



Common Problems at Layer-1 and Layer-2



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CCIE Routing & Switching



Video Overview

- Identify and correct problems at Layer-1 and Layer-2

Troubleshooting Progression

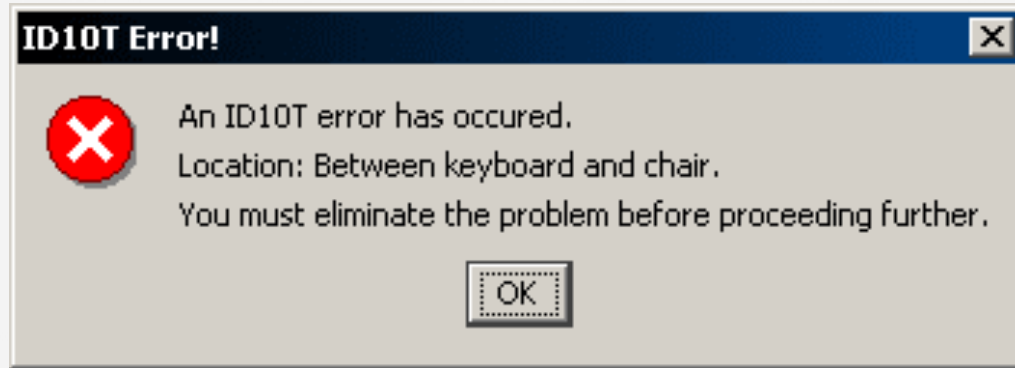
- ▶ Is the problem reported by only a single person, or a group of people?
- ▶ If a single person, is the problem:
 - Only affecting a single destination or application?
 - Affecting all network access by that person?
- ▶ If the issue affects all network connectivity on a single device, proceed as follows...

Physical Layer

- Identify and correct problems at Layer-1 on the **Host** device.

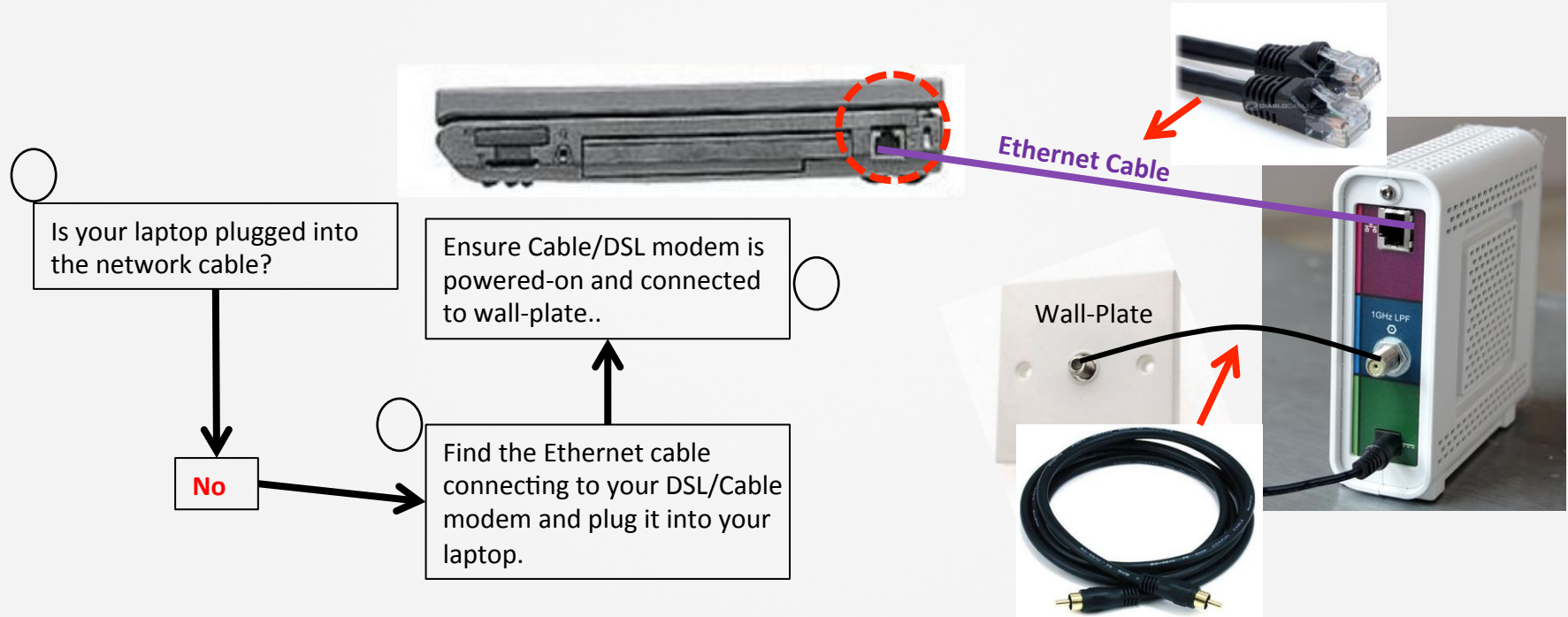
PEBKAC

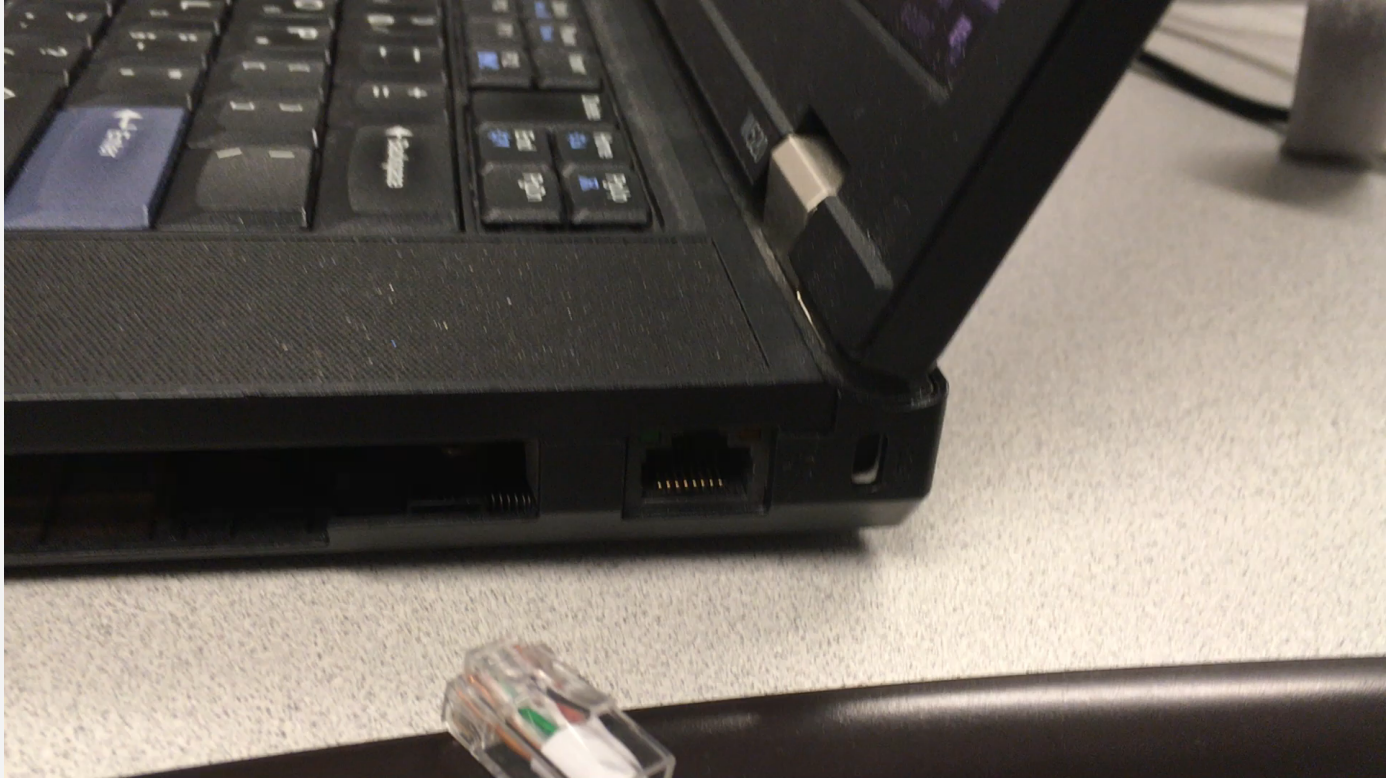
» Is the host device powered-on?



Missing a cable?

Initial Problem: I can't get on the network!!!





Disabled WiFi Switch?

Wireless (Wi-Fi) Home Networking

Is the Wi-Fi Radio **switch** turned on in your laptop/device?

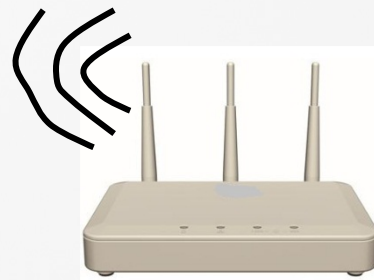
No

Turn on the Wi-Fi radio

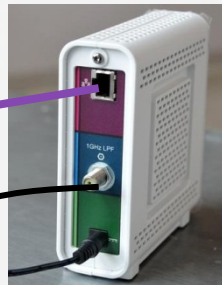
Connectivity Restored??

wait at least
1-minute

YES!!



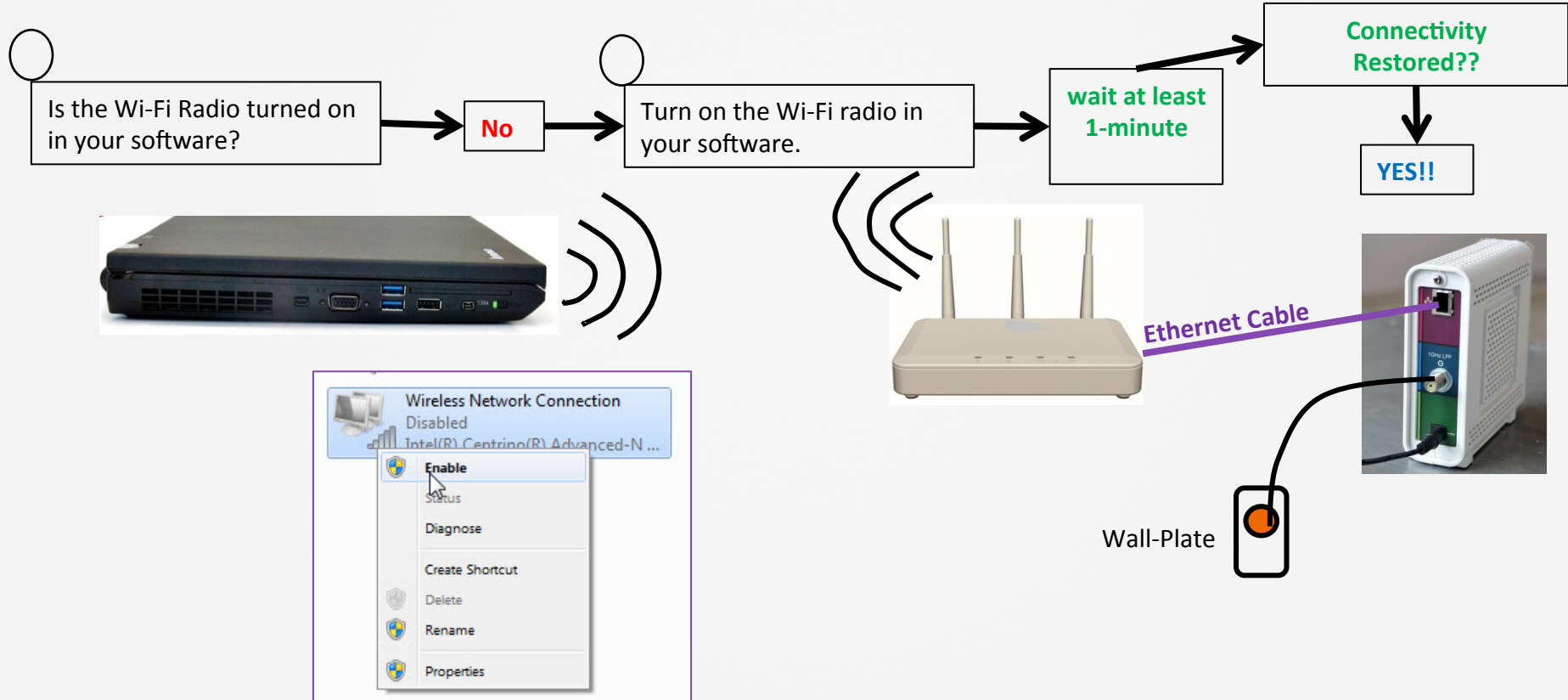
Ethernet Cable



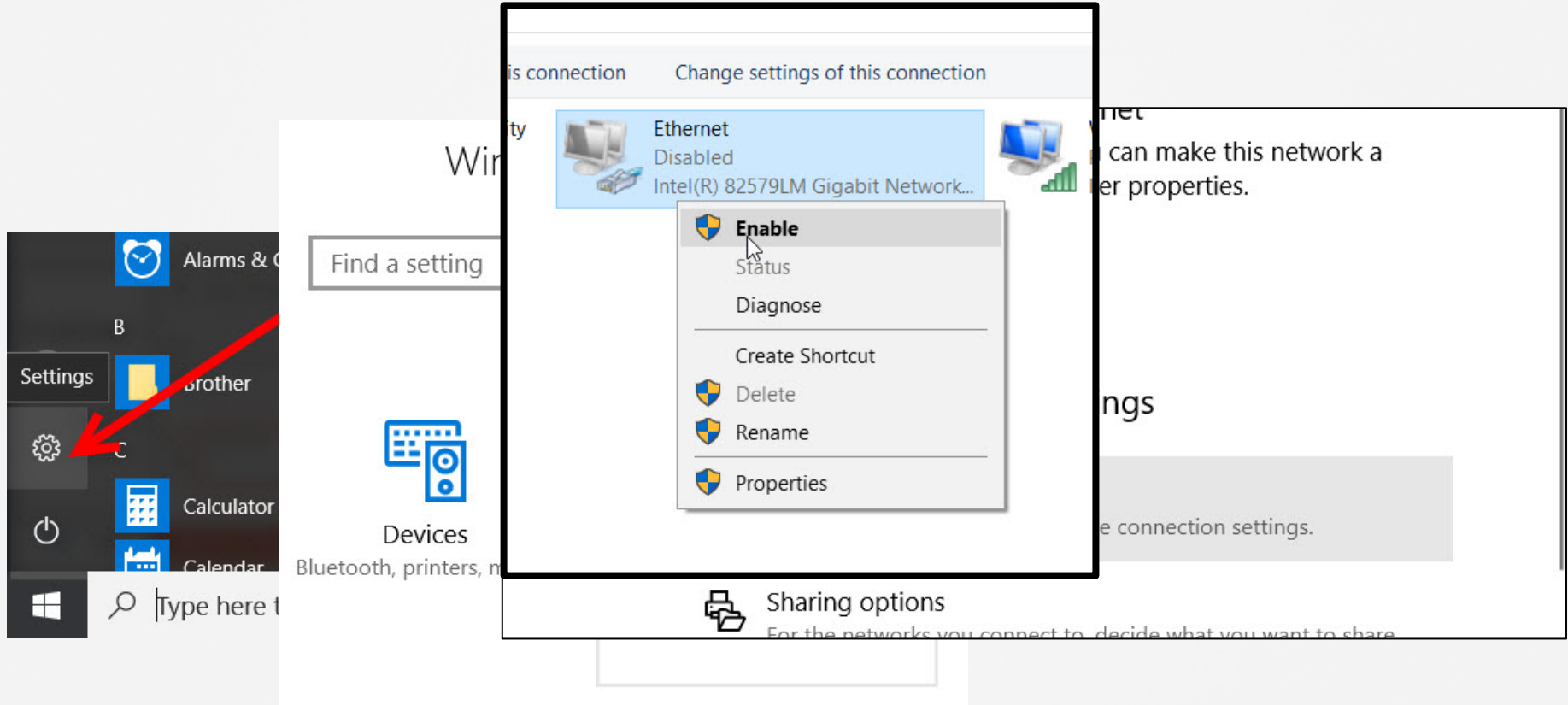
Wall-Plate



Disabled NIC in Software?



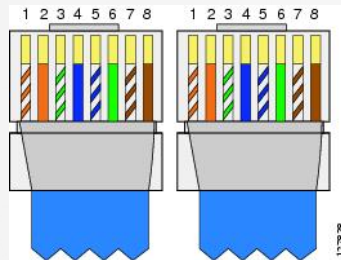
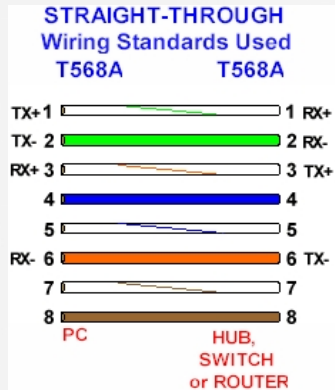
Enabling NIC in Software



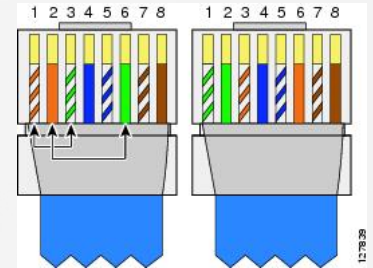
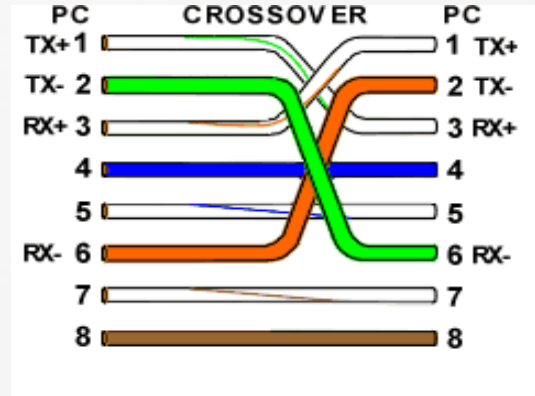
Wrong Cable Type?

» Twisted-pair Ethernet cabling comes in two varieties:

Straight-through



Crossover

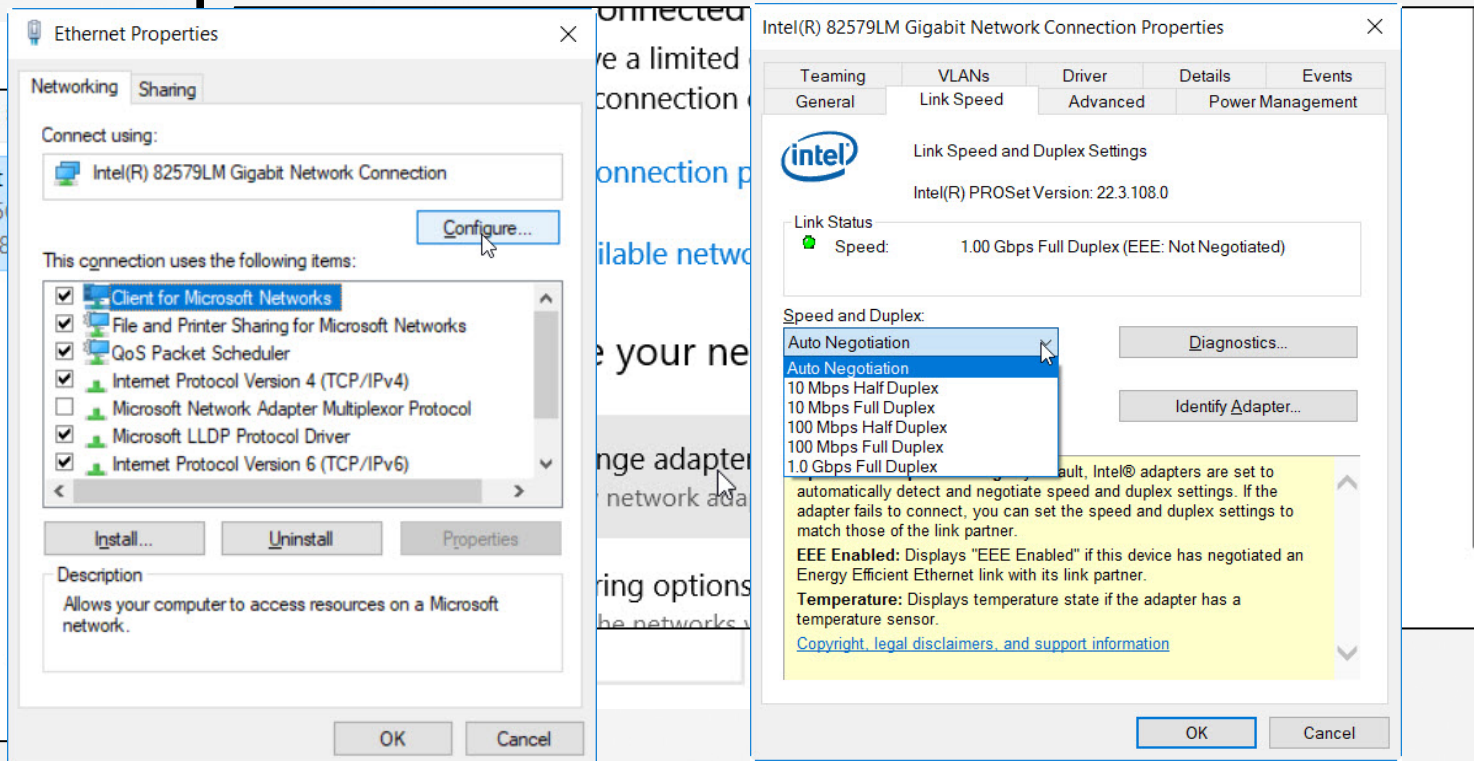


Data Link Layer

- Identify and correct problems at Layer-2 on the **Host** device.

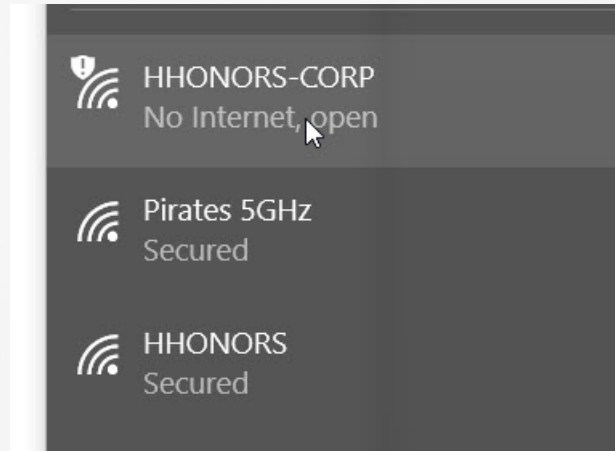
Wired Ethernet Duplex Issues

» Has the Duplex been hard-coded?



WiFi SSID Incorrect?

» Is the Host connected to the wrong SSID?



Physical Layer

- Identify and correct problems at Layer-1 on the **Network** device.

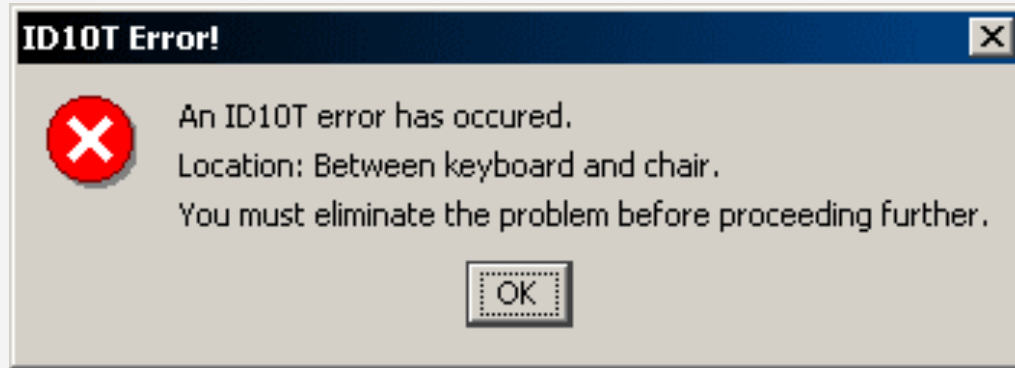
Basic IOS Troubleshooting

Commands

- ▶ IOS Modes – Quick Tutorial
- ▶ Show ip interface brief (Routers and Switches)
- ▶ Show interface <type/module>
- ▶ Show interface status (Switches)
- ▶ Show running-config

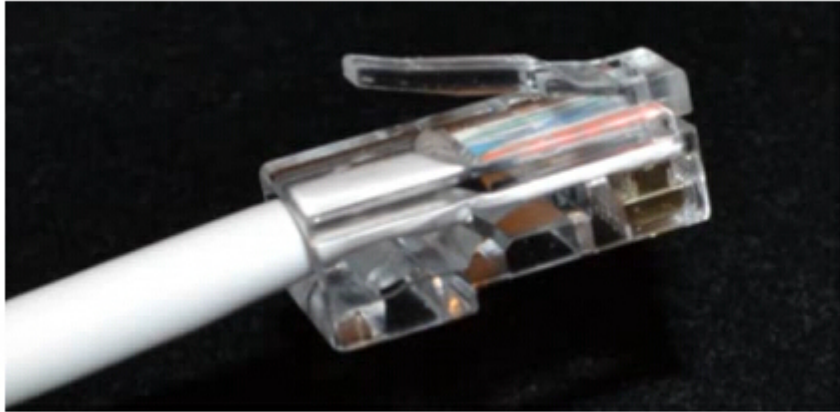
PEBKAC

» Is the Switch/Router powered-on?

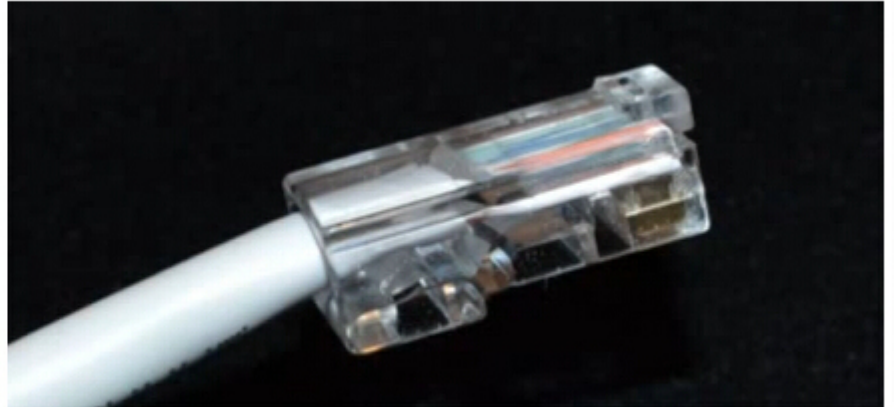


Broken Clips and Bad Connectors

- » Is the Ethernet cable pushed in all the way?
- Broken clips can lead to loose cables.



Normal RJ-45 Connector

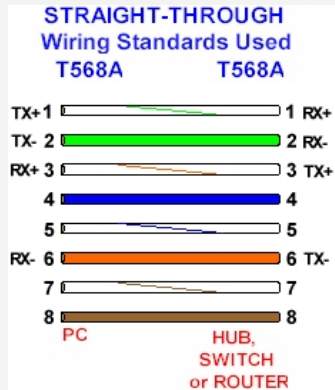


Broken RJ-45 Connector

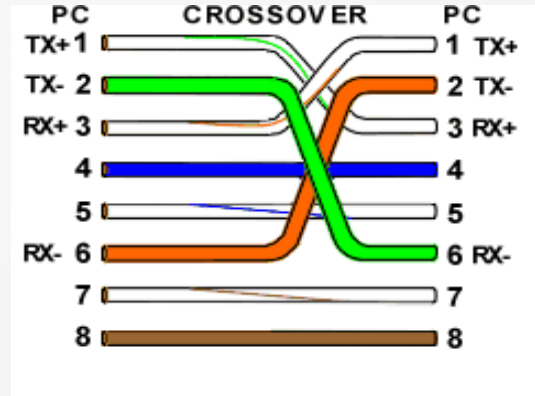
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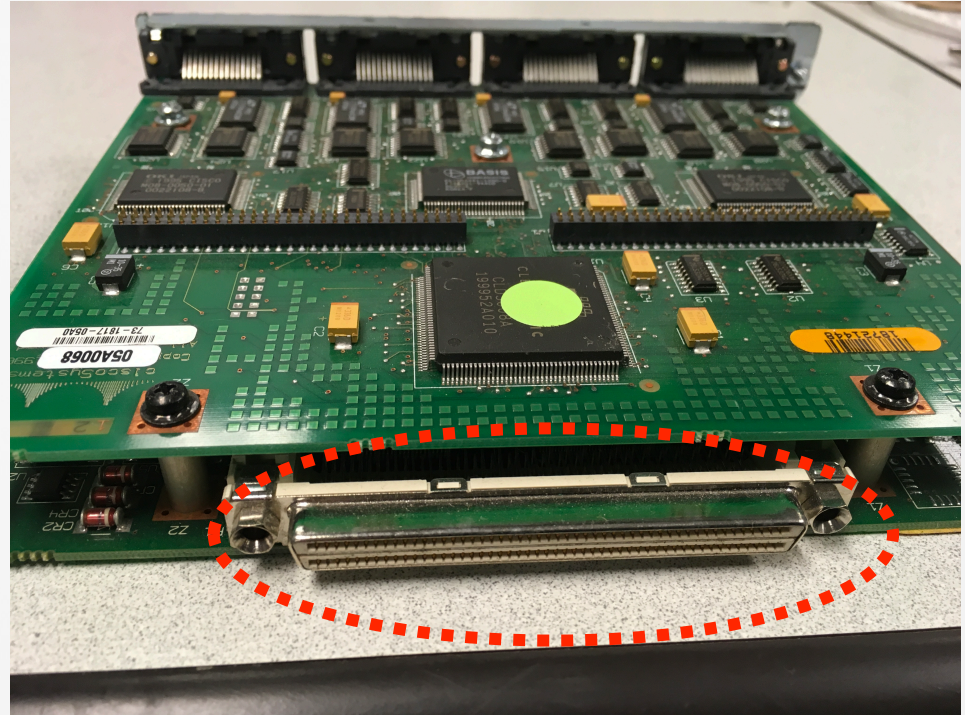


Crossover



Misaligned Network Modules

» Is the Network Module pushed in all the way?



Interfaces Administratively Disabled?

» Router interfaces are Admin Disabled by default.

```
Router-1#show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	1.2.3.1	YES	DHCP	up	up
FastEthernet0/1	unassigned	YES	unset	administratively down	down

```
Router-1#configure terminal
```

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

```
Router-1(config)#interface FastEthernet0/1
```

```
Router-1(config-if)#no shutdown
```

```
Router-1(config-if)#exit
```

```
Router-1(config)#
```

```
Router-1(config)#
```

```
*Aug  2 19:11:18.061: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
```

Interfaces Err-disabled?

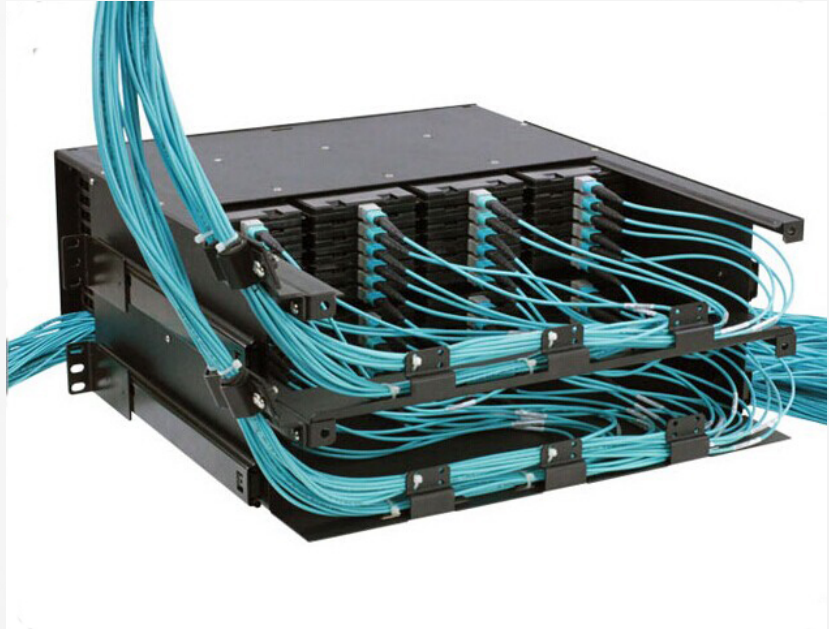
- » Switch interfaces may become err-disabled due to feature/protocol inconsistencies.

```
Switch-1#show interface FastEthernet0/14  
FastEthernet0/14 is down, line protocol is down (err-disabled)
```

```
Switch-1#show logging | i err-disable  
*Mar 6 04:04:23.533: %PM-4-ERR_DISABLE: bpduguard error detected on Fa0/14, putting Fa0/14 in err-disabled state  
Switch-1#
```

Incorrectly-cabled Fiber?

» Fiber-Optics could be incorrectly cabled.



Mismatched Ethernet Speed

```
Switch-3#show interface FastEthernet0/14
FastEthernet0/14 is down, line protocol is down (notconnect)
  Hardware is Fast Ethernet, address is 0021.a1c4.6990 (bia 0021.a1c4.6990)
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Auto-duplex, 100Mb/s, media type is 10/100BaseTX
```

```
Switch-3#show interface status | i Fa0/14
Fa0/14                                connected      trunk          a-full    a-100  10/100BaseTX
Switch-3#
```

```
Switch-3#show interface status | i Fa0/14
Fa0/14                                notconnect    1              auto      100    10/100BaseTX
```

```
Switch-3#
```

```
Switch-3#show run interface fastethernet0/14
```

```
Building configuration...
```

```
Current configuration : 198 bytes
```

```
!
```

```
interface FastEthernet0/14
```

```
  switchport trunk encapsulation dot1q
```

```
  switchport trunk native vlan 2
```

```
  switchport trunk allowed vlan 1,2,100,200,3000
```

```
  switchport mode dynamic desirable
```

```
  speed 100
```

```
end
```

Data Link Layer

- Identify and correct problems at Layer-2 on the **Network** device.

PPPoE Authentication Errors? (1)

- » PPP sessions typically utilize authentication
- » Authentication credentials may be incorrect.

```
*Aug  2 20:00:00.817: %DIALER-6-BIND: Interface Vi1 bound to profile Di1
*Aug  2 20:00:00.821: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
*Aug  2 20:00:00.849: %DIALER-6-UNBIND: Interface Vi1 unbound from profile Di1
client#
*Aug  2 20:00:00.853: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to down
```

```
client#show interface Virtual-Access1
Virtual-Access1 is down, line protocol is down
  Hardware is Virtual Access interface
  MTU 1500 bytes, BW 100000 Kbit/sec, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Closed
```

PPPoE Authentication Errors? (2)

» Running a PPPoE Debug can identify the root cause.

```
client#debug pppoe error
PPPoE protocol errors debugging is on
client#
```

```
client#
*Aug 2 19:58:31.729: %DIALER-6-BIND: Interface Vi1 bound to profile Di1
*Aug 2 19:58:31.733: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
*Aug 2 19:58:31.737: Vi1 PPP: Using dialer call direction
*Aug 2 19:58:31.737: Vi1 PPP: Treating connection as a callout
*Aug 2 19:58:31.737: Vi1 PPP: Session handle[7D000002] Session id[2]
*Aug 2 19:58:31.745: Vi1 PPP: No authorization without authentication
*Aug 2 19:58:31.761: Vi1 CHAP: I CHALLENGE id 1 len 27 from "server"
*Aug 2 19:58:31.765: Vi1 PPP: Sent CHAP SENDAUTH Request
*Aug 2 19:58:31.765: Vi1 PPP: Received SENDAUTH Response FAIL
*Aug 2 19:58:31.765: Vi1 CHAP: Using hostname from configured hostname
*Aug 2 19:58:31.765: Vi1 CHAP: Using password from interface CHAP
*Aug 2 19:58:31.765: Vi1 CHAP: O RESPONSE id 1 len 27 from "client"
*Aug 2 19:58:31.769: Vi1 CHAP: I FAILURE id 1 len 25 msg is "Authentication failed"
```


PPPoE Authentication Errors? (3)

```
hostname server
!
username client password cisco
!
bba-group pppoe INE|
  virtual-template 1
!
interface Virtual-Template1
  ip address 1.2.1.1 255.255.255.0
  peer default ip address pool MyPool
  ppp authentication chap
!
ip local pool MyPool 1.2.1.2 1.2.1.254
!
interface FastEthernet0/0
  shutdown
  no ip address
  duplex auto
  speed auto
  pppoe enable group INE
  no shutdown
  exit
!
end
```

```
hostname client|
!
interface FastEthernet0/0
  no ip address
  shutdown
  duplex auto
  speed auto
  pppoe enable
  pppoe-client dial-pool-number 1
!
interface Dialer1
  ip address negotiated
  encapsulation ppp
  dialer pool 1
  ppp chap password 0 Cisco
```

Correct Encapsulation?

- » Serial interfaces on routers support different Layer-2 encapsulations.
- » Encapsulation must match on both ends of the cable.
- » Use “show interface” to verify.

Router-On-A-Stick (1)

- » When trunking from a Switch to a Router, sub-interfaces are used.
- » Each VLAN carried on the Trunk must have an associated sub-interface.
- » A missing sub-interface would cause a Layer-2 issue.

Router-On-A-Stick (2)

» Verification Step-1: Identify VLANs carried on VLAN Trunk link:

```
Sw3#sho interface trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/3	on	802.1q	trunking	1

Port	Vlans allowed on trunk
Fa0/3	1-4094

Port	Vlans allowed and active in management domain
Fa0/3	1-4

```
interface FastEthernet0/1
no ip address
duplex auto
speed auto
!
interface FastEthernet0/1.1
encapsulation dot1Q 1 native
ip address 1.1.1.3 255.255.255.0
!
interface FastEthernet0/1.2
encapsulation dot1Q 2
ip address 2.2.2.3 255.255.255.0
!
interface FastEthernet0/1.4
encapsulation dot1Q 4
ip address 4.4.4.3 255.255.255.0
!
```

» Verification Step-2: Confirm each VLAN has associated sub-interface on router.

▶ Thank you!!