

# CCNP

alexander

May 30, 2025

## Physical/Data-Link Layer and Basic Access

CSMA/CD (Carrier Sense Multiple Access with Collision Detection) is a protocol used in half-duplex Ethernet networks, such as the original 10BASE5 Ethernet. Here's how it works:

1. Before sending data, the device checks whether the cable is currently in use by listening for any signals on the wire.
2. If the line is idle (no signal), the device sends its data.
3. While a device is transmitting its data, any other devices that sense the transmission will not attempt to transmit their own data.
4. When two or more devices detect each other's transmissions simultaneously and both start sending, they collide.

When a collision occurs, the following happens:

- The receiving device detects the error (garbled signal) and sends an "idle" sequence back to the transmitter.
- The transmitting device hears this idle sequence and stops transmitting immediately.
- After a short period of time (called the \*\*jamming signal\*\*), both devices that collided will retransmit their data.

This process is repeated until one or more of the colliding devices are successfully transmitted.

CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) is used in full-duplex Ethernet networks, such as 100BASE-TX and 1000BASE-T. Here's how it works:

1. Before sending data, the device checks whether the cable is currently in use by listening for any signals on the wire.

2. If the line is idle (no signal), the device sends a **request to send (RTS)** signal.
3. Upon receiving the RTS signal, the intended recipient responds with a **clear to send (CTS)** signal.

This process ensures that there are no collisions before data transmission begins:

- The transmitting device will only transmit its data if it receives the CTS signal.
- If a device senses another transmission on the wire while trying to send an RTS or after receiving a CTS, it will wait for the transmission to finish and then reattempt to transmit.

CSMA/CA is more efficient than CSMA/CD since devices can avoid collisions by sending RTS signals first.

## Hardware Components (Data Plane)

- Line Cards also known as Line Interface Cards (LICs) or Network Interface Cards (NICs), are modules that connect to the backbone network through an interface, such as Ethernet, fiber optic, or copper cable. Their primary function is to transmit data between devices on the network and the switch itself. Key features of line cards:
  - **Network connectivity**: Line cards provide a connection point for each device connected to the switch.
  - **Packet processing**: They can forward packets from incoming interfaces to outgoing interfaces.
  - **Quality of Service (QoS)**: Some line cards support QoS, allowing administrators to prioritize traffic based on various parameters.
- Switch Fabric
- Forwarding Engine

## Memory for Packet Lookup

- Adjacency Information Base
- Forwarding Information Base

## Switching Methods (Software Logic for Forwarding)

- Process Switching
- Fast Switching
- CEF

## Configuration Layer

SDM templates

## Switching technologies

- 802.1Q (VLAN tagging)
- 802.1D (STP)
- 802.1W (RSTP)
- 802.1S (MSTP)
- VTP
- DTP
- EtherChannels

**IPv4 and IPv6 Overview**

**NAT**

**DHCP**

**DNS**

**Static Routing Overview**

**NTP**

**SNMP**

**AAA (TACACS+ and RADIUS)**

**VRF**

**OSPF**

**IGRP/EIGRP**

**BGP**

**Multicast**

**QoS**