# Computing Models

- Mainframe
- Islands of computing
- LANS
- WANS

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# Mainframe

- Centralised processing
- Decentralised terminals

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# Islands of computing

- Typified by collections of PCs
- Connected by "sneaker net"

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# LANS

- Computers (PCs, workstations) connected by ethernet
- Typically used for file sharing, email

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# WANS

- Typically connections between LANS
- Allows connectivity across entire enterprise

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# Downsizing

- The cost of a mainframe MIP is very high
- The cost of a PC or workstation MIP is very low
- Moving computing off the mainframe can reduce costs
- Moving all computing off the mainframe can result in duplicated databases, etc.

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# Distributed Computing

- A Distributed Computing System is a set of computers connected in some way (serial lines, ethernet, ATM, etc)
- Each computer is able to communicate with some of the others
- Programs running on each computer are able to share information and request tasks to be executed

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# Client Server

- A Client Server System is more structured than general distributed computing
- A client sends request to servers to execute tasks
- The tasks may be just to provide information, or to perform a complex computation (perhaps returning information)
- Client and servers are asymmetric
- A server may be a client of another server

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# Client Server Properties

- Clients and servers are separate processes
- They may run on the same or different machines
- Each process can hide internal information
- Each process can implement its own set of business rules
- They communicate by peer to peer protocols



# Common Terms

- Interoperability
- Portability
- Integration
- Transparency
- Security



# Interoperability

- Allows different systems to exchange meaningful information
- Requires standard exchange formats
- Requires standard message formats



# Portability

- A system in one environment can be installed in another
- Can be within the same hardware environment
- Can be within the same Operating System environment
- Can be within the same network environment
- Can be within the same database environment

# Integration

- Share and exchange information without external intervention
- Consistency of behaviour and presentation

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# Transparency

- The user can read data from a site without knowing where it is
- The user can update data without knowing whether it is duplicated or not
- Tasks can be executed at various sites without the user knowing where they are
- Failures are dealt with

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# Security

- Users are protected against other users
- Users are protected against external agents
- Communications mechanisms are protected against snooping
- Communications mechanisms are protected against tampering
- Management has adequate access to user and system data

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# Examples of Client Server

- finger
- time
- telnet
- ftp
- NFS
- X Window System
- Gopher
- WAIS
- World Wide Web

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# Finger

- A server machine runs a server process fingerd
- A client sends a single message and gets a single reply
- A client message may have no contents, and the return message is the list of people logged on
- A client message may identify a user, and the reply is information about that person

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# time

- A client message has no contents, and gets a reply of the local time on the server

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# telnet

- telnet is a terminal emulator
- telnet establishes a connection between client and server, and messages pass both ways across this connection
- The client has a local display on the client machine
- The client sends messages to the server that is the input from the user
- The server runs a comand interpreter on the server and passes the input to it
- Output from the server is returned to the client for display

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# NFS (Network File System)

- NFS allows files on a server to be accessed across the network
- A message from a client is to send a section of a file
- The reply from the server is the relevant section
- Alternatively, the client message may be a write message plus the bytes to be written

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# X Window System

- X is the window system of Unix
- X inverts the client/server model: a client is an application, the server is a graphics server with a user
- A client prepares a graphics message such as CreateWindow
- The server is repsonsible for creating and drawing the window
- User events such as key presses are sent from the graphics server to application client

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# WAIS

- Wide Area Information System
- Each server has a set of free-text documents
- The server indexes the documents
- A client requests a free-text search for keywords
- The server returns a list of matching documents, or the documents themselves

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# Gopher

- Gopher maintains a set of documents in a tree hierarchy
- A client can request a document in the tree

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# World Wide Web

- The Web is a graph of documents
- A server maintains a local set of documents
- On request it returns a document
- The documents may be text, images, sounds, programs, movies.
- CGI scripts from the client request programs to be run on the server side.

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# Advantages of Client Server

- Exploits existing h/w s/w configurations
- Matches distributed business models
- Scalable
- The network is the computer

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# Disadvantages of Client Server

- Harder to build
- Less stable
- Susceptible to network load
- Lacking in specialists
- Difficult to debug
- Difficult to test

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