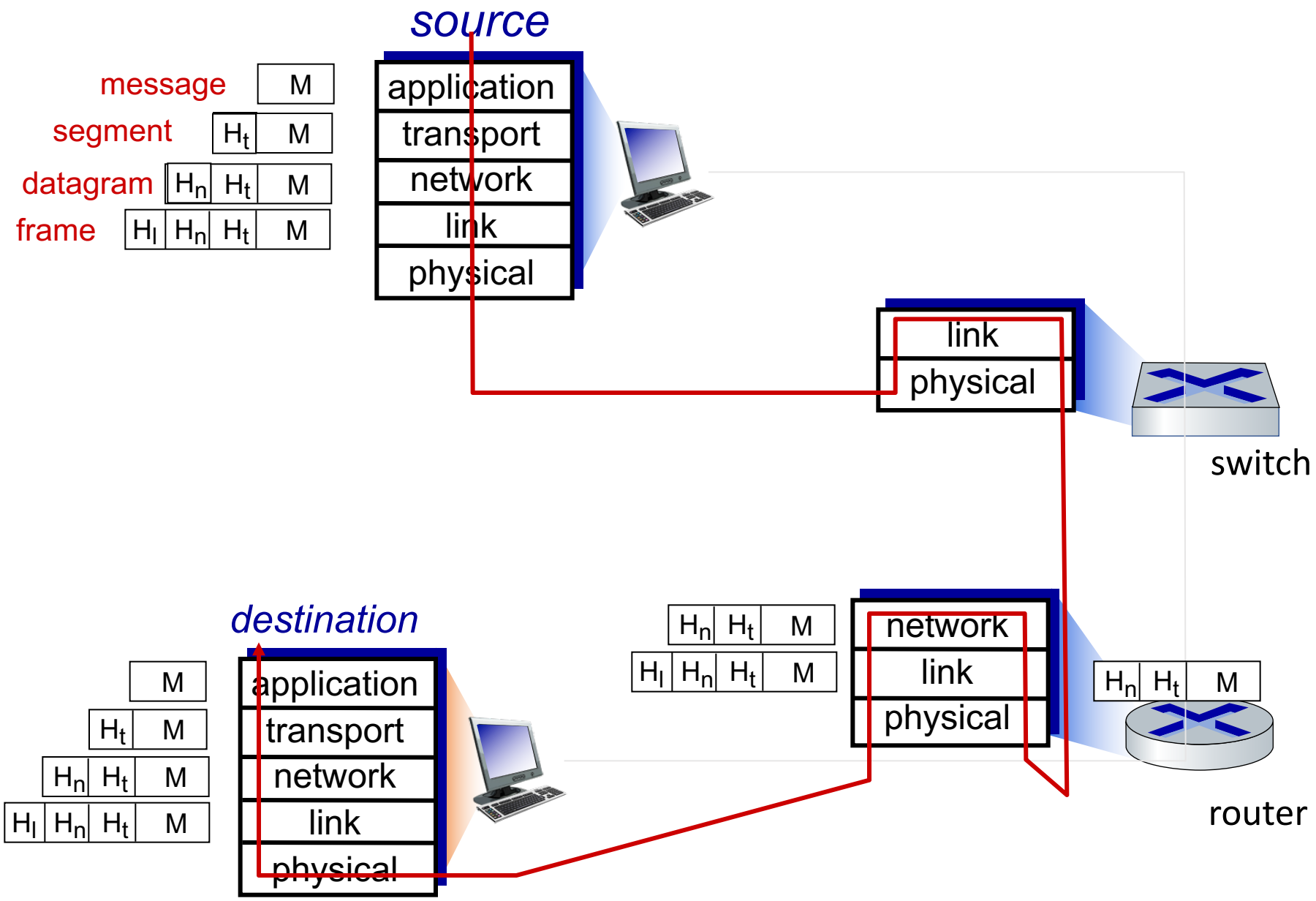

Slide from: *Computer Networking: A Top-Down Approach,* 8th edition, Jim Kurose, Keith Ross, Pearson, 2020