

Application Layer

Transport

Network

Data Link

Physical

HTTP/SMTP

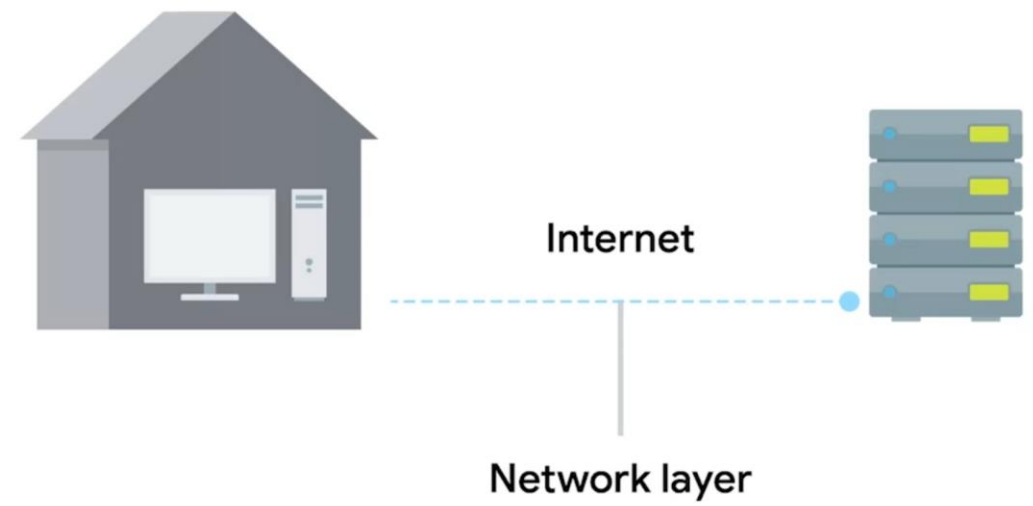
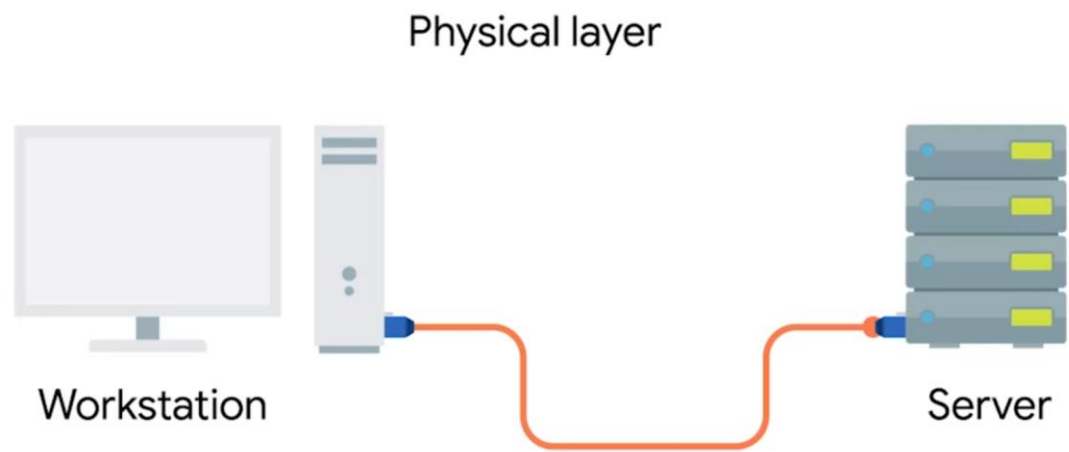
TCP/UDP

IP

Wi-Fi / Ethernet

10 Base T, 802.11

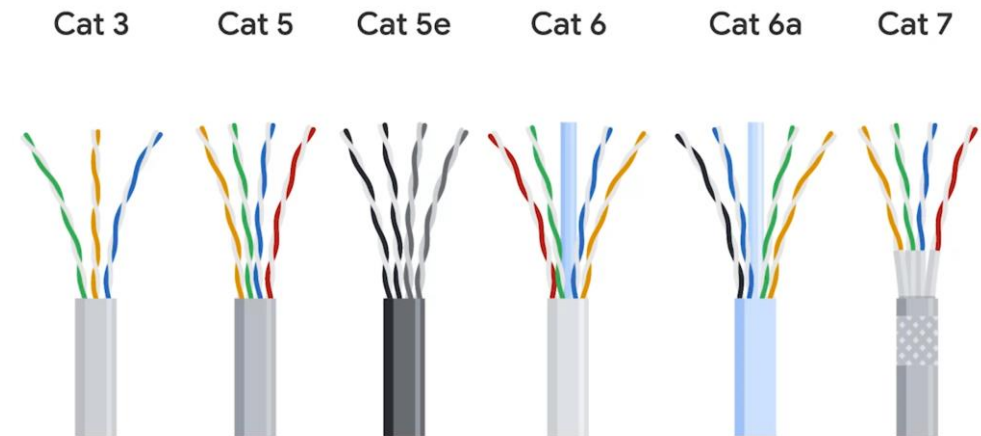
5	Application	HTTP, SMTP, etc..	Messages	n/a
4	Transport	TCP/UDP	Segment	Port #'s
3	Network	IP	Datagram	IP address
2	Data Link	Ethernet, Wi-Fi	Frames	MAC Address
1	Physical	10 Base T, 802.11	Bits	n/a



# Cables

Connect different devices to each other,  
allowing data to be transmitted over them

The most common forms of copper twisted-pair cables used in networking are **Cat5**, **Cat5e**, and **Cat6** cables.

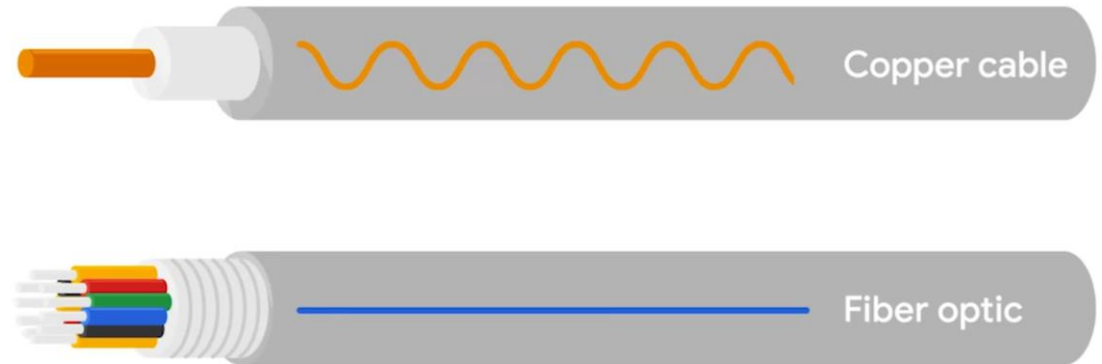


# Cables

Connect different devices to each other, allowing data to be transmitted over them

## Fiber cables

Contain individual optical fibers, which are tiny tubes made out of glass about the width of a human hair

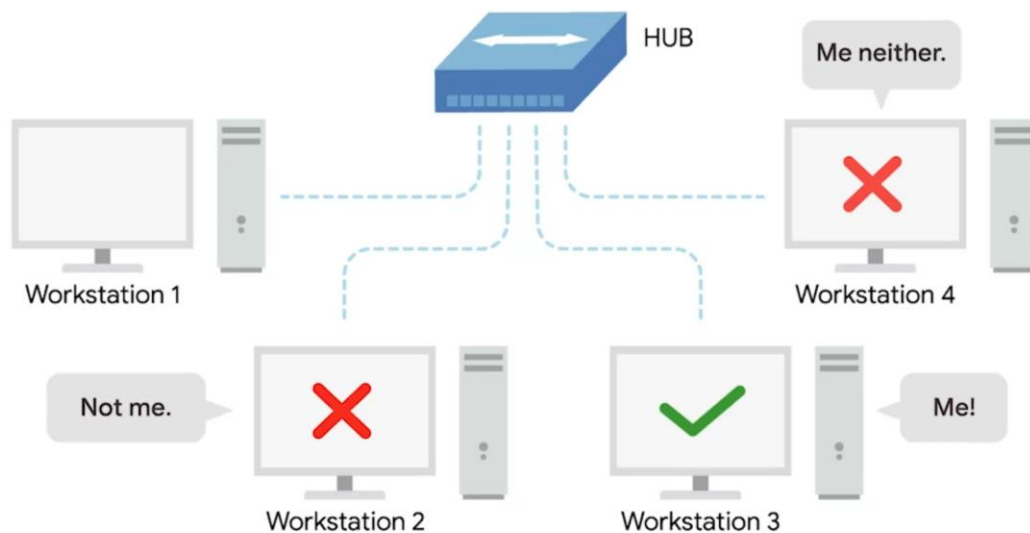


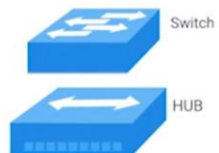
# Collision domain

A network segment where only one device can communicate at a time

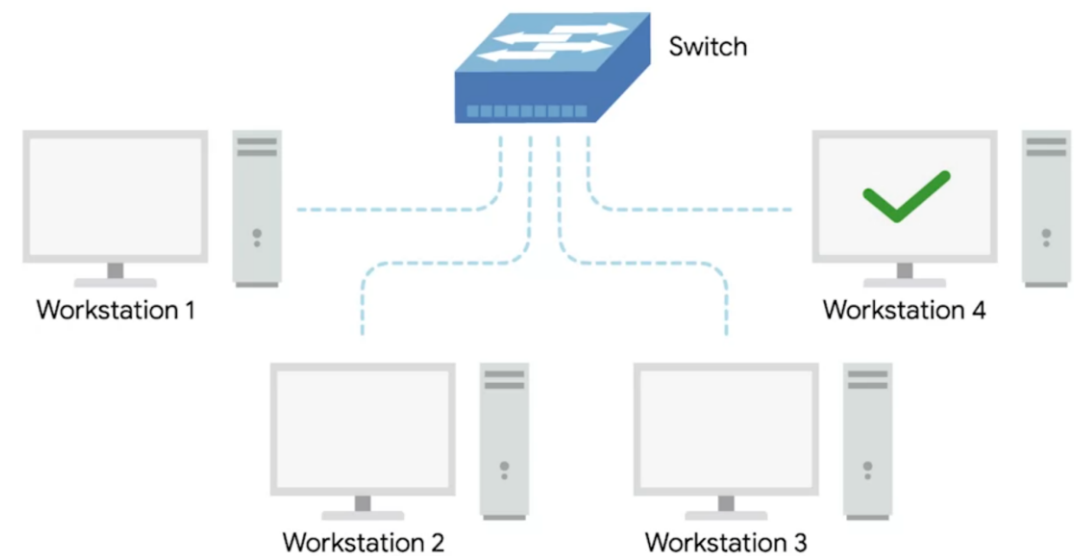
## Hub

A physical layer device that allows for connections from many computers at once





#	Layer Name	Protocol	Protocol Data Unit	Addressing
5	Application	HTTP, SMTP, etc..	Messages	n/a
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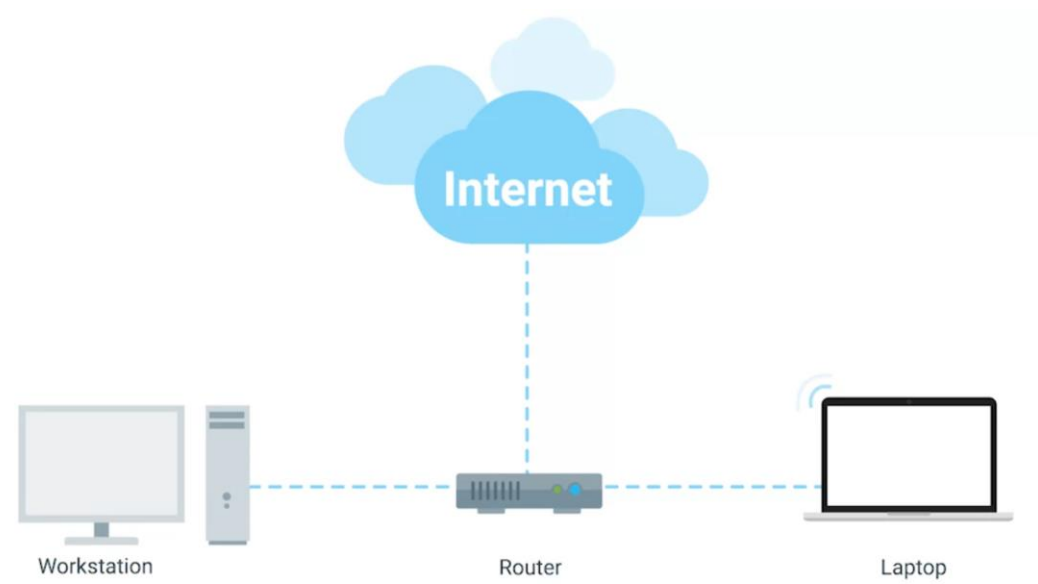


# Hubs and switches

The primary devices used to connect computers on a single network, usually referred to as a **LAN**, or **local area network**

# Router

A device that knows how to forward data between independent networks



	#	Layer name	Protocol	Protocol data unit	Addressing
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	2	Data link	Ethernet, Wifi	Frames	MAC address
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Router

Switch

Hub


The diagram includes three icons for network devices, each with a label to its left. The 'Router' icon is a blue cylinder with a white cross on top. The 'Switch' icon is a blue rectangular device with multiple ports on the front. The 'Hub' icon is a blue rectangular device with multiple ports on the front and a double-headed arrow on top, indicating it connects all devices to each other.



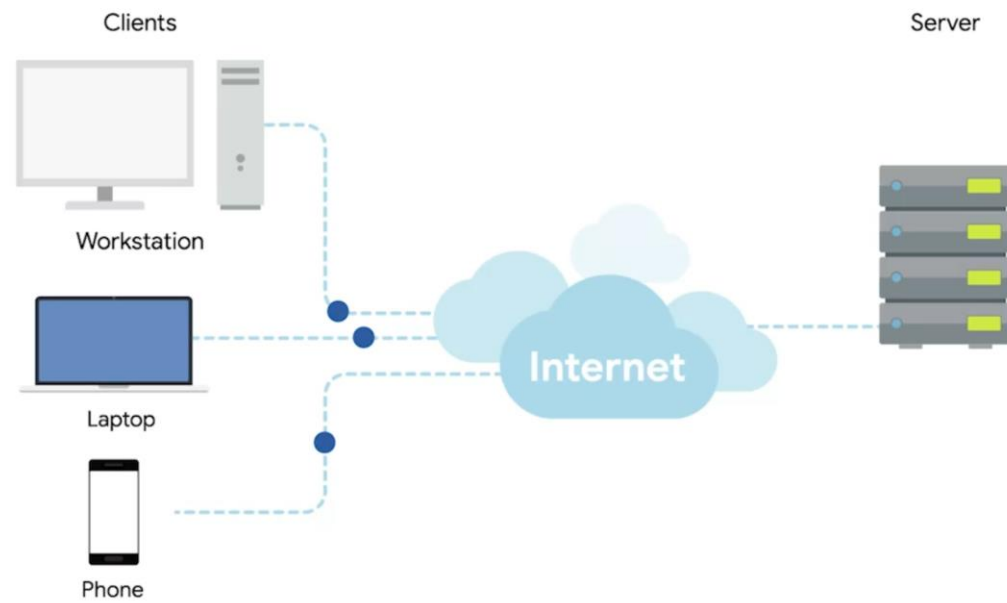
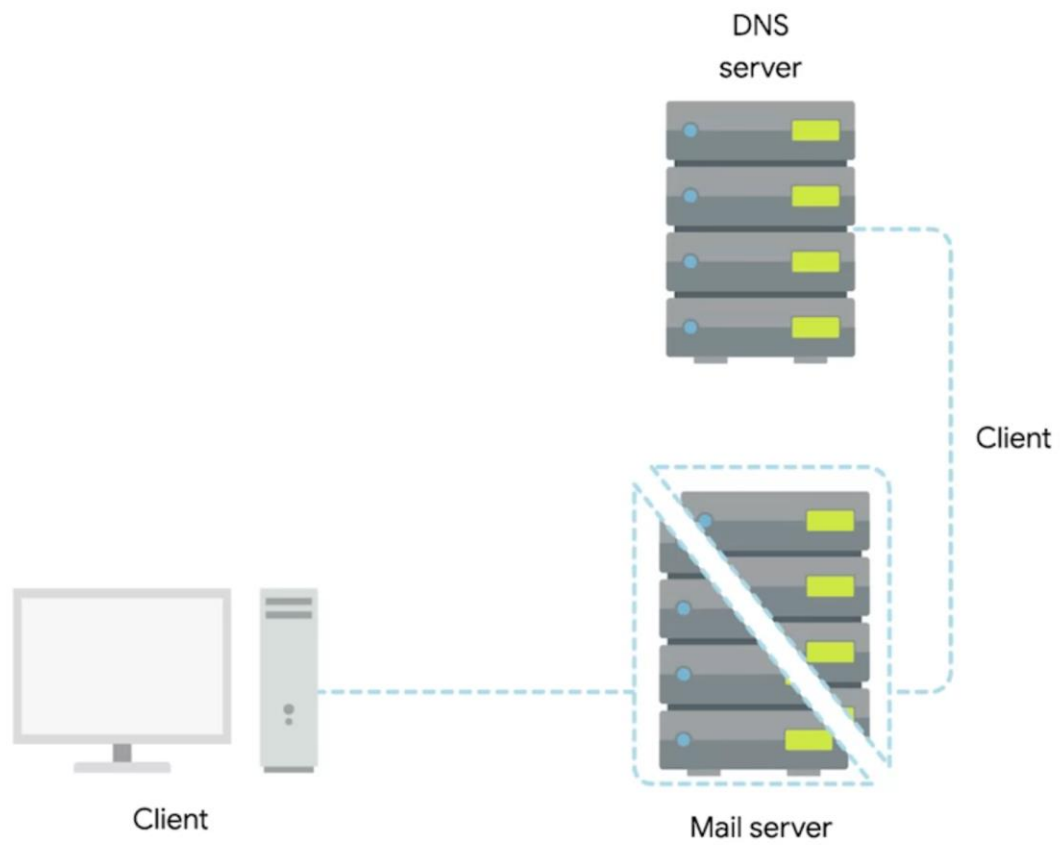


# Border Gateway Protocol (BGP)

Routers share data with each other via this protocol, which lets them learn about the most optimal paths to forward traffic





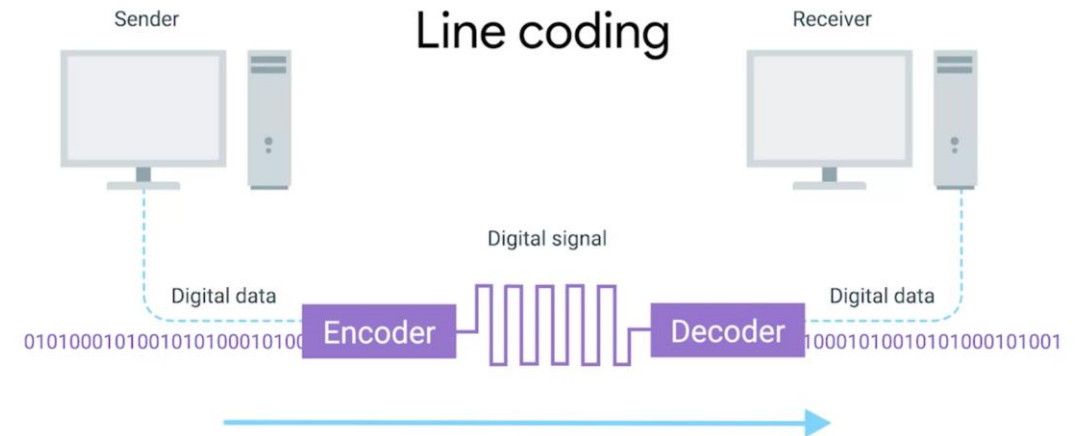


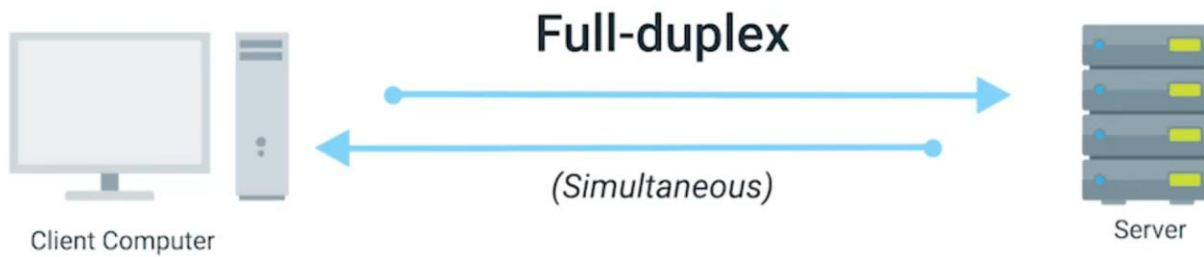
# Bit

The smallest representation of data that a computer can understand; it's a one or a zero

## Modulation

A way of varying the voltage of this charge moving across the cable





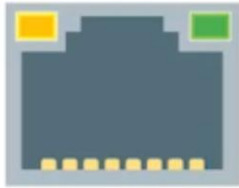
## Duplex communication

The concept that information can flow in both directions across the cable

## Simplex communication

This process is unidirectional

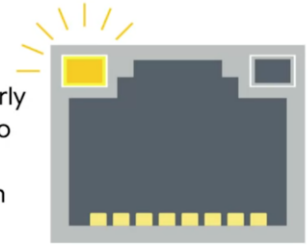
# RJ45 port



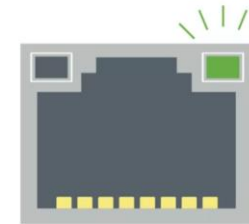
# RJ45 plug



Link LED  
Cable properly  
connected to  
two devices  
that are both  
powered on



## RJ45 port



Activity LED  
Would flash  
when data  
actively  
transmitted  
across the cable

## RJ45 port

## Patch panel



# CSMA/CD

Used to determine when the communications channels are clear, and when a device is free to transmit data

Ethernet as a protocol solved this problem by using a technique known as carrier sense multiple access with collision detection.

## MAC address

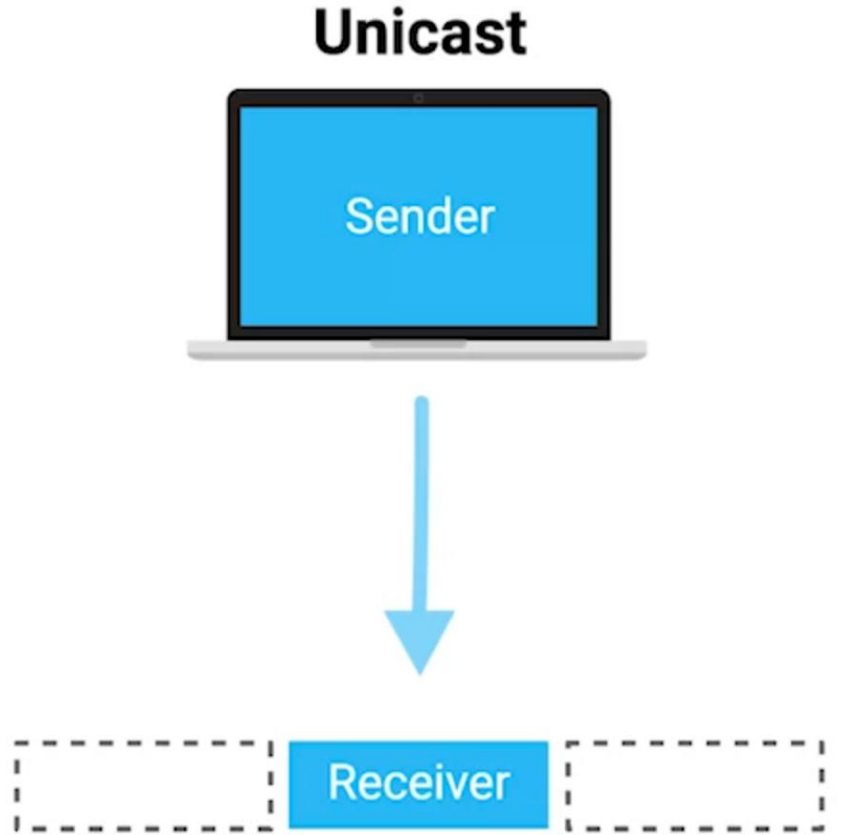
A globally unique identifier attached to an individual network interface

It's a 48-bit number normally represented by six groupings of two hexadecimal numbers.

**Ethernet** uses **MAC** addresses to ensure that the data it sends has both an address for the machine that sent the transmission, as well as the one the transmission was intended for.

	Organizational Unique Identifier	Vendor Assigned (NIC Cards, Interfaces)
Size, in bits	24 Bits	24 Bits
Size in hex digits	6 Hex Digits	6 Hex Digits
Example	00 60 2F	3A 07 BC
Structure	Cisco	Particular Device

A **unicast** transmission is always meant for just one receiving address.

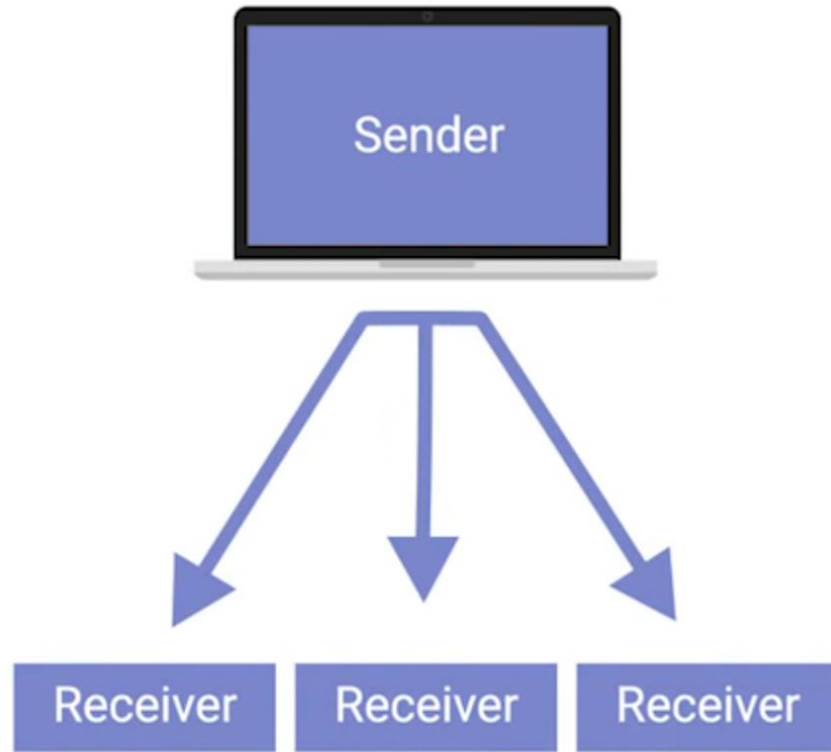




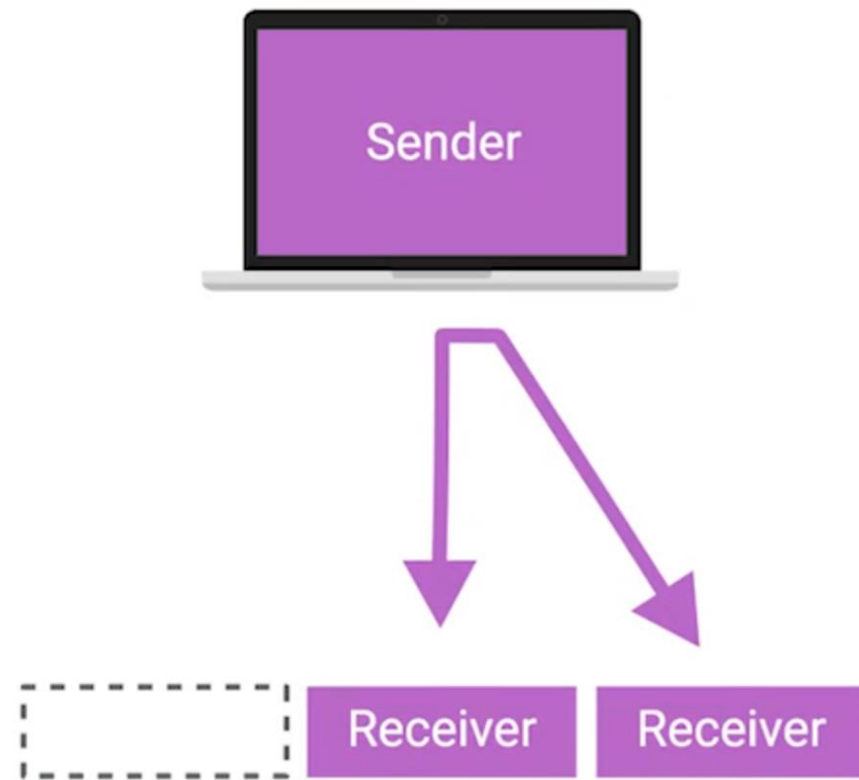
If the least significant bit in the first octet of a destination address is set to **zero**, it means that ethernet frame is intended for **only the destination address**.

If the least significant bit in the first octet of a destination address is set to **one**, it means you're dealing with a **multicast frame**.

## Broadcast



## Multicast



## Data packet

An all-encompassing term that represents any single set of binary data being sent across a network link

## Ethernet frame

A highly structured collection of information presented in a specific order

## EtherType field

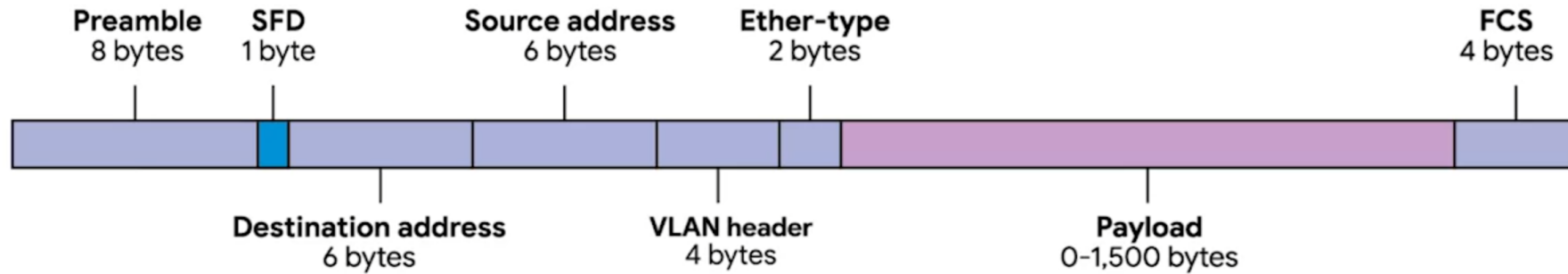
16 bits long and used to describe the protocol of the contents of the frame

## Frame Check Sequence

A 4-byte (or 32-bit) number that represents a checksum value for the entire frame

## VLAN header

Indicates that the frame itself is what's called a VLAN frame



## Destination MAC address

The hardware address of the intended recipient

## Preamble

8 bytes (or 64 bits) long, and can itself be split into two sections

## Start frame delimiter (SFD)

Signals to a receiving device that the preamble is over and that the actual frame contents will now follow