

CmpE 473: Internet Programming

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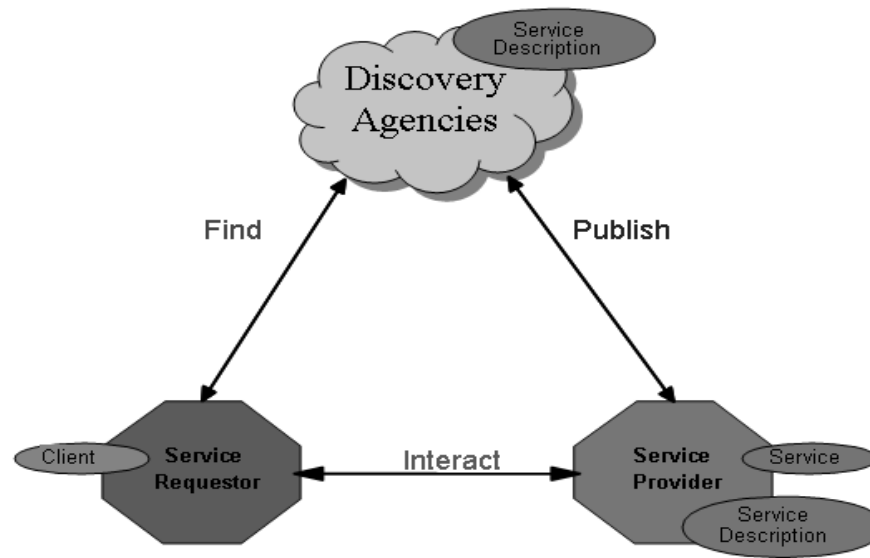
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Service-Oriented Architectures (SOA)

- Separate service implementation from the interface
 - No need to know the internal implementation
 - Follow a previously agreed protocol
- Find-Bind-Execute Paradigm

Service Oriented Architecture



SOA Entities

- Service Consumer
 - Locates the Producer in the Registry
 - Initiates the communication
 - Follows a Contract
- Service Producer
 - Delivers services
 - Advertises its services in a Registry
- Service Registry
 - Stores advertisements
 - Allows lookup service to Consumers

SOA Concepts

- Service Contract
 - Specifies how the Consumer and the Producer will interact
 - Specifies the necessary conditions for the Producer to execute a task
 - Defines the QoS requirements

SOA Properties (1)

- Entities are autonomous
 - Resources owned and managed by individuals
 - Choose how they will carry out their tasks
 - Choose whom they will carry out business with
- Entities are dynamic
 - Entities can change their behavior
 - Entities may not always be available
- Entities are interoperable
 - Entities can communicate even if they are written in different languages or run on different platforms
 - Standard protocols or data formats should be available

SOA Properties (2)

- Services are loosely coupled
 - Established by contracts and dynamic binding
 - No dependency on the service implementation
- Services are composable
 - Put together to offer a composite service
 - Dependencies between the services should be handled

Comparison of Architectures

	Monolithic	C/S	N-tier	Service-Oriented
Data formats	Proprietary	Proprietary	Open	Standard
Protocols	None	Proprietary	Open	Standard
Scalability	Low	Low	Medium	High
Number of nodes	Small	Small	Medium	High
Coupling	None	Tight	Tight	Loose

Web Services Overview

Component-Based Development

- Groups of objects
- Provides application functionality
 - Rather than access to individual data items
- Components communicate to yield enhanced functionality
- Components are composed and compiled at design time

Service-Based Development

- Allows late binding
 - Consumer looks up a service in a registry
 - Possibly chooses among several possibilities
 - Binds to the one it selects
 - Enacts the service
- Web-based standards
- Standardized data formats

Web Services Stack (1)

● Service Transport

- Transfer data between different nodes
- HTTP used most often
 - Not affected by firewalls
 - Connectionless and stateless: Independent requests and responses

● Service Messaging

- Extensible Markup Language (XML)
 - Self-describing messages
 - Data structured as a tree
- Simple Object Access Protocol (SOAP)
 - Defines how data is packaged in an XML message
 - Contains an envelope, a header, and a body

Web Services Stack (2)

- Service Description
 - Functionalities that the service provides
 - Set of acceptable messages
 - Protocol with which consumers can bind and communicate with the service
- Service Registry
 - Example: Universal Description, Discovery and Integration (UDDI) Registry
 - Itself a Web service
 - Allow service providers to publish information
 - Allow service consumers to find Web services for given service characteristics
 - Communication through SOAP messages

Web Services Stack (3)

- Service Composition
 - Each Web service is thought of carrying out small task
 - Combine tasks from different Web services into one large transaction
 - Example:
 - Web service A can be used for booking a flight.
 - Web service B can be used for reserving a hotel room
 - Compose them into one service to arrange the entire trip.
- Business Process Execution Language for Web Services (BPEL)

Quality of Service

- Availability

- When can it be used? Now? At certain intervals?
- Metrics for measuring availability.
- Example: Time-to-repair (TTR)

- Accessibility

- Extent of finishing the requested service
- Metrics for measuring accessibility
- Example: Success rate

- Can a Web service be available but not accessible?

Quality of Service (2)

● Performance

- Throughput: How many service requests can be handled by the Web service in a unit time?
- Latency: How long does it take to get a response to a request?
- Maximize throughput, minimize latency

● Reliability

- Can it guarantee the same performance over a period of time?
- How many failures take place in a period of time?

Quality of Service (3)

● Integrity

- How correctly is the source executed?
- All tasks need to be performed in the correct order
- Otherwise, roll back

● Security

- Provide authorization and authentication for accessing resources
- Preserve confidentiality of private consumer information

Example Applications

- Travel planning
 - Simple, individual services
 - Can be composed in various ways
 - Some service providers may be preferred over other