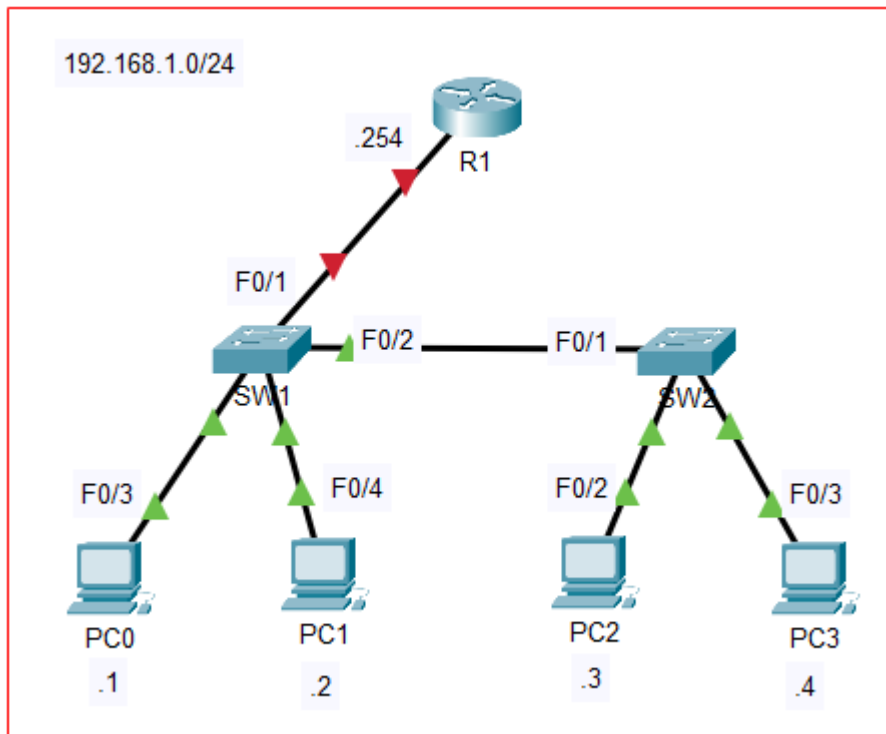


# DAY 9 - Switch Interfaces

Purinat33

## Switch Interface



## Viewing Interfaces:

From SW1:

- **Viewing SW1's interface** (Same command as router): `show ip interface brief`

```
SW1#show ip interface brief
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/1 unassigned      YES manual down        down
FastEthernet0/2 unassigned      YES manual up          up
FastEthernet0/3 unassigned      YES manual up          up
FastEthernet0/4 unassigned      YES manual up          up
FastEthernet0/5 unassigned      YES manual down       down
FastEthernet0/6 unassigned      YES manual down       down
FastEthernet0/7 unassigned      YES manual down       down
FastEthernet0/8 unassigned      YES manual down       down
FastEthernet0/9 unassigned      YES manual down       down
FastEthernet0/10 unassigned      YES manual down       down
```

- None of the interfaces have no **IP Assignment** because a **Switch** is a

**Layer 2 Device** while IP Address is a **Layer 3 Addressing**.

- There are reasons to assign IP Addresses to Switch's interfaces, but that comes later.

- **Router vs. Switch Interfaces:**

- **Router** interfaces have the `shutdown` command applied by default (`administratively down/down` State)
- **Switch** interfaces **DO NOT** have the `shutdown` command applied by default.
  - \* Will be in the `up/up` state if connected to another device.
  - \* Will be in the `down/down` state if **NOT** connected to another device.

- **View Speed and Duplex of each interface via** `show interfaces status`

```
SW1#show interfaces status
Port      Name      Status      Vlan      Duplex  Speed  Type
Fa0/1     Fa0/1     notconnect  1         auto    auto   10/100BaseTX
Fa0/2     Fa0/2     connected   1         auto    auto   10/100BaseTX
Fa0/3     Fa0/3     connected   1         auto    auto   10/100BaseTX
Fa0/4     Fa0/4     connected   1         auto    auto   10/100BaseTX
Fa0/5     Fa0/5     notconnect  1         auto    auto   10/100BaseTX
Fa0/6     Fa0/6     notconnect  1         auto    auto   10/100BaseTX
Fa0/7     Fa0/7     notconnect  1         auto    auto   10/100BaseTX
Fa0/8     Fa0/8     notconnect  1         auto    auto   10/100BaseTX
Fa0/9     Fa0/9     notconnect  1         auto    auto   10/100BaseTX
Fa0/10    Fa0/10    notconnect  1         auto    auto   10/100BaseTX
Fa0/11    Fa0/11    notconnect  1         auto    auto   10/100BaseTX
Fa0/12    Fa0/12    notconnect  1         auto    auto   10/100BaseTX
Fa0/13    Fa0/13    notconnect  1         auto    auto   10/100BaseTX
```

- **Name:** Description of an interface.
- **Status:** *Connected* or *Not Connected*
- **VLAN:** Will be covered later.
- **Duplex:** Direction of sending/receiving data.
- **Speed:** Depend on the **Speed of the slower of the two** (The interface *vs.* The device connecting to that interface).
  - \* eg: **10 Mbps** device connecting to the **100 Mbps** port will make the communication speed of this connection = **10 Mbps**.
- **Type:** `10` (**Ethernet**, Slower than **Fa**) and `100` (**Fast Ethernet** or **Fa**)
  - \* No `1000` or `10G` since these are **Fa** (**Fast Ethernet**) interfaces and not **G** (**Gigabit Ethernet**)

## Duplex:

```
Switch(config)#interface f0/1
Switch(config-if)#duplex ?
auto  Enable AUTO duplex configuration
full  Force full duplex operation
half  Force half-duplex operation
```

- **Full Duplex:**

- The device *can send and receive data AT THE SAME TIME*, it does

not have to wait. (Most Modern Devices have this capabilities.)

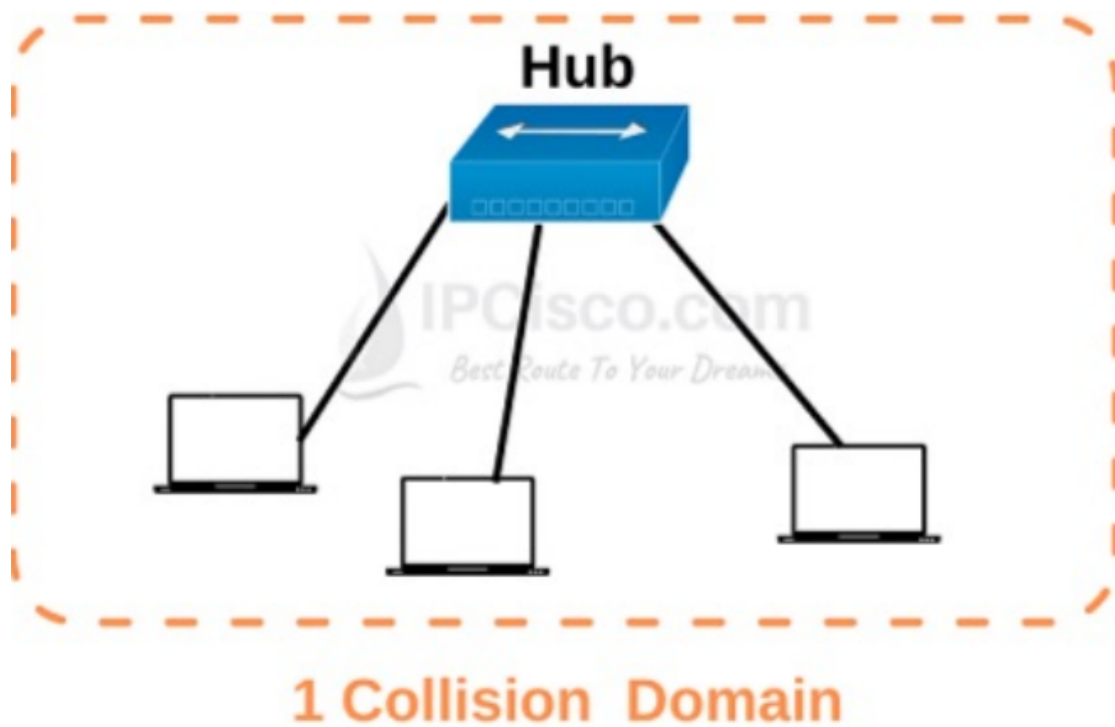
- **Half Duplex:**

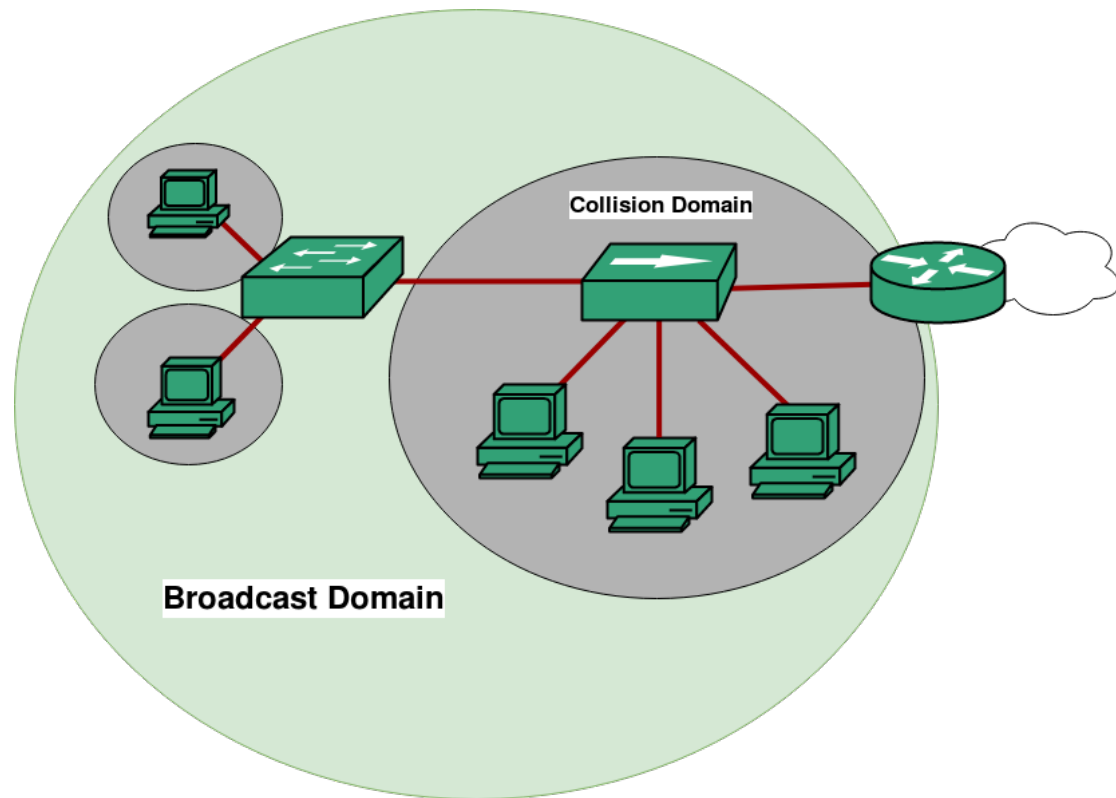
- The device *cannot send and receive* data at the same time.
- If it is receiving a frame, it must **wait** before sending a frame.
- eg: **Hub**



**Hub:**

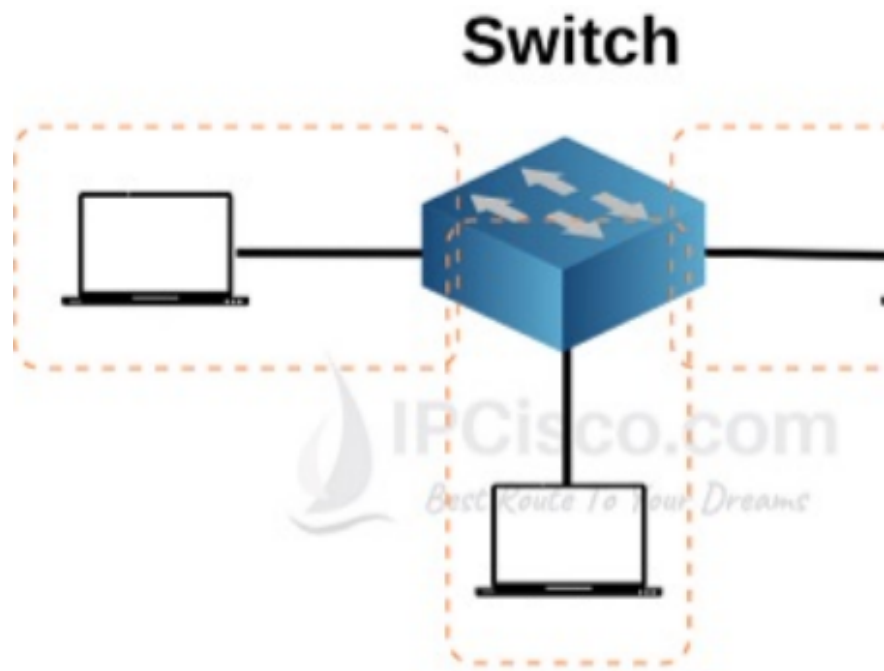
- Is considered to be a **Layer 1 Device** instead of Layer 2 because it performs similar function to *switches* (**Frame Routing**) but **without** the use of any **MAC Addressing** or **MAC Table**.
- More similar to a networking *repeater*.
- Will **Always Flood** the frames regardless of the frame's type.
- Devices connected to a Hub must always operate in **Half-Duplex** mode.
- Have a mechanism to deal with collisions called **CSMA/CD**.





### CSMA/CD in

- Carrier Sense Multiple Access *with* Collision Detection
- Used in Half-Duplex situation (like **Hub** network) to deal with collisions.
- Before sending frames, devices ***LISTEN*** to the **Collision Domain** until they detect that other devices are not sending.
- If a **Collision** does occur, the device sends a jamming signal to inform the other devices that a collision happened.
- Each device will wait *a random period of time* before sending frames again.



### Collision Domain in Switches

## 3 Collision Domain

- As established, **Switches** are considered a **Layer 2 Device** due to usage of **MAC Addressing, Frame Forwarding** etc.
- Collisions *rarely* occur (More of a configuration fault rather than normal usual occurrences like in Hub)
- Devices connected to a Switch can operate in **Full-Duplex** mode.

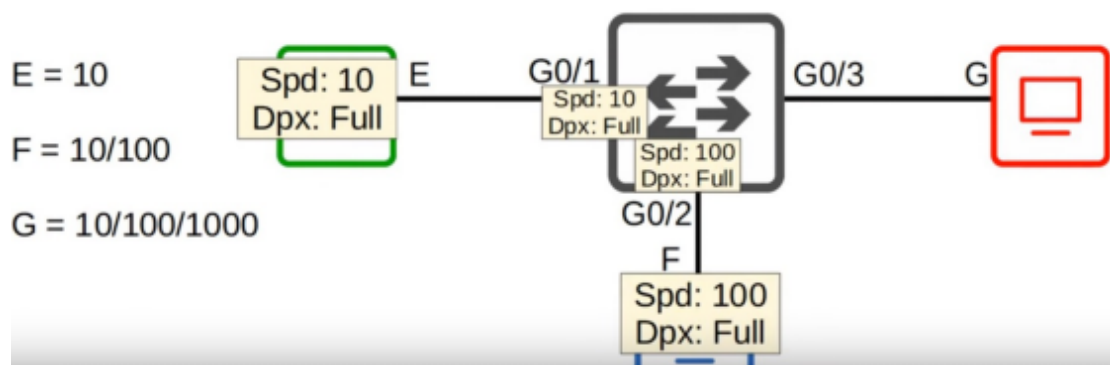
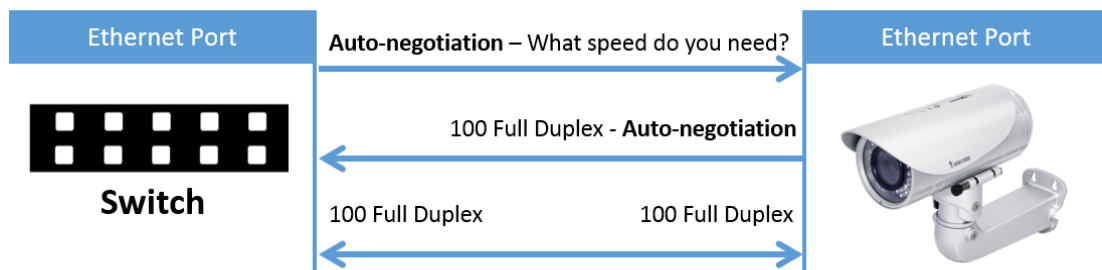
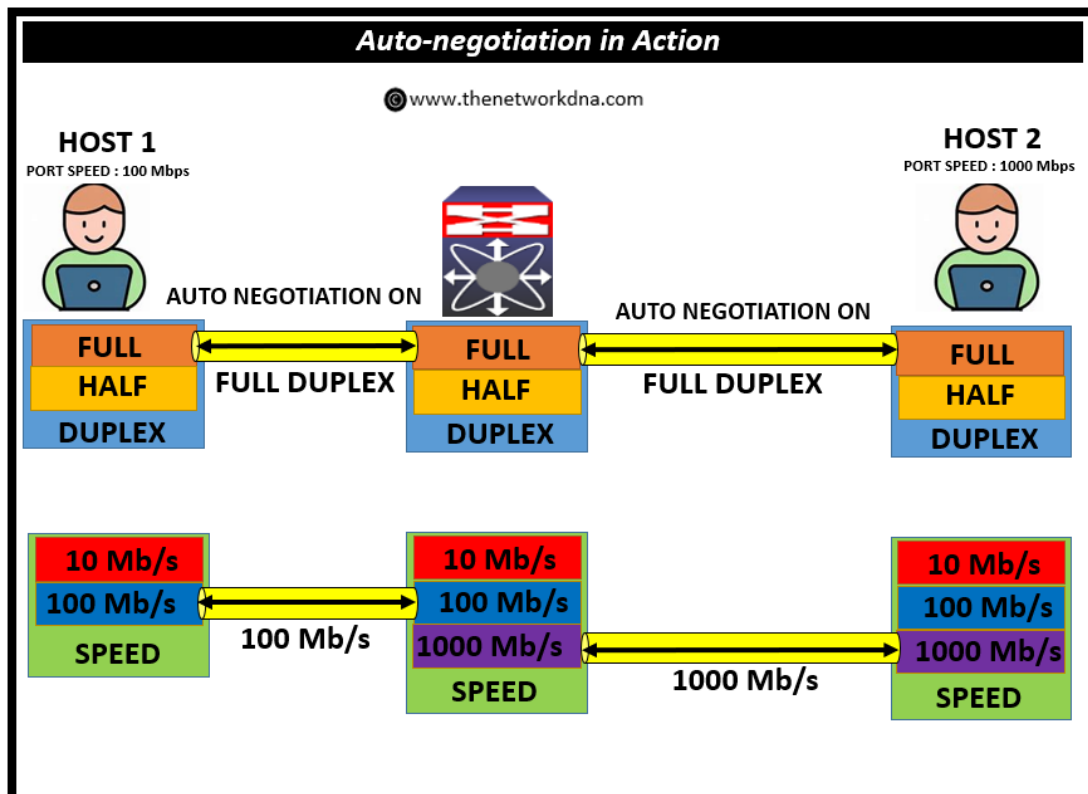
### Speed:

```
Switch(config-if)#speed ?  
 10      Force 10 Mbps operation  
 100     Force 100 Mbps operation  
 auto    Enable AUTO speed configuration
```

---

### ## Auto-negotiation

- Interfaces that can run at different speeds (**10/100** or **10/100/1000** have default settings of **speed auto** and **duplex auto**
- Interfaces **advertise** their capabilities to the neighboring device, and they negotiate the best **speed** and **duplex** settings they are capable of.



What if auto-negotiation is disabled on the device connected to the Switch?

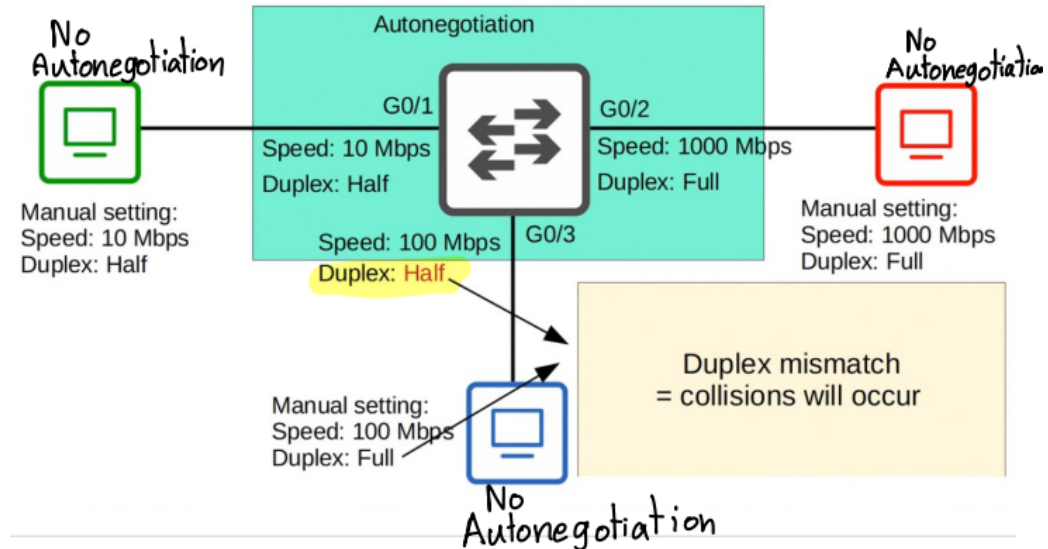
- **Speed:** The switch will try to sense the speed that the device is operating at.
  - If it fails to sense the speed, it will use the **slowest supported speed**

– eg. 10 Mbps on a 10/100/1000 Interface

- **Duplex:**

If the speed is **10 or 100 Mbps**, the switch will use **Half-Duplex**.

If the speed is **1000 Mbps** or greater, the switch will use **Full-Duplex**.



## Interfaces Error

- `show interfaces {interface-name}` (Like routers).

```
Switch#show interfaces f0/1
FastEthernet0/1 is down, line protocol is down (disabled)
  Hardware is Lance, address is 0001.c7d2.8a01 (bia 0001.c7d2.8a01)
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    956 packets input, 193351 bytes, 0 no buffer
    Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
  2357 packets output, 263570 bytes, 0 underruns
    0 output errors, 0 collisions, 10 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
```

- Interesting statistics (Routers have similar statistics):

```

956 packets input, 193351 bytes, 0 no buffer
Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
0 watchdog, 0 multicast, 0 pause input
0 input packets with dribble condition detected
2357 packets output, 263570 bytes, 0 underruns
0 output errors, 0 collisions, 10 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out

```

**Runts:** Frames that are Smaller than the minimum Frame size (64 Bytes)

**Giants:** Frames that are Larger than the maximum Frame size (1518 Bytes)

**CRC:** Frames that failed the CRC Check (Ethernet FCS trailer)

**Frame:** Frames that have an incorrect format (due to errors)

**Input Errors:** Total of various counters, including the above four.

**Output Errors:** Frames the switch tried to send but failed due to errors.

## Summary

```
SW1#show interfaces status
```

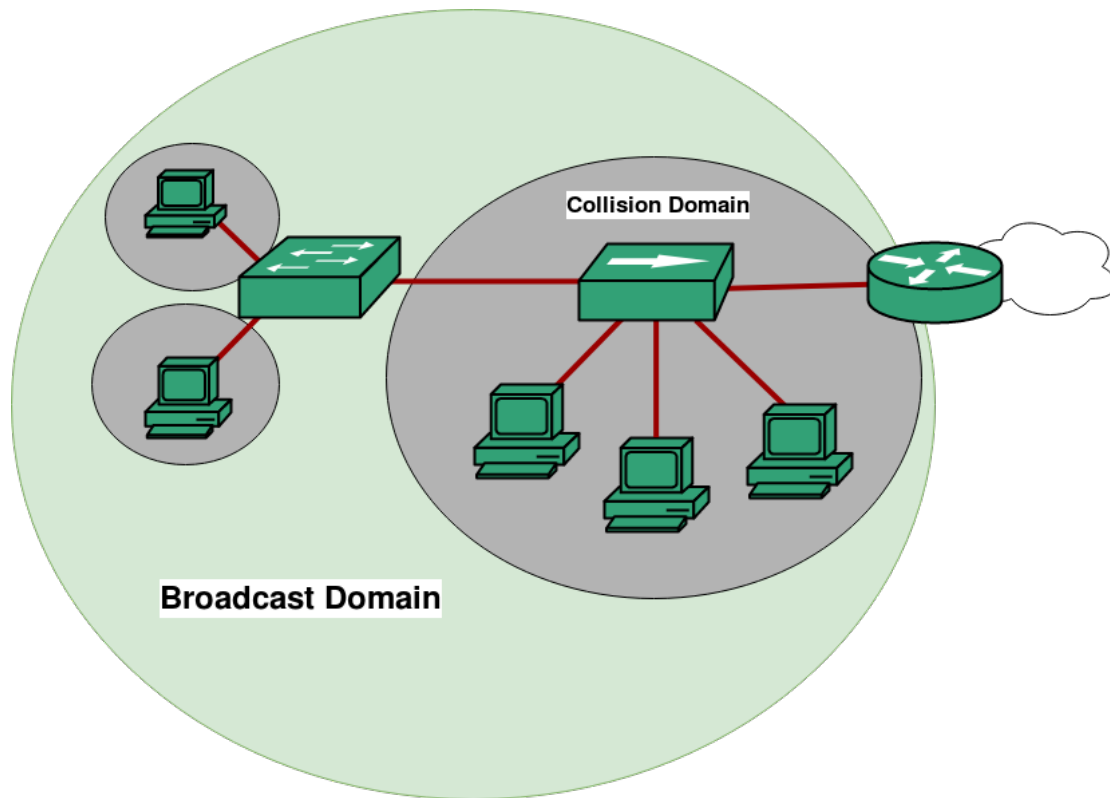
Port	Name	Status	Vlan	Duplex	Speed	Type
Fa0/1		notconnect	1	auto	auto	10/100BaseTX
Fa0/2		connected	1	auto	auto	10/100BaseTX
Fa0/3		connected	1	auto	auto	10/100BaseTX
Fa0/4		connected	1	auto	auto	10/100BaseTX
Fa0/5		notconnect	1	auto	auto	10/100BaseTX
Fa0/6		notconnect	1	auto	auto	10/100BaseTX
Fa0/7		notconnect	1	auto	auto	10/100BaseTX
Fa0/8		notconnect	1	auto	auto	10/100BaseTX
Fa0/9		notconnect	1	auto	auto	10/100BaseTX
Fa0/10		notconnect	1	auto	auto	10/100BaseTX
Fa0/11		notconnect	1	auto	auto	10/100BaseTX
Fa0/12		notconnect	1	auto	auto	10/100BaseTX
Fa0/13		notconnect	1	auto	auto	10/100BaseTX

- View switch's interfaces using `show interfaces status`
  - Each interface do not have `shutdown` applied by default (No `administratively down` like Routers).
  - Will be in `up/up` state if connected to another device.
  - Be in `down/down` state if not connected.
  - **Duplex:** `Full` , `half` , or `auto`
  - **Speed:** Depends on the *slower* speed of either the interface or the device connected to the interface.
  - **Type:** Slower speeds than the interface and up-to-and-including the speed of the interface. (100Mbps Interface includes both 10Mbps and 100Mbps **but** not 1000Mbps)



```
269 packets input, 71059 bytes, 0 no buffer
Received 6 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
7290 packets output, 429075 bytes, 0 underruns
0 output errors, 3 interface resets
0 output buffer failures, 0 output buffers swapped out
```

- View specific switch interface's detail using `show interfaces {interface-name}`
  - **Runts**: Smaller than **64** Bytes (Minimum)
  - **Giants**: Larger than **1518** Bytes (Maximum)
  - **CRC**: Failed CRC Check
  - **Frame**: Incorrect Format
  - **Input Error**: Total Counters
  - **Output Error**: Switch failed to send
- **Duplex**: Direction of data communication.
  - **Full**: Send and Receive at the same time (eg. **SWITCH** networks).
  - **Half**: Must wait before sending (eg. **HUB** networks)
    - \* **HUB**:
      - Considered to be a *Layer 1* device due to no MAC address nor table being used.
      - Will **always broadcast frames** regardless of type.
      - **Collisions** common.
    - \* **CSMA/CD**:
      - Used in **Half-Duplex** situation.
      - Carrier Sense Multiple Access *with* Collision Detection
      - Devices *listen* to the collision domain.
      - If a collision occur, the device sends a jamming signal to the collision domain.
      - Each device waits a random period of time before resending frames again.



- **Auto-Negotiation** ( `speed` and `duplex` ):
  - Interfaces usually can run at different speeds (**10/100** or **10/100/1000**) have default settings of `speed auto` and `duplex auto` .
  - Interfaces **advertise** their capabilities to connected device and negotiate the `speed` and `duplex` .
  - **If Auto-Negotiation is Disabled:**
    - \* **Speed:**
      - Try sensing the speed the connected device is operating at. If failed, it uses the *slowest supported speed*. (**10Mbps** on a **10/100/1000** Interface)
    - \* **Duplex:**
      - Speed of **10** or **100Mbps**, the switch uses **Half-Duplex**.
      - Speed of **1000Mbps** or higher, the switch uses **Full-Duplex**.