Collision Domain and Broadcast Domain

SDC CNW (CSE 4541)

Department of Computer Science & Engineering
ITER, Siksha 'O' Anusandhan Deemed To Be University
Jagamohan Nagar, Jagamara, Bhubaneswar, Odisha - 751030

Glen E. Clarke & Richard Deal

CCT/CCNA

Routing & Switching Exam Guide

McGrawHll

Talk Flow

Introduction to Different Domains

**Collision Domain (CD)**: In this group of systems, simultaneous data transmissions can collide with one another.

Broadcast Domain (BD): In this group of systems, each system can receive other systems' broadcast messages.

Collision Domain (CD)

⋆ In a collision domain, data collisions can occur when multiple systems send data simultaneously, common in hubs where all ports share the same collision domain.

⋆ Using a hub to connect systems makes all connected ports part of the same collision domain, increasing the likelihood of collisions.

Hub
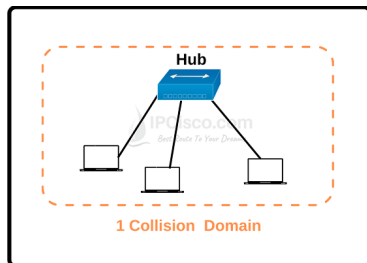
1 Collision Domain

★ Cascade connections of hubs further expand the collision domain, as all hubs are considered part of the same domain.
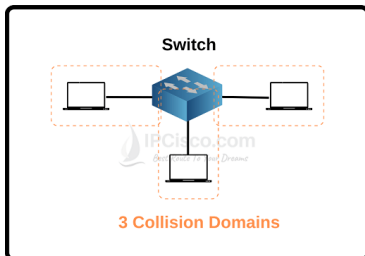
★ Switches, unlike hubs, create separate collision domains for each port, reducing the likelihood of collisions by directing data only to the intended destination port.


Switch

3 Collision Domains

Router

3 Collision Domains
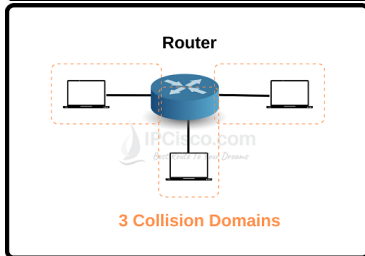
Broadcast Domain

- ⋆ A broadcast domain includes systems that can receive each other's broadcast messages.

- ⋆ With a hub, all connected systems receive broadcast messages, creating a single broadcast domain.

- ⋆ Similarly, using a switch, all ports are part of the same broadcast domain, and broadcast messages are received by all connected systems.

- ⋆ Broadcast domains are important for network management and traffic control.

37 Collision Domain
**17 Broadcast Domain**
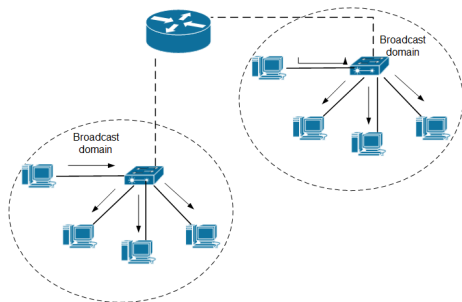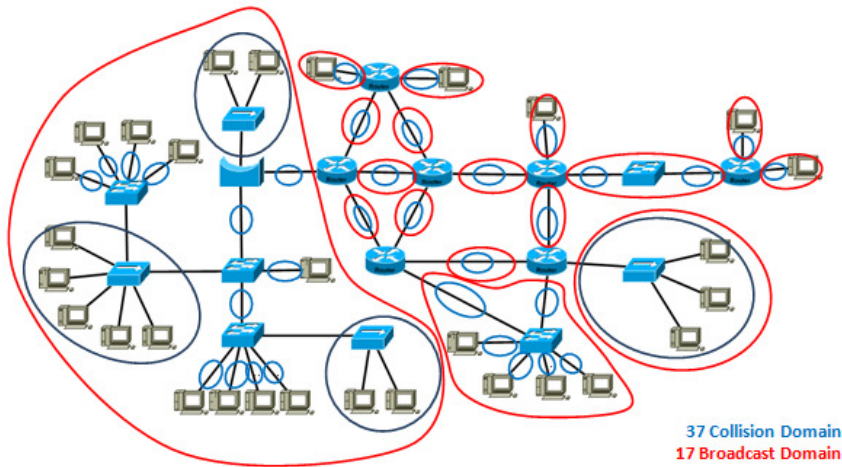
Different Types of Cables and their Usage

* LANs typically use either copper or fiber-optic cabling.
* **Copper** cabling can include one strand of copper across which an electrical voltage is transmitted, or it can be many strands of copper.
* **Fiber-optic** cabling uses light-emitting diodes (LEDs) and lasers to transmit data across a glass core. With this transmission, light is used to represent binary 1s and 0s: if light is on the wire, this represents a 1; if there is no light, this represents a 0.

★ Between copper and fiber, implementing copper cabling is less expensive. Three types of copper cabling have been used with networks over the years:

Thicknet Uses a thick coaxial cable (no longer used in today's networks)

Thinnet Uses a thin coaxial cable (no longer used in today's networks)

Unshielded twisted pair (UTP) Uses four pairs of wires in the cable, where each pair is periodically twisted

UTP Cables
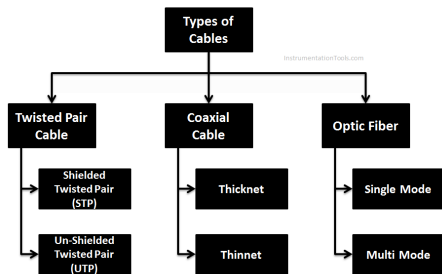
Of the three copper cabling types, UTP is the most common today, mainly because it is cheaper than the other two and is easier to install and troubleshoot.

Given its advantages, copper cabling, including UTP, has two disadvantages :

It is susceptible to electromagnetic interference (EMI) and radio frequency interference (RFI).

Distances of the cable are limited to a short haul (100 meters).

UTP Catagory

To help differentiate between the different kinds of UTP cabling, different categories were created. The below Table shows the categories of UTP cabling.

Category	Description
Category 1	Used for telephone connections (not suitable for data)
Category 2	Used for data connections up to 4 Mbps—Token Ring
Category 3	Used for data connections up to 10 Mbps—Ethernet 10BaseT
Category 4	Used for data connections up to 16 Mbps—Token Ring
Category 5	Used for data connections up to 100 Mbps—Ethernet
Category 5E	Used for data connections up to 1 Gbps (gigabit per second)—Ethernet
Category 6	Used for data connections up to 1 Gbps (24-gauge)—Ethernet
Category 6A	Used in 10 Gigabit Ethernet networks with speeds up to 10 Gbps
Category 7	Used in 10 Gigabit Ethernet networks with speeds up to 10 Gbps

Cabling Devices

As mentioned earlier, the UTP cable has eight wires in it (four pairs of wires). Two types of implementations are used for the pinouts of the two sides of the wiring:

straight-through
Use a straight-through cable to connect dissimilar devices, such as connecting a computer to a switch, a computer to a hub, a switch to a router.
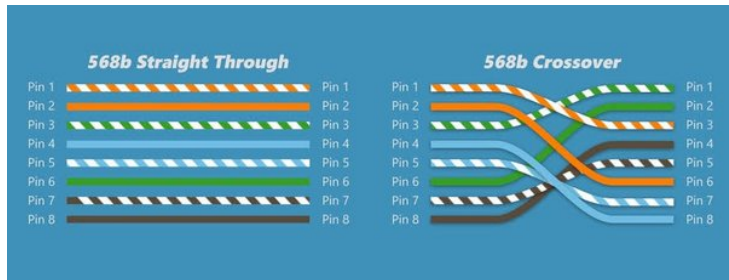
crossover
crossover cable is used to connect similar devices such as two computers together, two switches together, or a hub to a switch

Cabling Devices

straight-through Ethernet UTP cable has pin 1 on one end of the cable connected to pin 1 on the other end of the cable, pin 2 to pin 2, and so on.

crossover UTP Ethernet cable crosses over two sets of wires: pin 1 on one side is connected to pin 3 on the other side, and pin 2 is connected to pin 6.

straight-through cable to connect dissimilar devices, such as connecting a computer to a switch, a computer to a hub, a switch to a router.

crossover cable is used to connect similar devices together such as two computers together, two switches together, or a hub to a switch.
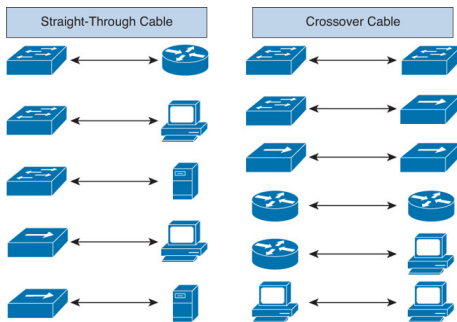
Fiber Optic Cables

- ★ Fiber-optic cabling is typically used to provide very high speeds and to span connections across Very large distances. fiber-optic cabling does have its disadvantages:
  - ★ it is expensive to implement.
  - ★ difficult to troubleshoot
  - ★ difficult to install

- ★ Fiber cabling is not affected by EMI and RFI, whereas copper cabling is. Because of issues of spanning copper between buildings in a campus network, fiber is the recommended cabling type.

Cable	Distance	Data Rates	Comparison
UTP	100 meters	10 Mbps–10 Gbps	Easy to install but susceptible to interference
Coaxial	500 meters	10–100 Mbps	Easy to install but difficult to troubleshoot (no longer used for Ethernet)
Fiber	10 kilometers	10 Mbps–100 Gbps	Difficult and expensive to install, difficult to troubleshoot, but can span very long distances and is not susceptible to interference

Cisco Three-Layer Hierarchical model

Core Layer: The Core Layer is the backbone of the network and is responsible for high-speed data transport between different parts of the network.

Distribution Layer: The Distribution Layer aggregates traffic from the Access Layer and provides routing, filtering, and policy-based connectivity.

Access Layer: The Access Layer is where end devices such as computers, printers, and IP phones connect to the network.
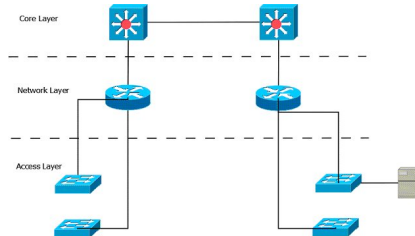
Introduction to Cisco Packet Tracer

* Cisco Packet Tracer is a versatile network simulation tool used for designing, configuring, and troubleshooting networks.

* It provides a virtual environment where users can create network typologies, connect devices like routers and switches, and simulate data flow.

* With features like the Activity Wizard for guided learning, Simulation Mode for network behavior simulation, and Realtime Mode for live data monitoring, Packet Tracer is an essential tool for networking education and practice.

Simulation, Visualization, Collaboration

★ It offers a range of services, protocols, and a CLI for device configuration, making it a comprehensive platform for learning and experimenting with networking concepts.
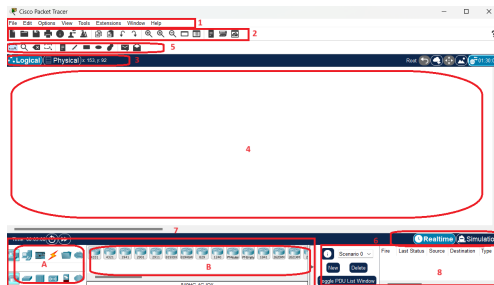
Simulation, Visualization, Collaboration

simulate IOS commands

visualize network traffic

collaborate on multiuser activities

★ **Area 1:** Menu bar

★ **Area 2:** Main toolbar –

★ **Area 3:** Logical/Physical workspace tabs
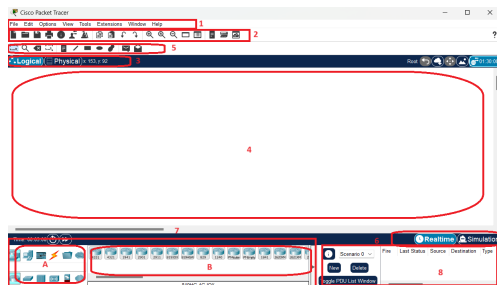
★ **Area 4:** Workspace

★ **Area 5:** Common tools bar

- ★ **Area 6:** Realtime/Simulation tabs
- ★ **Area 7:** Network component box

  Area 7a: Device-type selection box

  Area 7b: Device-specific selection box

- ★ **Area 8:** User-created packet box

Sample Questions

THANK YOU