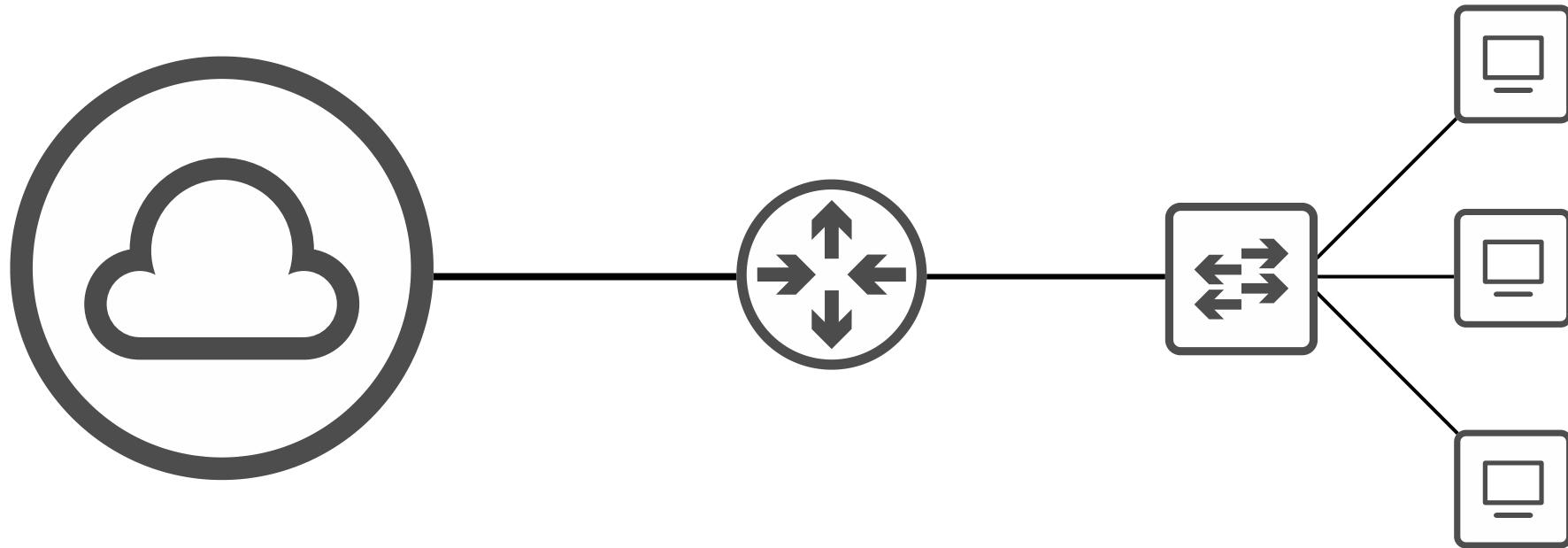


CCNA 200-301 Day 9

Switch Interfaces



Things we'll cover

- Interface speed and duplex
- Speed and duplex autonegotiation
- Interface status
- Interface counters & errors

Switch interfaces



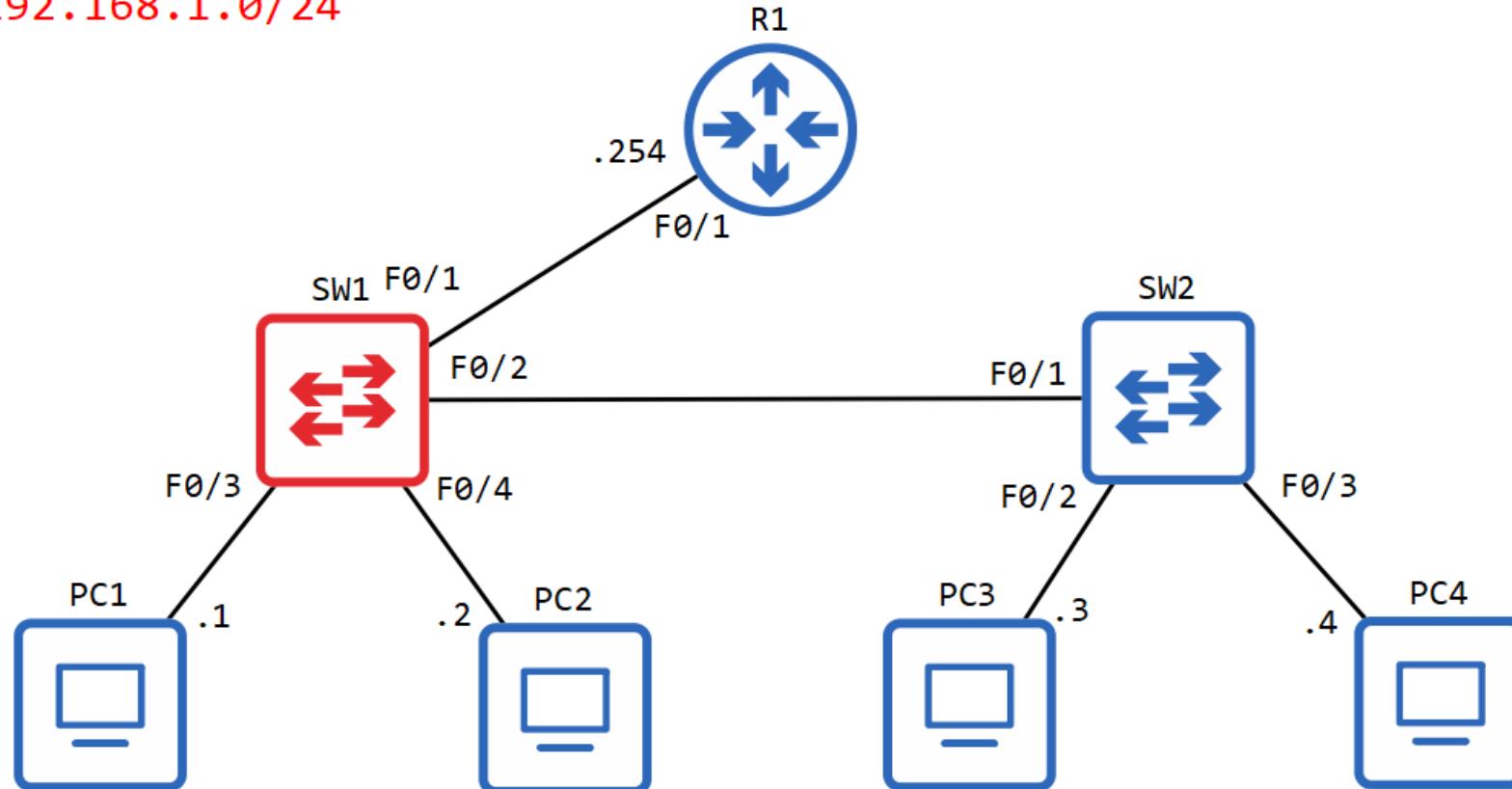
ASR 1000-X Router



Catalyst 9200 Switch

Network Topology

192.168.1.0/24



show ip interface brief

```
SW1>en
SW1#sh ip int br
```

| Interface | IP-Address | OK? | Method | Status | Protocol |
|------------------|------------|-----|--------|--------|----------|
| Vlan 1 | unassigned | YES | unset | up | up |
| FastEthernet0/1 | unassigned | YES | unset | up | up |
| FastEthernet0/2 | unassigned | YES | unset | up | up |
| FastEthernet0/3 | unassigned | YES | unset | up | up |
| FastEthernet0/4 | unassigned | YES | unset | up | up |
| FastEthernet0/5 | unassigned | YES | unset | down | down |
| FastEthernet0/6 | unassigned | YES | unset | down | down |
| FastEthernet0/7 | unassigned | YES | unset | down | down |
| FastEthernet0/8 | unassigned | YES | unset | down | down |
| FastEthernet0/9 | unassigned | YES | unset | down | down |
| FastEthernet0/10 | unassigned | YES | unset | down | down |
| FastEthernet0/11 | unassigned | YES | unset | down | down |
| FastEthernet0/12 | unassigned | YES | unset | down | down |

show ip interface brief

```
SW1 R1>en
SW1 R1#show ip interface brief
Interface          IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0 unassigned      YES unset administratively down down
GigabitEthernet0/1 unassigned      YES unset administratively down down
GigabitEthernet0/2 unassigned      YES unset administratively down down
GigabitEthernet0/3 unassigned      YES unset administratively down down
R1#
FastEthernet0/4    unassigned      YES unset up           up
```

Router interfaces have the `shutdown` command applied by default
=will be in the administratively down/down state by default

Switch interfaces do NOT have the 'shutdown' command applied by default
=will be in the up/up state if connected to another device
OR
in the down/down state if not connected to another device

show interfaces status

SW1#show interfaces status

| Port | Name | Status | Vlan | Duplex | Speed | Type |
|--------|------|------------|-------|--------|-------|--------------|
| Fa0/1 | | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/2 | | connected | trunk | a-full | a-100 | 10/100BaseTX |
| Fa0/3 | | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/4 | | connected | 1 | a-full | a-100 | 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 |

Configuring interface speed and duplex

```
SW1#conf t
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
SW1(config)#int f0/1
```

```
SW1(config-if)#speed ?
```

```
10
```

```
Force 10 Mbps operation
```

```
100
```

```
Force 100 Mbps operation
```

```
auto
```

```
Enable AUTO speed configuration
```

```
SW1(config-if)#speed 100
```

```
SW1(config-if)#duplex ?
```

```
auto
```

```
Enable AUTO duplex configuration
```

```
full
```

```
Force full duplex operation
```

```
half
```

```
Force half-duplex operation
```

```
SW1(config-if)#duplex full
```

```
SW1(config-if)#description ## to R1 ##
```

Configuring interface speed and duplex

```
SW1#sh int status
```

| Port | Name | Status | Vlan | Duplex | Speed | Type |
|--------|-------------|------------|-------|--------|-------|--------------|
| Fa0/1 | ## to R1 ## | connected | 1 | full | 100 | 10/100BaseTX |
| Fa0/2 | | connected | trunk | a-full | a-100 | 10/100BaseTX |
| Fa0/3 | | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/4 | | connected | 1 | a-full | a-100 | 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 |

Configuring switch interfaces

```
SW1#sh int status
```

| Port | Name | Status | Vlan | Duplex | Speed | Type |
|--------|--------------------|------------|-------|--------|-------|--------------|
| Fa0/1 | ## to R1 ## | connected | 1 | full | 100 | 10/100BaseTX |
| Fa0/2 | ## to SW2 ## | connected | trunk | a-full | a-100 | 10/100BaseTX |
| Fa0/3 | ## to end hosts ## | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/4 | ## to end hosts ## | connected | 1 | a-full | a-100 | 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 |

interface range

```
SW1(config)#interface range f0/5 - 12
```

```
SW1(config-if-range)#description ## not in use ##
```

```
SW1(config-if-range)#shutdown
```

```
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/5, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/6, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/8, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/9, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/10, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/11, changed state to administratively down
00:42:36: %LINK-5-CHANGED: Interface FastEthernet0/12, changed state to administratively down
```

```
SW1(config-if-range)#

```

```
SW1(config)#int range f0/5 - 6, f0/9 - 12
```

```
SW1(config-if-range)#no shut
```

```
00:57:07: %LINK-3-UPDOWN: Interface FastEthernet0/5, changed state to up
00:57:07: %LINK-3-UPDOWN: Interface FastEthernet0/6, changed state to up
00:57:07: %LINK-3-UPDOWN: Interface FastEthernet0/9, changed state to up
00:57:07: %LINK-3-UPDOWN: Interface FastEthernet0/10, changed state to up
00:57:07: %LINK-3-UPDOWN: Interface FastEthernet0/11, changed state to up
00:57:07: %LINK-3-UPDOWN: Interface FastEthernet0/12, changed state to up
```

Configuring switch interfaces

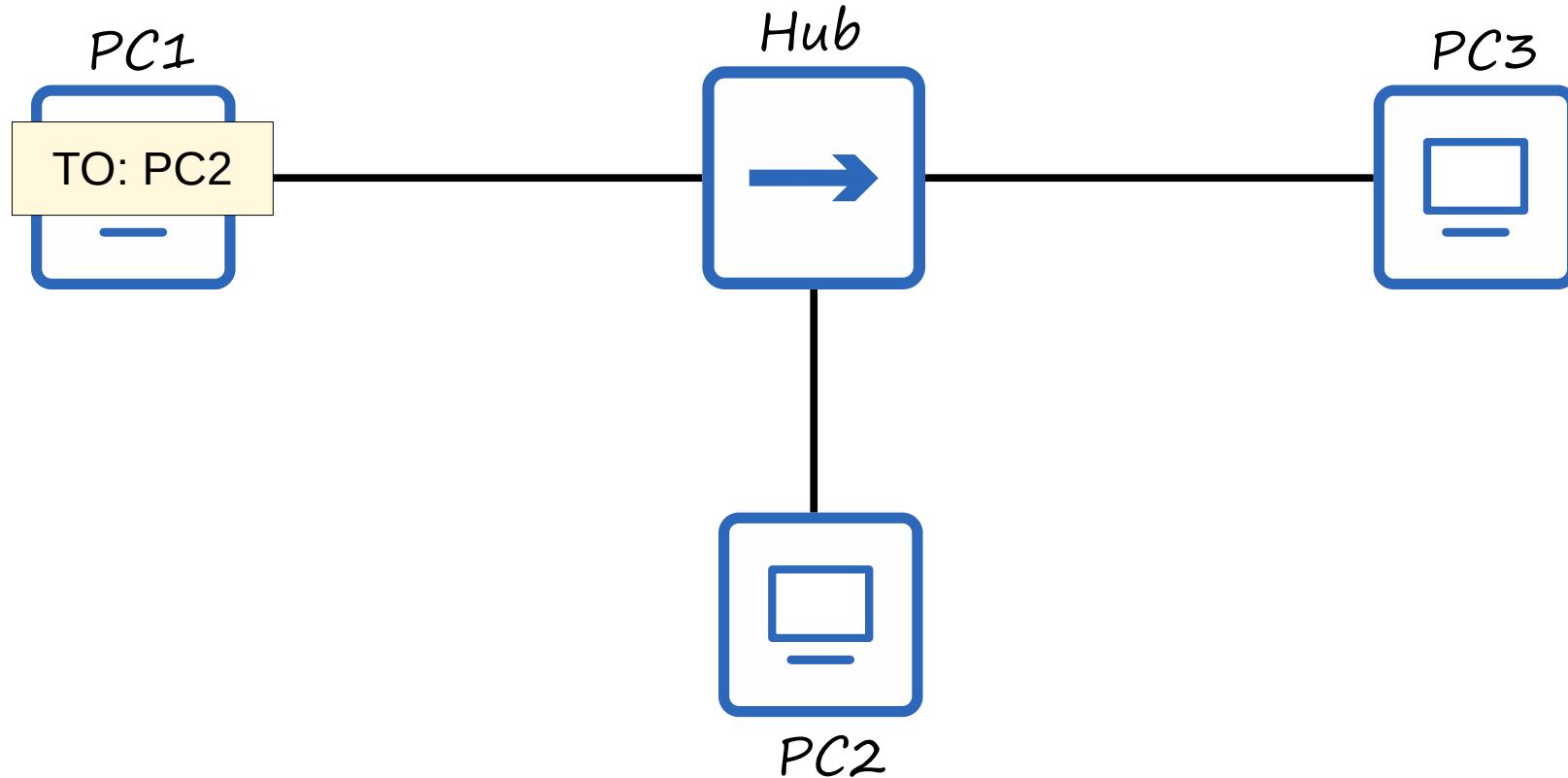
```
SW1(config-if-range)#do sh int status
```

| Port | Name | Status | Vlan | Duplex | Speed | Type |
|--------|--------------------|-----------|-------|--------|-------|--------------|
| Fa0/1 | ## to R1 ## | connected | 1 | full | 100 | 10/100BaseTX |
| Fa0/2 | ## to SW2 ## | connected | trunk | a-full | a-100 | 10/100BaseTX |
| Fa0/3 | ## to end hosts ## | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/4 | ## to end hosts ## | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/5 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/6 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/7 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/8 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/9 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/10 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/11 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/12 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |

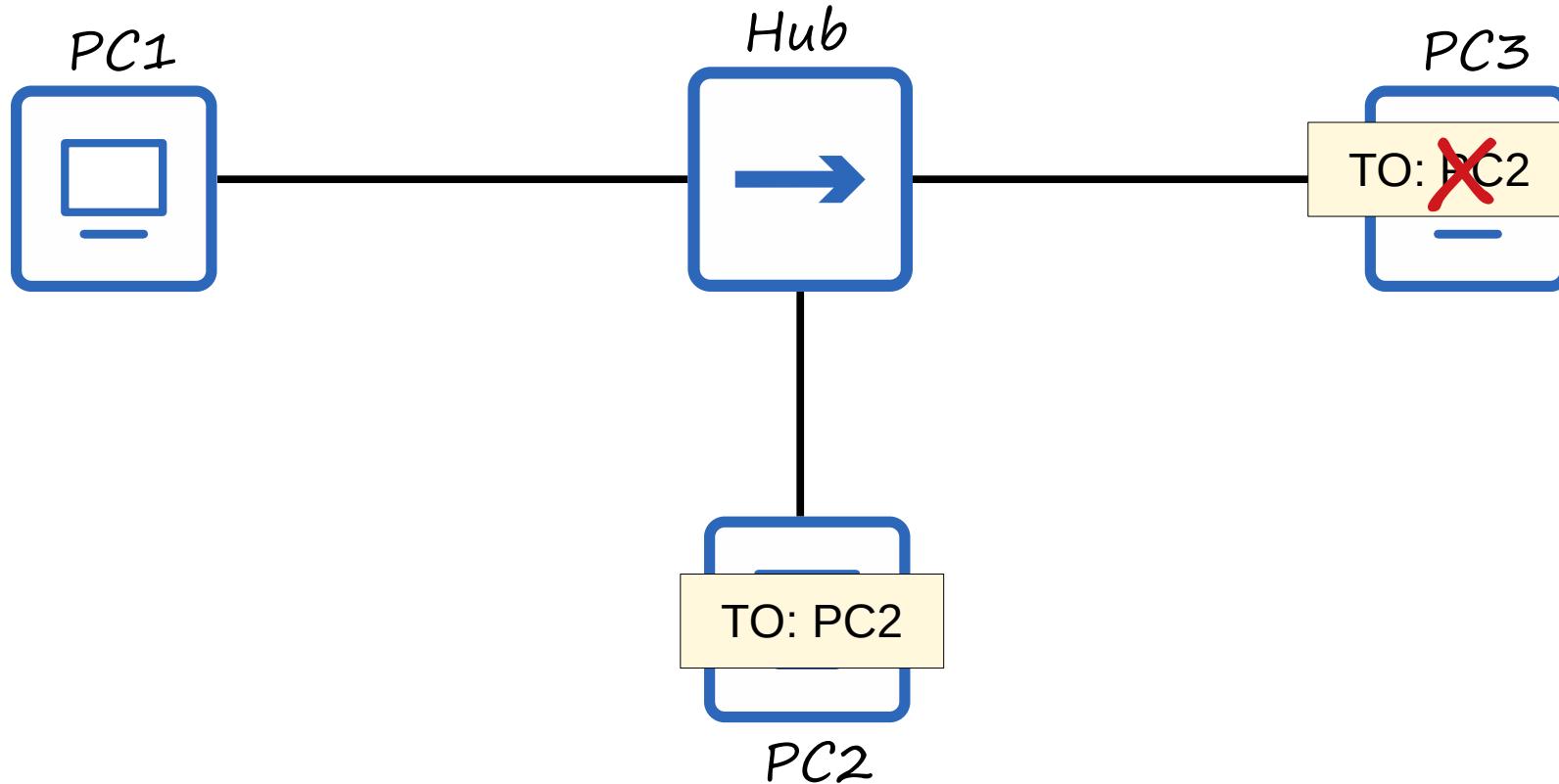
Full/Half Duplex

- **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.
- **Full duplex:** The device can send and receive data at the same time. It does not have to wait.

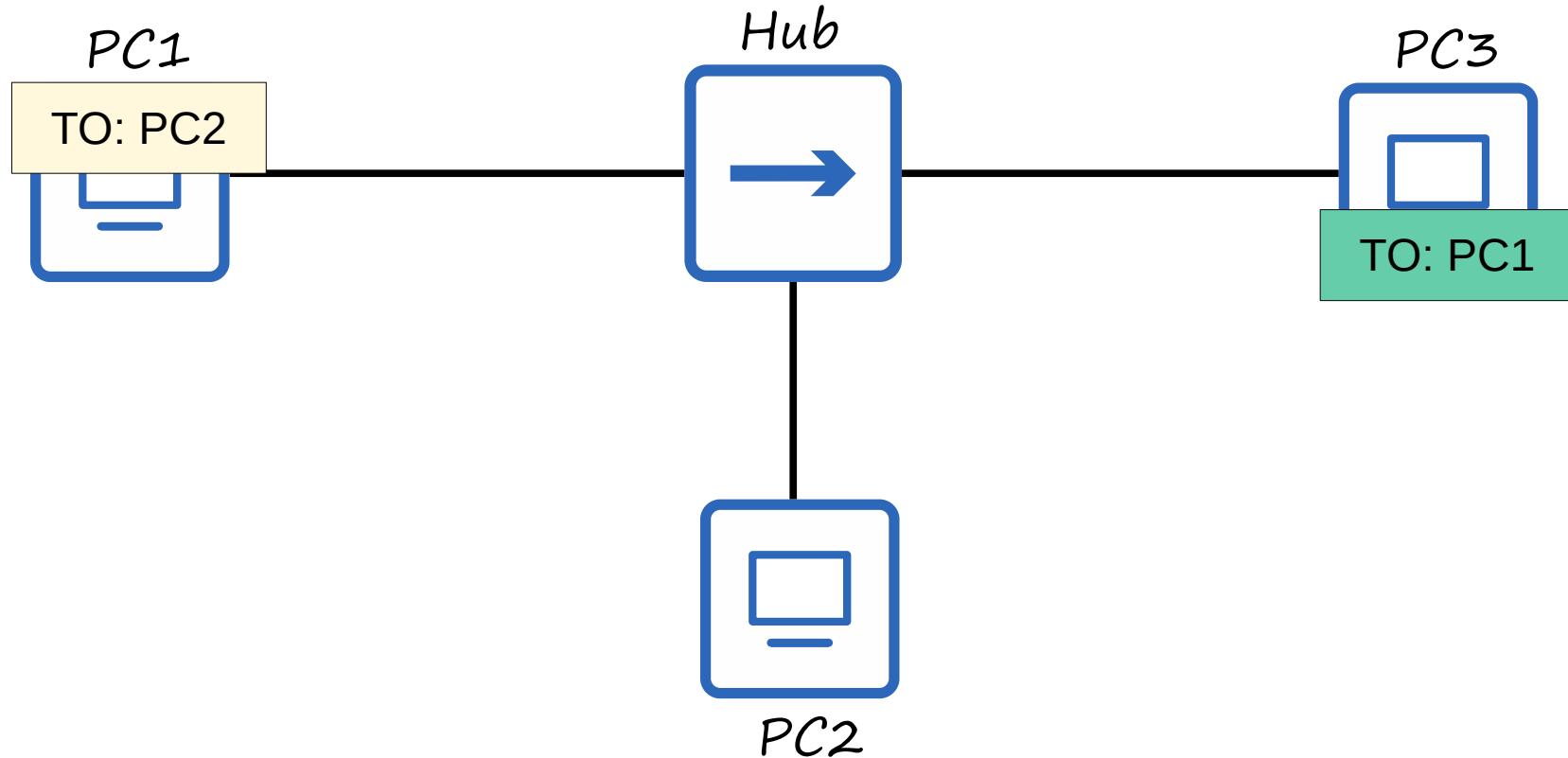
LAN Hubs



LAN Hubs

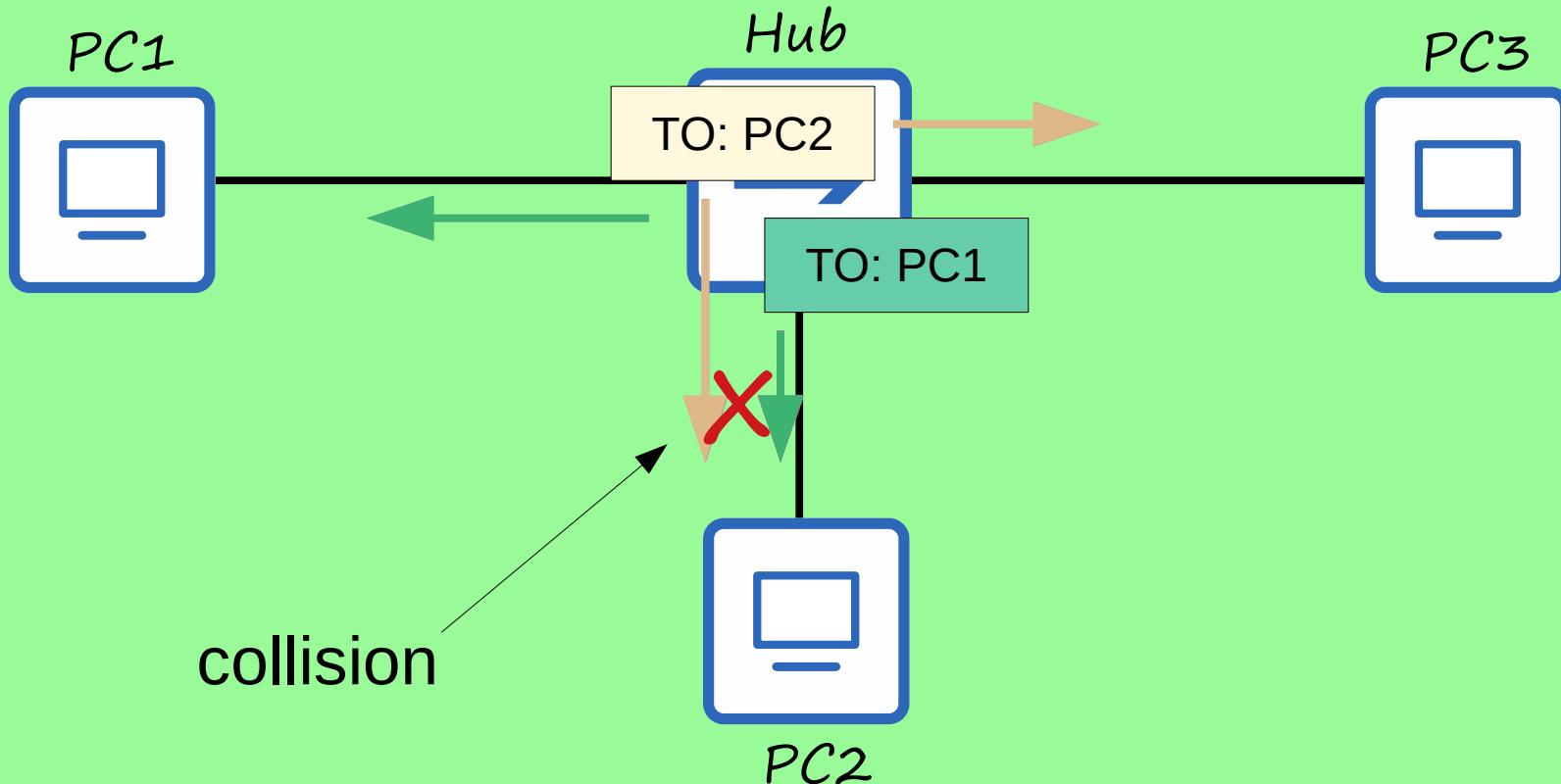


LAN Hubs



LAN Hubs

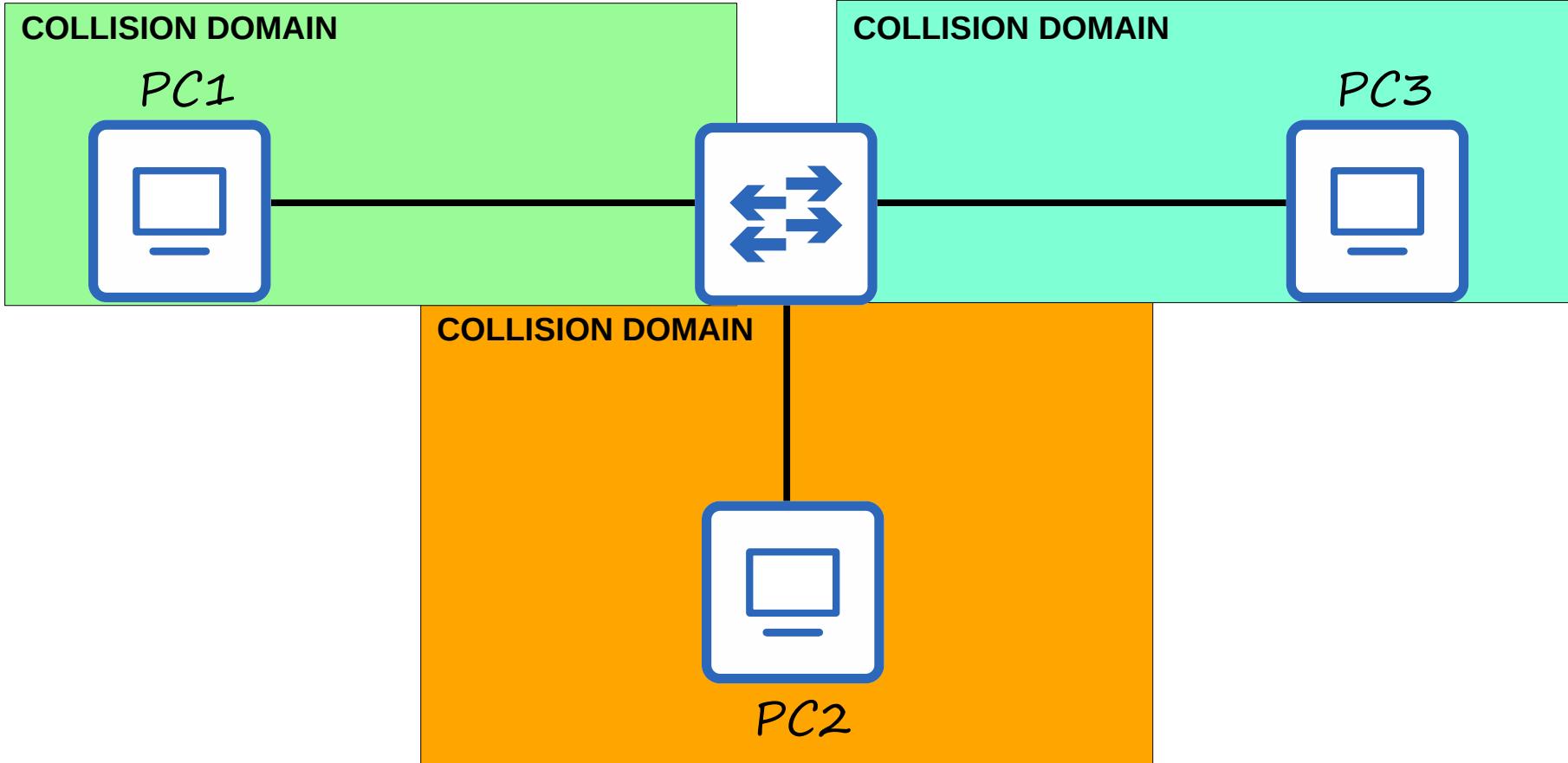
COLLISION DOMAIN



CSMA/CD

- Carrier Sense Multiple Access with Collision Detection
- 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.
- The process repeats.

Collision domains



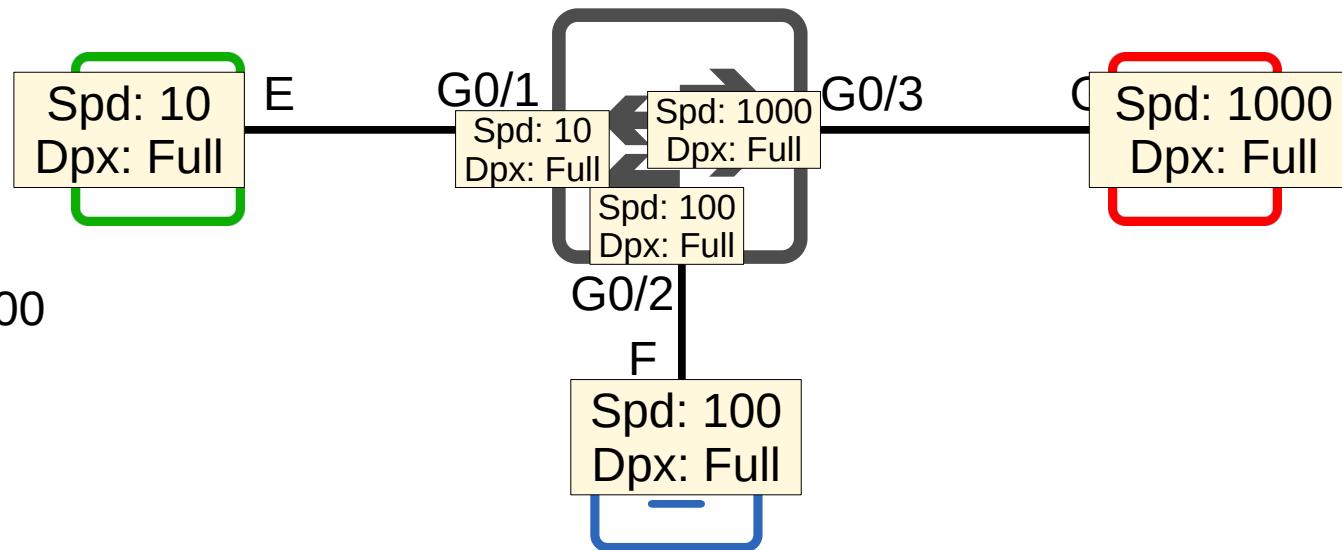
Full/Half Duplex

- **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.
- Devices attached to a hub must operate in half duplex.
- **Full duplex:** The device can send and receive data at the same time. It does not have to wait.
- Devices attached to a switch can operate in full duplex.

Speed/Duplex Autonegotiation

- 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 both capable of.

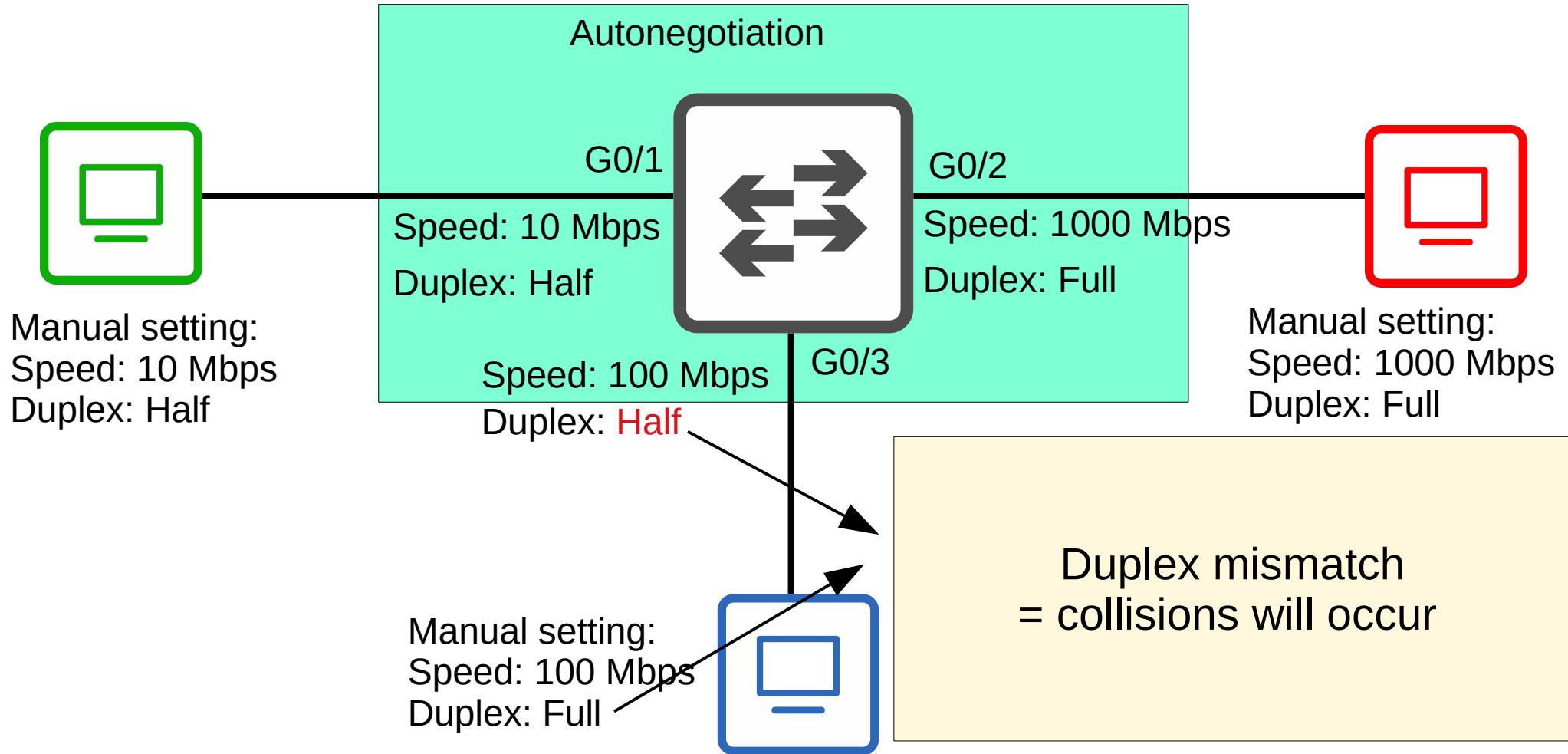
E = 10
F = 10/100
G = 10/100/1000



Speed/Duplex Autonegotiation

- What if autonegotiation is disabled on the device connected to the switch?
- SPEED: The switch will try to sense the speed that the other device is operating at.
If it fails to sense the speed, it will use the slowest supported speed
(ie. 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, use full duplex.

Speed/Duplex Autonegotiation



Interface Errors

```
SW1#show interfaces f0/2
FastEthernet0/2 is up, line protocol is up
  Hardware is Fast Ethernet, address is 000C.3168.8461 (bia 000C.3168.8461)
  Description: ## to SW2 ##
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Auto-duplex, Auto-speed
  Encapsulation ARPA, loopback not set
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 02:29:44, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queuing 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
    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
```

Interface Errors

```
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
```

- **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 (in the Ethernet FCS trailer)
- **Frame:** Frames that have an incorrect format (due to an error)
- **Input errors:** Total of various counters, such as the above four
- **Output errors:** Frames the switch tried to send, but failed due to an error

Things we covered

- Interface speed and duplex
- Speed and duplex autonegotiation
- Interface status
- Interface counters & errors

QUIZ

Quiz Question 1

There is a duplex mismatch between SW1's FO/1 interface and SW2's FO/1 interface, which are connected. Autonegotiation is disabled. What will be the result?

- a) Improved performance
- b) Collisions will occur
- c) SW1 will sense SW2 duplex setting and adjust to match

Quiz Question 2

What is used on half-duplex interfaces to detect and avoid collisions?

- a) CSMA/CD
- b) CSMA/CA
- c) Autonegotiation
- d) Duplex Auto

Quiz Question 3

Which command shows various counters of errors detected on an interface?

- a) show interfaces
- b) show ip interface brief
- c) show interfaces status
- d) show interfaces errors

Quiz Question 3

X) show ip interface brief

| Interface | IP-Address | OK? | Method | Status | Protocol |
|------------------|------------|-----|--------|-----------------------|----------|
| Vlan 1 | unassigned | YES | unset | up | up |
| FastEthernet0/1 | unassigned | YES | unset | up | up |
| FastEthernet0/2 | unassigned | YES | unset | up | up |
| FastEthernet0/3 | unassigned | YES | unset | up | up |
| FastEthernet0/4 | unassigned | YES | unset | up | up |
| FastEthernet0/5 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/6 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/7 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/8 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/9 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/10 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/11 | unassigned | YES | unset | administratively down | down |
| FastEthernet0/12 | unassigned | YES | unset | administratively down | down |

Quiz Question 3

X) show interfaces status

SW1#show interfaces status

| Port | Name | Status | Vlan | Duplex | Speed | Type |
|--------|--------------------|-----------|-------|--------|-------|--------------|
| Fa0/1 | ## to R1 ## | connected | 1 | full | 100 | 10/100BaseTX |
| Fa0/2 | ## to SW2 ## | connected | trunk | a-full | a-100 | 10/100BaseTX |
| Fa0/3 | ## to end hosts ## | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/4 | ## to end hosts ## | connected | 1 | a-full | a-100 | 10/100BaseTX |
| Fa0/5 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/6 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/7 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/8 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/9 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/10 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/11 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |
| Fa0/12 | ## not in use ## | disabled | 1 | auto | auto | 10/100BaseTX |

Quiz Question 3

X) show interfaces errors

```
SW1#show interfaces errors
% Invalid input detected at '^' marker.
```

Quiz Question 3

★ a) show interfaces

```
FastEthernet0/1 is up, line protocol is up
  Hardware is Fast Ethernet, address is 000C.2110.5542 (bia 000C.2110.5542)
SW1#show interfaces f0/1
FastEthernet0/1 is up, line protocol is up
  Hardware is Fast Ethernet, address is 000C.2110.5542 (bia 000C.2110.5542)
  Description: ## to R1 ##
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Full-duplex, 100Mb/s
  Encapsulation ARPA, loopback not set
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 02:29:44, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queuing 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
    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
```

Quiz Question 4

Which are examples of errors that might occur on a network interface?

- a) Runts, Giants, Broadcasts
- b) Shorts, Longs, Oversizes
- c) Packets, Bytes, Inputs, Outputs
- d) Runts, Giants, CRC

Quiz Question 5

SW1 is trying to autonegotiate interface speed settings with SW2. However, autonegotiation is disabled on SW2's interface. SW2's interface is configured with a speed of 100 Mbps and full duplex. What speed and duplex settings will SW1 use, assuming it succeeds in sensing the speed?

- a) Speed: 100 Mbps, Duplex: Full
- b) Speed: 100 Mbps, Duplex: Half
- c) Speed: 10 Mbps, Duplex: Full
- d) Speed: 10 Mbps, Duplex: Half

Supplementary Materials

- Review flash cards
(link in the description)



- Packet Tracer lab

