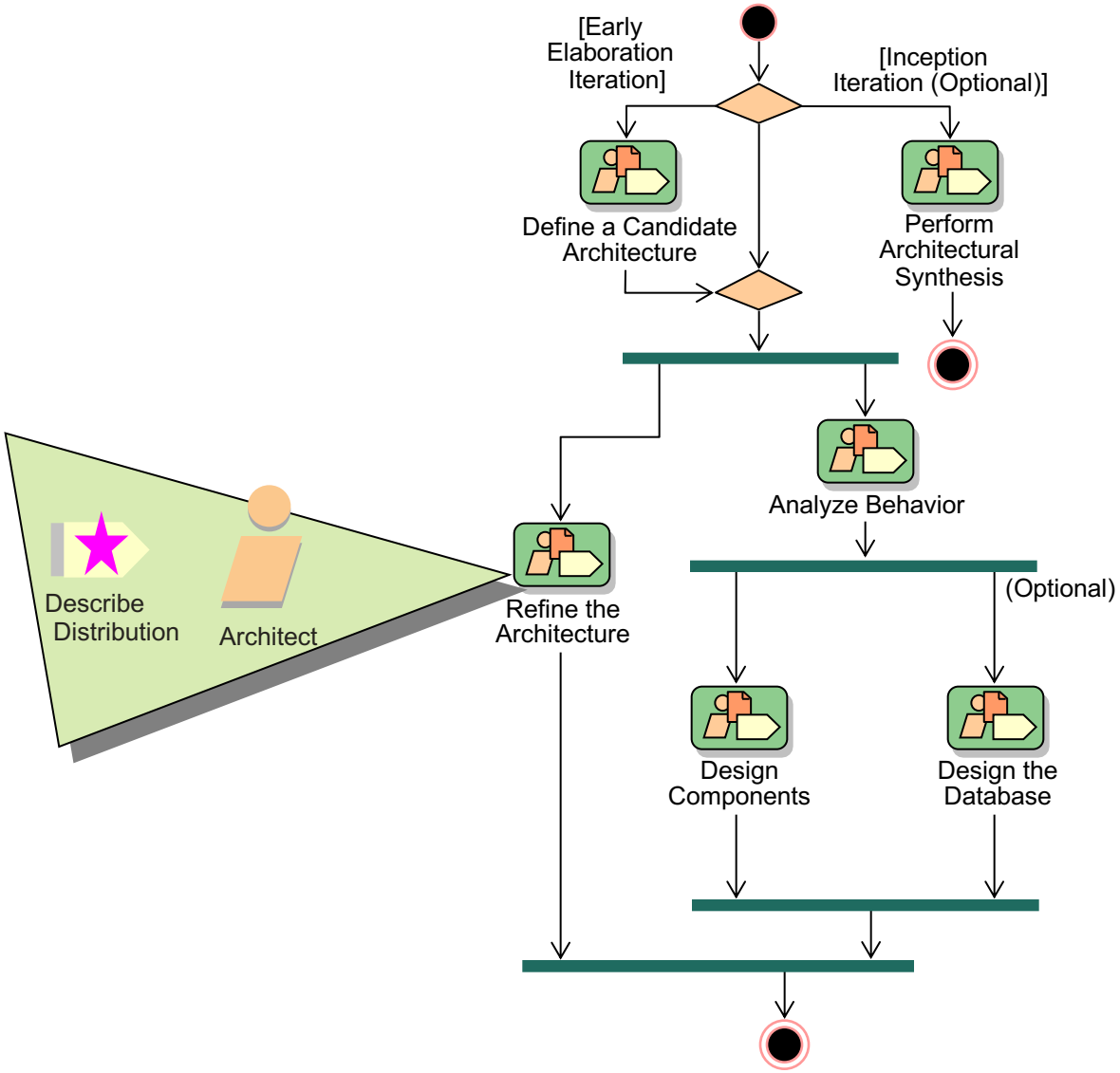
Software analysis and design

Module 14: Describe Distribution

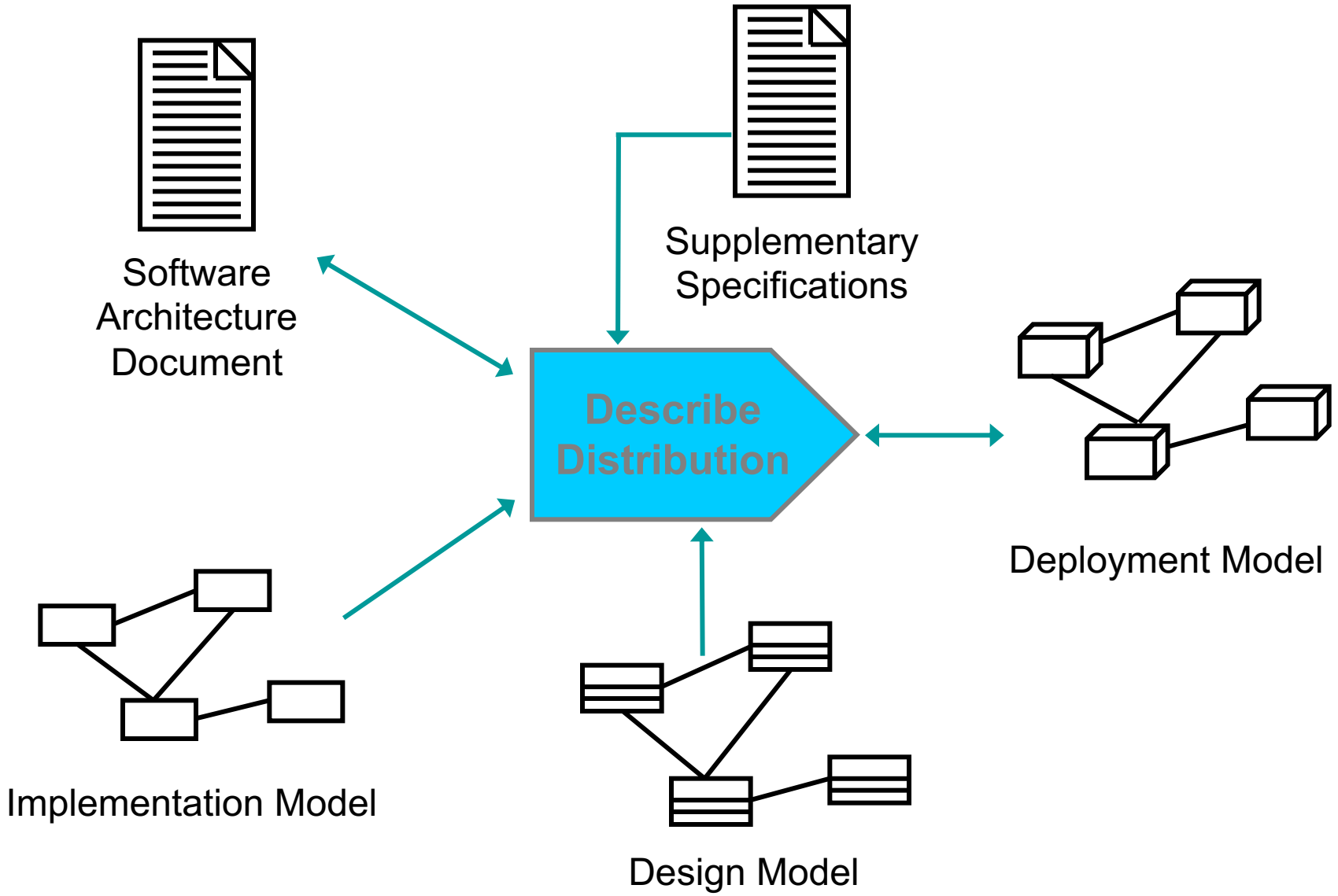
Objectives: Describe Distribution

- Explain the purpose of the Describe Distribution activity and when in the lifecycle it is performed
- Describe how the functionality of the system can be distributed across physical nodes
- Model the distribution decisions of the system in the Deployment Model
- Articulate the rationale and considerations that support the architectural decisions

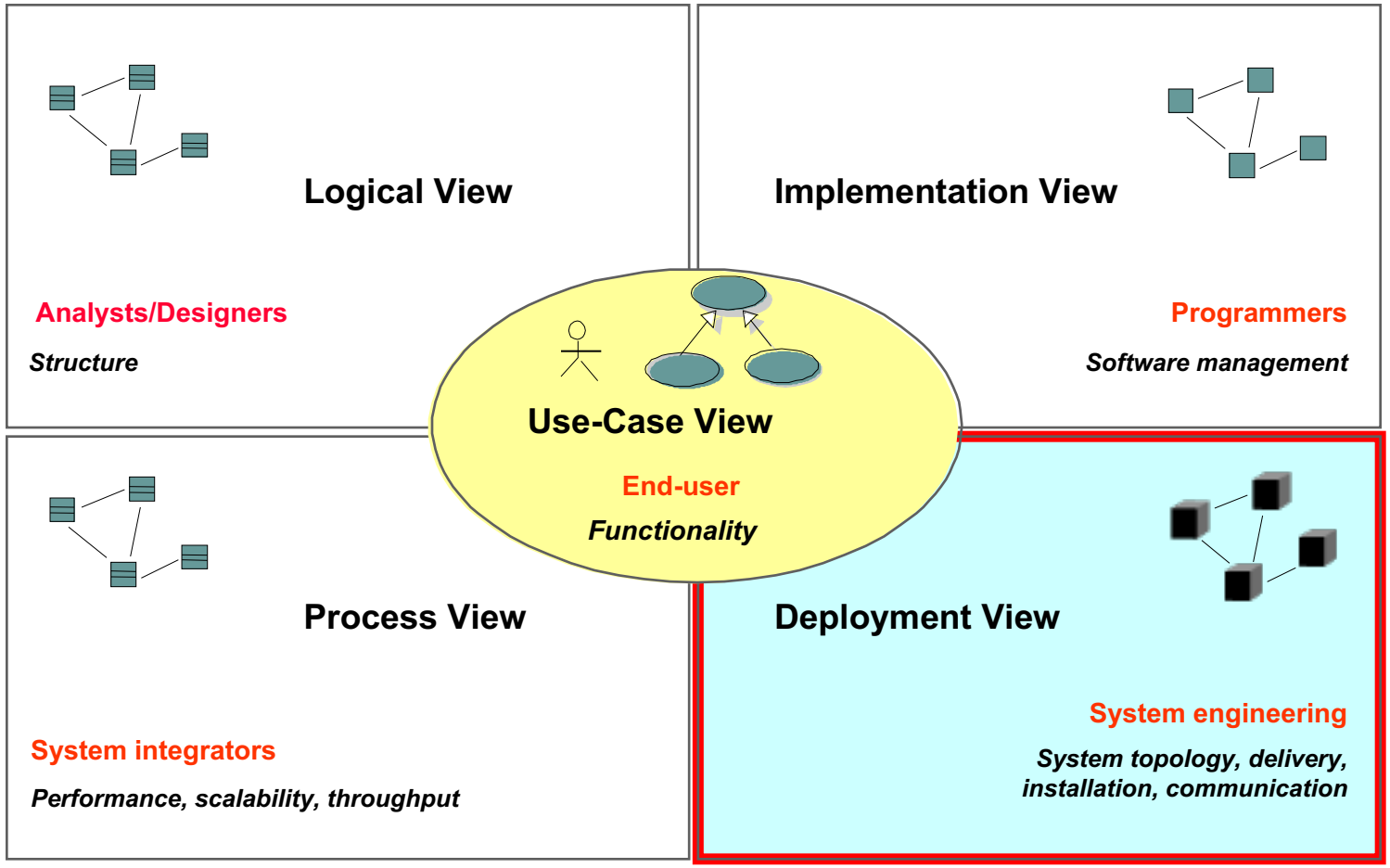
Describe Distribution in Context



Describe Distribution Overview



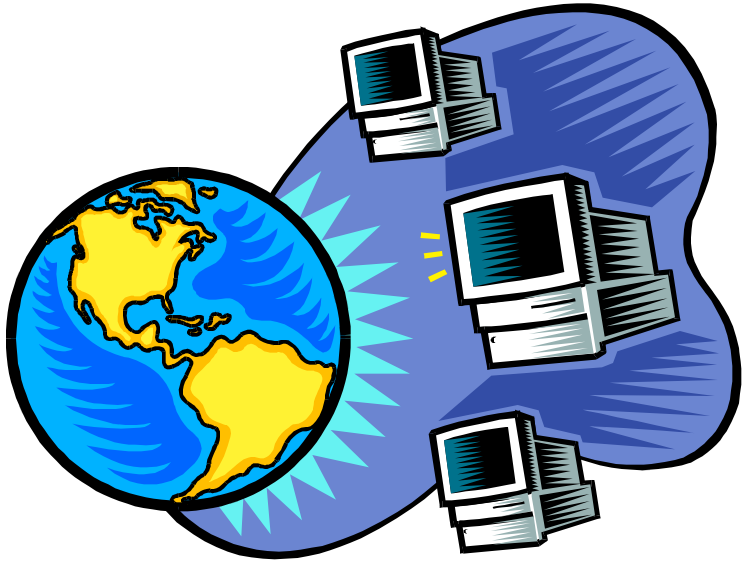
Key Concepts: The Deployment View



The Deployment View is an “architecturally significant” slice of the Deployment Model.

Why Distribute?

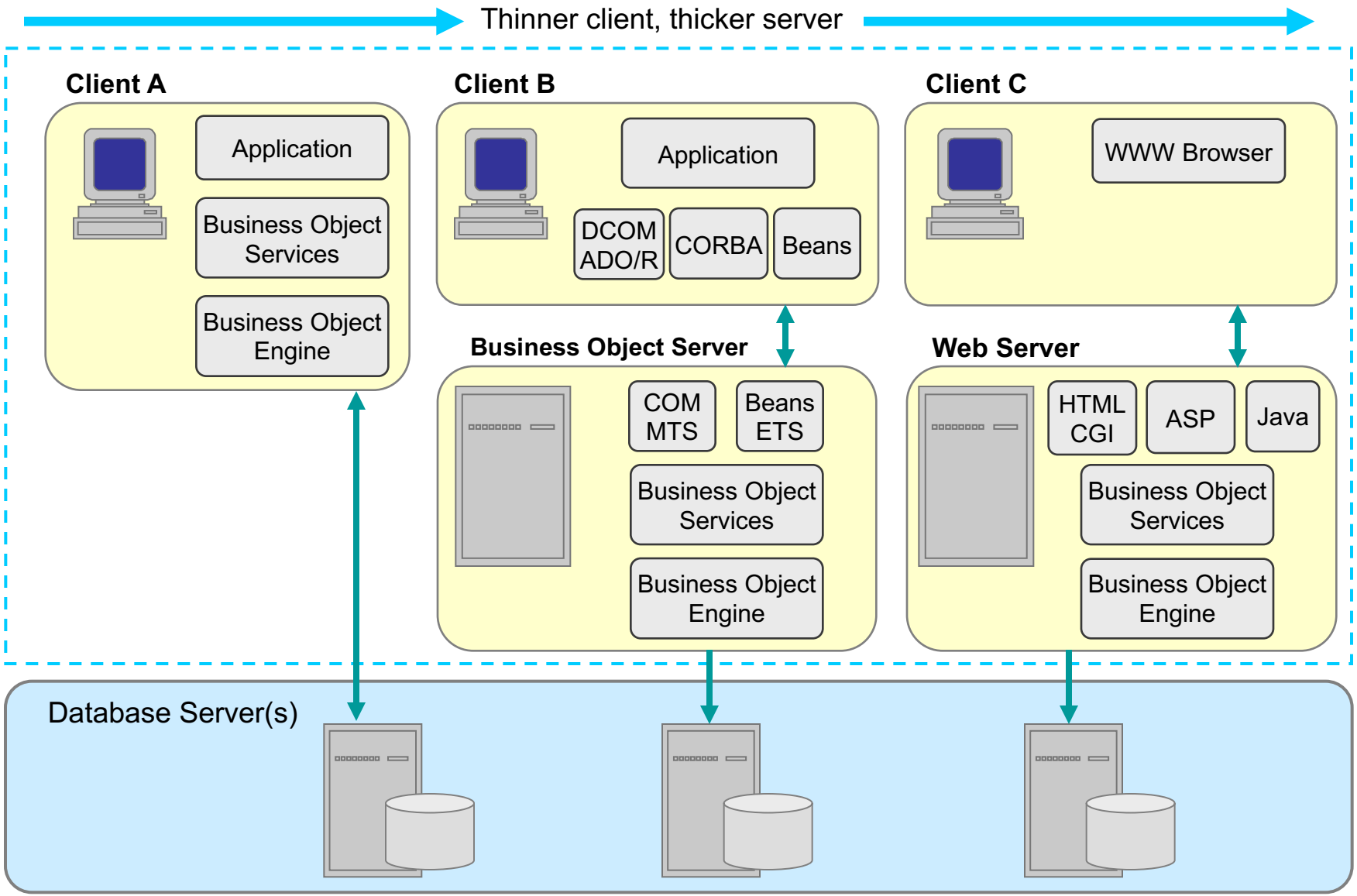
- Reduce processor load
- Special processing requirements
- Scaling concerns
- Economic concerns
- Distributed access to the system



Distribution Patterns

- Client/Server
  - 3-tier
  - Fat Client
  - Fat Server
  - Distributed Client/Server
- Peer-to-peer

Client/Server Architectures

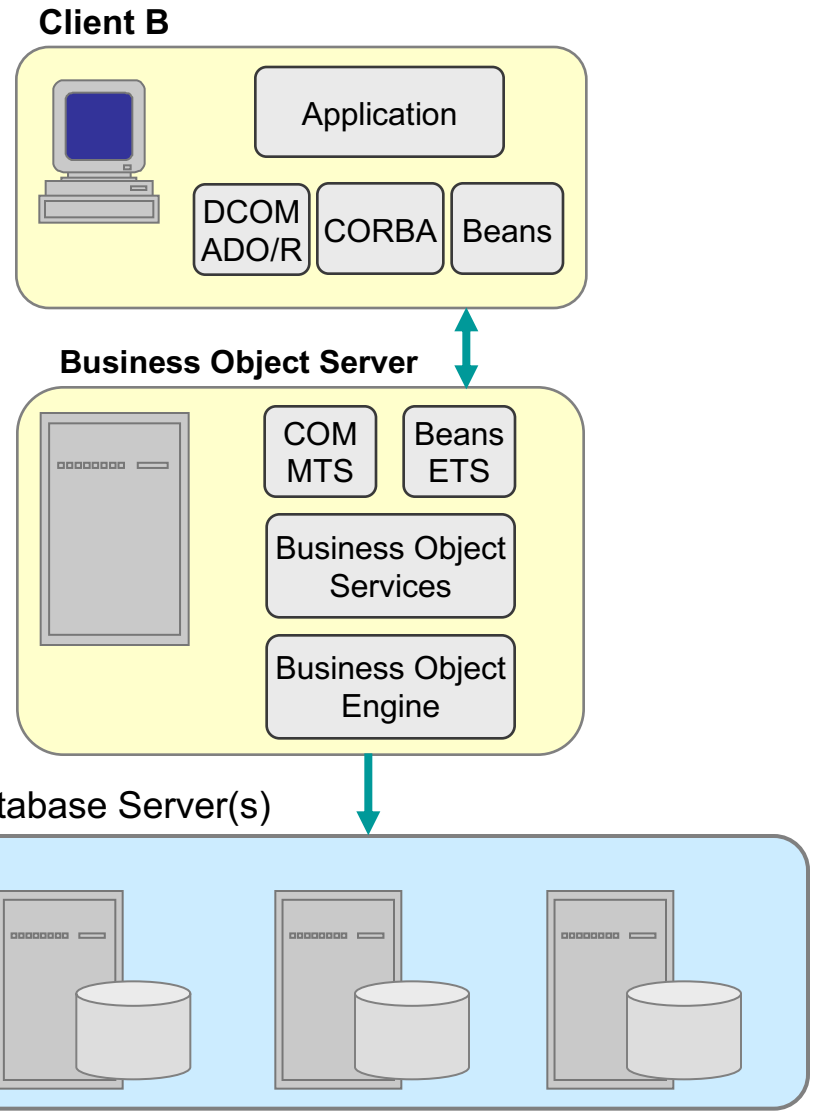


Client/Server: Three-Tier Architecture

Application Services

Business Services

Data Services

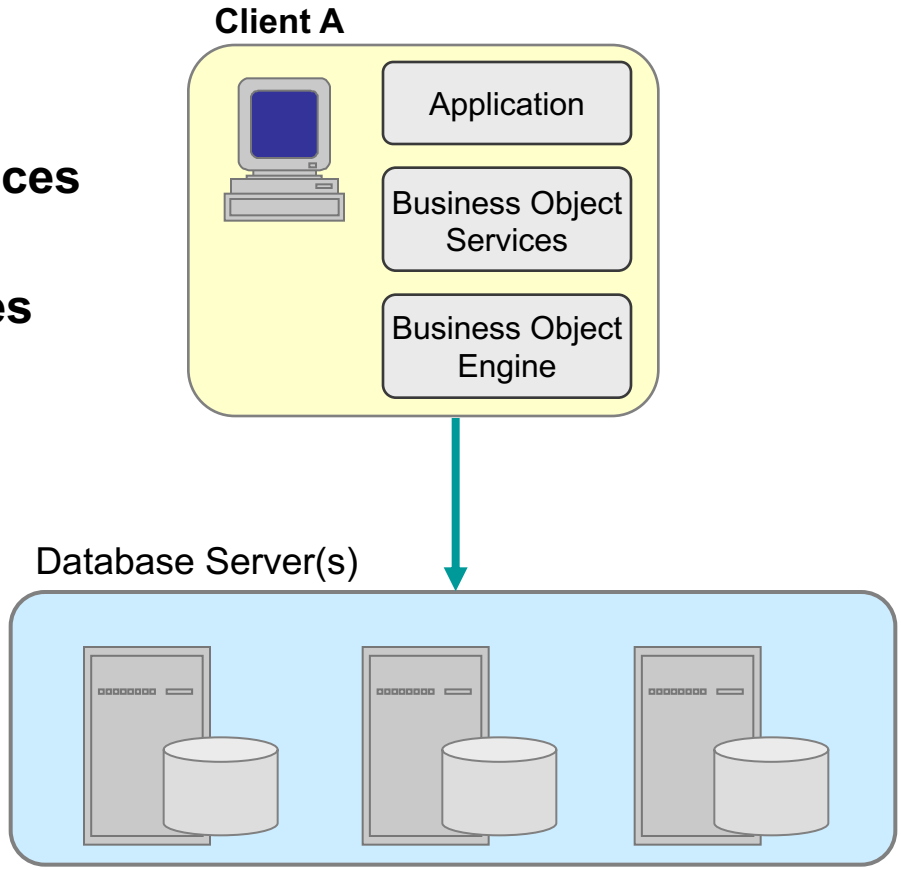


Client/Server: “Fat Client” Architecture

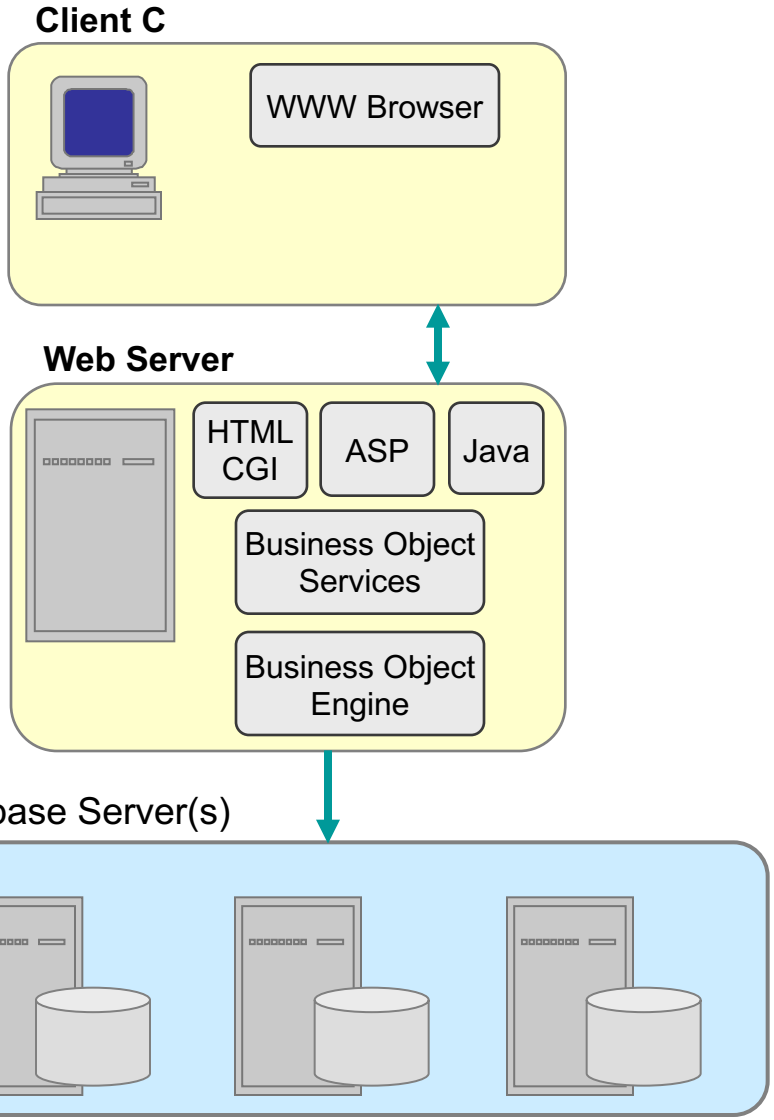
Application Services

Business Services

Data Services



Client/Server: Web Application Architecture

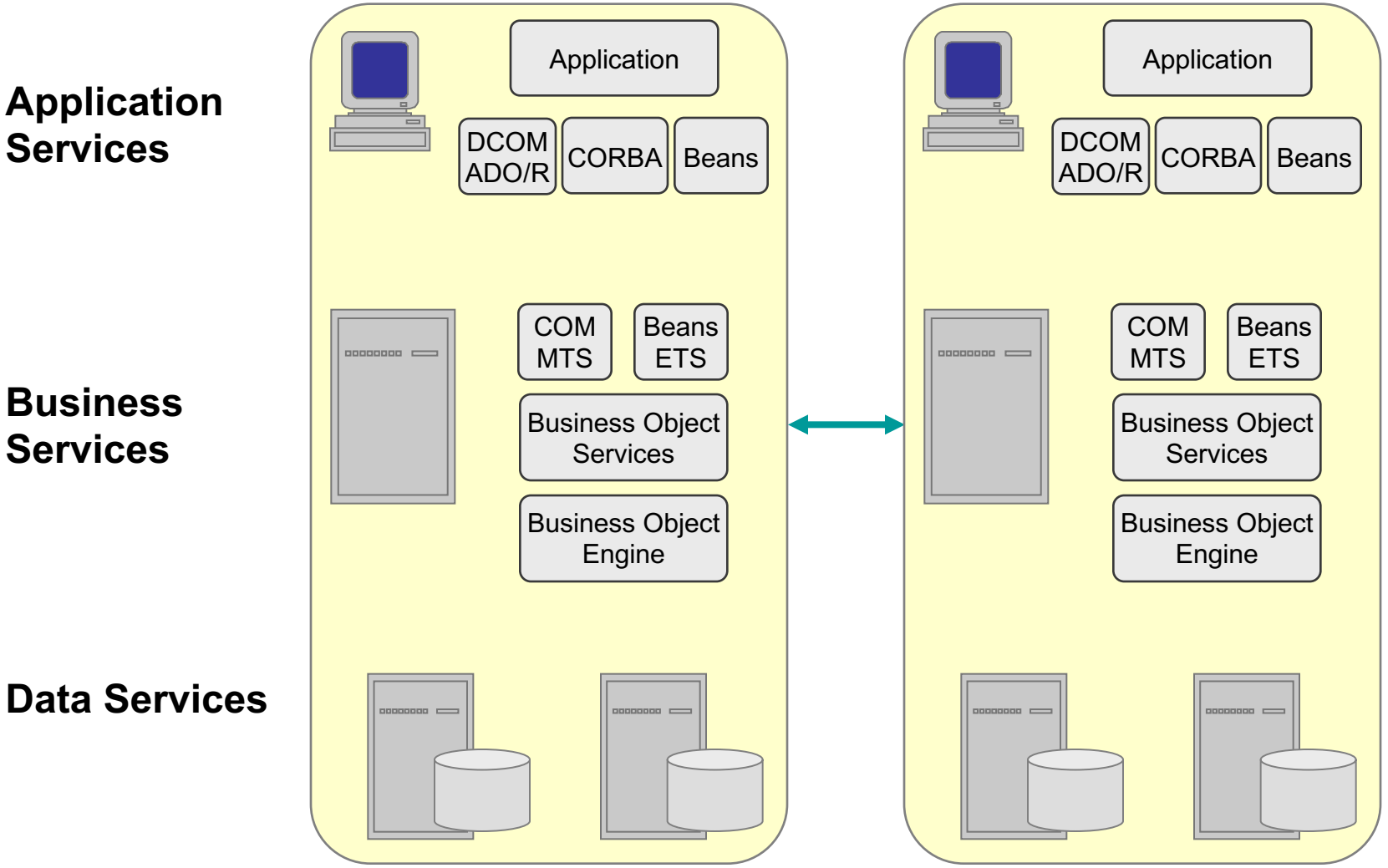


Application Services

Business Services

Data Services

Peer-to-Peer Architecture



Describe Distribution Steps

- Define the network configuration
- Allocate processes to nodes
- Define the distribution mechanism

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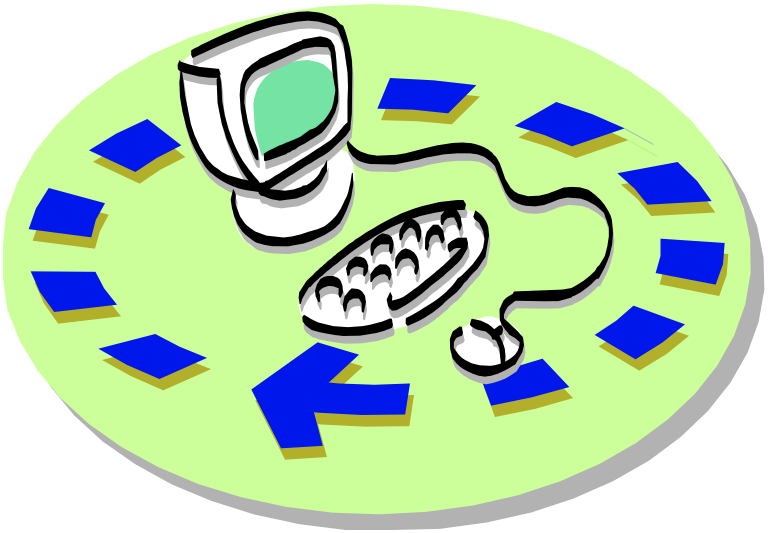
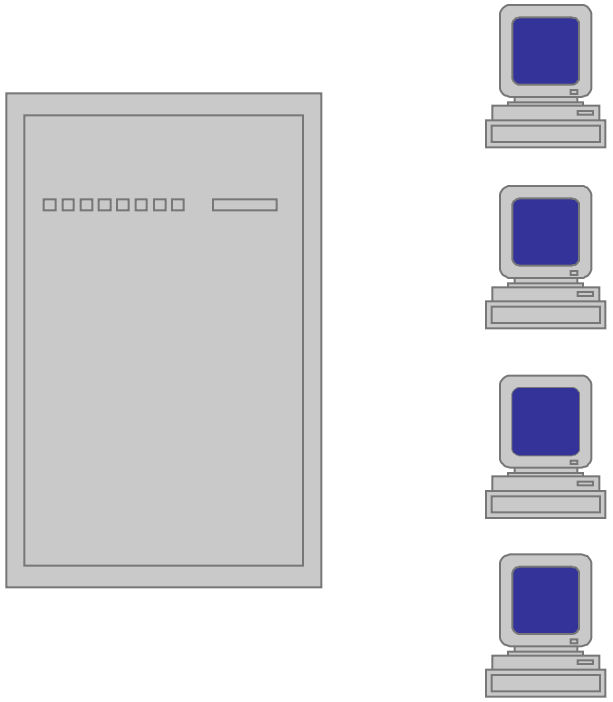
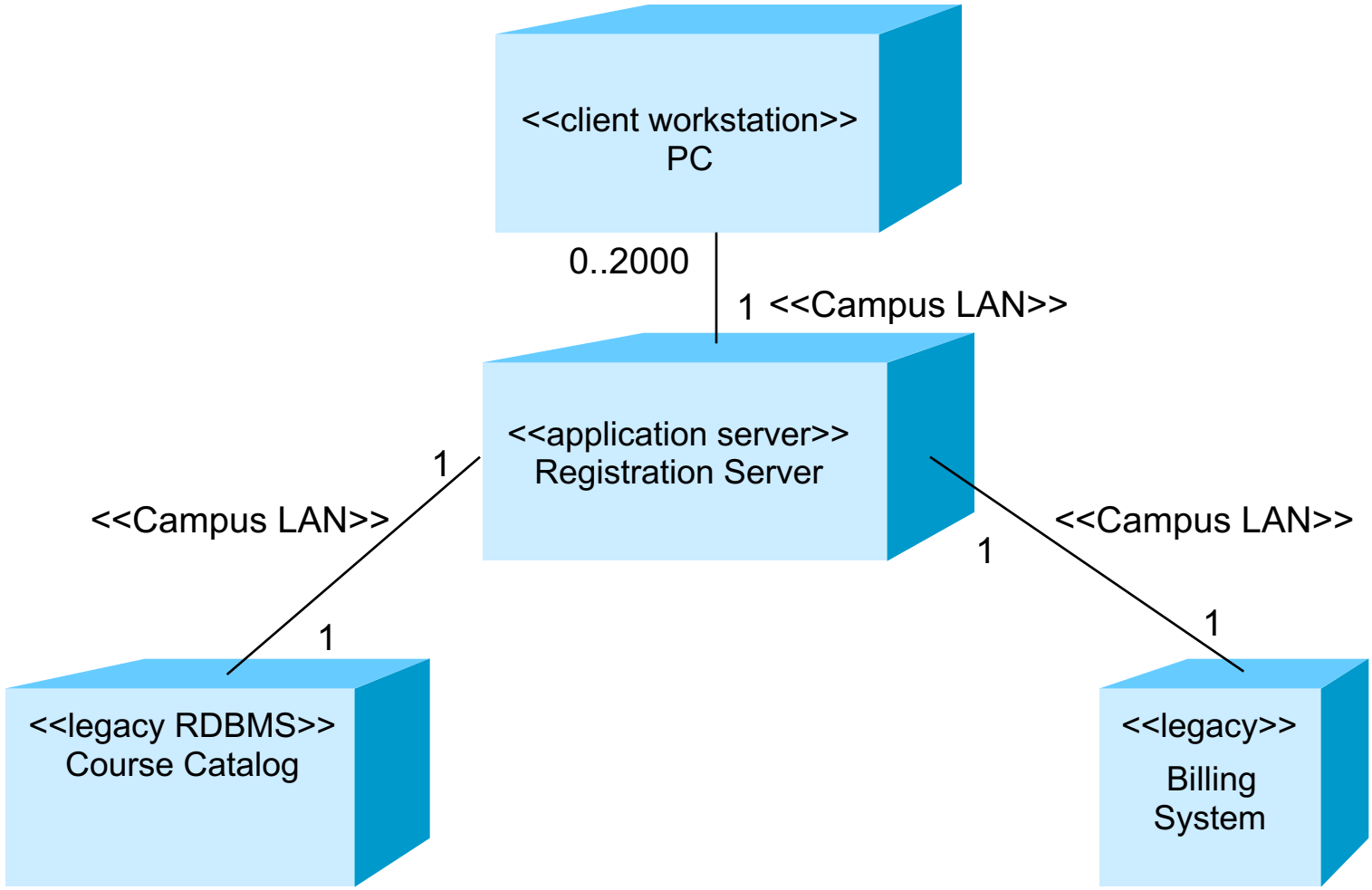


The Network Configuration

- End-user workstation nodes
- ”Headless" processing server nodes
- Special configurations
  - Development
  - Test
- Specialized processors



Review: Example: Deployment Diagram



Describe Distribution Steps

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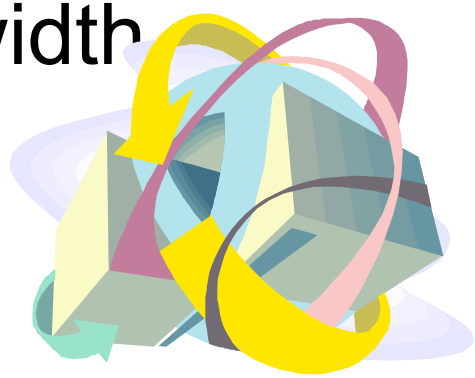
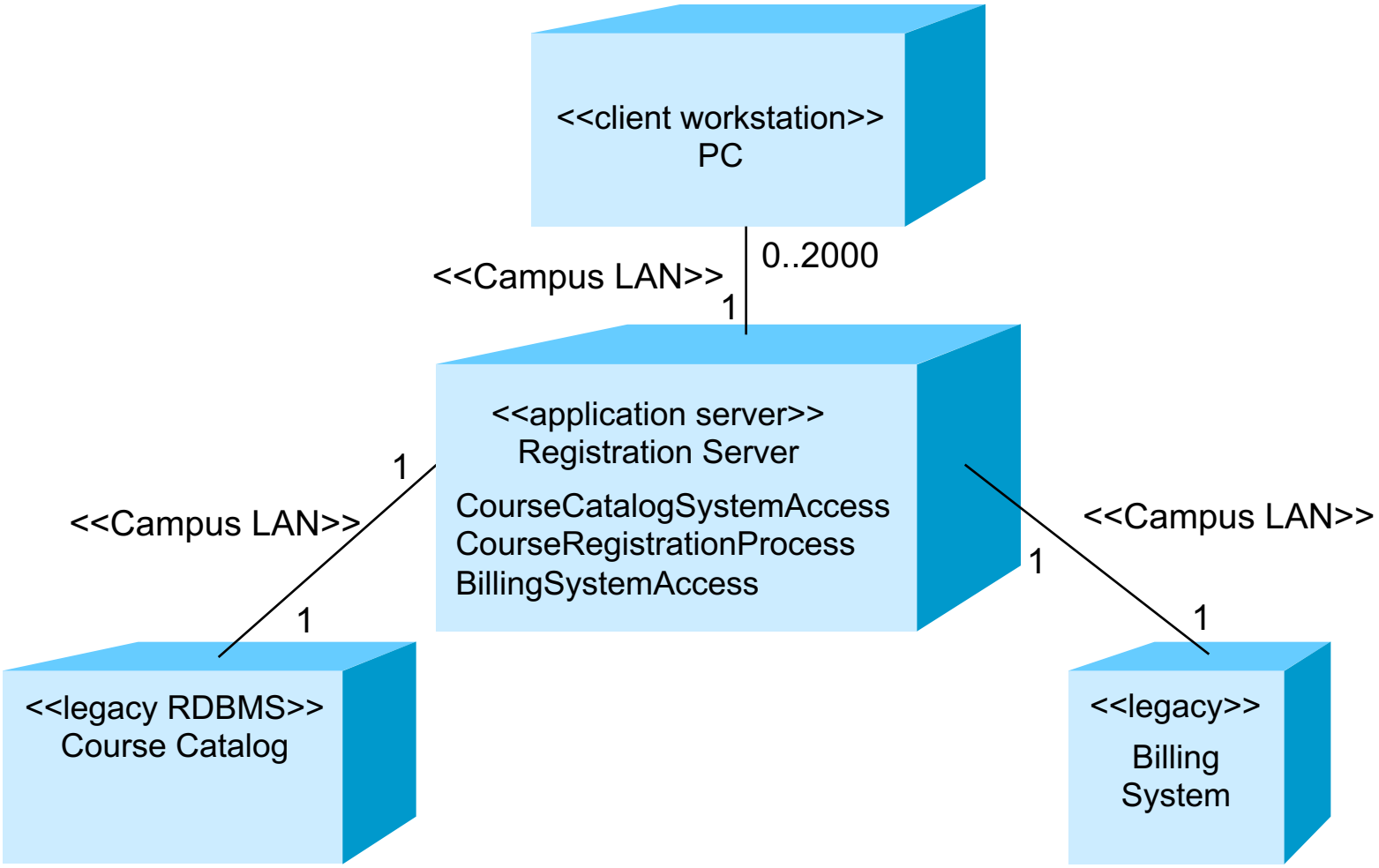
Process-to-Node Allocation Considerations

- Distribution patterns
- Response time and system throughput
- Minimization of cross-network traffic
- Node capacity
- Communication medium bandwidth
- Availability of hardware and communication links
- Rerouting requirements



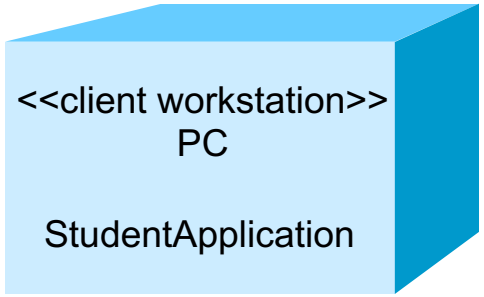
Review: Example: Deployment Diagram with Processes

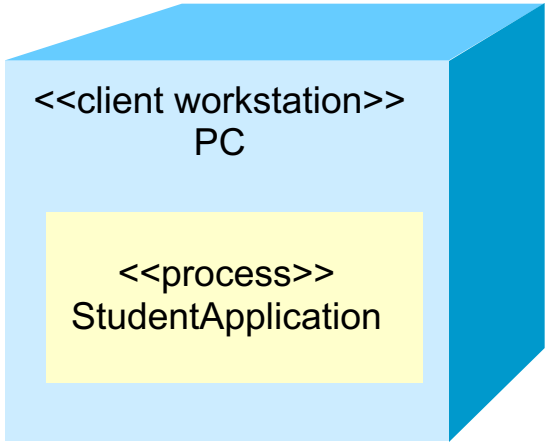


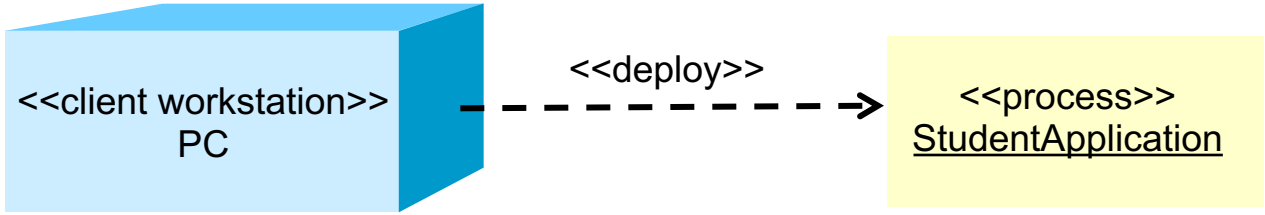
What is Deployment?

- Deployment is the assignment, or mapping, of software artifacts to physical nodes during execution.
  - Artifacts are the entities that are deployed onto physical nodes
    - Processes are assigned to computers
- Artifacts model physical entities.
  - Files, executables, database tables, web pages, etc.
- Nodes model computational resources.
  - Computers, storage units.

Example: Deploying Artifacts to Nodes







Describe Distribution Steps

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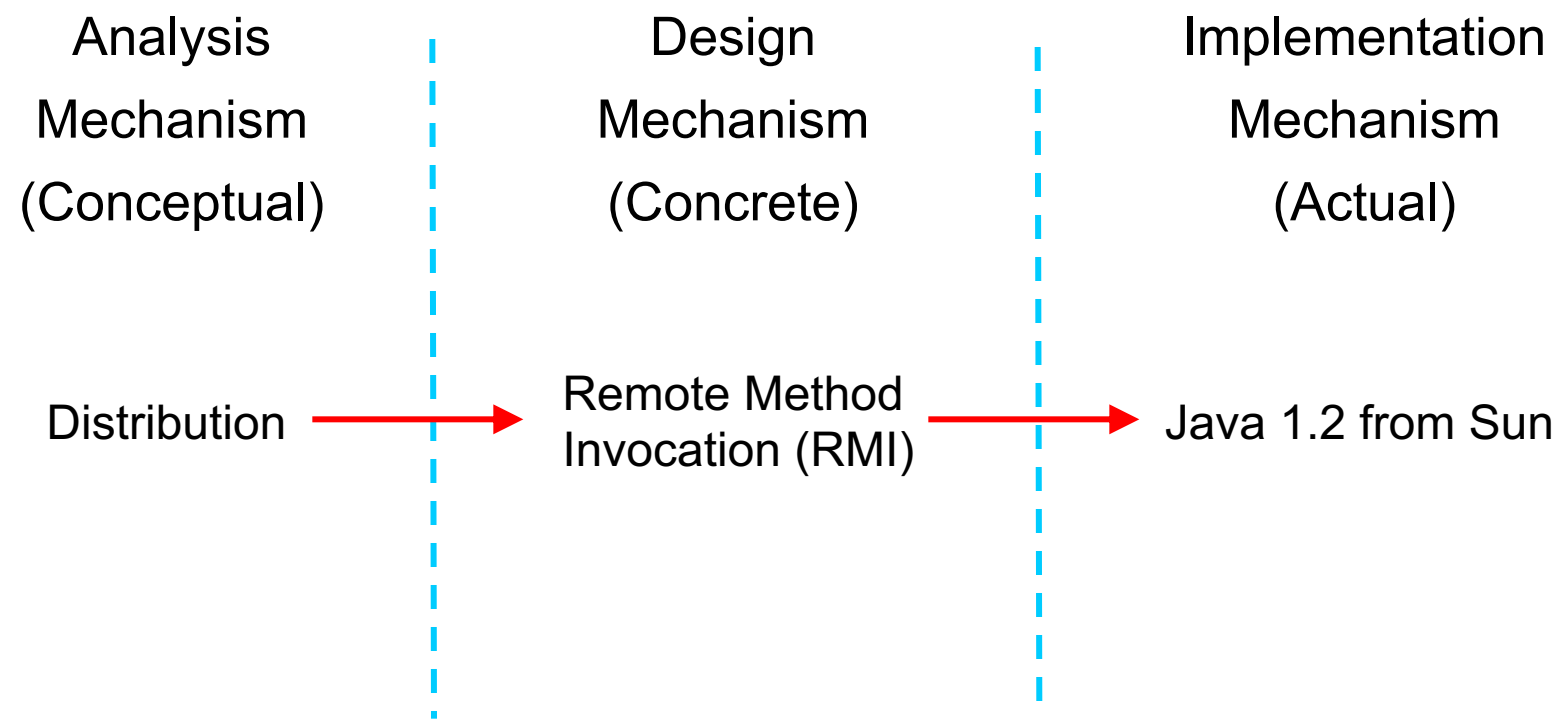
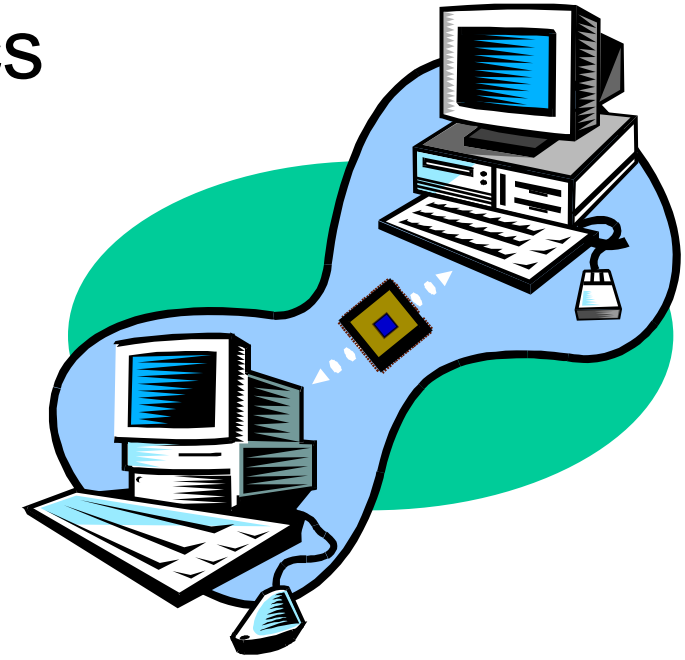
Distribution Mechanism

- RMI was chosen as the implementation mechanism for distribution

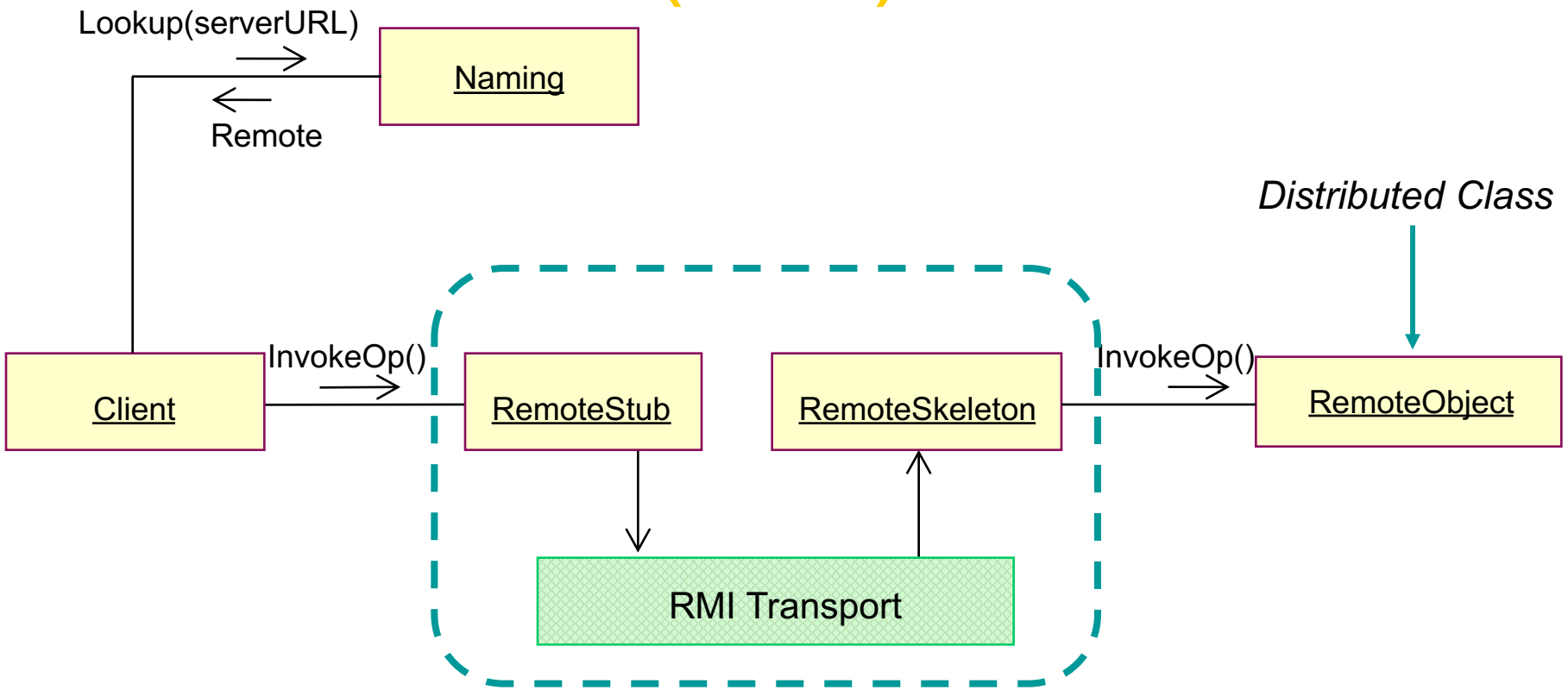


Design Mechanisms: Distribution: RMI

- Distribution characteristics
  - Latency
  - Synchronicity
  - Message Size
  - Protocol

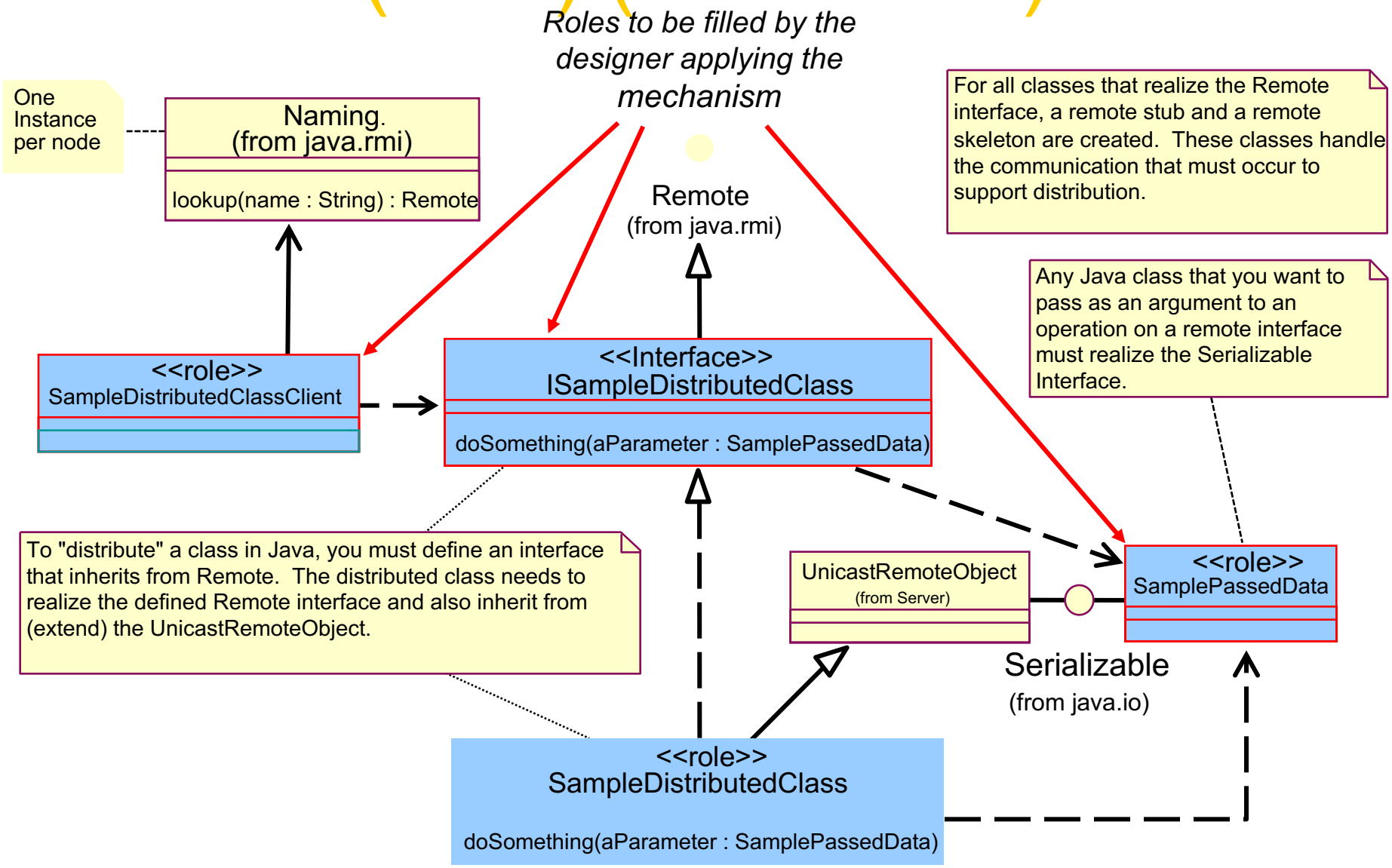


Remote Method Invocation (RMI)

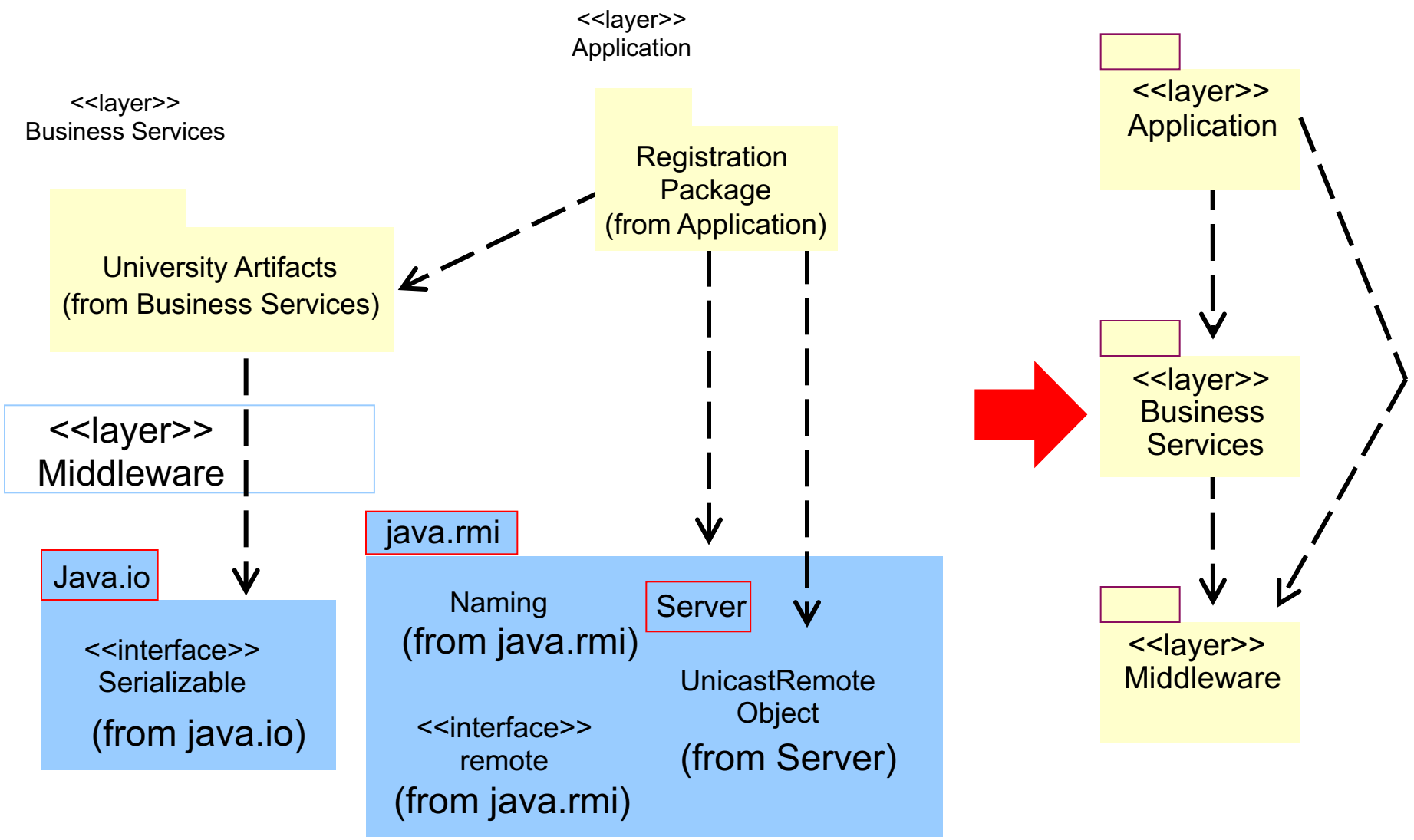


Provided “for free” with RMI for each distributed class.

Remote Method Invocation (RMI) (continued)



Example: Incorporating RMI



Checkpoints: Deployment View

- Have the distributed data update coordination and synchronization issues been addressed and documented?
- Are services that require more rapid response available locally (LAN vs. WAN)?
- Have all redundant server issues been addressed and documented (primary vs. secondary)?
- Are the failure modes documented?

Review: Describe Distribution

- What is the purpose of the Describe Distribution activity?
- What is a node? Describe the two different “types” of nodes.
- Describe some of the considerations when mapping processes to nodes.
- How do you model the Deployment View? What modeling elements and diagrams are used?