

Section 4: Ethernet Basics

17.What is Ethernet?

Ethernet - IEEE 802.3 (tons of revised versions)

Ethernet Frame

- Made up of to/from MAC addresses, Date, and the CRC which in this instance is called the (FCS)Frame Check Sequence.
- normally will never be more than 1500 bytes
- The frame does not change

Ethernet Frame Nomenclature Need to know this for the test

10Base5

10 - Speed in mbps

Base/Broad - Broadband one cable with multiple channels, Base is one cable with one channel at a time

5 - Length of the cable back in the day. (5=500 meters)

10BaseT - 10mbps, Baseband, unsheilded twisted pair with a switch in the middle.

18. Ethernet Frames

Frame Structure:

[(Preamble) (Destination MAC) (Source MAC) (Data Type) (Data) (FCS)]

Preamble: Preamble tells the NIC that a frame is coming

Destination MAC: 48bit MAC address that's built into every NIC

Source MAC: Return address

Data Type: (= Ethertype) - What kind of data that is being hauled

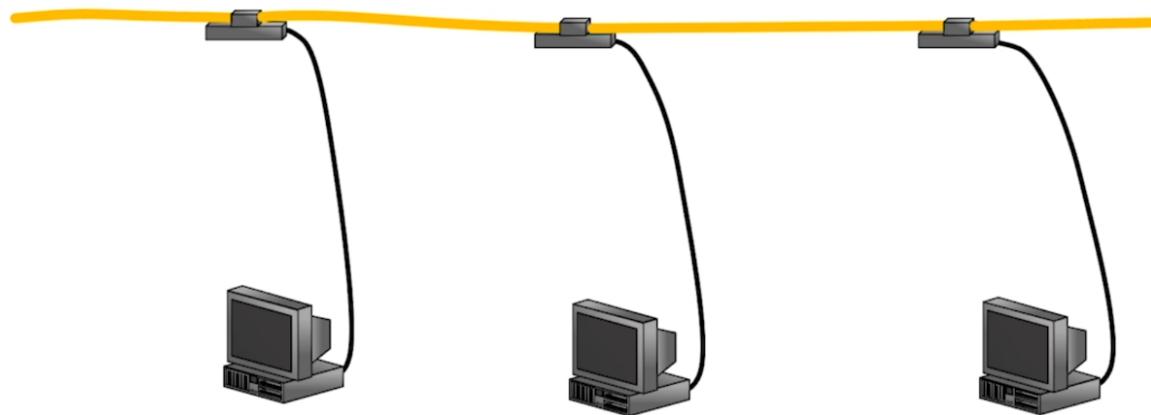
Data:

- Min=(64bytes or Octets(8bytes)) If you have a tiny bit of data you add a "PAD" to get it to 64bytes
[(Preamble) (Destination MAC) (Source MAC) (Data Type) (Data) (PAD**) (FCS)]**
- MAX (MTU - Maximum Transmission Unit)= 1522 Bytes/octets (Even though this is the max you can send, larger data is chopped up into smaller bits and reordered by the CRC or FCS number)

FCS (Frame Check Sequence) 32bit cyclic redundancy check. If the rest of the frame does not match the FCS the data will not be accepted because it is wrong. *Error Detection*

19.Early Ethernet

Segmented Ethernet will need to be known for the exam. - old ethernet cable which everyone used a 'vampire connection' to access. The cable ran through the ceiling and then a cable was run from the vampire connection to the computer on the floor (AKA "a Drop").



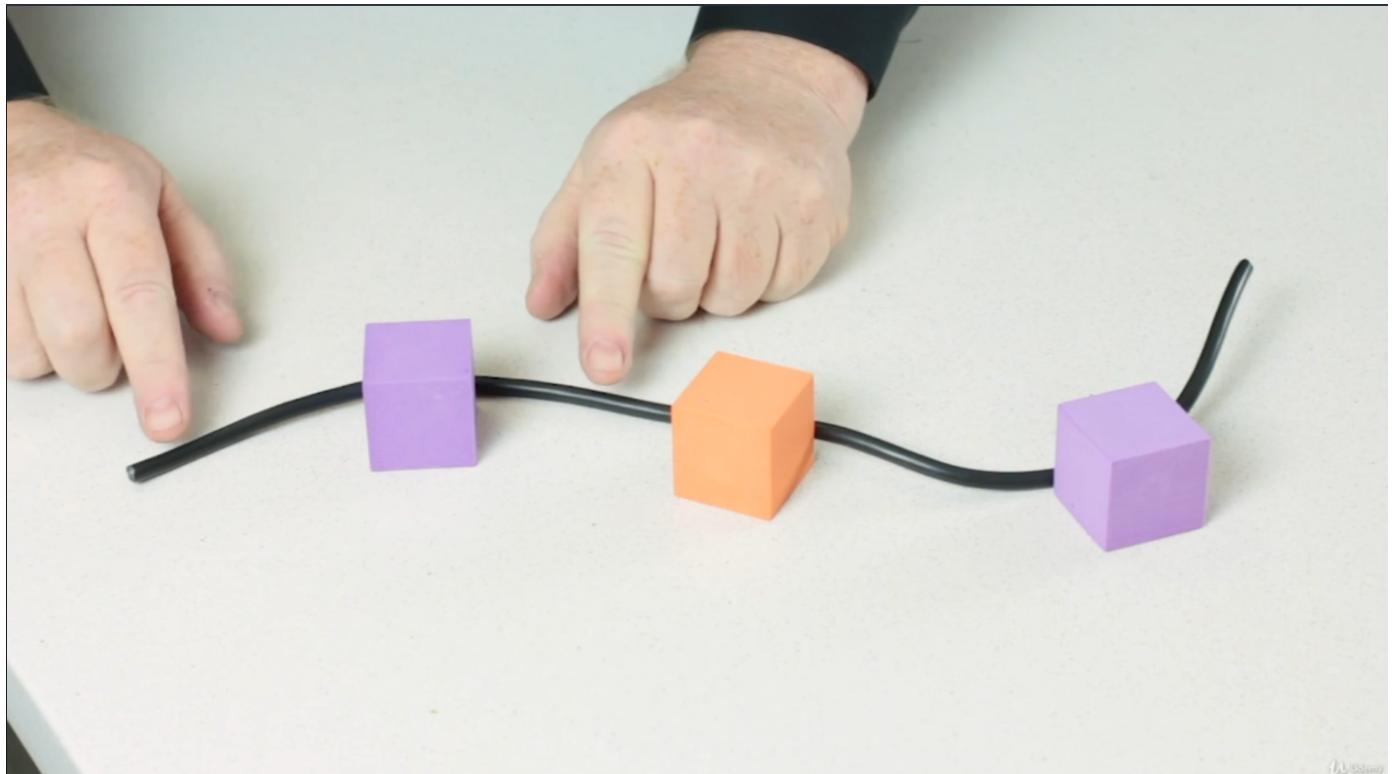
CCW

CSMA/CD (Carrier Sense Multiple Access/Collision Detection)

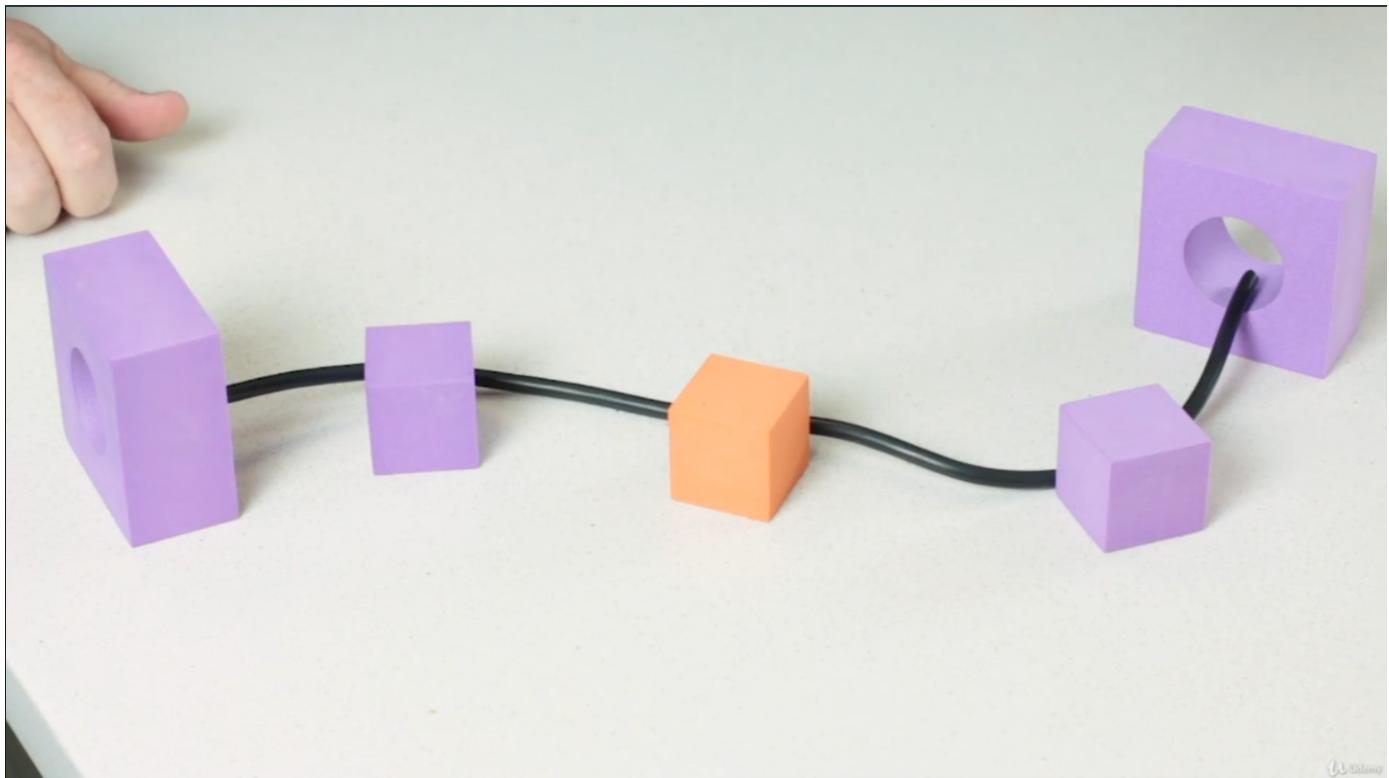
CSMA - Carrier Sense Multiple Computers - A computer listens to hear if another is talking on the line if they don't hear anyone talking they can talk.

**The frame sent from a computer propagates in both directions on the bus. It will hit the ends of the cable and cause reflection and this is bad. So on all Ethernet cable busses at the ends they put

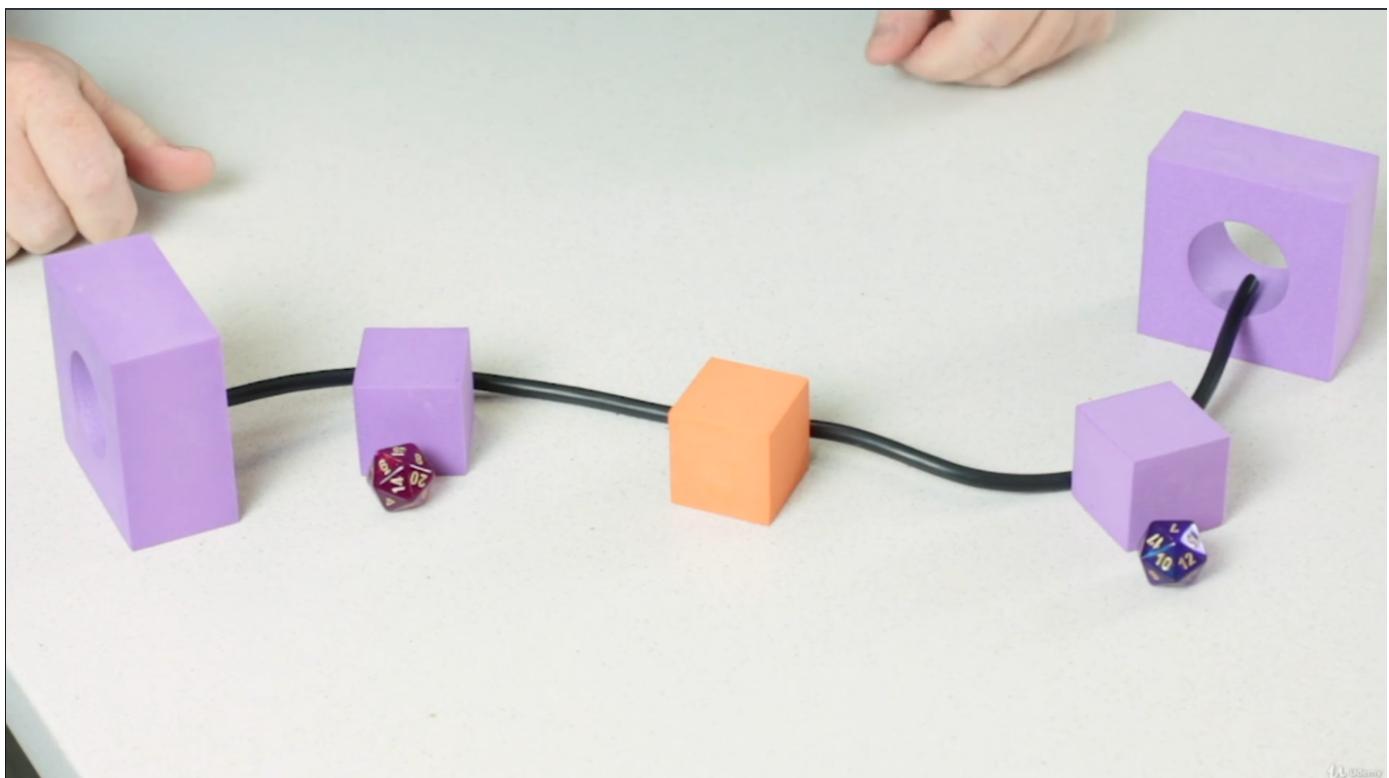
Terminating Resistors



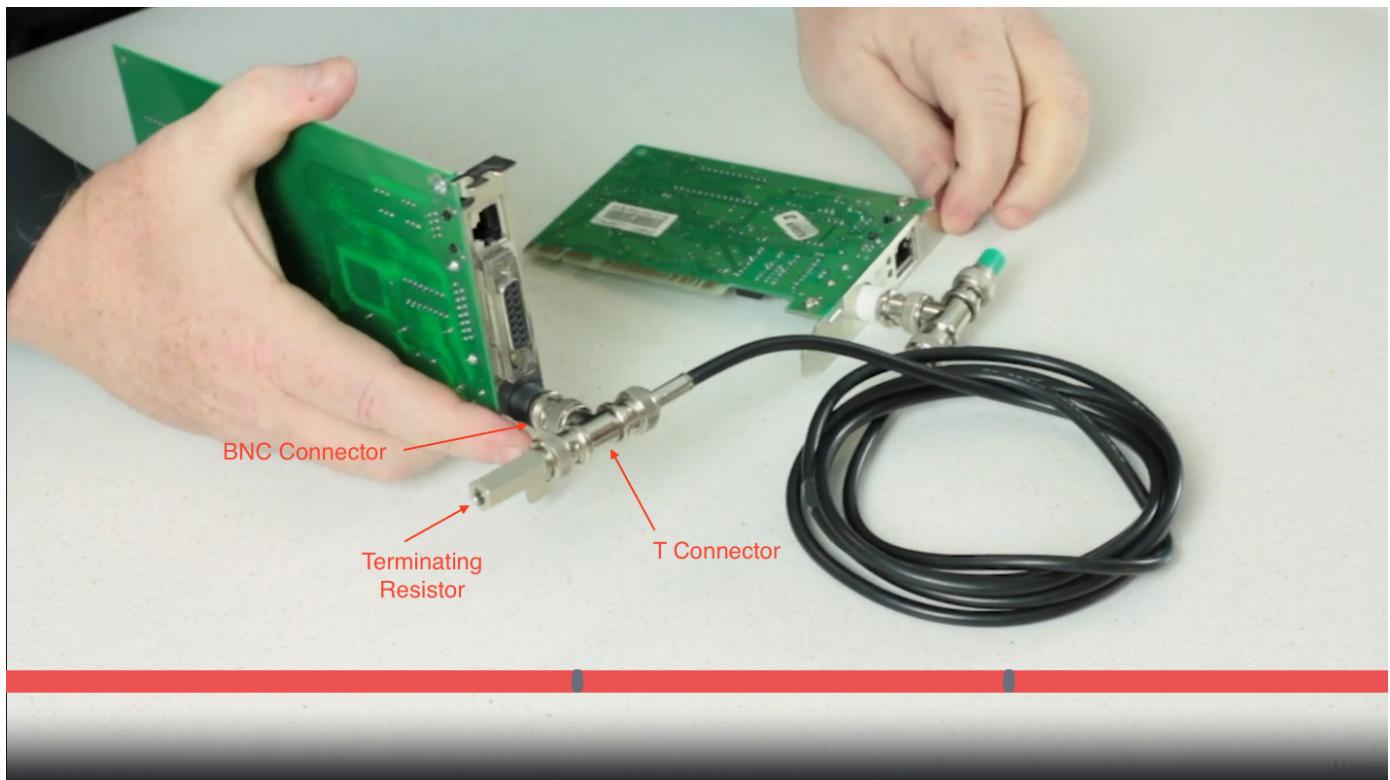
CCW



CD - Two computers cannot talk to each other at the same time. This causes a collision. Basically if two computers had a collision they would each roll a die and the resulting number would be how long they would wait in ms before they tried to retransmit.



10Base2 - 10mbps/Baseband/200m segments (actually 185), Can connect up to 30 Devices per segment. (See below)



20.The Daddy of Ethernet, 10BaseT

If one computer went down on the old bus system (previous section), then the whole system went down. IBM developed "Token ring" to improve this but it was proprietary and expensive so eventually the IEEE people tried to stay competitive and made a change by taking a long bus cable and converting it into a box calling it "10BaseT"

10baseT is old and outdated but it is important to know this as a cornerstone of how ethernet works today.

On the exam

10BaseT

-10mbps

-Max of 100 Meters between Hub or switch and the machine that's connected

-No more than 1024 Nodes (machines) per hub/switch

-Made to run with CAT 3 cable or better

21.Terminating Twisted Pair

Terminated Cable - Unshielded twisted pair with connectors (crimps) on it.

Process of terminating cables - Need to know this process for the exam

What we need:

-Cable

-Crimps(connectors)

-A Crimper/Cable strippers

1.Remove the jacket from the cable

*Crimp has 8 positions and each wire must be in a very specific position.

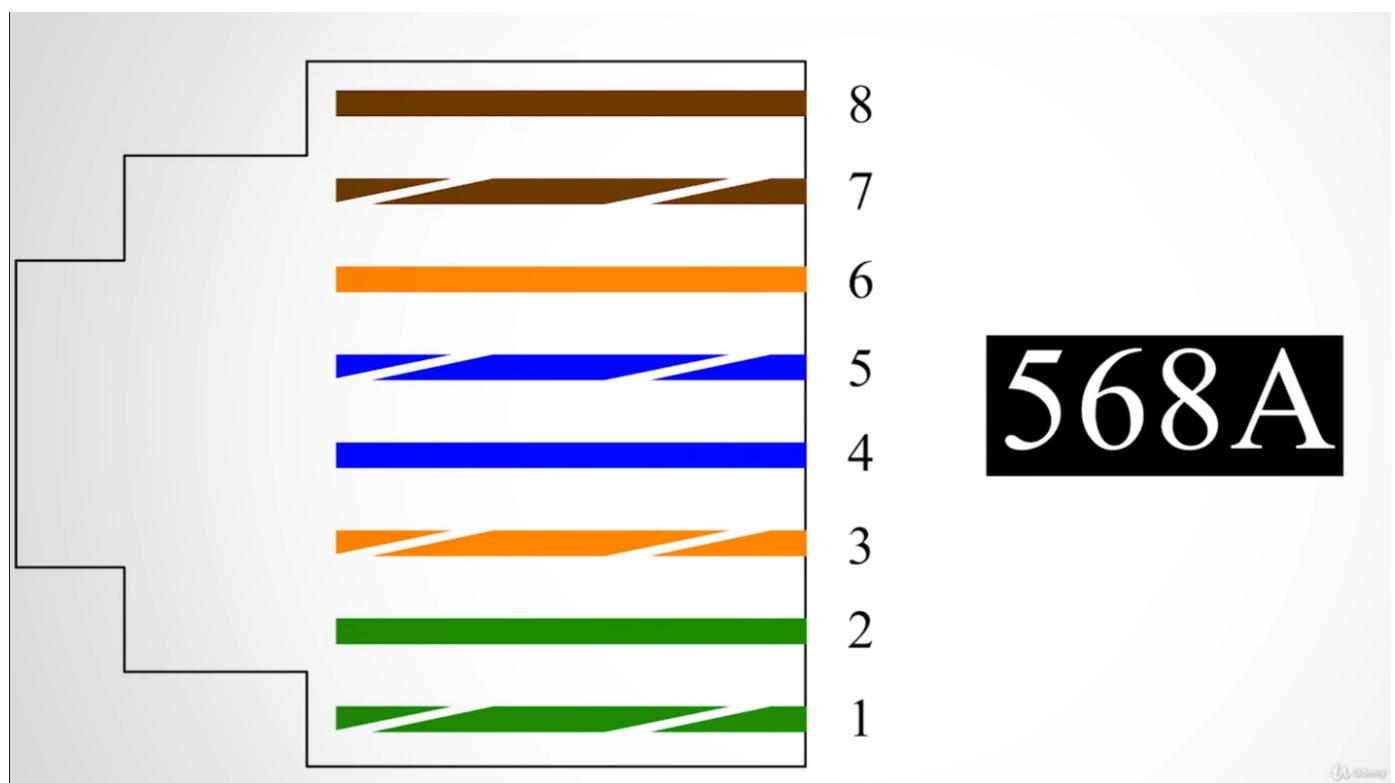
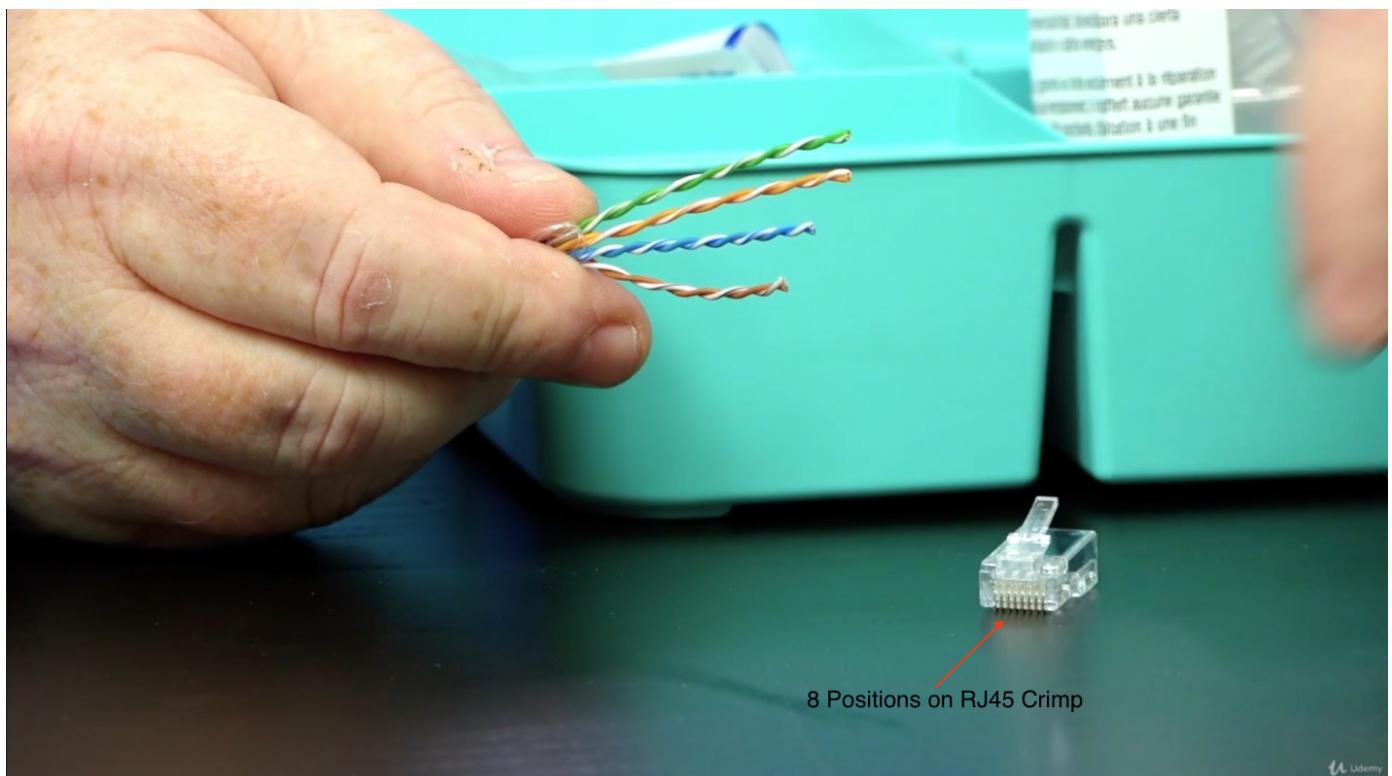
3.Untwist and create a fan shape/broom shape of the individual wires in order of color position (in this case it is 568A)

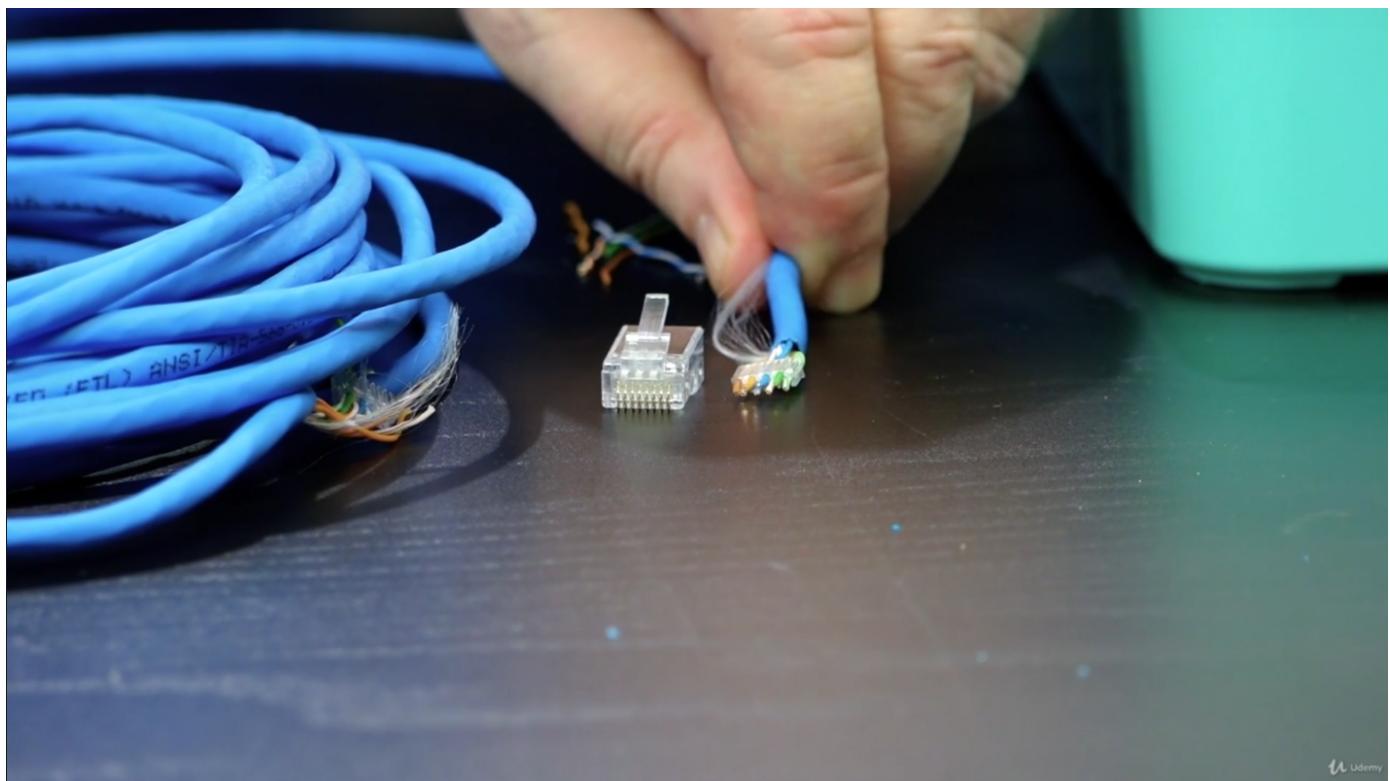
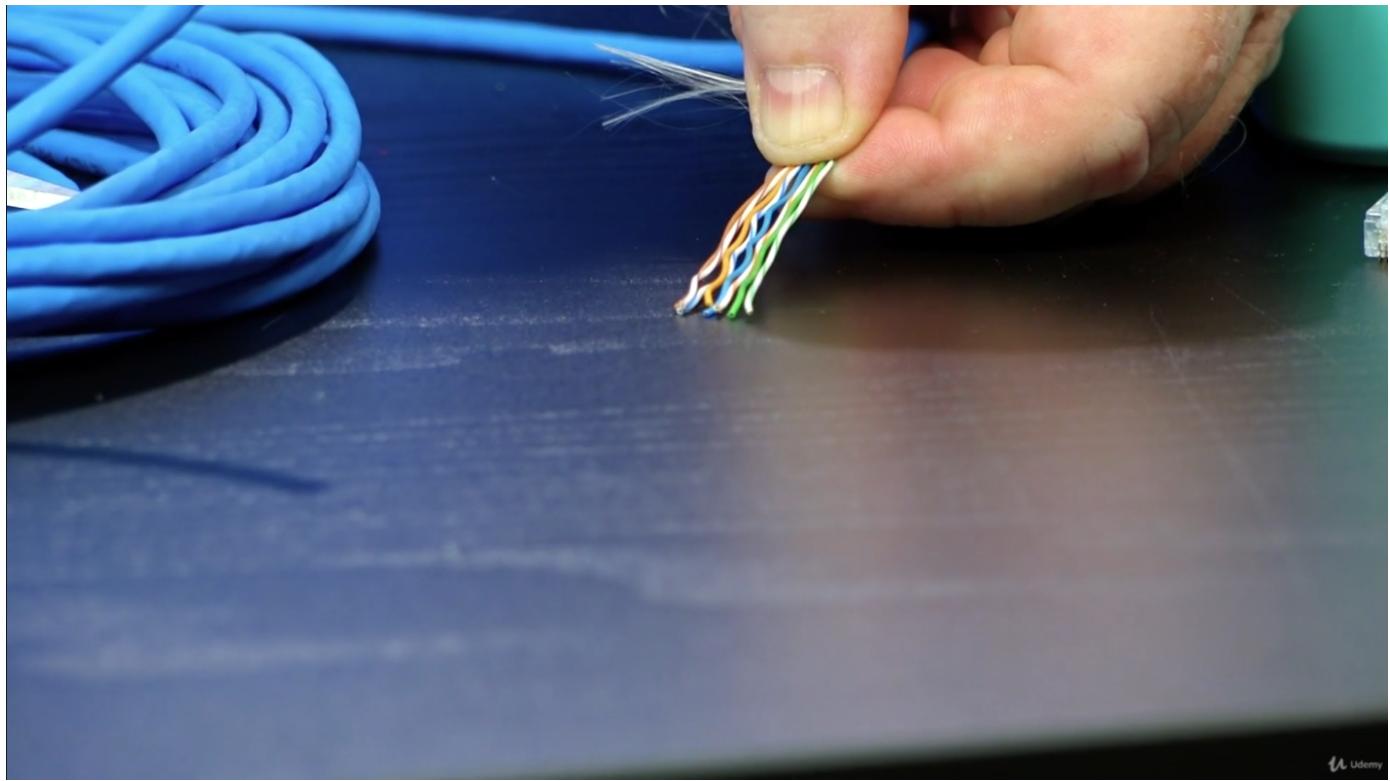
4.Put into collar of preguide *This helps the wires get prealigned before putting them into the RJ45 crimp.

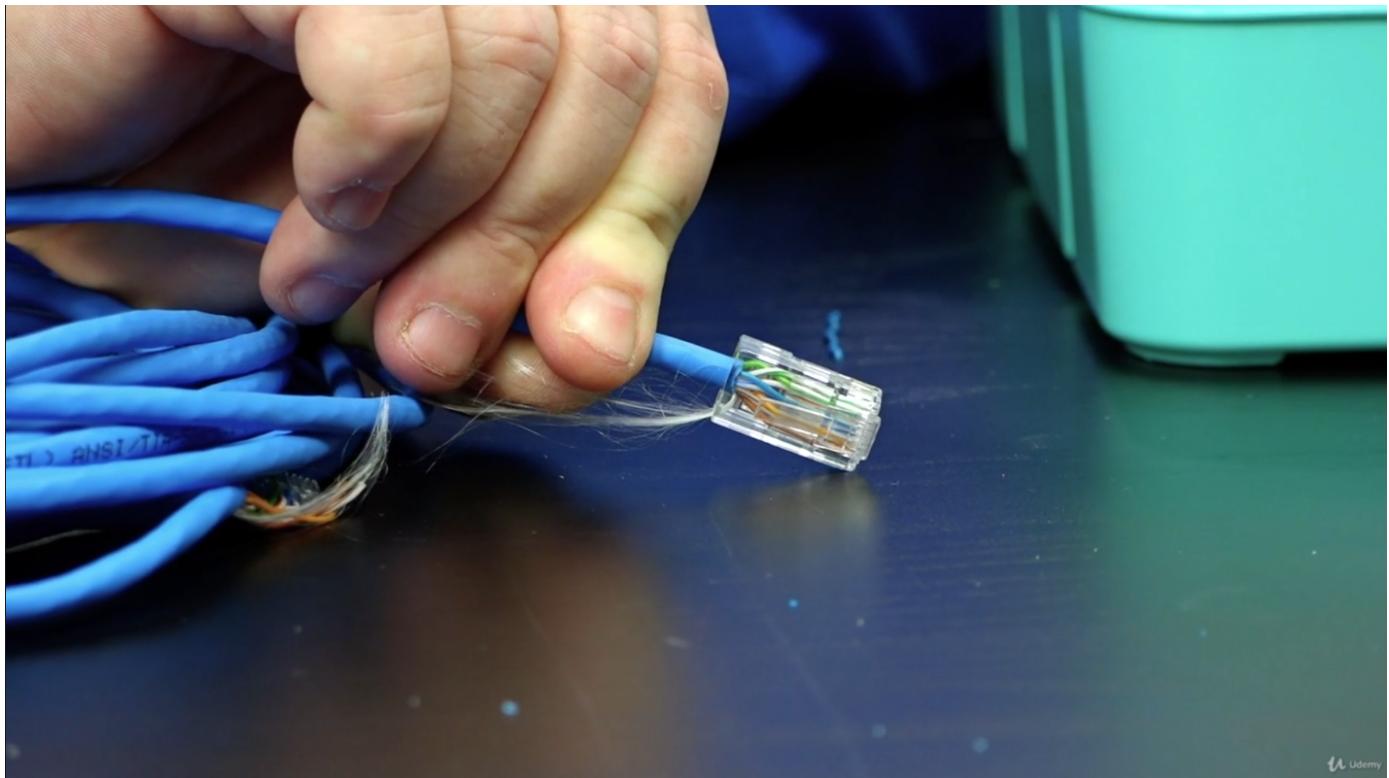
5.Ensure that all the wires are in place before crimping

6.Crimp into place

RJ45 - 8P8C is the offical term for RJ45

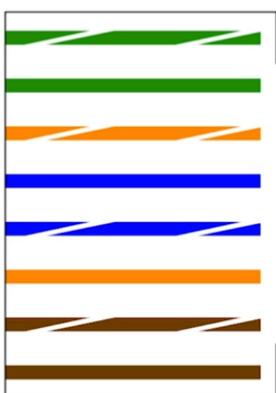




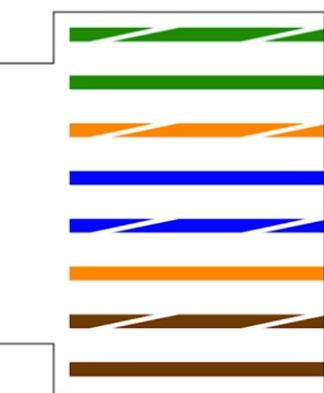


Udemy

568A



568A

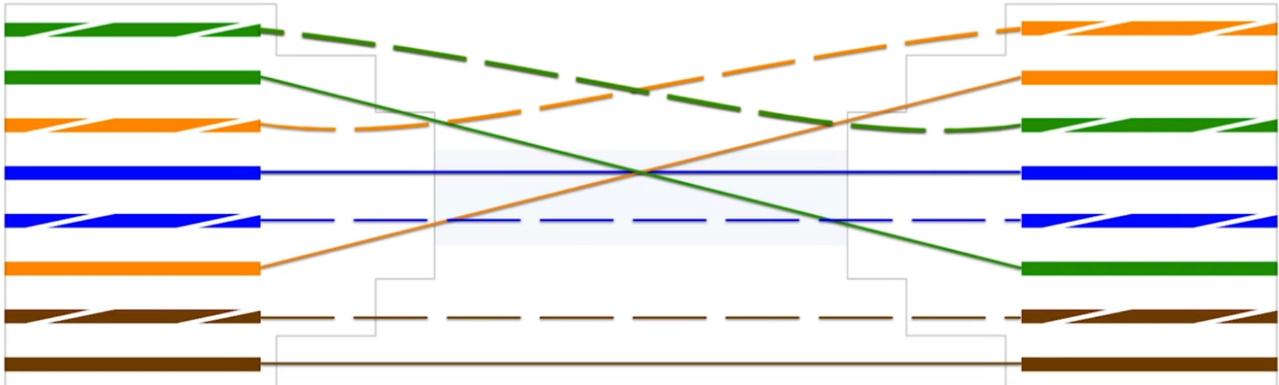


Straight through cable

Udemy

568A

568B



Crossover connection

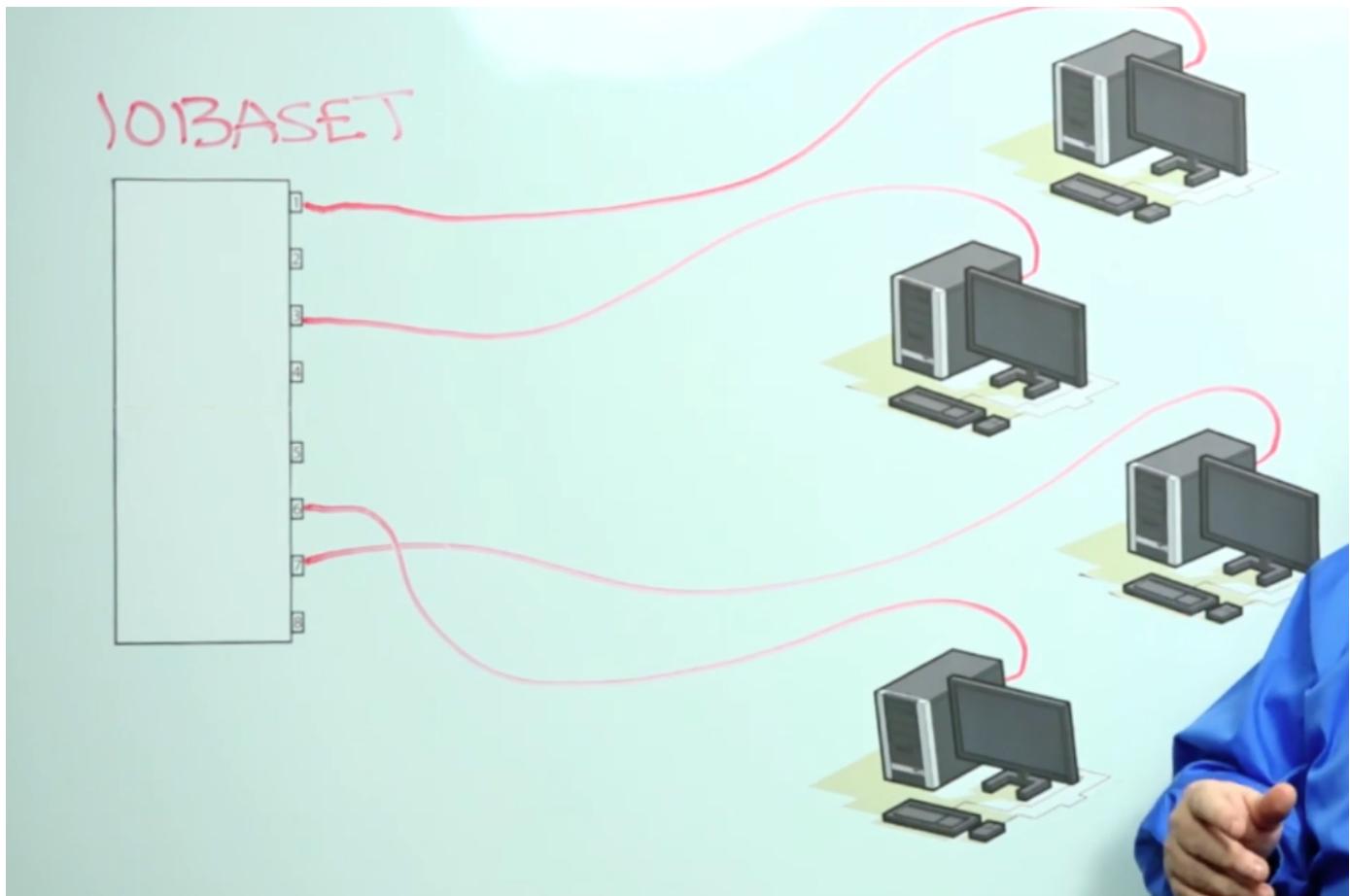
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22. Hubs vs. Switches

A Hub is a MultPort Repeater.

- Repeats a frame sent from one computer for every other attached computer.
- Large degradation of the through put.
- Uses CSMA/CD (Carrier Sense Multiple Acces/Collision Detection)
- Problem with a hub is that only one conversation can take place at any given instant. If more than one conversations is happening a collision happens.

Collision Domain - Every node/machine plugged into the hub can hear the collision. So, all the machines plugged into the hub are in what's called a collision domain.



A Switch is also a multiport repeater, except it looks a MAC addresses

- When switch is first turned on it acts as a hub but it quickly figures out the MAC addresses and where they are plugged into and builds a "MAC Table".
- This allows the Switch to send information directly to the MAC address that the information is being sent to. This avoids collisions and doesn't cause slow downs.

BroadCasting - in a broadcast the MAC is FF-FF-FF-FF-FF and the switch acts like a hub and repeats the broadcast to every machine in the *broadcast domain*.

- Switches have maintenance ports which gives the plugged in machine a copy of all traffic taking place.
- Best

QUIZ

1. Which committee governs the standards of Ethernet?
 - a.IEEE 802.11n
 - b.IEEE 9001
 - c.IEEE 9002
 - d.IEEE 802.3**
2. Which field would not be found in an Ethernet frame?
 - a.Destination IP address**
 - b.Source MAC address
 - c.Ethertype
 - d.Destination MAC address

3. Which statement is not true about early Ethernet?
- a.Thick Ethernet Coax is called 10Base5
 - b.10Base5 connects to a network card with a BNC T-Connector**
 - c.Thick Ethernet must be terminated on both ends of the coaxial cable
 - d.Thin Ethernet is called 10Base2
4. Which statement is not true about 10BaseT
- a.10BaseT runs at 10megabits persecond
 - b.Maximum distance between the switch and the node is 100 meters
 - c.10BaseT requires CAT 5a UTP Cable**
 - d.10BaseT supports a maximum of 1024 nodes per switch.
5. Which of the following is a UTP wiring standard?
- a.10BaseT runs at 10 megabits per second
 - b.TIA A568
 - c.IEEE 802.3
 - d.TIA 568B**