



# UTP Cable Connections

## Lecture 6

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# Coaxial Cables Recap

- **10Base2:**
  - 10Mbps Ethernet network cable using a 5mm diameter 50-ohm coaxial cable as the transmission medium. Also known as **cheaperNet** or **thin Ethernet** (IEEE spec 802.3a-1985).
- **10Base5:**
  - The original 10Mb/s Ethernet cable , using a 10mm diameter 50-ohm coaxial cable as the transmission medium. Also known as **thick Ethernet** (IEEE spec 802.3-1983)
- **10BaseT:**
  - 10Mb/s Ethernet using two pairs of 100-ohm UTP cable rated to Category 3 or better.



# CAT 3 Cable

- **Category 3 Cabling**

- Developed in 1990, the CAT 3 cable was one of the most popular data communication cables until 2000
- Was mainly used in 10Base-T (supports 10Mb/s data transfer speed)
- Can also be used in 100Base-T networks (supports 100Mb/s)





# CAT 4 - Not In Use

- **Category 4 Cabling:**

- A Cat 4 cable consists of four pairs of UTP copper cables
- was primarily designed for token ring, 10Base-T and 100Base-4 networks
  
- The Cat 4 cable is no longer in use and is not supported by current data cabling standards and associated device

# CAT 5 (Category 5 Cables)

- **100BaseT:**
  - 100Mb/s Ethernet, using two pairs of 100-ohm UTP cable rated to Category 5. Also called **Fast Ethernet**.



# CAT 5 (Category 5 Cables)

- **Category 5 cabling:**
  - Unshielded twisted-pair cabling (UTP) which is manufactured such that it will support 100Mb/s data transmission.
  - As technology for twisted pair copper cabling has progressed, **Category 5e** and **Category 6** cable offer more potential for bandwidth and better potential reducing signal loss



# CAT 6 (Category 6 Cables)



*Lecture 5 Slides 38 and 39*

- **Category 6 Cabling**

- A Cat 6 cable is used for computer networks reaching a Gigabit per second, 1000 Mbps or one Gbps of data transfer speed (DTR) or higher.
- Also called **Gigabit Ethernet**
  
- Consists of four pairs of copper wires, which are **all** utilized for data transfer
- Electrically **backwards compatible** with CAT 5



# CAT 6 (Category 6 Cables)

- **Category 6 Cabling**

- Provides bandwidth of 250 MHz (analog) or speeds up to 10 Gbps (digital)
- can be stretched to 100 meters in length
- The Cat 6 cable is supported by Ethernet networks, including:
  - 10BaseT
  - 100Base-TX
  - 1000 Base-T
  - and 10 GBase-T.

*\*Exercise: find out the advantages that CAT7 cables have compared to CAT 6 cables*



# Cable Applications Compared

- **10Base5 and 10base2 - Obsolete**
  - The two early coaxial cable versions (10Base5 and 10Base2) are now considered obsolete/outdated and are **not recommended** for current nor new networks
- **Fast Ethernet (100Base-T)**
  - Suitable and Cost-effective for both home and small office networking
- **Gigabit Ethernet (1000Base-T Network)**
  - More expensive than 100Base-T network, suitable for larger organizations, regarded as excessive performance for most home and small office network uses.



# UTP Connections

- 10Base-T and 100Base-T Ethernet both use UTP (Unshielded twisted pair) cables are both fitted with **RJ45 Connectors**



*RJ45 Connector*

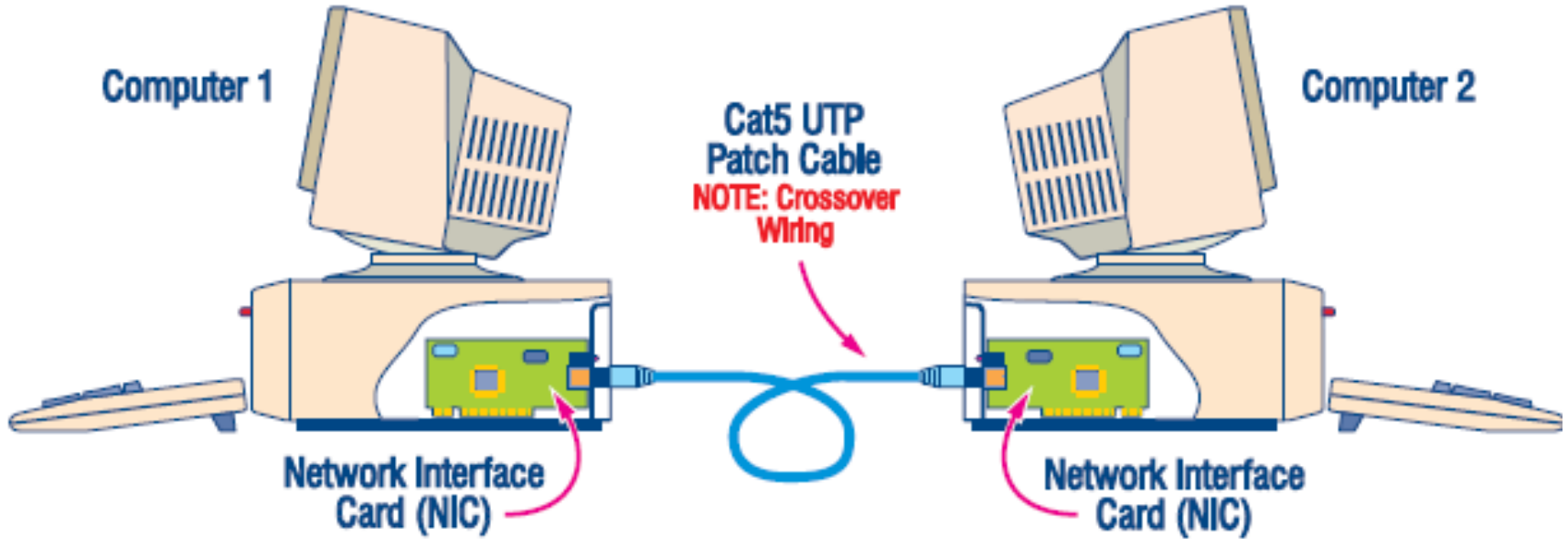


# UTP Connections

- whether the PC's network interface is in the form of a NIC (Network Interface Card) or built into the motherboard, it has a fixed and unique network address or MAC (media access control) address
  - The interface or NIC will only accept data packets which carry the unique address of the packet's destination



# UTP Connections





# UTP Connection Types

- Three common types of UTP cable connections:
  - **Crossover cable**
  - **Straight Through cable**
  - **Rollover cable**

# Crossover Cable

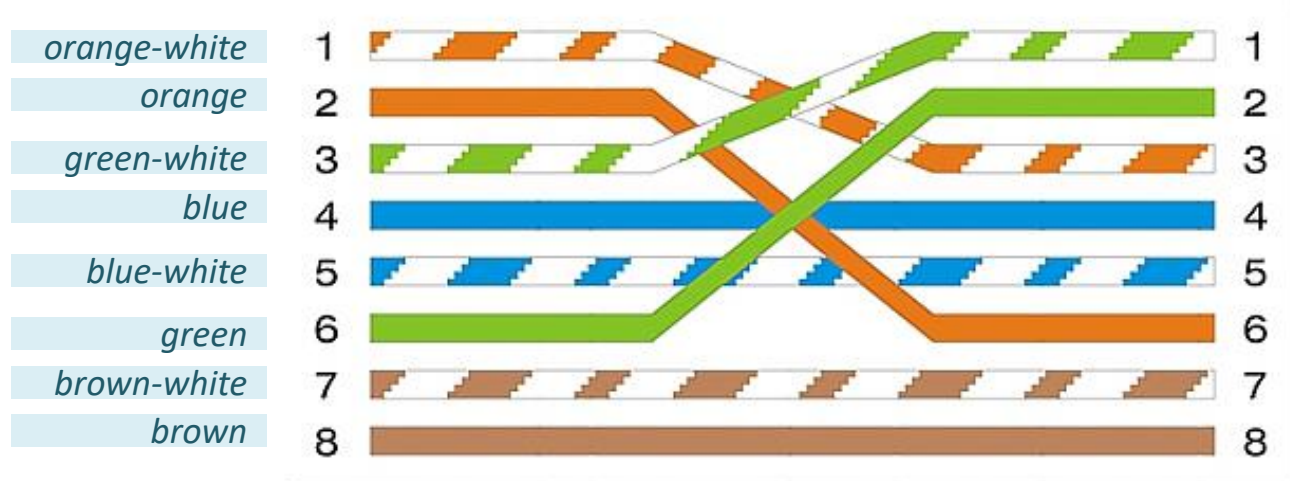


- **Crossover cable** is a type of cable used for the interconnection of two similar devices
  - e.g. connecting a PC to another PC directly (*depicted on Slide 12*)
- It is enabled by reversing the transmission and receiving pins at both ends
  - so that output from one computer becomes input to the other, and vice versa



# Crossover Cable

- Crossover Wiring (T568 B)



*1<sup>st</sup> side of  
the cable*

**O O G B B G B B - (T568 B)**

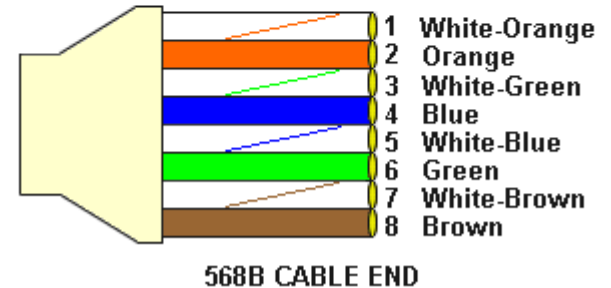
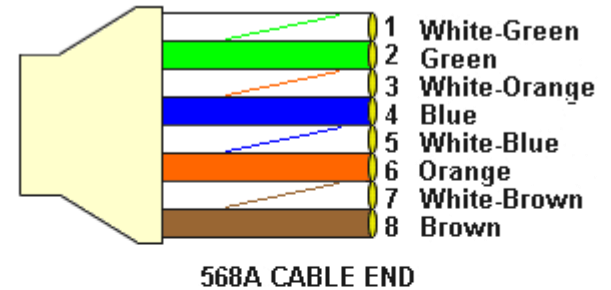
*2<sup>nd</sup> side of the  
same cable*

**G G O B B O B B - (T568 A)**



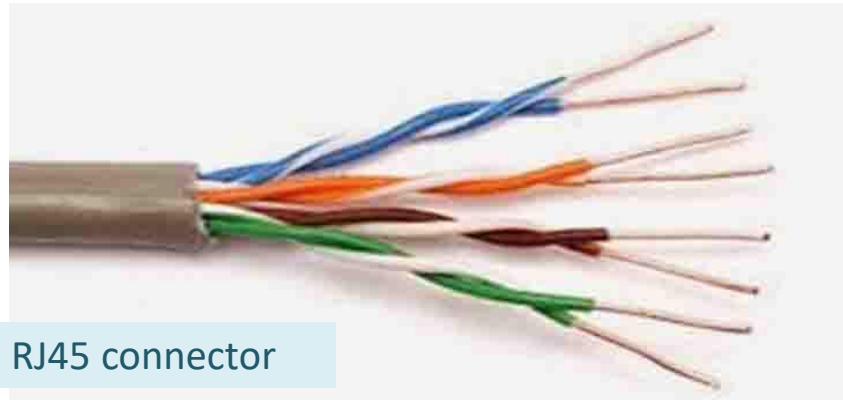
# Crossover Cable – T568 A and T568 B

- **Difference between T568 A and T568 B Cables**
  - T568A and T568B are the two color codes used for wiring eight-position RJ45 plugs.
  - Both are allowed under the ANSI/TIA/EIA wiring standards.
  - **The only difference between the two color codes is that the orange and green pairs are interchanged.**



# Straight Through Cable

- A straight-through cable is a type of twisted pair cable that is used in local area networks to connect a computer to a network hub such as a **router** or a **switch**
  - (i.e. unlike the crossover cable which connects a PC to a PC / similar devices)



Open UTP Cable without an RJ45 connector





# Straight Through Cable

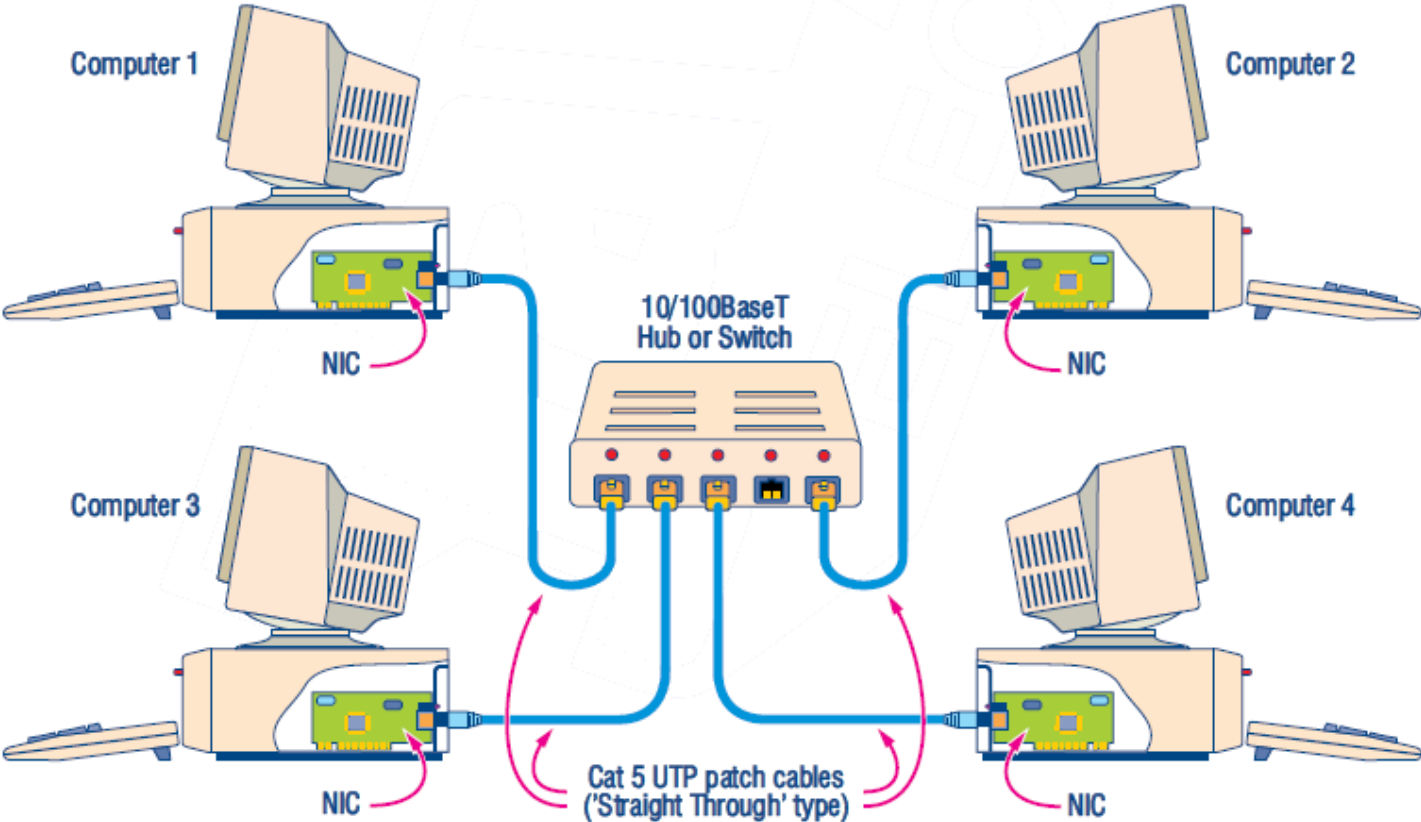
- **Straight-through cable** is a type of CAT5 cable whereby the RJ-45 connectors at each end have the same color order

Straight-through wiring (T568 B)



O O G B B G B B

# Straight Through Cable - Example



# Straight Through Cable

- **Note:** Traditionally a Straight Through cable should be used to connect a PC to a switch and/or connect a switch to a router.
  - However, currently a PC using a CAT5e (or higher) cable might connect to a switch with a straight through or crossover cable since the NIC are intelligent enough to detect the type of connected devices
- **Note 2: The color order of the inner twisted pairs is important!**
  - *OOGBBGBB (T568B standard) and GGOBBOBB (T568A standard)*
  - e.g. 2 devices will fail to connect the twisted pairs are incorrectly ordered, such as brown wires in the wrong order, IT Technicians can be required to make UTP cables and as such are required to know the UTP color order



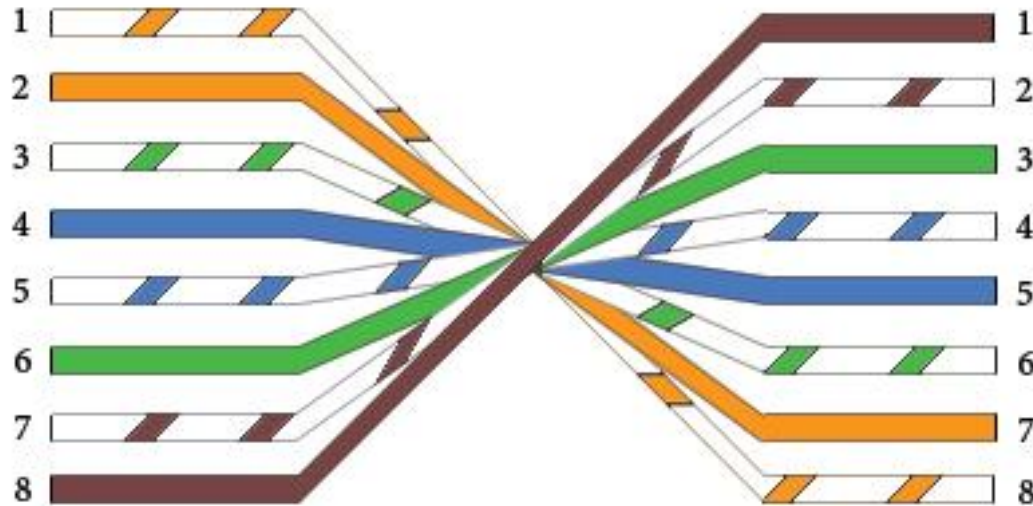
# Rollover cable

- Also known as Console Cable
  - connects a PC to a router's console port
    - This permits an engineer or programmer to connect to the network device and manipulate the programming as required
    - technicians to use rollover cables for network hardware upgrades, maintenance, and troubleshooting
  - normally flat and light blue so as to distinguish it from other network cable types.



# Rollover cable

- Note: the color order is inverted for a Rollover cable
  - i.e. wire 1 (orange-white) becomes wire 8 at the other end of the same cable



Rollover Wiring (T568 B)

# UTP Cable Type Summary

- **Straight-through cable**
  - is used for unlike devices: router to switch/hub, computer to Switch/hub.
- **Crossover cable**
  - is used for like devices: Switch to Switch, Router to Router, Computer to Computer
- **Rollover cable (or Rolled cable)**
  - is used for configuring a router or a switch which are connected to a computer.

