CSE 3412
Sessional on Data Communication

Lab#1: Network Devices & Cabling

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Acknowledgement
Thanks to the authors of all the books and online tutorials used in this slide.

Network Devices

- Components to connect computers to other devices together so that they can share files/resources like printer/Fax.

- NIC
- Repeater
- Hub
- Bridge
- Switch
- Router

NIC (Network Interface Card)

- Also called Network Adapter.
- It connects a host to a network medium.
- It provides the physical interface between computer and cabling.
- It prepares data, sends data, and controls the flow of data.
- It can also receive and translate data into bytes for the CPU to understand.
- Contain unique MAC Address to control data communication.

Repeater

- Two port device , functioning at PHY Layer
- A repeater is an electronic device that receives a signal and Regenerates it at a higher level and/or higher power
  - so that the signal can cover longer distances.
- It removes Noise from the received signal
  - then regenerates the original bit pattern/signal
  - then sends the refreshed signal.
- No Filtering of signal
  - Broadcast the regenerated signal to all ports.

Hub

- It is basically a MULTI-port Repeater
- Functioning at PHY Layer
- A hub connects multiple wires coming from different branches
- No Filtering of signal
  - Broadcast the regenerated signal to all ports.

Active Hub

- These are the hubs that have their own power supply
- It serves both as a repeater as well as a wiring centre.
- Can clean, boost, and relay the signal along with the network.
- These are used to extend the maximum distance between nodes.

Passive Hub

- These are the hubs that collect wiring from nodes
- No own Power Supply
  - Power supply from the active hub.
- These hubs relay signals onto the network without cleaning and boosting them
- Can’t be used to extend the distance between nodes.

Intelligent Hub

- It works like active hubs
- Includes remote management capabilities.
- They also provide flexible data rates to network devices.
- It also enables an administrator to monitor the traffic passing through the hub and to configure each port in the hub.

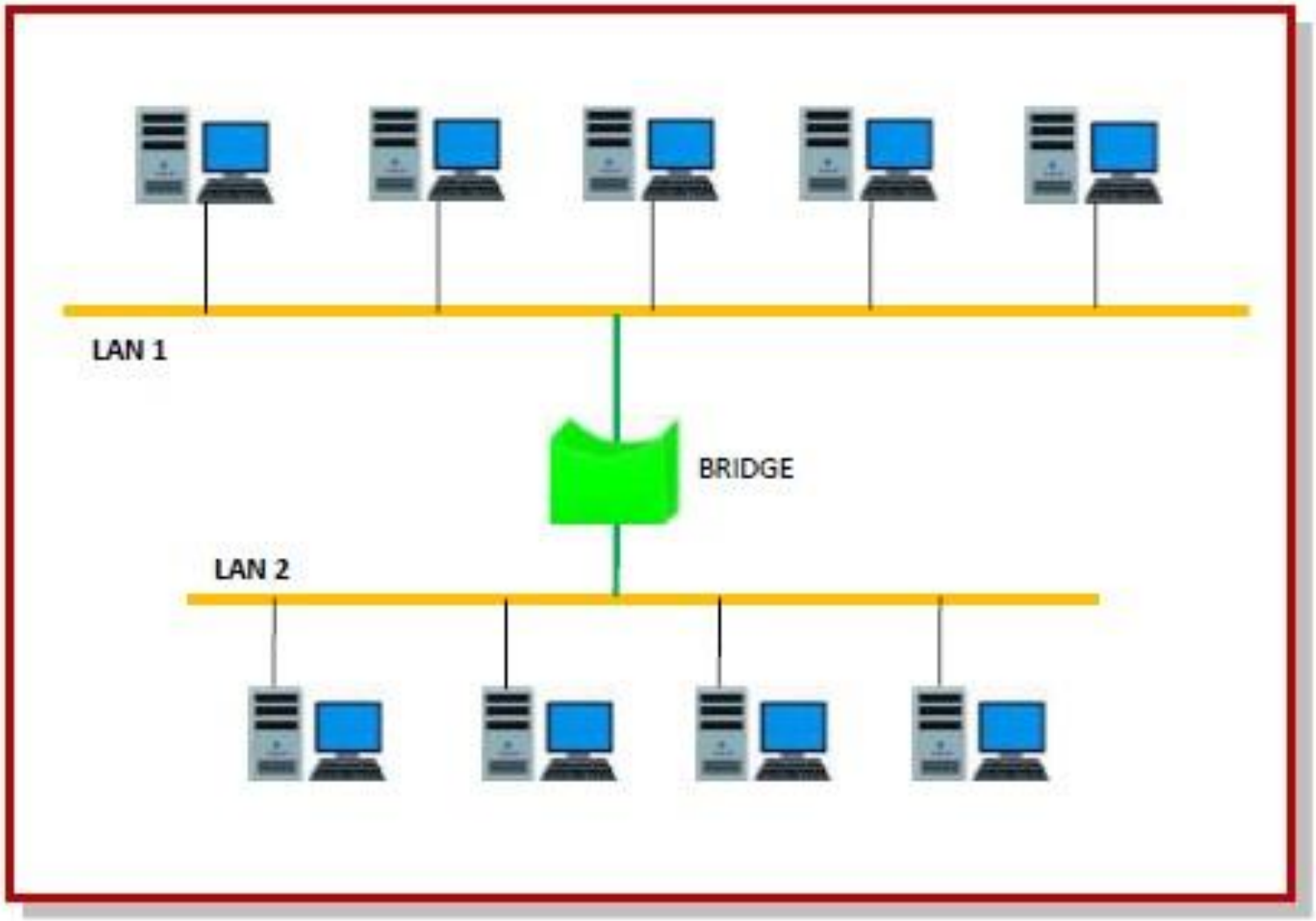
Repeater

Hub

Bridge

- A bridge operates at the DLL (Layer 2 of the OSI model)
- Bridges connects two or more different LANs that has a similar protocol and provides communication between the devices (nodes) in them.
- **Filtering of traffic :** On the basis of MAC Address
- On receiving a Data Frame, the bridge consults a database (MAC Table) to decide whether to pass, transmit or discard the frame.
  - If the frame has a destination MAC address in the same network, the bridge passes the frame to that node and then discards it.
  - If the frame has a destination MAC address in a connected network, it will forward the frame toward it.

Bridge

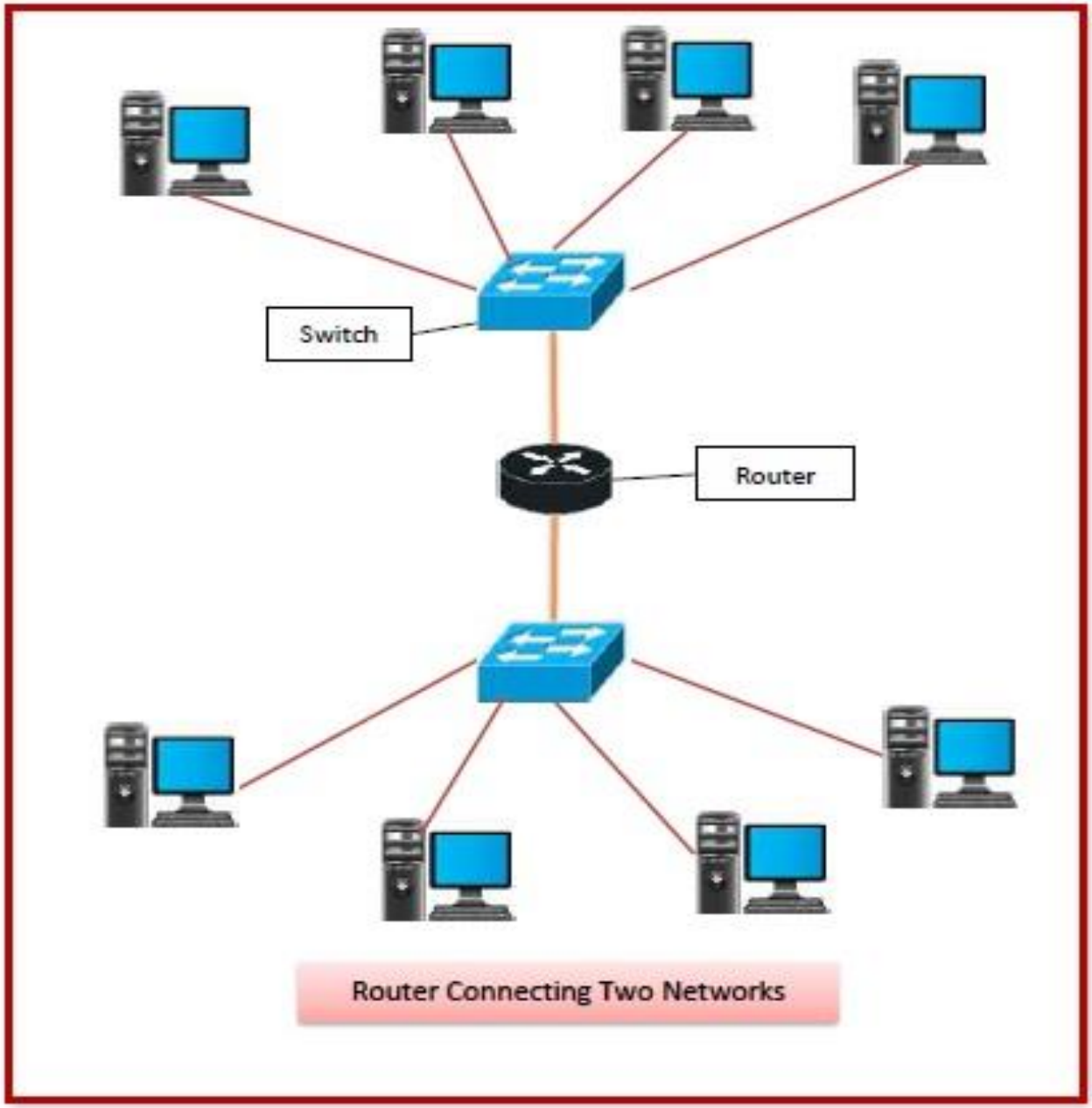


Switch

- A Switch operates at the DLL (Layer 2 of the OSI model)
- It is an intelligent network device that can be conceived as a ***multiport network bridge***.
- Switches connects two or more different LANs that has a different protocol and provides communication between the devices (nodes) in them
- It uses MAC addresses to send data packets to selected destination ports.
- **Filtering of traffic :** On the basis of MAC Address

Router

- A Router operates at the NWL (Layer 3 of the OSI model)
- A router is a device that routes data packets based on their IP addresses.
- It connects different networks together and sends data packets from one network to another.
- Routers have a dynamically updating ***routing table*** based on which they make decisions on routing the data packets
- In order to prepare or refresh the routing table, routers share information among each other
- Routers are *more expensive than other networking devices* like hubs, bridges and switches.


Switch
Router
Router Connecting Two Networks

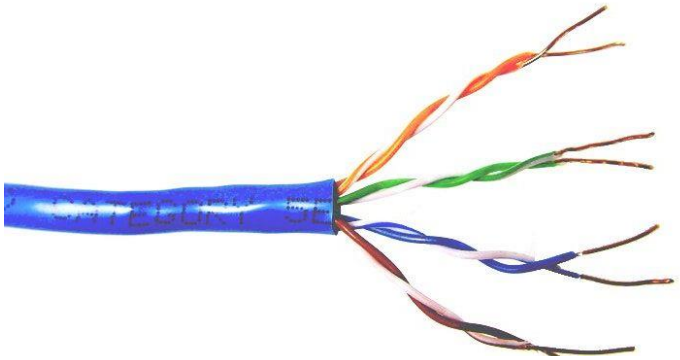
Network Cabling

Making connections with Cat5

Common network cable types

- Coaxial cable

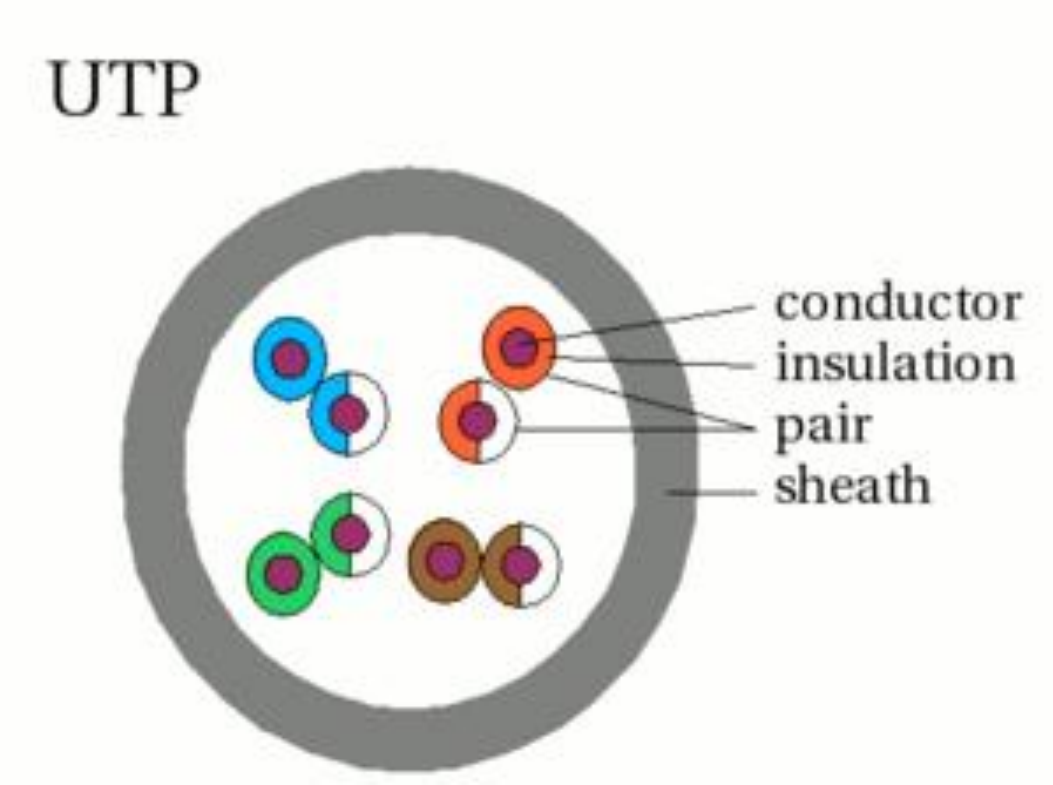
- Unshielded twisted pair



- Fiber optic

UTP characteristics

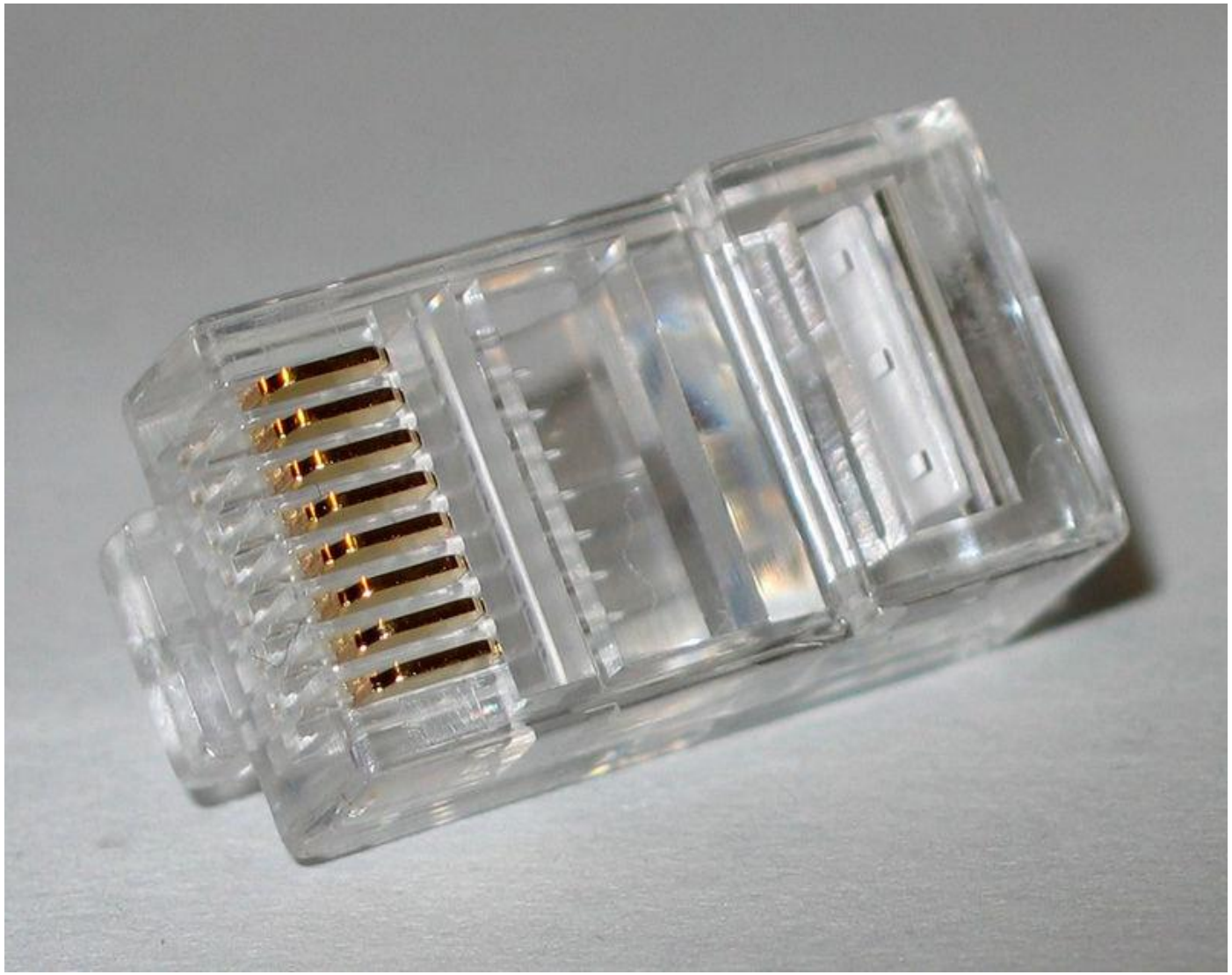
- Unshielded
- Twisted (why?) pairs of insulated conductors
- Covered by insulating sheath



UTP categories

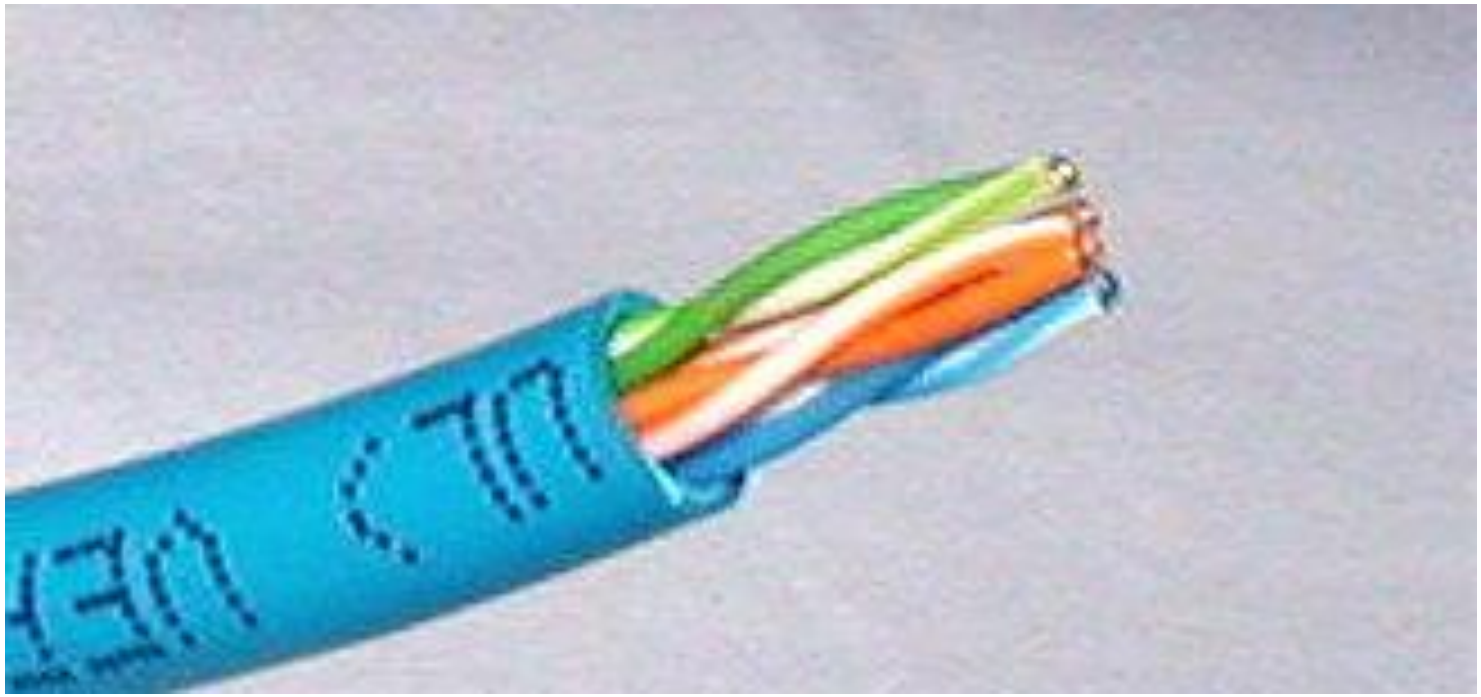
Category 1	Voice only (Telephone)
Category 2	Data to 4 Mbps (Localtalk)
Category 3	Data to 10Mbps (Ethernet)
Category 4	Data to 20Mbps (Token ring)
Category 5 Category 5e	Data to 100Mbps (Fast Ethernet) Data to 1000Mbps (Gigabit Ethernet)
Category 6	Data to 2500Mbps (Gigabit Ethernet)

RJ45 connector



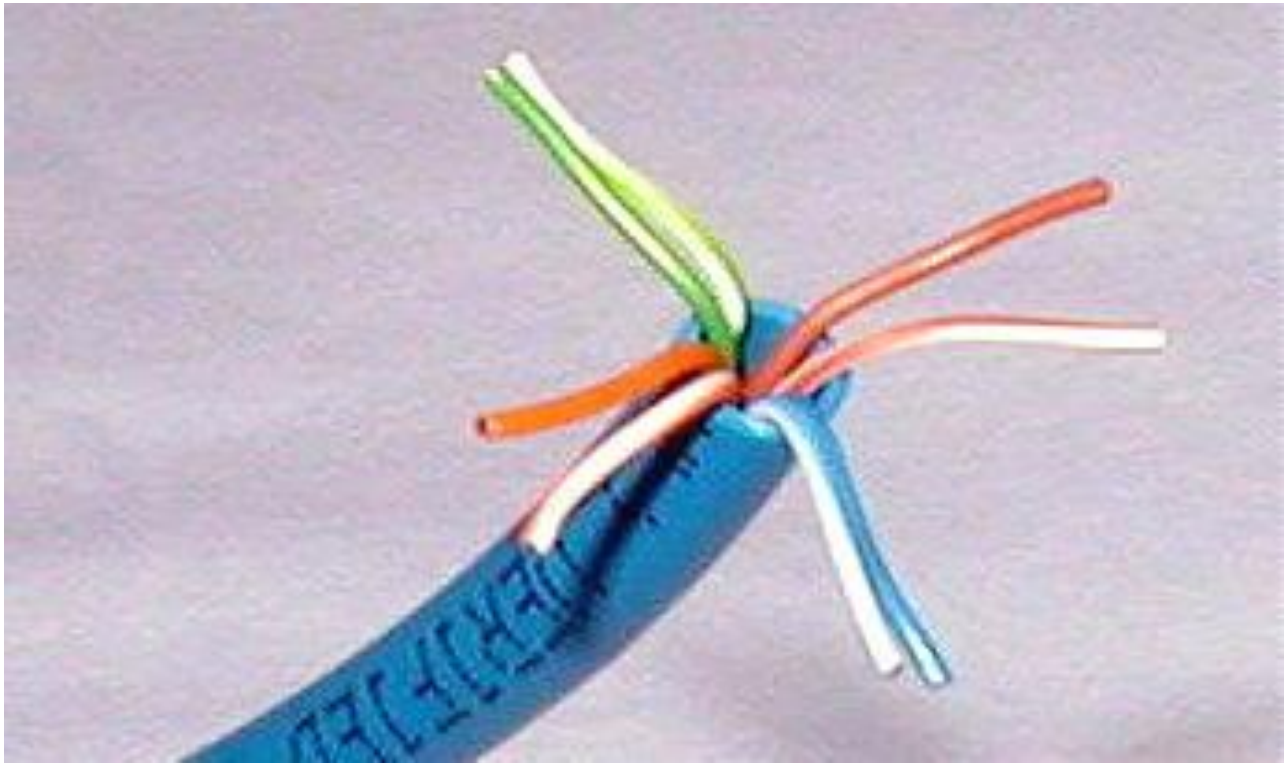
Step 1 – Strip cable end

- Strip 1 – 1½” of insulating sheath
- Avoid cutting into conductor insulation



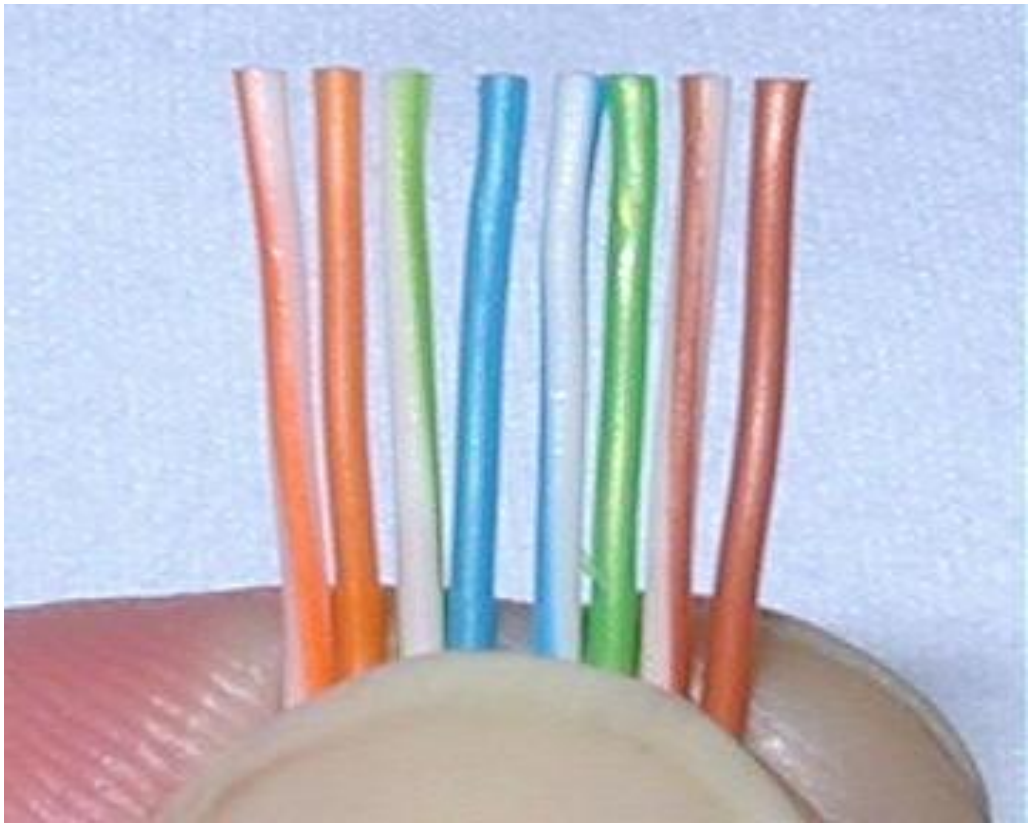
Step 2 – Untwist wire ends

- Sort wires by insulation colors



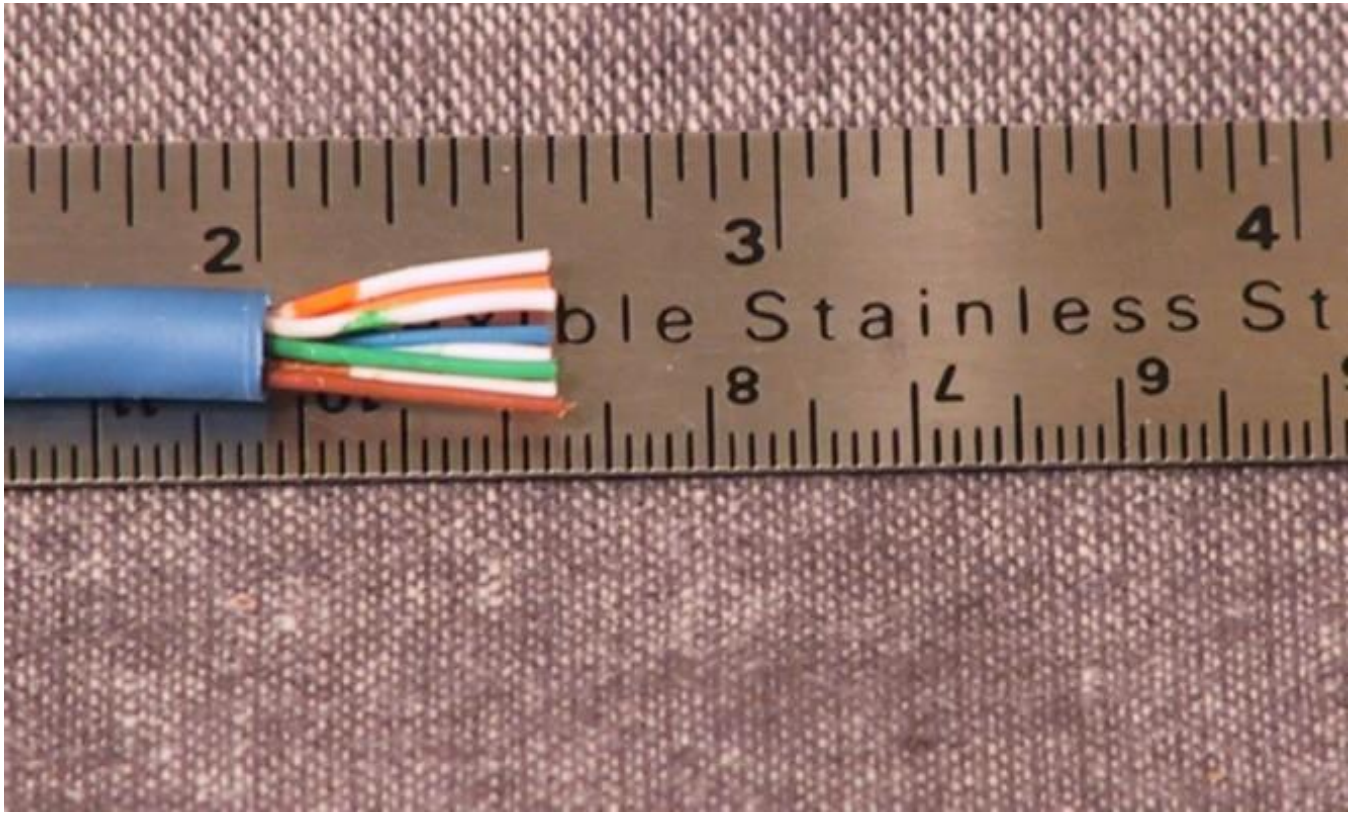
Step 3 – Arrange wires

- TIA/EIA 568B: OW-O GW-Bl BlW-G BrW-Br



Step 4 – Trim wires to size

- Trim all wires evenly
- Leave about ½” of wires exposed



Step 5 – Attach connector

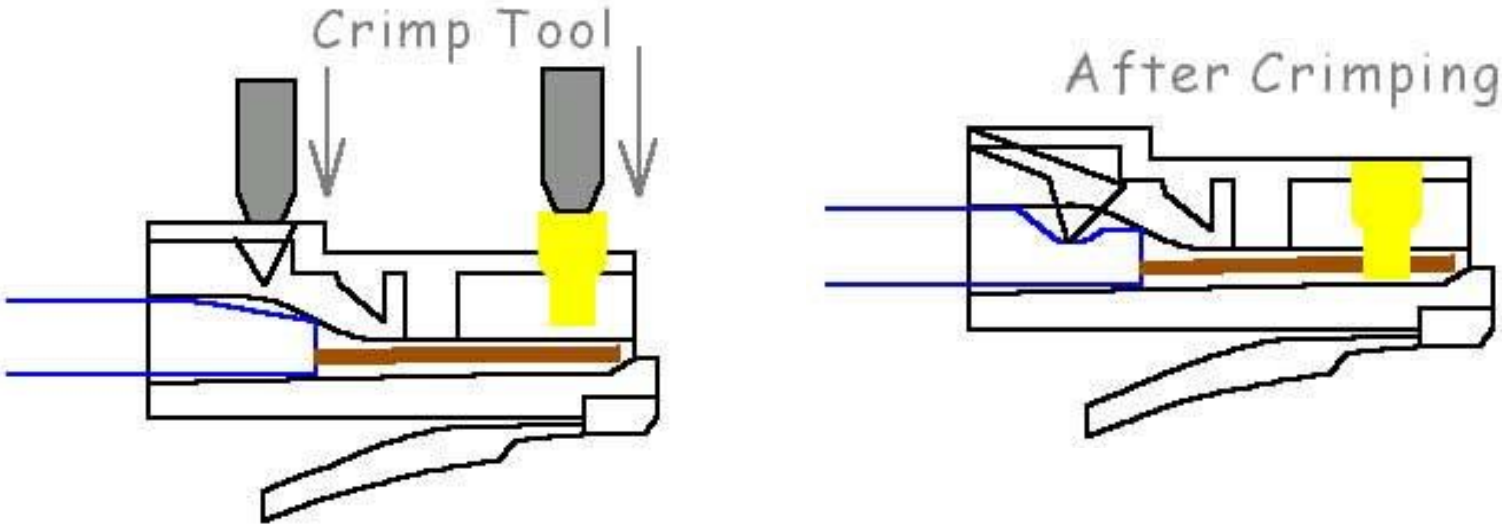
- Maintain wire order,
- left-to-right,
- with RJ45 tab facing downward

Step 6 - Check

- Do all wires extend to end?
- Is sheath well inside connector?

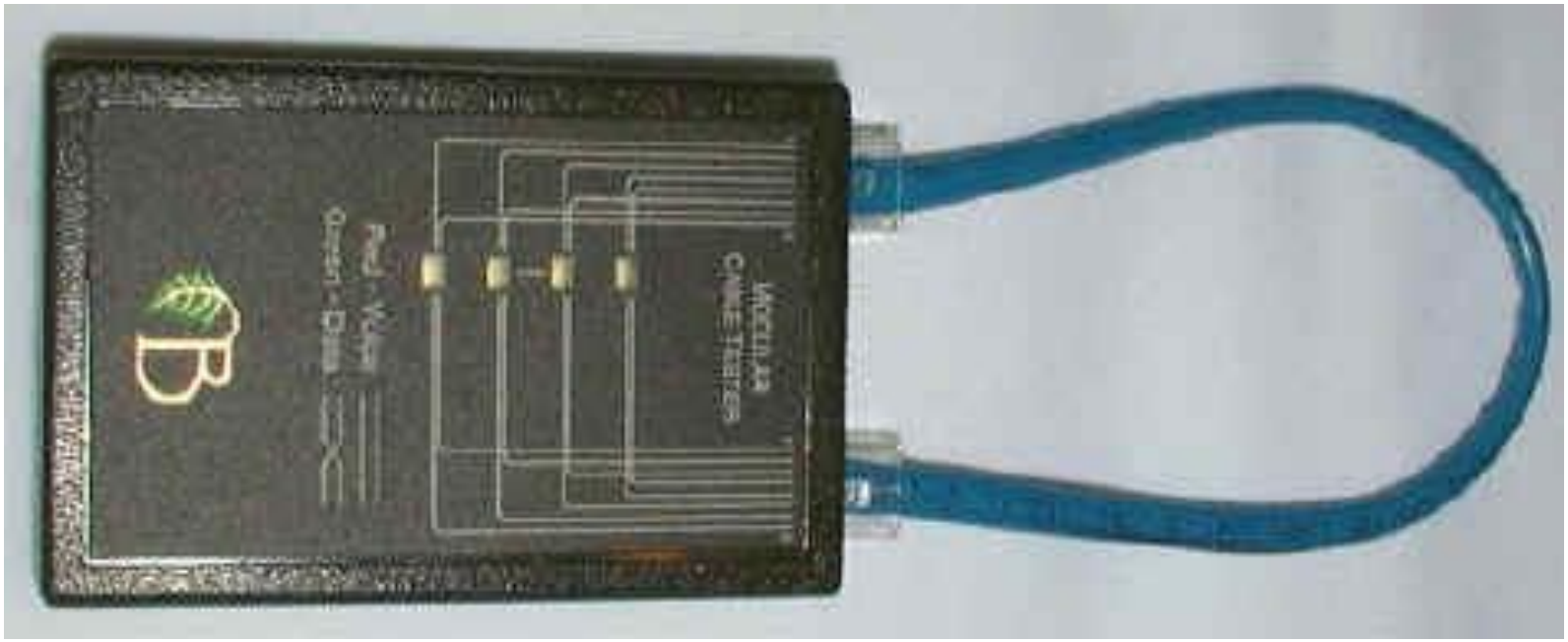
Step 7 - Crimp

- Squeeze firmly to crimp connecter onto cable end



Step 8 – Test

- Does the cable work?



Cabling Variations

- Straight Through Cable
- Cross Over Cable
- Rollover /Management/Console Cable

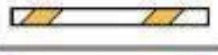
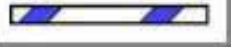
Straight Through Cable

- Straight-through cables are mainly ***used for connecting different types of devices,*** e.g., PC-switch, Hub-PC etc
- Pin 1 connector A goes to Pin 1 on connector B, Pin 2 to Pin 2, etc. Straight-Through wired cables are most commonly used to connect a host to a client.
- Diagram shows how to prepare Straight Through Connection

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #1
1	White/Orange		1	White/Orange	
2	Orange		2	Orange	
3	White/Green		3	White/Green	
4	Blue		4	Blue	
5	White/Blue		5	White/Blue	
6	Green		6	Green	
7	White/Brown		7	White/Brown	
8	Brown		8	Brown	

Cross Over Cable

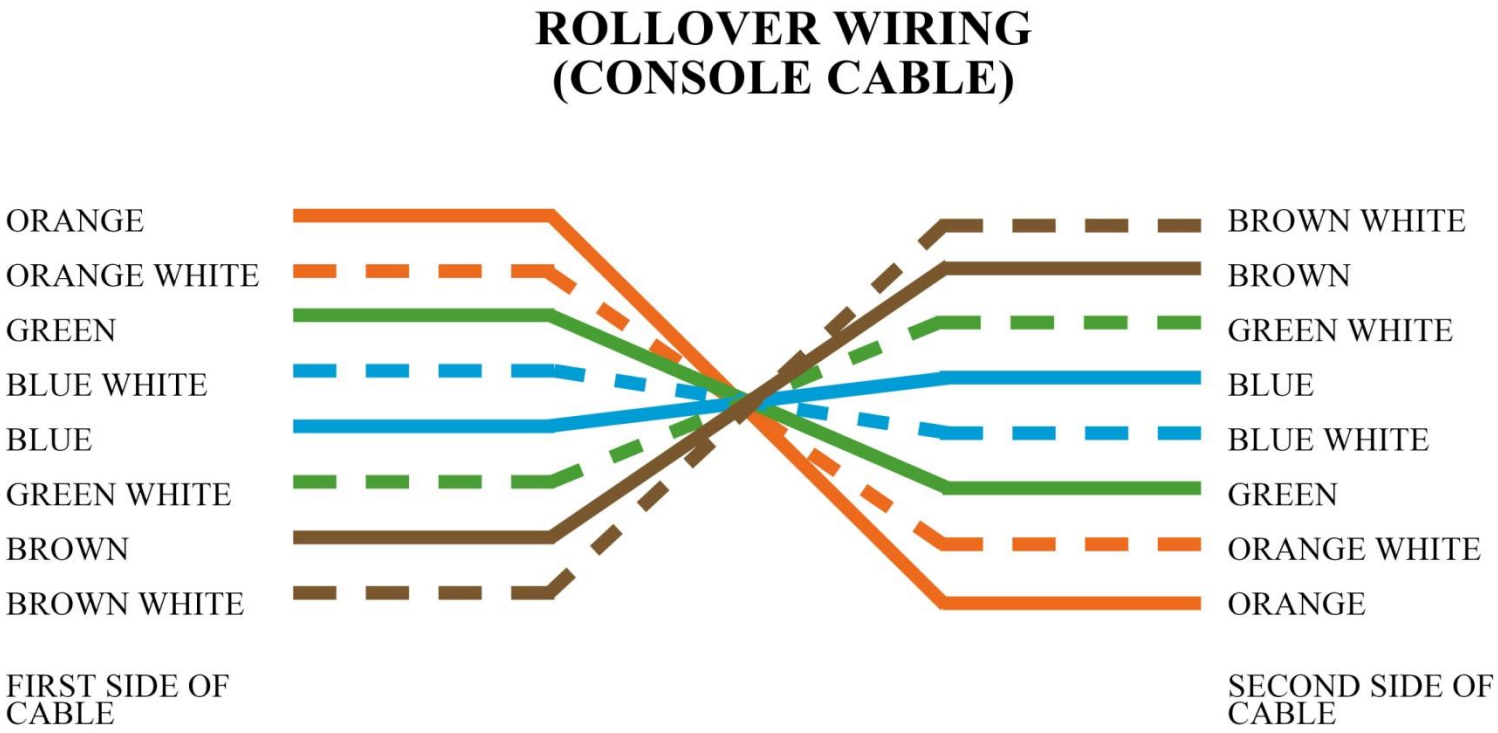
- Crossover cables are mostly ***used for connecting similar devices***. e.g PC-PC, Switch-switch, Route-Router, PC-Router
- Crossover cable, Pin 1 is crossed with Pin 3, and Pin 2 is crossed with Pin 6
- Diagram shows how to prepare Cross Over Connection

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

Rollover /Management/Console Cable

- Rollover cables, have opposite Pin assignments on each end of the cable or, in other words, it is "rolled over.“
- Pin 1 of connector A would be connected to Pin 8 of connector B. Pin 2 of connector A would be connected to Pin 7 of connector B and so on.
- Rollover cables, sometimes referred to as console cables are most commonly used to connect to a device's console port to make programming changes to the device.
- Rollover cables are not intended to carry data but instead create an interface with the device.
- Diagram in the next slide shows how to prepare Cross Over Connection

Rollover /Management/Console Cable



Thank You