Manitoba UNIX Users Group

Network Cabling for Dummies

Presented by Katherine Scrupa
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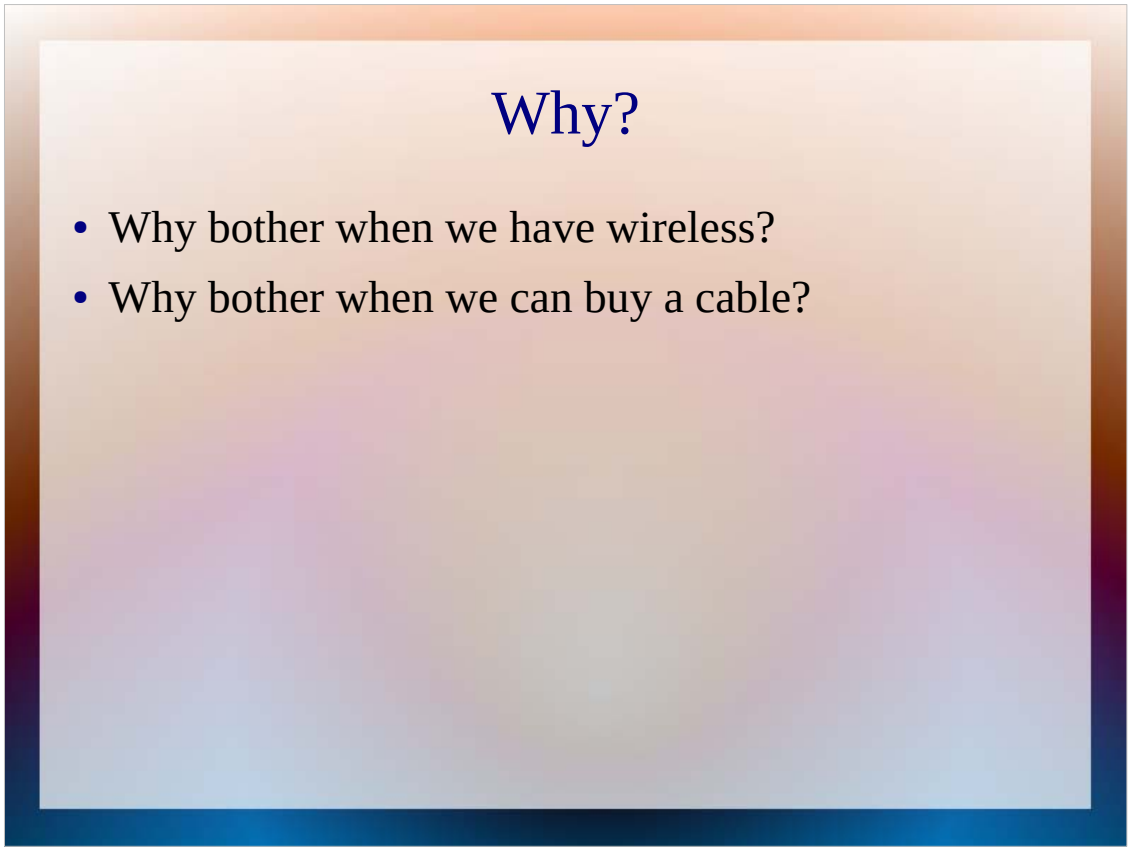
Overview

- Why?
- Wired Options
- Cable Evolution
- Technical
- Troubleshooting



Device doesn't have wireless (i.e. network printer)
Reliability (conditions probably don't change much)
Speed
Collision domains (neighbours on same radio, other devices may use same wireless spectrum)
Security (physical layer only)
Wireless antenna throw / device antennati
Distance
Avoid interference RF/EMI
Longer reach wireless susceptible to weather, moving leaves, rain

Wiring at home with nice faceplates (impress your spouse and neighbours)
Custom cables in a hurry
Knowledge helps you troubleshoot problems

Wired Options

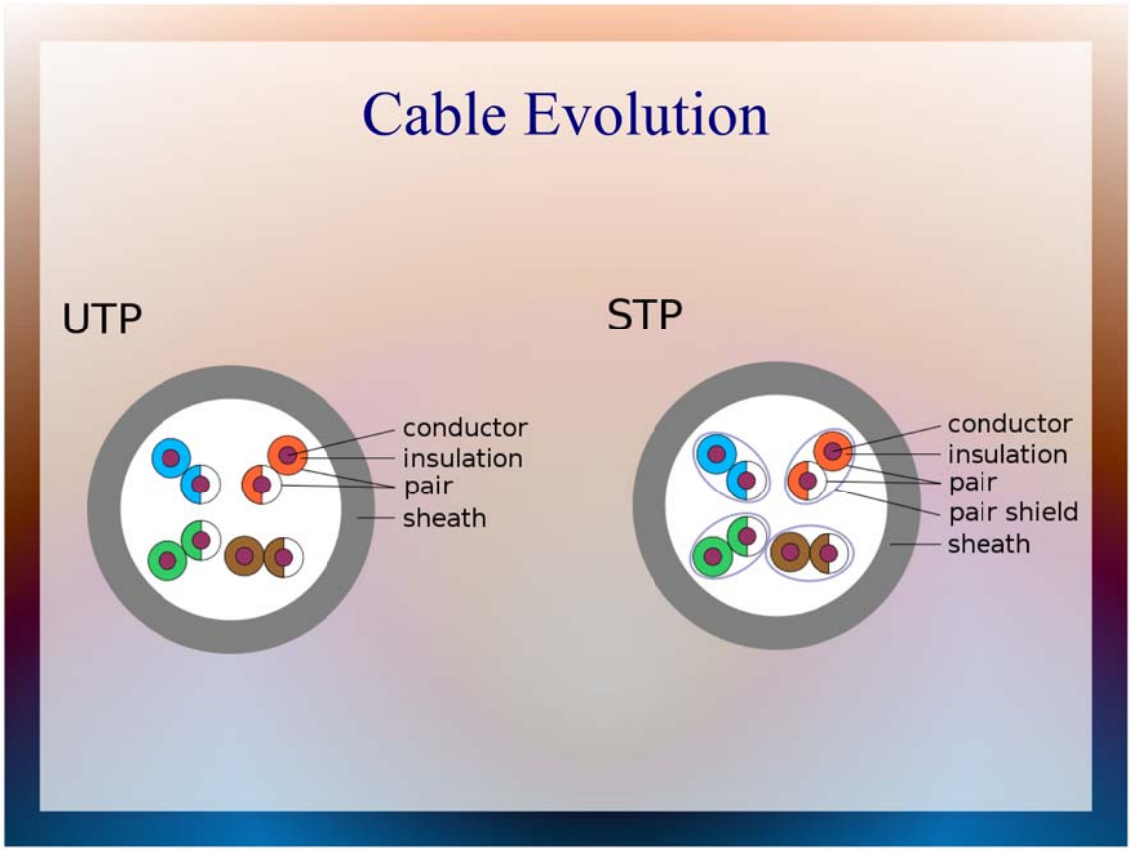
Coaxial, BNC

UTP & STP / “RJ45”
(Copper, 8P8C)

Fiber
(lots... ST, SC, TOSLINK)

Power Lines!

8p8c = "eight positions, eight conductors"

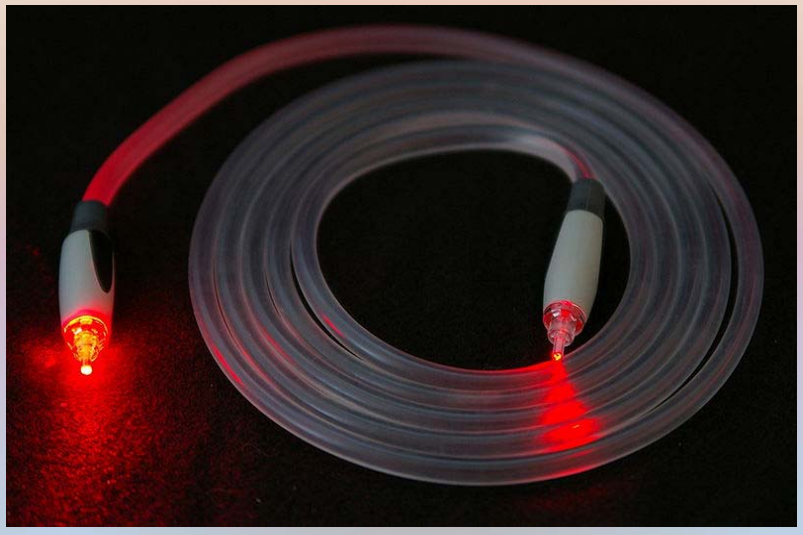


Unshielded twisted pair
Shielded twisted pair
To avoid Electomagnetic Interference

Causes of EMI
Devices
Machinery, factory environments
Some lights!

Cable Evolution

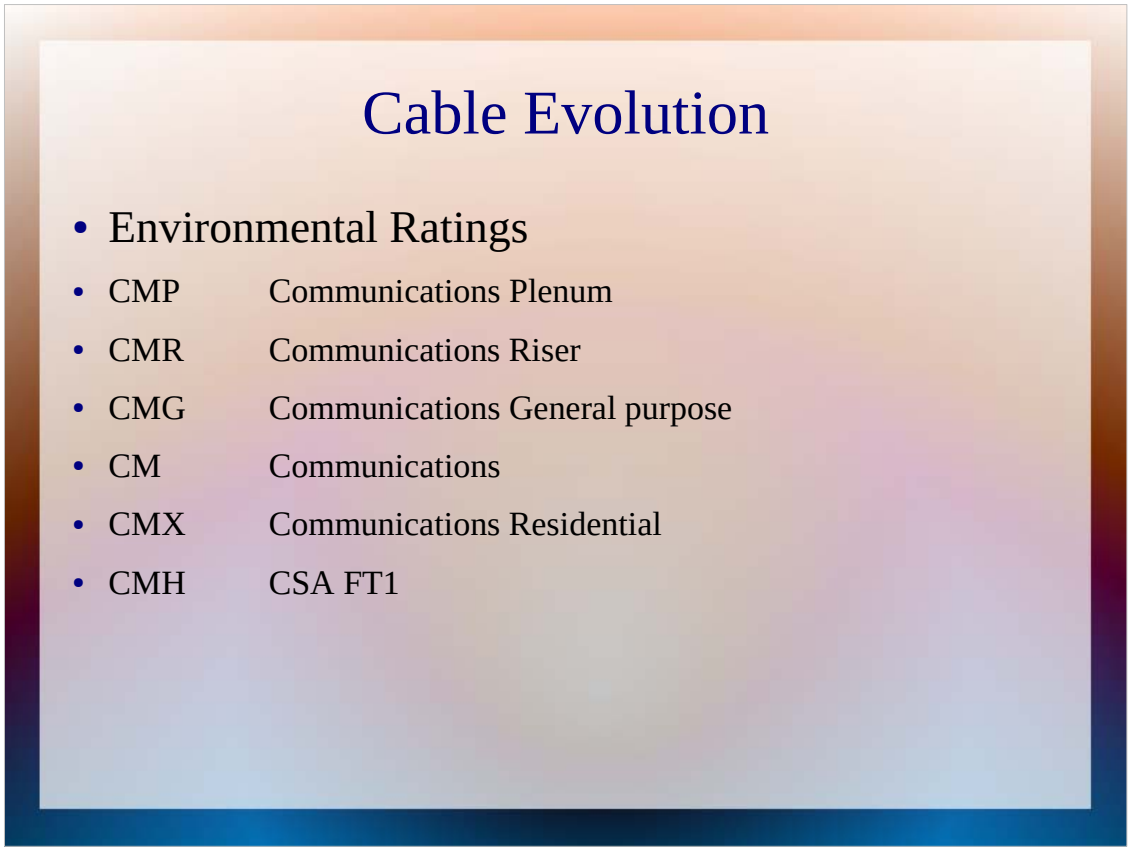
- Copper vs Fiber



Fiber is light, not electrical; not susceptible to EMI

Length is a plus 550m or 5km instead of 100m

Not as bendy



Describe plenum

CMR (Communications Riser), insulated with high-density polyolefin and jacketed with low-smoke polyvinyl chloride (PVC) can be replaced by a CMP (Communications Plenum), insulated with fluorinated ethylene propylene (FEP) and polyethylene (PE) and jacketed with low-smoke polyvinyl chloride (PVC), due to better flame test ratings. CM (Communications) is insulated with high-density polyolefin, but not jacketed with PVC and therefore is the lowest of the three in flame resistance

"UV-rated" or "UV-stable usually made with pvc

Gel filled or sealed cables suitable for direct burial (keep out moisture)

Plenum-rated cables are slower to burn and produce less smoke than pvc (may affect sprinkler system requirements in an area

Cable Evolution

- Cat5 (100 MHz)
- Cat5e (100 MHz)
  - stricter testing than Cat 5
- Cat6 (250 MHz)
  - even more resilient to crosstalk and noise
- Cat6a (500 MHz)
  - maximum 100m for up to Gigabit Ethernet, 55m for 10Gigabit.
  - More resilient to alien crosstalk

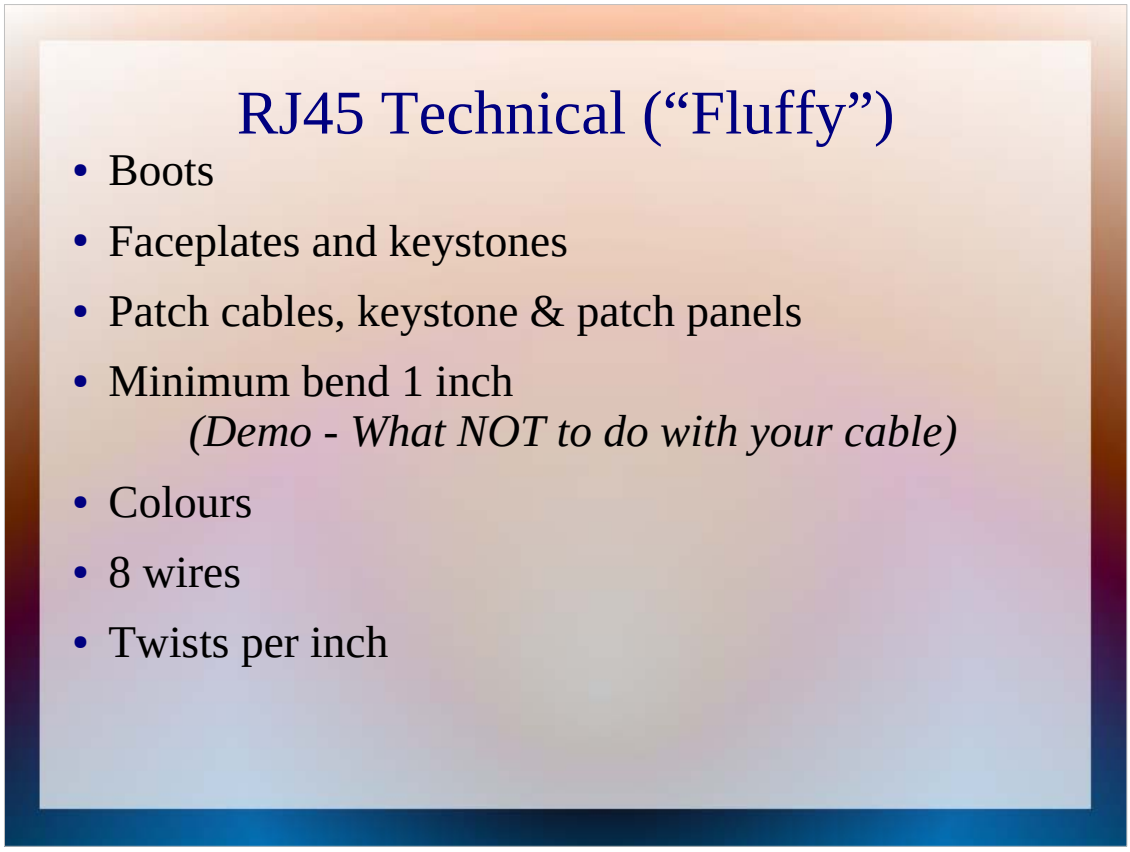
Alien crosstalk = EMI originating from outside the calbe

Cable Evolution

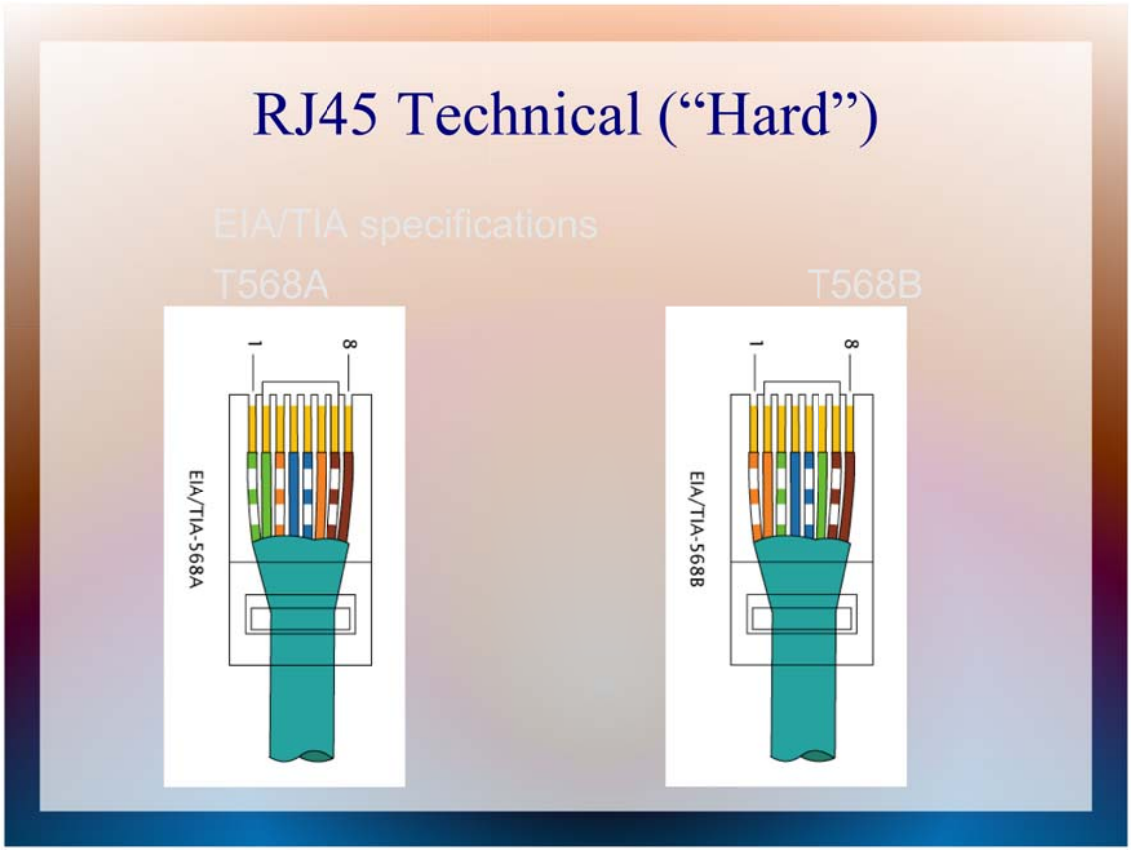
- Speeds

Common Name	Speed	Technical Name	Medium	Max Length
Ethernet	10Mbps	10Base-T	Copper	100m
Fast Ethernet	100Mbps	100Base-TX	Copper	100m
Gigabit Ethernet	1000Mbps	1000Base-SX 1000Base-LX	Fiber	550m (SX) 5km (LX)
Gigabit Ethernet	1000Mbps	1000Base-T	Copper	100m

Max length suggested... YOU'VE BEEN WARNED
100m may not be as long as you think when you're running it up and down walls, to wiring closets etc.



Boots (cover tab to prevent snapping)
Keystone snap in faceplate
Crimp for patch cable, punch down for keystone and patch panel, router NIC throughput (megabit switch with 24 ports = 100Mbps x 24 = 24Mbps or 2.4 Gbps potential throughput)
Gbic hwic card slot to update an old router
Demo (wrap, corners & yanking, making magnets, untwist and damages wires)
Colours and vlans, creating “virtual multiple switches” per switch (encapsulation and traffic boundary), picking one colour for crossovers
8 wire colours
Twists in each set cancels directional emi (opposing)
Twists per set vary
Don't untwist more than necessary
NEXT, cable stats



electrical/telecommunications industry

Canmake a “straight through cable” with either, as long as both ends the same type (A+A or B+B)

A is common/standard

Crossover made from one of each EIA/TIA standard (A and B)

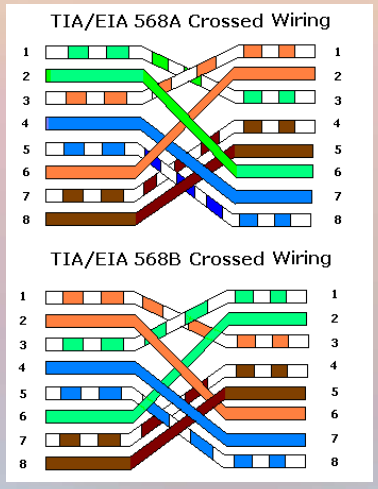
Read as greenwhite, green, orangewhite, blue, bluewhite, orange, brownwhite, brown

For Ethernet (10Mbps) and FastEthernet (100Mbps), only four wires/pins are used (1, 2, 3, 6)

Yup, everything else doing nothing

RJ45 Technical (“Hard”)

- Gigabit copper – two crossovers!



Straight Through vs Crossover Usage

Send on 1,2 receive on 3,6		Send on 3,6 receive on 1,2
PC NICs		Hubs
Routers		Switches
Wireless Access Point		
Networked Printers		

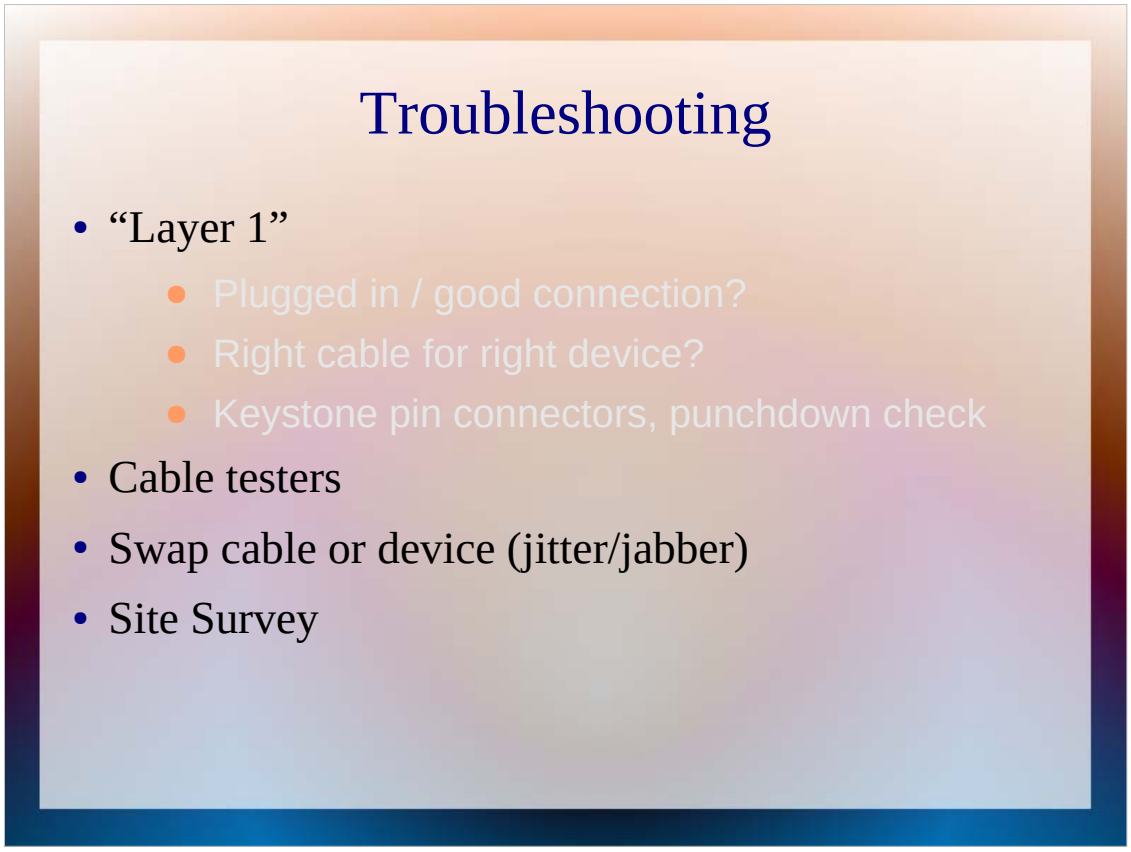
Just remember “hubs and switches”

If you're connecting devices in the same column, you need crossover. Otherwise, send and receive needs straight through because something sent from those pins ends up getting received on the right pins on the other end.

What do you use to connect to your “router” at home. BTW, is a bastardization of a router.

Auto-MDIX, just to mess withyou (it auto fixes your mistakes, need for crossover cables)

Good to know what SHOULD be used, regardless.



Check keystone contacts aren't bent

Jitter or jabber will either be caused by the cable or device

Site survey – any EMI interference around? Lights, metal, other cables or electrical. A/C turning on on roof. Abuses to cable (vaccuum cleaners, carts, etc)

Thanks / Image Sources

- user *Meggar* (Wikipedia), GPL 1.2
- David Monniaux, GPL 1.2
- Adam Antios, GPL 1.2
- Uwe Schwöbel, GPL 1.2
- Hustvedt, GPL 1.2
- public domain