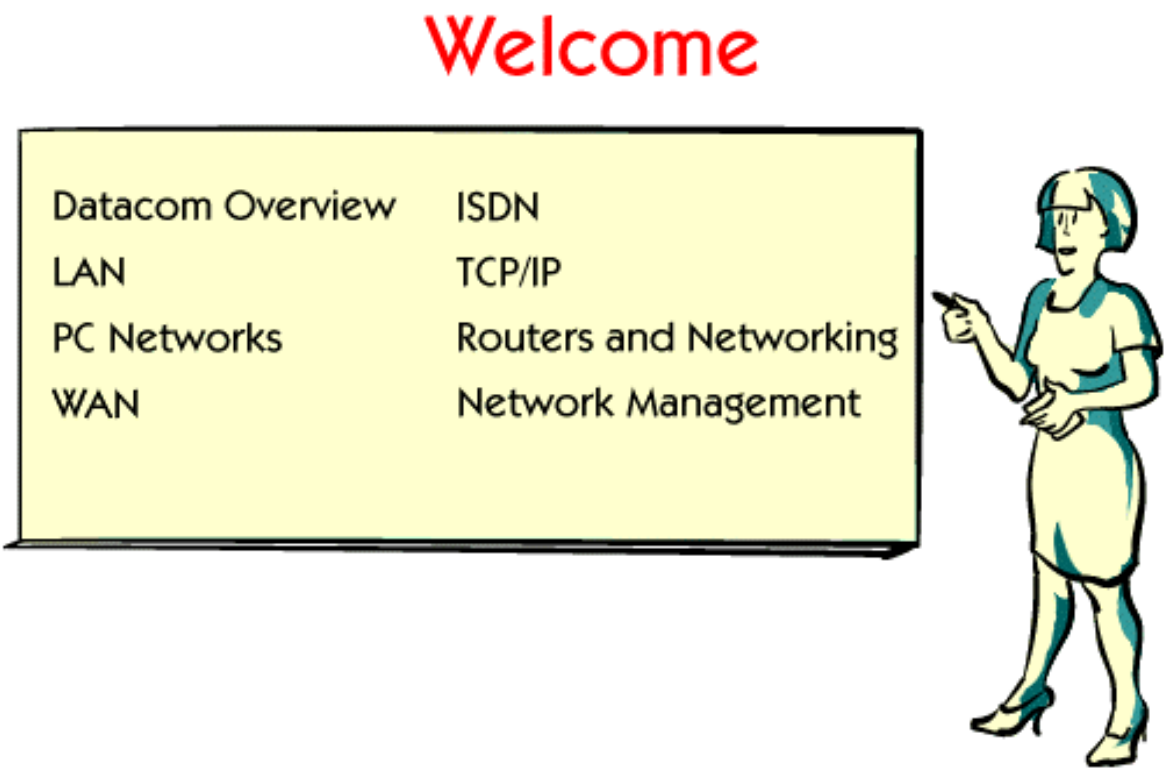
# Ch. 1 - Datacom overview

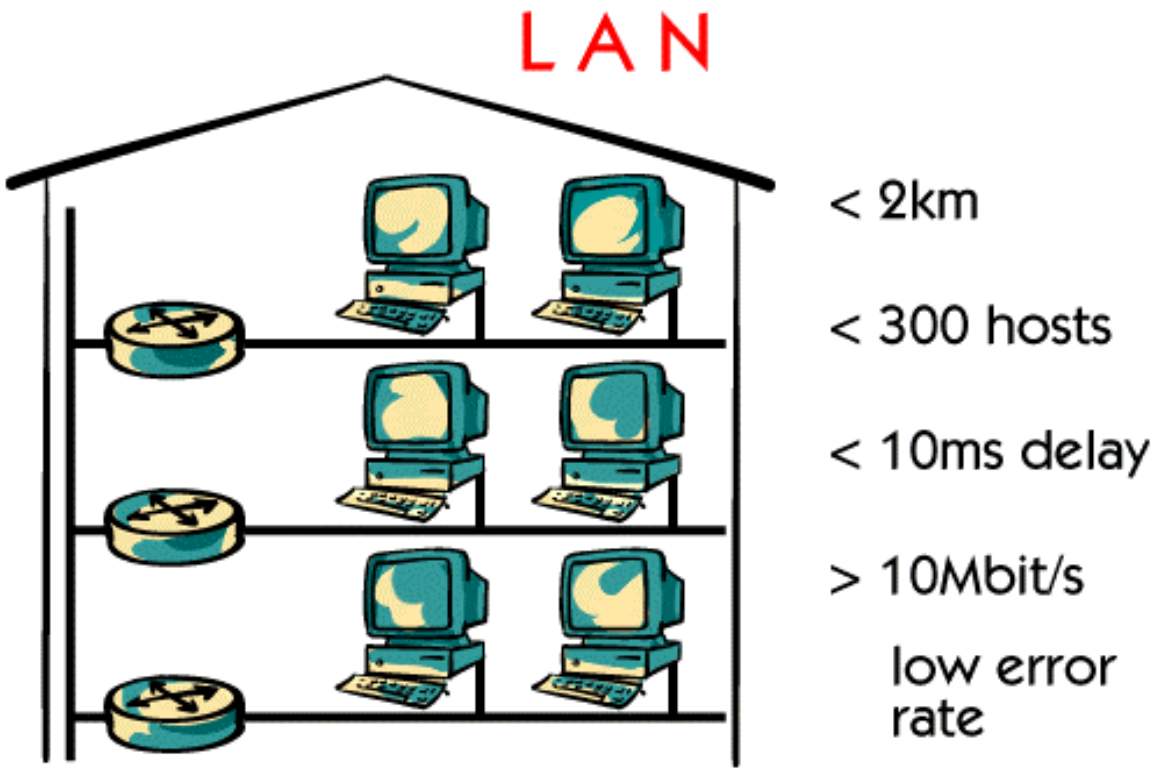



Welcome. This course consists of three parts: Datacom, Internet and Mobile Datacom. In the first part we are going to discuss different techniques for building local and regional networks, an overview of PC-networks and different public networks, such as WAN and ISDN.

We are going to learn about communication architectures such as TCP/IP, which is the most popular and common open architecture on the market. There are implementations of TCP/IP for all types of modern computers, and TCP/IP is the basis of the Internet and many other networks.

Furthermore we are going to discuss routers and networking, which are used to connect different networks with each other.

At the end we are going to learn about network management. How to supervise and configure the entire network with different tools.




LAN, which stands for  Local Area Network, is the local network inside a company or department. On this network you can connect all types of hosts such as workstations, servers, printers and other shared resources.

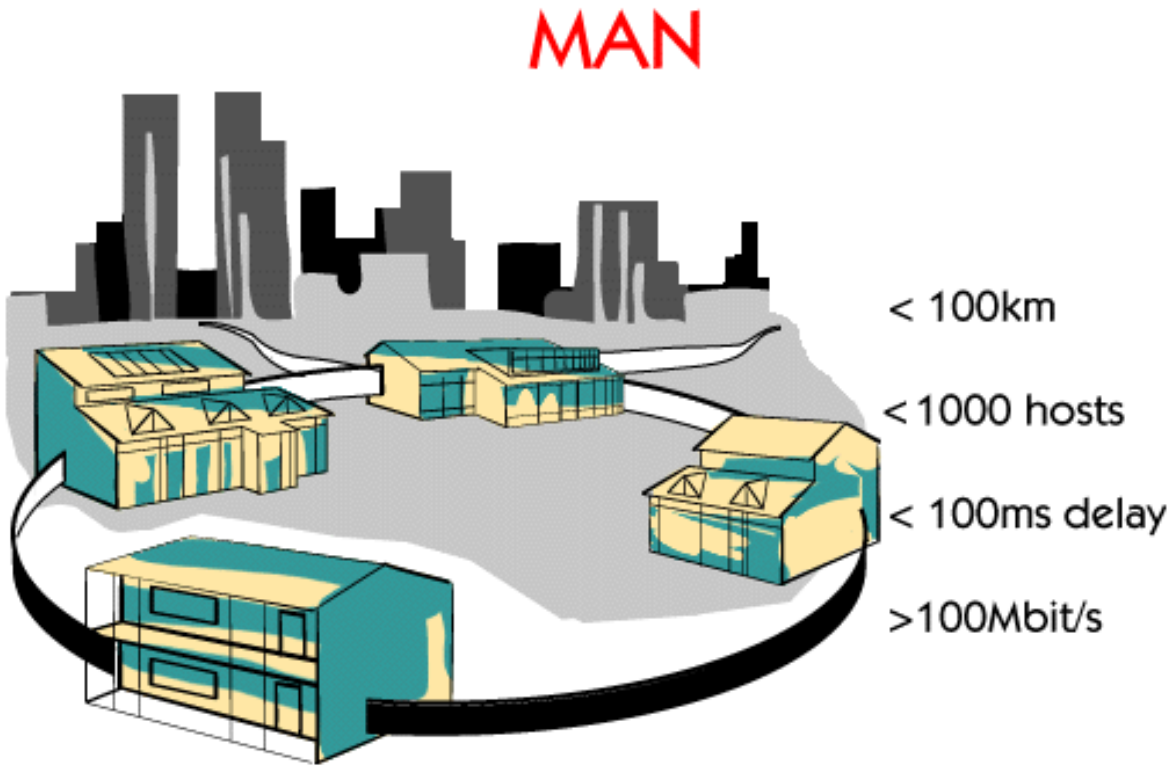
If you want to connect different LANs you have to use a router or a switch .

The most common LAN techniques are Ethernet and Token Ring.

Typical characteristics for LANs are:

- Limited geographic area up to 2 km.
- The number of hosts is less than 300.
- The normal bandwidth is 10 Mbit/s but could also be higher.
- The delay for transmission is less than 10 ms.
- LANs often consist of good quality components which means low error-rate.

In the future we will see LANs with higher bandwidths. Fast Ethernet with 100 Mbit/s exists already today. Gigabit Ethernet with 1000 Mbit/s is a coming standard. ATM is used on LANs, MANs and WANs with bandwidths of 25, 155 and 622 Mbit/s.

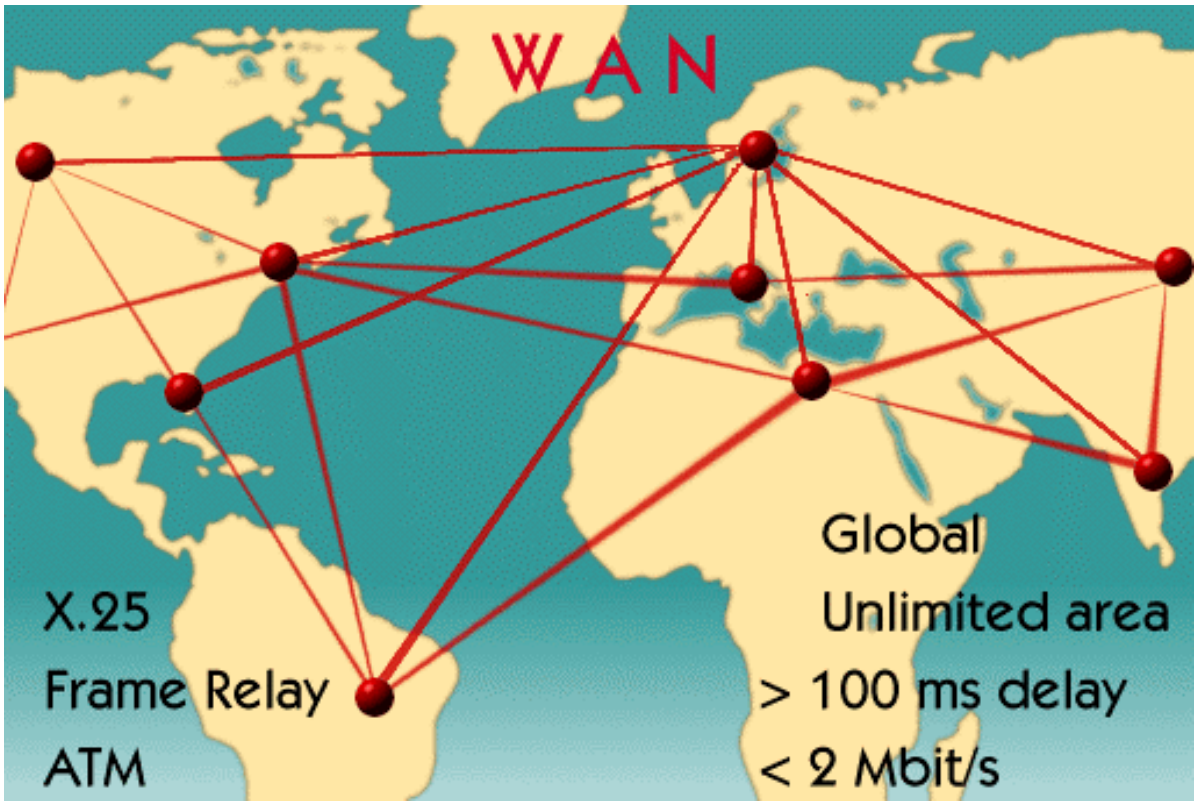



MAN, which stands for Metropolitan Area Network, is a city network that connects different LANs in the same town. FDDI, that stands for Fiber Distributed Data Interface, is a common technique for this.

Typical characteristics for MANs are:

- Limited geographic area up to 100 km.
- The number of hosts is less than 1000.
- The normal bandwidth greater than 100 Mbit/s.
- The delay for transmission is less than 100 ms.

In the future MANs will be based on techniques with higher bandwidth, such as ATM with 622 Mbit/s.




WAN, which stands for Wide Area Network, covers large geographical areas. If a company wants to connect different local branches in different towns they have to use a WAN.

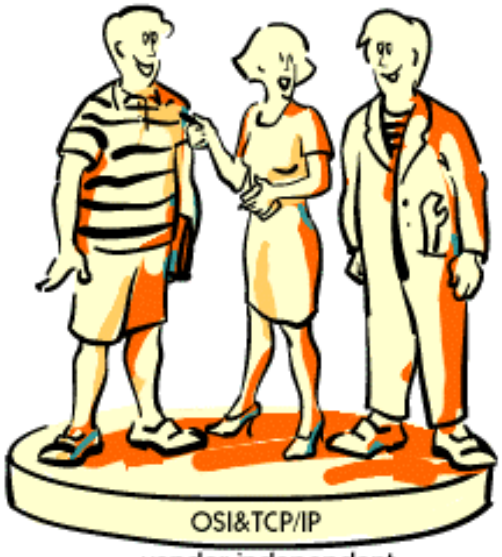
Examples of different WAN techniques are: X.25, Frame Relay and ATM.

Typical characteristics for WANs are:

- Unlimited area
- The normal bandwidth is less than 2 Mbit/s.
- Long delays, more than 100 ms.

# Communication Architectures


vendor specific




vendor independent

With communications architectures we mean a collection of protocols which define how two or more computers shall talk to each other.

There are two types of architectures:

Vendor specific architectures such as SNA from IBM, DNA from Digital and IPX from Novell.

Open architectures are vendor independent and can therefore be used for communication between computers from different manufacturers.

Examples of open architectures are OSI and TCP/IP.

## The OSI Model

| Level | Name | Specifies | Protocol examples |
|---|---|---|---|
| 7 | Application | communication services | telnet,FTP SMTP, X.400,http |
| 6 | Presentation | coding | HTML,ASCII |
| 5 | Session | session handling | netBIOS winsock |
| 4 | Transport | end-to-end packet flow | UDP,TCP, SPX |
| 3 | Network | routing logical-addresses | IP, IPX |
| 2 | Data Link | frame physical-addresses | Ethernet,Token Ring HDLC, PPP |
| 1 | Physical | cabling | V.24, V.35, V.34, G.703 |

It took ISO, the International Organization for Standardization, about 10 years, from 1977 to 1986, to make the OSI model into a standard. This is just a theoretical reference model and it was not tested in the real world.

The OSI model consists of 7 layers.

Layer 1 is called Physical layer. This layer specifies transfer of bits over the physical media. The specification is divided into three areas.

1. Mechanical, which specifies connectors and cables

2. Electrical, which specifies voltage and reference levels.

3. Functional, which specifies handshaking signals.

Examples of Layer 1 standards are V.24, V.35, V.34 and G.703.

Layer 2 is called Data Link layer. This layer specifies frames and physical addresses. Important functions that are specified are:

Error detection, Re-sending, Flow-control and Sequence-control.

Examples of Layer 2 standards are Ethernet, Token Ring, HDLC and PPP.

Layer 3 is called Network layer. This layer specifies routing, logical addresses and fragmentation.

Examples of Layer 3 standards are IP and IPX.

Layer 4 is called Transport layer. This layer specifies end-to-end protocol in a session.

Examples of Layer 4 standards and protocols are UDP, TCP and SPX.

Layer 5 is called Session layer. This layer specifies session handling. This involves control that the session is not terminated before all data is transfered and special messages for recovery of a crashed session.

Examples of Layer 5 standards and protocols are NetBIOS and Winsock.

Layer 6 is called Presentation layer. This layer specifies coding, that is transformation to common representation of data

Examples of Layer 6 standards are HTML and ASCII.

Layer 7 is called Application layer. This layer specifies communication services such as E-mail, File transfer and Telnet,

Examples of Layer 7 standards and protocols are http, telnet, FTP, SMTP and X.400.