

## Systems Analysis & Design

CS183 Spring Semester 2008

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Course Textbook:

Systems Analysis and Design With UML 2.0  
An Object-Oriented Approach, Second Edition

Chapter 13:

Physical Architecture Layer Design

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Physical Architecture Layer Design

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## Objectives

- Understand the different physical architecture components.
- Understand server-based, client-based, and client server physical architectures.
- Understand how operational, performance, security, cultural, and political requirements affect the design of the physical architecture layer.

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## Physical Architecture

- Software Components
  - Data Storage
  - Data Access Logic
  - Application logic
  - Presentation logic
- Hardware Components
  - Client computers
  - Servers
  - Connecting network

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## Server Based Architecture

- Client is a terminal
- Server has functions of
  - Presentation logic
  - Application logic
  - Data access logic
  - Data storage

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## Server Based Architecture

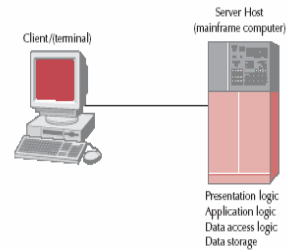


FIGURE 13-1  
Server-Based  
Architecture

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## Client-Server Architectures

- Thin Client/Fat Server
  - Client is little more than a terminal
  - Server handles all processing
- Fat Client/Thin Server
  - Client does all processing
  - Server may just store data

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## Fat (Thick) Client

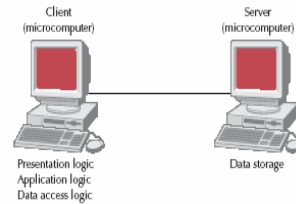


FIGURE 13-2  
Client-based  
Architectures

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## Server has Data

### 2-Tiered Architecture

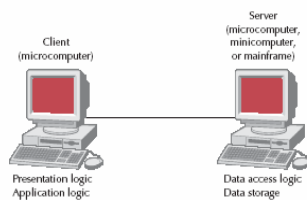


FIGURE 13-3  
Client-Server  
Architecture

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## Client has Presentation Logic

### 3-tiered Architecture

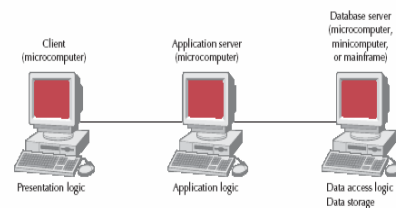
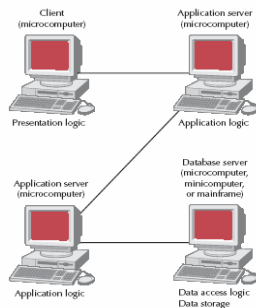


FIGURE 13-4  
A Three-Tier  
Client-Server  
Architecture

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## N-tiered Architecture



## Client-Server Benefits

- **Scalable**
- Support **multiple** clients and servers
- Multiple servers make for a generally **more reliable** network

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## Client-Server Limitations

- **Complexity**
- Updating the network computers is more complex
- Development and Installation
  - different on client and server
  - training for developers

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## Distributed Objects Computing (Middleware)

- DOC allows the developer to simply concentrate on the users, objects, and methods of an application instead of worrying about which server contains which set of objects. The client object simply requests the "network" to locate and execute the server object's method.
- *Middleware* is a type of system software designed to translate between different vendors' software, and is installed on both the client computer and the server computer.

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## Competing Approaches

- Object Management Group
  - *Common Object Request Broker Architecture (CORBA)*
- Sun
  - *Enterprise JavaBeans (EJB)*
  - *Java 2 Enterprise Edition (J2EE)*
- Microsoft
  - *Distributed Component Object Model (DCOM)*
  - *.net* initiative

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## Selecting a Physical Architecture

- Cost of Infrastructure
- Cost of Development
- Ease of Development
- Interface Capabilities
- Control and Security
- Scalability

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## Characteristics

FIGURE 13-6  
Characteristics of  
Computing  
Architectures

	Server-Based	Client-Based	Client-Server
Cost of infrastructure	Very high	Medium	Low
Cost of development	Medium	Low	High
Ease of development	Low	High	Low-medium
Interface capabilities	Low	High	High
Control and security	High	Low	Medium
Scalability	Low	Medium	High

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## NonFunctional Requirements

- Operational
  - Specify the operating environment
- Performance requirements
  - Speed, number of users, availability
- Security
  - Protect from disruption, data loss

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## Cultural and Political Rqrts.

Type of Requirement	Definition	Examples
Multilingual Requirements	The language in which the system will need to operate	<ul style="list-style-type: none"> <li>▪ The system will operate in English, French, and Spanish.</li> </ul>
Customization Requirements	Specification of what aspects of the system can be changed by local users	<ul style="list-style-type: none"> <li>▪ Country managers will be able to define new fields in the product database to capture country-specific information.</li> <li>▪ Country managers will be able to change the format of the telephone number field in the customer database.</li> </ul>
Making Unstated Norms Explicit	Explicitly stating assumptions that differ from country to country	<ul style="list-style-type: none"> <li>▪ All date fields will be explicitly identified as using the month-day-year format.</li> <li>▪ All weight fields will be explicitly identified as being stated in kilograms.</li> </ul>
Legal Requirements	The laws and regulations that impose requirements on the system	<ul style="list-style-type: none"> <li>▪ Personal information about customers cannot be transferred out of European Union countries into the United States.</li> <li>▪ It is against U.S. federal law to divulge information on who rented what videotape, so access to a customer's rental history is permitted only to regional managers.</li> </ul>

FIGURE 13-15 Cultural and Political Requirements



## Summary

- Physical Architecture Layer
  - Choose server vs. client-server
  - Middleware
  - Assess strengths and weaknesses
- Infrastructure design
  - Various clients
  - Network equipment
- Nonfunctional Requirements
  - Operational
  - Performance
  - Security

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