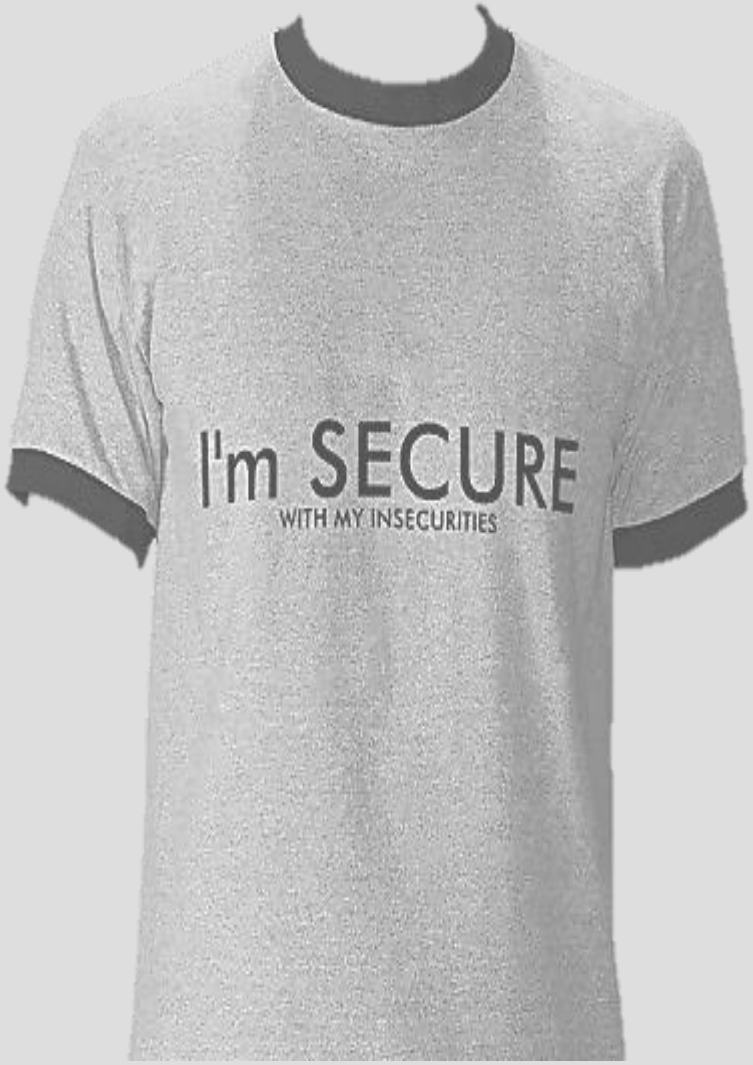
Secure Communications & Cryptography

Networking 101



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Securing Network Traffic

- To understand how safe or vulnerable our information is when we send it across the network we need to understand exactly how it is sent.

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OSI Model

	data unit	layers
Host Layers	data	**application** Network Process to Application
	data	**presentation** Data Representation & Encryption
	data	**session** Interhost Communication
	segments	**transport** End-to-End Connections and Reliability
Media Layers	packets	**network** Path Determination & Logical Addressing (IP)
	frames	**data link** Physical Addressing (MAC & LLC)
	bits	**physical** Media, Signal and Binary Transmission

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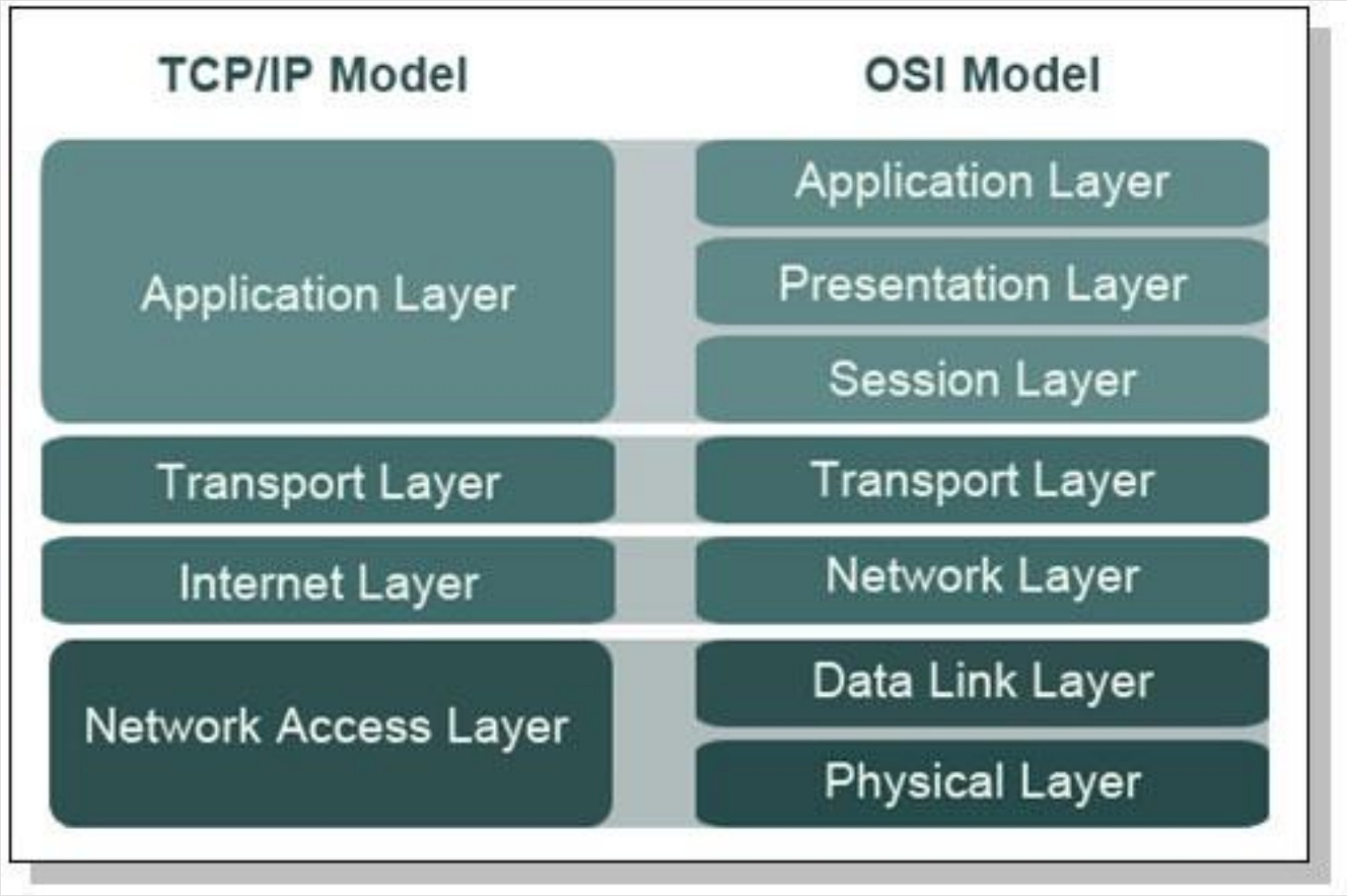
OSI Versus TCP/IP Model



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Ethernet & Switched Networks

How does Ethernet Work?

Why are modern networks fully switched?

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Wireless Versus Wired networks

- CSMA / CD (wired)
- CSMA / CA (wireless)

- Can we sniff packets like on a wired network?

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How is information sent across the internet?

IPsec
ARP
Telnet
ACK
HTTP
Subnet
CIDR
SYN
URL
TCP/IP
WAN
OSI
TCP
DNS
4 Layers
TLS
MAC
Transport Layer
Routers
VPN
SSL
FTP
Ethernet
LAN
SYN/ACK
7 Layers
UDP
SMTP
HTTPS
IP Addresses

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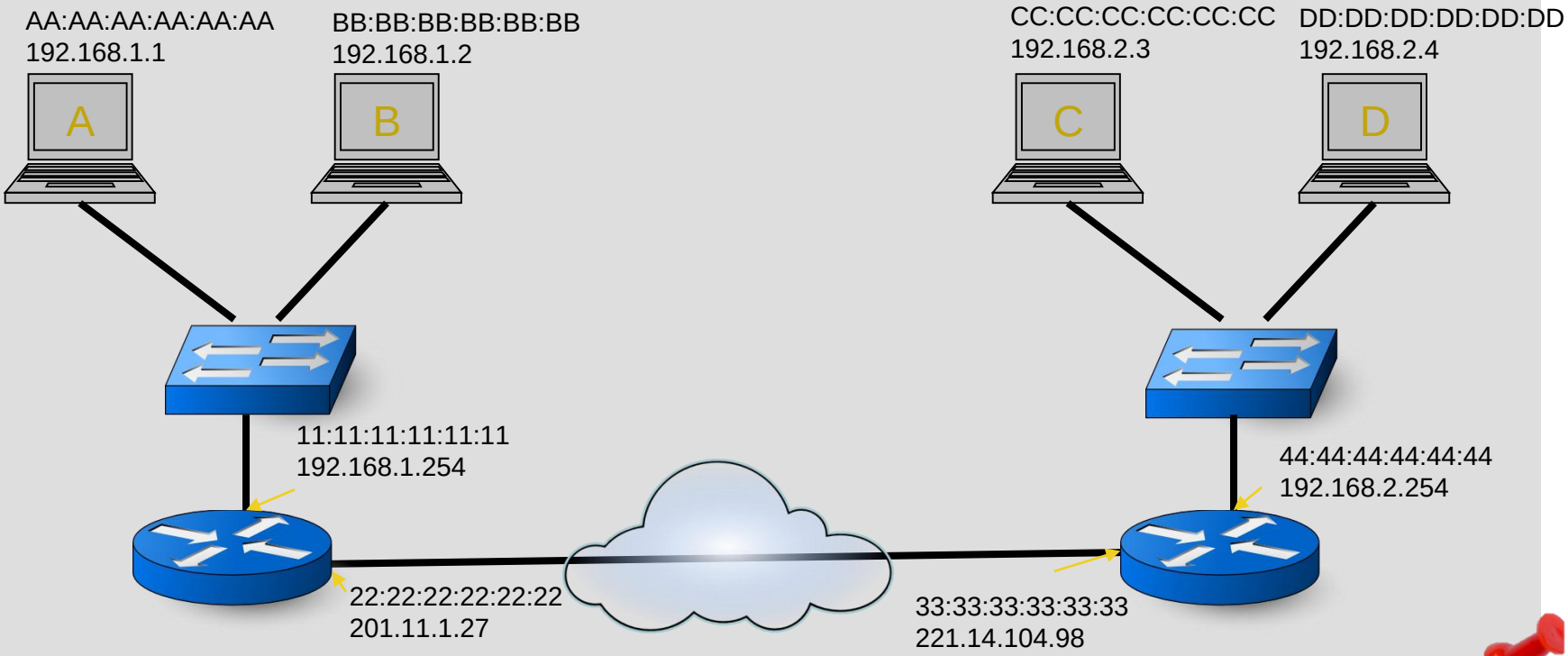
How is information sent across the internet?



Destination MAC	Source MAC	Destination IP	Source IP

Full P2P Demo

Legacy Protocols

- All of the older protocols were concerned with getting stuff to communicate.
- Security wasn't considered, until more recently.
- These unencrypted protocols are vulnerable to numerous attacks and expose networks to attack

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Types of attack

- Eavesdropping
  - Identity theft /
  - Packet capture
- Spoofing
  - Replay
  - Man-in-the-middle
  - Hijacking
- Denial of Service
  - DDOS
  - RDDOS

Smurf Attack

Fraggle Attack

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Attacking Tools

- Protocol/Network analysers, Sniffers
  - Wireshark

- Network mappers port scanners
  - Nmap

Sniffing on switched networks

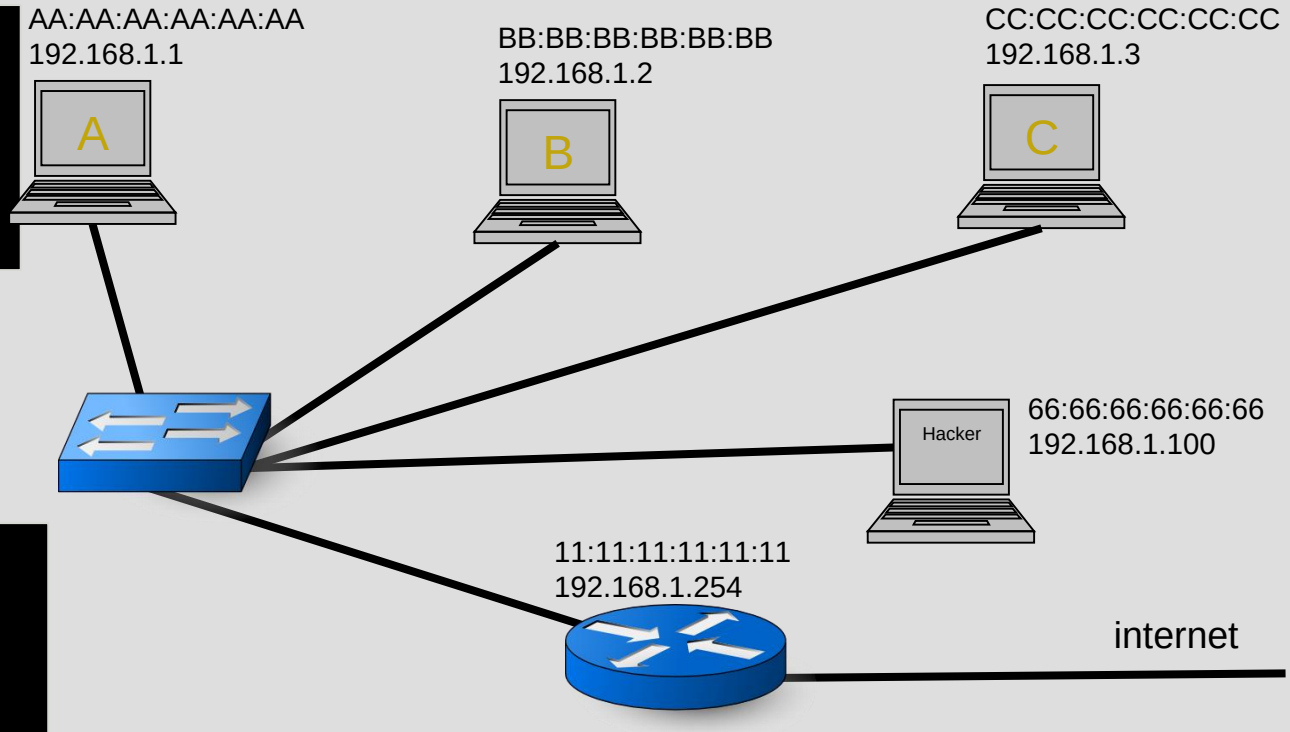
- So how can we sniff traffic on a switched network?
- How does ARP work?

MAC Flooding
+ ARP
Poisoning

Sniffing on a switched network

ARP Table – PC A

192.168.1.2 BB:BB:BB:BB:BB
192.168.1.254 11:11:11:11:11:11



CAM Table – Switch

Port 1	AA:AA:AA:AA:AA
Port 2	BB:BB:BB:BB:BB
Port 3	CC:CC:CC:CC:CC
Port 4	66:66:66:66:66:66
Port 5	11:11:11:11:11:11

Thank You