

Networking components and devices

CNE Computer Networks

Faculty of Information Technology
Hanoi University

Terminology

- Computer network
- Transmission media
- Bandwidth: bps, Kbps, Mbps, Gbps
- Network resource: hard (devices) + soft (software)
- Account/password
- Servers
- Clients

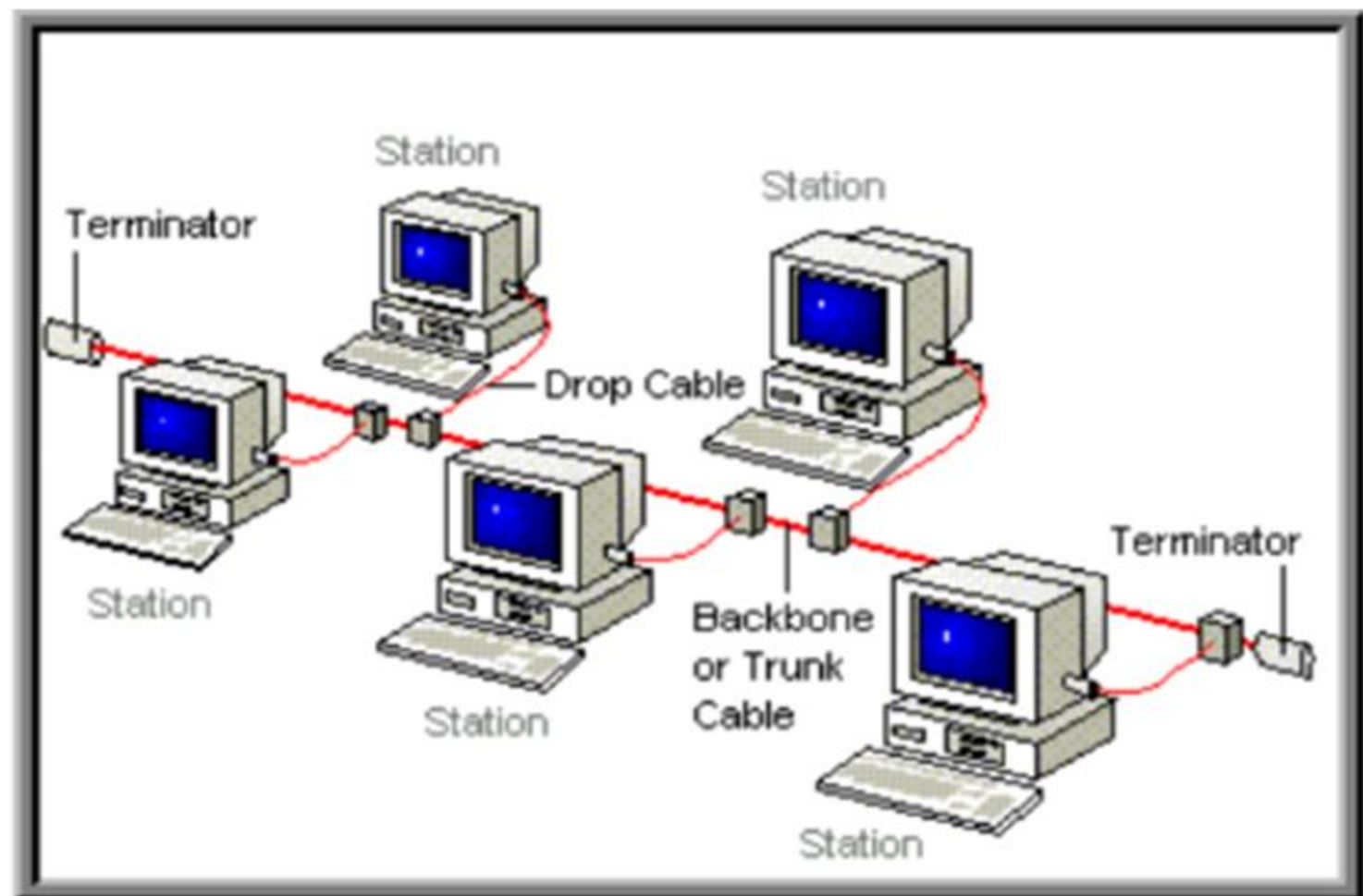
■ ...

Network classification

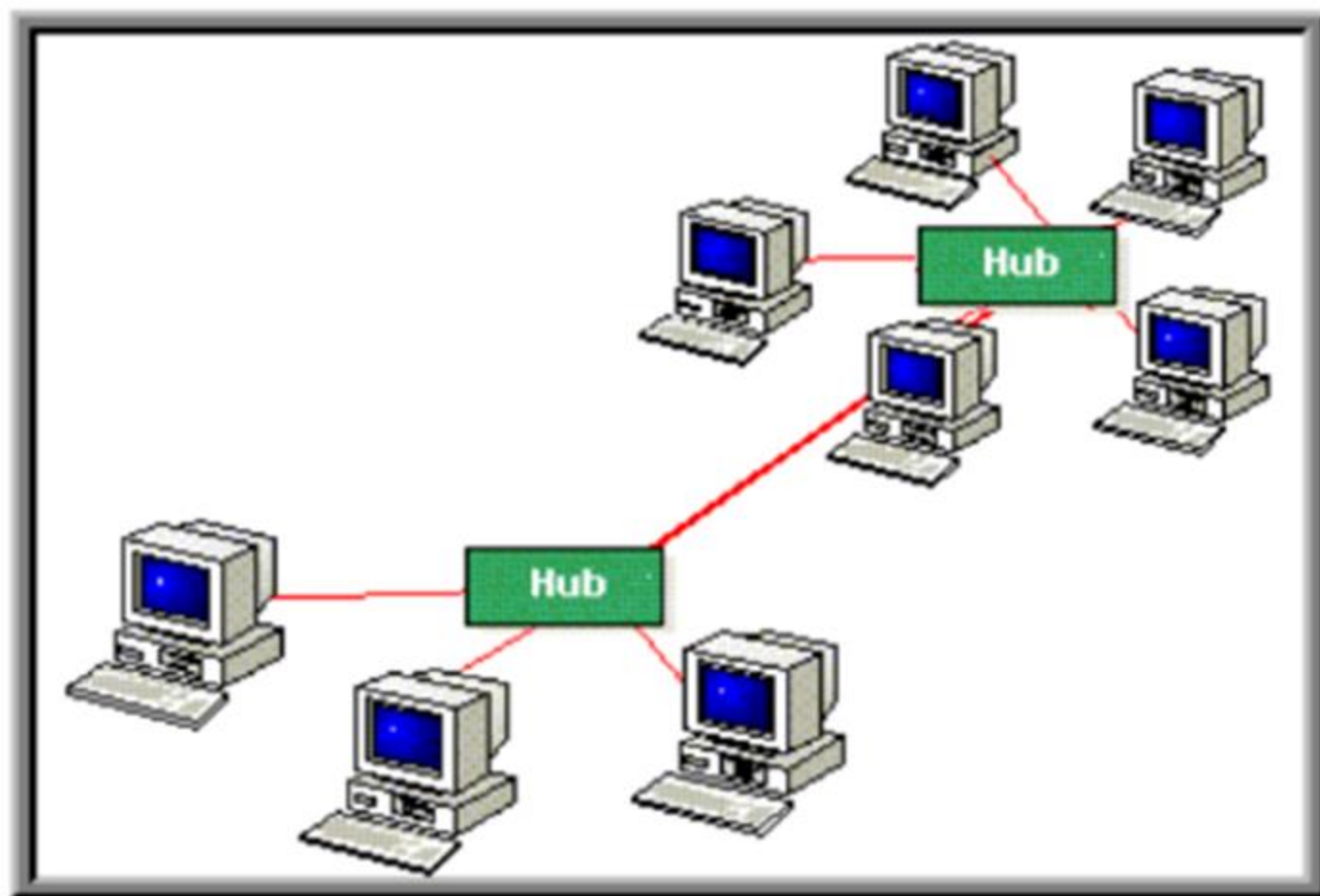
- Type of transmission:
 - client-server
 - peer-to-peer
 - Size of network
 - LAN (Local Area Network)
 - MAN (Metropolitan Area Network)
 - WAN (Wide Area Network ~ Internet)
-

Network classification

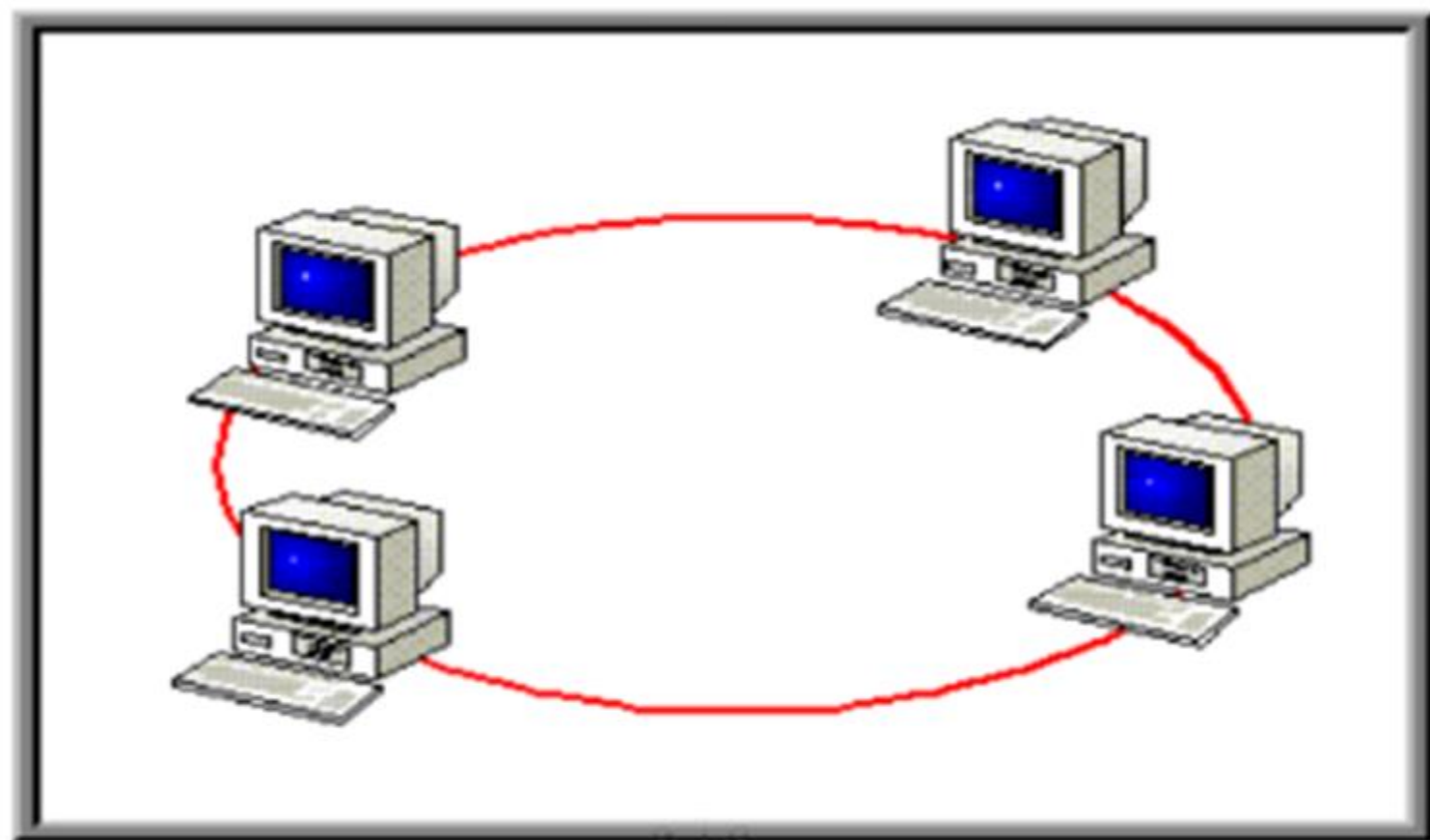
- Network topology :
 - Bus
 - Star
 - Ring
- NIC (Network card interface):
 - Ethernet: ~100Mbps, bus topology
 - Token ring
 - Fiber optic



BUS



Star



Ring

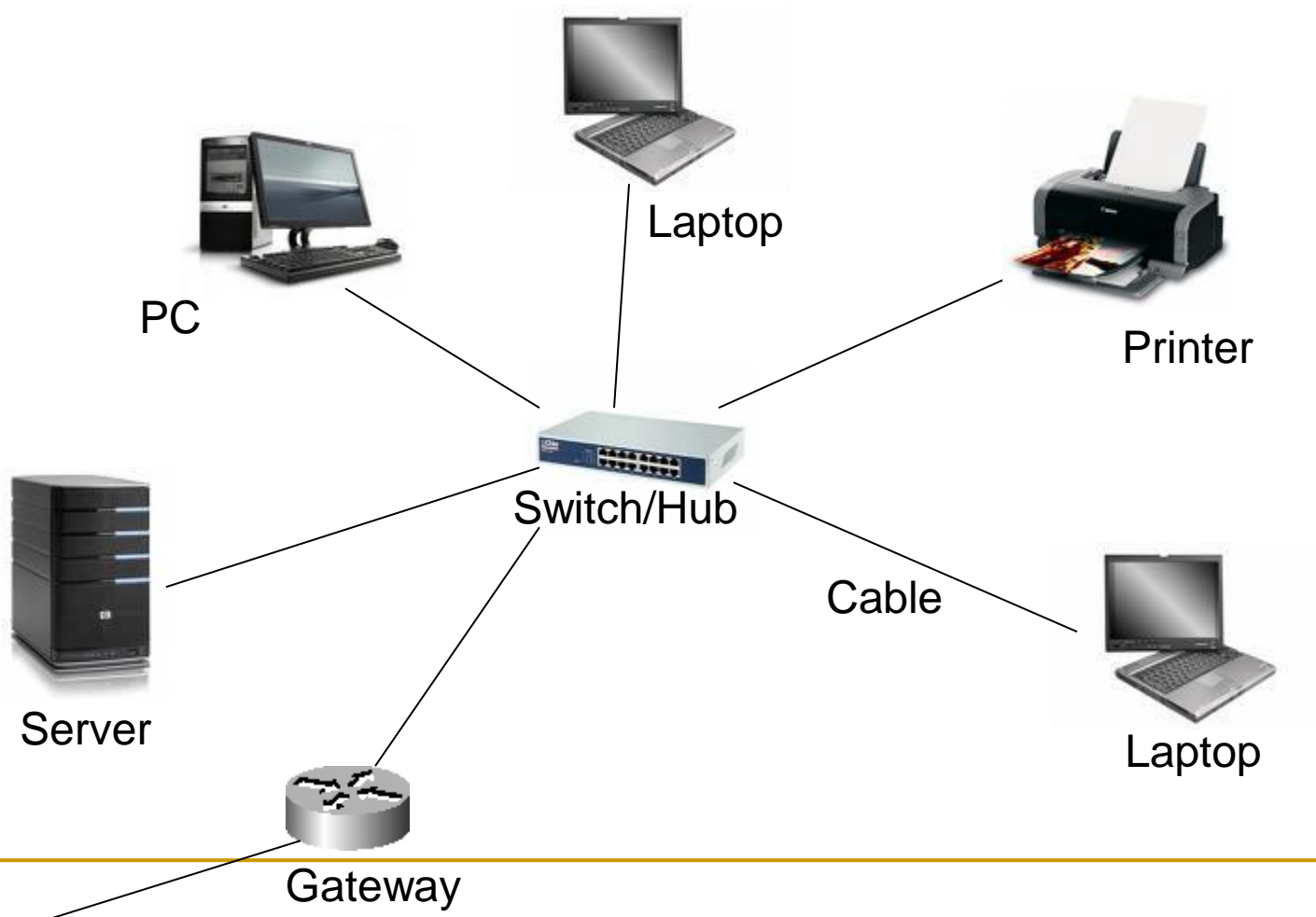
Content

1. LANs (Local Area Networks)
2. WAN (Wide Area Network) – Internet

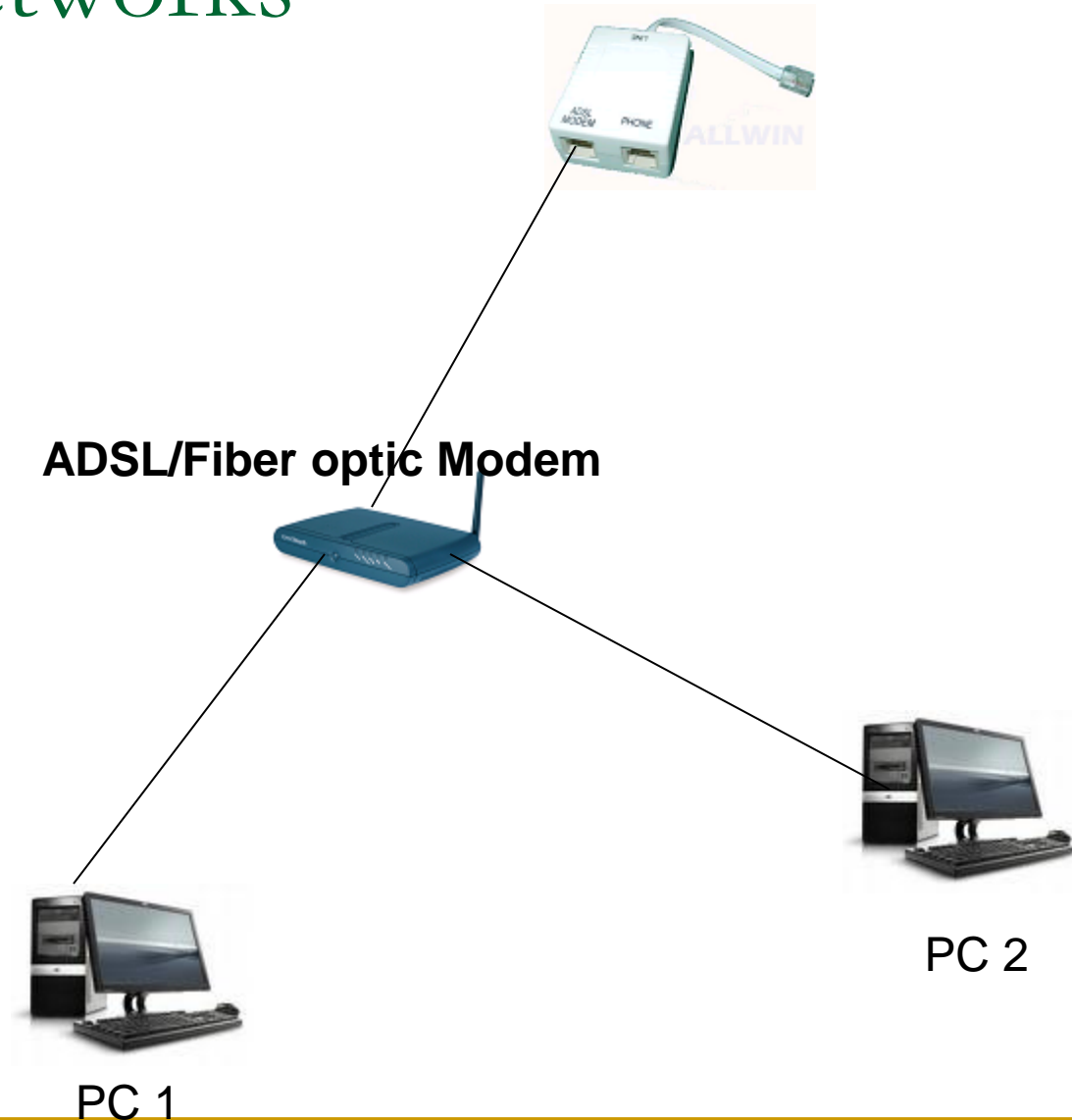
1. Local Area Networks

- Local Area Networks, generally called LANs, are **privately-owned** networks within a single building or campus of up to a few kilometers in size. They are widely used to connect personal computers and other network devices in company offices and factories to share resources (e.g., printers) and exchange information.
 - Other name: Intranet
-

Example



Home networks



Wi-Fi networks

ADSL Modem



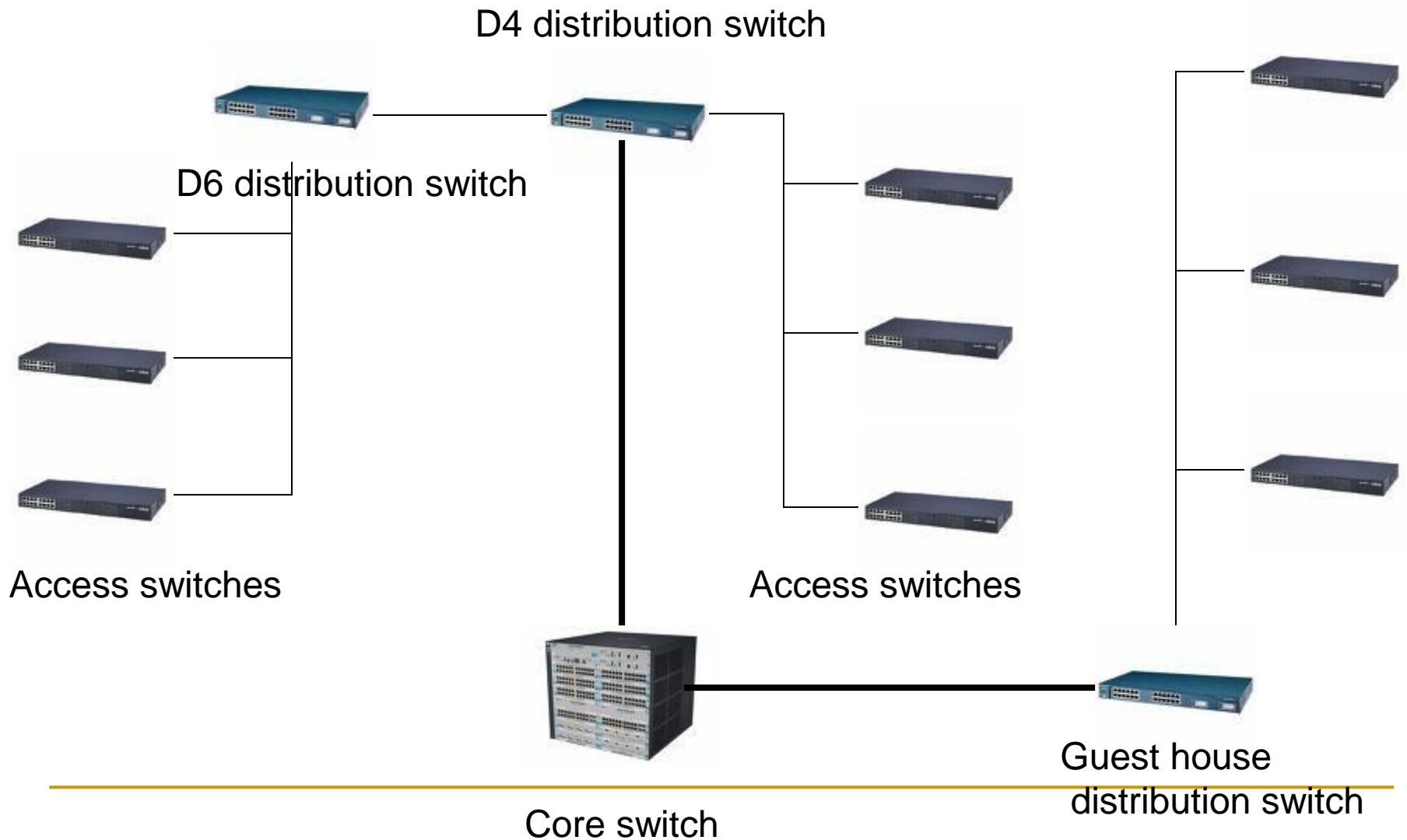
PC 1

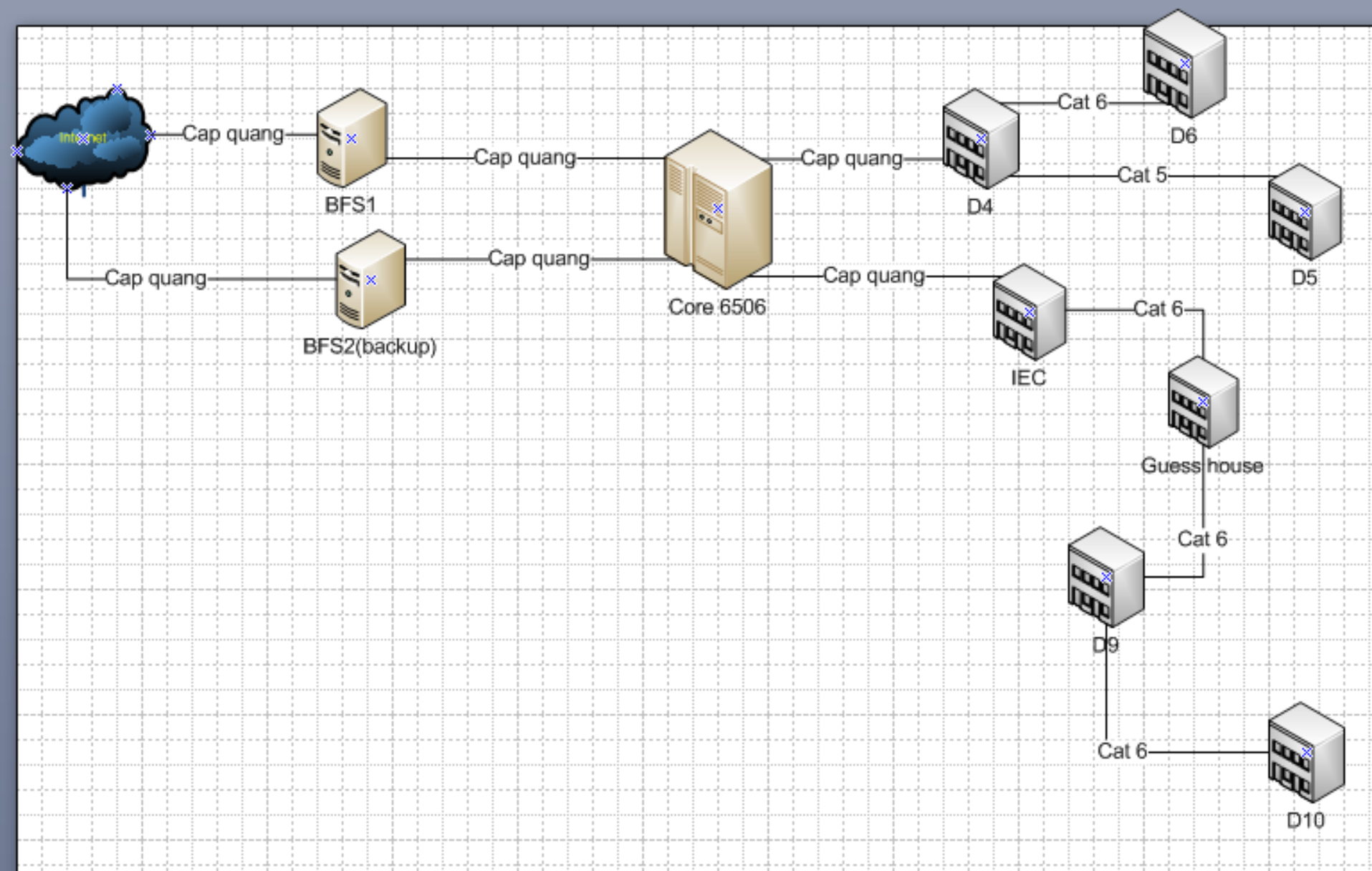


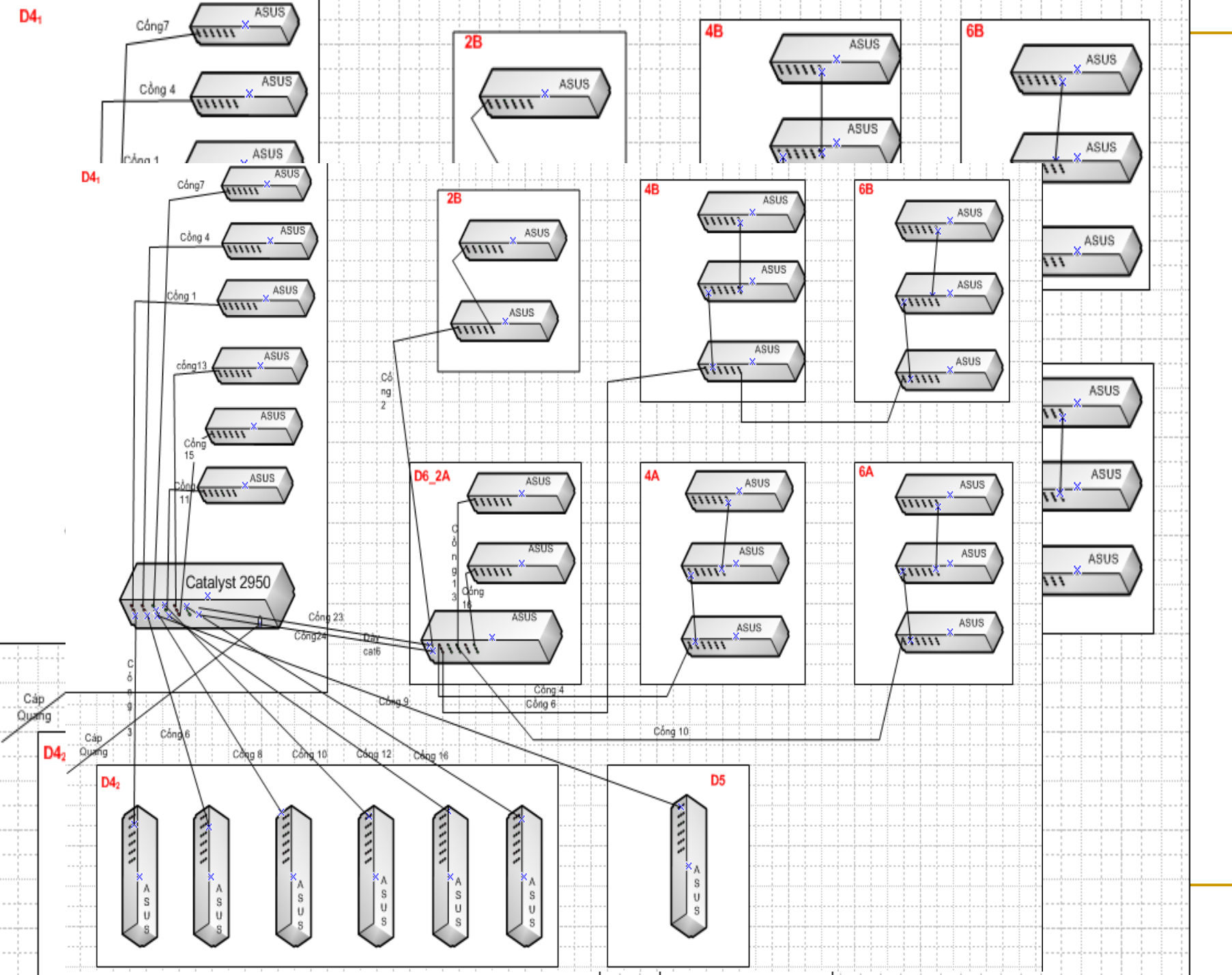
PC 2



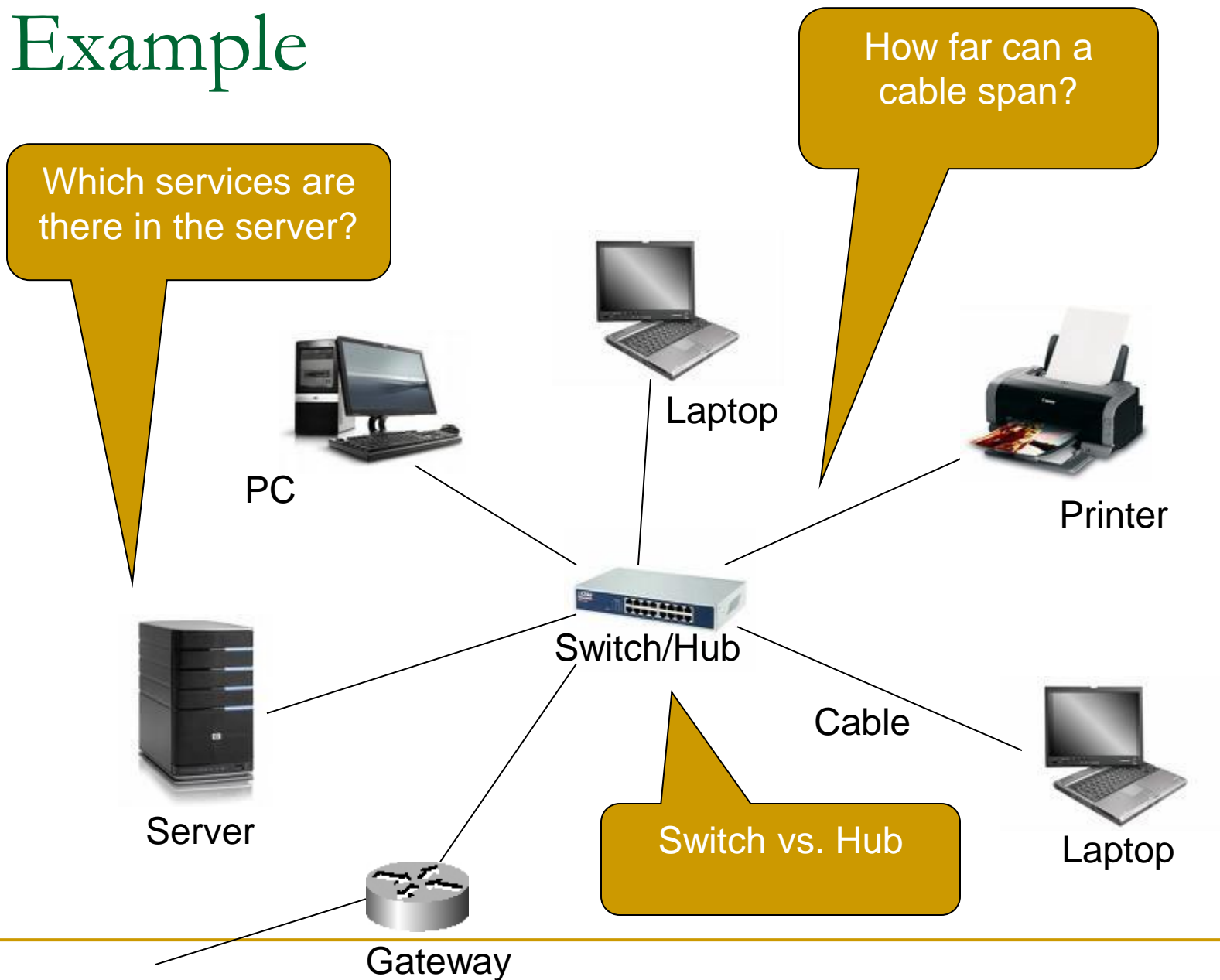
KTX Network







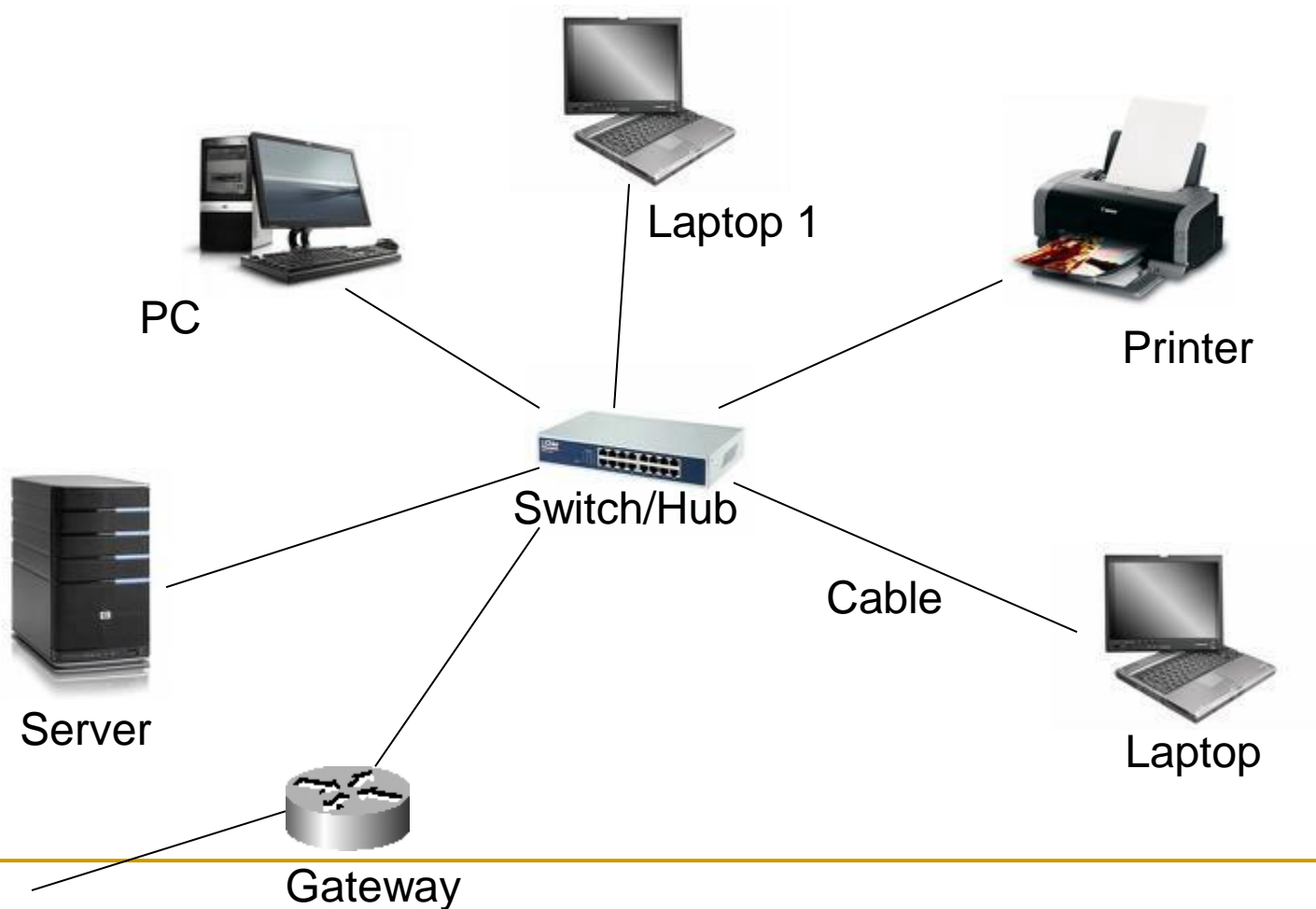
Example



What are there in a LAN?

- PCs
- What more?

How to send a message from PC to Laptop 1?



LAN Access Control Methods

- Deterministic access (TDMA)
 - Transmission rights allocated to terminals in advance. The terminals can send data in the allocated order.
 - Nondeterministic access (CSMA/CD)
 - Transmission rights is carried out at the point of time when a transmission request is issued. Conflicts may occur.
-

TDMA

- Time Division Multiple Access
 - Data channel is divided in to time slots.
 - Time slots are allocated to terminals.
 - Collision does not occur
 - Waste is large
-

CSMA/CD

- Carrier Sense Multiple Access with Collision Detection
 - Terminals monitor whether data is passing on the cable
 - Transmission starts when no data is passed
 - If collision is detected, all terminals will have to wait a specified time before retransmission
 - Ethernet
-

Switch vs. Hub

■ Hub

- Hub takes data from one of the connected devices and forward it to all the other ports on the hub.

■ Switch

- Rather than forwarding data to all the connected ports, a switch forwards data only to the port on which the destination system is connected.
-

How far can a cables span?

- Category 5: 100 m
 - Optical fiber: 50 km???
 - Wireless: 20 m
-
- How did we connect D4 and D5 using Cat 5 cable?
-

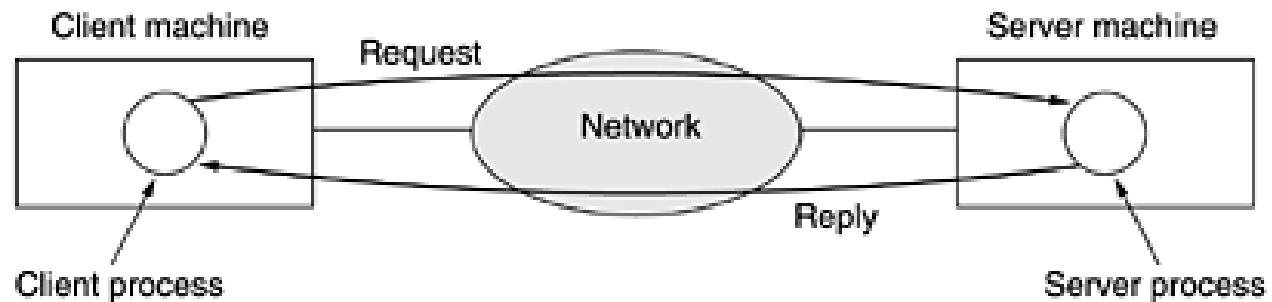
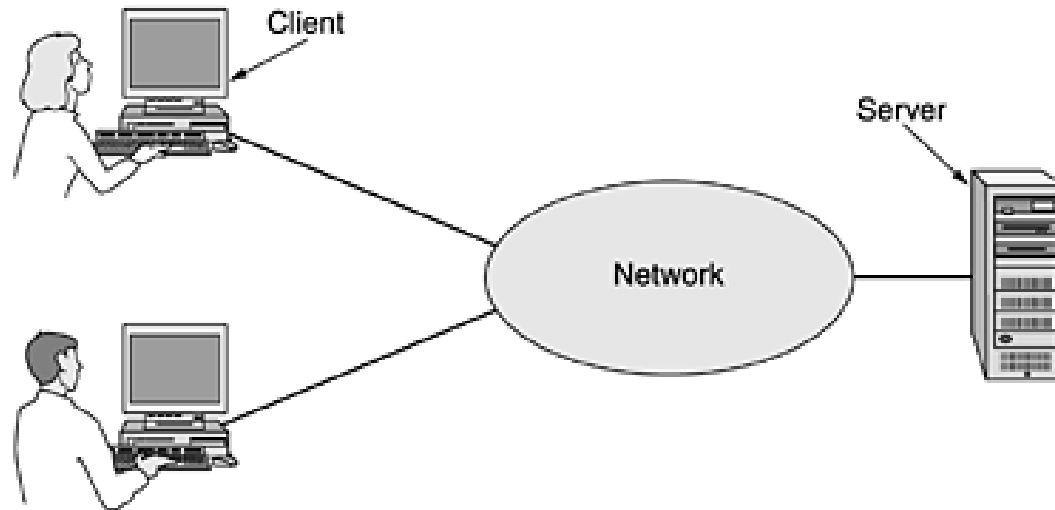
Which services we may need in LAN?

- Web
 - Email
 - FTP
 - DNS
-

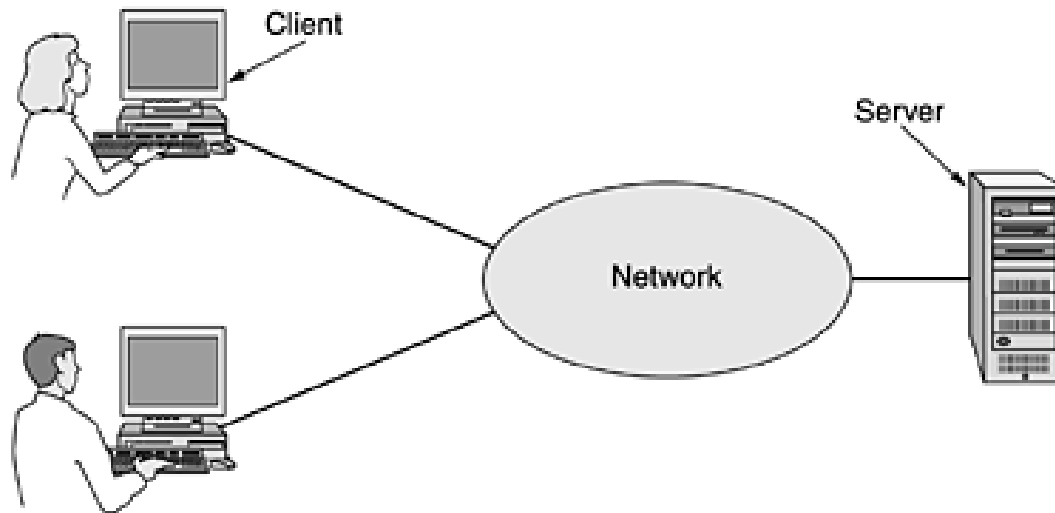
Use of LAN

- Resource sharing
 - Services: WWW, Email...
 - Client-Server mode
 - Instant messaging
-

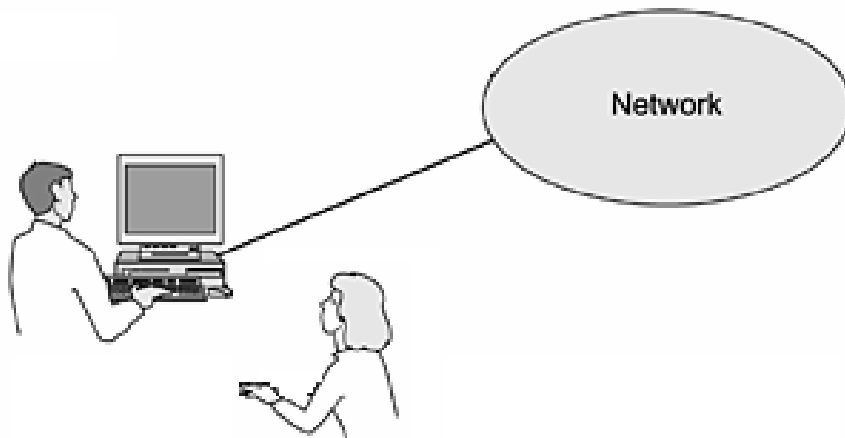
Client-Server mode



Client-server mode vs. Workstation



Client-server mode



Workstation

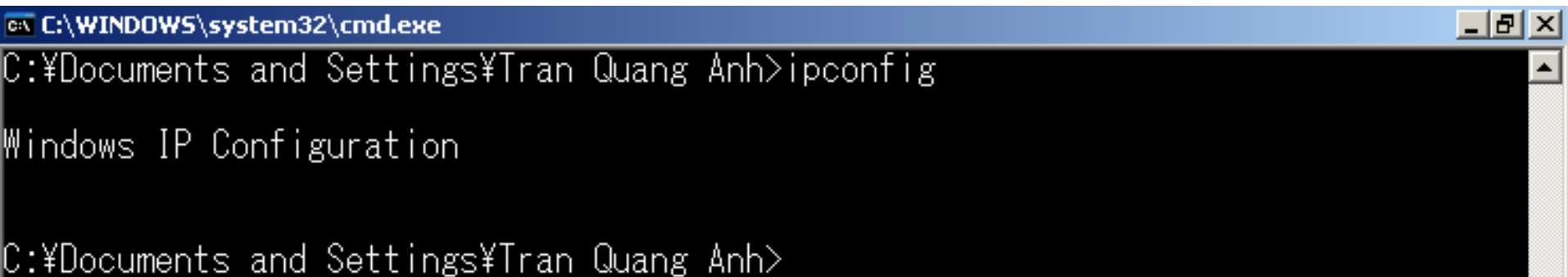
How to configure network in PC

- Information need to know
 - IP range (192.168.x.1-253)
 - Network mask (255.255.255.0)
 - Gateway (192.168.6.254)
 - DNS (192.168.100.2)
 - Dynamic Host Configuration Protocol (DHCP)
-

How to test the network

- Check the IP address:
 - ipconfig (Windows)/ifconfig (Linux, Mac)
 - Ping gateway
 - Ping `www.google.com`
 - Ping `www.google.com /t`
 - Ping DNS
-

NIC not found



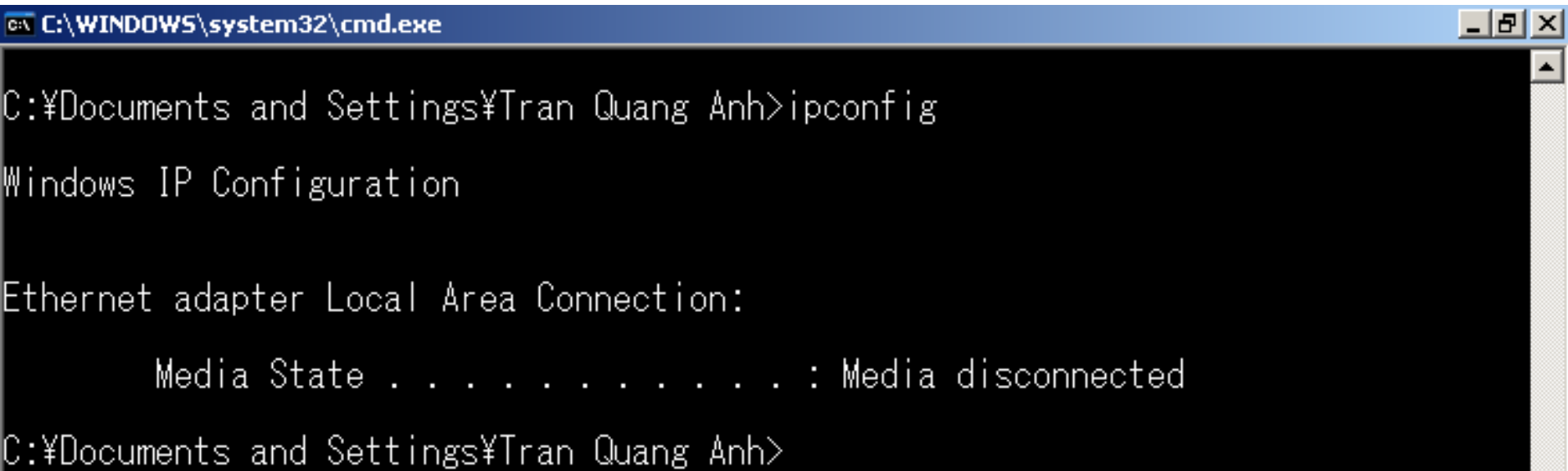
```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\Tran Quang Anh>ipconfig

Windows IP Configuration

C:\Documents and Settings\Tran Quang Anh>
```

The image shows a Windows command prompt window. The title bar reads "C:\WINDOWS\system32\cmd.exe". The command prompt shows the user "Tran Quang Anh" at the "C:\Documents and Settings\Tran Quang Anh" directory. The user has entered the command "ipconfig", and the output is "Windows IP Configuration". The prompt is currently waiting for further input.

Cable not connected



```
C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings\Tran Quang Anh>ipconfig

Windows IP Configuration

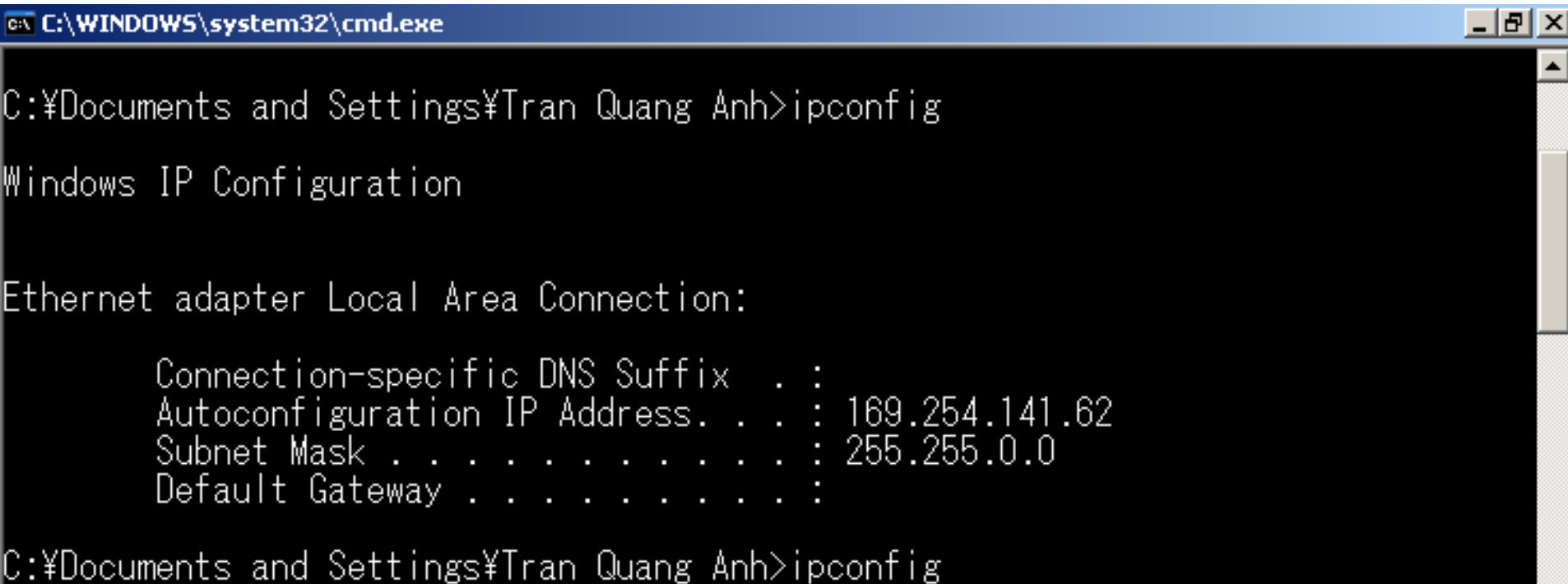
Ethernet adapter Local Area Connection:

    Media State . . . . . : Media disconnected

C:\Documents and Settings\Tran Quang Anh>
```

The image shows a Windows command prompt window with the title bar "C:\WINDOWS\system32\cmd.exe". The user has entered the command "ipconfig". The output shows the configuration for the "Ethernet adapter Local Area Connection", indicating that the "Media State" is "Media disconnected".

No IP address



A screenshot of a Windows command prompt window. The title bar at the top reads "C:\WINDOWS\system32\cmd.exe". The command prompt shows the user's location as "C:\Documents and Settings\Tran Quang Anh" and the command "ipconfig" has been entered. The output displays the configuration for the "Ethernet adapter Local Area Connection:", including the "Connection-specific DNS Suffix", "Autoconfiguration IP Address" (169.254.141.62), "Subnet Mask" (255.255.0.0), and "Default Gateway". The command "ipconfig" is entered again at the bottom of the window.

```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\Tran Quang Anh>ipconfig

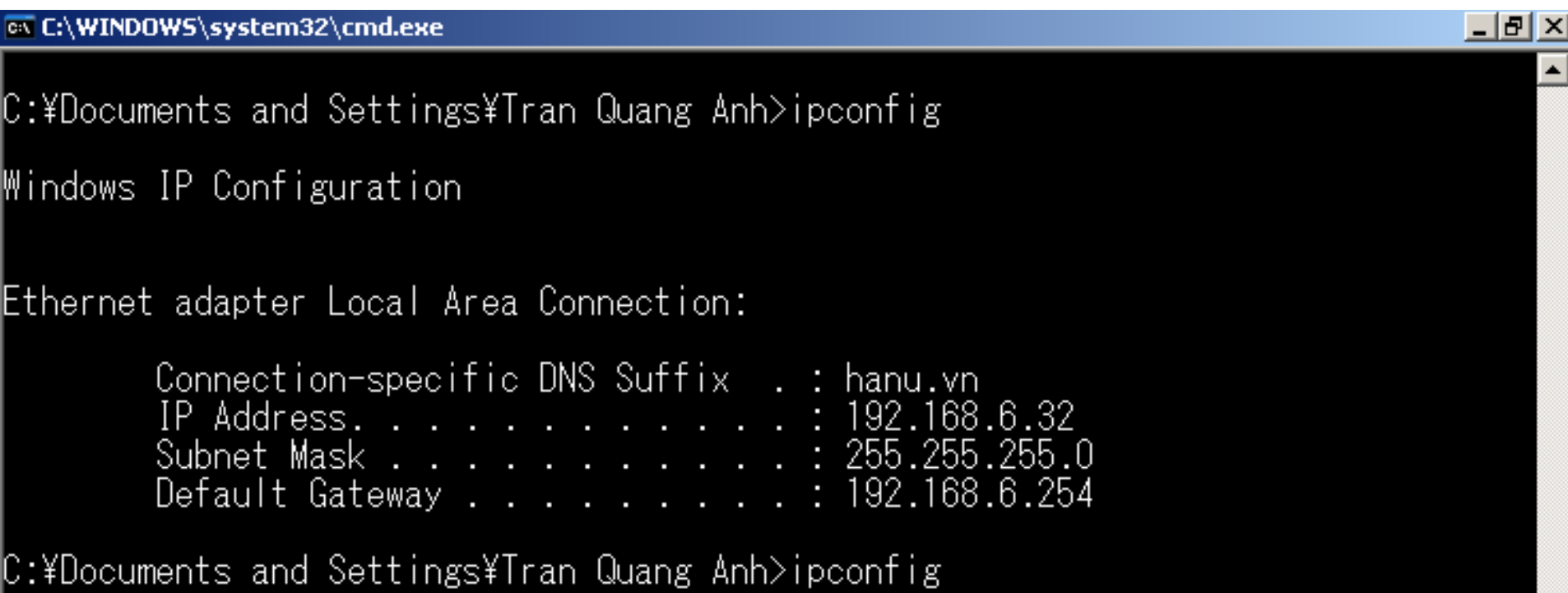
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    Autoconfiguration IP Address. . . : 169.254.141.62
    Subnet Mask . . . . .           : 255.255.0.0
    Default Gateway . . . . .       : 

C:\Documents and Settings\Tran Quang Anh>ipconfig
```


Looks good



```
C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings\Tran Quang Anh>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : hanu.vn
    IP Address. . . . .               : 192.168.6.32
    Subnet Mask . . . . .             : 255.255.255.0
    Default Gateway . . . . .         : 192.168.6.254

C:\Documents and Settings\Tran Quang Anh>ipconfig
```

C:\Documents and Settings\Tran Quang Anh>ipconfig /all

Windows IP Configuration

Host Name : tuevan
Primary Dns Suffix :
Node Type : Mixed
IP Routing Enabled. : Yes
WINS Proxy Enabled. : No
DNS Suffix Search List. : hanu.vn

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . : hanu.vn
Description : Intel(R) PRO/1000 PL Network Connect
ion
Physical Address. : 00-15-58-7F-81-F9
Dhcp Enabled. : Yes
Autoconfiguration Enabled : Yes
IP Address. : 192.168.6.32
Subnet Mask : 255.255.255.0
Default Gateway : 192.168.6.254
DHCP Server : 192.168.1.2
DNS Servers : 192.168.100.2
192.168.100.1
Lease Obtained. : Friday, August 29, 2008 12:13:31 PM
Lease Expires : Saturday, September 06, 2008 12:13:31 PM

1 PM

C:\Documents and Settings\Tran Quang Anh>

C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings\Tran Quang Anh>ping 192.168.6.254

Pinging 192.168.6.254 with 32 bytes of data:

Reply from 192.168.6.254: bytes=32 time=1ms TTL=255

Reply from 192.168.6.254: bytes=32 time<1ms TTL=255

Reply from 192.168.6.254: bytes=32 time<1ms TTL=255

Reply from 192.168.6.254: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.6.254:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\Documents and Settings\Tran Quang Anh>

C:\WINDOWS\system32\cmd.exe

C:\Documents and Settings\Tran Quang Anh>ping 192.168.6.253

Pinging 192.168.6.253 with 32 bytes of data:

Request timed out.

Request timed out.

Request timed out.

Request timed out.

Ping statistics for 192.168.6.253:

Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Documents and Settings\Tran Quang Anh>

3 private IP address ranges: used Only in LAN

- ❑ 10.0.0.0 – 10.255.255.255/8 (16,777,216 IPs)
- ❑ 172.16.0.0 – 172.31.255.255/12 (1,048,576 IPs)
- ❑ 192.168.0.0 – 192.168.255.255/16 (65,536 IPs)

Public IP address: used in Internet

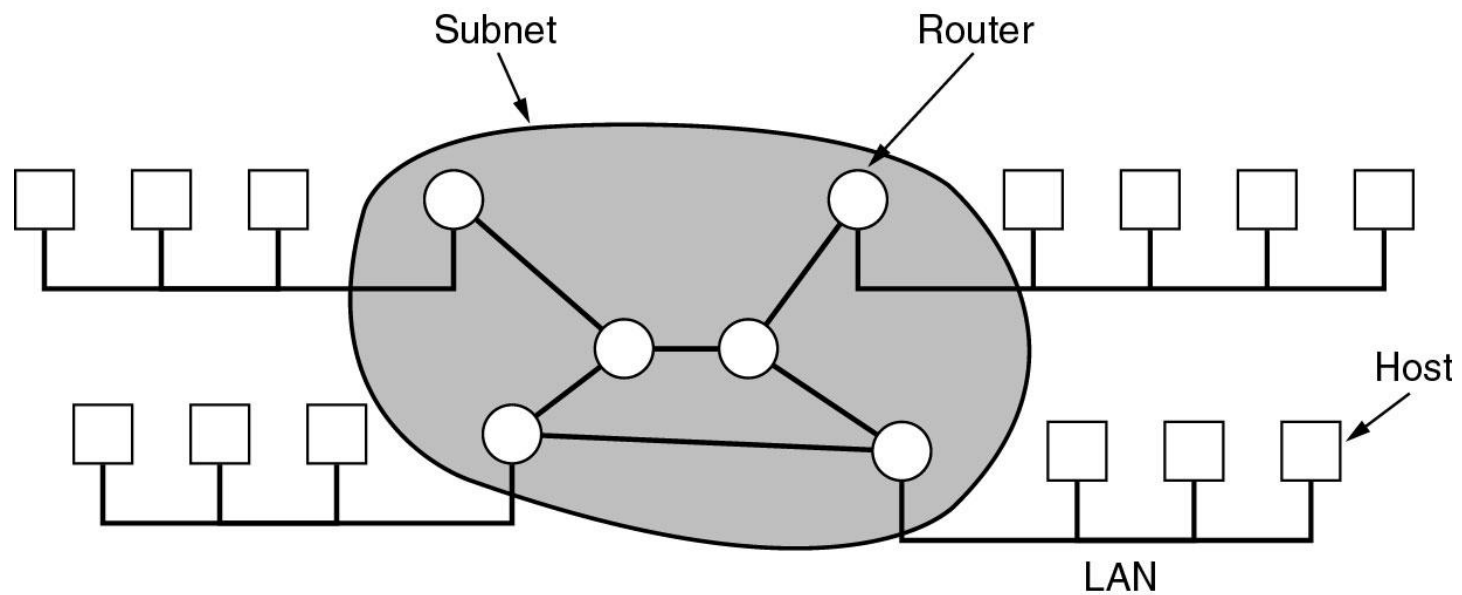
HANU Network

- Can you discover the network?
 - nmap
 - Tracer (Windows)/traceroute(Linux/Mac)
-

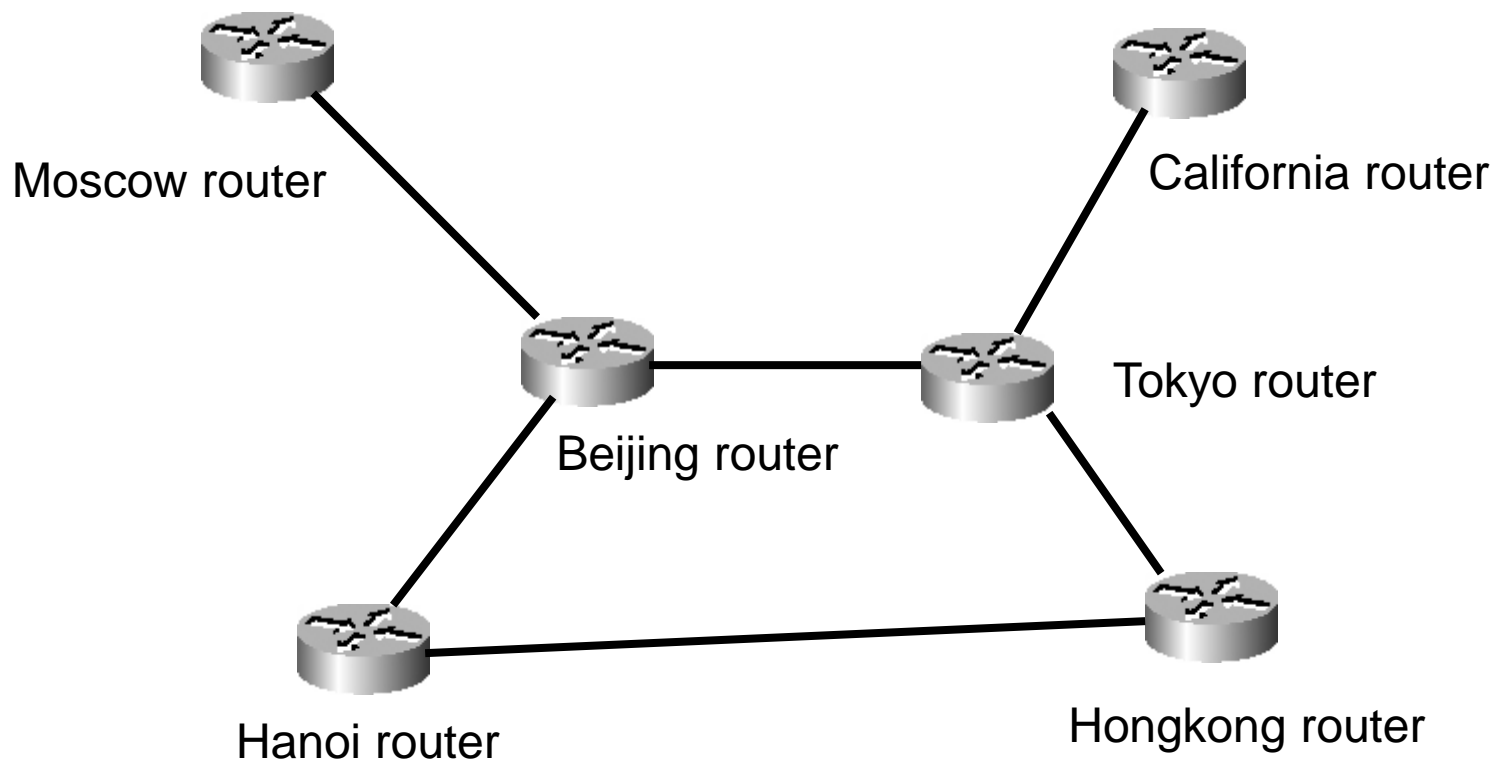
2. Wide Area Networks

- A wide area network, or WAN, spans a large geographical area, often a country or continent. It contains a collection of hosts. The hosts are connected by a subnet. The hosts are owned by the customers (e.g., people's personal computers), whereas the communication subnet is typically owned and operated by a telephone company or Internet service provider.
 - Other name: Internet
-

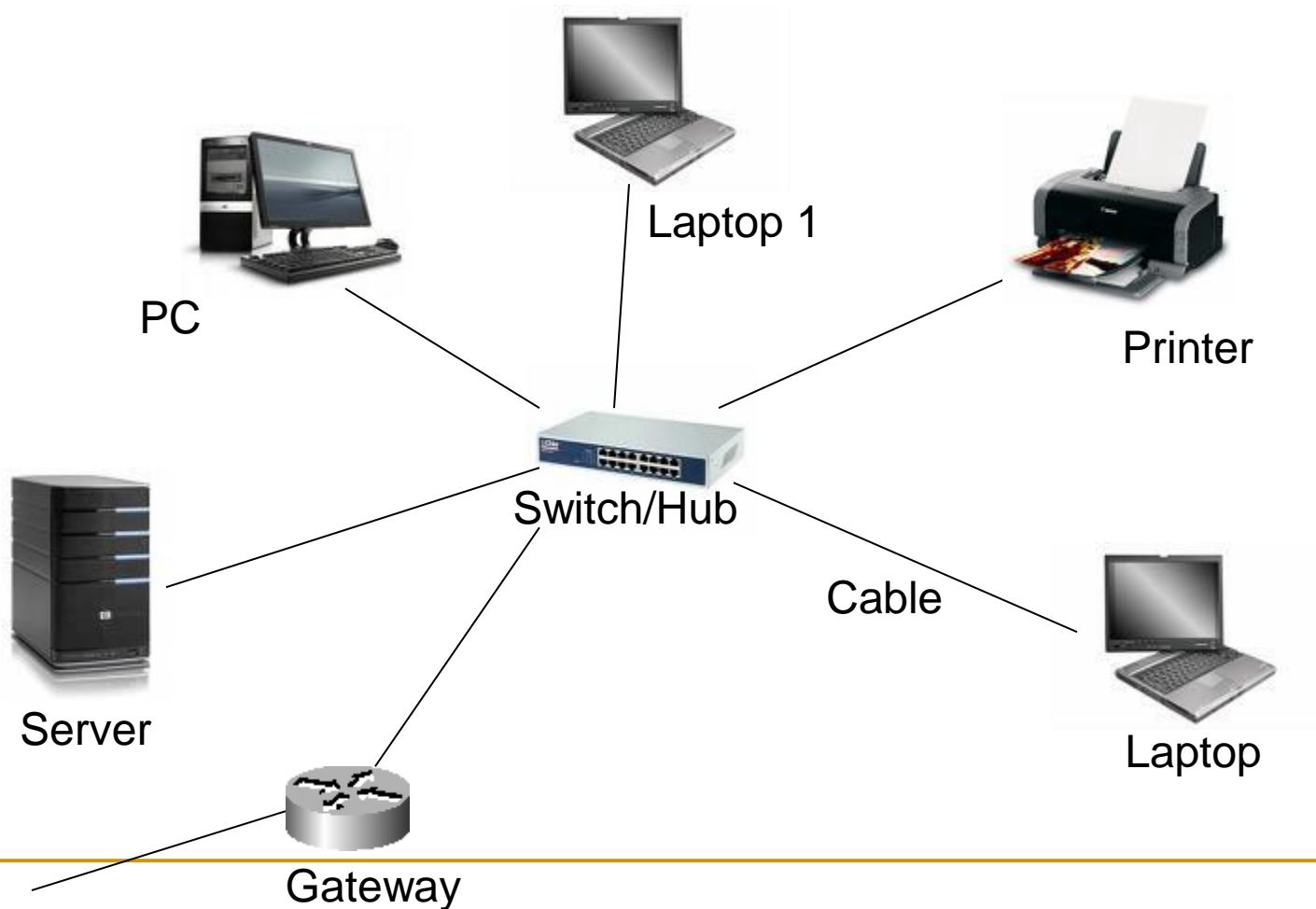
Wide Area Networks



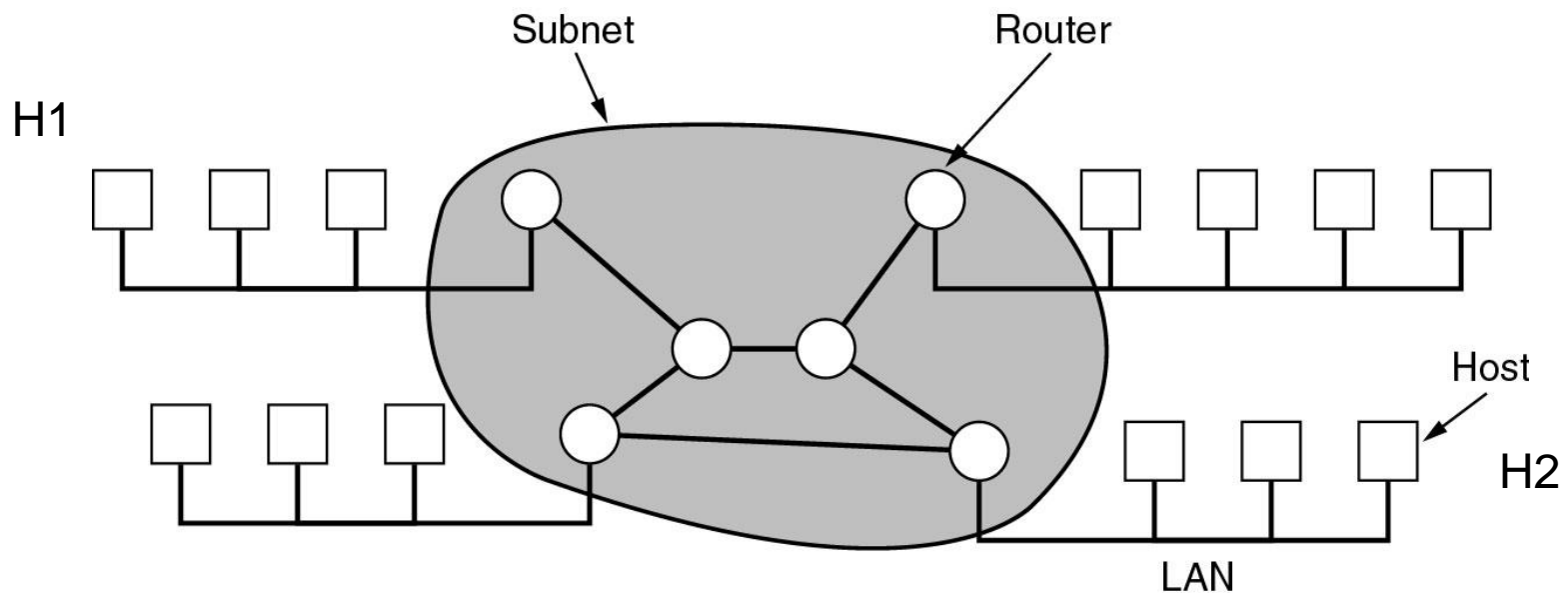
WAN Subnet

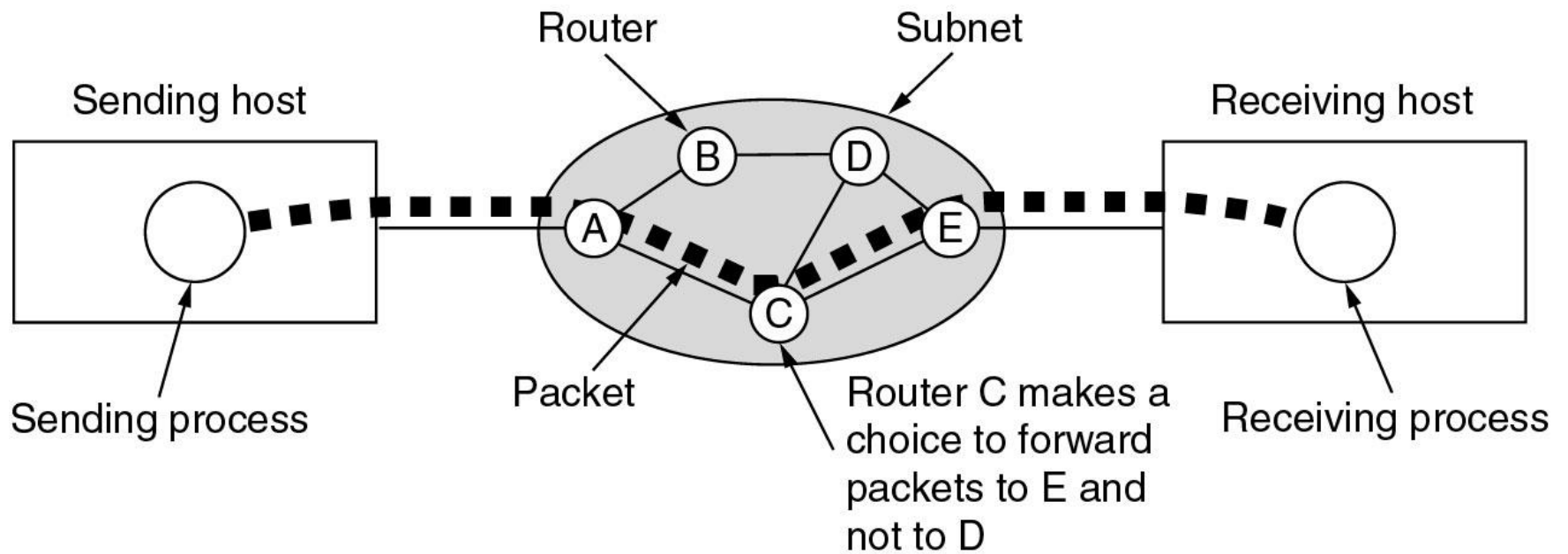


How to send a message from PC to Laptop 1?



How to send a message from H1 to H2?





How to test WAN?

- Use tracert (Windows) or traceroute (Linux/Mac)

```
C:\ Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Tran Quang Anh>tracert www.google.com

Tracing route to www.l.google.com [209.85.175.104]
over a maximum of 30 hops:

  1      3 ms      2 ms      2 ms      172.17.0.1
  2      3 ms      2 ms      2 ms      10.1.0.2
  3      *          *          *          Request timed out.
  4     15 ms     12 ms     12 ms     117.3.128.1
  5     12 ms     10 ms     23 ms     203.113.128.5
  6     25 ms     *          10 ms     203.113.158.133
  7     11 ms     10 ms     10 ms     203.113.158.145
  8     42 ms     29 ms     40 ms     72.14.196.81
  9     30 ms     29 ms     29 ms     72.14.233.25
 10     53 ms     55 ms     49 ms     209.85.240.28
 11     52 ms     52 ms     51 ms     209.85.250.103
 12     51 ms     53 ms     52 ms     209.85.252.65
 13     53 ms     52 ms     52 ms     tc-in-f104.google.com [209.85.175.104]

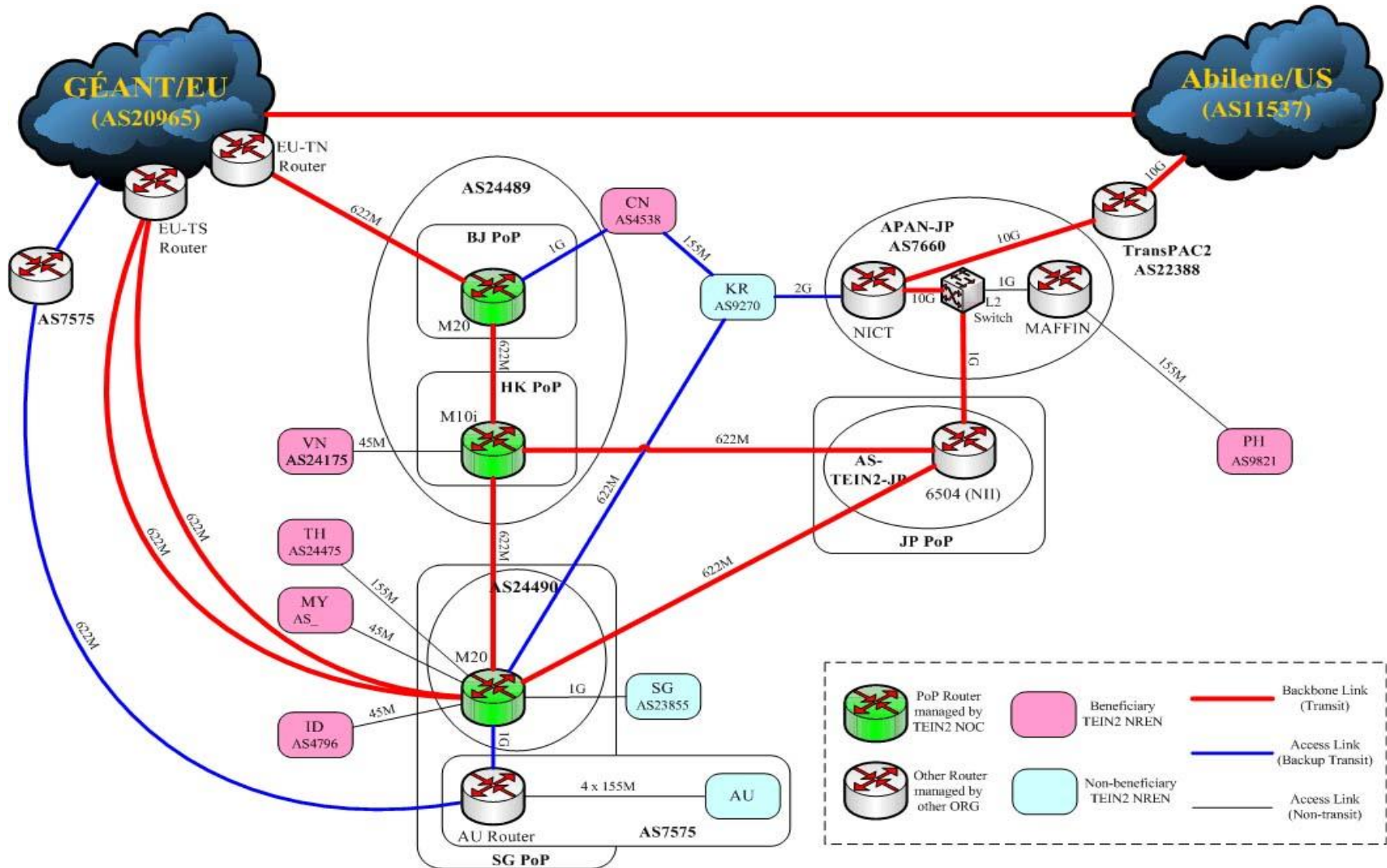
Trace complete.

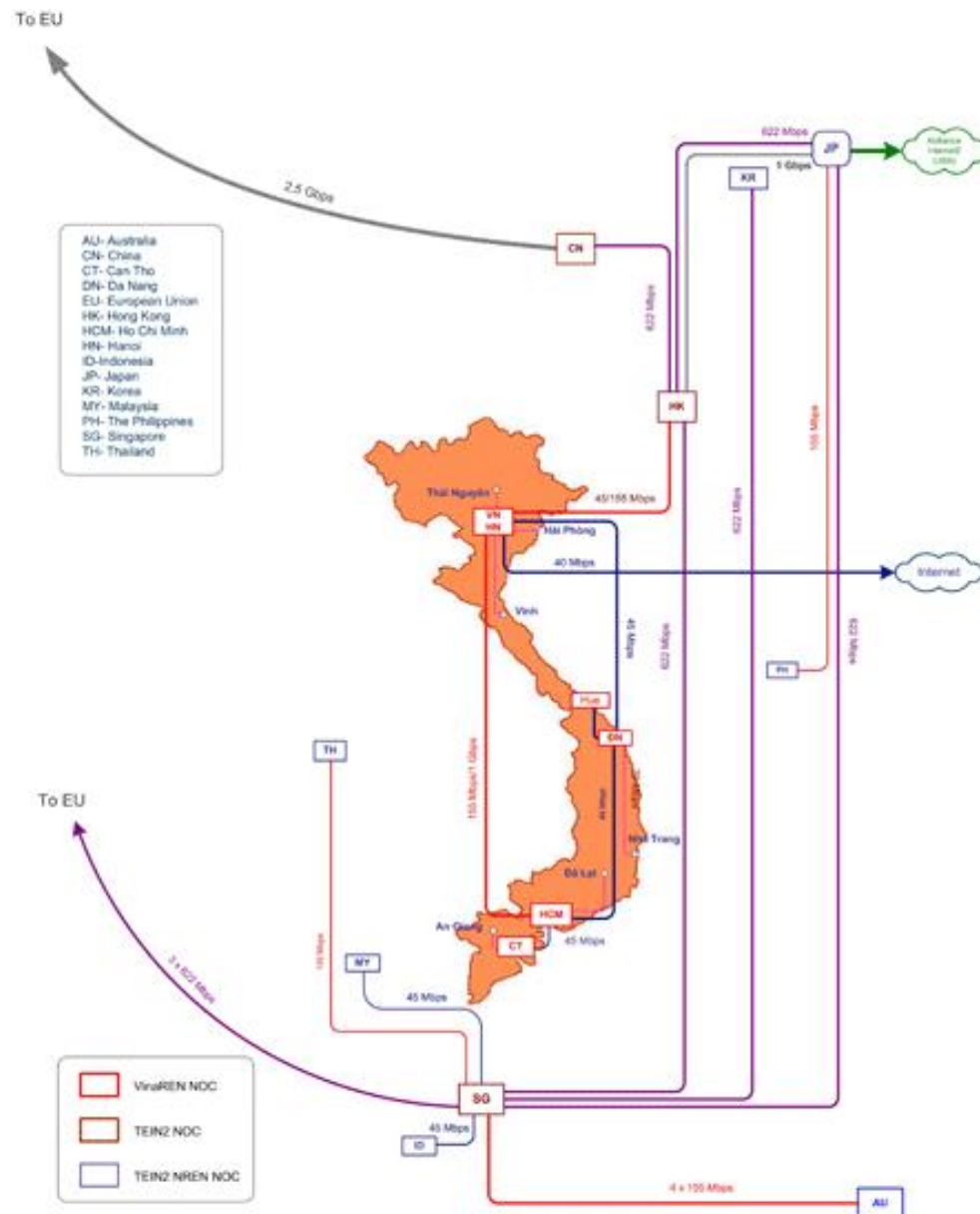
C:\Documents and Settings\Tran Quang Anh>_
```

Network in Vietnam

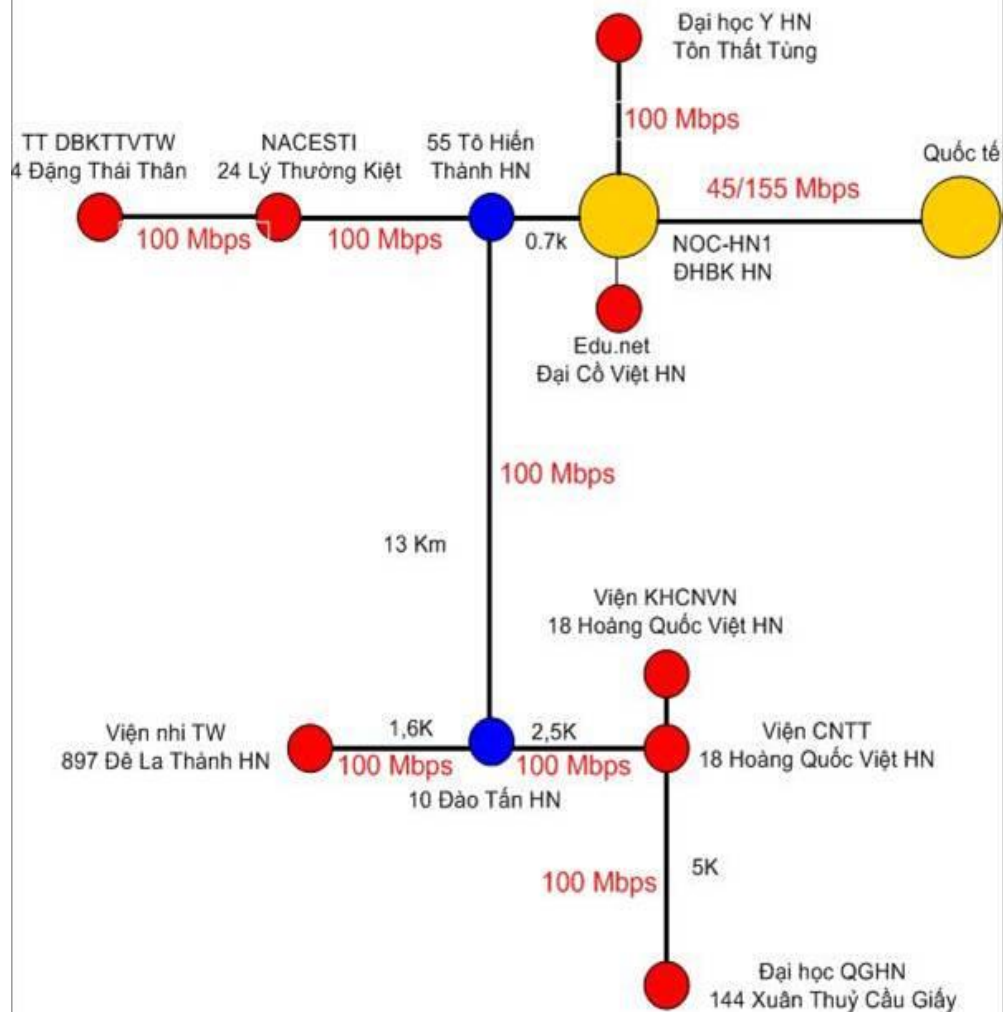
- VNIX

VINAREN/TEIN2





SƠ ĐỒ KẾT NỐI MẠNG CẤP QUANG TẠI HÀ NỘI



ADSL question

- You use ADSL modem to dial up and connect to the Internet. What are LAN, WAN in this scenario?

Reading

- Chapter 1 in textbook
- How the internet came to be – Vinton Cerf