SOA Reference Model OASIS

What is a Reference Model

- Abstract framework for understanding significant relationships among the entities of some environment.
- Enables the development of specific reference or concrete architectures.
- Is a minimal set of unifying concepts, axioms and relationships within a particular problem domain.
- The SOA Reference Model applies to software architecture and not generally to "service environments".

What is a Reference Architecture?

- Recommended patterns.
- Explains and underpins a generic design template.
- A reference model, on the other hand, works at a higher level of abstraction.
- Consider a reference model for residential housing…
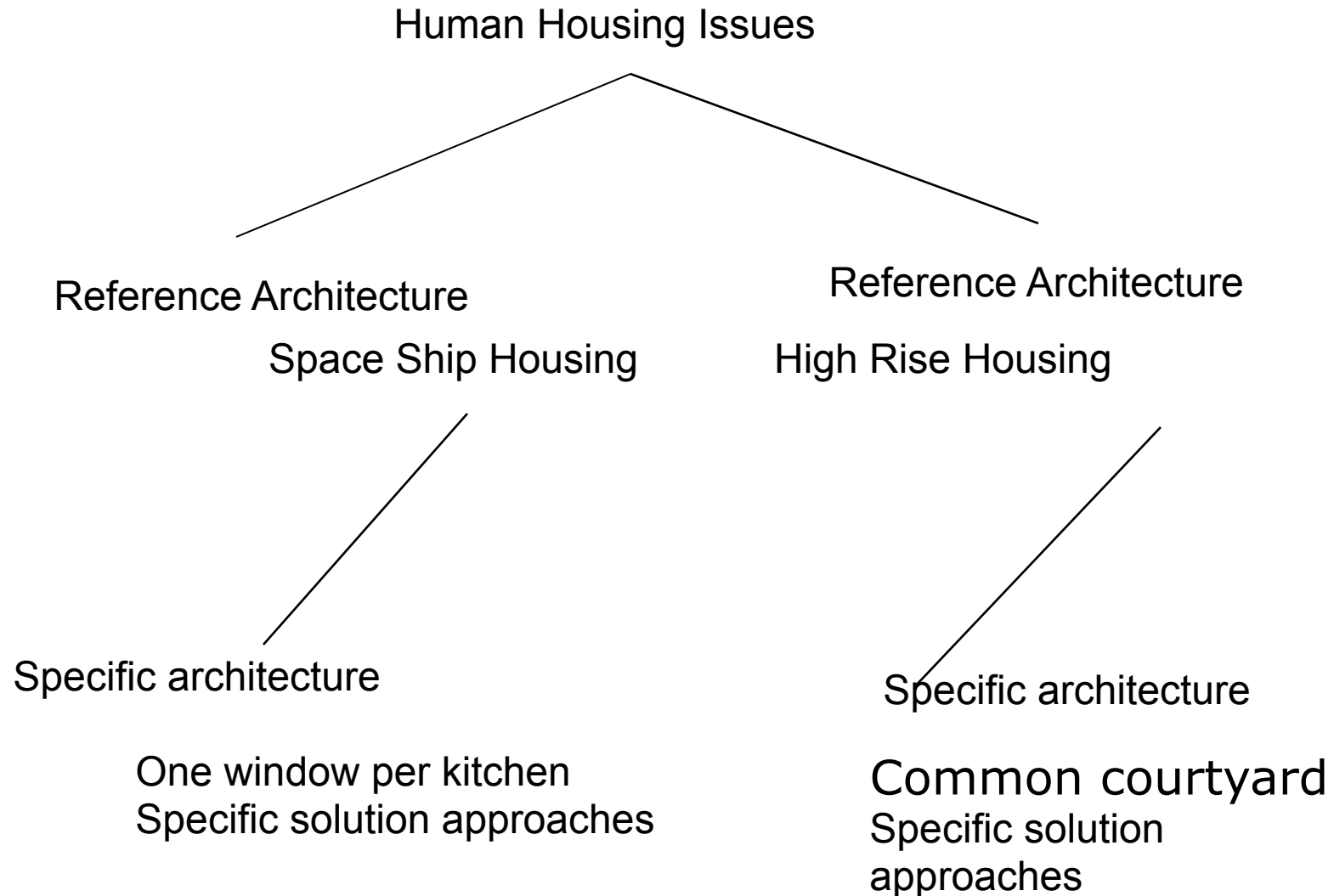
Residential Housing Example

- A <u>reference model</u> would talk about eating areas, hygiene areas and sleeping areas.

- More than one <u>reference architecture</u> may address the problem of providing housing. A reference architecture may exist for space station housing and another for high density housing.
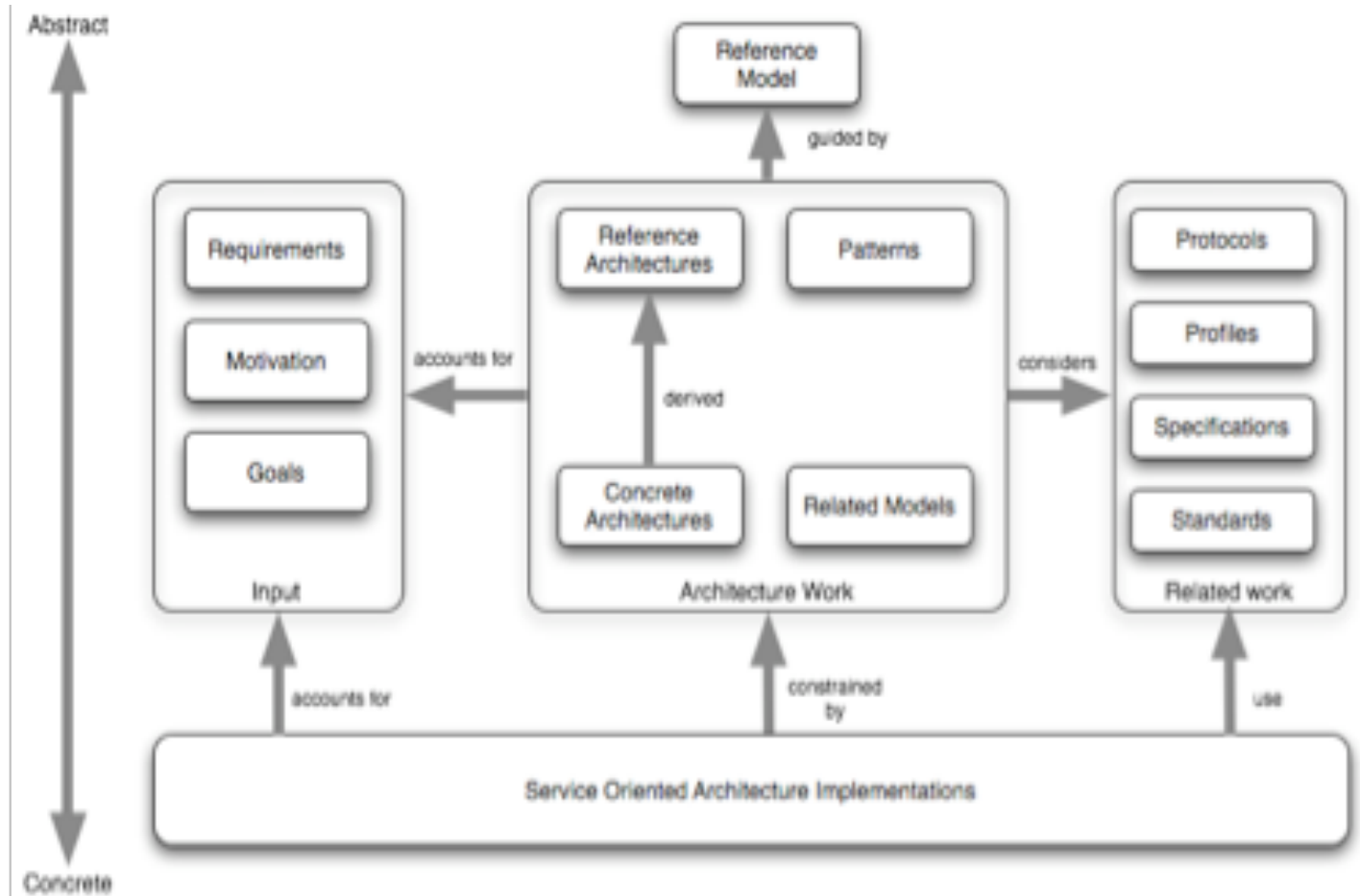
Concrete or Specific Architecture

- In residential housing we would:
- Incorporate particular styles.
- Describe window arrangements.
- Assign construction materials.
- Present blueprints.

Reference Model

Human Housing Issues

Reference Architecture

Space Ship Housing

Reference Architecture

High Rise Housing

Specific architecture

One window per kitchen
Specific solution approaches

Specific architecture

Common courtyard
Specific solution approaches

6

How the Reference Model relates to other work

Figure 1 How the Reference Model relates to other work

7

Terms

- <u>Visibility</u> refers to the capacity of those with needs and those with capabilities to see each other.

- <u>Interaction</u> is the activity of using capability grounded in a particular execution context.

- <u>Capabilities</u> are used to realize real world effects (return of information or change in state of entities).

Terms

- **Private actions**

    are inherently unknowable by other parties. Think information hiding.

- **Public actions**

    result in changes to the state that is shared between those involved in the current execution context and possibly shared by others.

Terms

- The notion of <u>Service</u> includes:
  - -- The performance of work (a function) by one for another.
  - -- The capability to perform work for another.
  - -- The specification of the work offered for another.
  - -- The offer to perform work for another.
  - -- In SOA, services are the mechanisms by which needs and capabilities are brought together. Think marketplace.

Terms

- SOA is a means of organizing solutions that promotes reuse, growth and interoperability.
- SOA is an organizing and delivery paradigm that enables one to get more value from use both of capabilities which are locally "owned" and those under the control of others.
- The provider of the underlying capability may not be the same entity that eventually provides the service through which

  the underlying capability is accessed.
- The entity that creates, evolves and maintains the capability may be different from the entity that creates, evolves and maintains the service.

SOA Differs from OOP

- The Object Oriented Paradigm focuses on packaging data with operations. The SOA Paradigm focuses on the task or business function. It may or may not be associated with methods and properties.
- To use an object, you first create it. One interacts with a service where it exists.
- SOA places greater emphasis on clear semantics.
- SOA, like human activity, works by delegation.
- SOA takes ownership boundaries more seriously.
- SOA is more closely aligned with the marketplace. An
- Services are simpler things.

SOA Benefits

Through simplification perhaps we can:

- Facilitate the manageable growth of large-scale enterprise systems.
- Facilitate internet-scale provisioning and use of services.
- Reduce cost in organization-to-organization interaction.
- Increase scalability and interoperability.
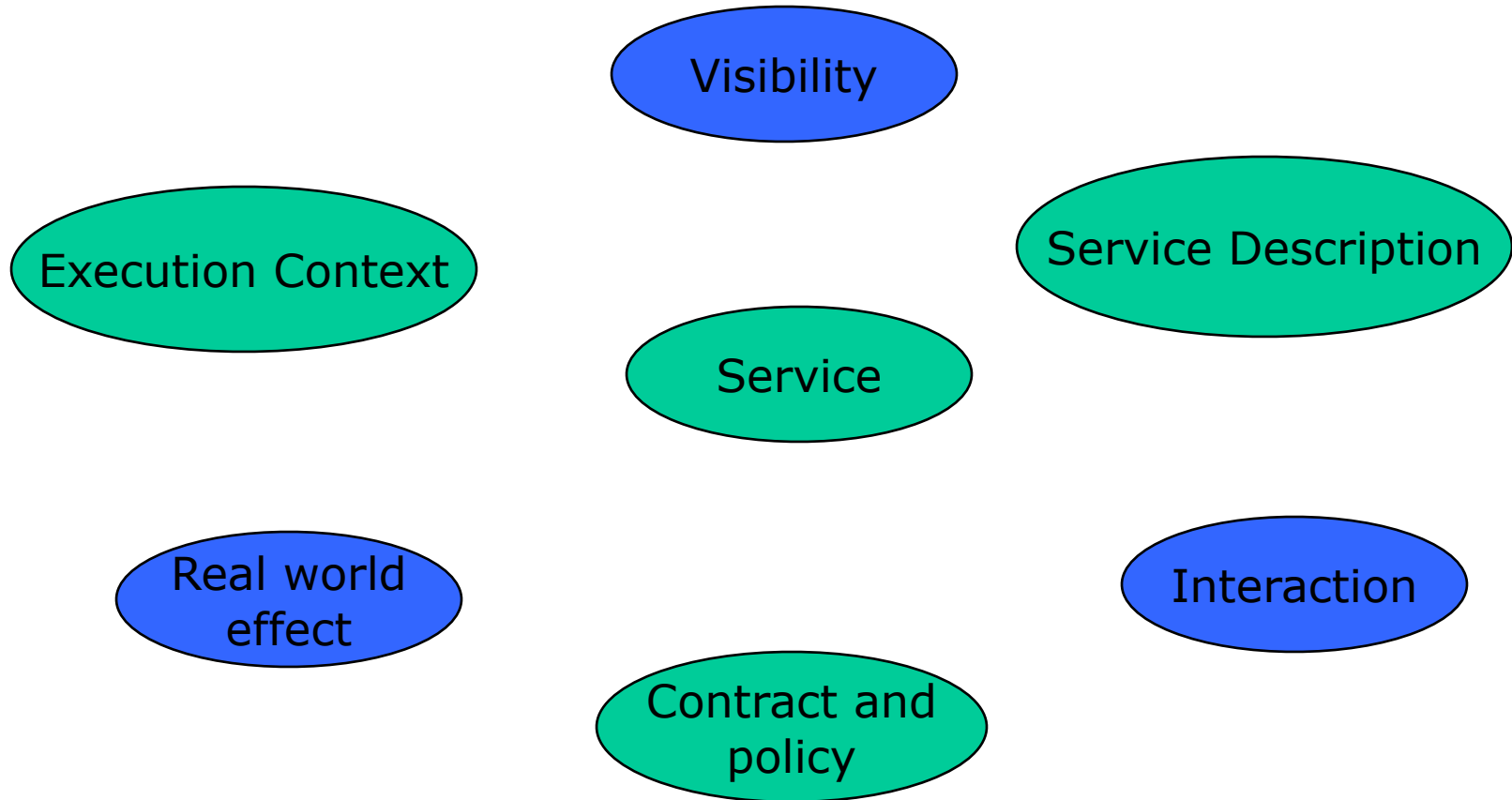- Allow for evolution and manageability.

Goal of SOA Reference Model

- Define the essence of service oriented architecture.
- Develop a vocabulary.
- Be independent of technological changes.

The Reference Model

- Concept of service.
- Concepts relating to dynamic aspects of service.
- Concepts relating to meta-level aspects of services.

The Reference Model

Visibility

Execution Context

Service Description

Service

Real world effect

Interaction

Contract and policy

A Service

-- Is a mechanism to <u>enable access</u> to one or more <u>capabilities.</u>
-- Permits access via a clear interface.
-- Is exercised consistent with constraints and policies as
   specified by the service descriptions (metadata).

Service

-- A service is opaque except for :
   -- Information model
   -- Behavior Model
   -- Information required to match needs.

-- Effects include:
   -- Information returned and/or a change in shared state

Dynamics of a Service

Service dynamics include:
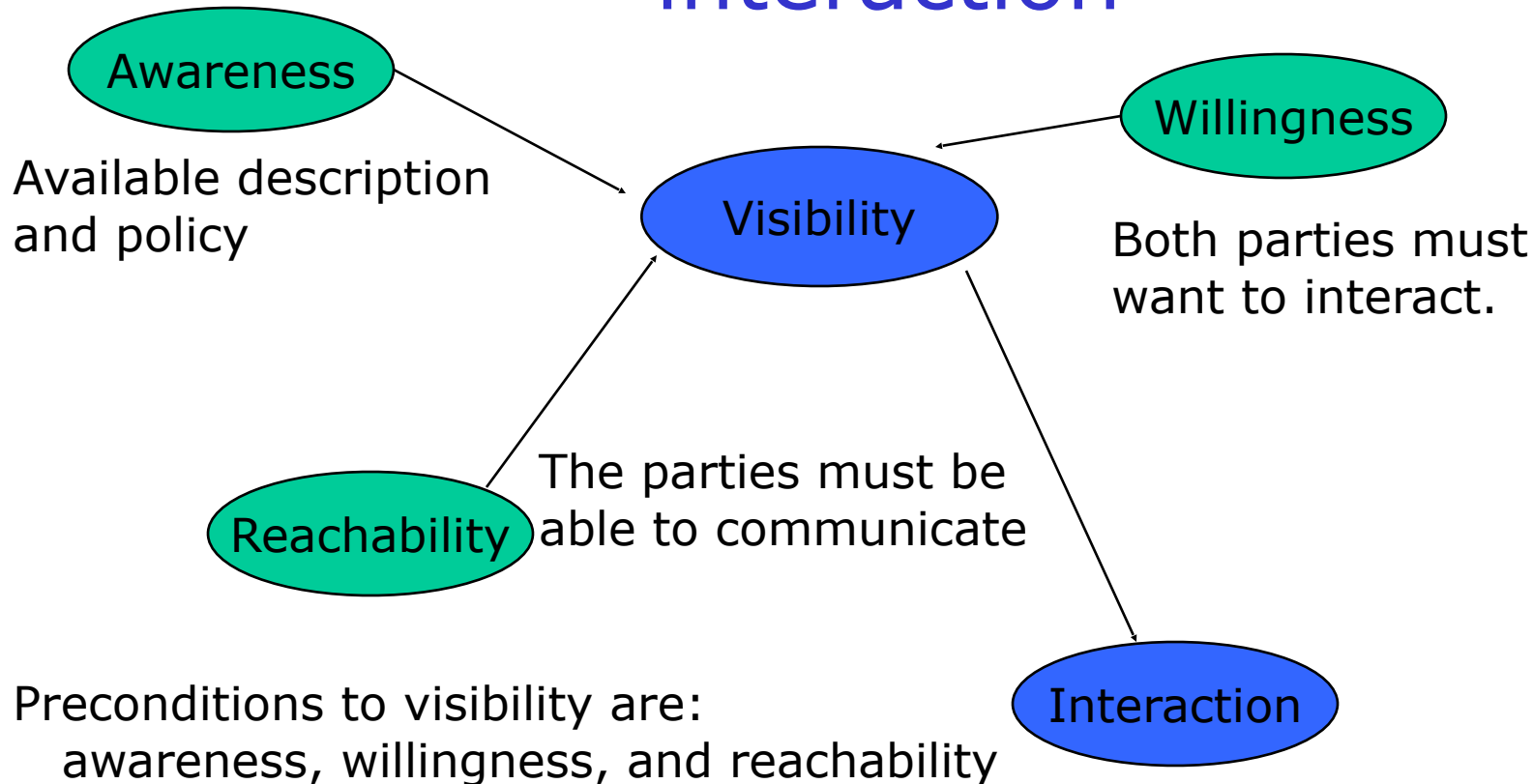
-- visibility
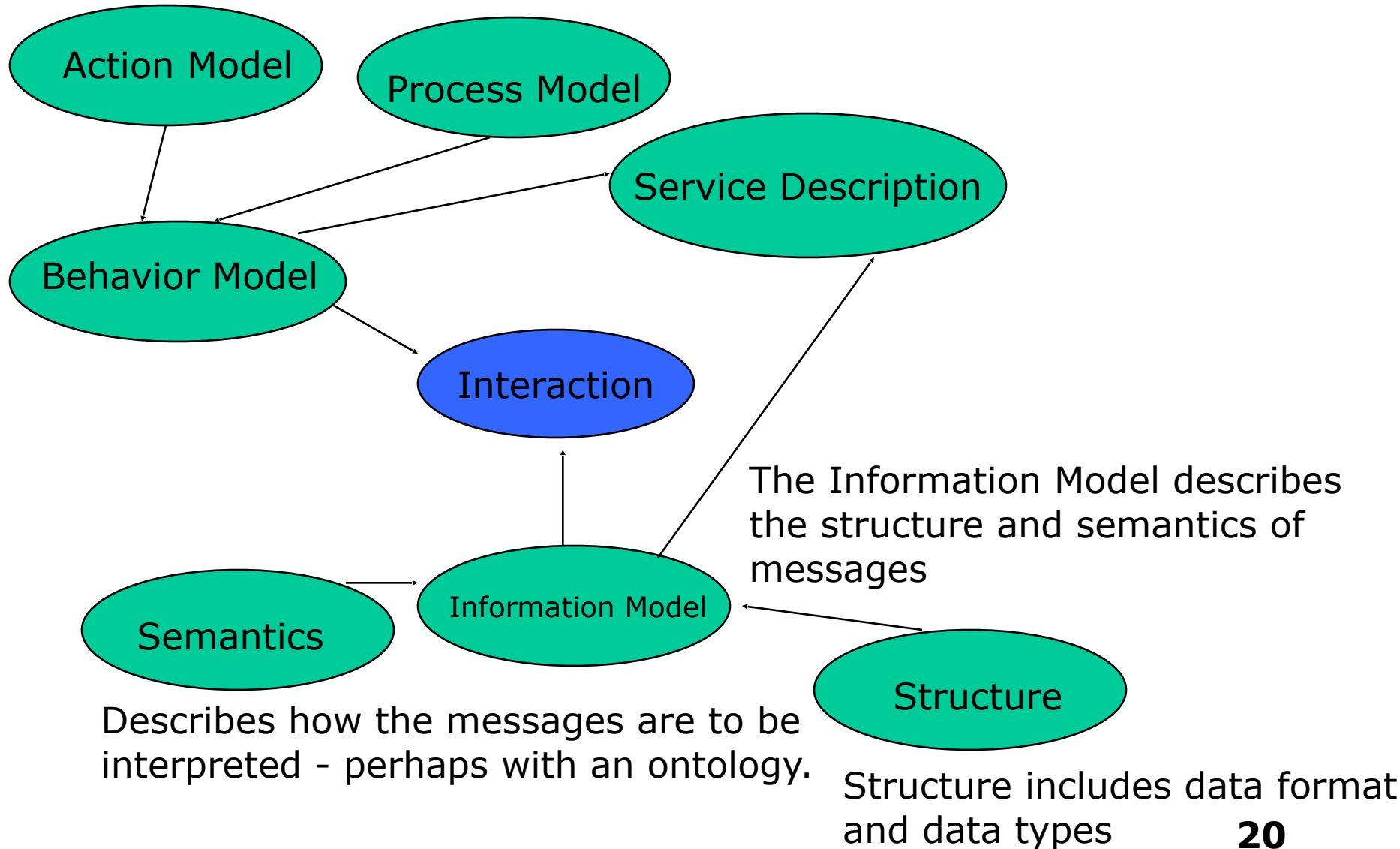-- interaction
-- real world effects
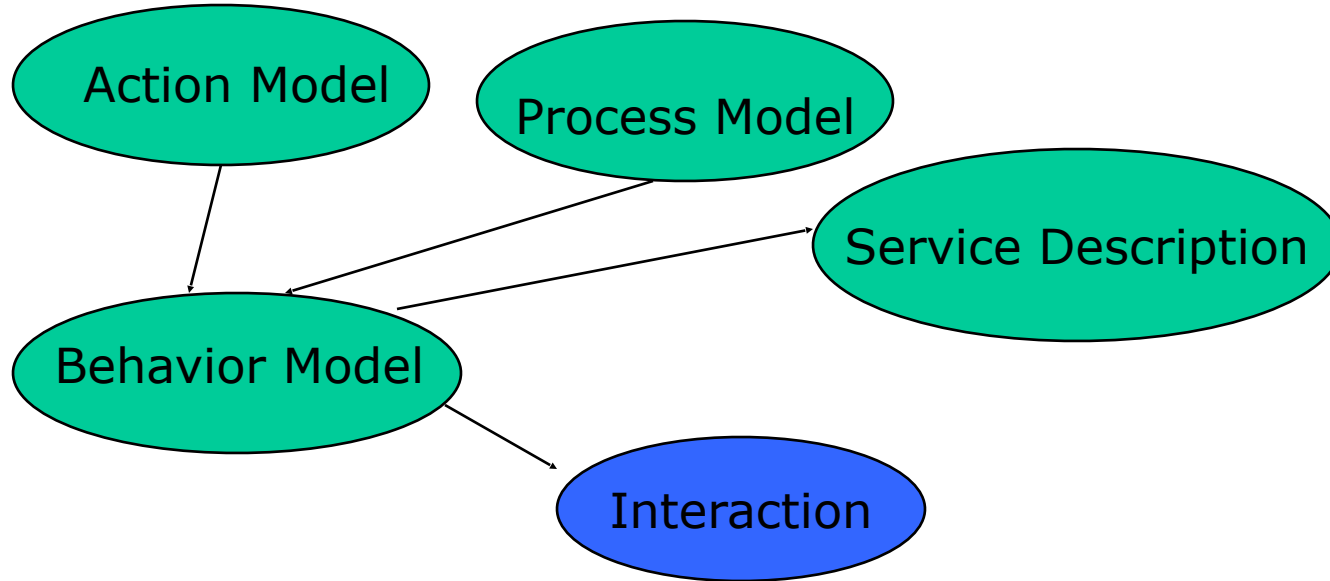
Visibility

Service

Real world effect

Interaction

Visibility a Prerequisite to interaction

Awareness

Willingness

Available description and policy

Visibility

Both parties must want to interact.

The parties must be able to communicate

Reachability

Preconditions to visibility are:
awareness, willingness, and reachability

Interaction

Important Interaction Concepts

Action Model

Process Model

Service Description

Behavior Model

Interaction

Semantics

Information Model

Structure

The Information Model describes the structure and semantics of messages

Describes how the messages are to be interpreted - perhaps with an ontology.

Structure includes data format and data types

20

Important Interaction Concepts

Action Model

Process Model

Service Description

Behavior Model

Interaction

A behavior model is characterized by knowledge of the actions on, responses to, and temporal dependencies between actions on the service.

For example, when accessing a secure database, several steps may be required for identification, authentication and authorization prior to issuing an SQL query.

Important Interaction Concepts

Action Model

Process Model

Processes may be idempotent, long-running, transactional, etc.

Service Description

Behavior Model
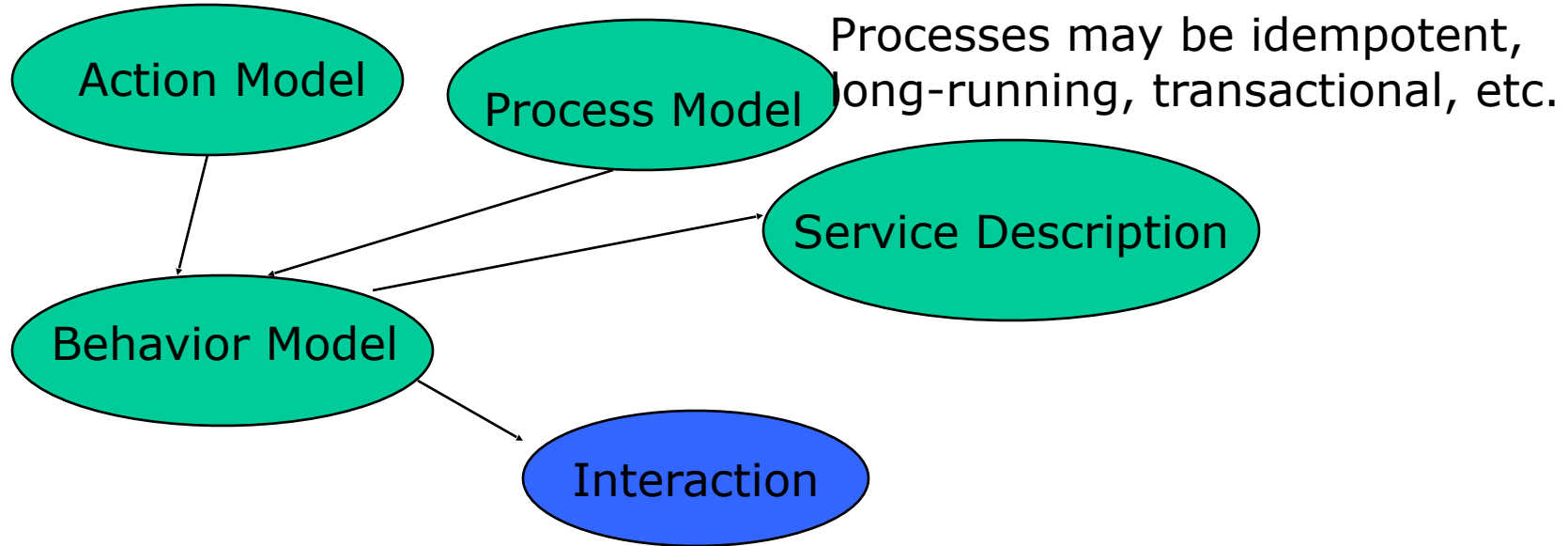
Interaction

Important Interaction Concepts

Characterizes the actions that
may be invoked against the service

Process Model

Action Model

Service Description
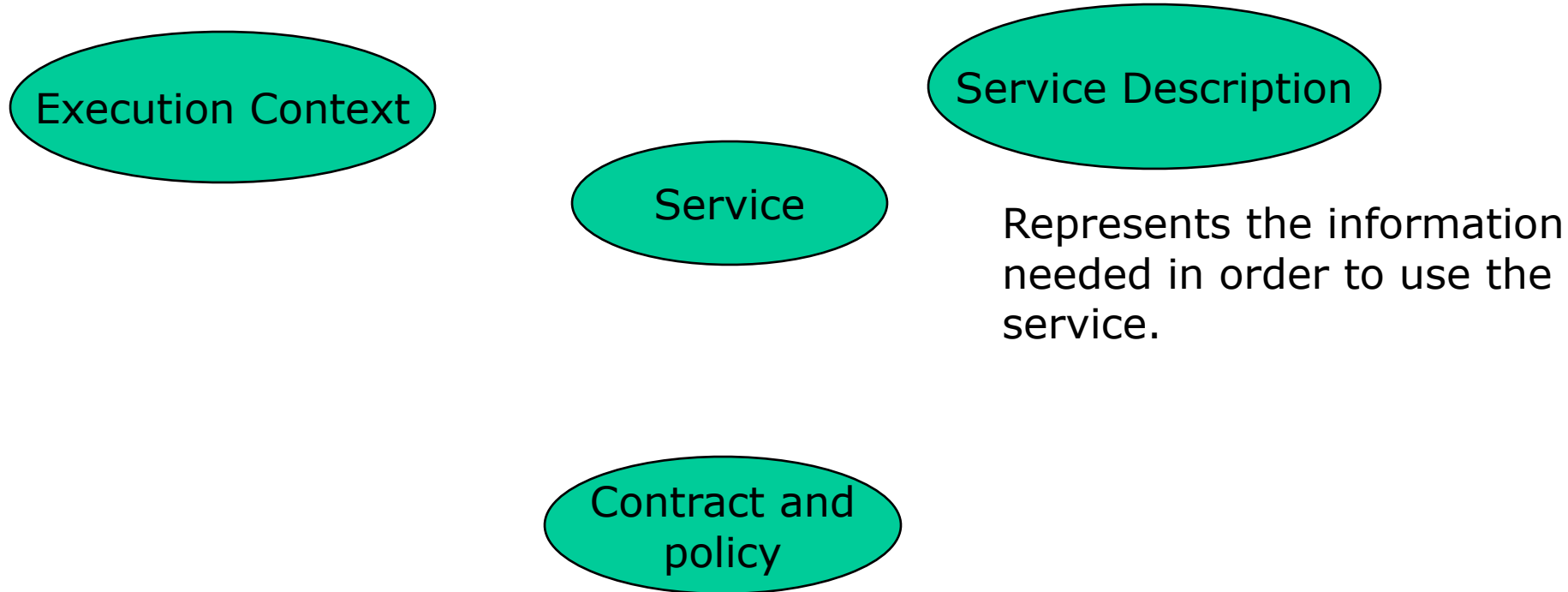
Behavior Model
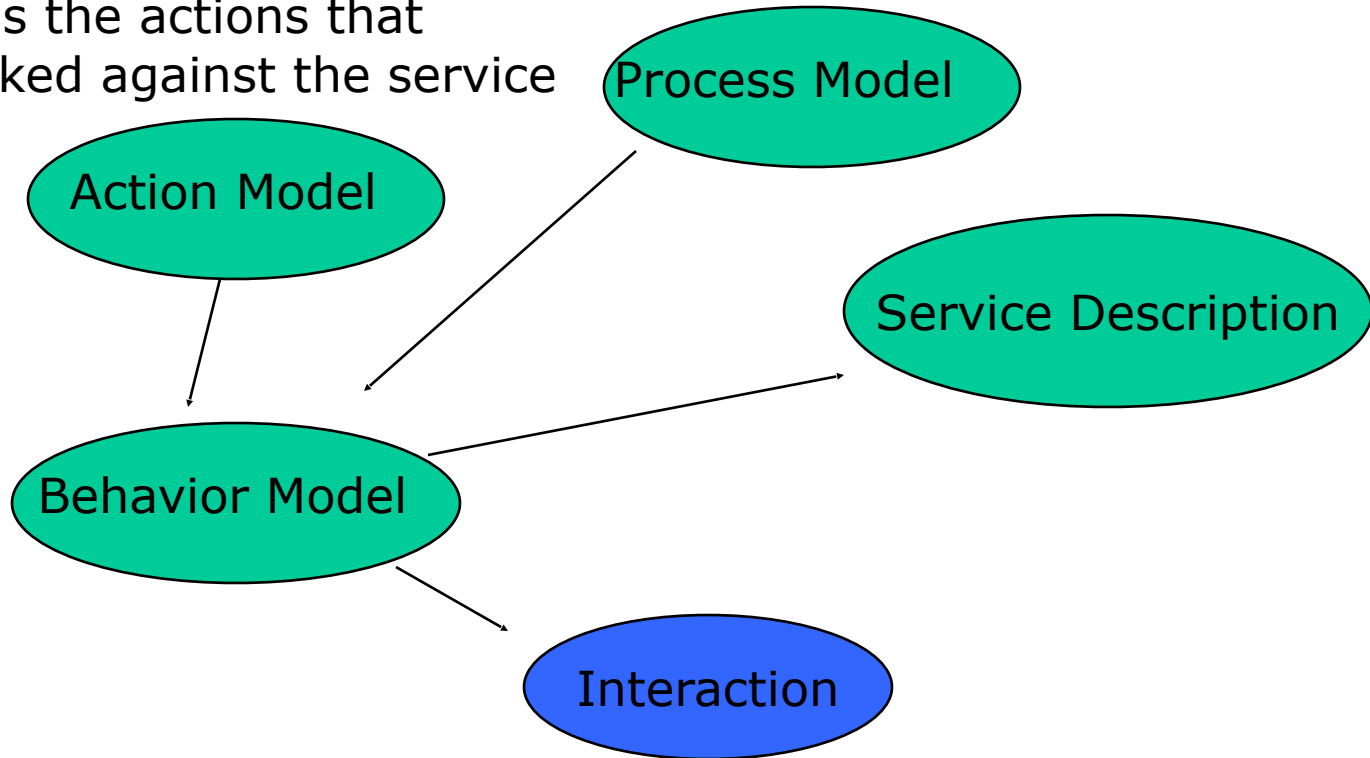
Interaction

Real World Effect

Interactions have purpose.
The purpose is often to change
the shared state of the world or to
gain information.
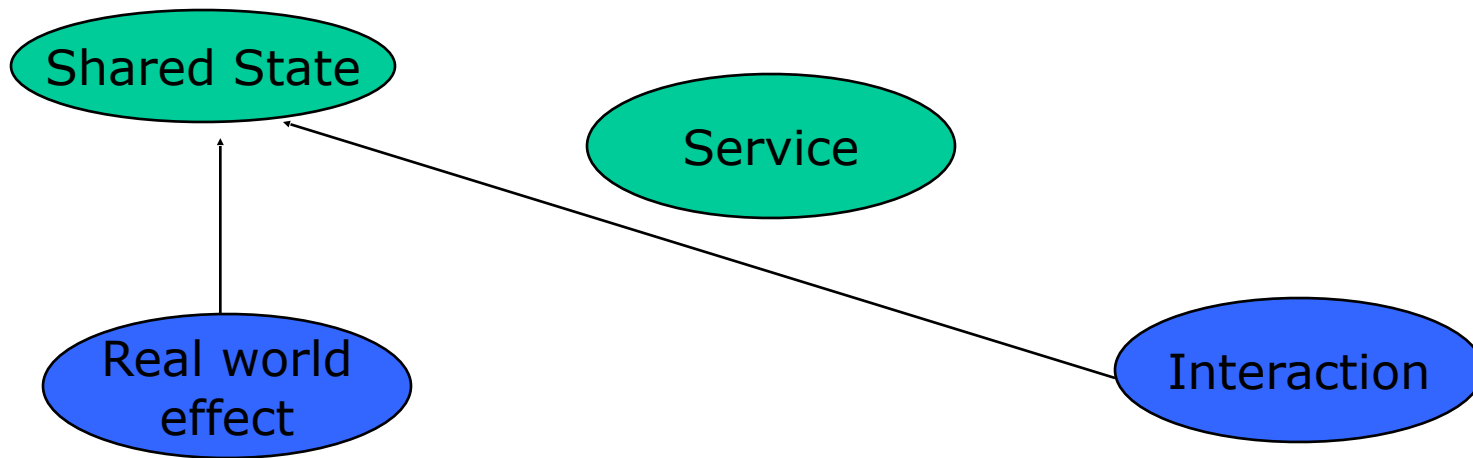
Concepts About services

A hallmark of SOA is the large amount of associated documentation and description.

Execution Context

Service

Service Description

Represents the information needed in order to use the service.

Contract and policy

Service Description

- Purpose is to facilitate interaction and visibility.
- Best if represented in a machine readable standard way.
- Information includes:

  - Reachability
  - Set of functions performed
  - Set of constraints and policies
  - Format and content of exchanged messages
  - Expected sequence of messages

Service Description
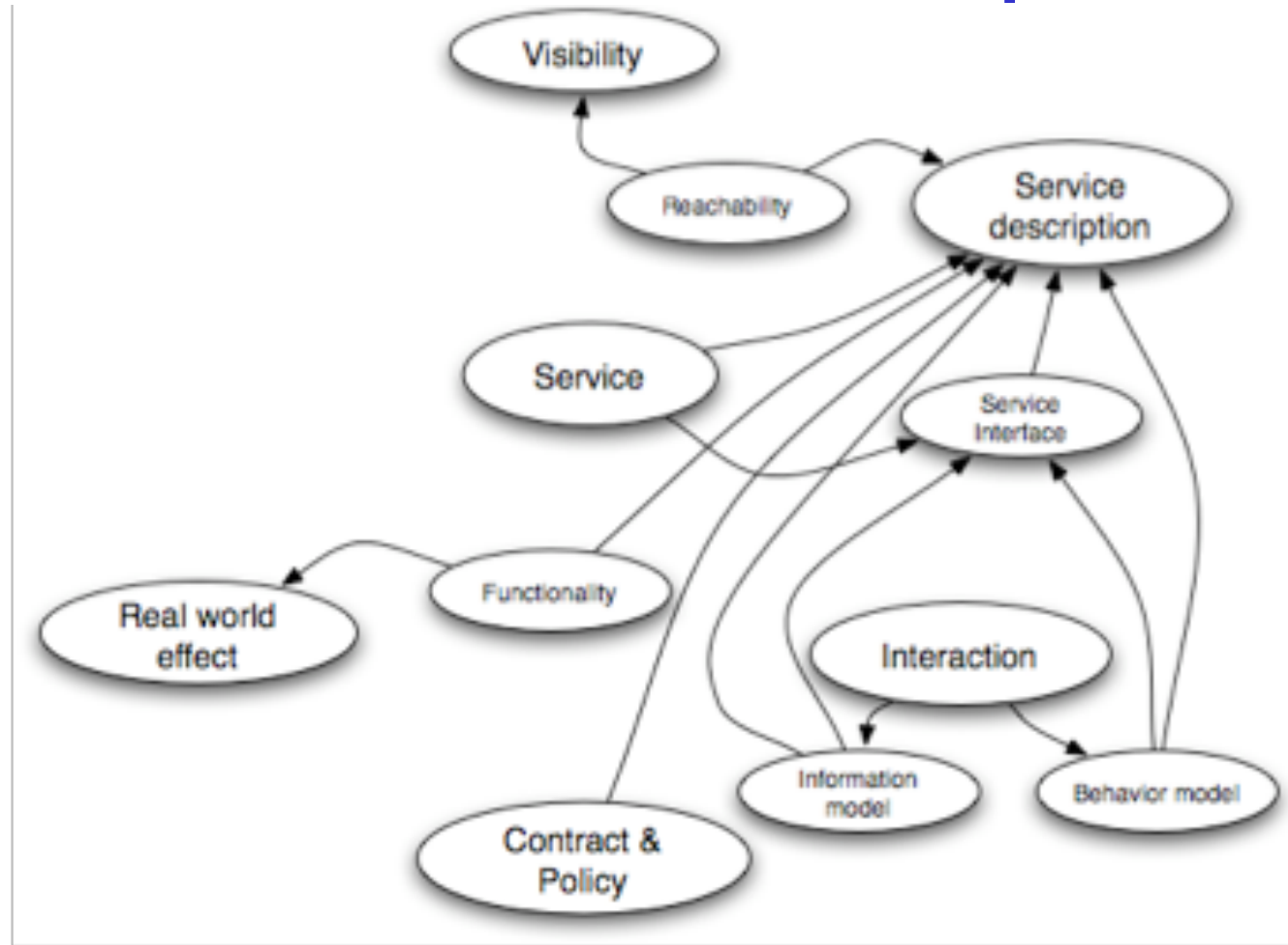
564
565 Figure 9 Service description

Policy Related to a Service

A policy represents some constraint or condition on the use, deployment or description of an owned entity as defined by any participant. A policy is from a participant's viewpoint.

A contract represents an agreement by <u>two or more parties</u>. Contracts may also address condition of use issues.

Service policies involve:
Assertions - e.g. all messages will be encrypted
Ownership - e.g. the service or consumer
Enforcement - if it's not enforced it's a wish

Policy applies to:
Security, privacy, manageability, quality of service as well as hours of business, return policies and so on…
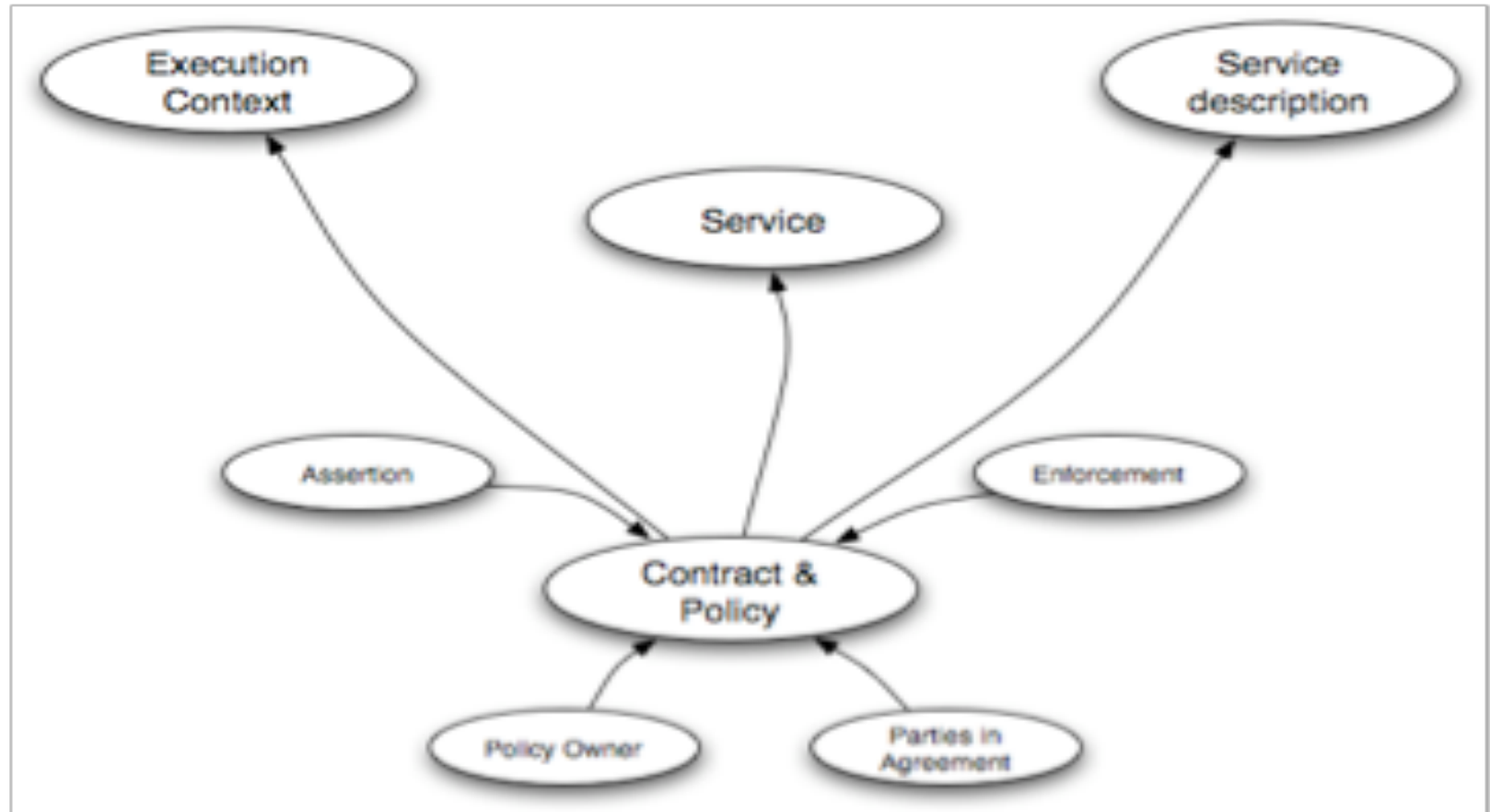
Policies and Contracts

Figure 10 Policies and Contracts

Execution Context

The execution context of a service interaction is the set of infrastructure elements, process entities, policy assertions and agreements that are identified as part of an instantiated service interaction, and thus forms a path between those with needs and those with capabilities.
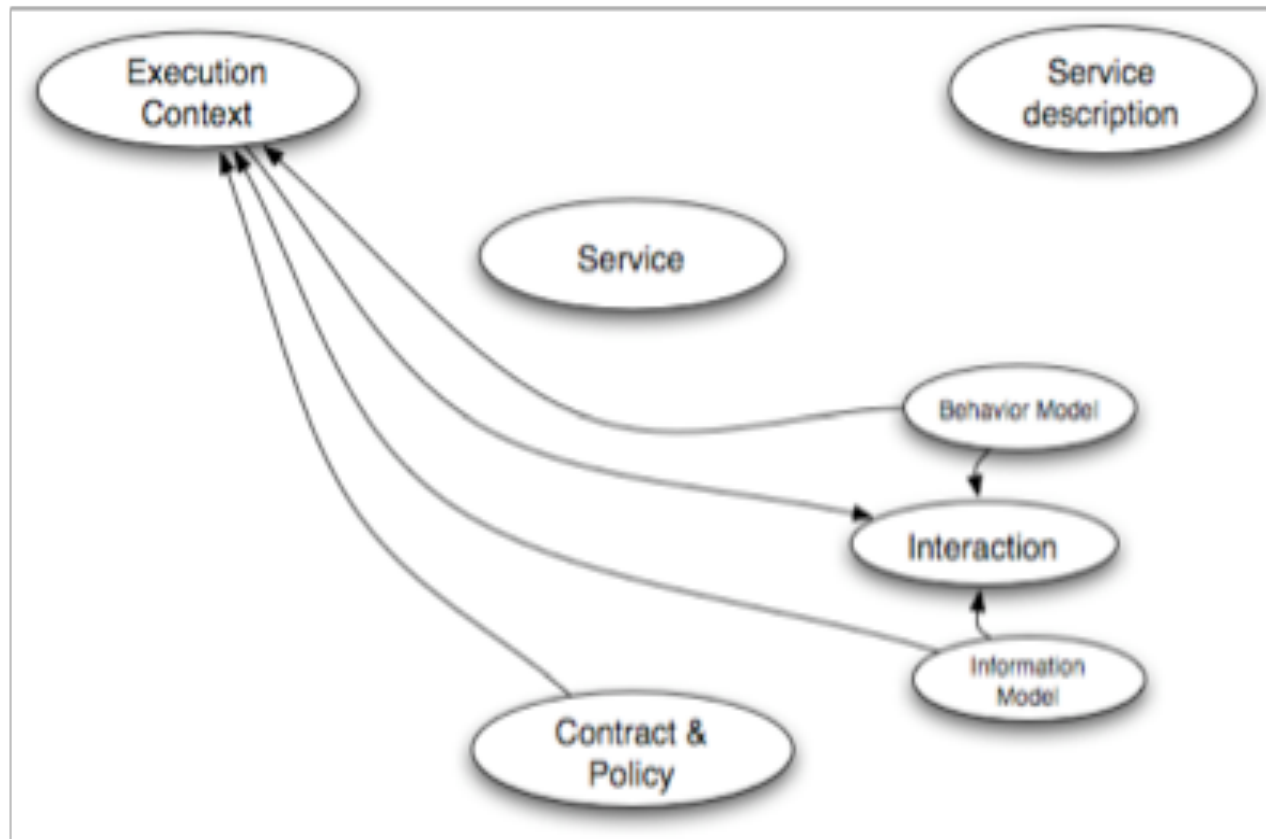
It concerns the totality of the interaction.

Different instance of the same service have different execution contexts.

The context may evolve during a service interaction. It may be decided, for example, that subsequent exchanges will be encrypted.

Execution Context

Figure 11 Execution Context

Conformance Guidelines(1)

- Have entities that can be identified as services defined by the Reference Model.
- Be able to identify how visibility is established between service providers and consumers.
- Be able to identify how interactions are mediated.
- Be able to identify how the effect of using services is understood.

Conformance Guidelines (2)

- Have descriptions associated with services.

- Be able to identify the execution context required to support interaction.

- It will be possible to identify how policies are handled and how contracts are modeled and enforced.