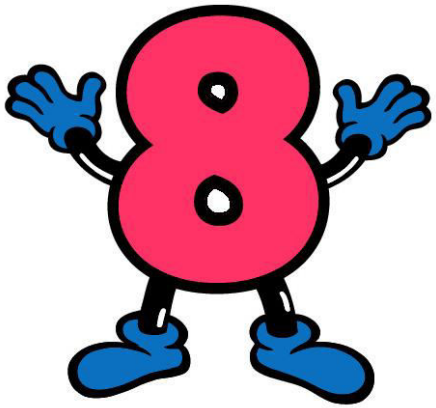


Install a physical network

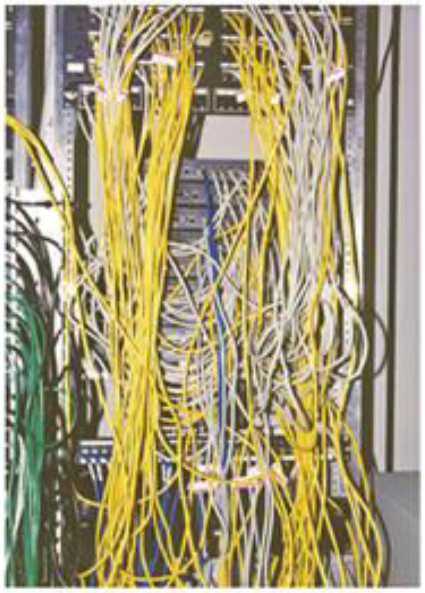
(more components)

1. Structured Cabling
2. Cabling standards (TIA/EIA)
3. Patch Panel
4. Demarcation Point
5. Pulling cable
6. Testing cables

Structured Cabling

Systematic approach to cabling

Create an organized cabling system that can be easily understood by installers/network administrators



Bad cable management

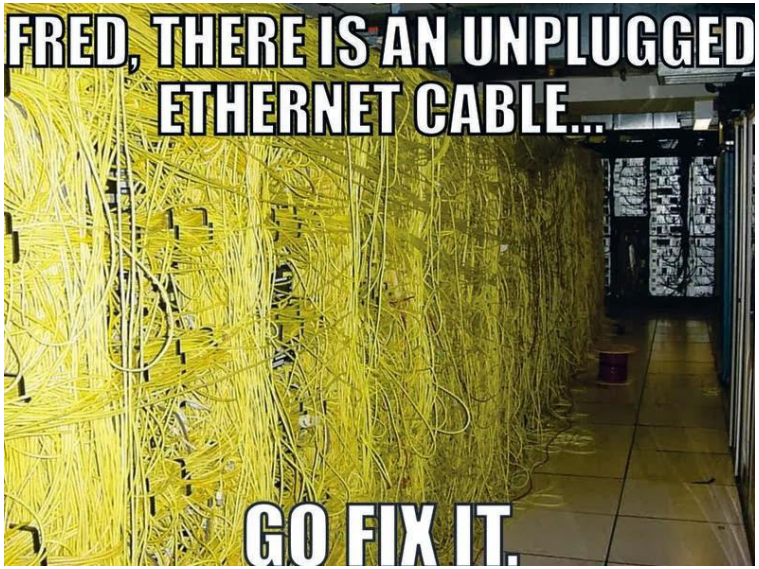
Good cable management

Details on every aspect of cabled network e.g. type of cabling, position of wall outlets

Cabling Standards

(define)

- Cabling types
- Distances
- Connectors
- Architectures
- Cable termination standards
- Cable installation requirements
- Methods of testing installed cable



Adherence to cabling standards ensures reliable data communications

TIA/EIA 568 published in 1991 (draft)

(1st Commercial Building Telecommunications wiring standard that specified the basic transmission requirements of Category 3, 4 & 5)

TIA/EIA-568-A was published in 1995

TIA/EIA 568-B (2001) standard is a revision of the 568-A standard

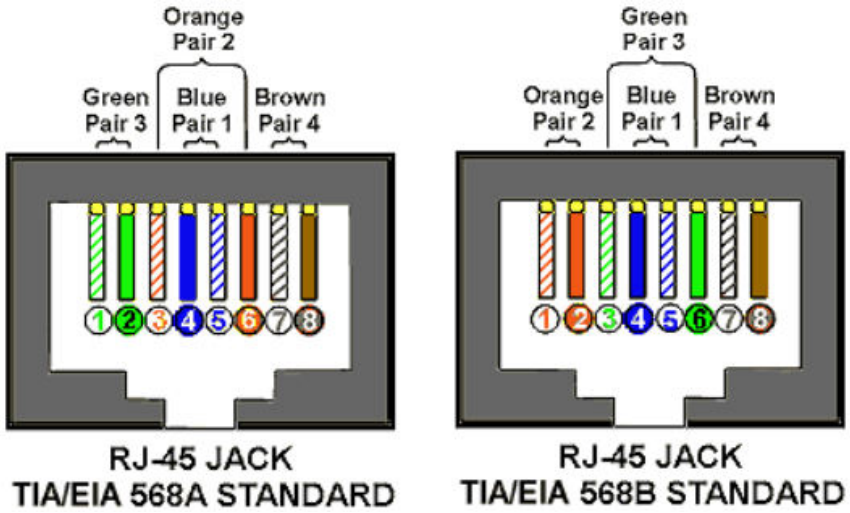
TIA/EIA 568-C (2008) standard is a revision of the 568-B standard

Purpose of EIA/TIA 568A was to create a multiproduct, multivendor, standard for connectivity.

Prior to the adoption of this standard, many "proprietary" cabling systems existed.

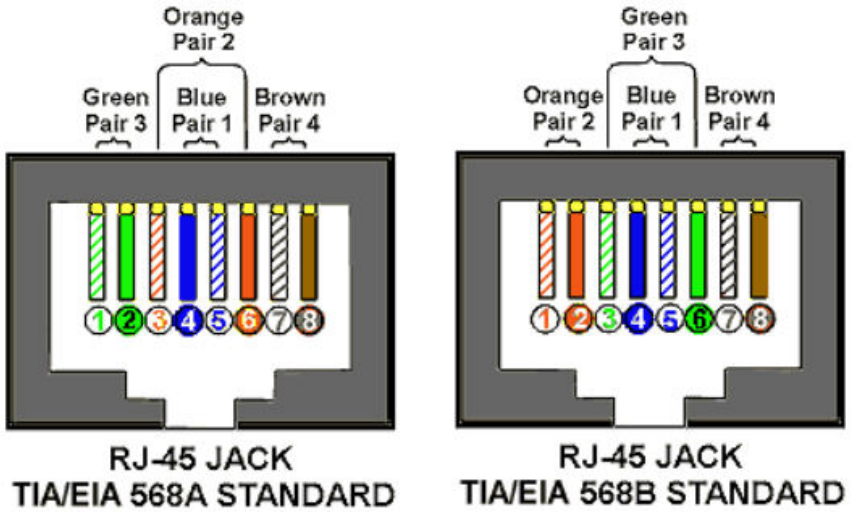
Standard set the minimum requirements for UTP category 5E cable and hardware (RJ-45 connectors).

Best known feature of TIA/EIA-568 is the 568A or 568B wiring schemes
(part of the 568A standard)



568 committee decided to allow both wiring schemes (568A & 568B) to exist within the TIA/EIA-568-B Standard

TIA/EIA 568A and TIA/EIA-568B wiring schemes determine the order of the wires placed in the RJ45 connector. Functionally, there is no difference between TIA/EIA 568A and TIA/EIA-568B standards.

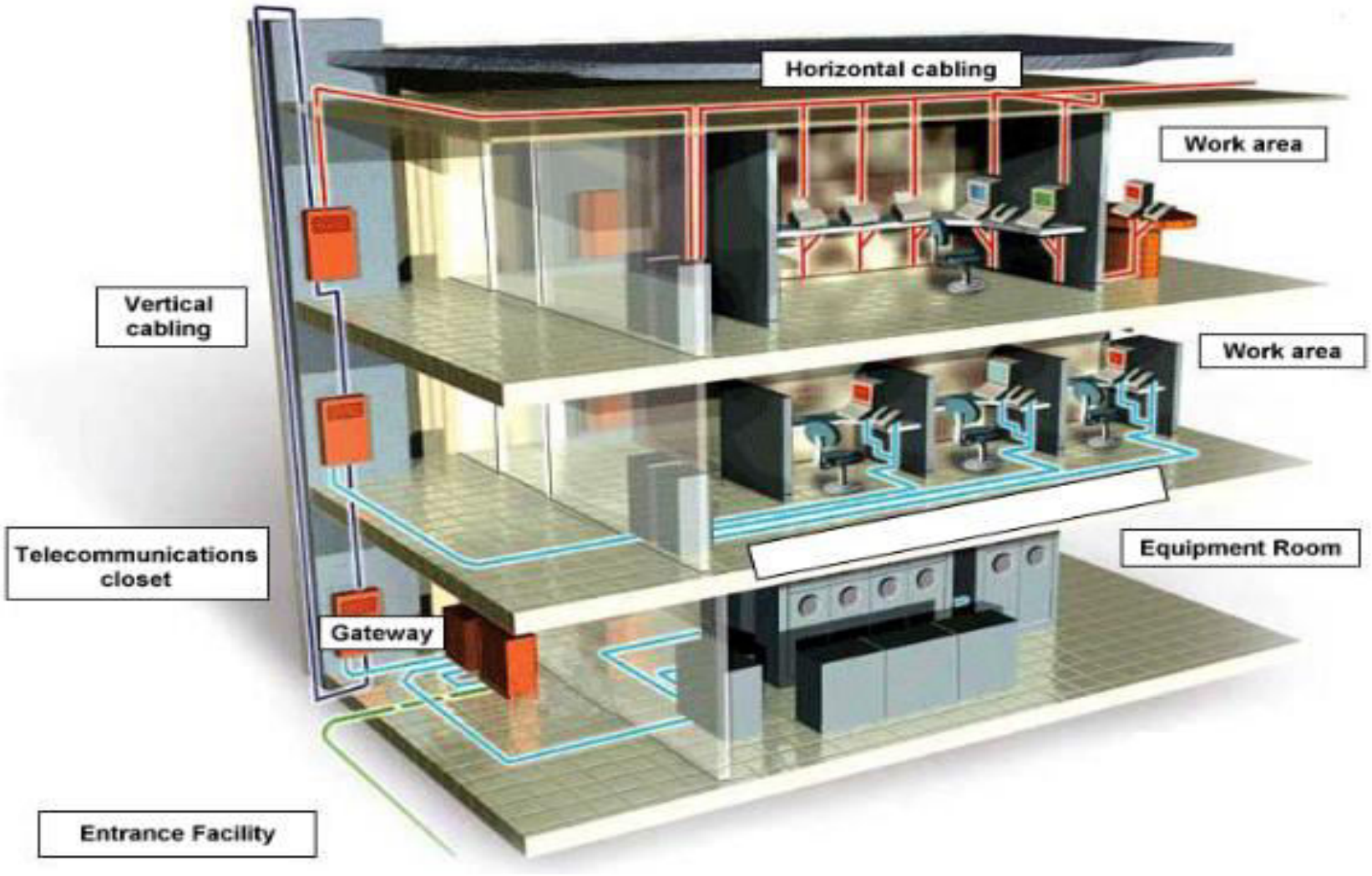


Only the difference is that the position of Green and Orange wires are switched.

When designing and installing a network, one schema should be selected and consistency maintained

Ease of maintenance and the prevention of errors

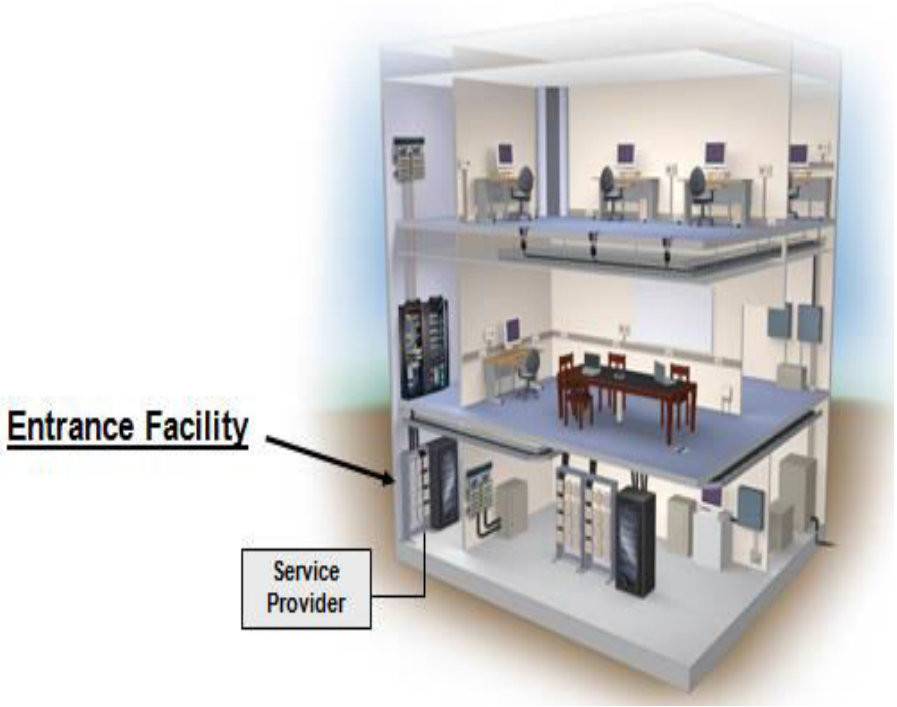
TIA/EIA-568A covers 6 areas



Building Entrance

(Entrance Facilities (EF))

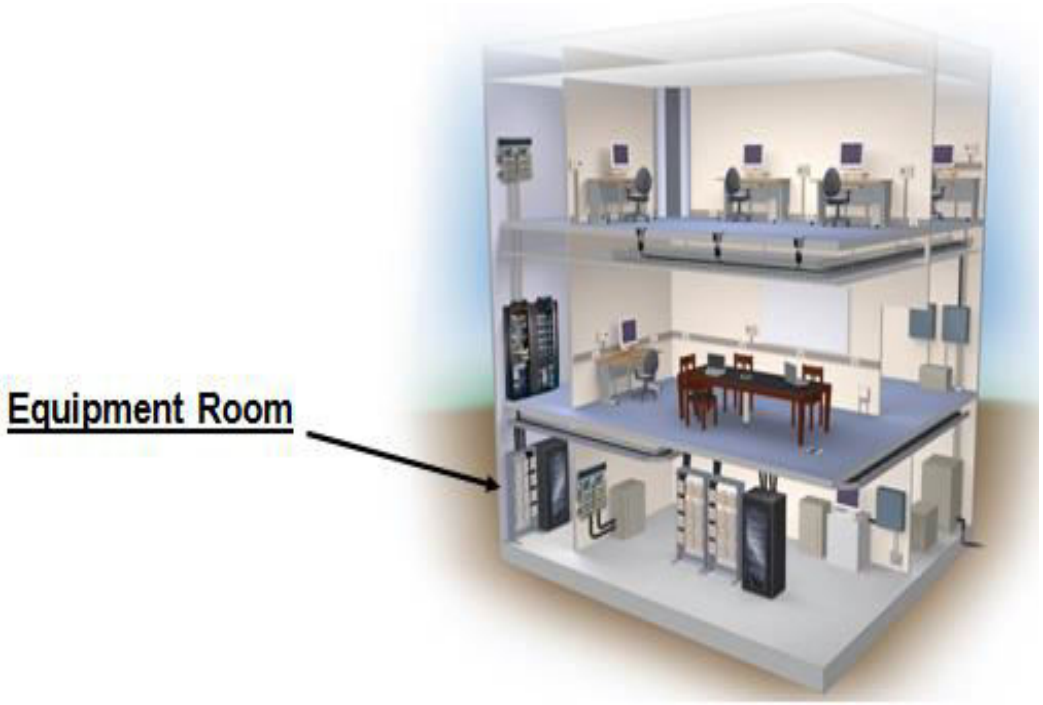
Point at which outside cabling interfaces with the intra-building cabling in the equipment room



Equipment Room (ER)

(Main Distribution Frame)

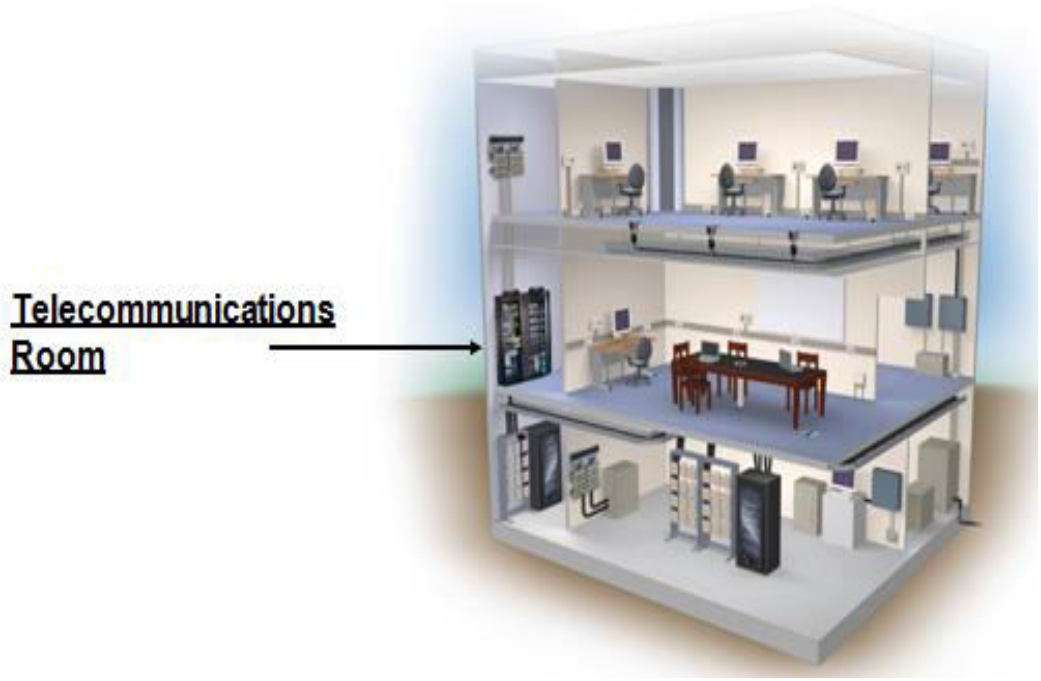
Room where incoming cabling interfaces with electronic equipment e.g. servers, telephone equipment (carriers equipment)



Telecommunications Closet

(Intermediate Distribution Frame (IDF))

All cables run from individual PCs to a central location i.e. telecommunications room
Cables run horizontally from this central room to the PC's



If you have an office with multiple floors,
You will have 1 MDF for the entire building and every floor will have its own IDF

Remember, CAT 5 cable should only be 100 meters

All PC's, telephones, surveillance cameras on a floor will go to the IDF
Connect these IDF's to the MDF

EIA/TIA's Structured Cabling Standards

(Define components you need in Telecommunications Room)

- Equipment Rack
- Patch Panel
- Hub/Switch
- Servers
- Uninterruptible power supply

Equipment is mounted into **equipment rack**
Central component (19 inches wide but varies in height)

Wall Mount Racks are primarily used for racking network equipment such as switches or patch panels

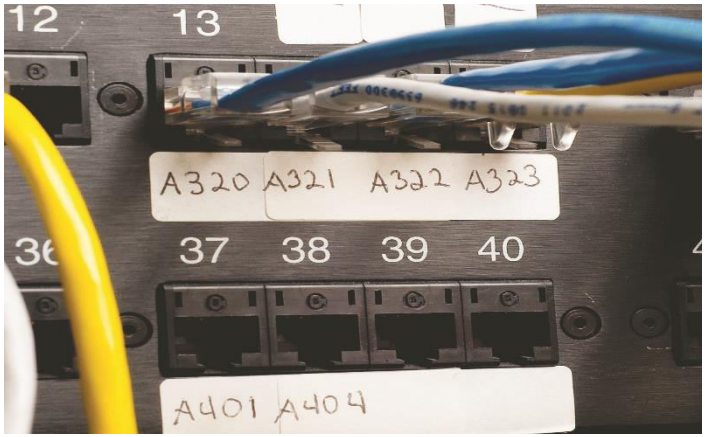
A floor-to-ceiling rack

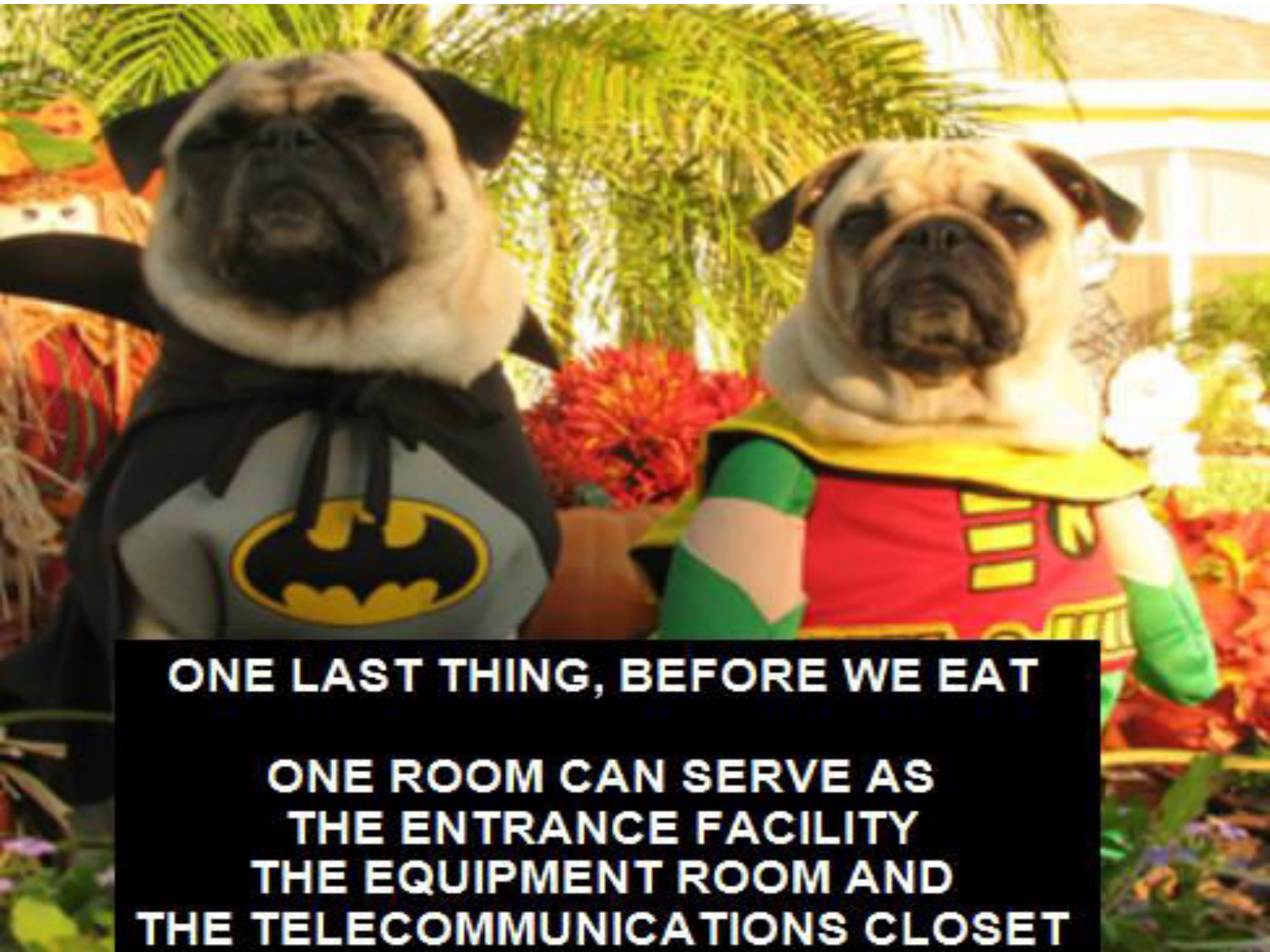
Patch Panel

- Terminate the cable from the PCs at the patch panel so you can move the switch around.
- You can connect PC's directly to the switch if you want, but this lacks flexibility.
- It is easier to add more switches for more PCs when the PCs are terminated at the patch panel.
- Patch cables are short (2 to 5 feet using a stranded wire core i.e. not a solid core)

Wall Mount Patch Panel

Patch panels can get very messy over time, so label your patch panels.

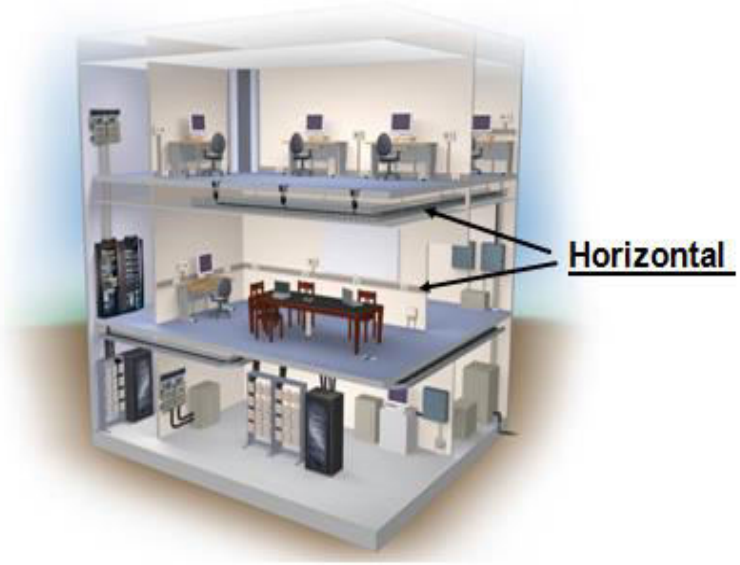



ONE LAST THING, BEFORE WE EAT
ONE ROOM CAN SERVE AS
THE ENTRANCE FACILITY
THE EQUIPMENT ROOM AND
THE TELECOMMUNICATIONS CLOSET

Horizontal Cabling

Consists of the pathway and cabling that extends between the Telecoms Room and the Work Area.

Runs to the Telecoms room where it gets punched down into the patch panel/punch down block

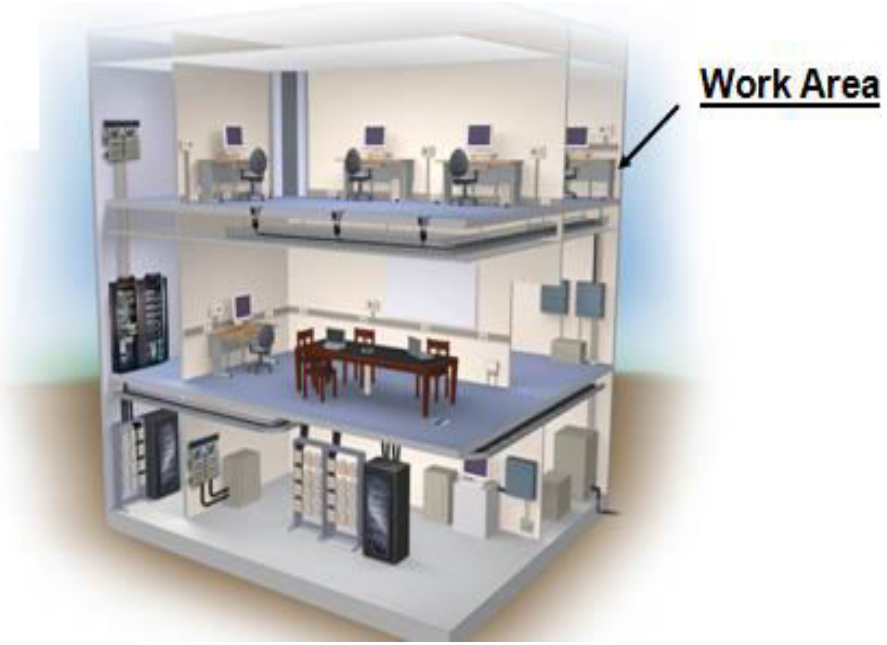


Work Area

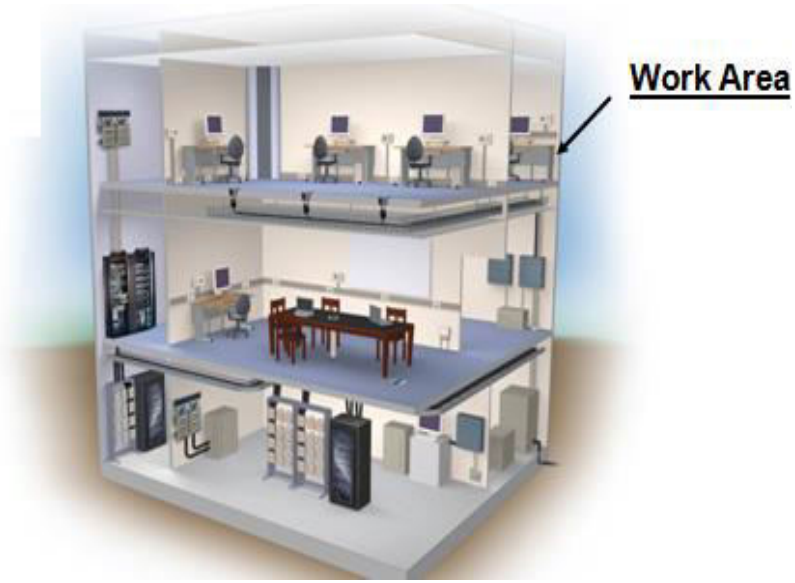
Office where the PC is located

Occupies one floor or part of one floor of a building

Designed to be relatively simple to interconnect, so moves, adds and changes are easily managed.



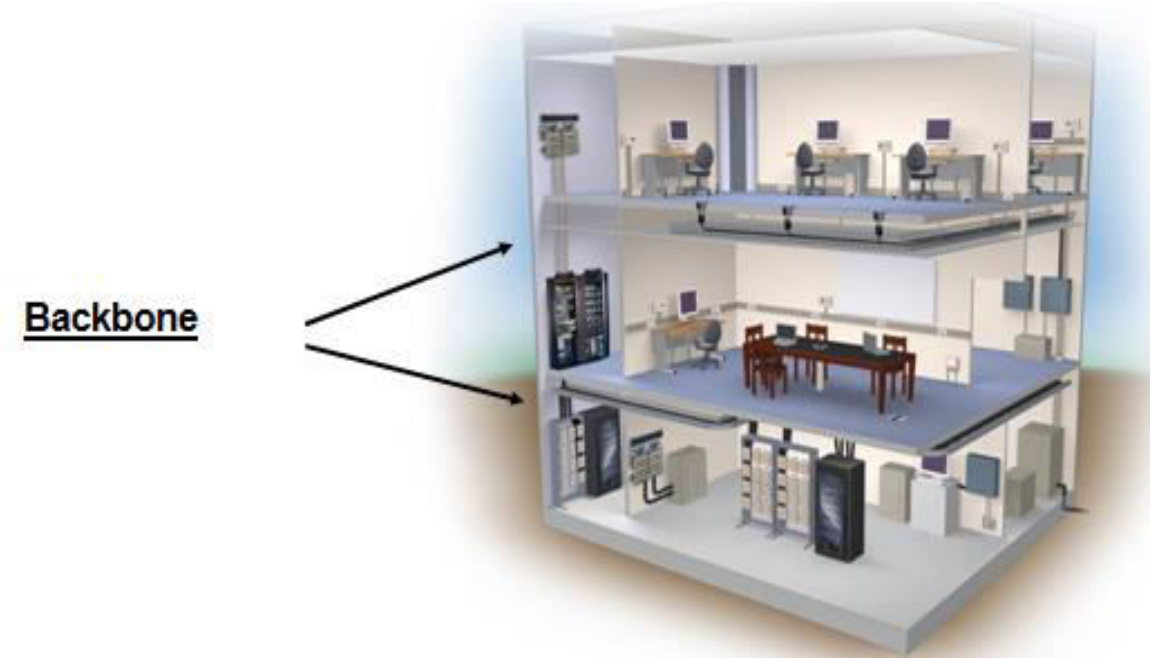
- Most cables cannot be strung across the floor
- Cables are usually contained in wire management devices i.e. trays, baskets, ladders, and raceways.



Vertical/Backbone Cabling

Runs up through the floors of a building (risers)

Provides interconnection between telecommunications rooms, equipment rooms and entrance facilities



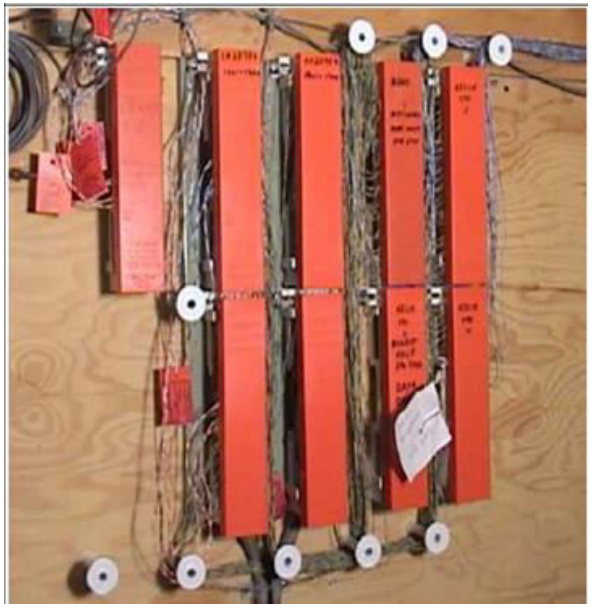
Demarcation Point

(Minimum Point of Entry (MPOE))

Separates customer's responsibility from service provider's
(boundary)

Telephone company or ISP are responsible for Internet connection ALL the way up till your building.

Once inside your building, then its your responsibility



If a tree falls on the telephone line, the it's the telephone companies responsibility

If your network switch blows up, the it's your responsibility

1ST Demarc Point

(Telephone Company or ISP Provider)

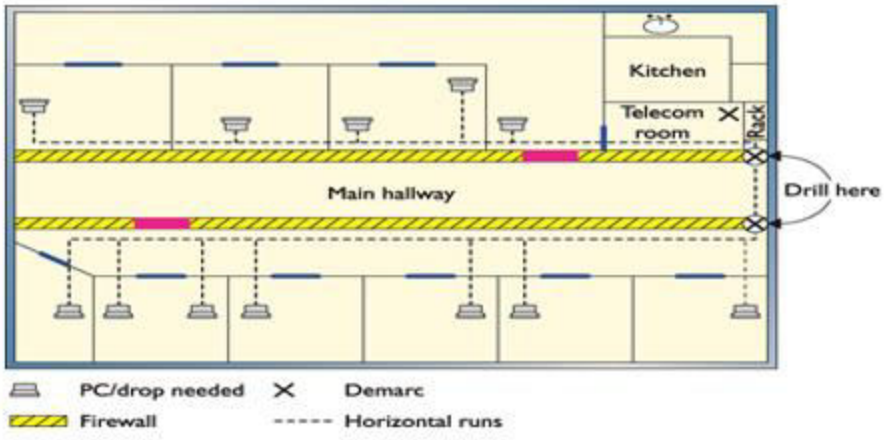
- Sitting outside or just inside your building or the wall of your building
- Comcast has a green box, Verizon has a grey box
- You can test the box to see if its 'their' problem, if you get a signal at the box, then its your problem

2nd Demarc Point

- Once the authority has been handed over to the office building, now the property management has cabling that is their responsibility
- Management will run cable from the 1st demarc point to your point (your renting the top two floors)

Installers should always begin with a **floor plan**

- Key to proper planning
- Determine potential locations for telecommunications rooms
- Locate physical firewalls
- If no floor plan, create one



Hand-drawn network floor plan

Mapping the Cable Runs

- Determine the length of cable runs
- Determine the route of cable runs
- Determine the location of each cable drop i.e. location where the cable comes out of the wall
- Talk to users, management (determine future plans)

A typical raceway

Coolness

Telecommunications room get warm, make sure there is an air conditioning duct in the room

Access

Prevent unauthorized access – the room should be locked

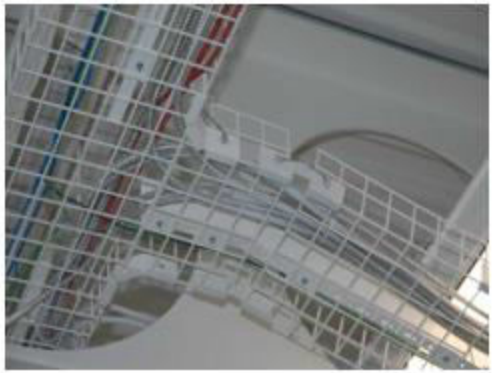
Make it easy to get to the equipment and troubleshoot it

Pulling Cable

Requires two people to get the job done quickly

Proper hooks and cable trays should be used

Cable tray is the bridge that allows for safe transport of wires across open spans



Running the cable down through the wall to an outlet

- A hole is cut in the drywall using a stud finder
- A weight on the end of the nylon string is dropped through the wall down to the opening
- The network cable is tied to the nylon string and then pulled down

Cutting a hole

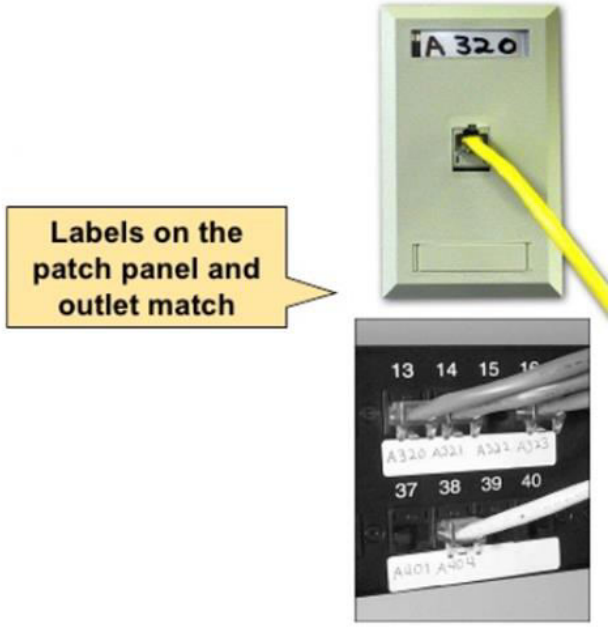
Locating a dropped pull rope

- An outlet box or low voltage mounting bracket is then installed in the wall
- The cable is then terminated on the back of the jack
- A faceplate covers the front of the mounting bracket

Installing a mounting bracket

Label the cable

- Organize the patch panel based on your network
  - Based on the physical layout of the network
  - Based on user groups
- Label the outlet in the work area and the jack on the patch panel with the same number
- Color coding may be desirable



Cable Tester

- Verifies cable and terminated ends are correct
- Low-end are continuity testers (under $100) where you insert both ends of the cable into the tester
- Better testers run wire map test to pick up shorts, crossed wires, and so on

Advanced cable testers ($1000+)

- Tests the electrical characteristics of the cable e.g. cross talk and attenuation
- May generate a printed report
- May draw a diagram of the network including MAC addresses, IP addresses, and even the operating system for each computer

Time Domain Reflectometer (TDR) ($400+)
Determine the length of cable and where is the break

A typical medium-priced TDR called a micro-scanner

OTDR (Optical Time Domain Reflectometer)
Fiber optic cable testers
Fiber does break i.e. test with OTDR

An optical time domain reflectometer

Most network problems are Layer 1
Cable not plugged in, NIC not plugged in properly, computer not plugged in

Diagnostics/Repair of cable

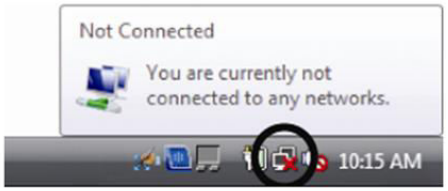
Check your lights (if available), if they are not on then you have a cable issue

e.g. system tray icon may indicate ‘network cable unplugged’

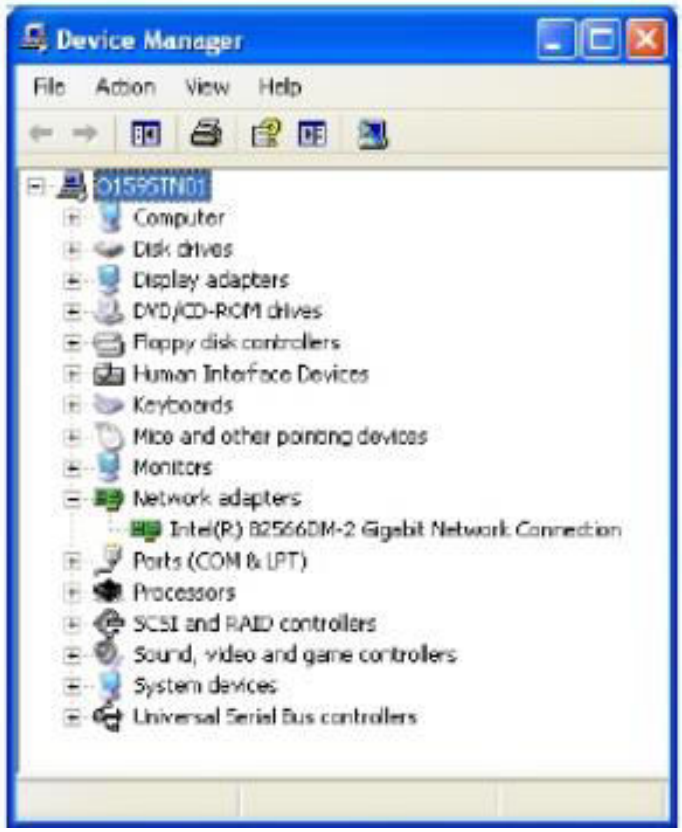
Check the NIC

- Verify the NIC is working in device manager
- Run the NIC's diagnostic software if available
- A loopback test sends data out of the NIC to see if it comes back
  - Loopback plug connects TX on NIC directly back to RX.
  - If NIC lights up, it's probably working fine.

Loopback plug



Disconnected NIC in Windows 7




WHO DID NOT LABEL THE CABLES?


JUST USE A TONER TO TRACE THE CABLES

Tone generator connects to the cable and sends an electrical signal along the wire

Tone probe makes a sound when placed near the right cable at the other end


The End