

Application Architecture

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Design Checklist

- Before selecting application architecture, the analyst must consider the following issues:
 - ◆ Enterprise resource planning
 - ◆ Initial cost and Total Cost of Ownership (TCO)
 - ◆ Scalability
 - ◆ Web integration
 - ◆ Legacy interface requirements
 - ◆ Security
 - ◆ Processing options

Enterprise Resource Planning (ERP)

- ERP defines a specific architecture, including standards for data processing, network, and user interface design.
- In a dynamic, highly competitive economy, ERP can help companies achieve faster response, better customer service, and lower operating costs.

Initial cost and Total Cost of Ownership (TCO)

- Review all previous cost estimates.
- Re-analyze system requirements and alternatives now, before proceeding to design the application architecture

Scalability

- The measure of a system's ability to expand, change, or downsize easily to meet the changing needs of a business enterprise.
- It is especially important in implementing systems that are volume-related, such as transaction processing systems.

Web Integration

- A Web-centric architecture follows Internet design protocols and enables a company to integrate the new application into its e-commerce strategy.

Legacy Interface Requirements

- The new system might have to interface with one or more legacy systems, which are older systems that typically run on mainframe computers.

Security

- System security is a concern at every stage of application development and design.
- As the logical and physical design is translated into specific hardware and software, the systems analyst must consider security issues and determine how the company will address them.

Processing Options

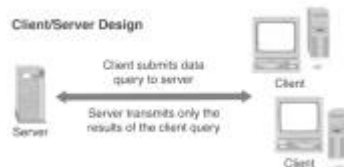
- How the new application will process data affects the physical design.
- If system updates, file maintenance, or batch processing can be done at off-peak times, costs will be lower.

Planning the Architecture

- Every information system involves three main functions:
 - ◆ Data storage and access methods.
 - ◆ Application programs to handle the processing logic.
 - ◆ An interface that allows users to interact with the system.
- Depending on the architecture, the three functions are performed on a server, on a client, or are divided between the server and the client.

Client/server Architecture

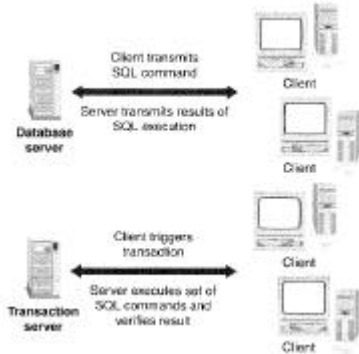
- A systems that divide processing between one or more networked clients and a central server.
- The data file is not transferred from the server to the client
 - ◆ Only the request and the result are transmitted across the network.



Some Major differences between Client/Server and Mainframe Systems.

CHARACTERISTICS OF CLIENT/SERVER VERSUS MAINFRAME SYSTEMS		
Characteristics	Client/Server	Mainframe
Basic architecture	Very flexible	Very rigid
Application development	Flexible Fast Object-oriented	Highly structured Slow Traditional
User environment	PC-based GUI Empowers the user Improves productivity	Uses terminals Text interface Constrains the user Limited options
Security and control features	Decentralized Difficult to control	Centralized Easier to control
Processing options	Can be shared and configured in any form desired	Cannot be modified
Data storage options	Can be distributed to place data closer to users	All data is stored centrally
Hardware/software utilization	Very flexible Multivendor model	Very rigid Single proprietary vendor

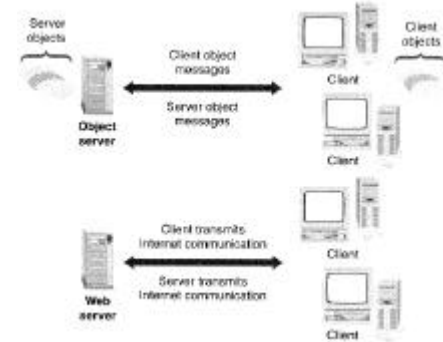
Client/Server Design Styles



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Client/Server Design Styles



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Types of Clients

- A fat client, also called a thick client, design locates all or most of the application processing logic at the client.
- A thin client design locates all or most of the processing logic at the server.

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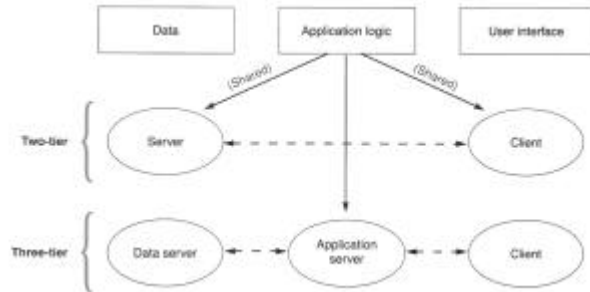
Fat Client vs. Thin Client

Characteristic	Fat Client	Thin Client
Network traffic	Higher, because the fat client must communicate more often with the server to access data and update processing results.	Lower, because most interaction between code and data takes place at the server.
Performance	Slower, because more network traffic is required.	Faster, because less network traffic is required.
Initial cost	Higher — more powerful hardware is required.	Lower — workstation hardware requirements are not as stringent.
Maintenance cost	Higher, because more program code resides on the client.	Lower, because most program code resides on the central server.
Ease of development	Easier, because systems resemble traditional file-server designs where all processing was performed at the client.	More difficult, because developers must optimize the division of processing logic.

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Client/Server Tiers



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Two-tier Design

- In a two-tier design, the user interface resides on the client, all data resides on the server, and the application logic can run either on the server, on the client, or be divided between the client and the server.

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Three-tier Design

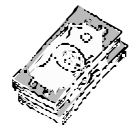
- In a three-tier design, the user interface runs on the client and the data is stored on the server, just as with a two-tier design.
- A three-tier design also has a middle layer between the client and server that processes the client requests and translates them into data access commands that can be understood and carried out by the server.

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Cost-Benefit Issues

- To support business requirements, information systems need to be scalable, powerful, and flexible.
- For most companies, client/server systems offer the best combination of features to meet those needs



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Client/Server Performance Issues

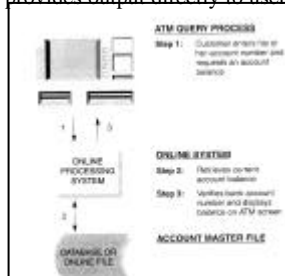
- Client/server systems must be designed so the client contacts the server only when necessary, and makes as few trips as possible.

Processing Methods

- In selecting an application architecture, the systems analyst must determine whether the system will be an online system, a batch processing system, or a combination of the two.

Online Processing

- An online system handles transactions when and where they occur and provides output directly to users.



Characteristics of Online Processing System

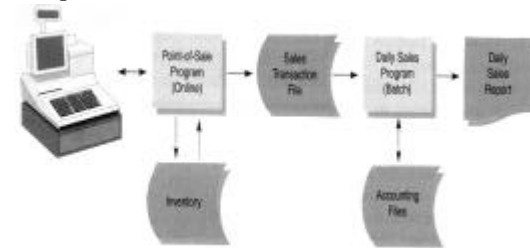
- The system processes transactions completely when and where they occur.
- Users interact directly with the information system.
- Users can access data randomly.
- The information system must be available whenever necessary to support business functions

Batch Processing

- In a batch processing system, data is collected and processed in groups, or batches.

Combined Online and Batch Processing

- Even an online system can use batch processing to perform certain routine tasks.



Network Models

- When planning a network design, you must consider Network Topology, Protocols, and Licensing Issues.
- You also must consider System Performance, Security, and Interruption Issues.

Network Topology

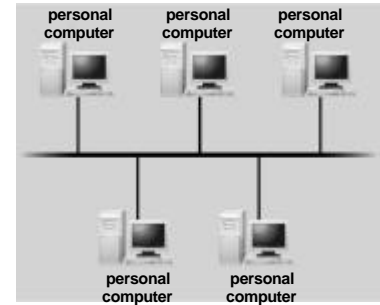
- Hierarchical Network
 - ◆ In a hierarchical network, one computer (typically a mainframe) controls the entire network.
- Bus Network
 - ◆ In a bus network, a single communication path connects the mainframe computer, server, workstations, and peripheral devices.

Network Topology

- Star Network
 - ◆ A star network has a central computer with one or more workstations connected to it that forms a star.
- Ring Network
 - ◆ A ring network resembles a circle of computers that communicate with each other.

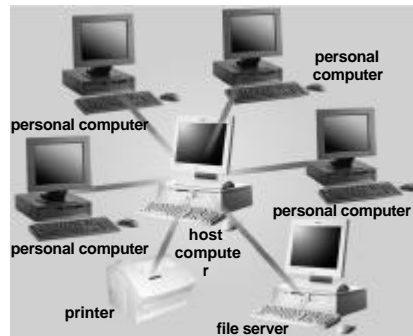
Bus network

- Consists of a single central cable, to which all computers and other devices connect
- Bus is physical cable or backbone
- Inexpensive and easy to install



Star network

- All devices connect to a central computer, called the hub
- All data transferred from one computer to another passes through hub



Ring network

- Cable forms closed ring, or loop, with all computers and devices arranged along ring
- Data travels from device to device around entire ring, in one direction



Network Protocols

- TCP/IP (Backbone of the Internet)
- NetBIOS (A popular protocol for LANs)
- IPX/SPX (Used by Novell Corporation for its NetWare products)

Licensing Issues

- When considering a network design, it is important to take into account software licensing restrictions.

Modeling Application Architecture

- Multipurpose drawing tools are available to construct the application architecture.
 - ◆ Example: Microsoft Visio



System Management and Support

- The information system design must include provision for system management and support tools to monitor system performance, maintain system security, and deal with system interruptions - from fault management to disaster recovery.

Performance Management

- To monitor system usage, capacity and trends. Performance management also can include fine-tuning the network configuration or software settings to optimize performance.

System Security

- Maintaining system security involves two main tasks.
 - ◆ Provisions to assign and monitor user IDs, passwords, and access levels.
 - ◆ Handle virus protection and detect any unauthorized access.

Fault Management, Backup And Disaster Recovery

- An overall backup and recovery plan often is called a disaster recovery plan.

Fault Management

- Monitoring the system for signs of trouble, logging all system failures, diagnosing the problem, and applying corrective action.

Backup and Disaster Recovery

- Backup refers to copying data continuously, or at prescribed intervals.
- Recovery procedures involve restoring the data and restarting the system after an interruption.

Systems Design Completion

- The final activities in the systems design phase are:
 - ◆ Preparing a system design specification,
 - ◆ Obtaining user approval, and
 - ◆ Delivering a presentation to management.

System Design Specification

- The system design specification is a document that presents the complete design for the new information system along with detailed costs, staffing, and scheduling for completing the next SDLC phase - systems implementation.

System Design Specification

- A typical system design specification uses the following structure:
 1. Management Summary
 2. System Components Details
 3. Environmental Requirements
 4. Implementation Requirements
 5. Time and Cost Estimates
 6. Appendices

Management Summary

- Overview of the project for company managers and executives .

System Components Details

- Includes the user interface, outputs, inputs, files, databases, network specifications. source documents, report and screen layouts, DFDs and 0-0 diagrams.

Environmental Requirements

- Describes the constraints affecting the system, , including any requirements that involve operations, hardware, systems software, or security.

Implementation Requirements

- Specify start-up processing, initial data entry or acquisition, user training requirements, and software test plans.

Time and Cost Estimates

- This section provides detailed schedules, cost estimates, and staffing requirements.

Appendices

- Include copies of documents from the first three phases if they would provide easy reference for readers.

User Approval

- Users must review and approve the interface design, report and menu designs, data entry screens, source documents, and other areas of the system that affect them.
- Other IT department members also need to review the system design specification:
 - ◆ IT management
 - ◆ The programming team
 - ◆ The operations group

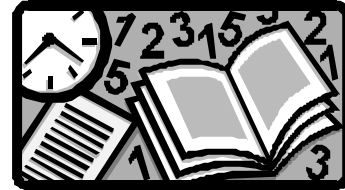
Presentations

- The presentations give you an opportunity to explain the system, answer questions, consider comments' and secure final approval.

Presentations

- First Presentation
 - ◆ To systems analysts, programmers, and technical support staff members
- Second Presentation
 - ◆ To department managers and users from departments affected by the system.
- Final Presentation
 - ◆ To company management.

Some Technical Keywords



Remember these
Keywords



Middleware

- Middleware is software that connects dissimilar applications and enables them to communicate and exchange data.

Server

- A server is a computer that supplies data, processing services, or other support to one or more computers, called clients

Client

- As PC technology exploded in the mid-1980s, microcomputers quickly appeared on corporate desktops.
- Users found that they could run their own word processing, spreadsheet, and database applications, without assistance from the IT group, in a mode called stand-alone computing.
- Most companies linked the stand-alone computers into networks that enabled the clients to exchange data and perform local processing.

Stand-Alone Computing

- When an individual user works in a stand-alone mode, the workstation performs all the functions of a server by storing, accessing, and processing data, as well as providing a user interface.
- Although PCs improved productivity and allowed users to perform tasks that previously required IT department assistance, stand-alone computing is inefficient, expensive, and raises major concerns about data security, integrity, and consistency.

Server-Based Processing

- Advantage:
 - ◆ Various types of terminals can communicate with the mainframe, and the design is not tied to a specific hardware platform.
- Disadvantage:
 - ◆ Typically uses character-based terminals that provide a limited interface for users. In a server-based system, all data storage, access, and application programs are located on the mainframe.

Client-Based Processing

- In a typical LAN, clients share data stored on a local server that supports a group of users or a department. As LANs became popular, the most common LAN configuration was a file server design.

Local area network (LAN)

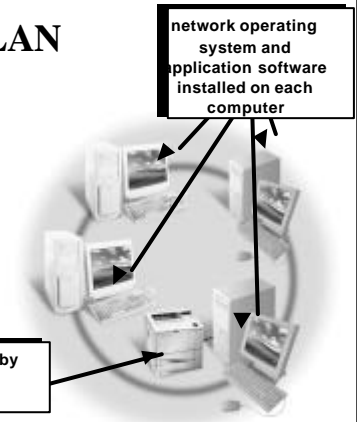
- Network in limited geographical area such as home, school computer laboratory, or office building



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Peer-to-peer LAN

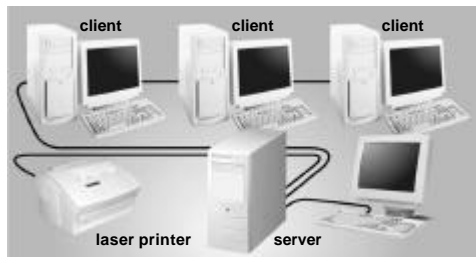
- Small network that shares hardware, data, or information located on any other computer in network
- Each computer stores files on its own storage devices



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Client/server LAN

- Network in which one or more computers act as a server and other computers on the network can request services from server



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Wide area network (WAN)

- Network that covers large geographic area
- Internet is world's largest WAN



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