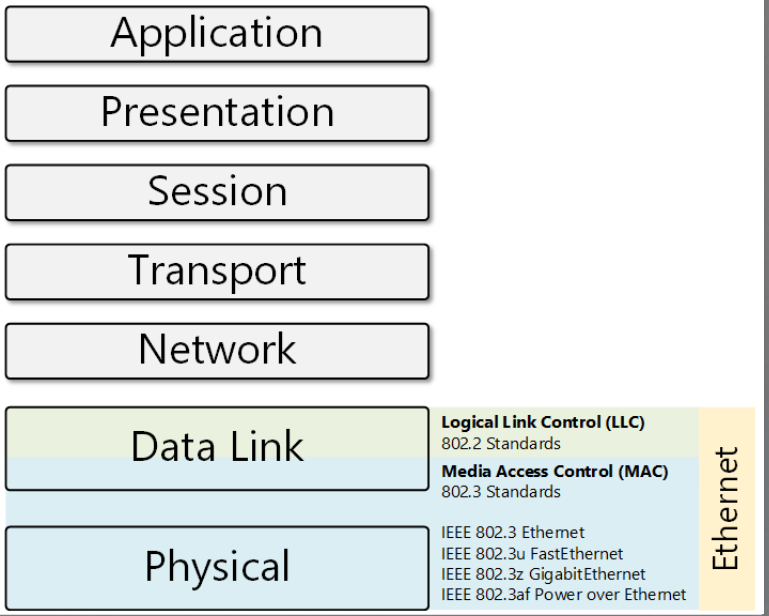
آموزش نتورک پلاس

Ethernet Fundamentals

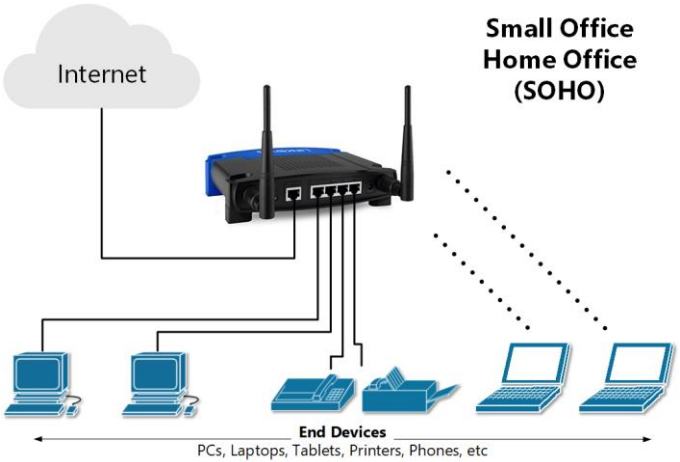
آشنایی با تکنولوژی اترنت

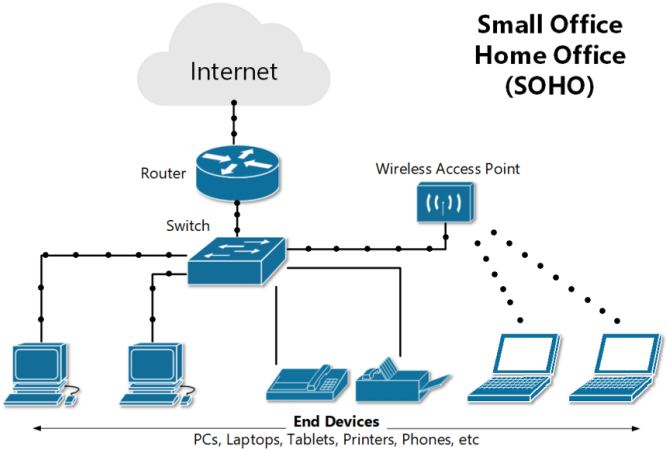
Local Area Network Protocols

- Ethernet, Token Bus, Token Ring, FDDI, Local Talk, Apple Talk, . . .
- Ethernet is
  a physical and data link layer technology
  for Local Area Networks

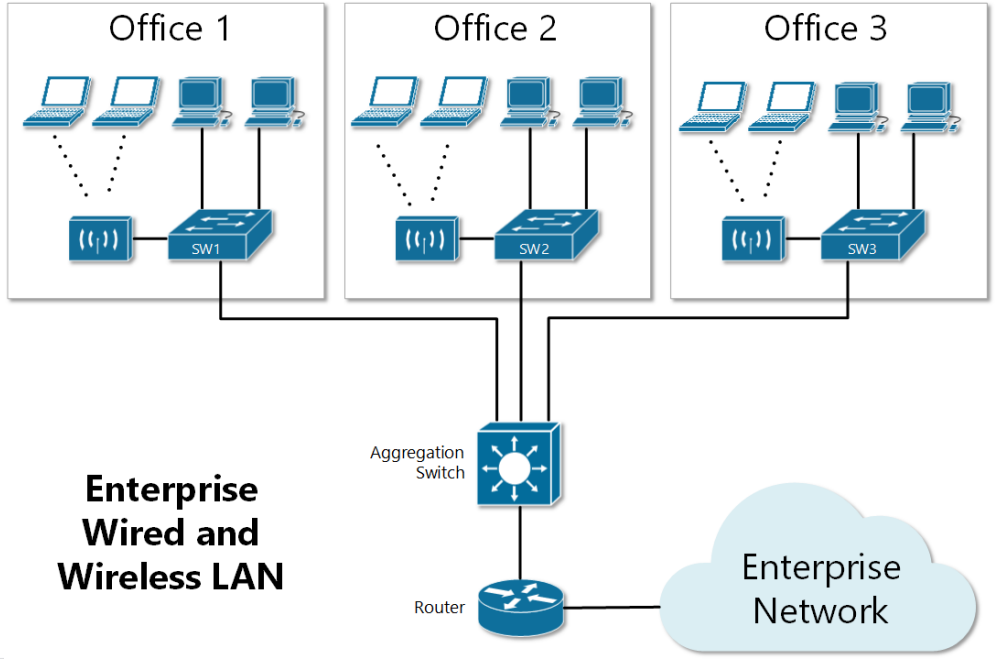


Small–Office / Home–Office LANs



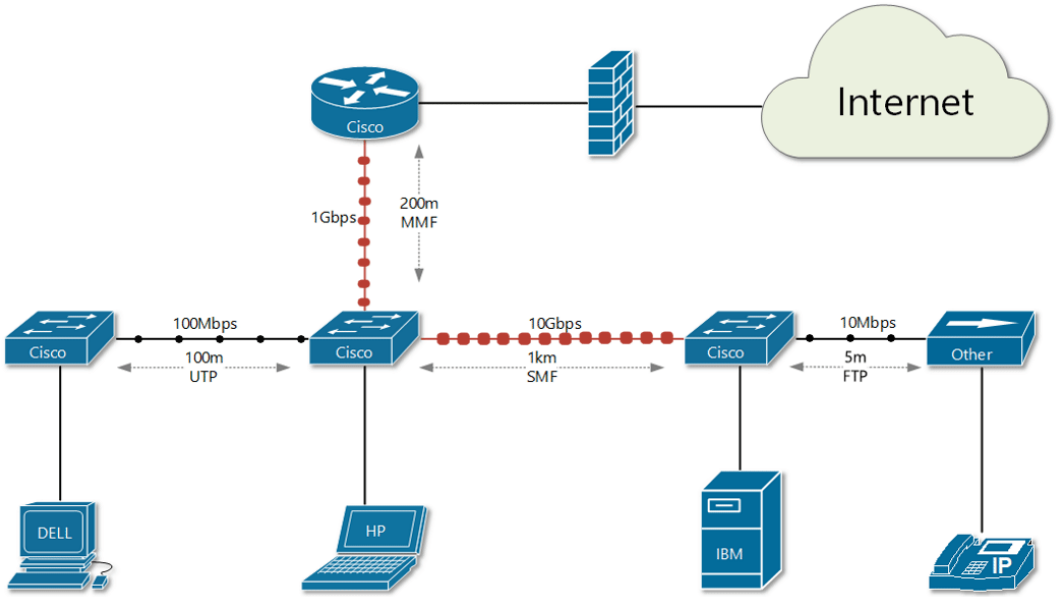


Enterprise LANs



Enterprise Wired and Wireless LAN

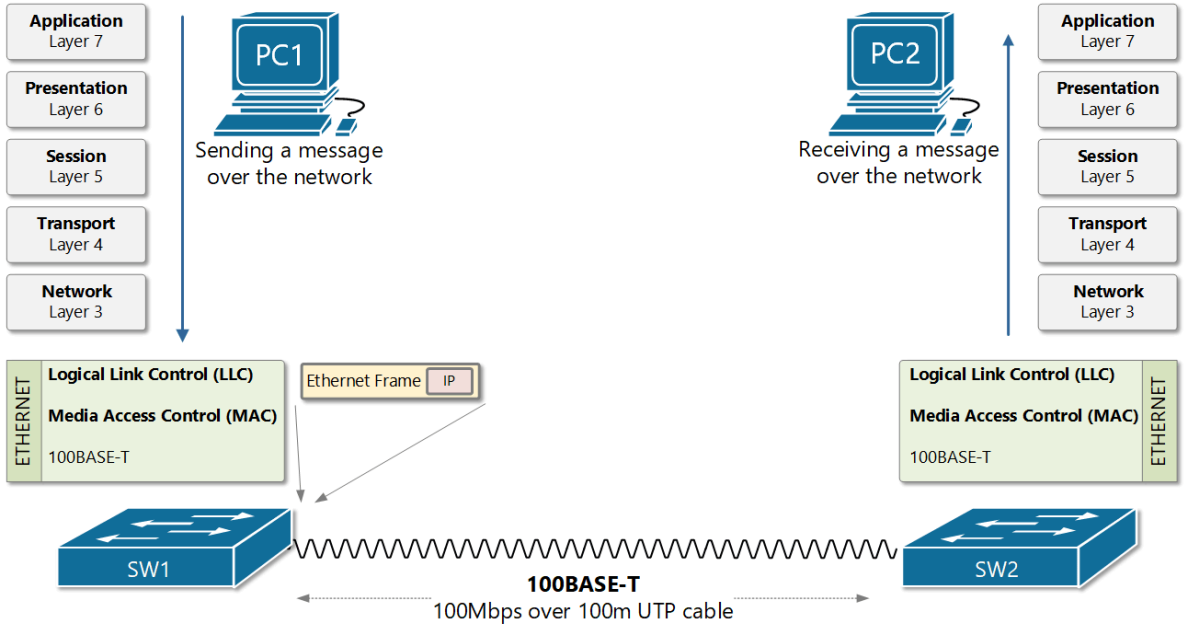
Ethernet Physical Layer Standards



Ethernet Physical Layer Standards

- PC1 sends a message to PC2.
- The Logical-Link Control sublayer is responsible to receive the IP packet and to encapsulate it in an Ethernet Frame, including all necessary information such as header and trailer. Then the frame is passed to the Media Access Control Layer.
- The MAC layer knows what media the frame has to be sent to and how to convert the frame to 1s and 0s based on the 802.3 media standard used. If the link is IEEE802.3u Fast Ethernet for example, the 1s and 0s are represented as electrical signals, if for example fiber optic link is used, the 1s and 0s are send as light pulses.

Ethernet Physical Layer Standards

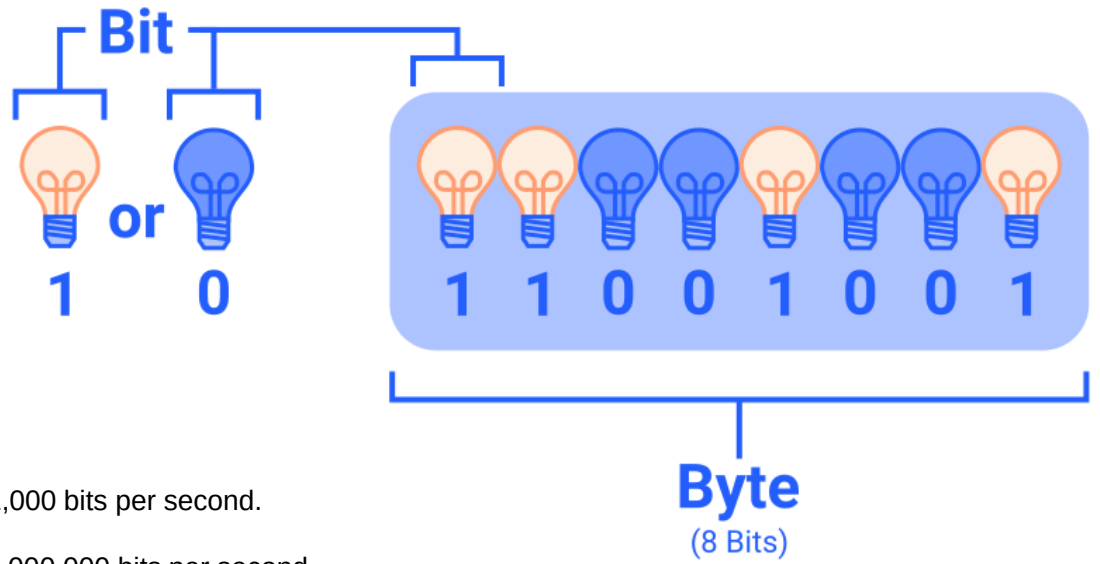


Ethernet Physical Layer Standards

CATEGORY	STANDARD	BANDWIDTH	DISTANCE
CAT 3	10BASE-T	10 Mbps	100 meters
CAT 5	100BASE-TX	100 Mbps	100 meters
CAT 5e	1000BASE-T	1000 Mbps	100 meters
CAT 6	1000BASE-T/ 10GBASE-T	1000 Mbps/ 10 Gbps	100 meters/ 55 meters
CAT 6a	10GBASE-T	10 Gbps	100 meters
CAT 7	10GBASE-T	10 Gbps	100 meters
CAT 8	40GBASE-T	40 Gbps	30 meters

STANDARD	MODE	BANDWIDTH	DISTANCE
100BASE-FX	MMF	100 Mbps	2 kilometers
100BASE-SX	MMF	100 Mbps	300 meters
1000BASE-SX	MMF	1000 Mbps	220-550 meters
1000BASE-LX	SMF/ MMF	1000 Mbps	5 kilometers/ 550 meters
10GBASE-SR	MMF	10 Gbps	400 meters
10GBASE-LR	SMF	10 Gbps	10 kilometers

Ethernet Physical Layer Standards

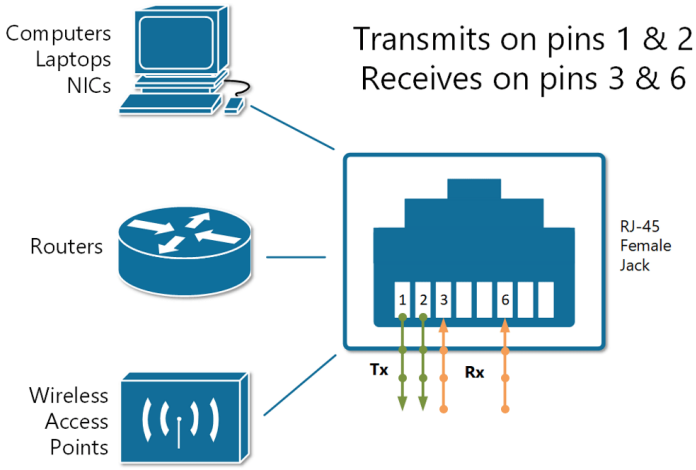


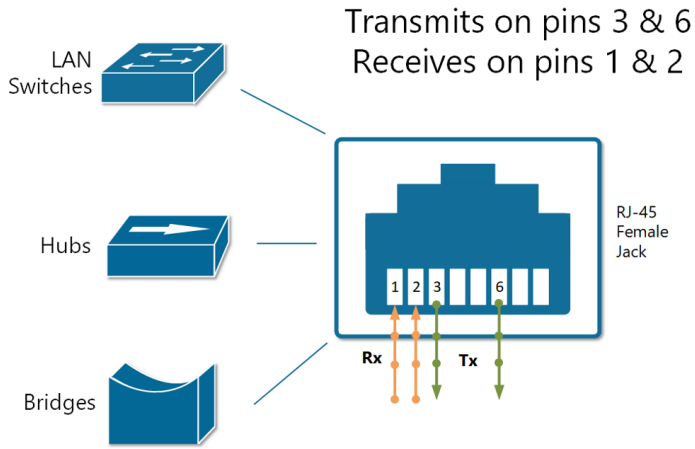
1 kilobit per second (kbps) = 1,000 bits per second.

1 megabit per second (Mbps) = 1,000,000 bits per second.

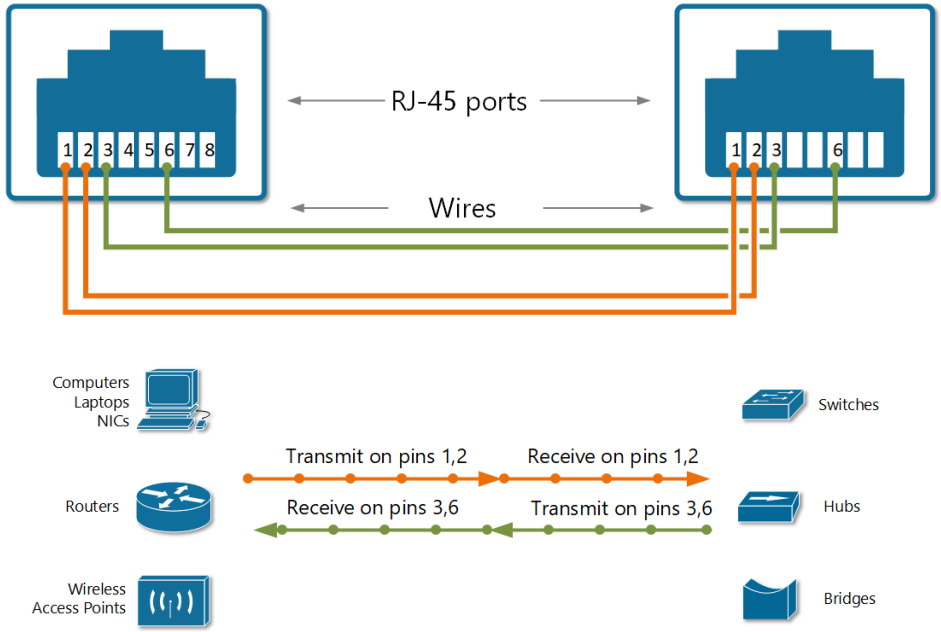
1 gigabit per second (Gbps) = 1,000,000,000 bits per second.

Media (Copper cabling)

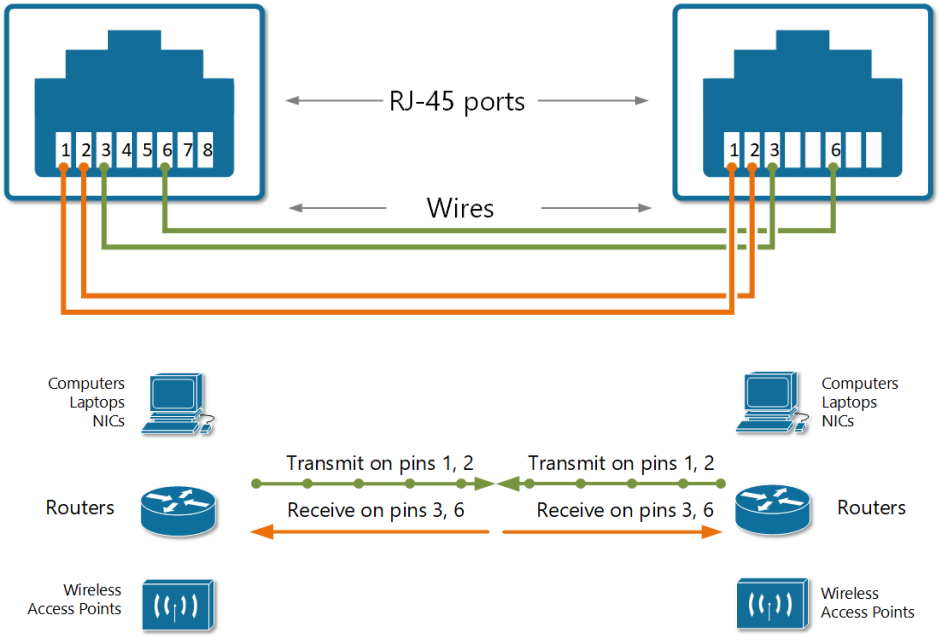




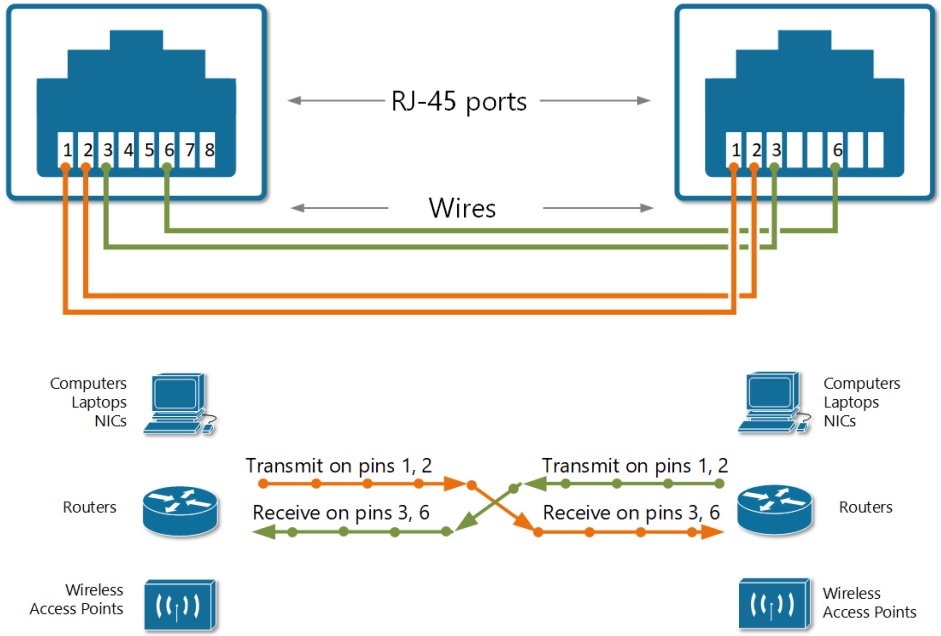
Straight-Through cable pinout



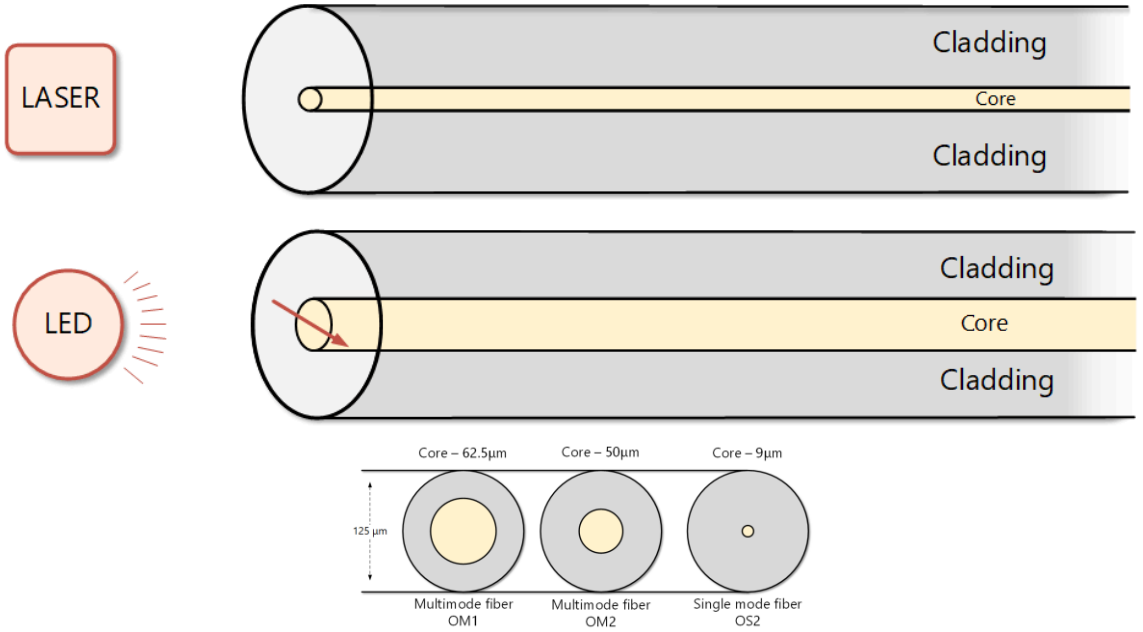
Straight-Through cable pinout



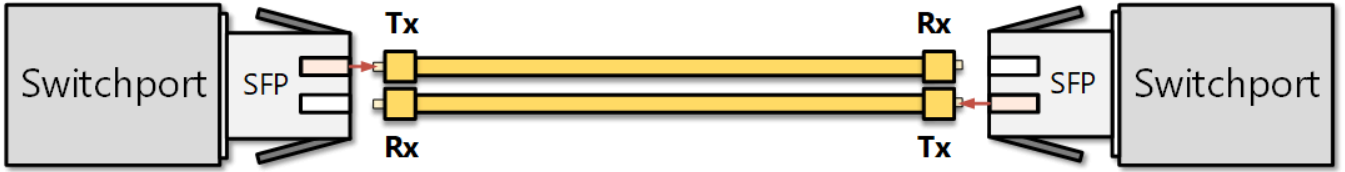
Crossover cable cable pinout



Media (Fiber–Optic Cabling)



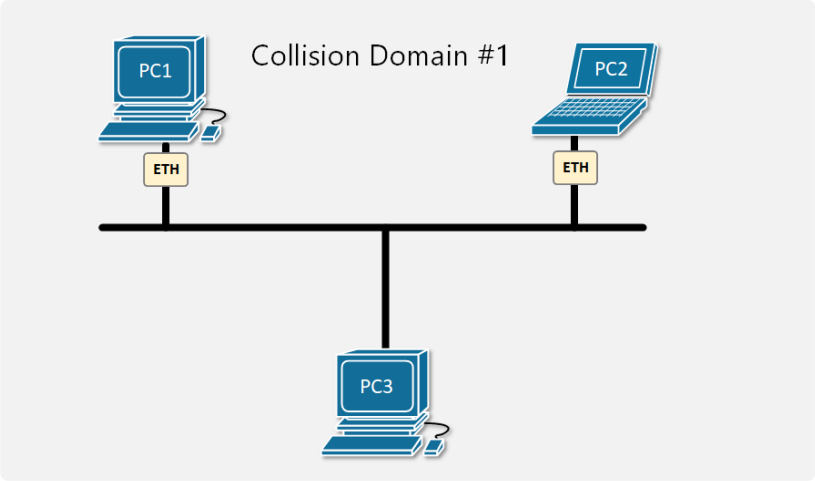
Using Ethernet with fiber-optics



Collision Domains

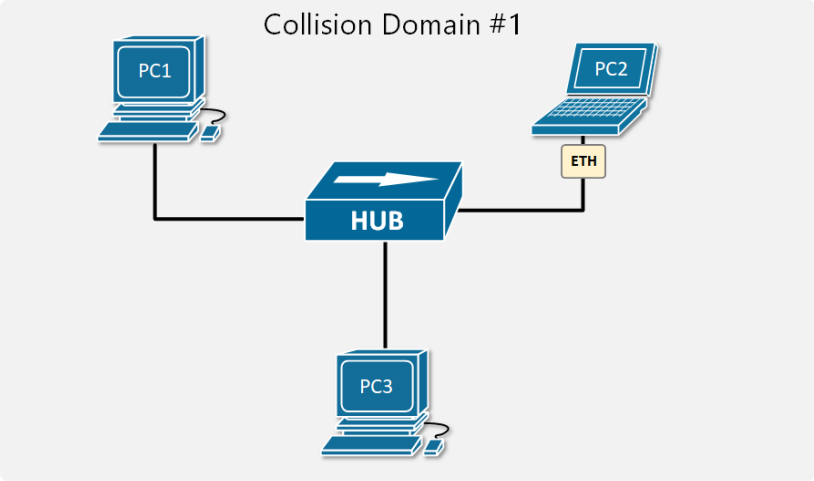
10Base2 (Thin Net)

10Base5 (Thick Net)

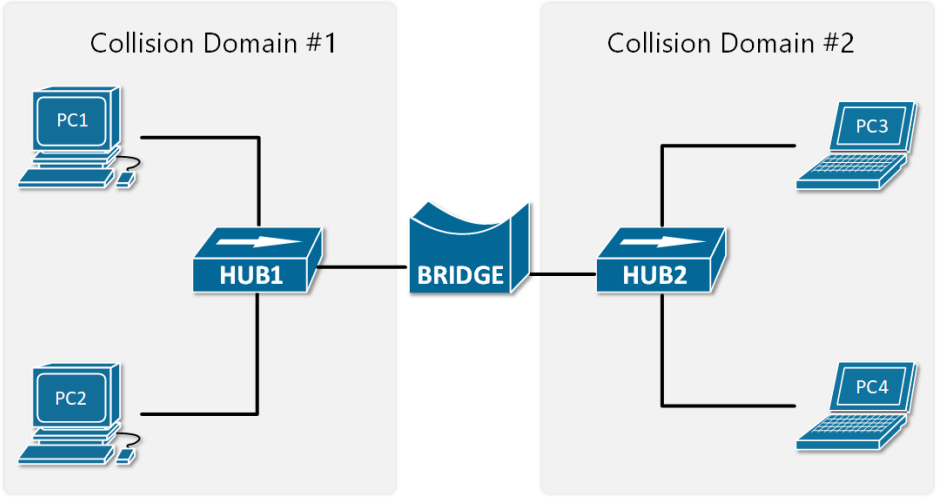


Carrier-sense multiple access with Collision Detection (CSMA/CD)

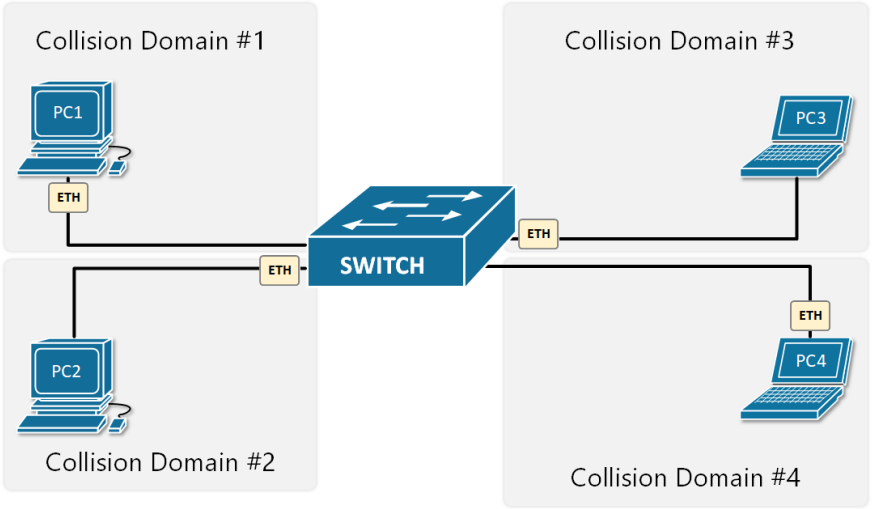
Collision Domains



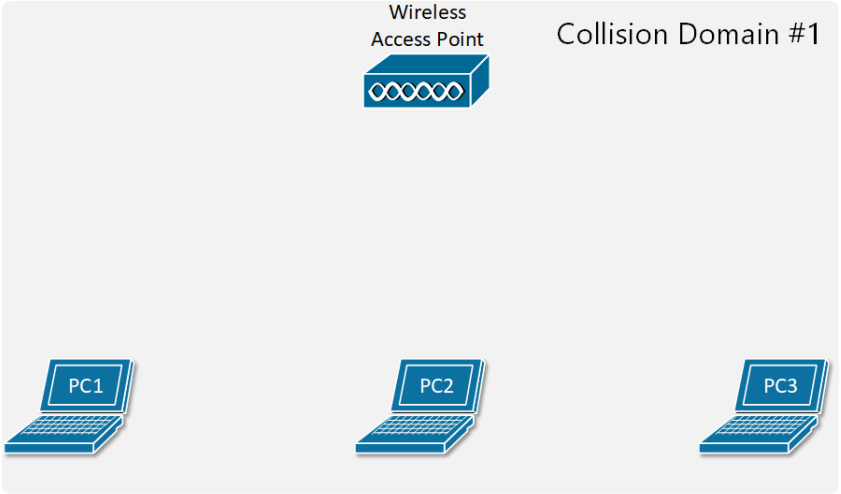
Collision Domains



Collision Domains

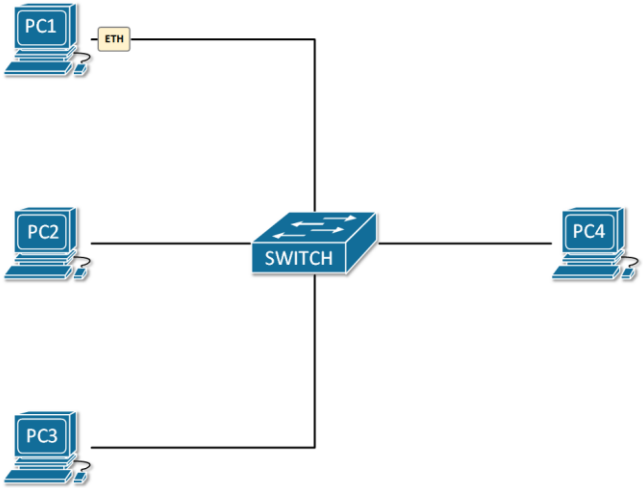


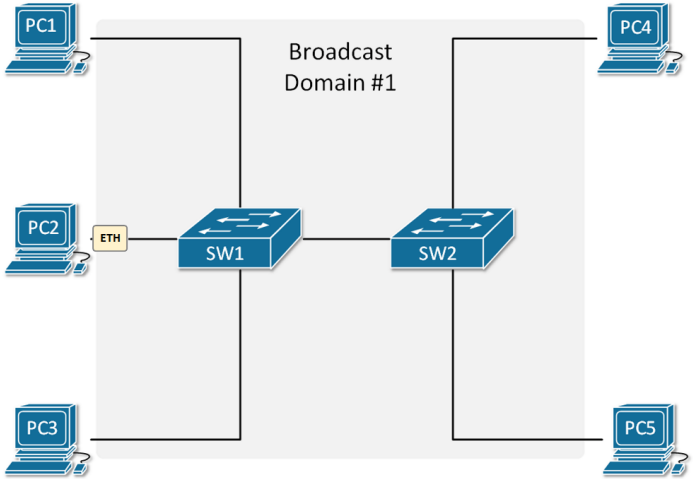
Collision Domains



Broadcast Domains

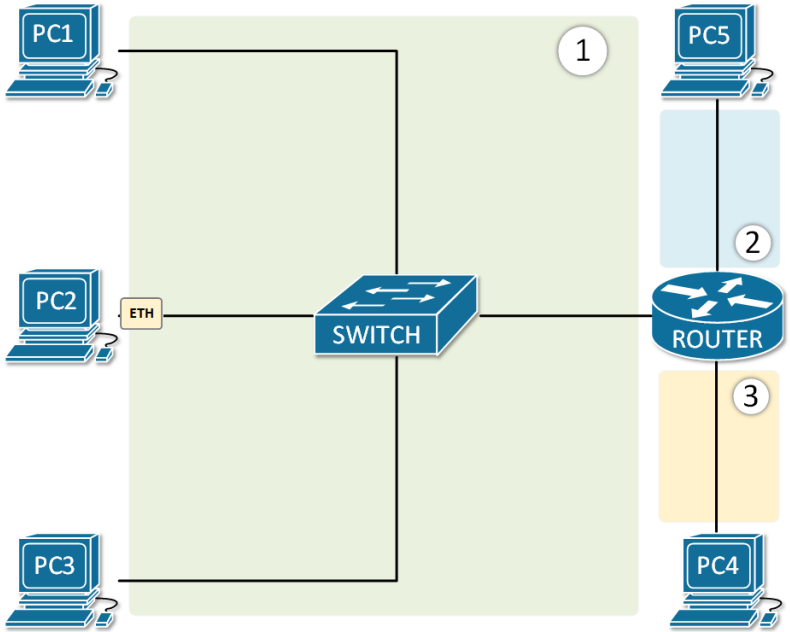
In Ethernet LANs, **a broadcast is one-to-all. everybody receives a copy of it.**



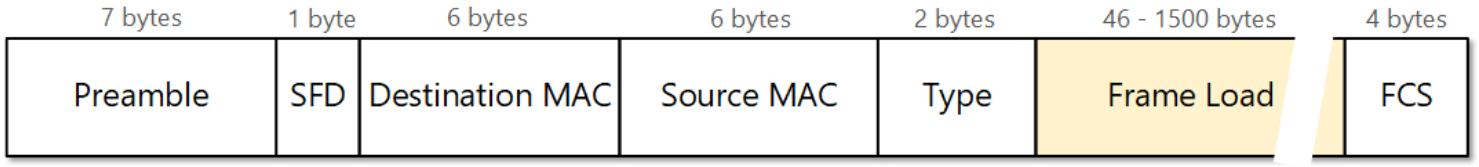


Switches **flood broadcast traffic** out all interfaces, except the one they received the broadcast on.

Broadcast Domains and Routers



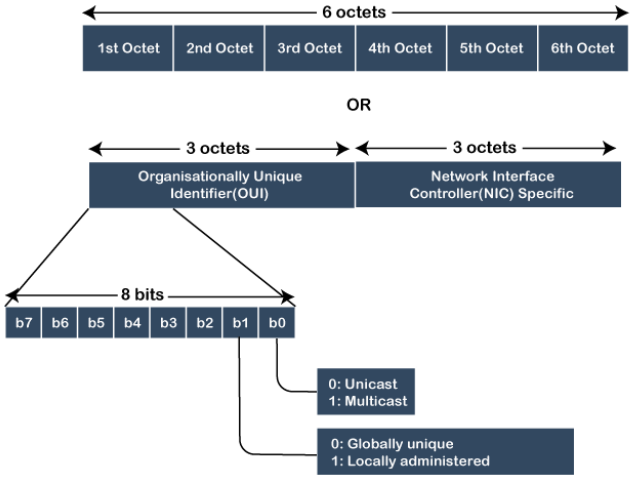
Ethernet Frame Structure



56-bit (7-byte) Preamble							SFD byte
10101010	10101010	10101010	10101010	10101010	10101010	10101010	10101011

MAC (Media Access Control) addresses

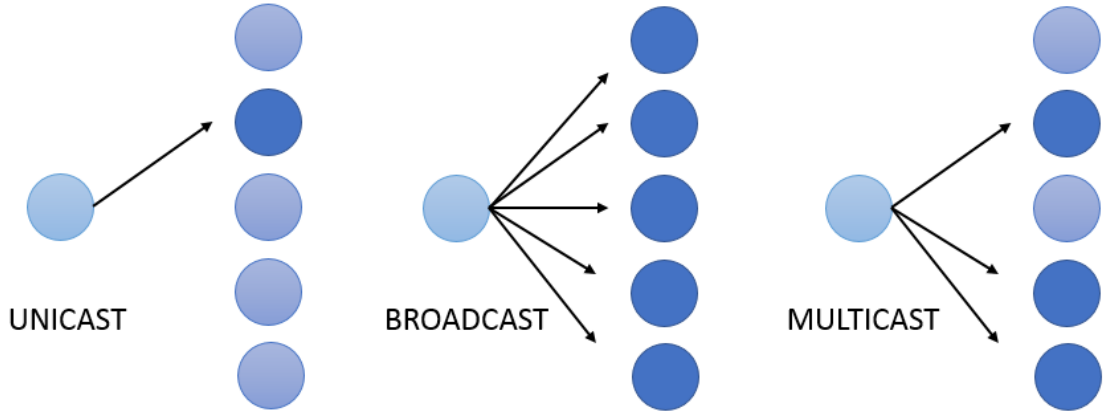
1100	0000	0010	0101	1110	1001	0001	1010	0011	0110	0111	1110
C	0	2	5	E	9	1	A	3	6	7	E



MAC (Media Access Control) addresses

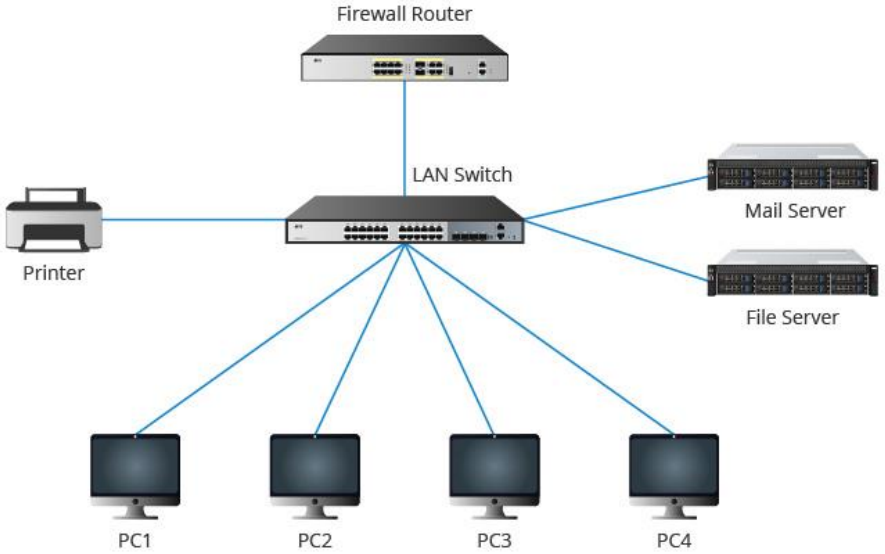
- Burned-in address C025.E91A.367E
- Hardware address C0:25:E9:1A:36:7E
- Physical address C0-25-E9-1A-36-7E

Types of traffic



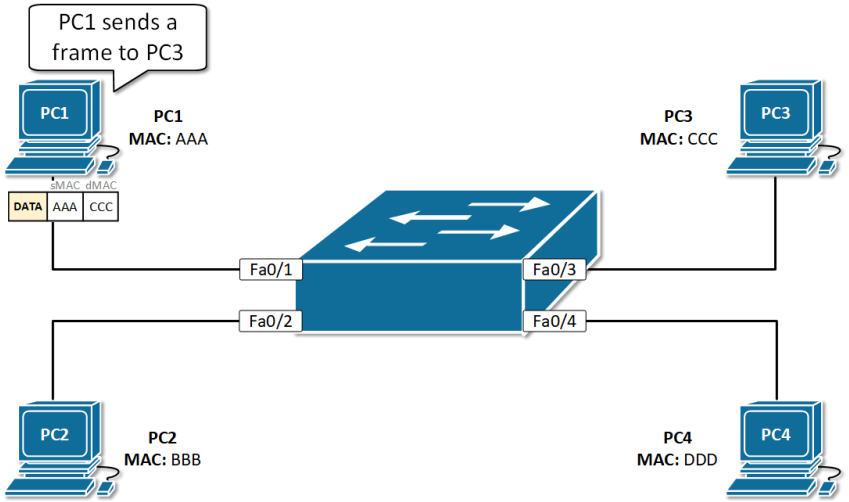
LAN Switching

- Flooding Broadcast
- Unknown Unicast
- Unicast
- Multicast

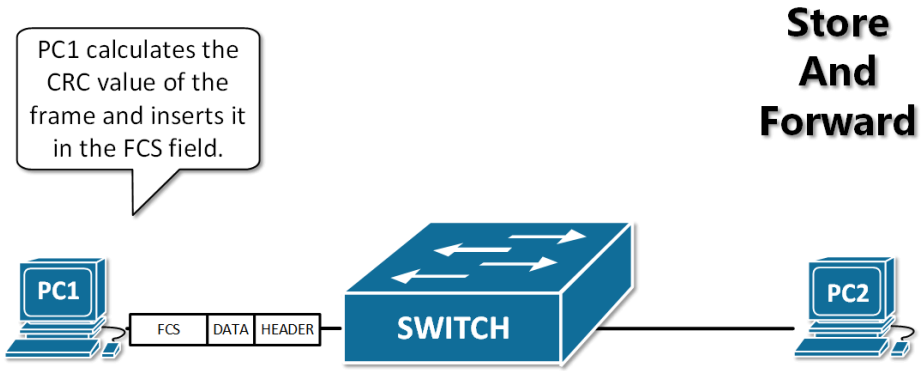


LAN Switching

- ❑ Flooding Broadcast
- ❑ Unknown Unicast
- ❑ Unicast
- ❑ Multicast



Switching modes: Store–and–Forward vs Cut–Through



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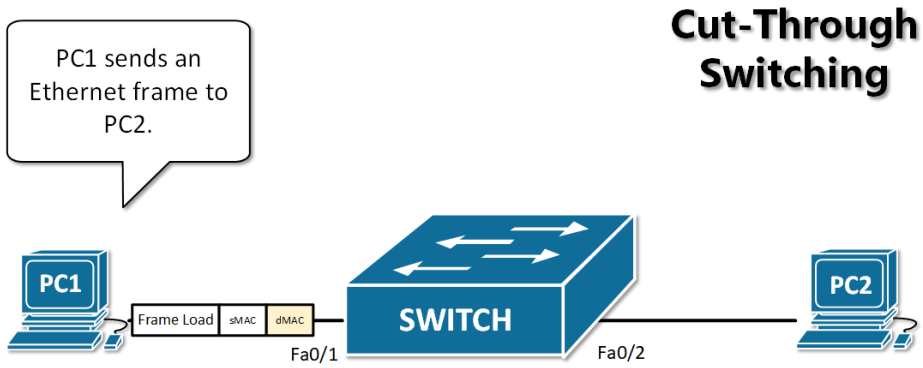
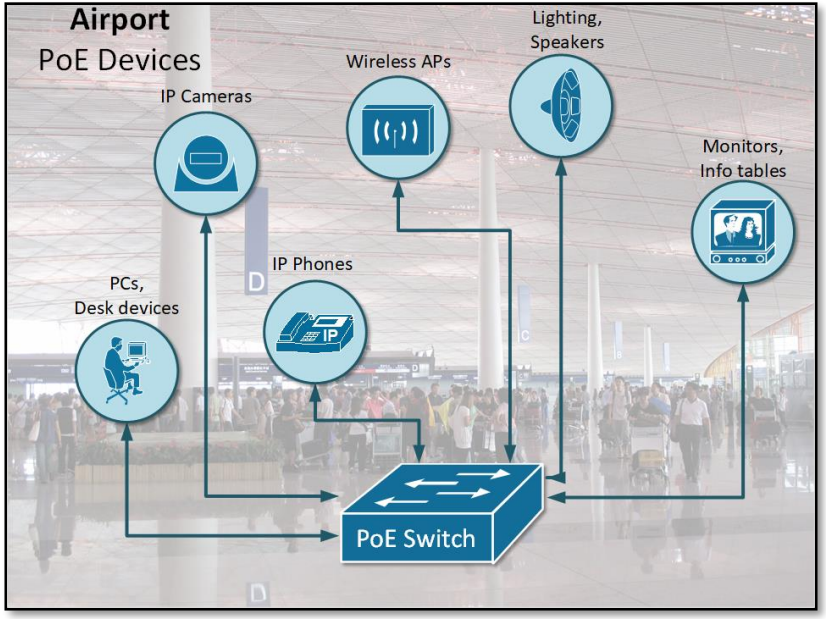
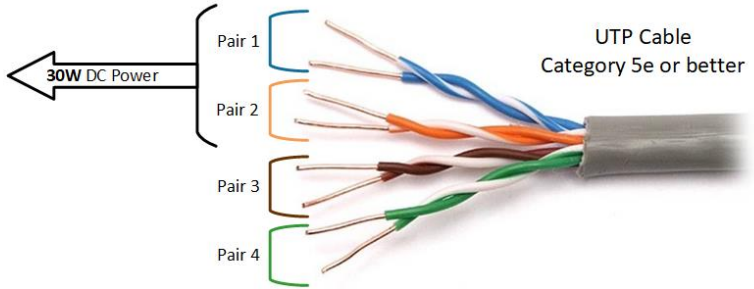


Power over Ethernet

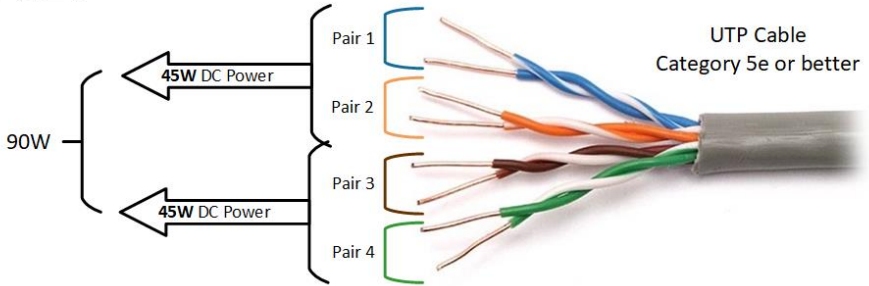


Power over Ethernet

PoE/PoE+



UPOE/UPOE+



Power over Ethernet

	PoE	PoE+	UPoE	UPoE+
Minimum cable type	Cat. 5e	Cat. 5e	Cat. 5e	Cat. 6a
IEEE standard	802.3af	802.3at	Cisco proprietary	Cisco proprietary
PoE Type Designation	Type 1	Type 2	Type 3	Type 4
Maximum power per interface	15.4W	30W	60W	90W
Maximum power at the end device	12.95W	25.5W	51W	71.3W
Number of twisted pairs used	2	2	4	4
Max Cable Length	100m	100m	100m	100m

Passive PoE Injector and PoE Splitter

عباس ولی زاده

مدرس دوره های شبکه و امنیت