Hardcore Networking

(Things that IEG3310 won't teach you
and will probably make your hands dirty)

Seminar for Playpen
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Are you suitable for this?

- ~~IEG3310~~ – not required
- ~~Theoretical background~~ – not required
- Know roughly what is networking
- What to know more
- Have a good sleep last night.....

Are you suitable for this?

- It will be boring if:
  - You are very sound in networking
  - You played with networking for long
  - You're a CCNA/CCDA and beyond
  - You're a MCSE (NT track, not Windows 2000!)

Aim of this talk

- Jargons of Networking
  - Vocab building exercise?
- Lead you to appreciate the network stuff

Part I

What is Networking?

What's Networking?

- Communication
  - Exchange of [*fill something here*]

Networking

- Laplink cable over LPT/COM port
- Coaxial cable
- Twisted pair
- RF
- IR
- .....

Wanna try at home? - ver.1

- Prepare two computers
- Buy a laplink cable (~HKD 30)
- Set up direct cable connection (and IP?) in Windows
- Done

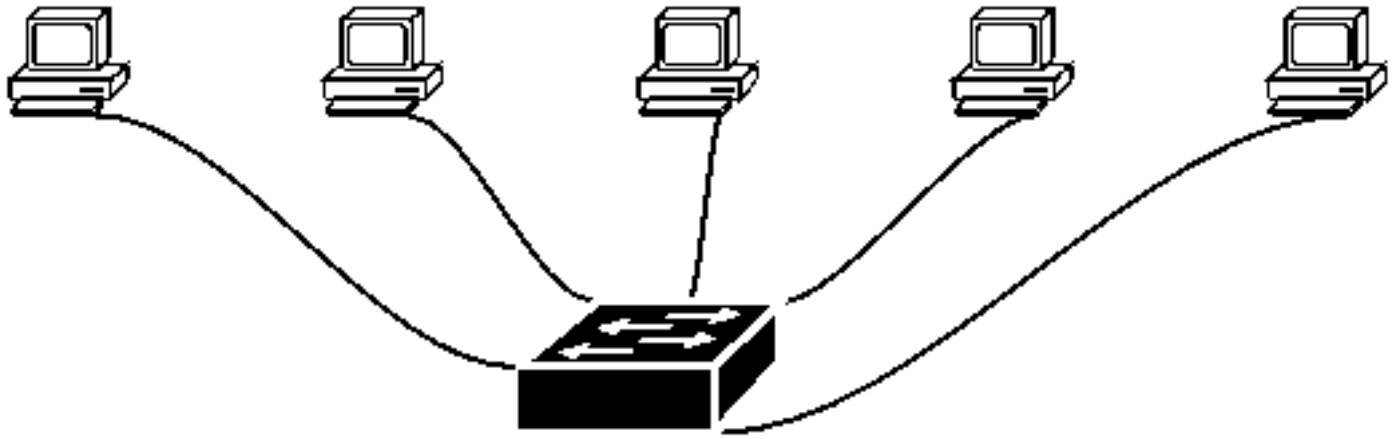
Wanna try at home? - ver.2

- Prepare two computers
- Buy two Ethernet card (~HKD 50 x 2)
- Buy a cross-over cable (~HKD 30)
- Set up LAN drivers and IP in Windows
- Done

Wanna try at home? - ver.3

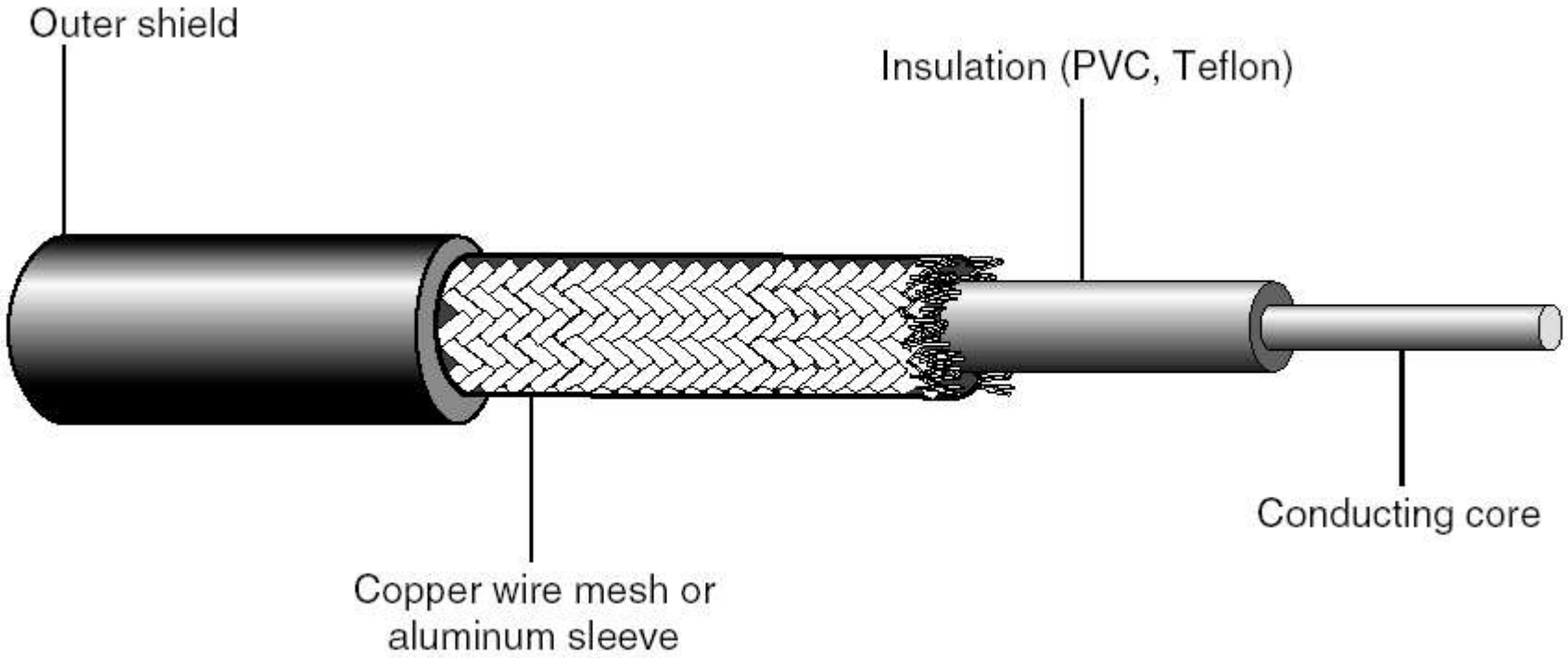
- Prepare n>1 computers
- Buy n Ethernet card (~HKD 50 x n)
- Buy n straight cable (~HKD 30 x n)
- Buy a hub or switch (~HKD 100)
- Set up LAN drivers and IP in Windows
- Done

Wanna try at home? - ver.3



Coaxial Cable

- Plain old thing
- Same thing as I-Cable, TV Antenna

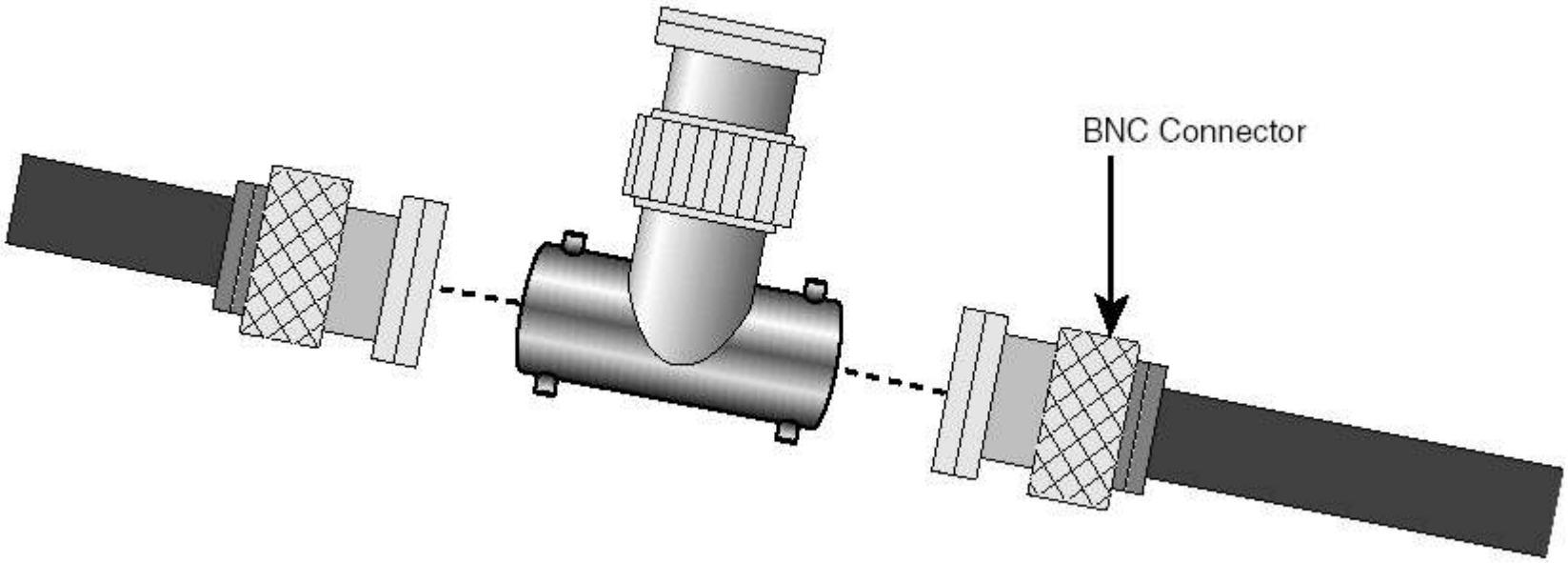


Coaxial Cable

- Sleeve as ground voltage
- Core transmits baseband signal
- Supports Simplex, 10 Mbps
  - In 10Base2 standard

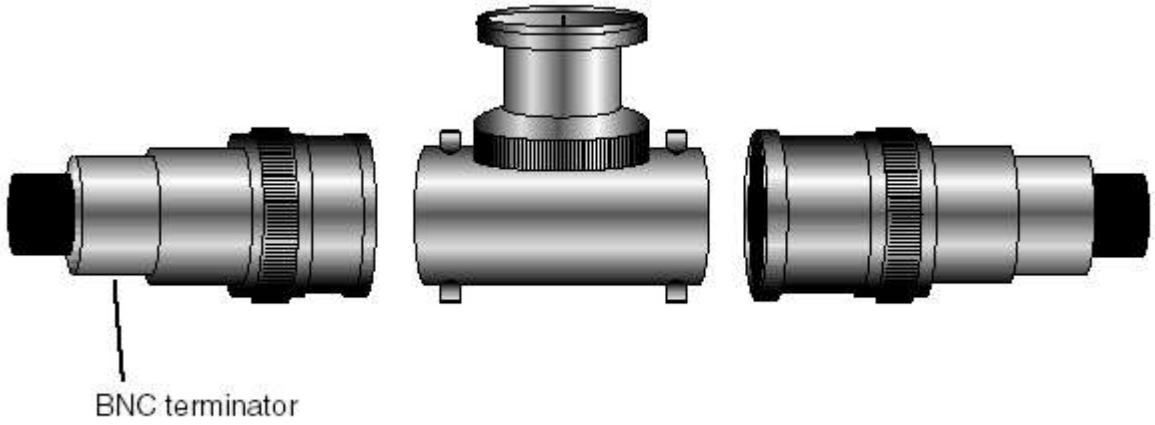
Coaxial Cable

- Connect cables end-to-end
- Via *BNC Connectors*



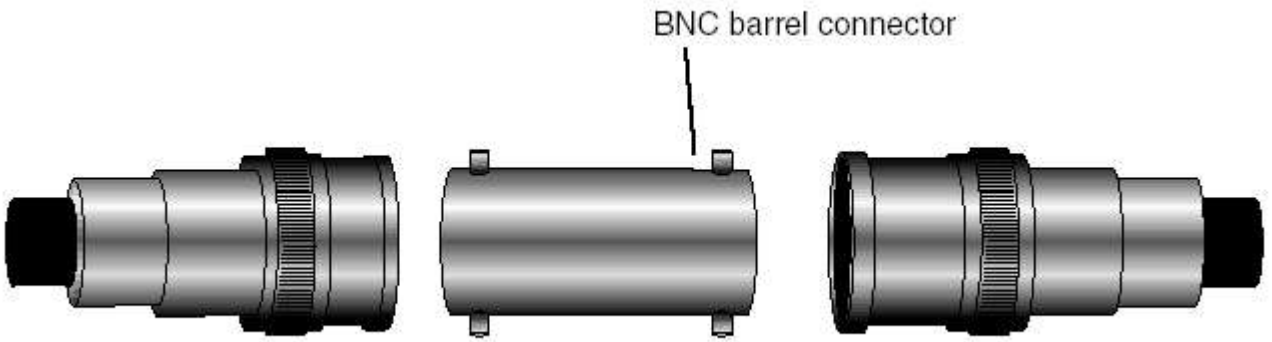
Coaxial Cable

- At the end, use a *Terminator* to prevent signal bounce



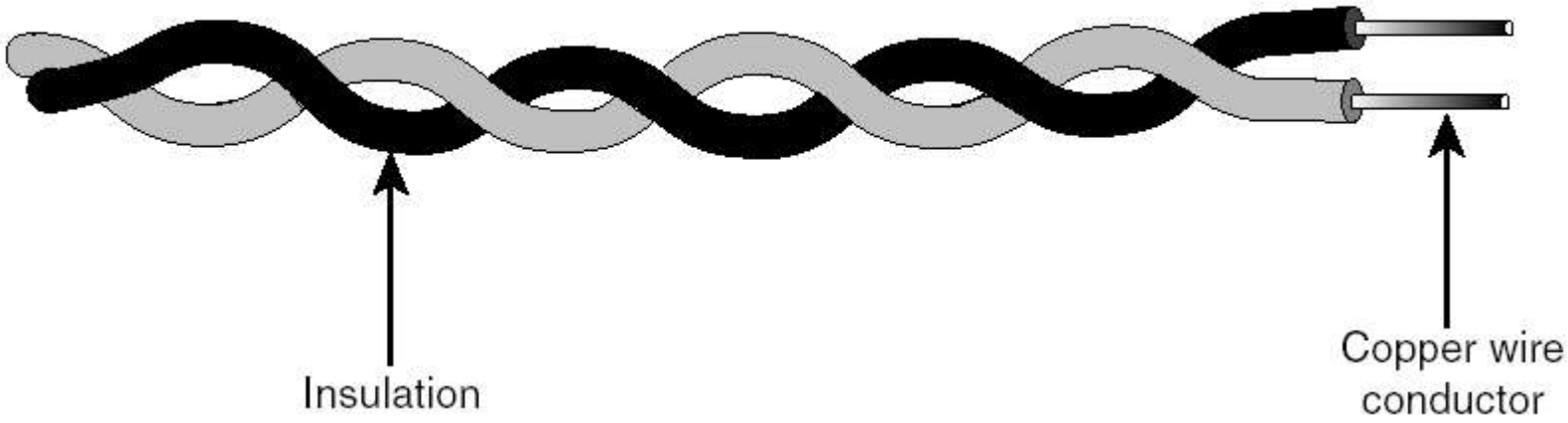
Coaxial Cable

- Use a *T-joint* to make a branch
- Use a *I-joint* to lengthen cables



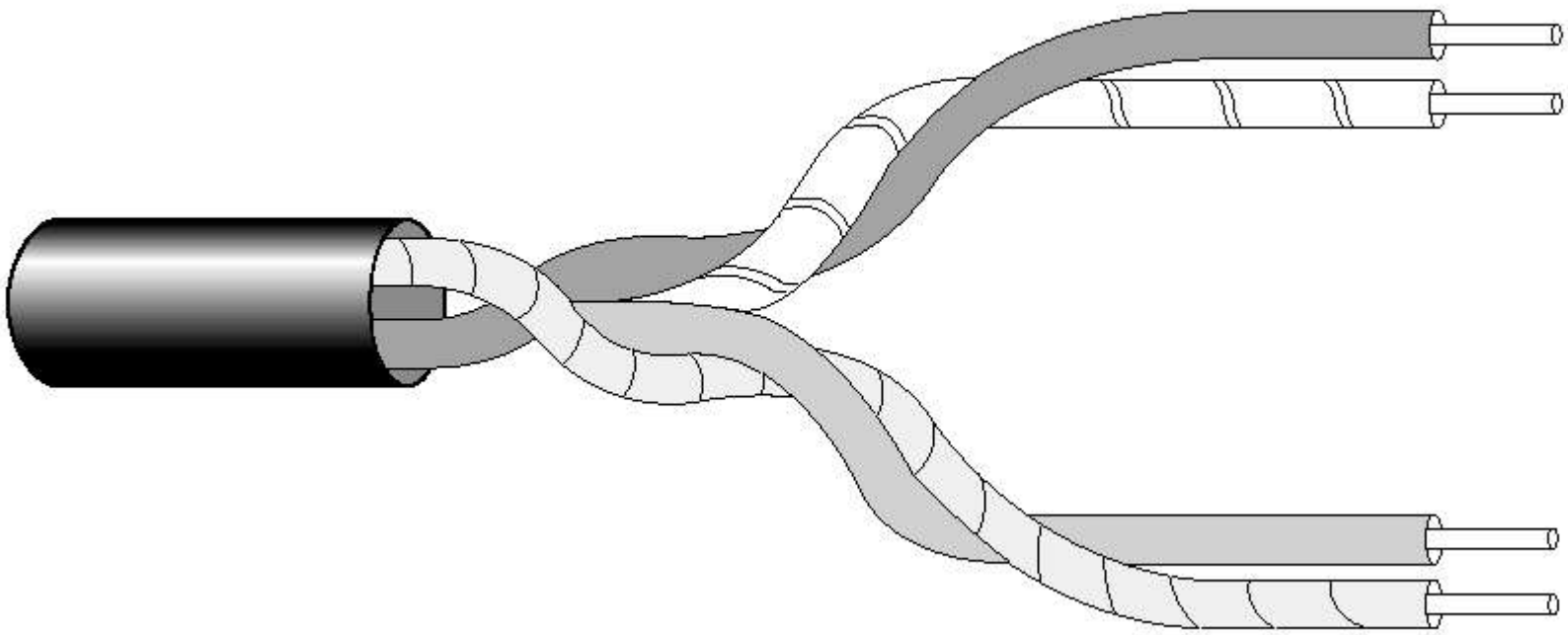
Twisted Pairs

- Twisted cablets (+/–) to transmit signals



Twisted Pairs

- Many twisted pairs comprises a cable
- Cat.5 = 4 pairs



Twisted Pairs

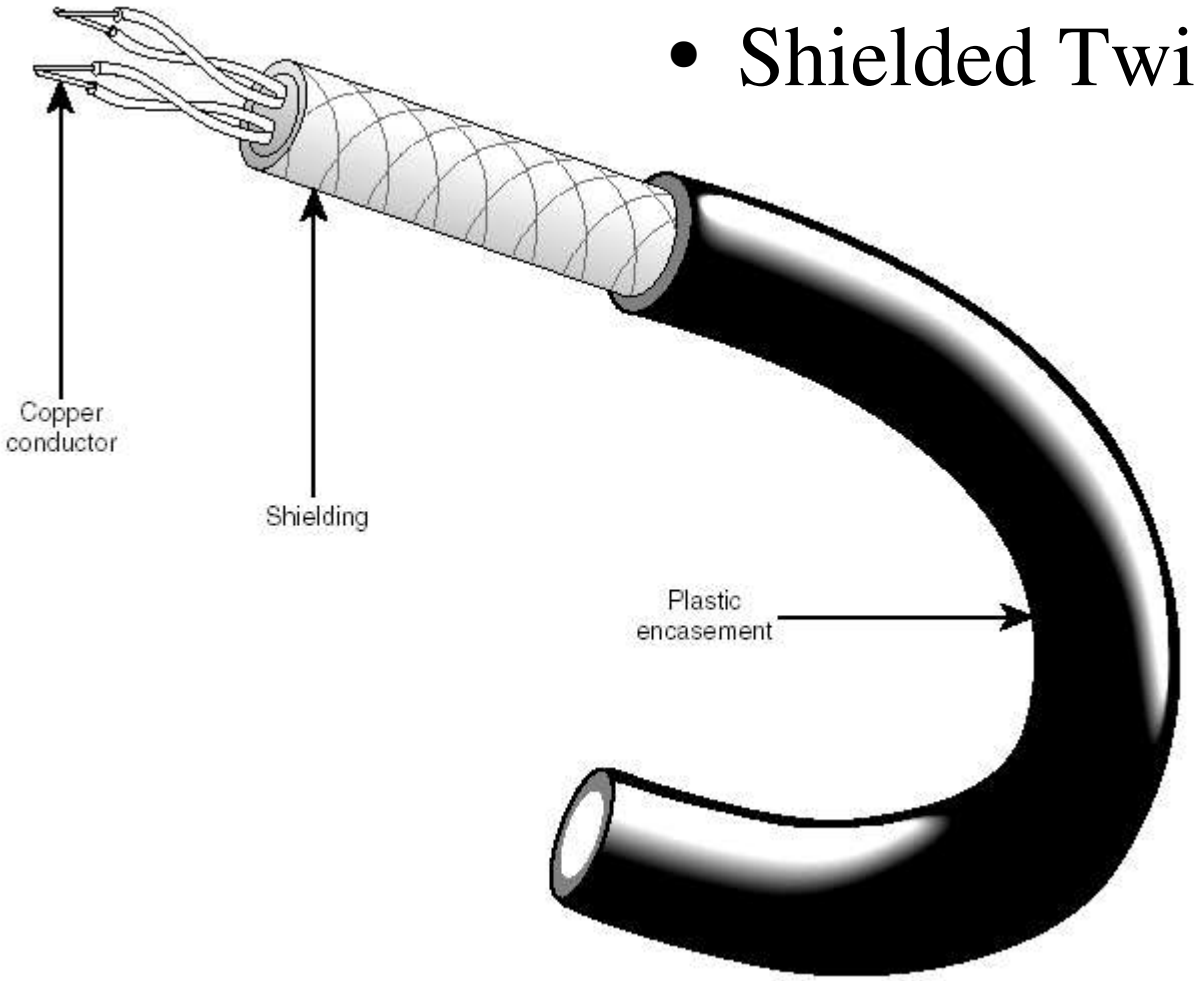
- Supports duplex
- Supports very fast transmission
  - 1000BaseTX = 1000 Mbps

Twisted Pairs

- Different specifications
  - Shielded (STP) / Unshielded (UTP)
  - Number of twists per feet
  - Copper conductivity
  - Resistance
  - Electromagnetic interferences
- Specified as Categories

Twisted Pairs

- Shielded Twisted Pairs



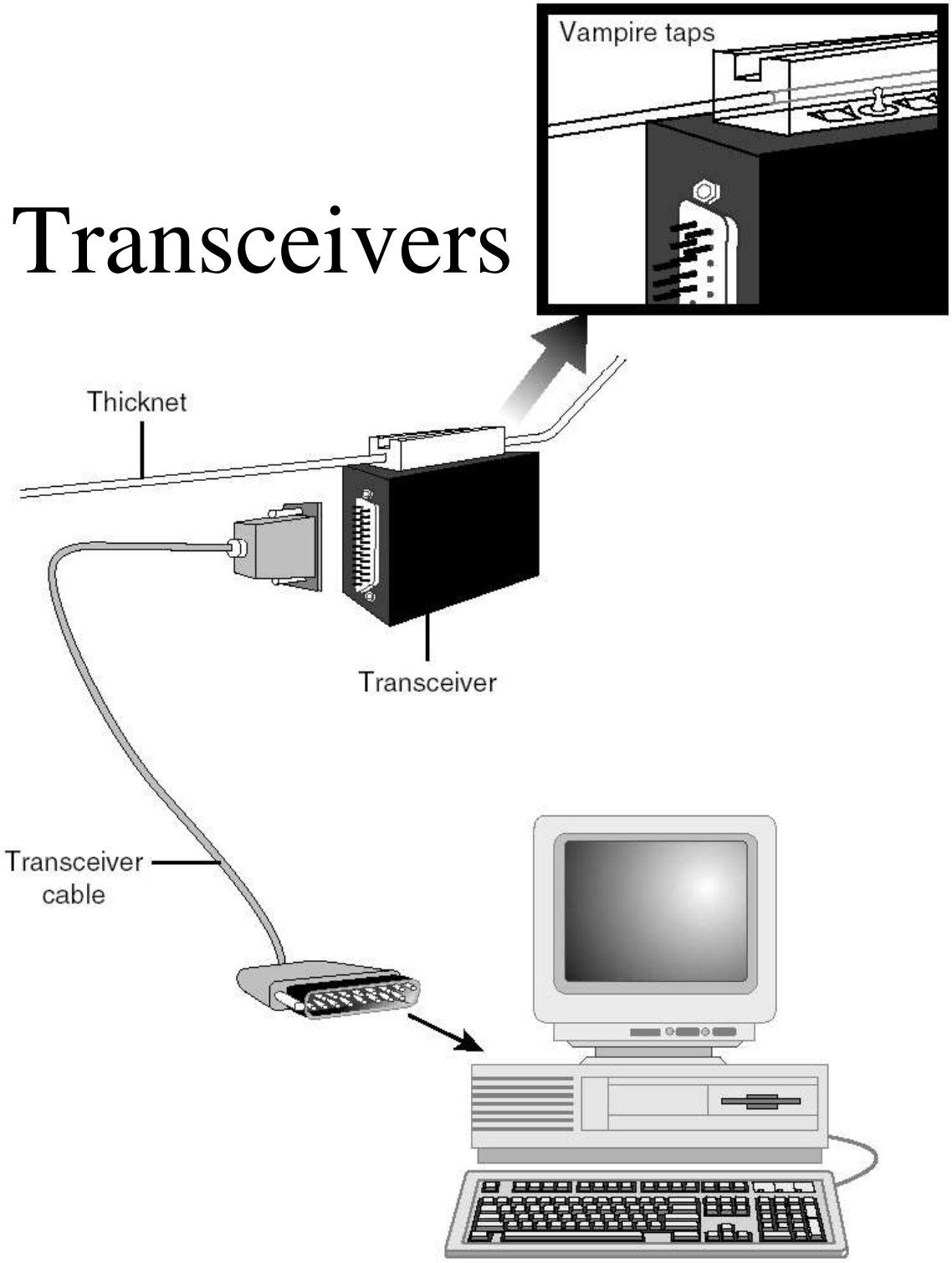
Twisted Pairs

Category	*Speed*	*Note*
Cat.1	N/A	For old telephone systems
Cat.2	4 Mbps	
Cat.3	10 Mbps	Minimum requirement for data networks
Cat.4	16 Mbps	
Cat.5	100 Mbps	Most commonly available
Cat.7	1000 Mbps	IE Labs

Transceivers

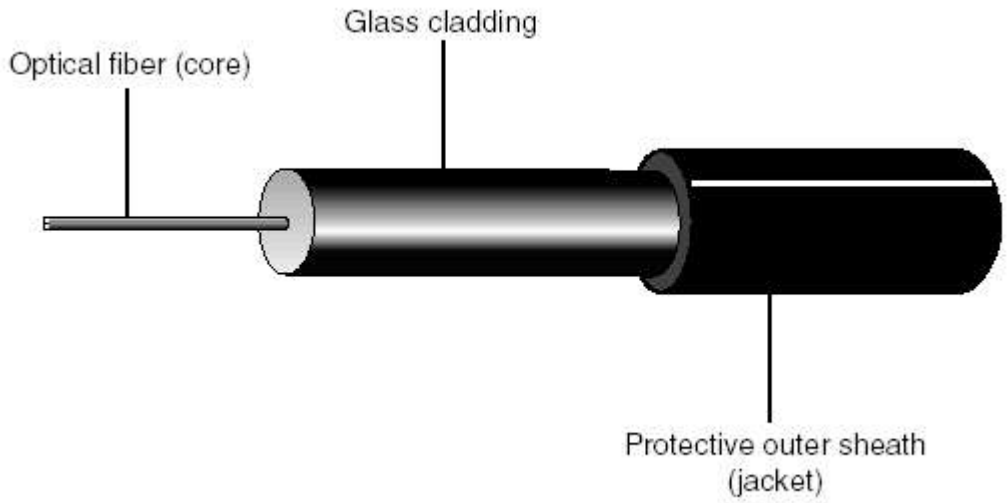
- Common in the plain old days
- Bridging different media types without DCE/DTE
- Usually with AUI connector
- Use with Coaxial or Twisted pair or both

Transceivers



Fiber

- IEG4030
- Glass fiber shielded under another glass

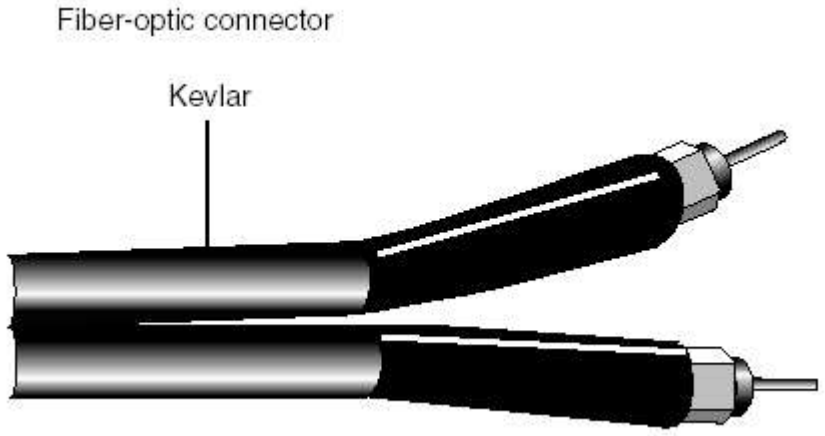


Fiber

- Supports simplex communication only
- Supports very fast communication
  - 1000BaseSX
  - 10GE
  - OC-xxx

Fiber

- Because fiber supports uni-direction only
- Fiber comes with a pair
- Due to opto-electronics constrain



Fiber

- Difficult to install
- 5 cm radius
- 30º blending = Half power loss
- ...

Compare

Medium	*Length*	*Speed*	*Installation*	*Interference*	*T.C.O.*
UTP	100 m	10-1000 Mbps	Easy	High	Least expensive
STP	100 m	16-155 Mbps	Moderate	Low	Moderate
Thinnet	185 m	10 Mbps	Easy	Low	Inexpensive
Thicknet	500 m	10 Mbps	Difficult	Low	High
Fiber	2000 m	100-1000 Mbps	Difficult	None	Most expensive

Part II

What's Fun with Networks?

What's fun?

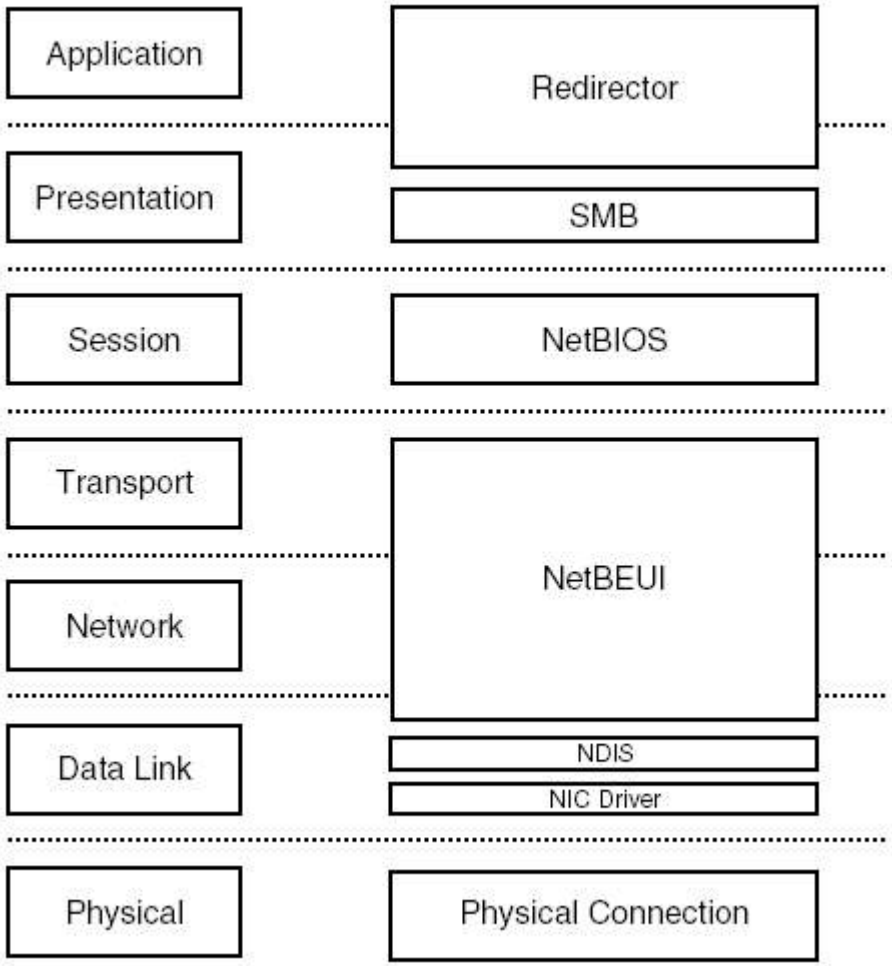
- Sharing files
- Sharing printers
- Sharing Internet
- Collaborative computing
- Flooding, Cracking, Exploiting, DoS, ...
- Just For Fun™

Protocol Stacks

- Foundation of networking
- The first step before you can play

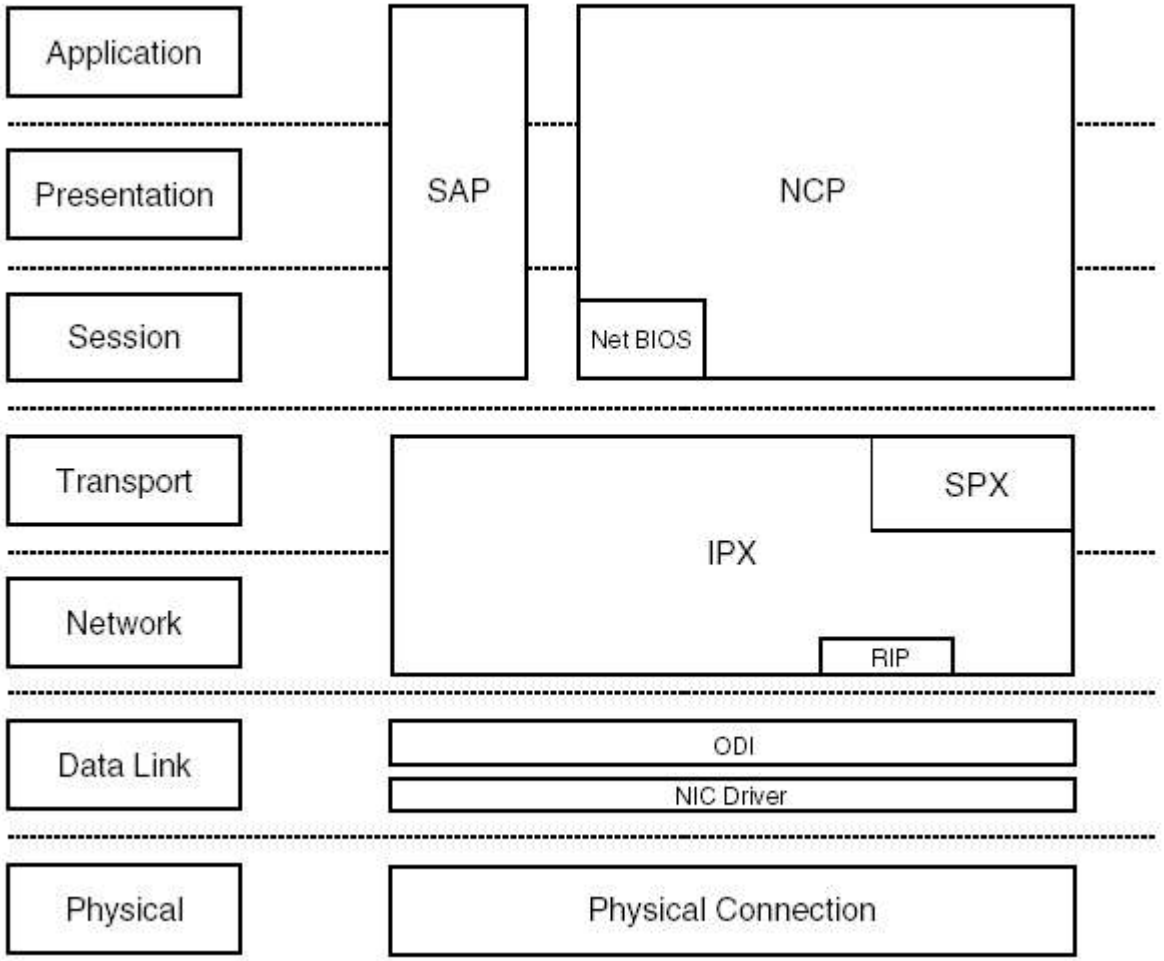
Protocol Stacks

- NetBIOS (Windows)



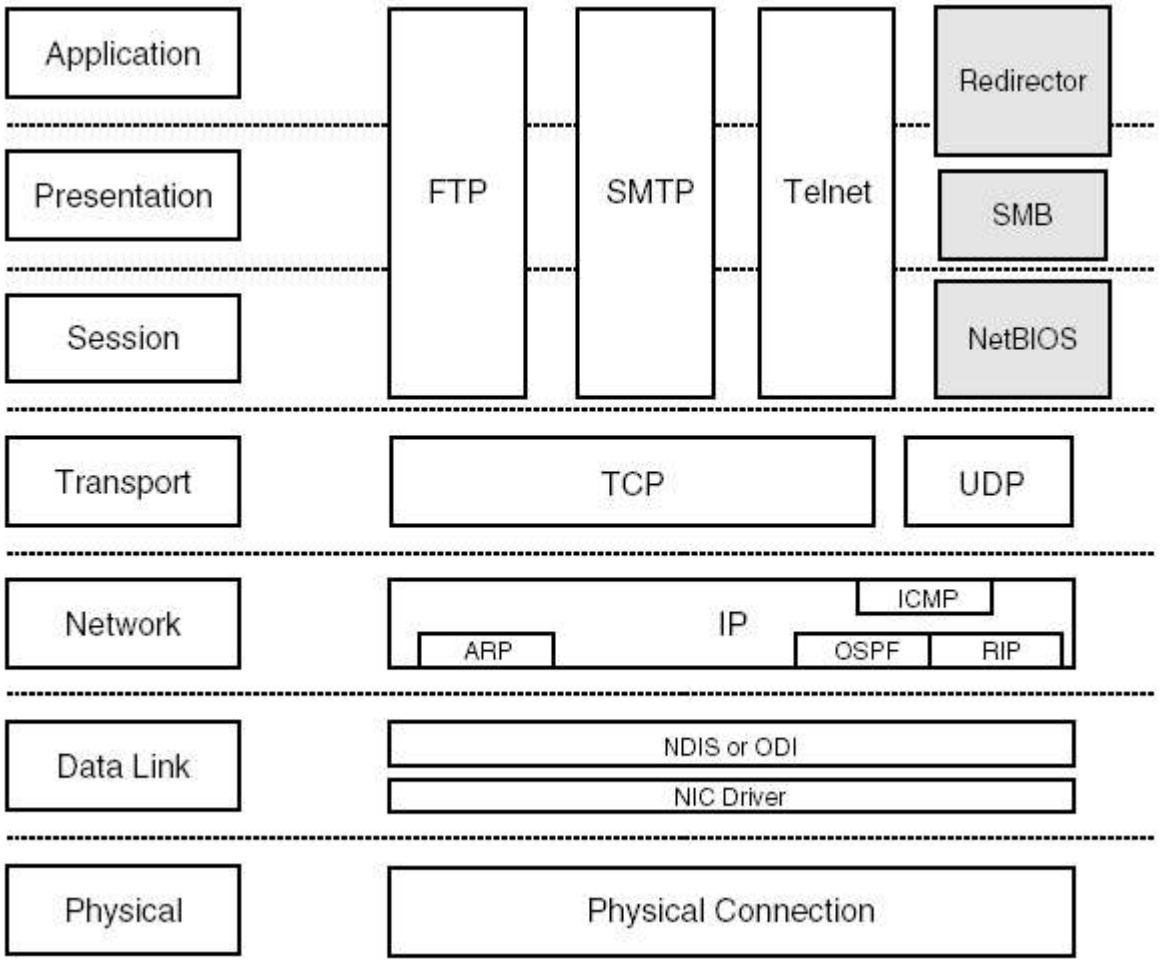
Protocol Stacks

- IPX/SPX (Novell)



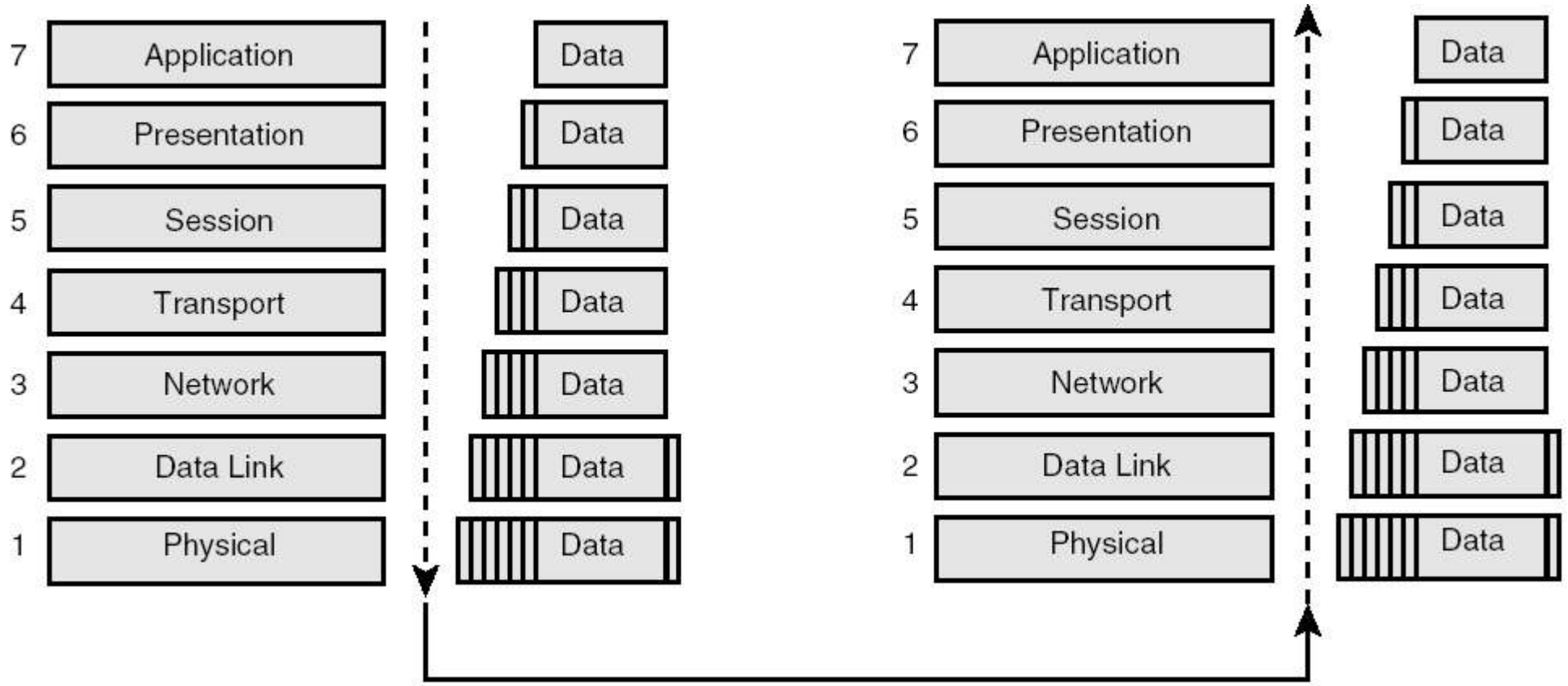
Protocol Stacks

- TCP/IP (UNIX)



TCP/IP

- Foundation of everything nowadays



TCP/IP

- Required
  - IP Address
  - Subnet mask
  - Gateway
  - DNS server addresses

TCP/IP

- Let's watch a movie!
  - by Ericson Medialab

So?

- Linux:
  - ifconfig
  - route
  - /etc/resolv.conf
  - ping
  - netstat
  - .....

So?

- Windows
  - Network Neighborhood
  - Network connections
  - Command console:
    - ping
    - netstat
    - nbtstat
    - ipconfig
    - ....

More...

- ping
  - See if the guy still alive
  - Test round-trip time
  - Broadcast ping
- netstat
  - Check for different connections and status
  - Learn about TCP state machine

More...

- nbtstat
  - NetBIOS over TCP/IP status
  - Check Network Neighborhood connections
  - Who connected to your share?
- ifconfig/ipconfig
  - Check interface card properties
  - Linux: Artificially modify MAC address!

More...

- tcpdump
- Ethereal
- sniffit
- arp
- ...

What's fun?

- Linux: Remote X, SSH, servers, ...
- Windows: Remote desktop, SMB/CIFS, ...

What's next?

- Server management
  - Web/File/FTP/Mail/Database/Computation/...
- Connectivity
  - VPN/Tunneling/Proxying/...
- Large-scale
  - Routing (IGP, EGP)/Failover/Policy/...
- Security
  - Host security/Network security/IPSec/...

Part III

Cisco Stuff

Who's Cisco?

- A large corp. who makes network hardwares
- Catalyst series: Switches
- Routers
- Other equipments (WLAN, VPN, Hub, ...)

Why Cisco?

- Function and features
- Robustness
- Strength
- Performance
- Managable
- People

How Cisco?

- Remote:
  - Access router (C2511)
  - Telnet
  - SSH
- Local:
  - RS232C-RJ11 console cable

How Cisco?

- Serial connection: 9600 8N1
- Use Hyperterminal or Minicom or Telix or ...
- Type commands to manage it!
- http://www.cisco.com/

What's fun?

- Switches:
  - VLAN: Cisco Inter-Switch Link (ISL)
  - VLAN: IEEE 802.11q
  - VLAN Trunking
  - STP (Spanning-Tree Protocol)
  - Forward delay

What's fun?

- Multilayer switch:
  - MPLS
  - Routing/Filtering

What's fun?

- Routers: IGP
  - RIP
  - OSPF
  - IGRP
  - IBGP

What's fun?

- Routers:
  - EGP: BGP
  - BGP Policies
  - Failover
  - Access list
  - Firewall
  - NAT

What's fun?

- Protocols
  - TCP/IP
  - IPX/SPX

What's fun?

- Link-layer
  - AUI
  - 10BaseT
  - 100BaseTX
  - 1000BaseT
  - 1000BaseSX
  - PPP
  - HDLC
  - ISDN BRI
  - ISDN PRI
  - Dial-on-Demand Routing (DDR)
  - Frame-relay

Huh?

- Cisco is dominating!
- Network is inevitable!