

Ethernet Frame

802.3 Ethernet frame structure

Preamble	Start of frame delimiter	MAC destination	MAC source	802.1Q tag (optional)	Ethertype (Ethernet II) or length (IEEE 802.3)	Payload	Frame check sequence (32-bit CRC)	Interframe gap
7 octets of 10101010	1 octet of 10101011	6 octets	6 octets	(4 octets)	2 octets	42 ^[note 2] –1500 octets	4 octets	12 octets
		64–1522 octets						
		72–1530 octets						
		84–1542 octets						

Shamelessly copied from Wikipedia article “Ethernet frame”

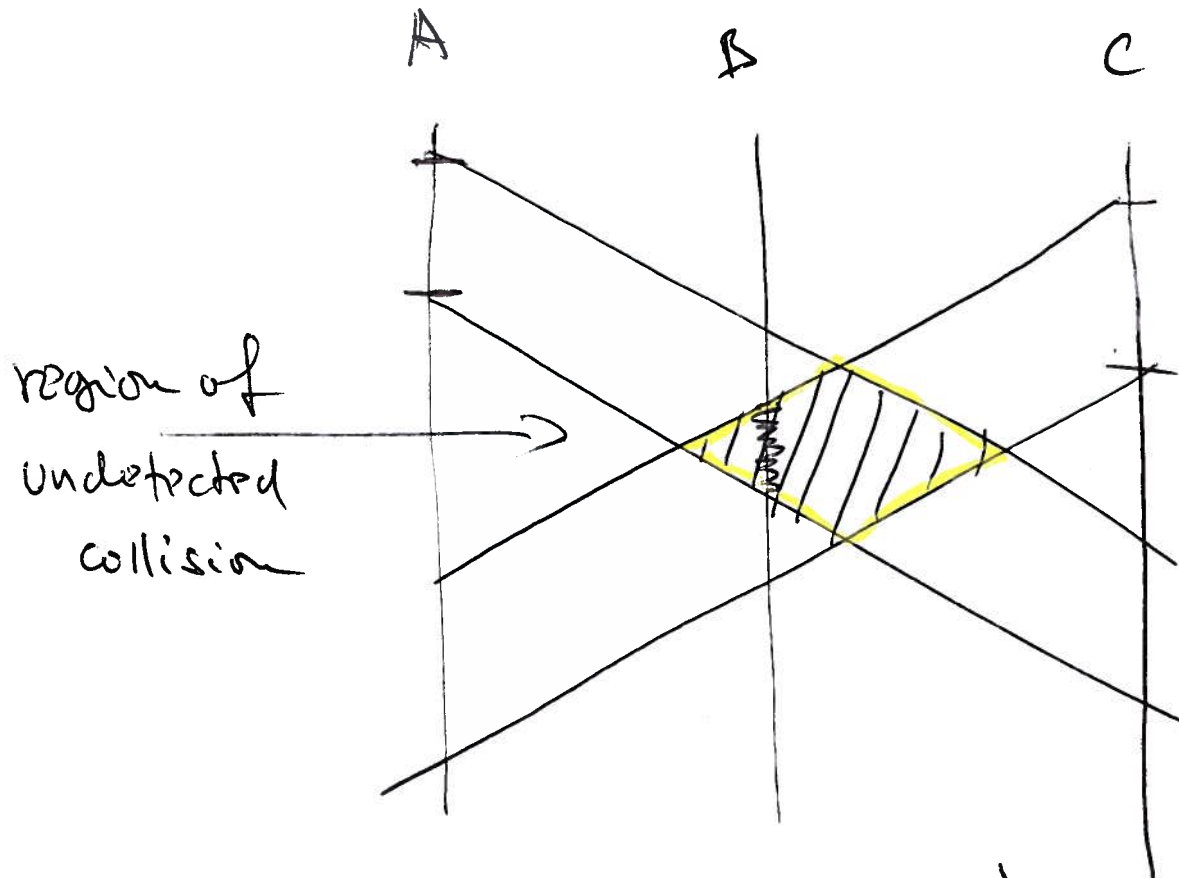
Ethernet Nomenclature

▶ XBASE Y

- X - rate in Mbps
- Y - maximum distance in 100's of meters

▶ XBASE-Z

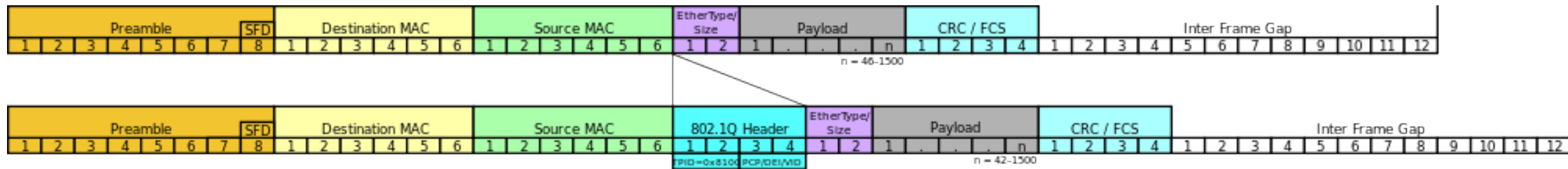
- X - rate (10, 100, 1000, 10G, 40G, 100G)
- Z - PHY technology (e.g., T - twisted pair)



- SOLUTIONS:
- slower rate X
 - longer packets ✓ (PAD)
 - distance limit ✓

802.1Q Virtual LANs (VLANs)

- ▶ Adds 32-bit field to a standard Ethernet frame



- ▶ **802.1Q** header:
 - **TPID** (16 bits) 0x8100
 - **TCI** - Tag Control Information (16 bits)
 - PCP - priority code point (3 bits)
 - DEI - drop eligible indication (1 bit)
 - VID - VLAN Identifier (12 bits)

Wireless Networks

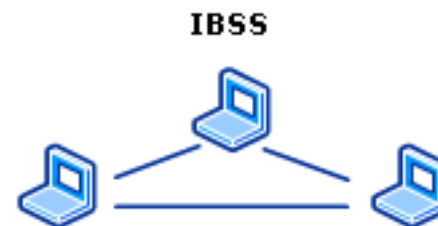
- ▶ Radio Frequency (RF) transmission:
 - Omnidirectional (broadcast and select)
 - Point to point (directional antennas)
- ▶ Organization:
 - WLAN
 - Access network (WiMAX)
 - Cellular networks
 - Personal area networks / home automation / sensor networks

IEEE 802.11 (WiFi)

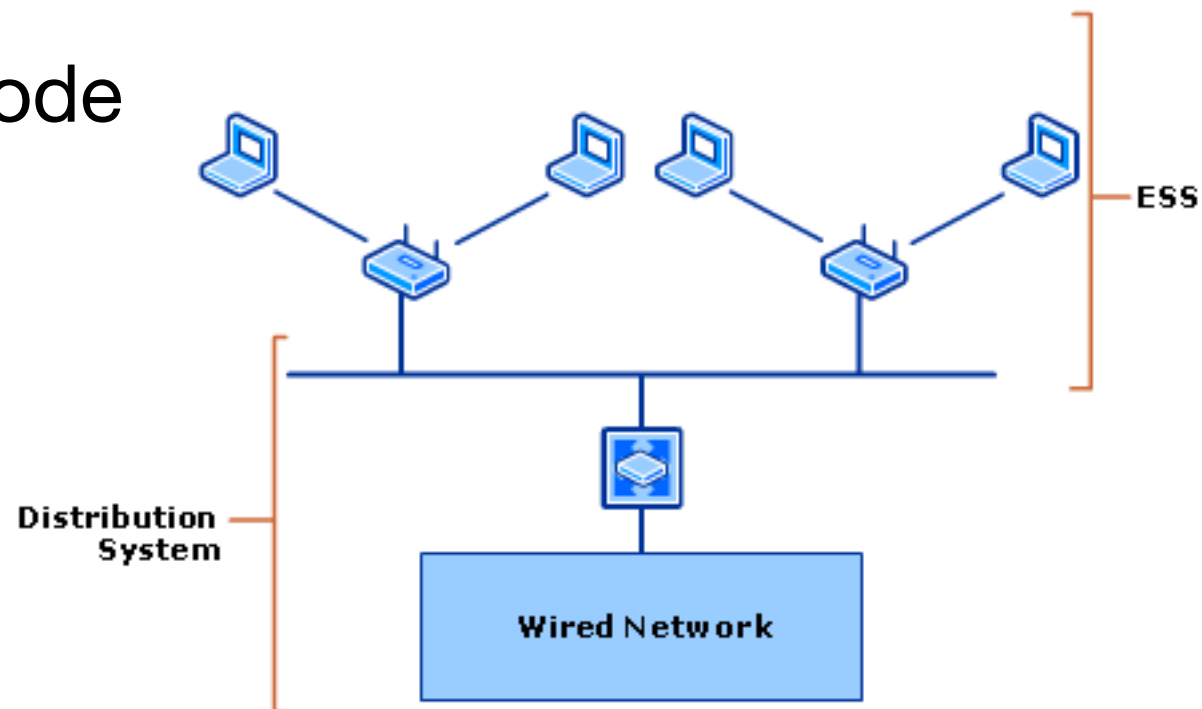
▶ IEEE 802.11: a, b, g, n, ac, ad,

▶ Modes of operation:

– ad hoc mode



– infrastructure mode



IEEE 802.11 Terminology

- ▶ station (STA)
- ▶ wireless access point (AP)
- ▶ basic service set (BSS)
- ▶ independent basic service set (IBSS)
- ▶ distribution system (DS)
- ▶ extended service set (ESS)

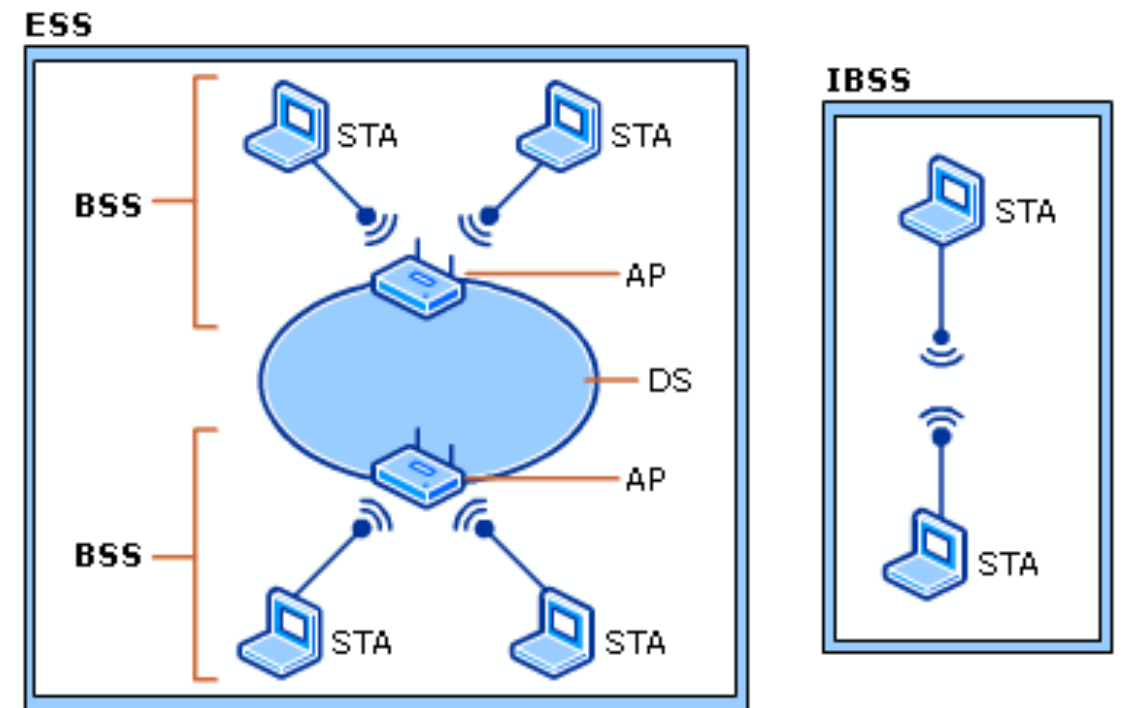
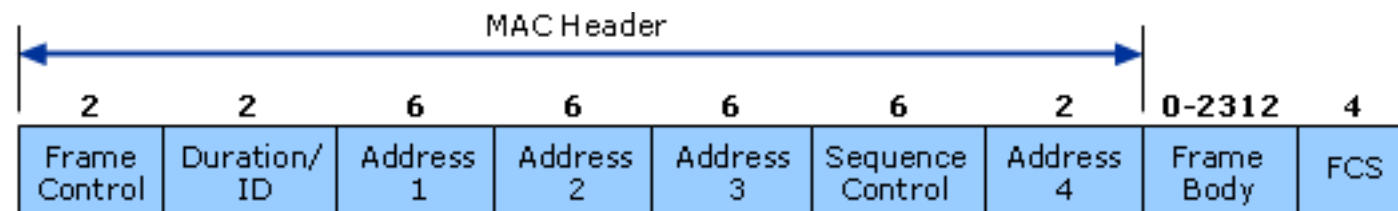
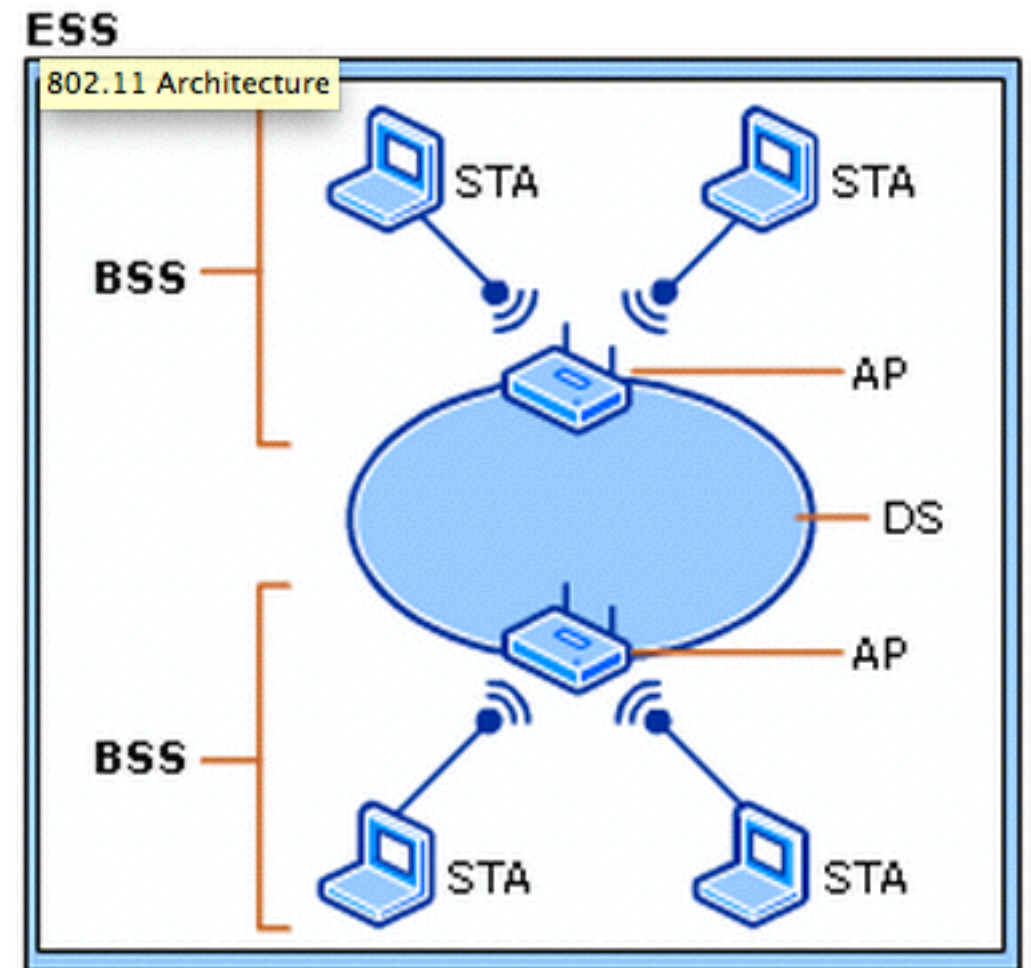


Image source: <http://technet.microsoft.com/en-us/library/cc757419.aspx>

IEEE 802.11 Frame Format

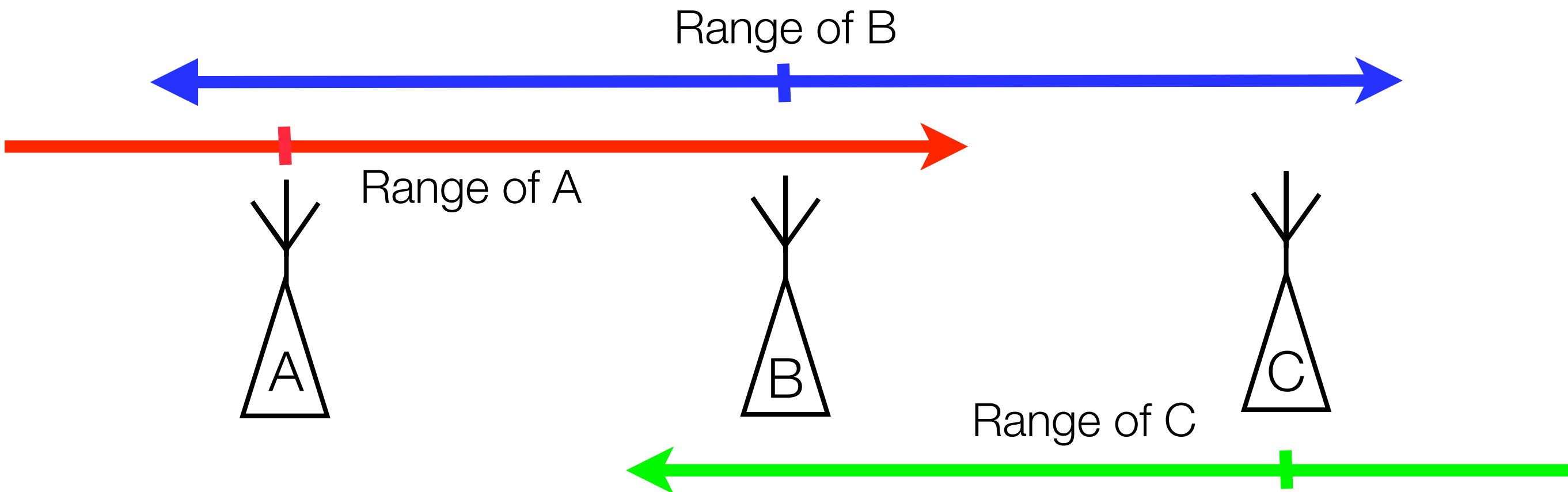


- ▶ **Destination Address (DA)**: final destination to receive the frame.
- ▶ **Source Address (SA)**: the original source that initially transmitted the frame.
- ▶ **Receiver Address (RA)**: next immediate STA on the wireless medium to receive the frame
- ▶ **Transmitter Address (TA)**: STA that transmitted the frame onto the wireless medium



Wireless Link Layer

▶ Hidden Terminal Problem



Solution: CSMA/CA

► Collision Avoidance (CA)

- make sure that the all nodes in the ranges of both source and destination are allowed to transmit

