

# Software Architecture

## Distributed Architecture

logical view   layered architecture가   deployment view

### Types of Distributed Architecture Style

- Client-server
- Multitier
- Proxy
- Dispatcher (Load Balancer)
- P2P
- Broker
- Service-oriented architecture
- Microservice architecture

## Multi-tiers Architecture Style

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# One-tier Architectures

- ▶ Mainframe-based and dumb-terminal interaction
- ▶ Concern: efficient use of the CPU and of the system
- ▶ Monolithic information system
  - Presentation, application logic, and resource management layers merge into a single tier
- ▶ Dumb terminals : the clients
- ▶ The entire presentation layer resides in the main-frame

application logic = business logic

layered architecture :

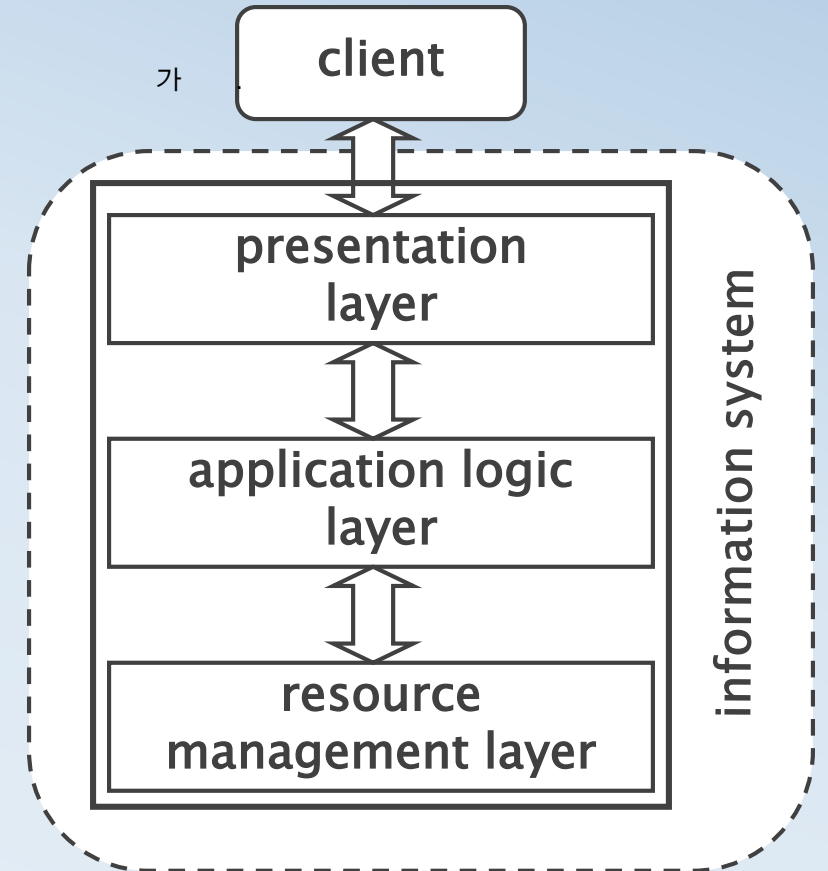
tier :

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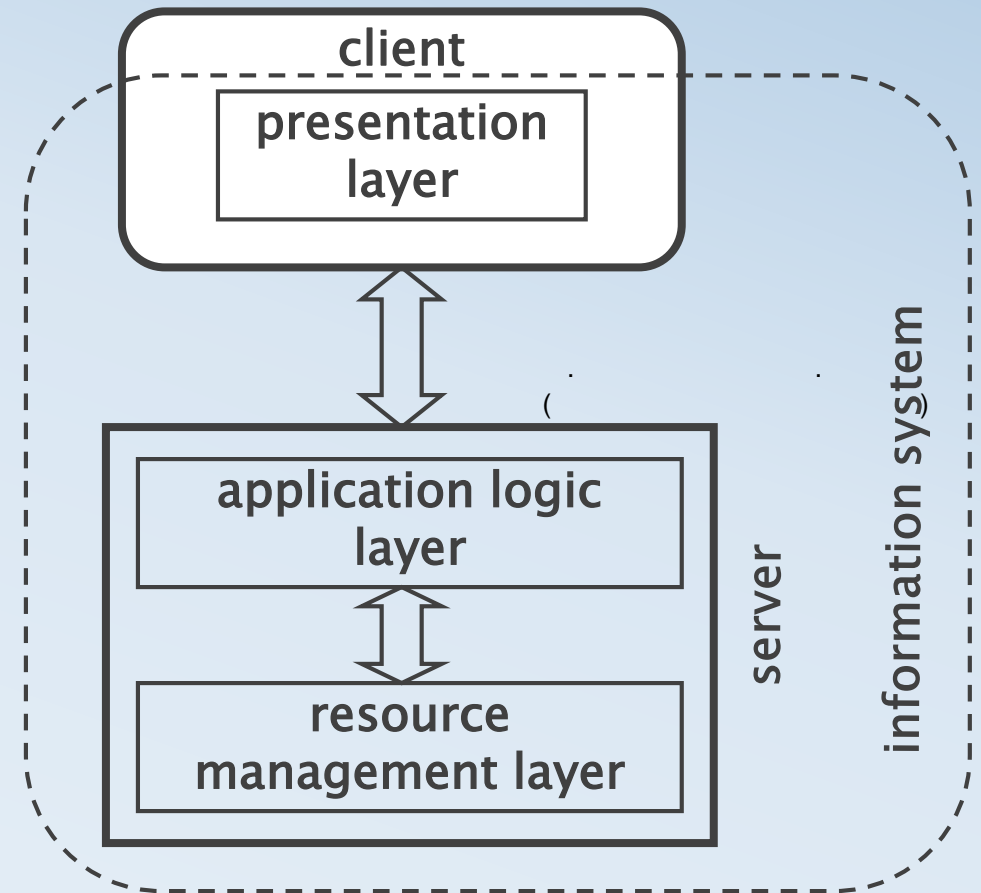
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# Two-tier Architectures

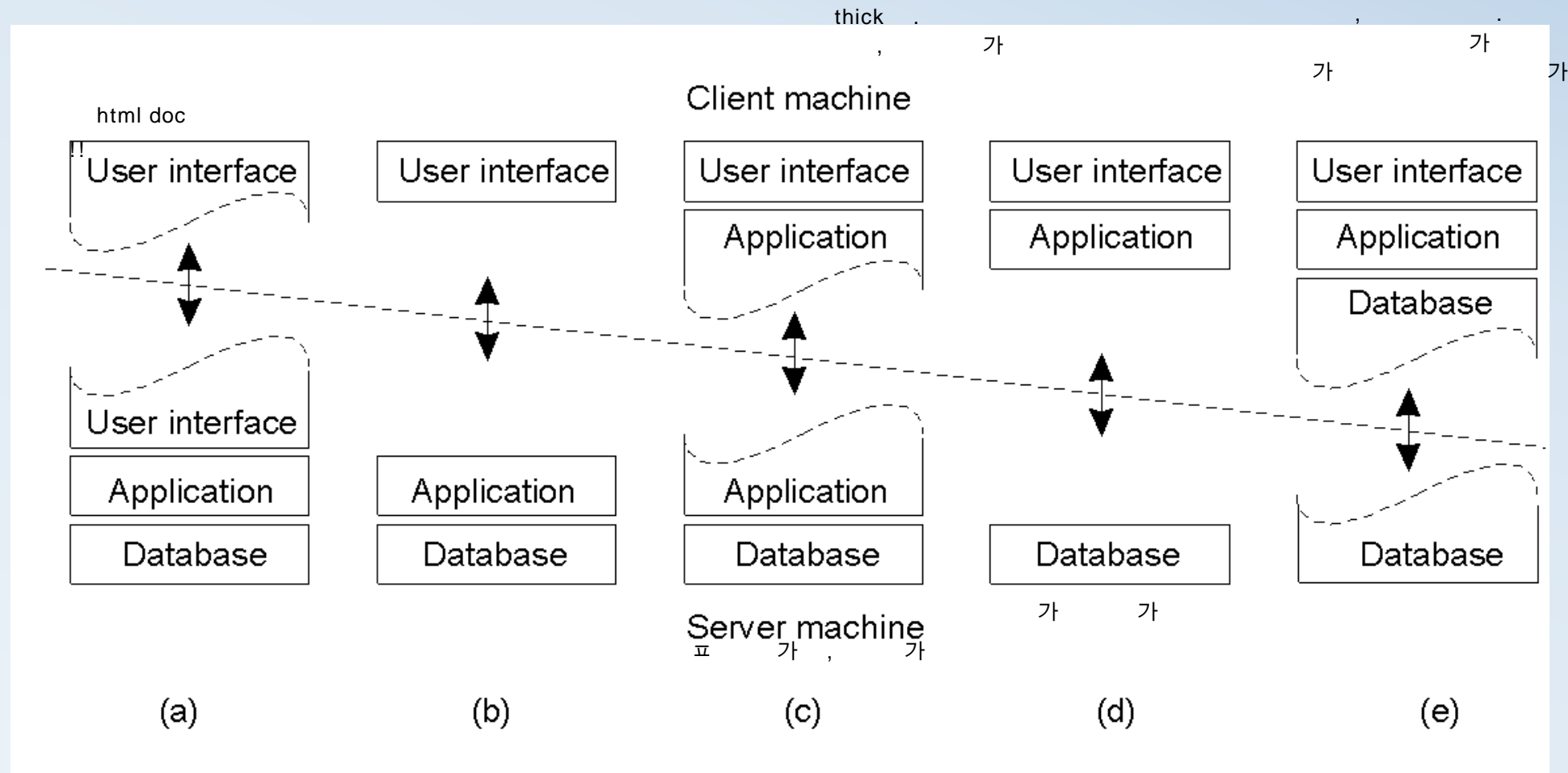
- ▶ Consider two groups: large computers (mainframes and servers) and small computers (PCs and workstations)
- ▶ Presentation layer : the client and the PC
  - Presentation layer can utilize the computational power available in a PC
  - Tailor the presentation layer for different purposes without increasing the complexity of the system
  - Administration purposes and ordinary users
- ▶ Application logic layer and Resource management layer





# Two-tiered Client-Server Architectures

- Alternative client-server organizations (a) – (e).



# Two-tier Architectures (Cont'd)

- ▶ Client/server architecture

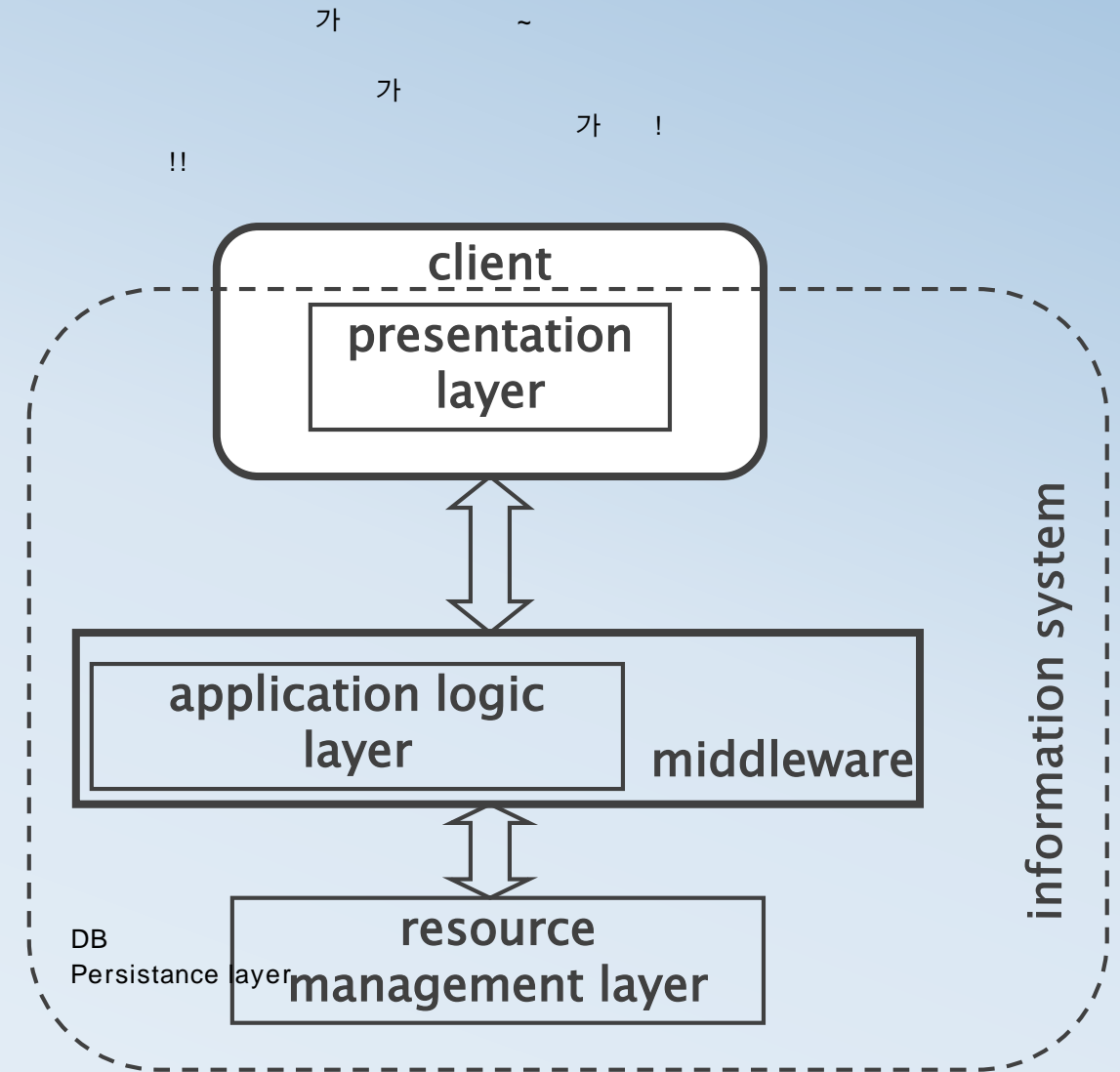
- Client: corresponds to the presentation layer and the actual client software ( )
- Server: encompasses the application logic and resource management layers

- ▶ Depending on complexity of the client

- Thin clients with only minimal functionality 가 가
  - Easier to port, install, and maintain
- Fat clients with a wide range of functionality
  - More sophisticated and richer functionality
  - Large pieces of code requiring considerable resources on the client machine

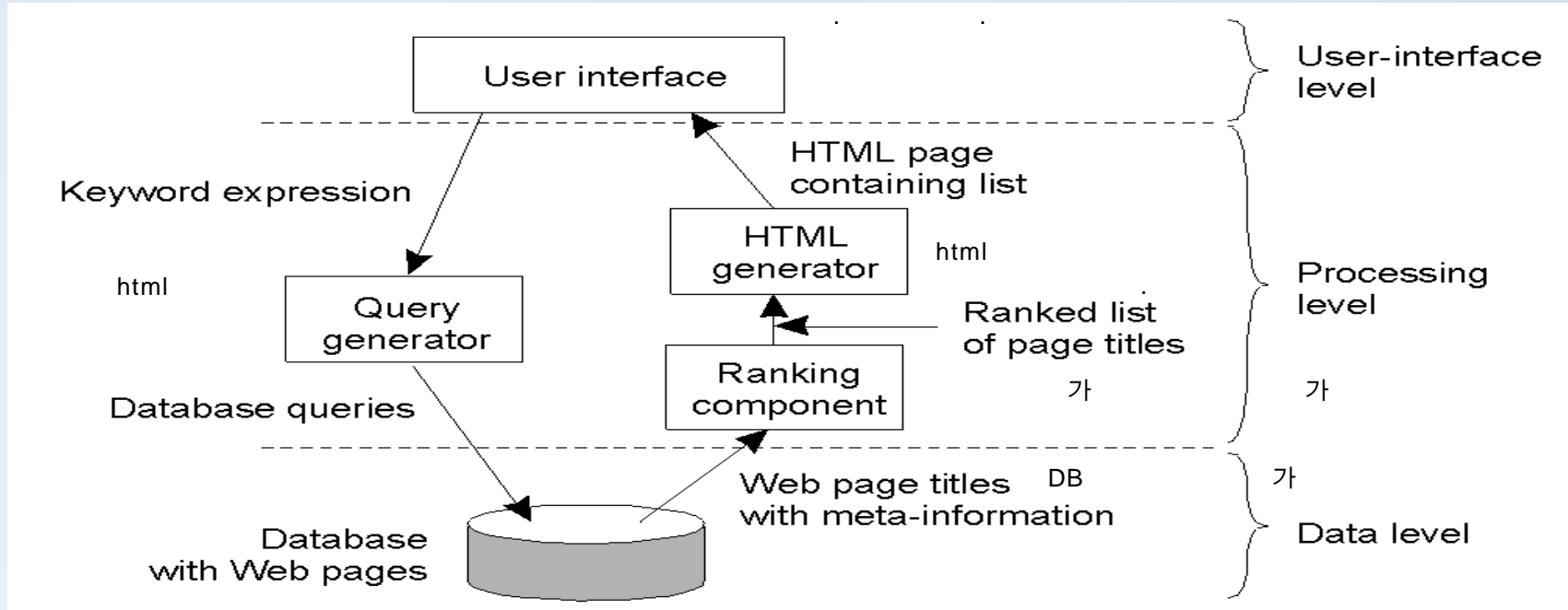
# Three-tier Architectures

- ▶ Three-tier architectures
  - Introduce an additional tier between the clients and the servers.
  - Additional tier is where the application logic implementing integration resides.
- ▶ Abstract level based on a clear separation
  - Presentation layer: resides at the client
  - Application logic layer:
    - resides at the middle tier
    - Middleware: abstractions and infrastructure to collectively support the development of the application logic
  - Resource management layer:
    - Composed of all servers that the 3-tier architecture tries to integrate.



# Application Layering

- Application Layering
  - User-Interface Level
  - Processing Level
  - Data Level
- Ex) Internet search engine



# 2-Tier vs. 3-Tier Client/Server

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- **2-tier client/server system**

- the application logic is either busied inside the user interface on the client or within the Database on the server (or both)
- Ex) file server, database server with stored procedures

- **3-tier client/server system**

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- the application logic lives in the middle-tier
- In theory, 3-tier systems are more scalable, robust, and flexible.
- The can integrate data from multiple sources on heterogeneous systems
- Ex) TP Monitors, Distributed Objects, and the Web

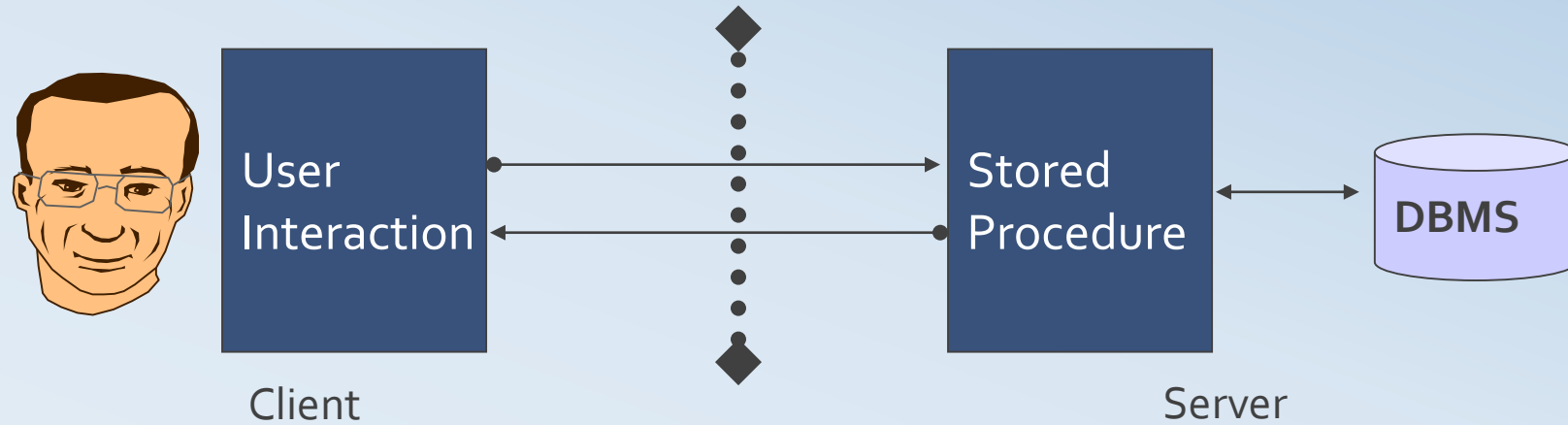
TP Monitors

All or nothing

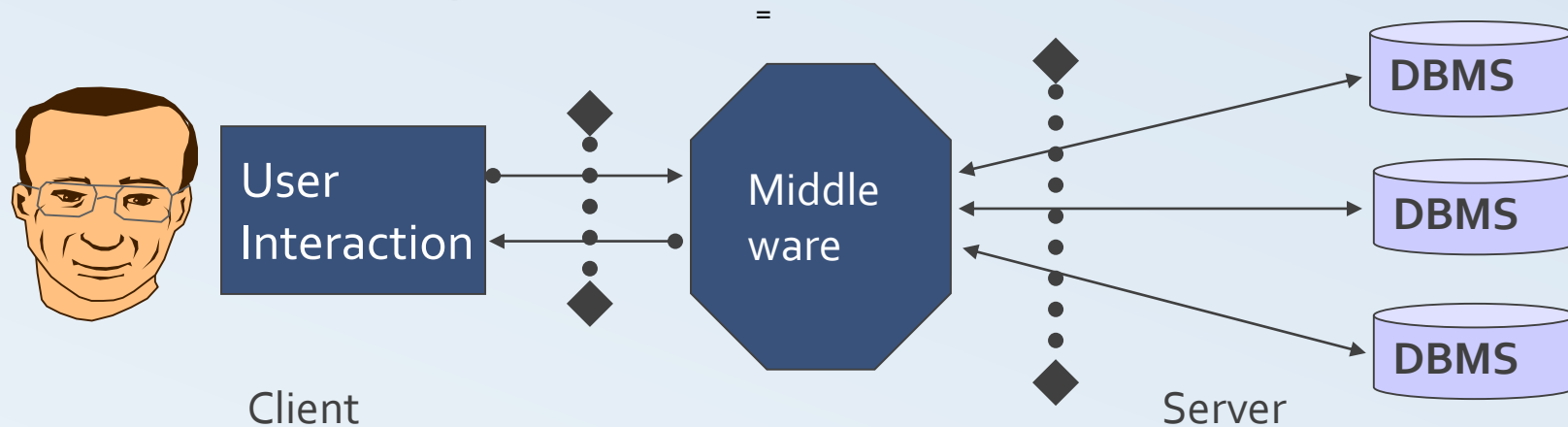


# 2-Tier vs. 3-Tier Client/Server

## 2-Tier Client/Server

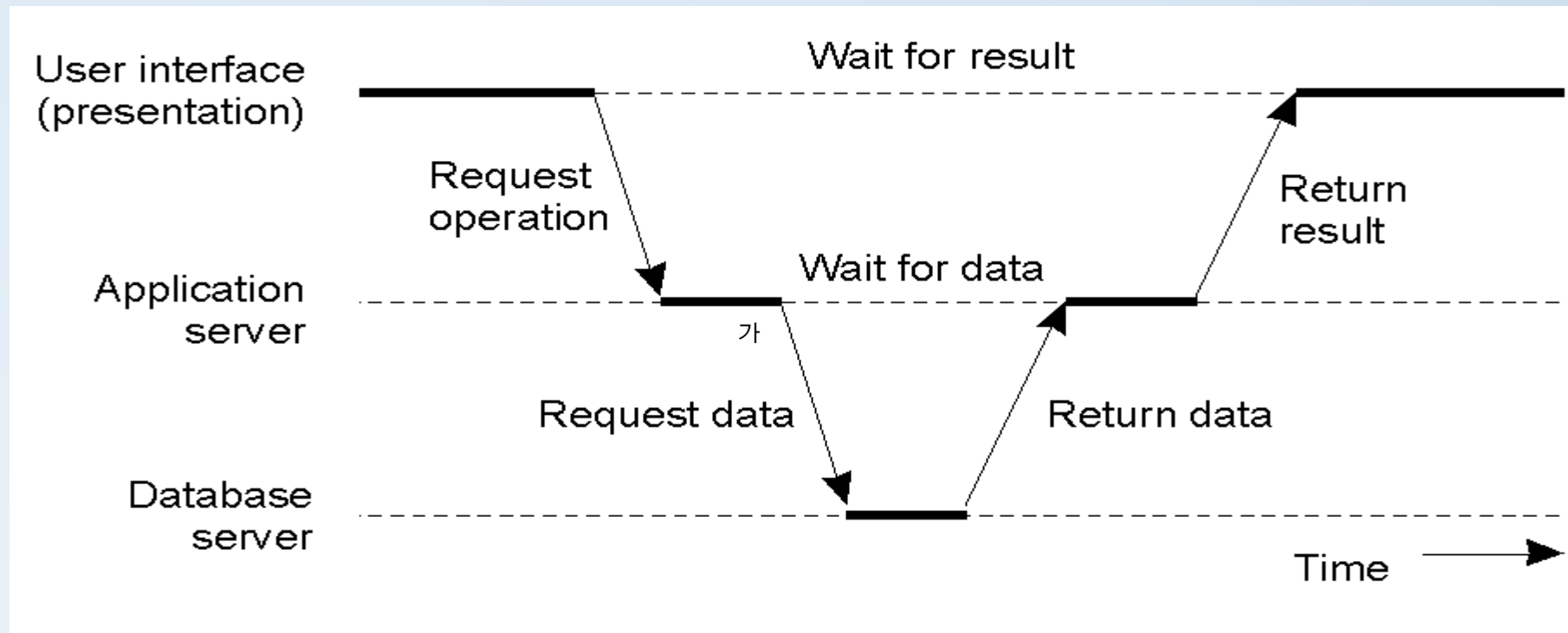


## • 3-Tier Client/Server



# Modern Architectures

- Vertical Distribution
  - Placing logically different components on different machines
- 3-Tier Architecture



# Multi-tiers Architecture Style

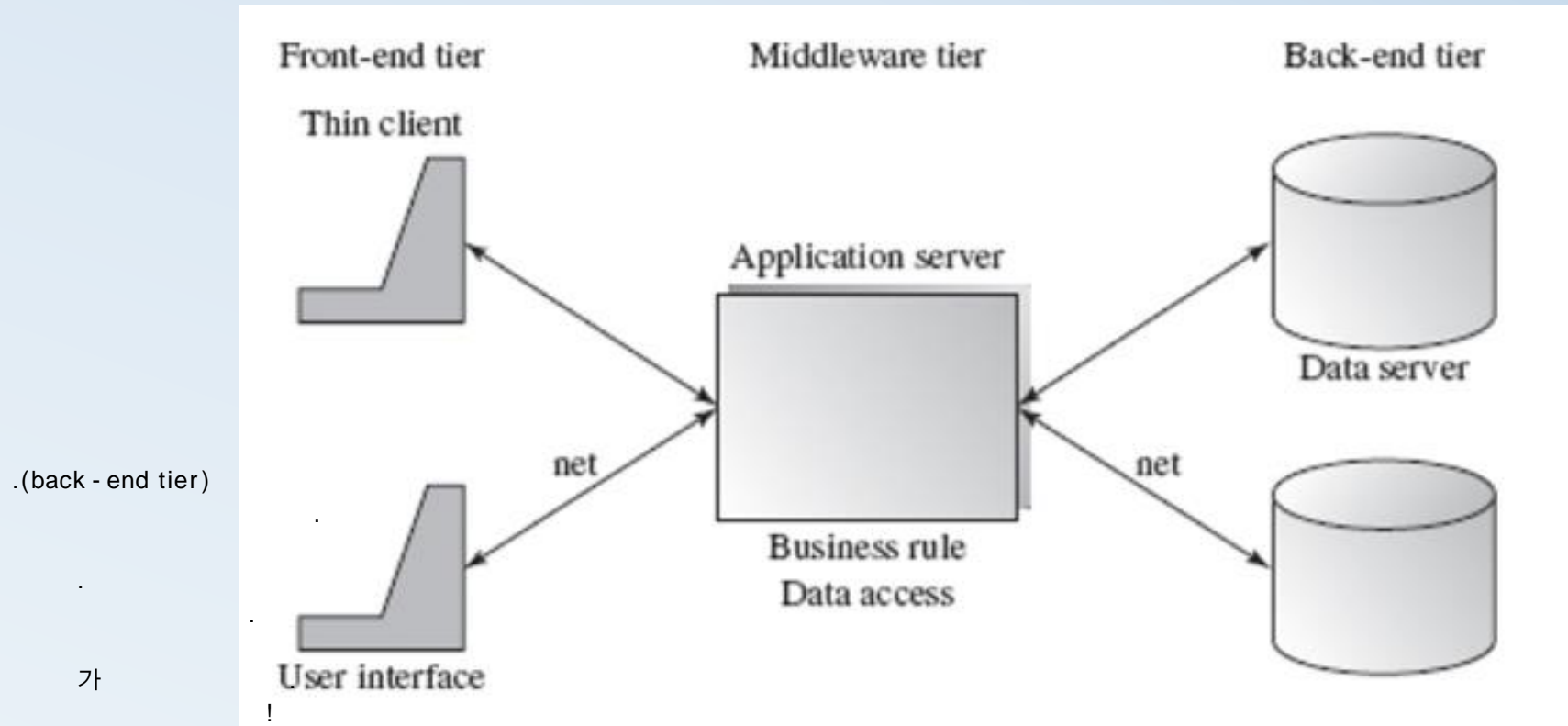
N - tiers

가 Multi - tiers

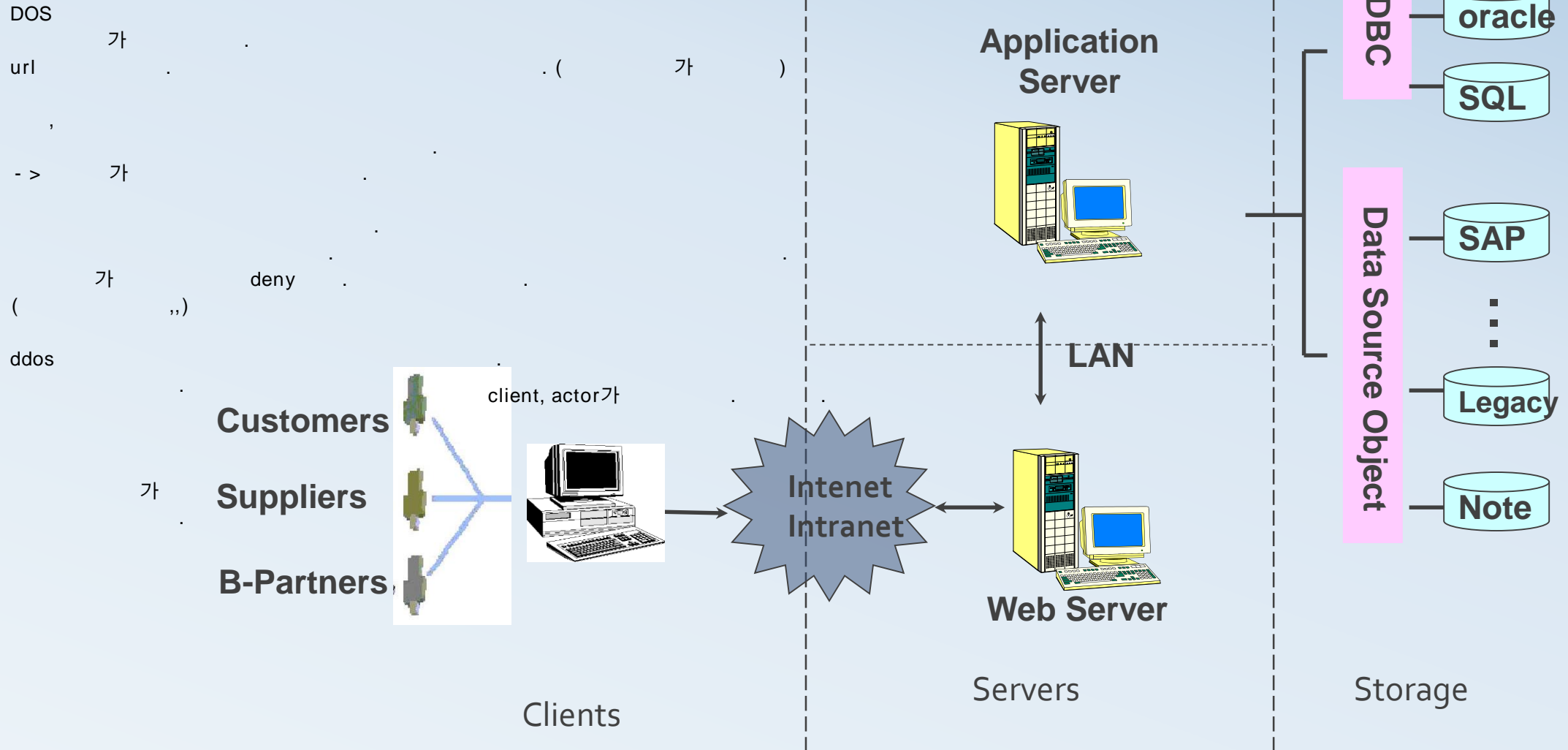
- Synopsis
  - The front-end tier in a multi-tier architecture
    - the user interface presentation tier.
  - The middle tier
    - manages business logic and execution.
  - The back-end tier
    - usually handles database management.
- Multi-tier architecture is gaining popularity in enterprise applications.

# Multi-tiers Architecture Style

- Three-tier architecture



# 4-Tier System Architecture





# Multi-tiers Architecture Style

- The advantage of multi-tier over the two-tier architecture
  - The enhancement of reusability and scalability by adding the middle tier.
  - Any business related changes are made only to the middle tier.
  - Can be portable and nonproprietary design and implementation.
  - provide multithreading supports for scalability.
  - Multi-tier architecture also reduces traffic on the network.
  - Its main disadvantage is testability due to the general lack of testing tools.
  - Adding multiple servers in the system makes the server reliability and availability even more critical.