Ethernet Framing

Foreword

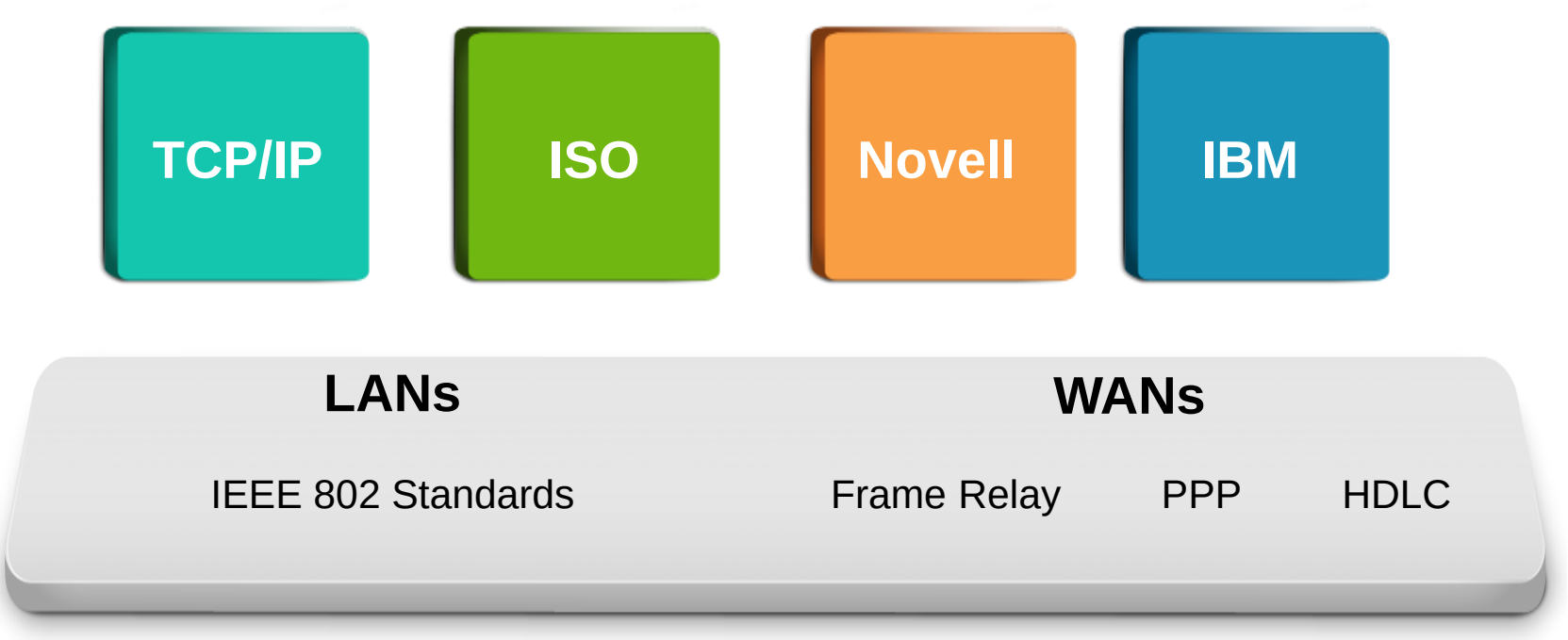
Transmission over a physical medium requires rules that define the communication behavior. The management of the forwarding behavior of Ethernet based networks is controlled through IEEE 802 standards defined for Ethernet data link technology. A fundamental knowledge of these standards is imperative to fully understand how link layer communication is achieved within Ethernet based networks.

Objectives

Upon completion of this section, trainees will be able to:

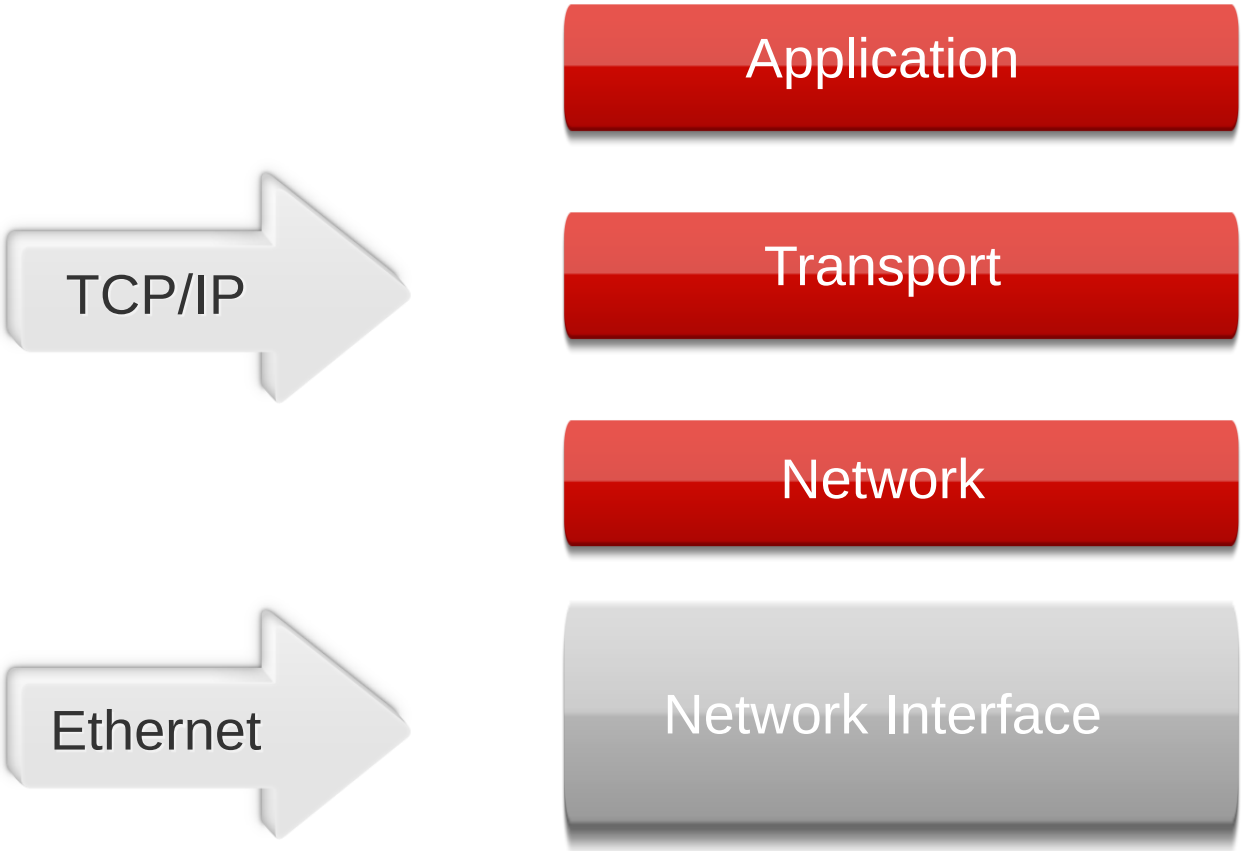
- Explain the application of reference models to networks.
- Describe how frames are constructed.
- Explain the function of MAC addressing at the data link layer.
- Describe Ethernet frame forwarding and processing behavior.

Managing Network Communication

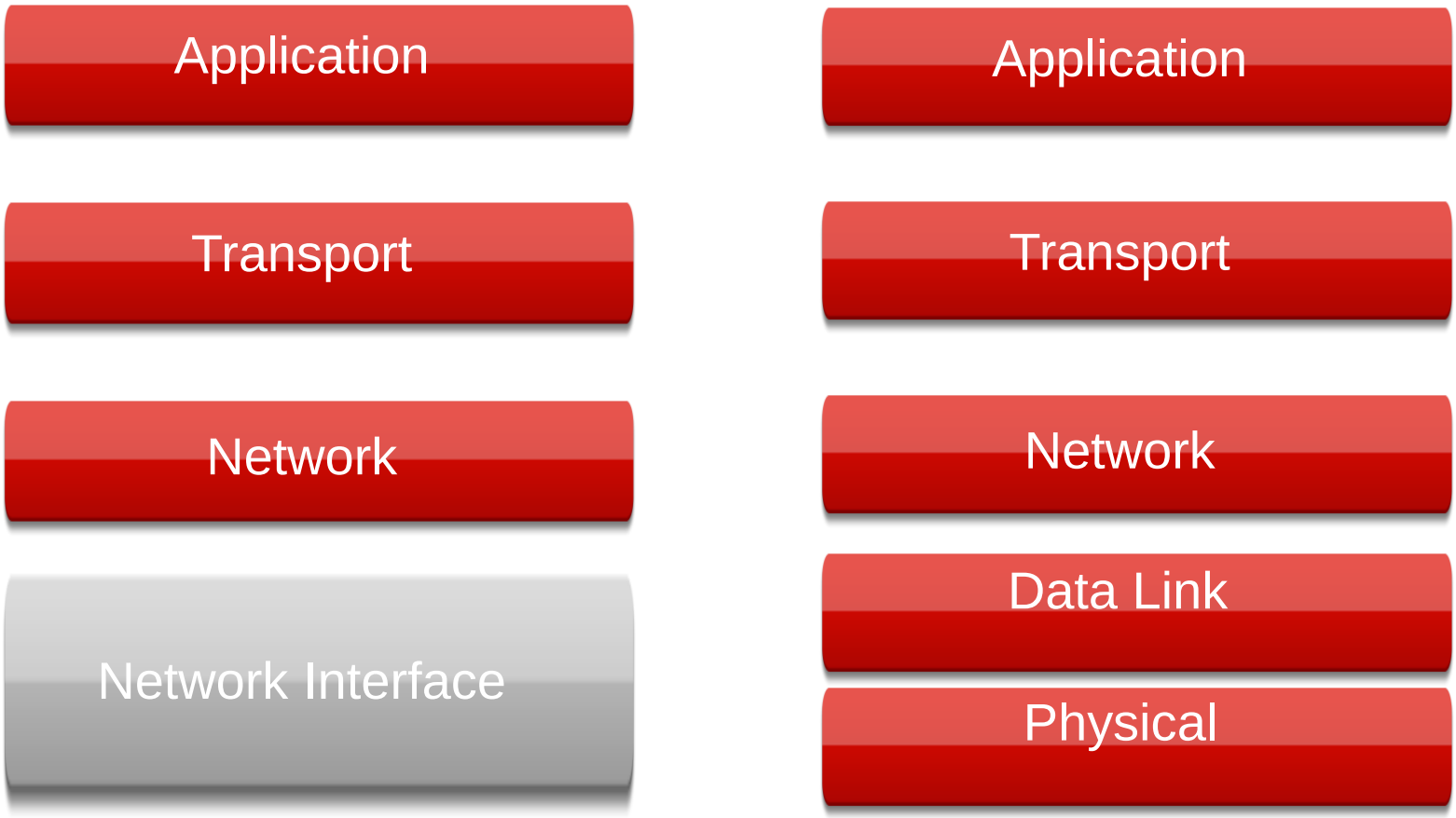


- Networks are primarily managed by upper and lower layer protocols.

Layered Models - TCP/IP (RFC 1122)

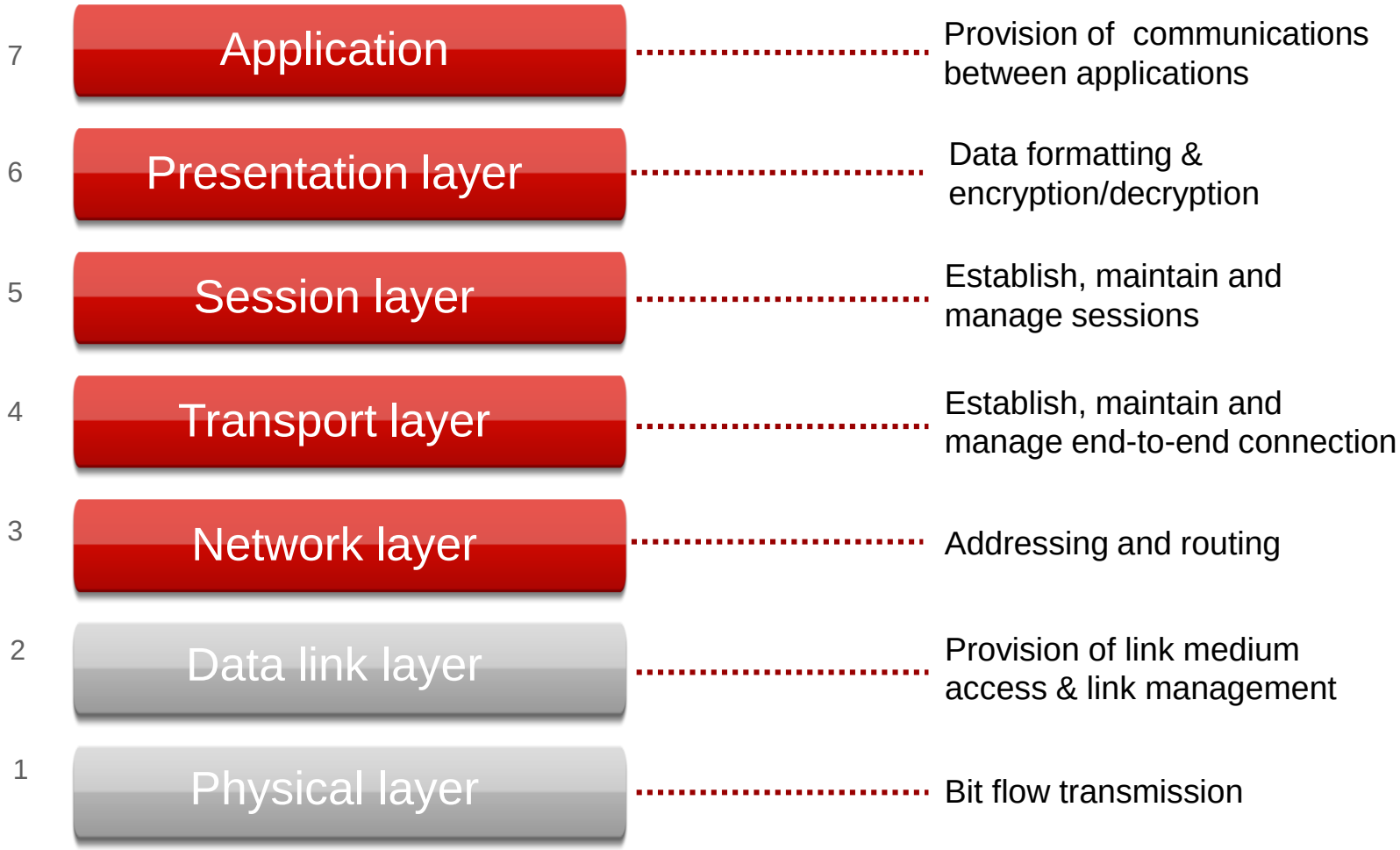


Layered Models - TCP/IP vs Perceived



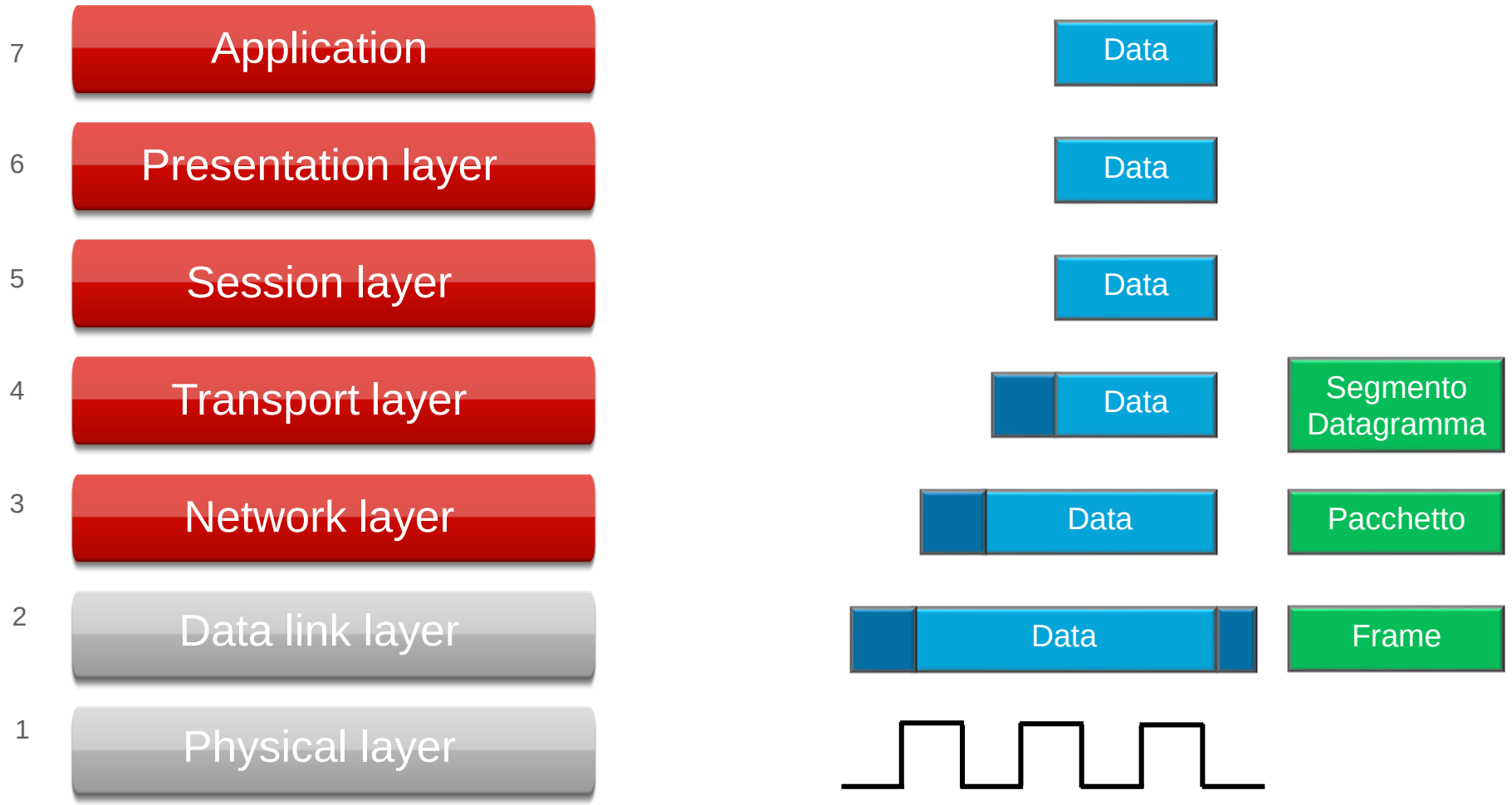
HUAWEI

Layered Models - OSI



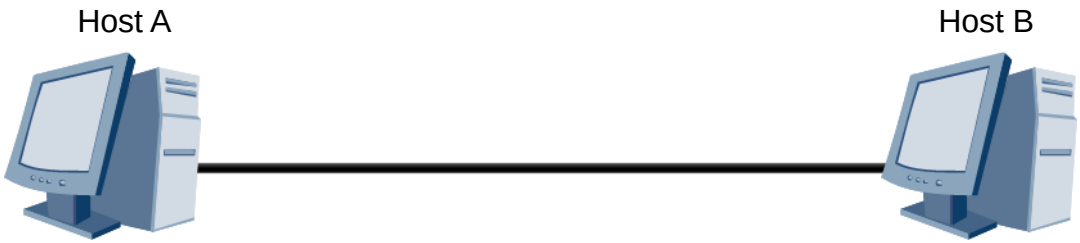
HUAWEI

Encapsulation



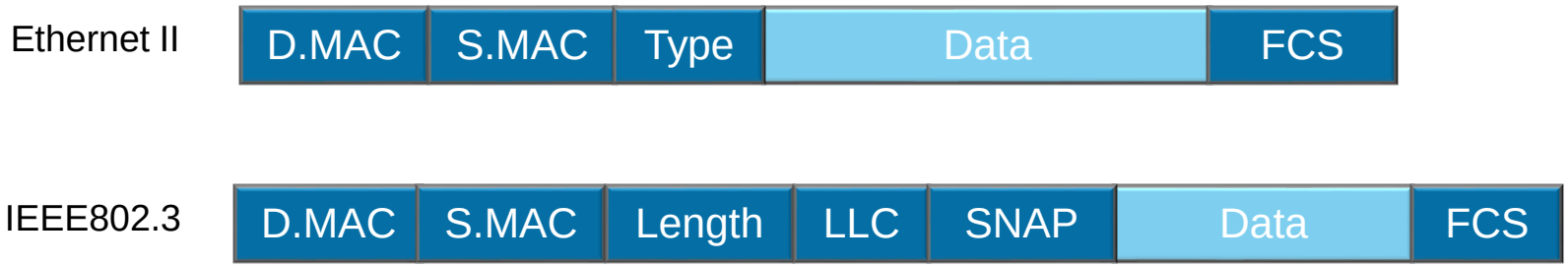
HUAWEI

Communication Between Two End Stations



- Data link layer frames are used to govern transmission over the communications medium.

Frame Formats

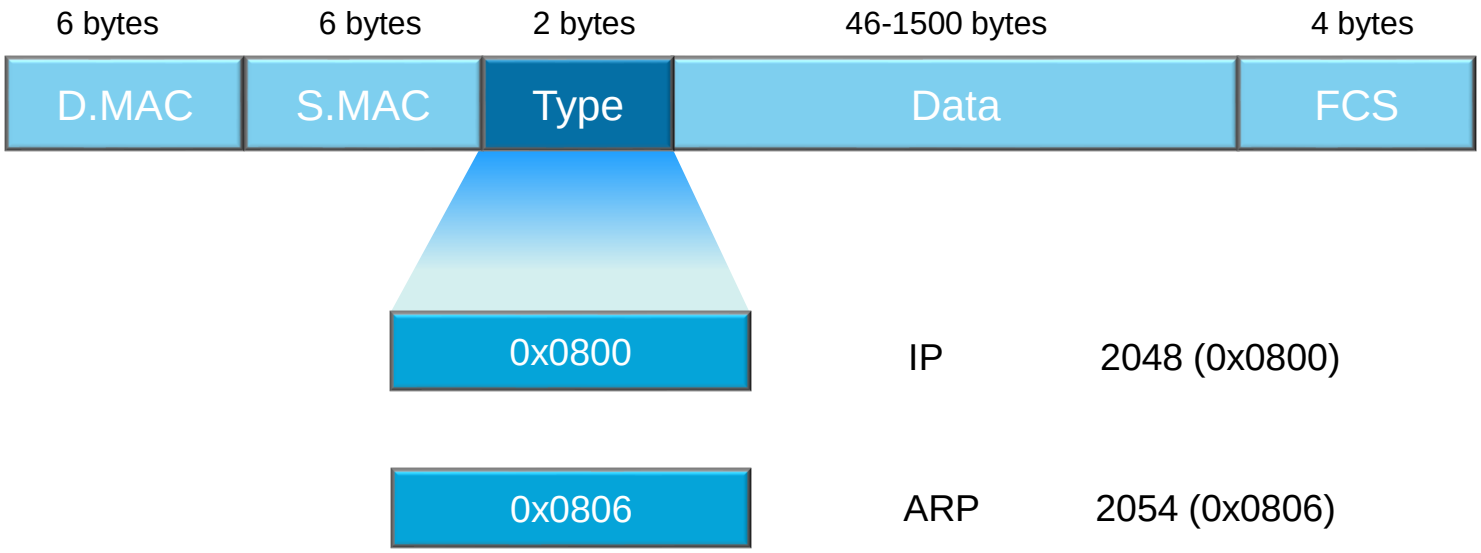


Type Field Value >= 1536 (0x0600) Ethernet II

Length Field Value <= 1500 (0x05DC) IEEE802.3

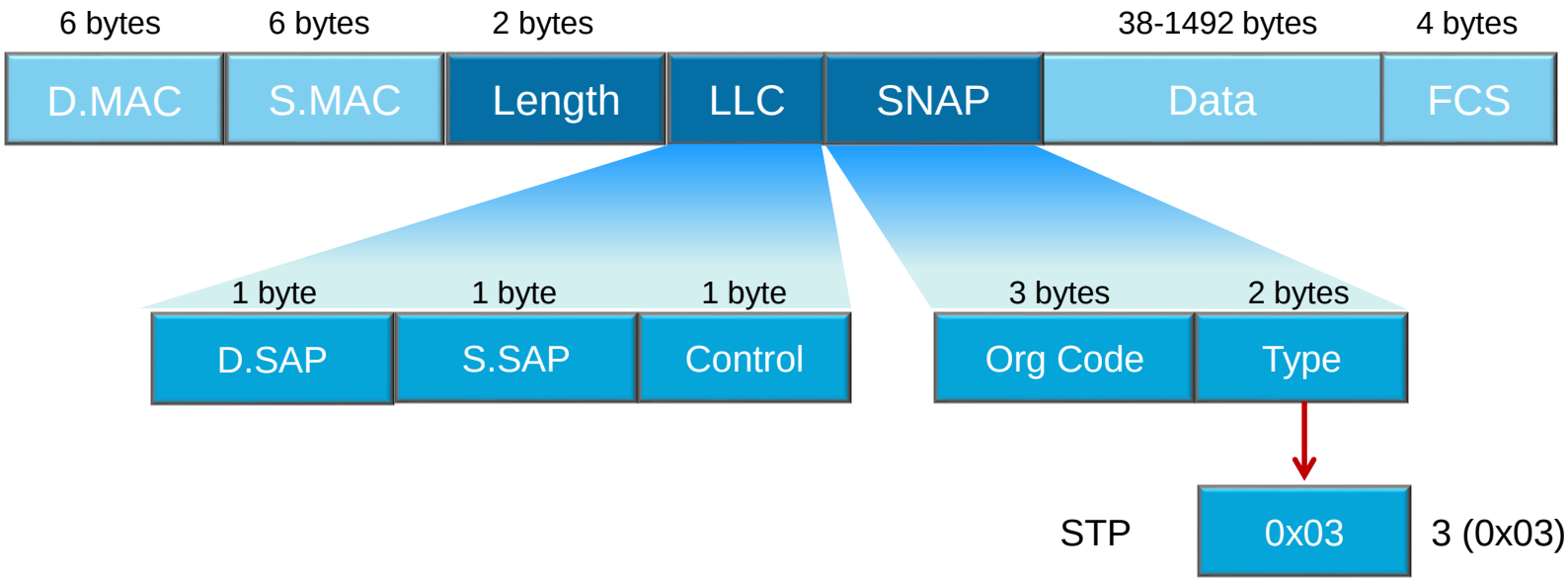
HUAWEI

Ethernet II Frame



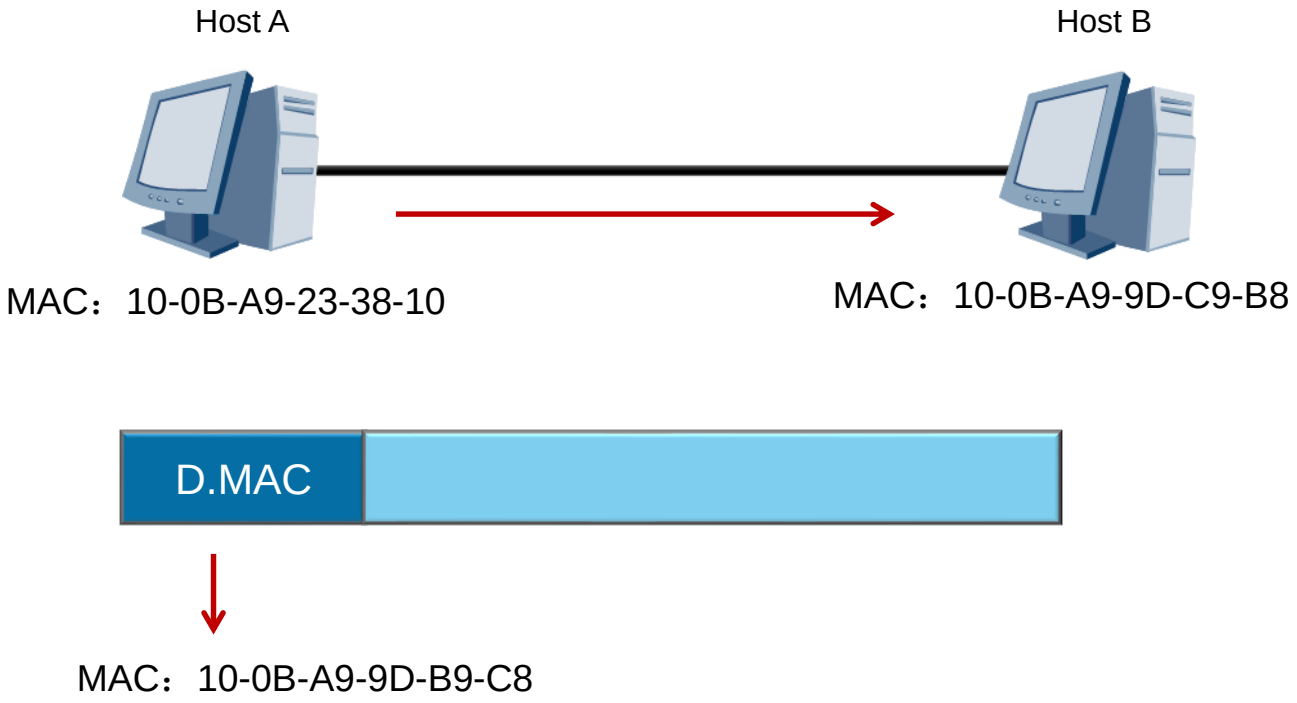
- The Ethernet II frame type is associated with protocols with a type value greater than 1536 (0x600).

IEEE802.3 Frame



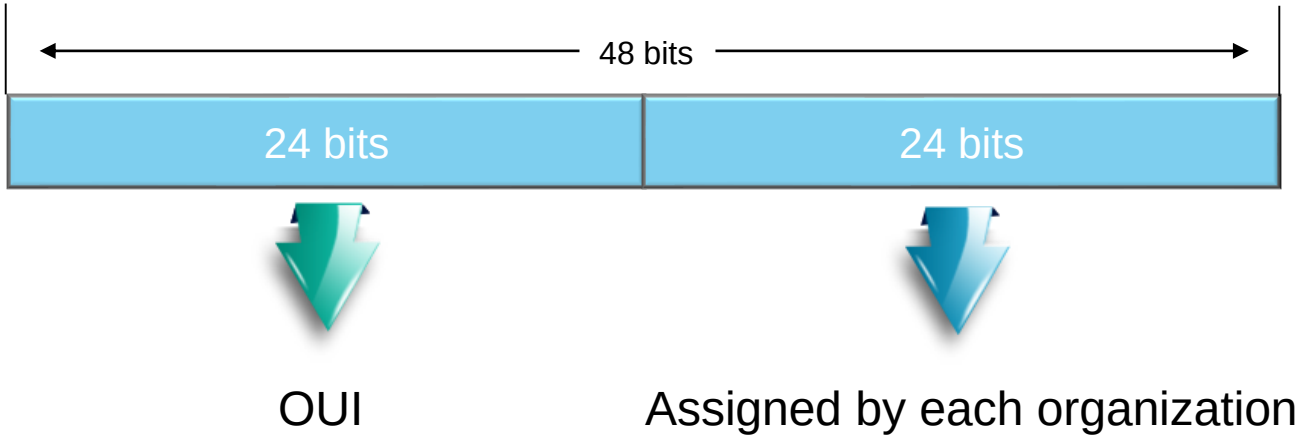
- The IEEE 802.3 frame type is associated with protocols with a type value less than 1500 (0x05DC).

Frame Forwarding



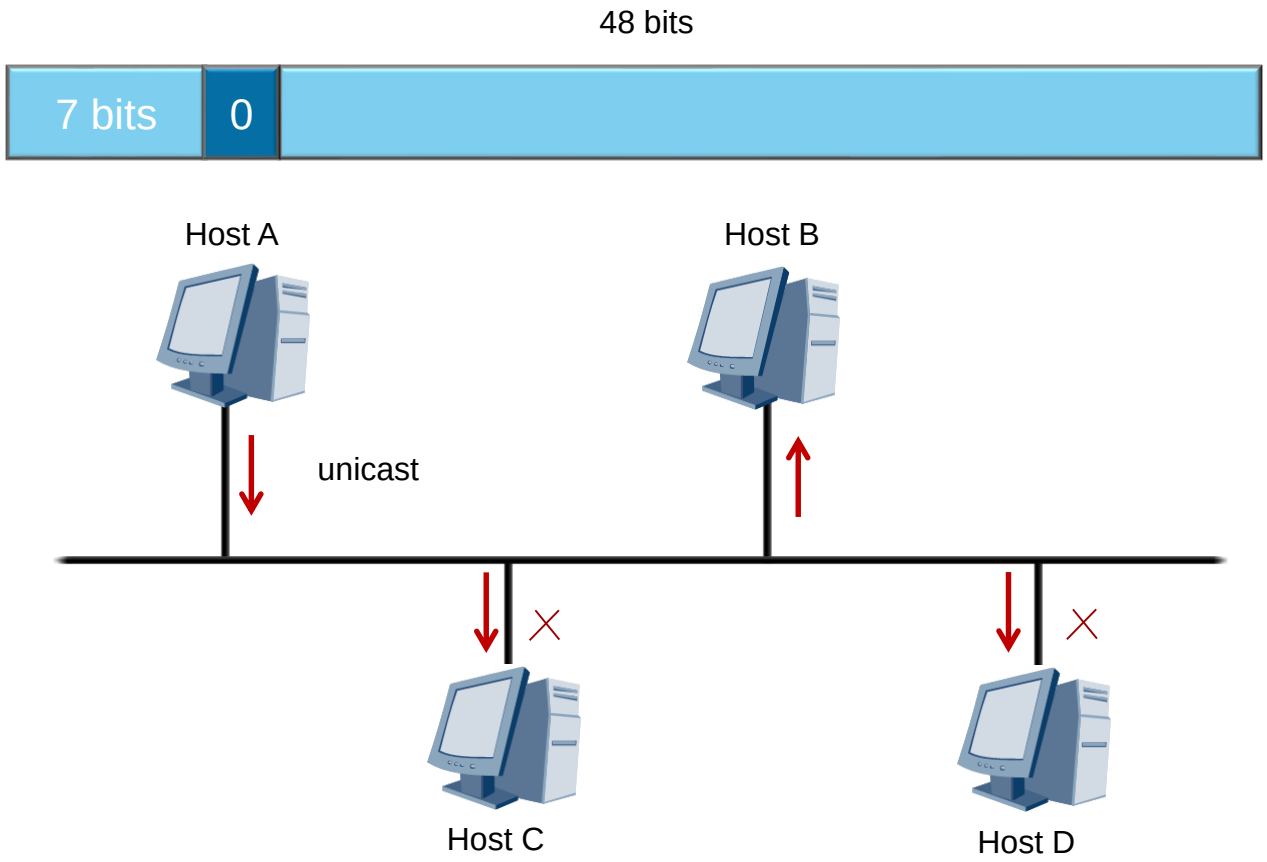
- Media Access Control (MAC) addressing facilitates data link layer communication.

The Ethernet MAC Address

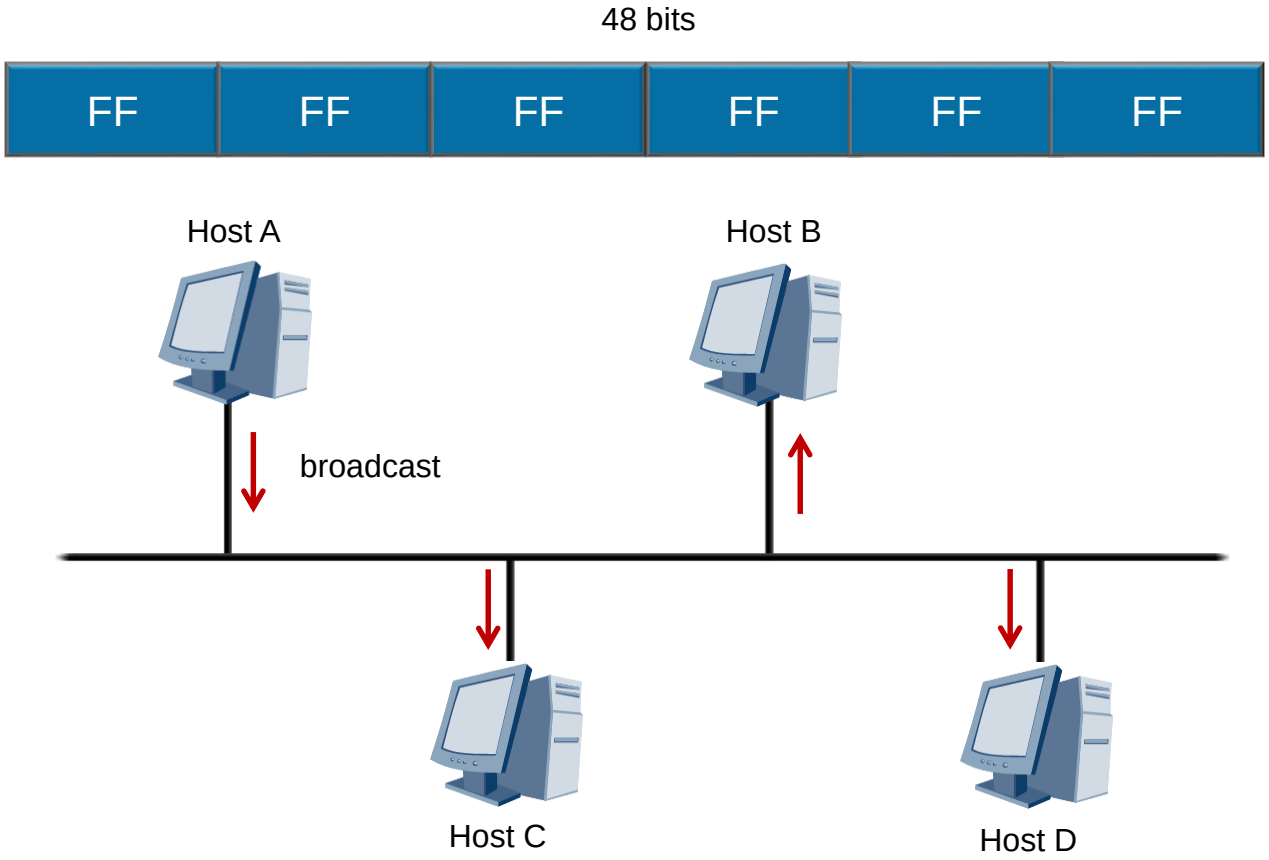


- MAC addresses are comprised of an organizationally unique identifier and a vendor assigned address value.

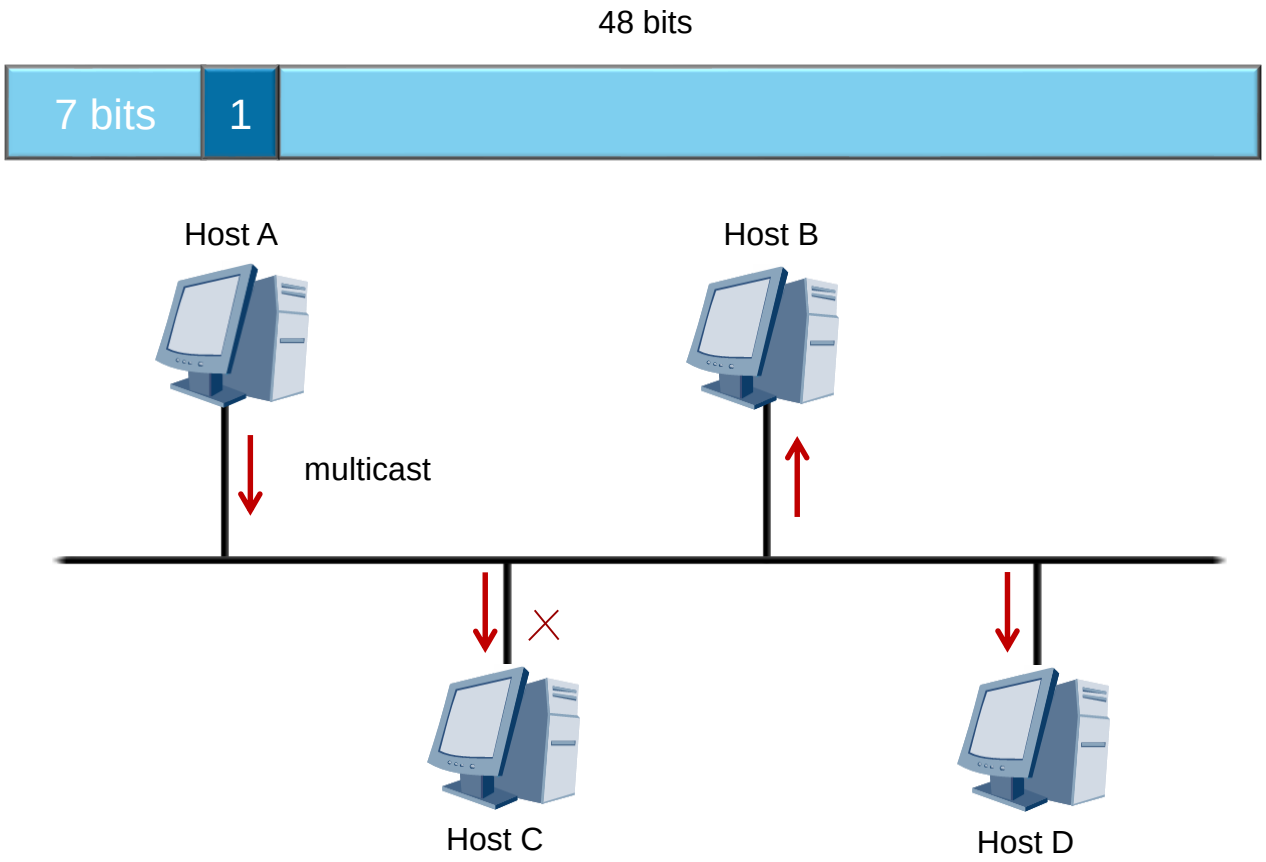
Unicast Frame Forwarding



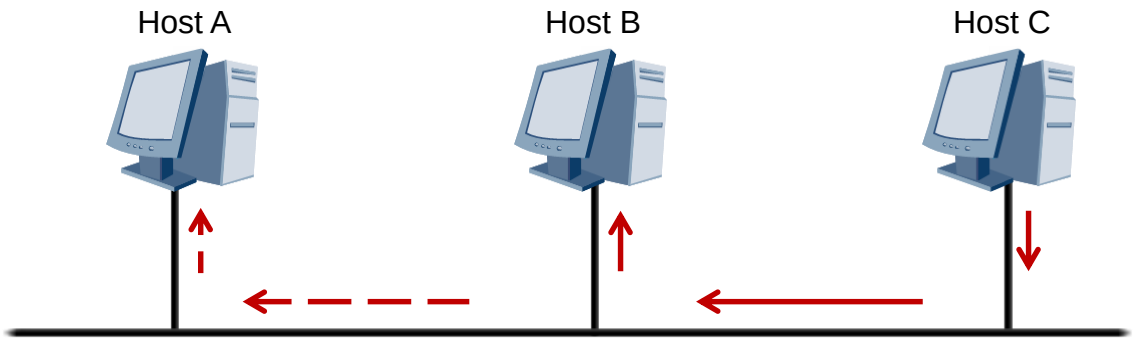
Broadcast Frame Forwarding



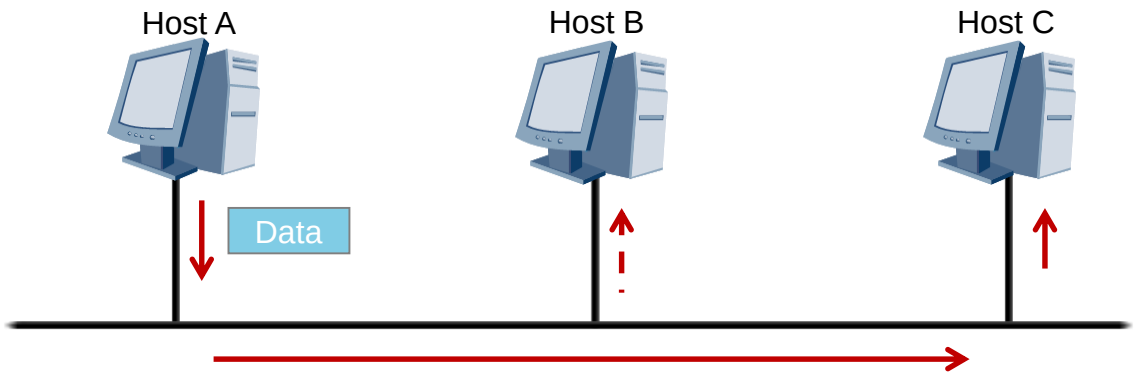
Multicast Frame Forwarding



Carrier Sense

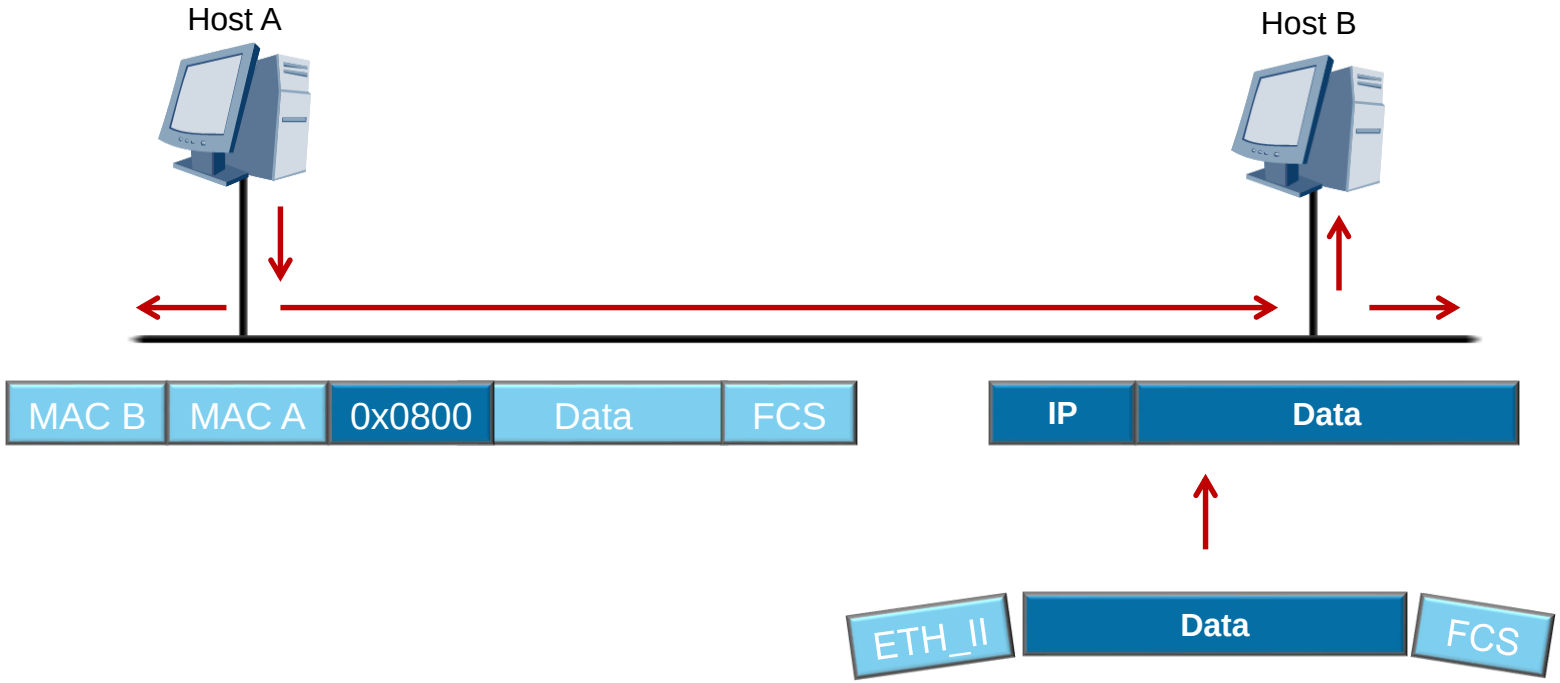


Carrier Sense (Network Occupied)



HUAWEI

Frame Processing



- Data link (frame) instructions are received, processed and discarded.

Dominio di collisione – Dominio di broadcast

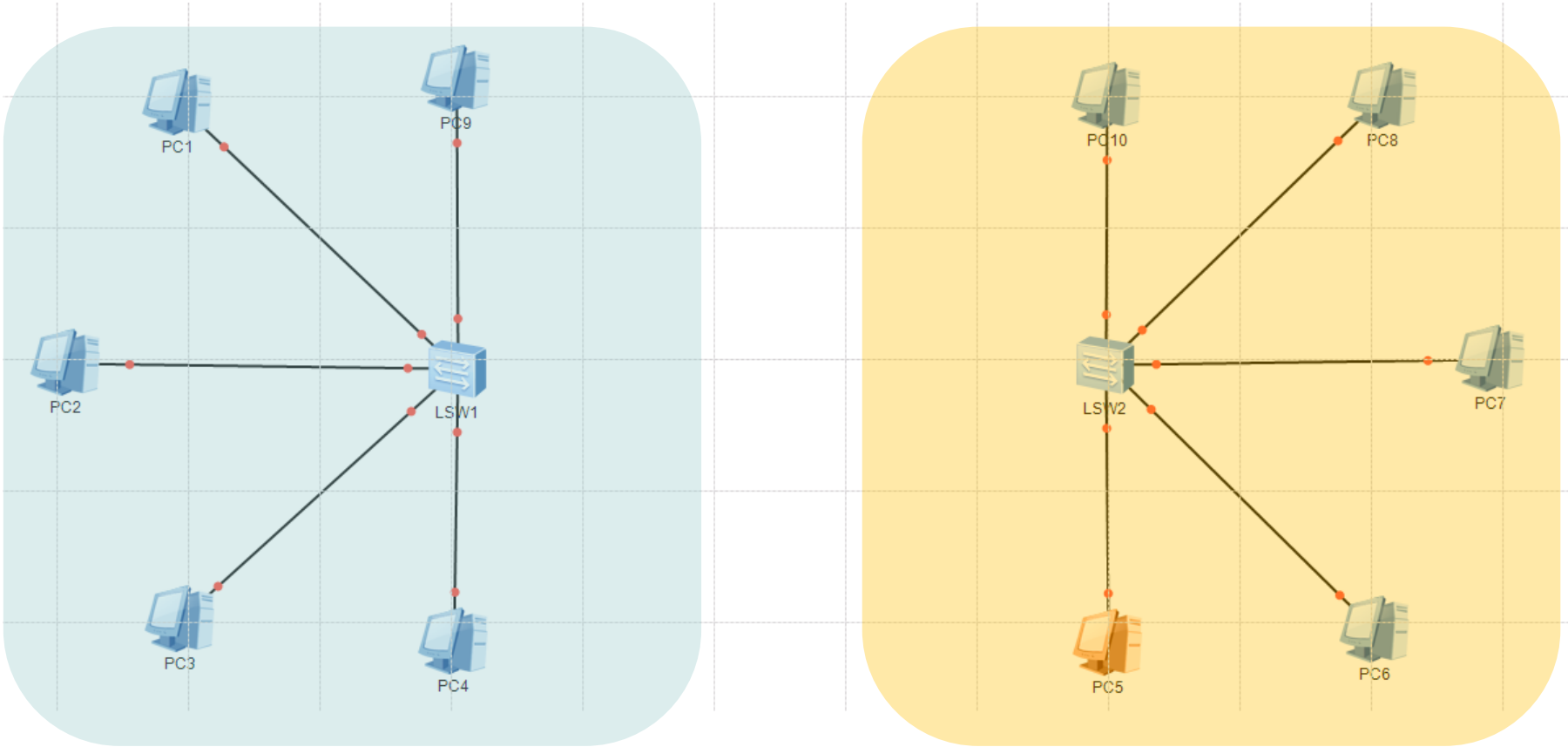
- Collisione:

  Concetto “elettrico”, comprende tutti i nodi che sono interessati dallo stesso segnale elettrico (importante nelle reti a BUS);

- Broadcast:

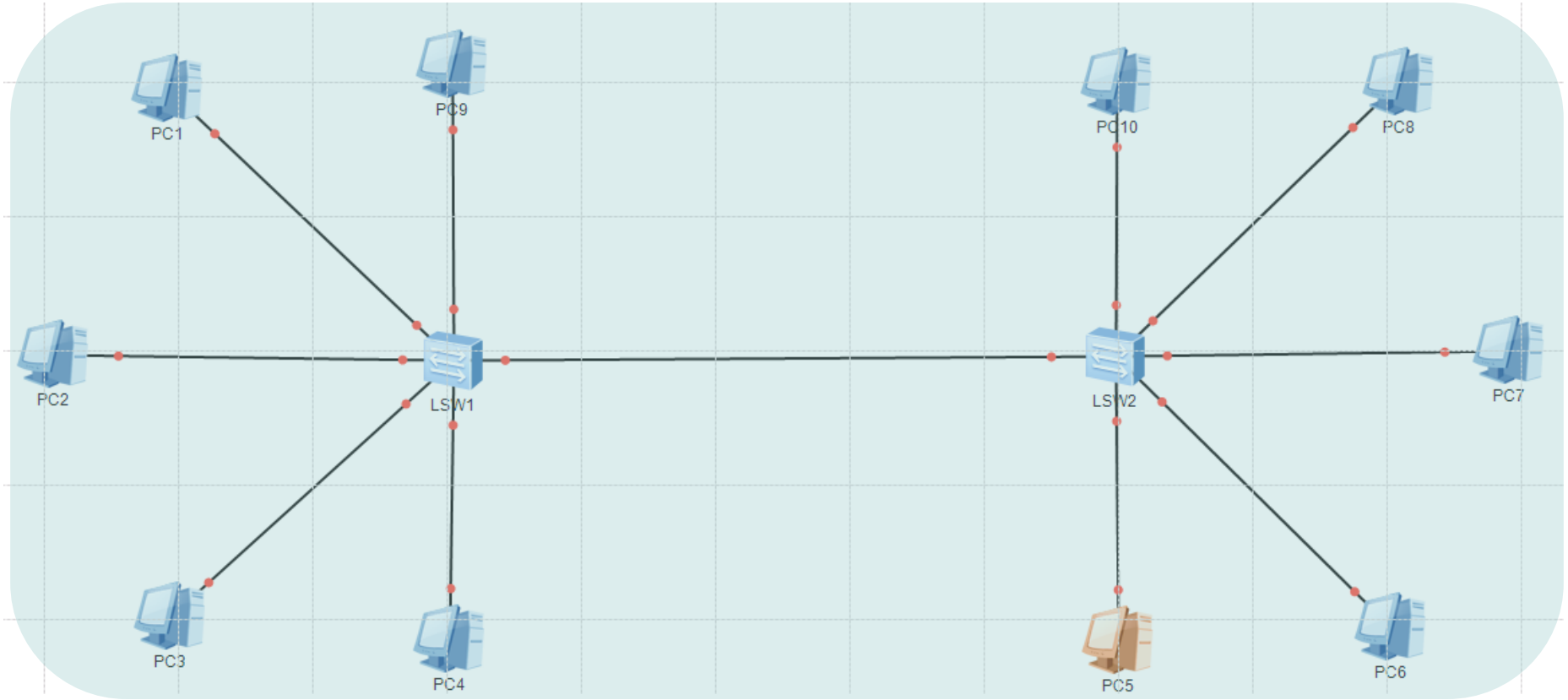
  Concetto “logico”, comprende tutti i nodi che possono essere raggiunti da un frame con destination address valorizzato con FF:FF:FF:FF:FF:FF.

Dominio di broadcast

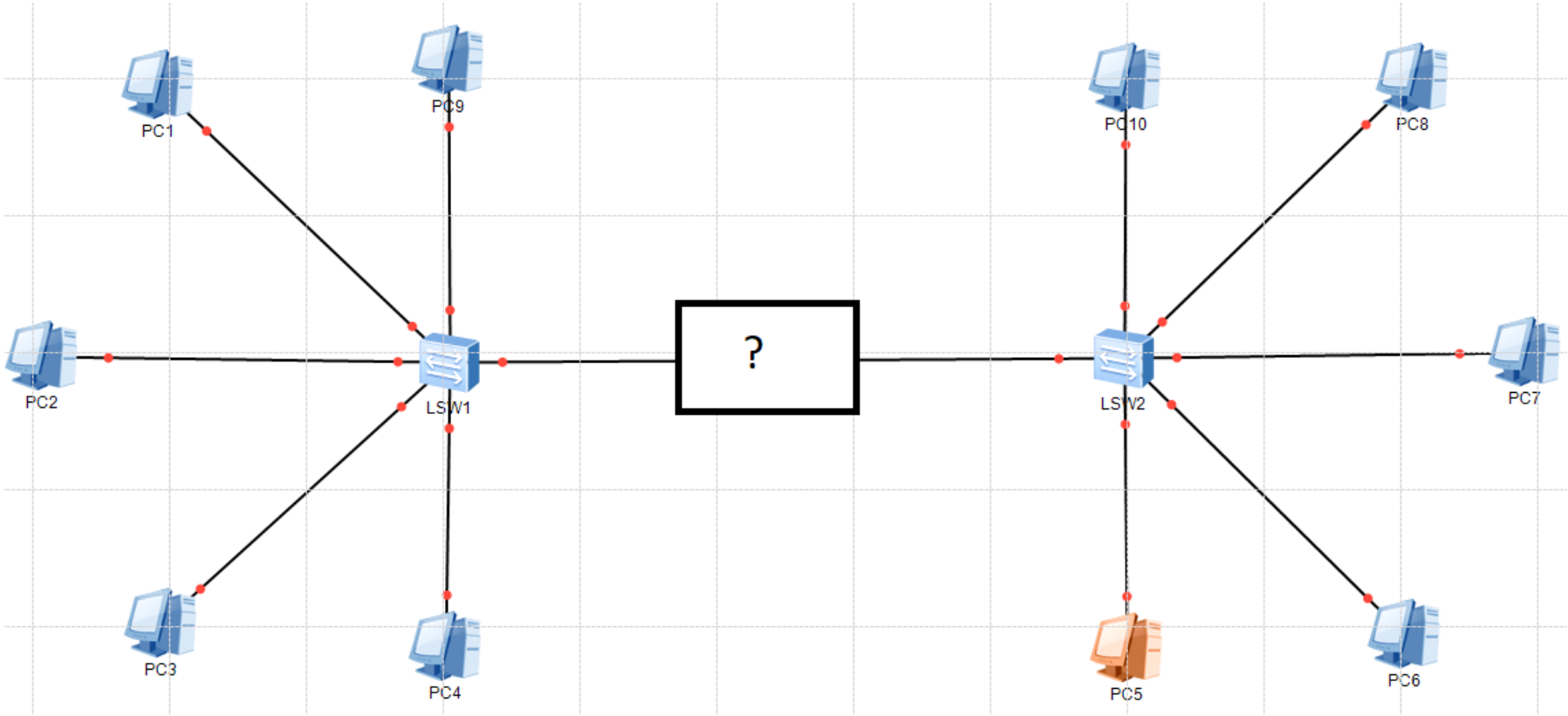


HUAWEI

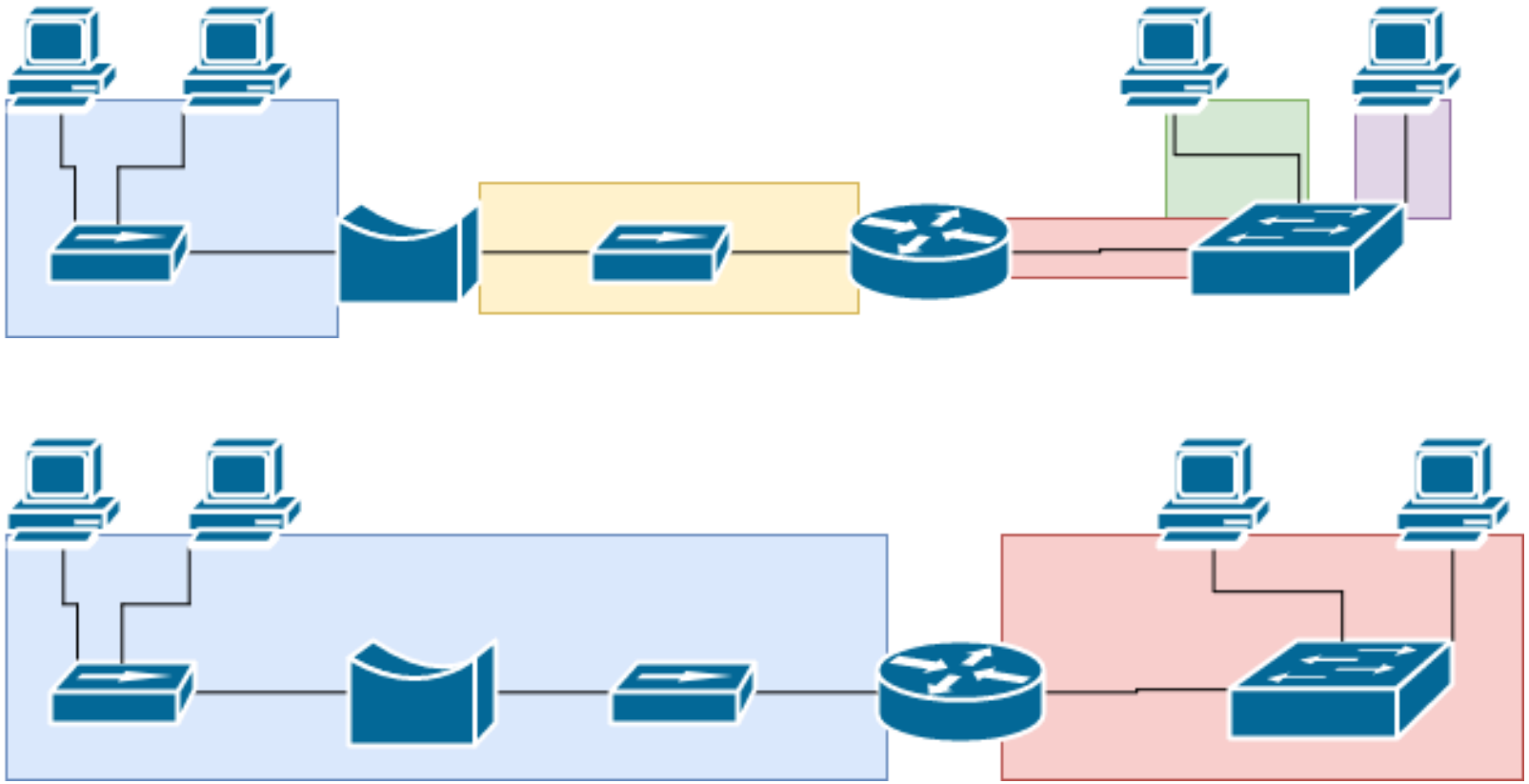
Dominio di broadcast - Estensione



Dominio di broadcast - Rottura



Domini di collisione – di broadcast



Mini - Lab

- Verificare il mac address del proprio pc in ambiente windows;
- Verificare il mac address dei componenti PC1 e Client1 nel simulatore Huawei;
- Mini-Lab_basic: 01-mac_address

MTU

- Concetto di MTU:

  la massima dimensione di un pacchetto L3 che può essere trasferito in una singola transizione.

- La dimensione del FRAME (std) ethernet è compresa tra 64 byte e 1518 byte.

- Il pacchetto proveniente da L3, viene inserito nel campo DATA, il payload ha dimesione compresa tra 46 byte e 1500 byte.

- Se il L3 deve trasmettere un pacchetto di dimensione maggiore a 1500byte, questo viene FRAMMENTATO.

MTU

- Alcuni apparati di rete supportano JUMBO frames:
  MTU > 1500 byte.
- Sono utilizzati in applicazioni particolari e consentono di aumentare l'efficienza della rete.
- Aumentano il ritardo della trasmissione

Transmission Time per Frame in Microseconds		
Link Speed, Gigabits per second (Gbps)	1500 byte MTU frame	9000 byte MTU frame
1 Gbps Ethernet	12.00	72.00
10 Gbps Ethernet	1.20	7.20
40 Gbps Ethernet	0.30	1.80
100 Gbps Ethernet	0.12	0.72

Summary

- How does Ethernet determine the protocol to which a processed frame should be delivered?
- How is it determined whether a frame should be processed or discarded upon being received by an end device?

Thank you

www.huawei.com