

# Communication & Information Systems



# Centralised processing systems

- Large central mainframe the norm into the seventies
  - All processing carried out on the central machine
  - Only on-line access was via 'dumb' terminals
    - i.e. no processor of their own
- This kind of system less common, but still exists for some applications
  - e.g. ATM systems in banks
  - Central system allows access from any terminal in the country
  - The remote terminals are not dumb terminals
    - they have processors which control cash dispensing and permit customer queries

# Dispersed systems

- With cheaper hardware, processing power moved to users' desks
- In the 80s standalone computers appeared throughout large companies
- Word processing and spreadsheet packages became very popular
- Shortcomings of these systems:
  - Computers could not communicate with one another
  - Many companies – even very large ones – had no policy to control purchase of these systems
    - Work was often duplicated
    - Expertise was not necessarily shared within a company

# Networks

- **Nowadays, such microcomputers would be linked on a network**
  - **Via a combination of cables and telecommunications**
- **These systems form what are known as distributed systems**
- **The main types of network are:**
  - **Local area networks (LANs)**  
group of linked computers on same site, connected by cables
  - **Wide area networks (WANs)**  
link whole organisations for communication and data exchange, countrywide or worldwide
  - **Public networks**  
e.g. The Internet, BT's Home Campus, or MSN

# Local area networks (LANs)

- **Advantages over standalone systems:**
  - Shared use of hard disk space and peripherals such as scanners and printers
  - Comms. between users becomes possible.
    - Software such as Lotus Notes even allows users to work on the same document at the same time
  - Software can be loaded once on the file server and be available to all users
    - Upgrades are then much more straightforward
  - All users can have access to a database
  - Backup of server data can be controlled easily and processed every night
- Many LAN systems will have a **gateway** (hardware and software) to allow access to other networks

# Network types

## ■ Client-server

### ■ Most networks use a client-server system

- The 'clients' are PCs with their own processors
- They are connected to a file server which holds software and data
- Software is downloaded into client RAM
- Print server for printing tasks – queue system
- Processing power and data may be distributed across various machines on the network
- Backup and security handled by server

## ■ Peer-to-peer configurations

### ■ For small networks – up to 10 computers

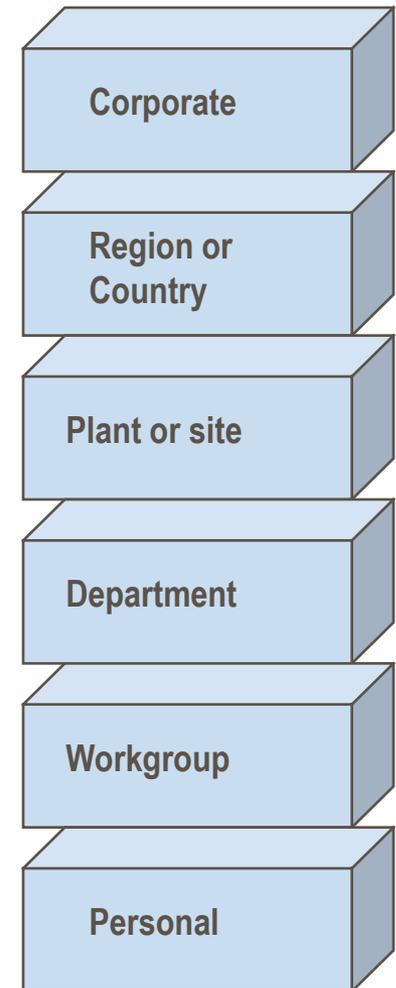
- No single computer in control
- Software on any machine is available to all other machines
- Enables small offices to share disk space, software and data
- Any more machines and the processes would slow down too much

# Wide area networks (WANs)

- Allow data exchange and communications between separate networks
  - Either within the same organisation
  - Or between different organisations
- Examples are systems that allow
  - Airline tickets to be booked
  - Credit card transactions to be made

# Distributed processing

- Minicomputers and microcomputers replaced central mainframes
- They directly serve local and regional branches
- Data can be passed to regional and HQ offices
- Decisions to be made:
  - Location of processing power and databases
  - How to connect the nodes
  - What levels to place systems at
    - Large companies may have several layers of systems to cater for global requirements



# Distributed databases

- Early systems had a single centralised database
- Gradually databases created locally
- Local branches still need access to main company database
- Global access becomes very expensive
- Central database gets distributed to local systems
- Software needed to maintain integrity of database
  - Separate versions of database
  - Security considerations
- A distributed database is one that is stored in more than one physical location

# Methods of distributing database

- 1. Central database can be partitioned**  
each remote processor has the data on its own customers, stock, etc.
- 2. Entire database is duplicated at each remote site.**  
In both cases, the two databases have to be reconciled - usually by updating the central database each night
- 3. Central database contains only an index to entries which are held on local databases.**  
This system is used for very large databases  
A variation of this system is not to hold an index, and to simply poll all remote databases until the required record is found. The complete record is then transferred to the local computer that requests it.

# Distributed databases

## ■ Advantages

- reduce the dependence on a single, central database.
- increase responsiveness to local users' and customers' needs

## ■ Limitations

- dependent on powerful and reliable telecoms systems
- local databases can sometimes depart from central data definitions and standards,
- security can be compromised when distribution widens access to sensitive data.

- Despite the drawbacks, distributed processing is growing rapidly. For large organisations operating on several sites, the question is not *whether* to distribute but *how* to distribute.

# Use of telecommunications

- **Rapid development of comms. has changed the way that businesses operate**
  - Speed and efficiency of operations has improved
  - Management can be more effective
  - Better services to customers
- **Examples of business changes:**
  - **Electronic transfer of documents allows orders to be processed faster**
    - no dependence on postal service
  - **Internet-based order systems allow 'just-in-time' despatch**
    - goods despatched direct from supplier – no stock has to be held
    - order-tracking possible on internet
  - **Advertising sales force equipped with laptops allowing direct access to sales systems and corporate databases**
    - approved advertising copy can be sent direct to production department

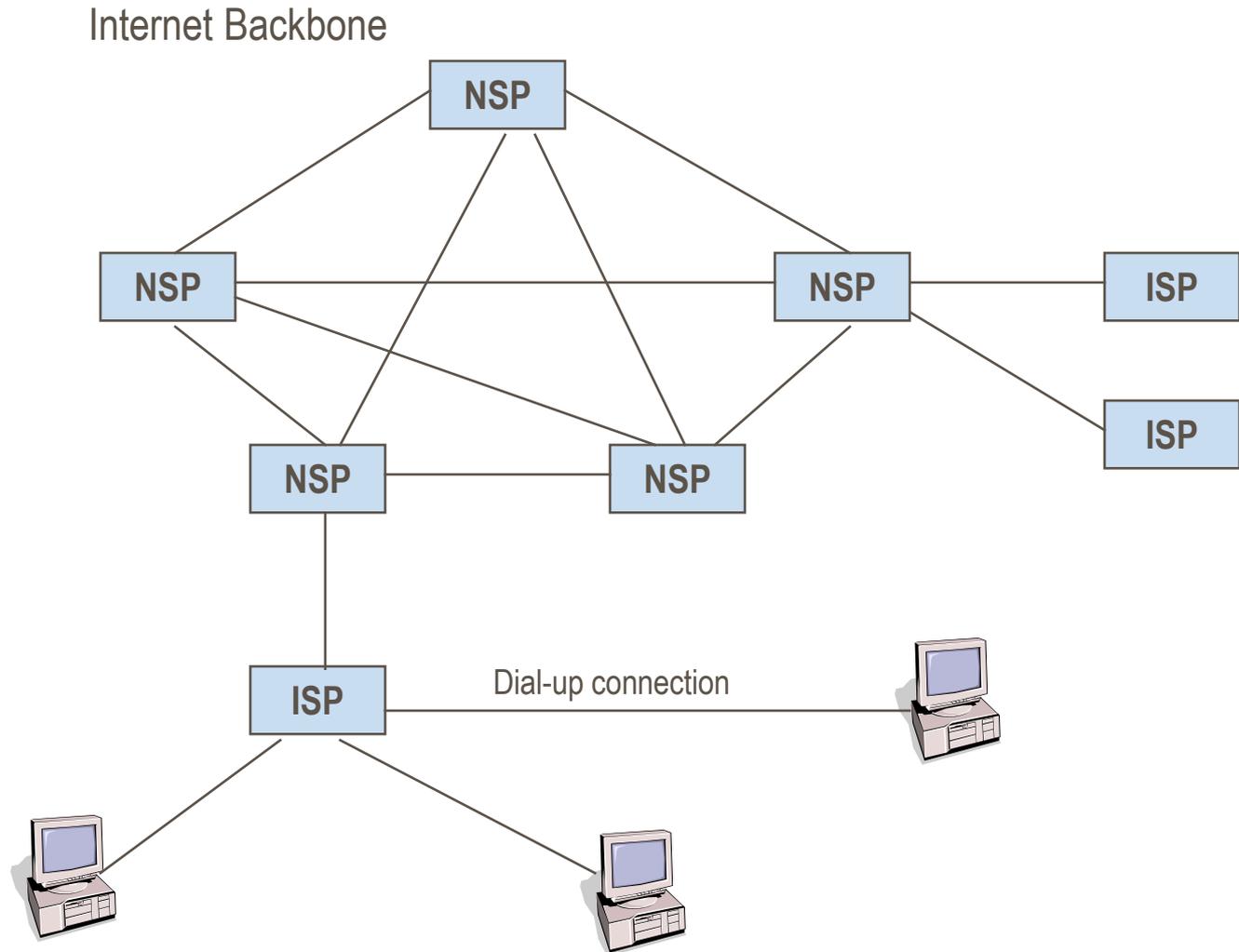
# Internet and World Wide Web

- Internet is the ultimate WAN – network or networks
- Originally conceived by the Advanced Research Projects Agency (ARPA) of the US government in 1969
  - first known as the ARPANet and consisted of 4 computers
  - The original aim was to create a network that would allow users of a research computer at one university to be able to "talk to" research computers at other universities
- By 1997, it included 1.7 million computers and continues to grow exponentially

# Internet Structure

- Cables, wires and satellites form an interlinked communications network
- Data is transmitted from one link to another along the best possible route
- If some links are overloaded or out of service, data can be rerouted through different links
- Major links are called the Internet Backbone
  - A handful of network service providers (NSPs) (e.g. BT) maintain a series of nationwide links
  - Links are like pipes – data flows through the pipes
  - NSPs are continually adding links with extra capacity to cater for increased Internet use
- Individually, we connect to the Internet via an ISP (Internet Service Provider) which in turn connects to the backbone

# Internet Structure



# Other Internet features

## ■ ISPs

- Some are free – although many charge a monthly fee
- Requirements
  - Computer
  - Modem
  - Phone line
- A normal phone line does not provide particularly fast access to the internet – 56K bps

## ■ World Wide Web

- This is a particular part of the internet which allows users to view information stored on participating computers
- Information is stored on pages which can be accessed directly, or via hypertext links

# Servers and Routers

- **Servers**
  - hold data files
  - data exchanged as packets (PSS)
- **Routers**
  - connect similar networks
- **Gateways**
  - connect dissimilar networks

# Routers

