

#### Distributed Systems Architectures

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 Architectural design for software that executes on more than one processor

Design issue	Description design
Resource identification	The resources in a distributed system are spread across different computers and a naming scheme has to be devised so that users car discover and refer to the resources that they need. An example of such a naming scheme is the URL (Uniform Resource Locator) that is used to identify WWW pages. If a meaningful and universally understood
	identification scheme is not used then many of these resources will be inaccessible to system users.
Communications	The universal availability of the Internet and the efficien implementation of Internet TCP/IP communication protocols means that, for most distributed systems, these are the most effective way for the computers to communicate. However, where there are specific requirements for performance, reliability etc. alternative approaches to communications may be used.
Quality of service	The quality of service offered by a system reflects its performance, availability and reliability. It is affected by a number of factors such as the allocation of processes to processors in the system, the distribution of resources across the system, the network and the system hardware and the adaptability of the system.
Software architectures	The software architecture describes how the application functionality is distributed over a number of logical components and how these components are distributed across processors. Choosing the right architecture for an application is essential to achieve the desired quality of service.

#### **Topics covered**

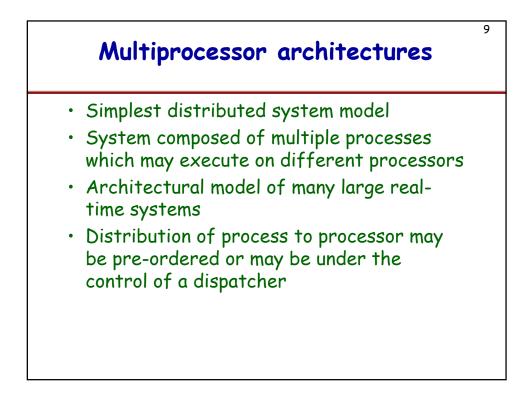
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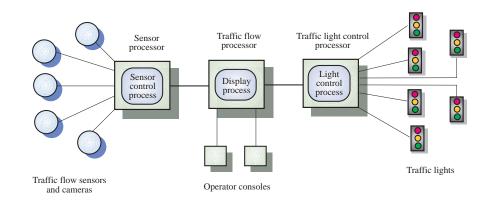
- Multiprocessor architectures
- Client-server architectures
- Distributed object architectures
- · CORBA

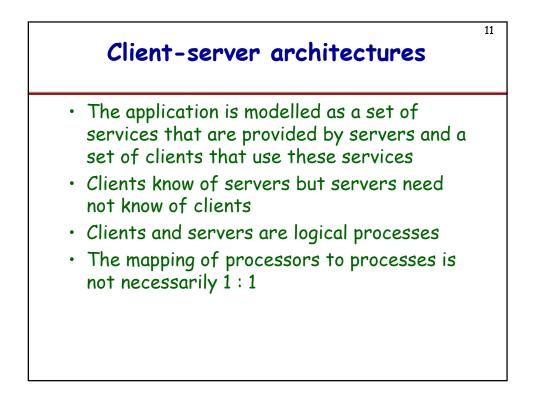
#### Distributed systems architectures

- Multiprocessor architectures
  - System composed of multiple processes that may execute on different processors
- Client-server architectures
  - Distributed services which are called on by clients. Servers that provide services are treated differently from clients that use services
- Distributed object architectures
  - No distinction between clients and servers. Any object on the system may provide and use services from other objects

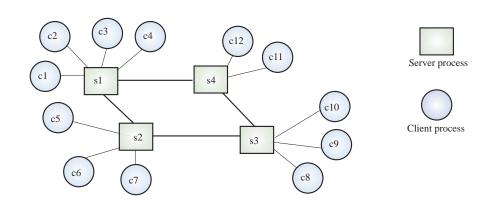


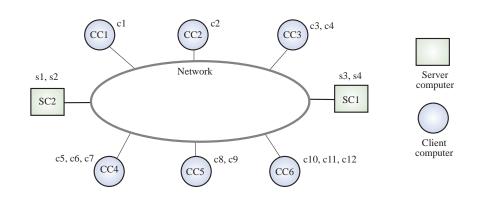
#### A multiprocessor traffic control system

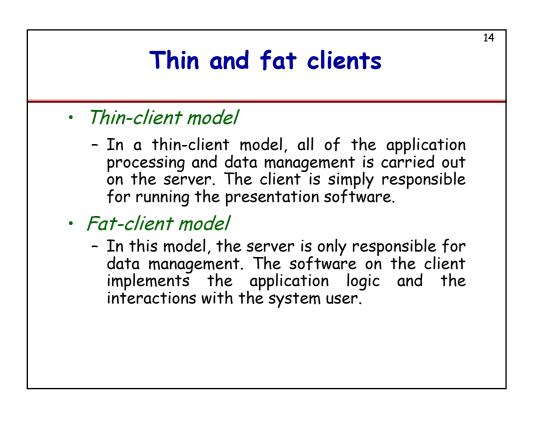




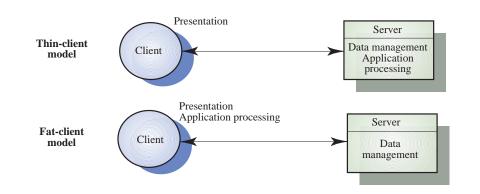
#### A client-server system

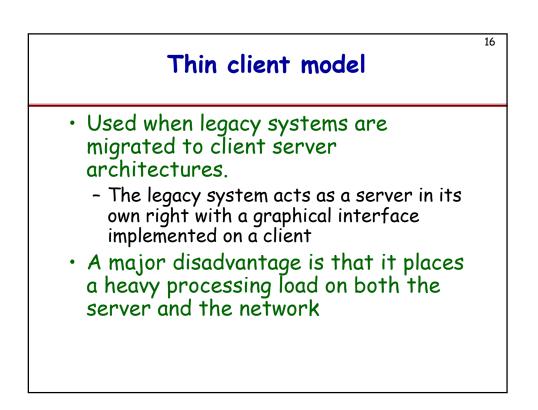


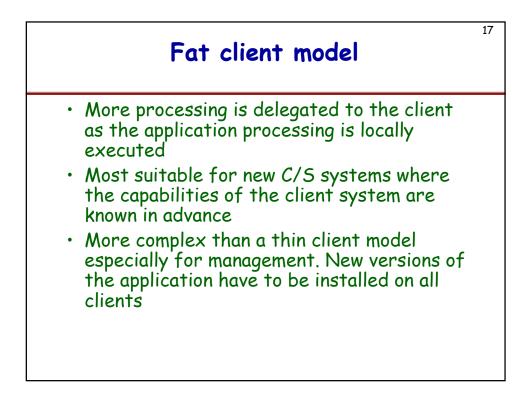




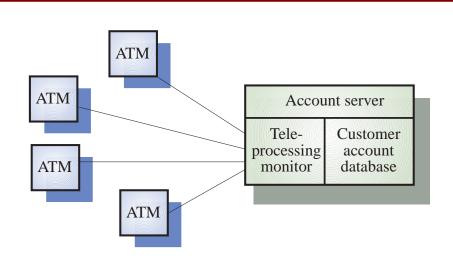
#### Thin and fat clients

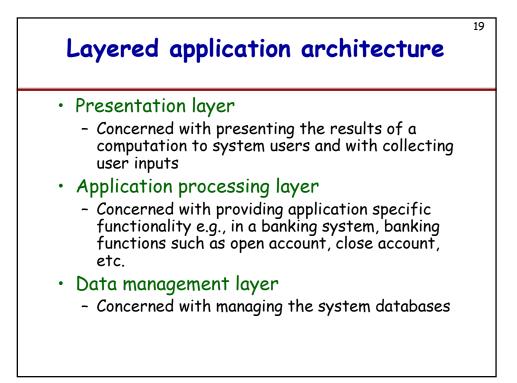




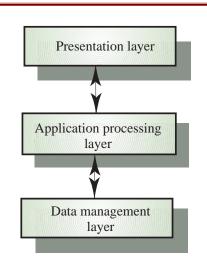


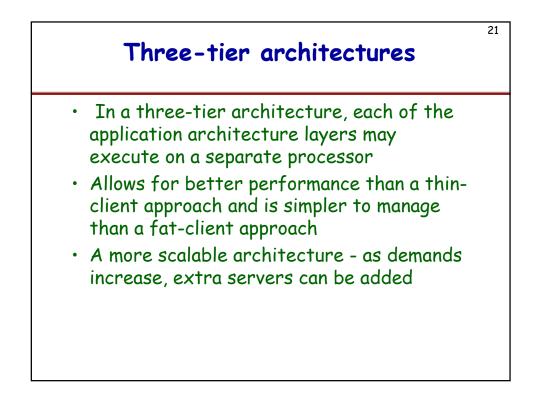
#### A client-server ATM system



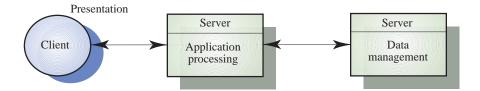


#### **Application layers**

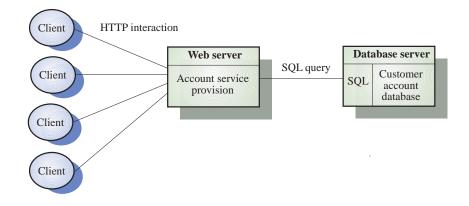




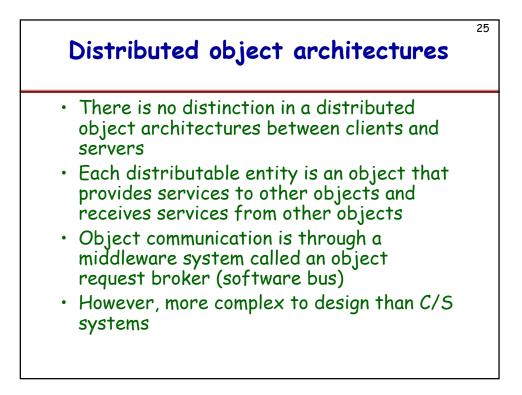
## A 3-tier C/S architecture



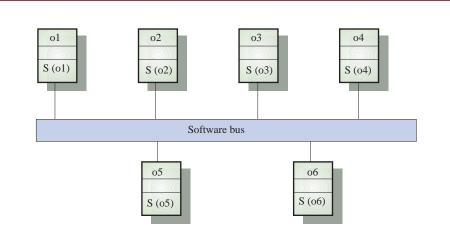
# An internet banking system



Use of C/S architectures	
Architecture	Applications
Two-tier C/S architecture with	Legacy system applications where separating application processing and data management is impractical
thin clients	Computationally-intensive applications such as compilers with little or no data management
	Data-intensive applications (browsing and querying) with little or no application processing.
Two-tier C/S architecture with	Applications where application processing is provided by COTS (e.g. Microsoft Excel) on the client
fat clients	Applications where computationally-intensive processing of data (e.g. data visualisation) is required.
	Applications with relatively stable end-user functionality used in an environment with well-established system management
Three-tier or multi-tier C/S architecture	Large scale applications with hundreds or thousands of clients Applications where both the data and the application are volatile.
	Applications where data from multiple sources are integrated



#### Distributed object architecture



## Advantages of distributed object architecture

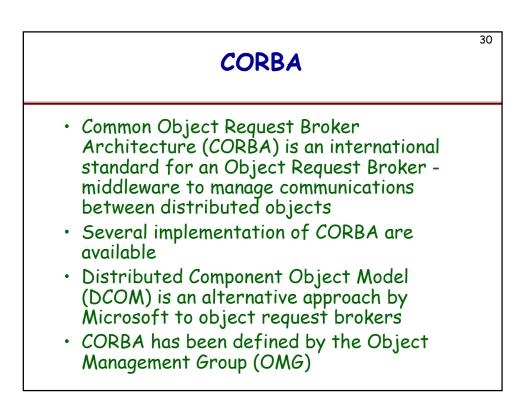
- It allows the system designer to delay decisions on where and how services should be provided
- It is a very flexible and scaleable system architecture that allows new resources to be added to it as required
- It is possible to reconfigure the system dynamically with objects migrating across the network as required

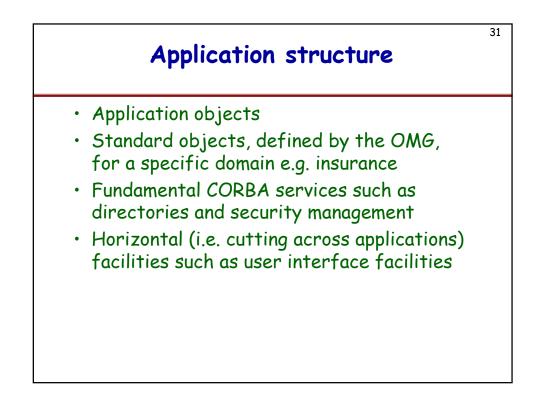
## Uses of distributed object architecture

- As a logical model that allows you to structure and organize the system. In this case, you think about how to provide application functionality solely in terms of services and combinations of services
- As a flexible approach to the implementation of client-server systems. The logical model of the system is a clientserver model but both clients and servers are realized as distributed objects communicating through a software bus

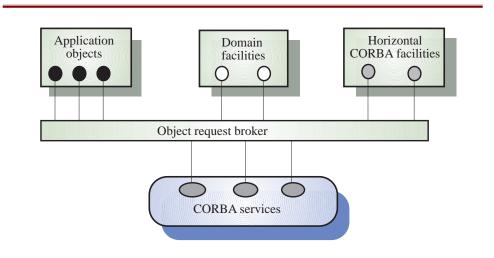
#### Middleware

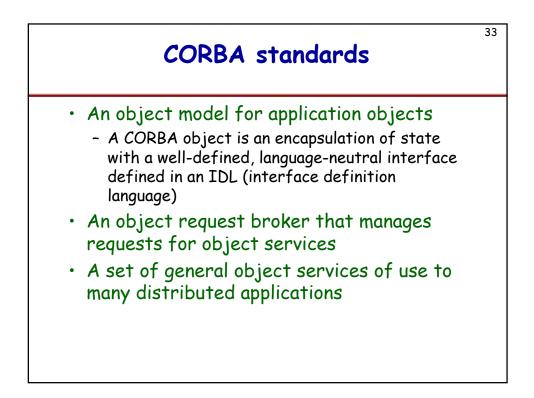
- Software that manages and supports the different components of a distributed system. In essence, it sits in the *middle* of the system
- Middleware is usually off-the-shelf rather than specially written software

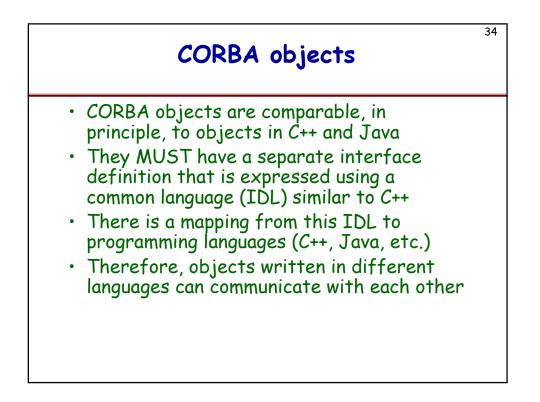


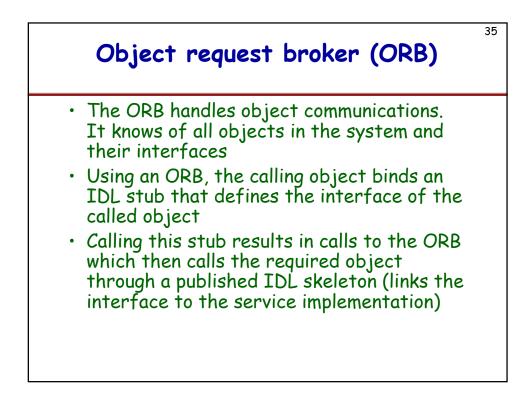


## **CORBA** application structure

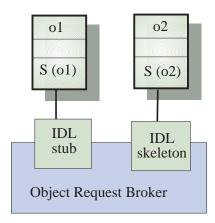


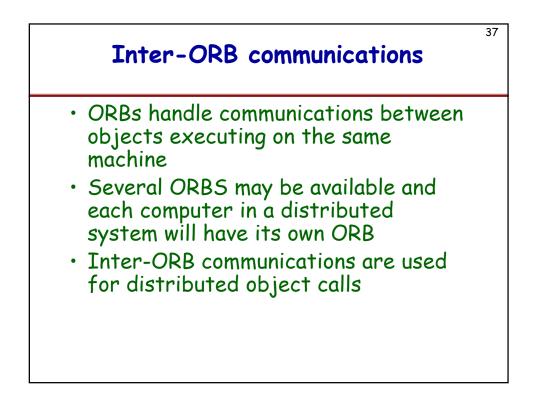






#### **ORB-based** object communications





**Inter-ORB** communications

