System Integration

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Integrating Services

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Objectives

- Identify some of the common services of an integrated system
- Understand the issues that can result from integrating systems that have these services

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Integrated System Services: Naming

- Naming – All entities have a unique name and can be found
- What is a naming service? Software that converts a name into a physical address
  - Every entity sees the entire system as the same set of objects
  - Defined interfaces to entities
  - Users know how to find other system entities
- Most famous Naming Service?
  - Domain Name Service!

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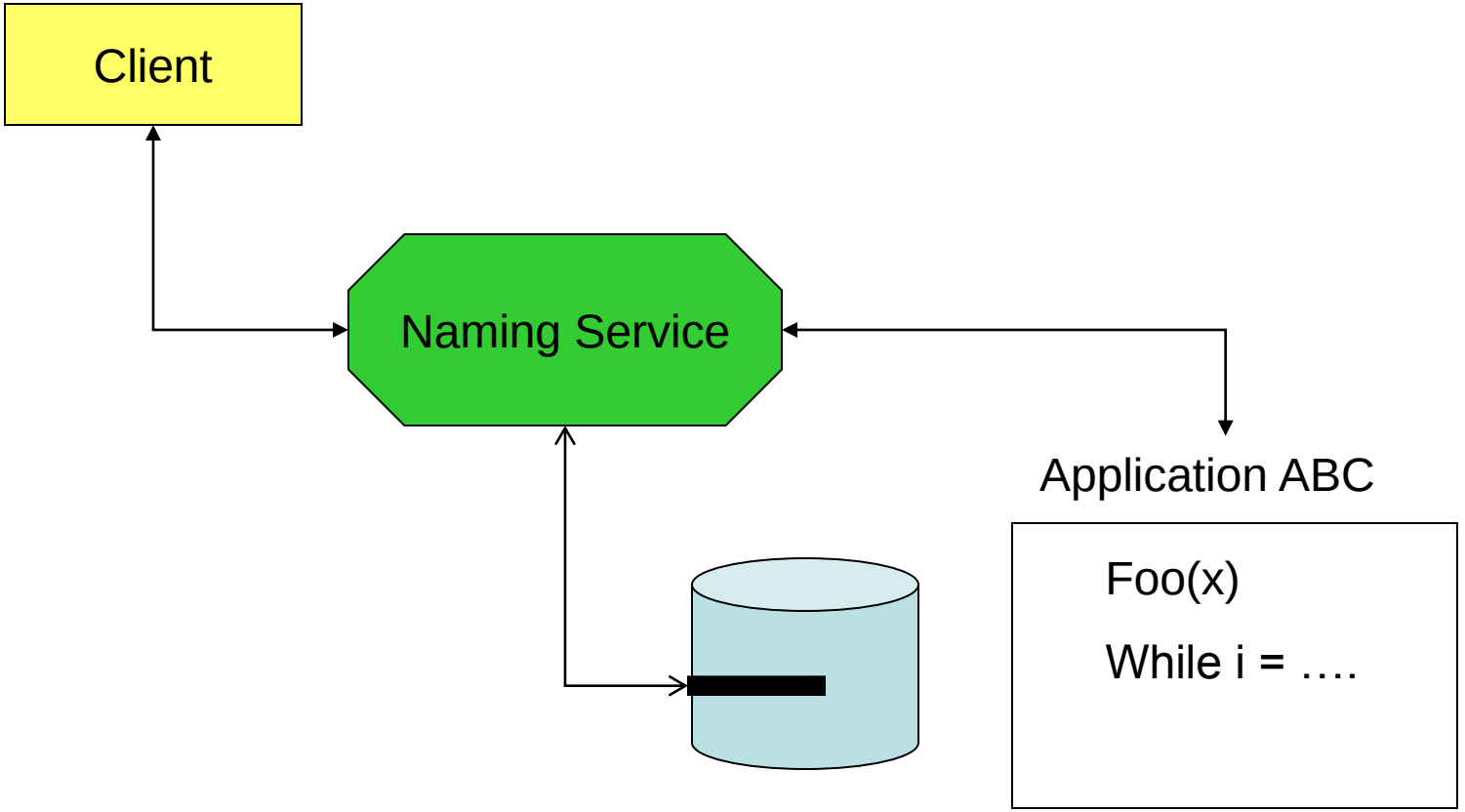
Naming Services



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Integrated System Services: Naming

- Naming–All entities have a name and can be found
  - Every entity sees the entire system as the same set of objects
    - Integrating different systems will cause problems in resolving duplicative names
    - Different types of name services have different attributes associated with the registered entities
    - The system may periodically be in an inconsistent state
  - Defined interfaces to entities
    - Entities don't have interfaces to register with the name service
    - Mismatched protocols
  - Users/Objects know how to find other system entities
    - Entities make assumptions about their environment

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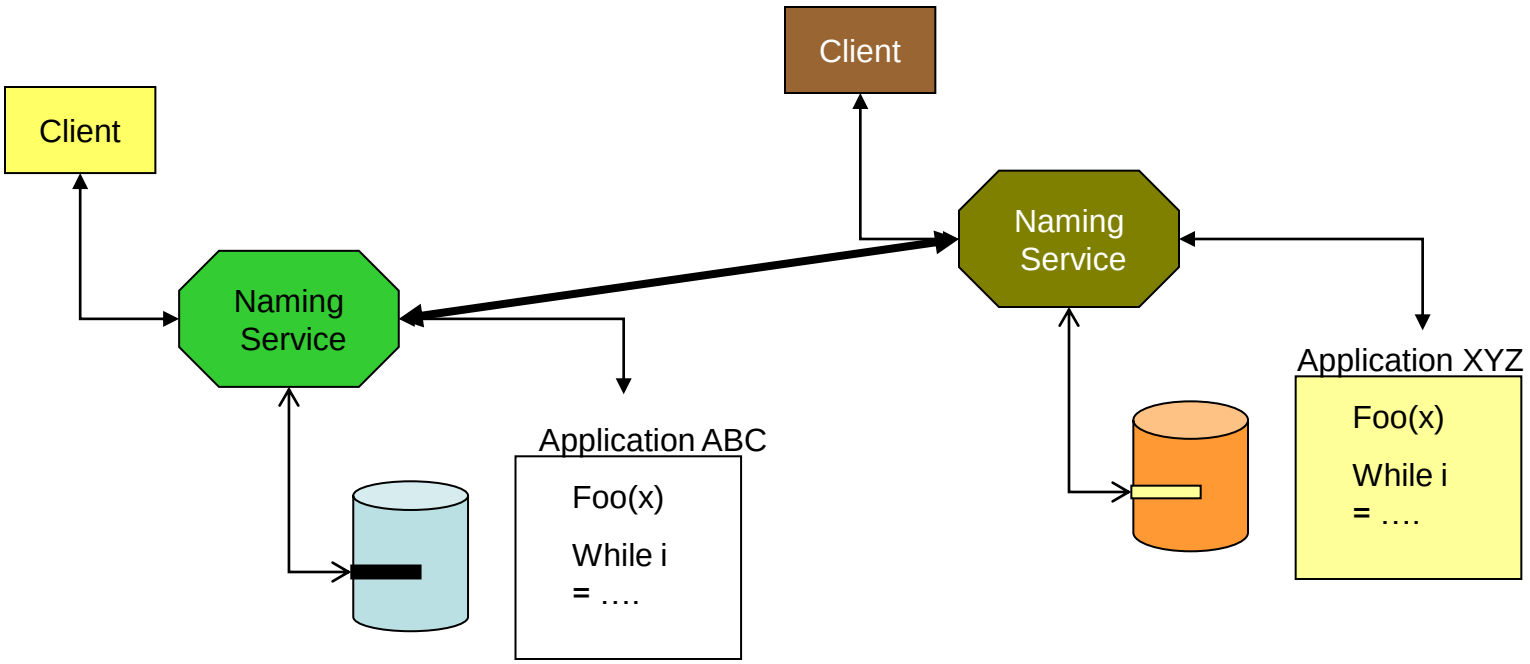
Naming Services



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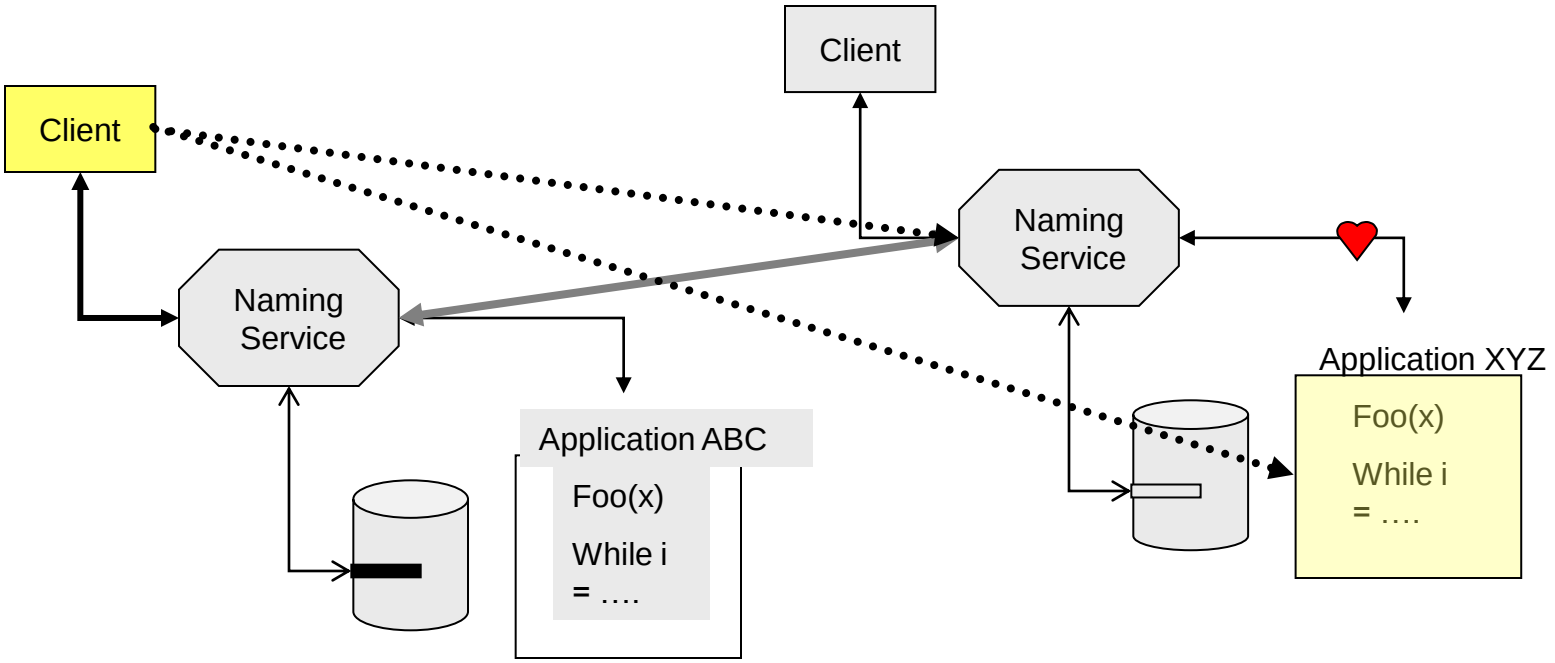
Naming Services



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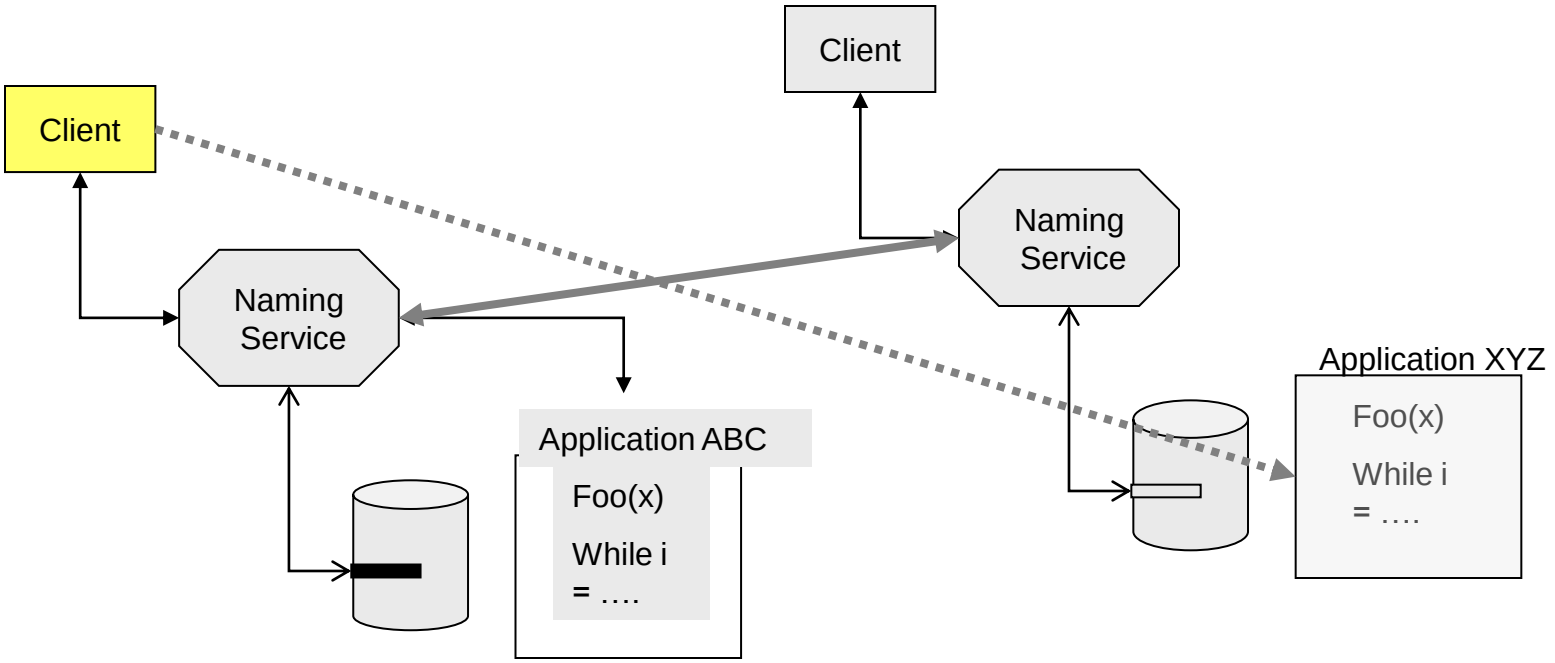
Naming Services: Inconsistent State



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Global Services of an Integrated System: Security

- Security – Entities are authenticated, resources are managed through access control, and activities can be logged
  - All entities (principles) are known with some degree of reliability
  - Access to resources are managed based on defined policies
  - Activities can be logged to ensure accountability and recovery

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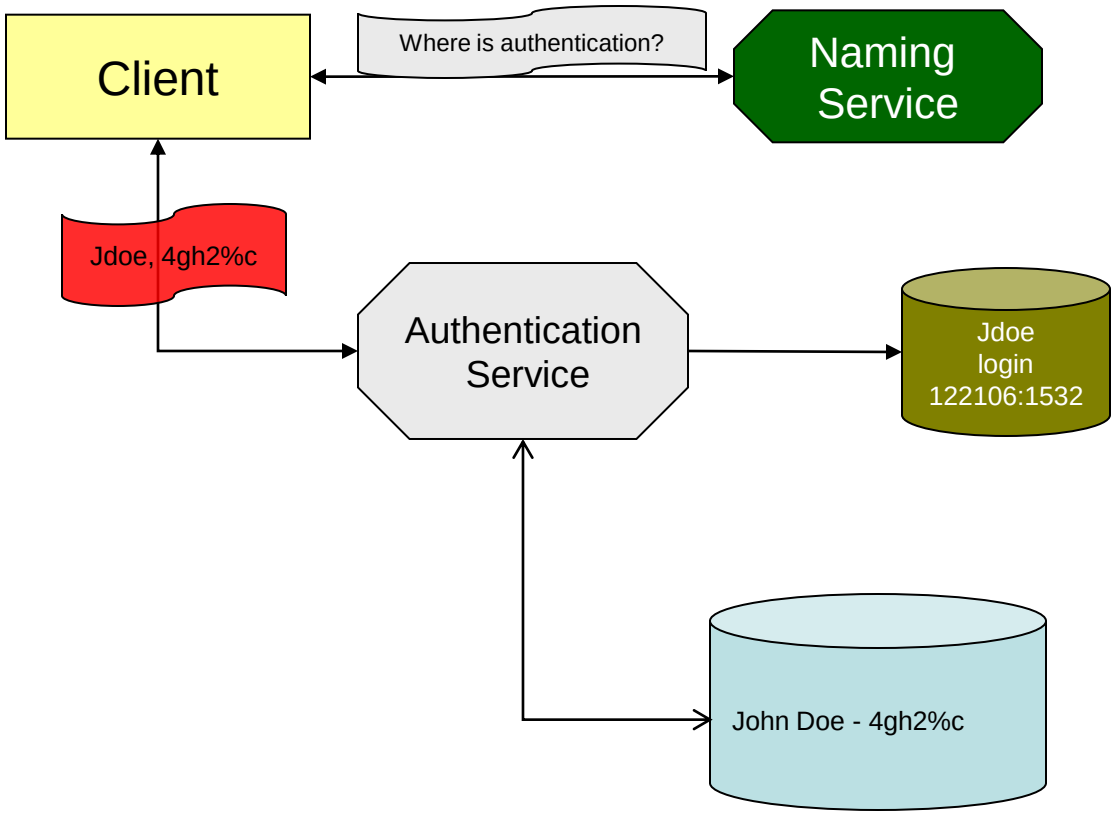
Security Services



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Integrated System Service: Security

- Security Services– Entities are authenticated, resources are managed through access control, and activities can be logged
  - All entities (principles) are known with some degree of reliability
  - Access to resources are managed based on defined policies
  - Activities can be logged to ensure accountability and recovery
    - Different systems log different events

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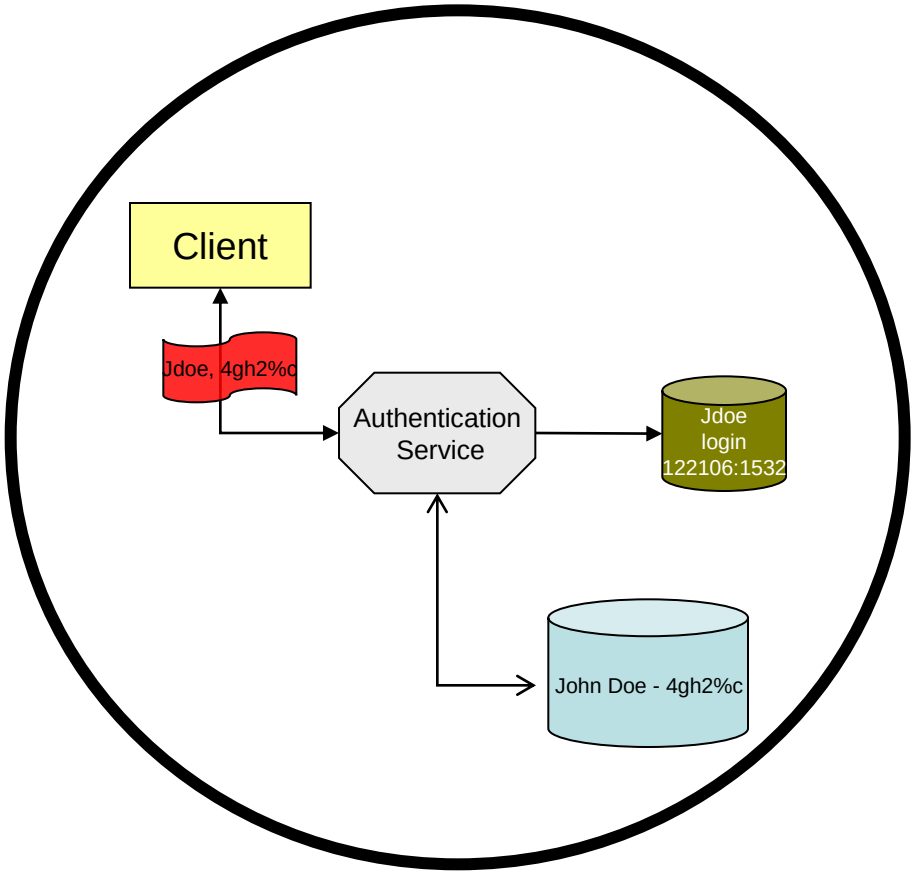
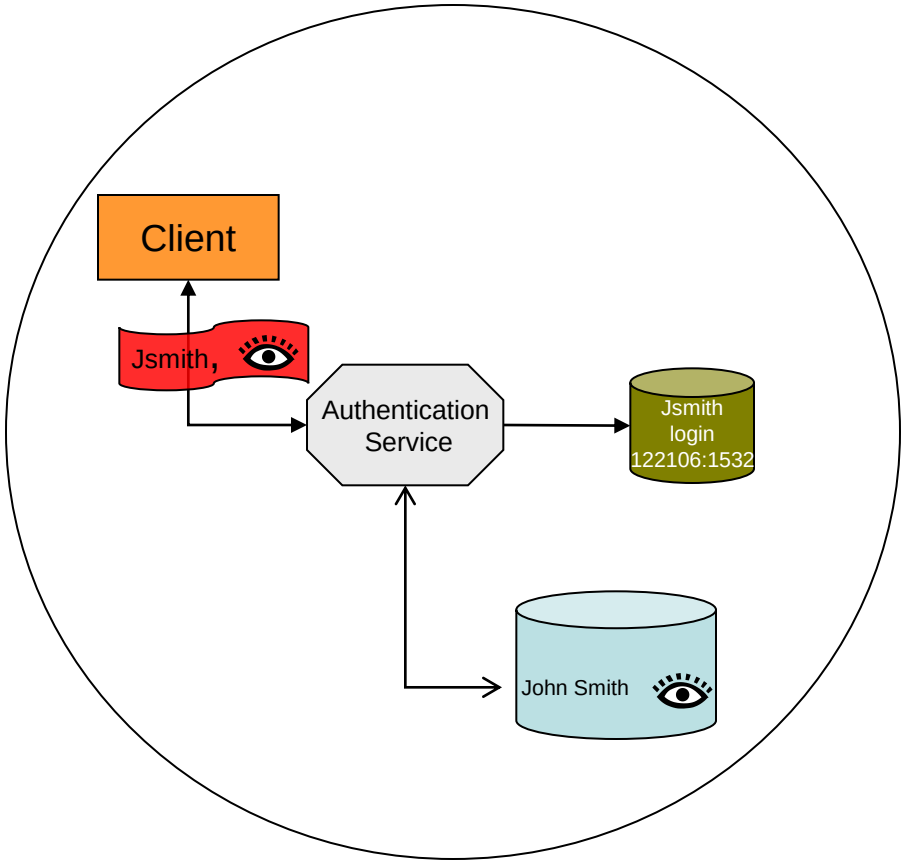
Security Services - Authentication





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Integrated System Service: Authentication

- Different systems have different degrees of authentication
  - System X user logs on with user ID and password
  - System Y user must have a smart token
  - Systems have different levels of authentication and different types of authentication
- Establish a degree of trust between systems

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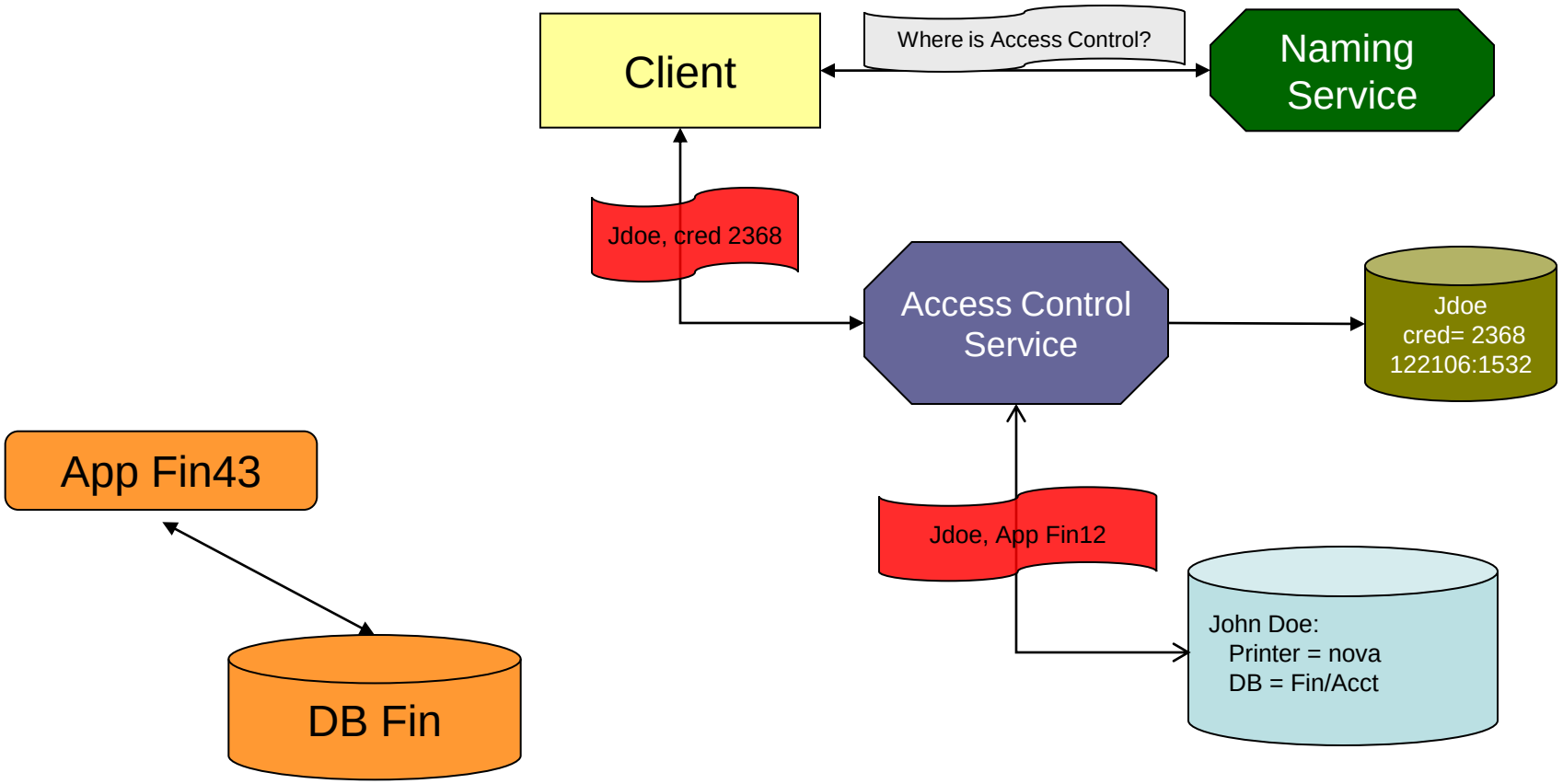
Security Services: Access Control



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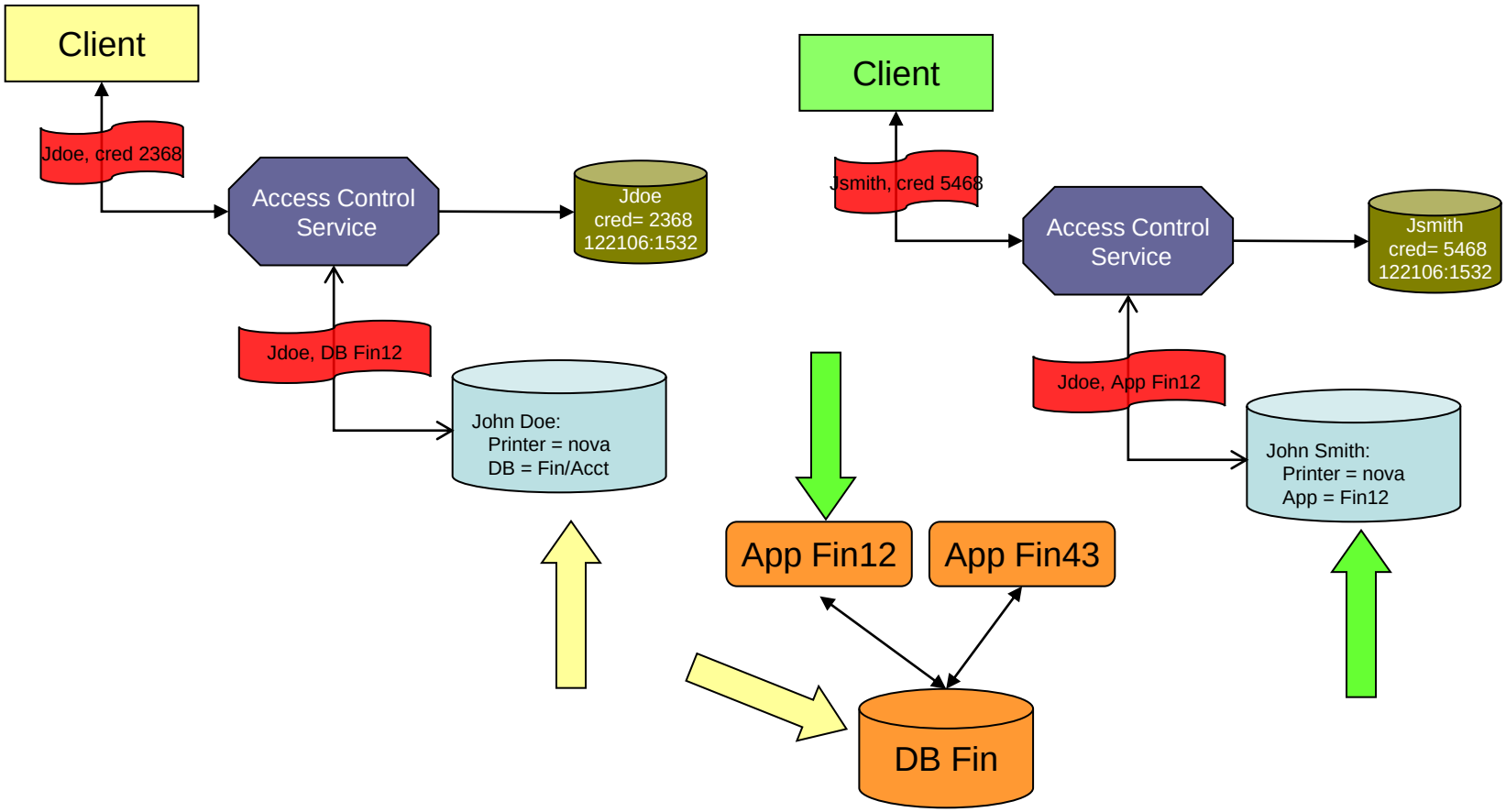
Security Services: Access Control



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Integrated System Service: Access Control

- Policies conflict – example, users who have different roles in the organization can access data that should not be accessed
- Access to the data, but not the application
- Access to the application, but not the data
- Users are often assigned to groups
- Users can be in multiple groups
- Access determined by groups

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Global Properties of an Integrated System: Reliability

- Reliability – The ability of the system to provide necessary functionality despite unexpected events
  - Reliability primarily achieved with replication or redundancy
  - Graceful degradation of functionality when full functionality cannot be achieved
  - Transparent to the user when possible
  - Definition of failure difficult to identify

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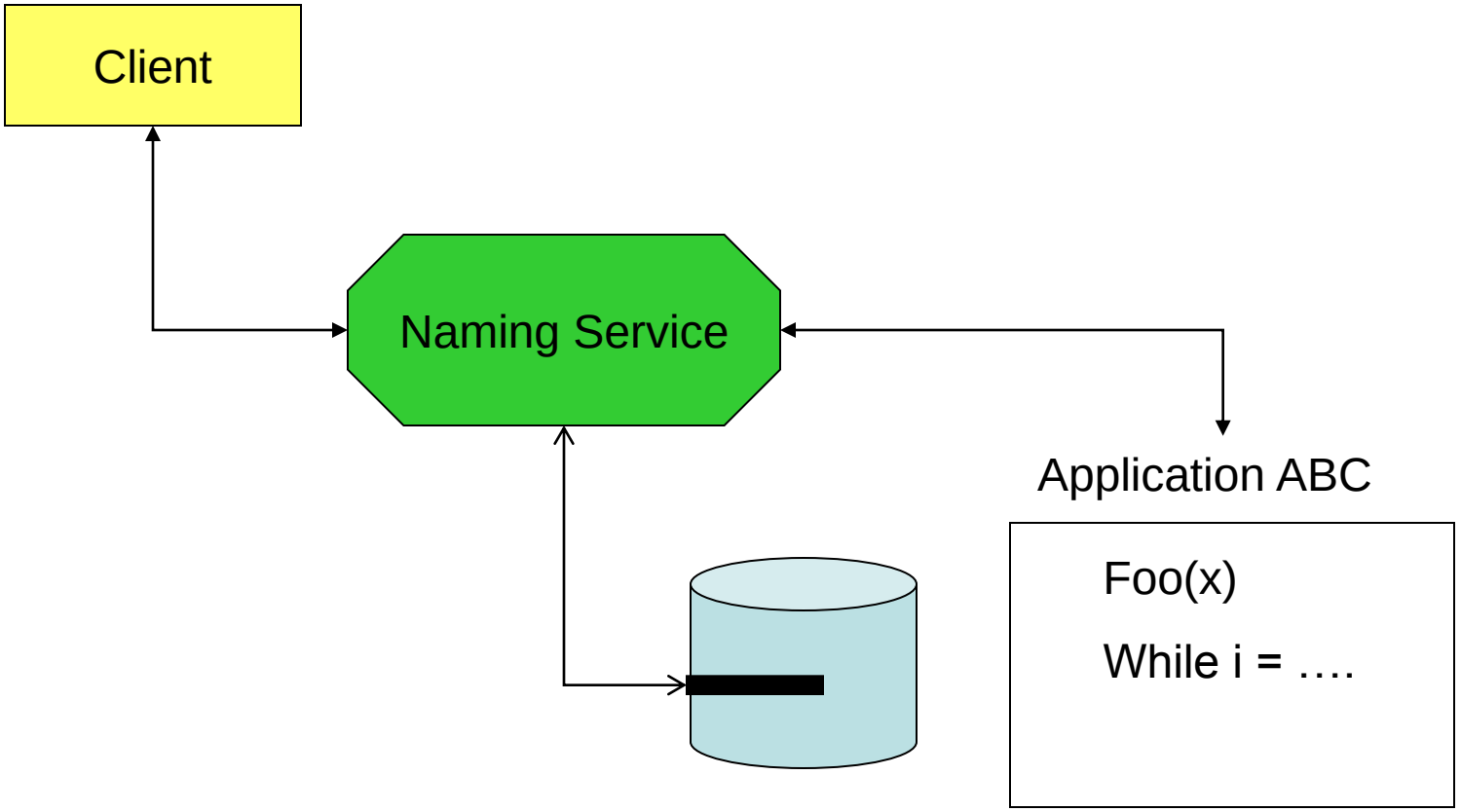
Reliability Services



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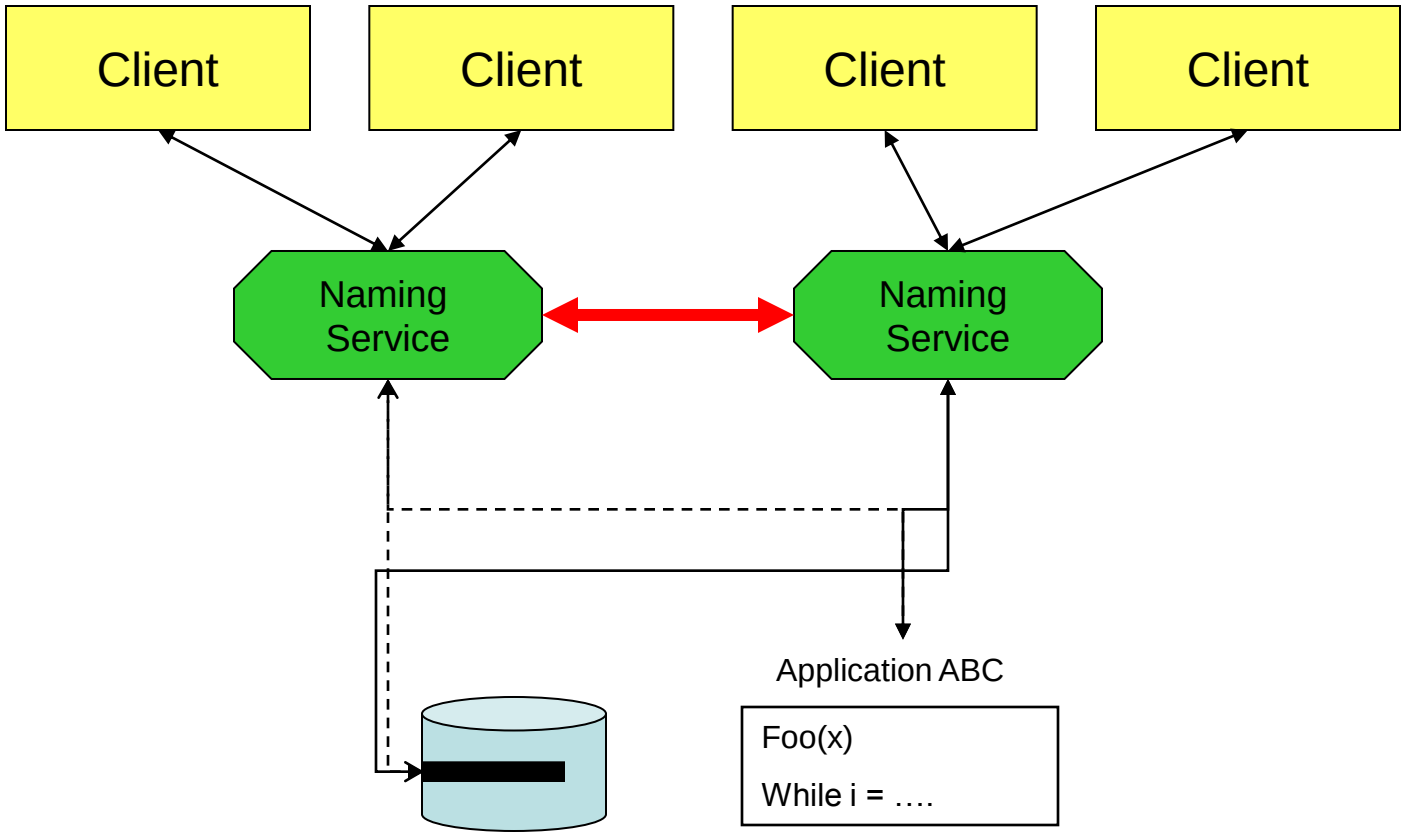
Reliability Services: Balancing



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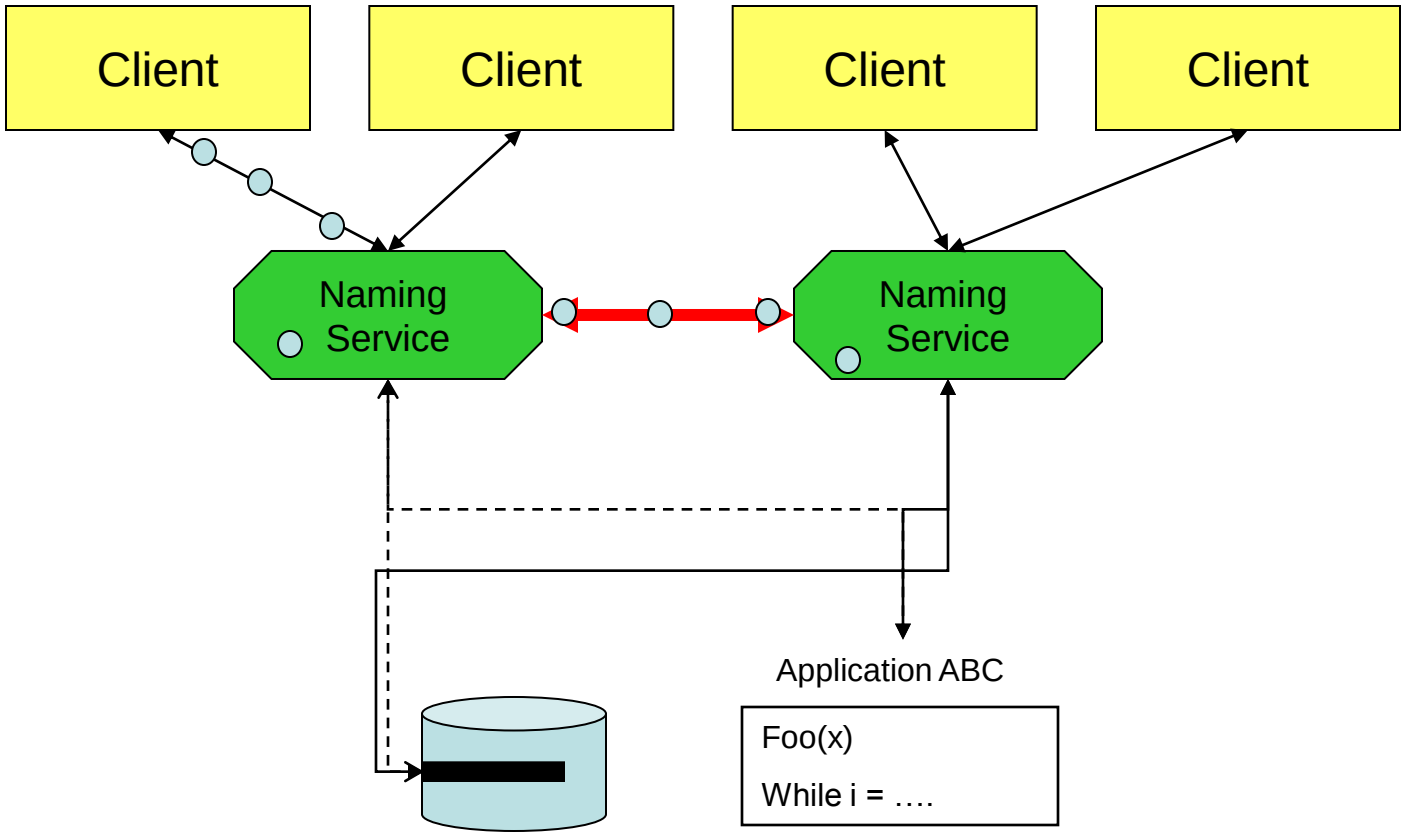
Reliability Services: Balancing



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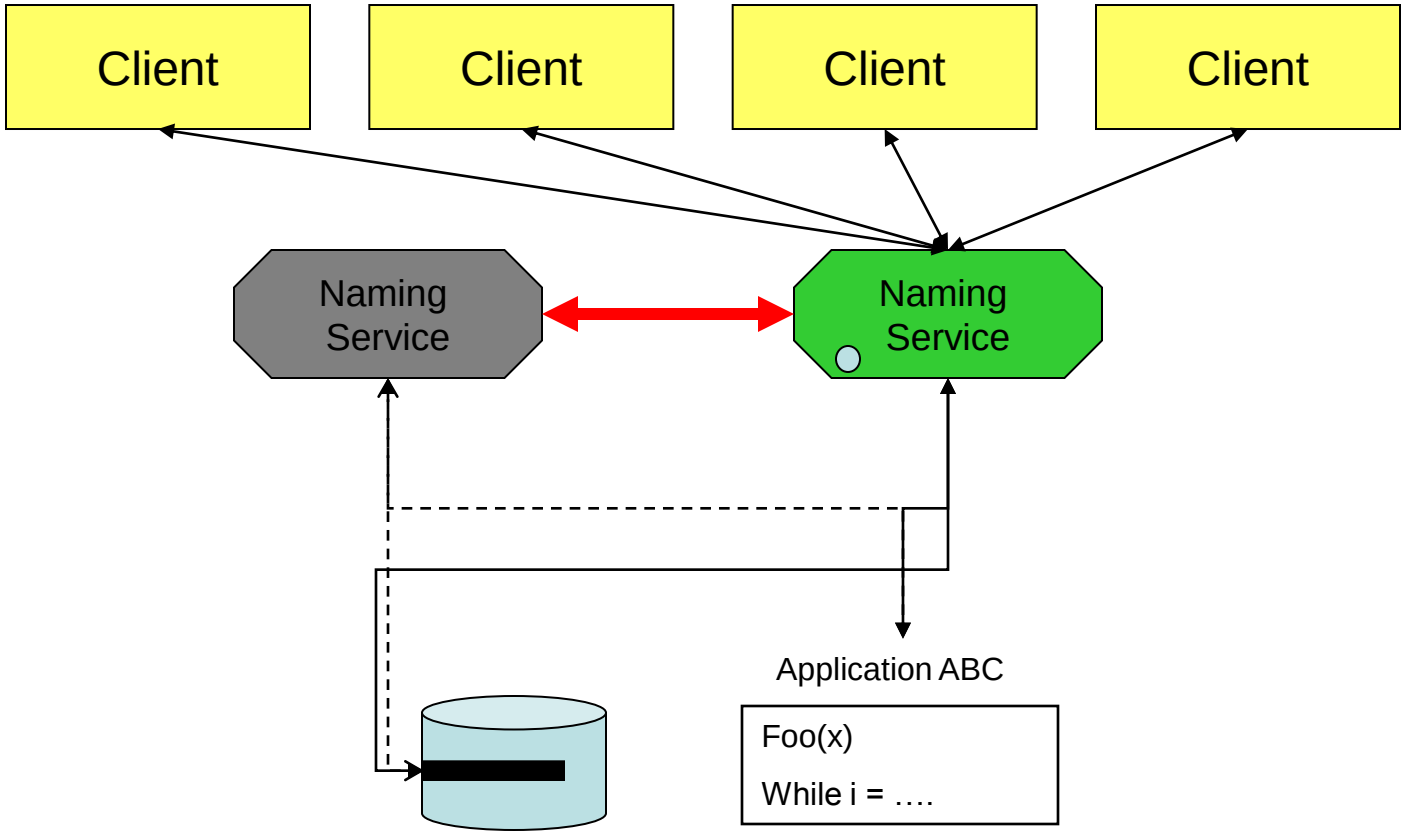
Reliability Services: Balancing



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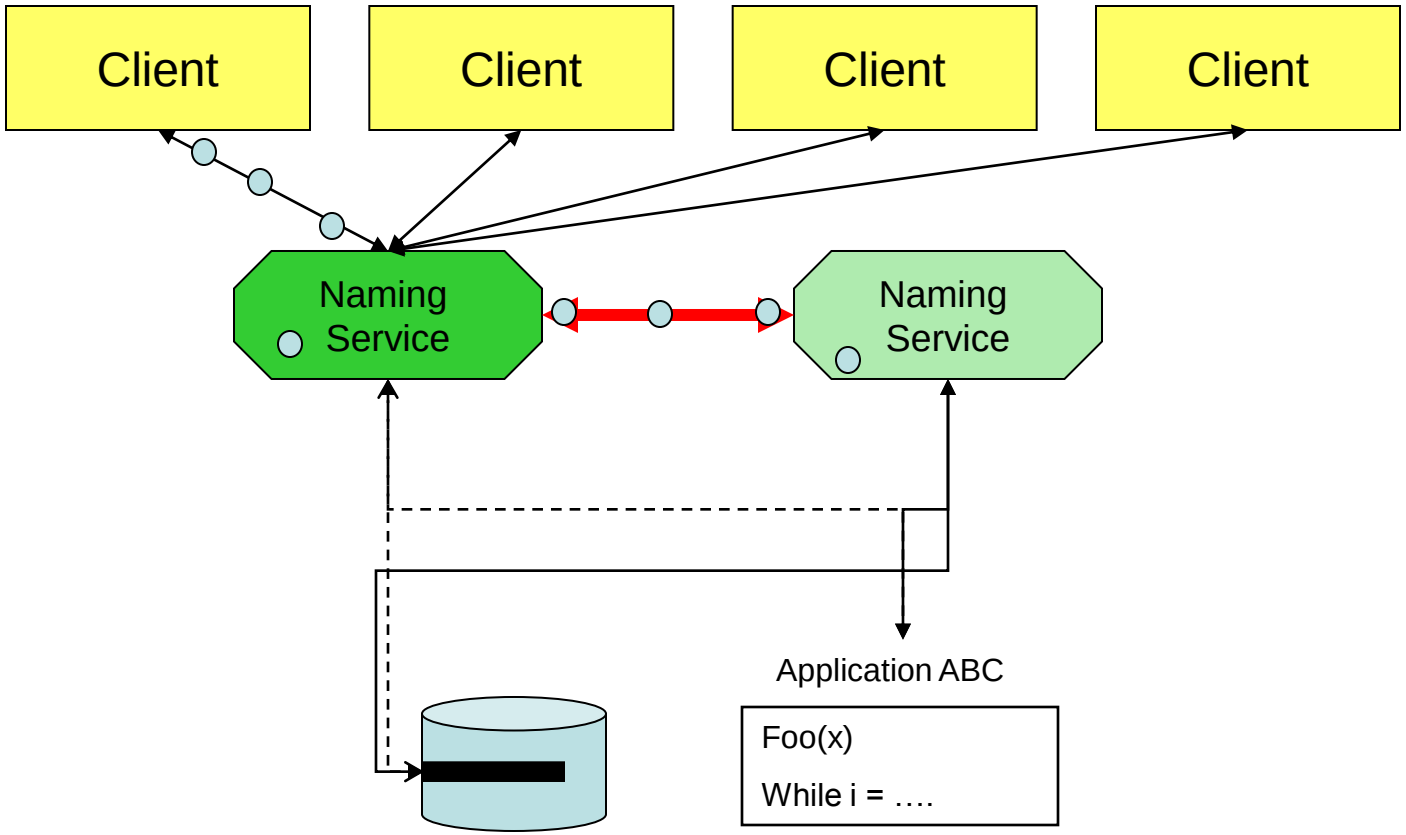
Reliability Services: Balancing



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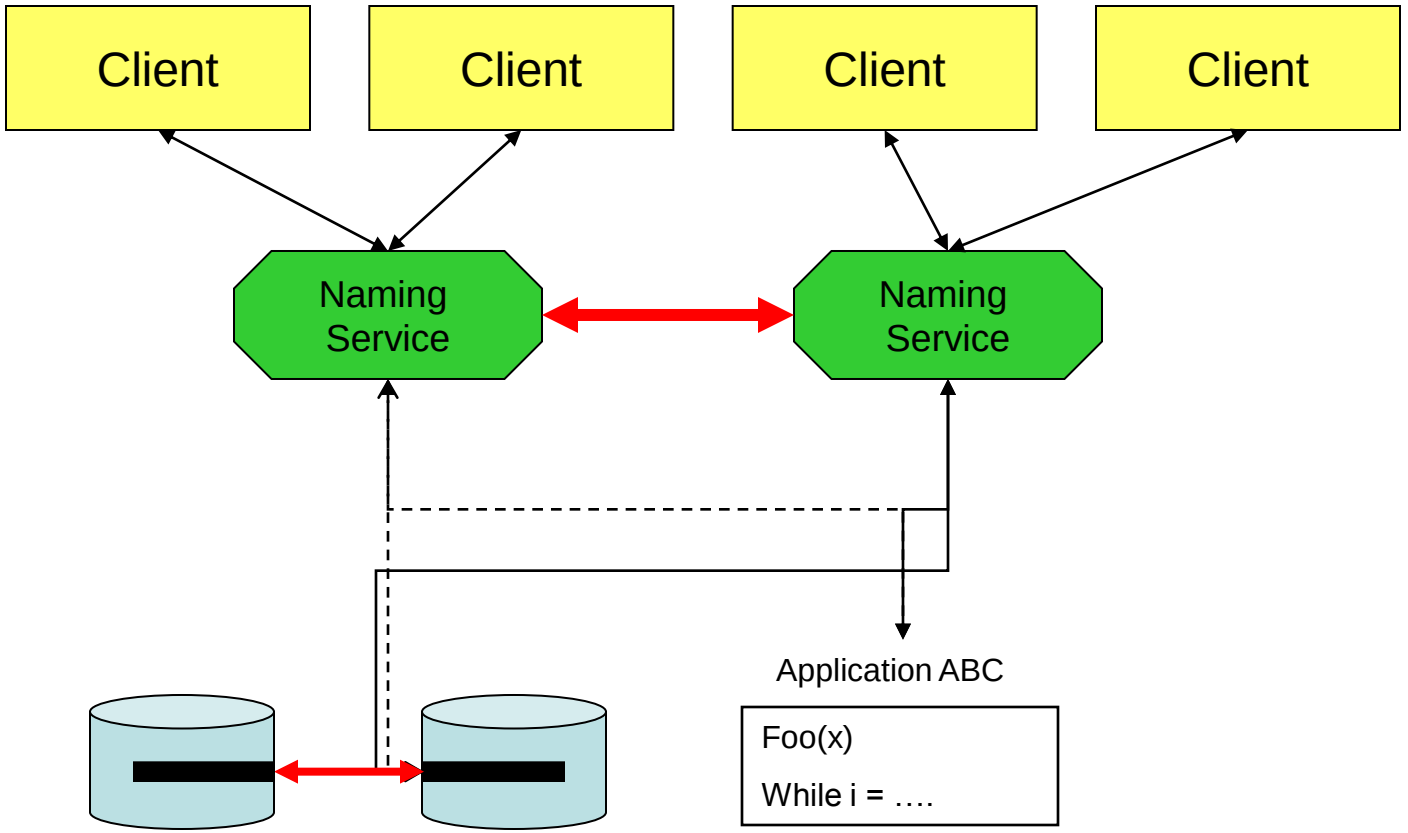
Reliability Services: Data Redundancy



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Summary

- Modern systems rely on different types of services that often must be integrated:
  - Naming service: Finding other services and objects in the system
  - Security services: Includes authentication, logging, and access control
  - Reliability services: ensuring a fully functional or partially functional system when one or more services is not available

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