Subject: Object Oriented Analysis and Design

Module 5: Architectural Modeling

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Architectural Modeling

Components

- A component is generally a substantial and substitutable part of a considered system that fits to and furnishes the realization of a collection of interfaces.

- Pictorially, components are rendered as rectangular boxes with tabs.

- All the components should have component different names so that they could be distinguished from each other components.

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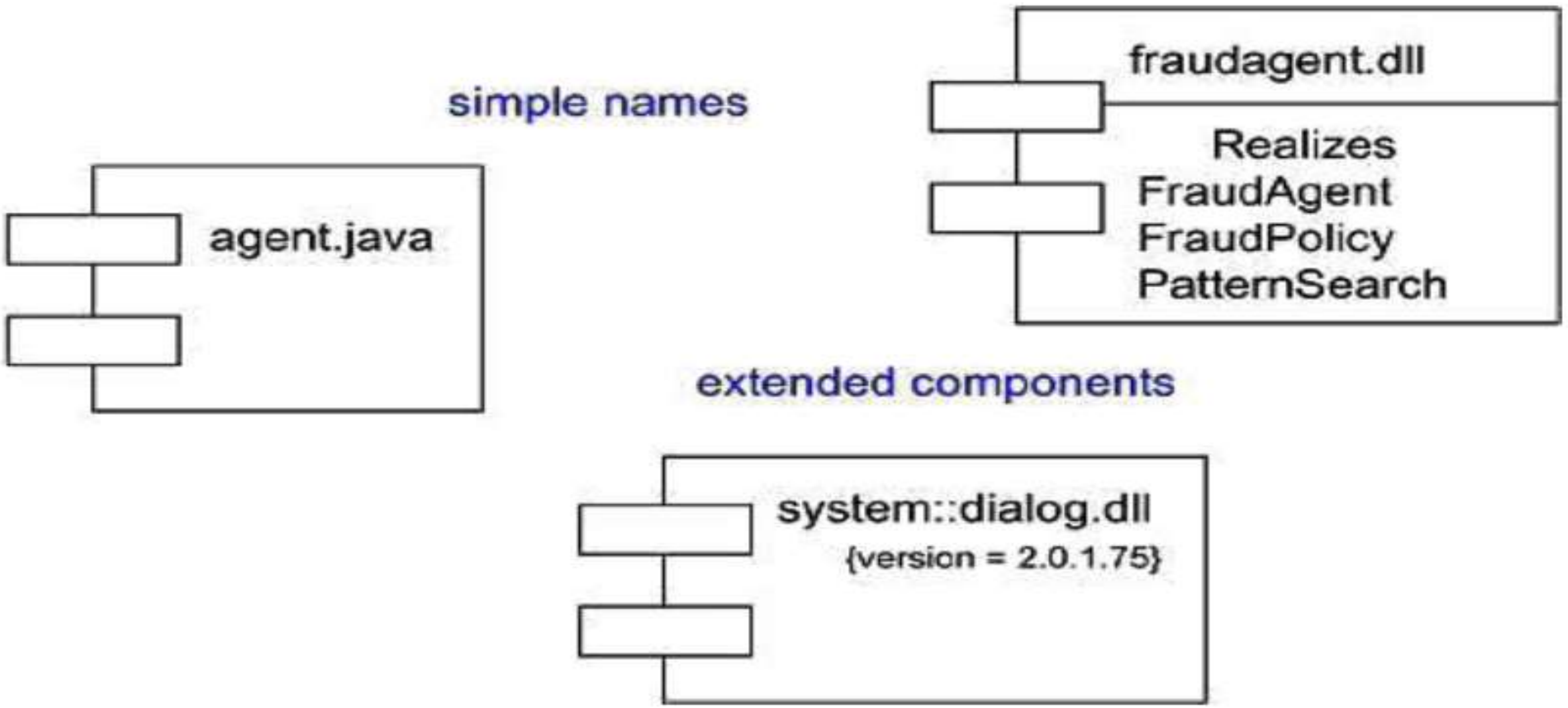
Figure Simple and Extended Component



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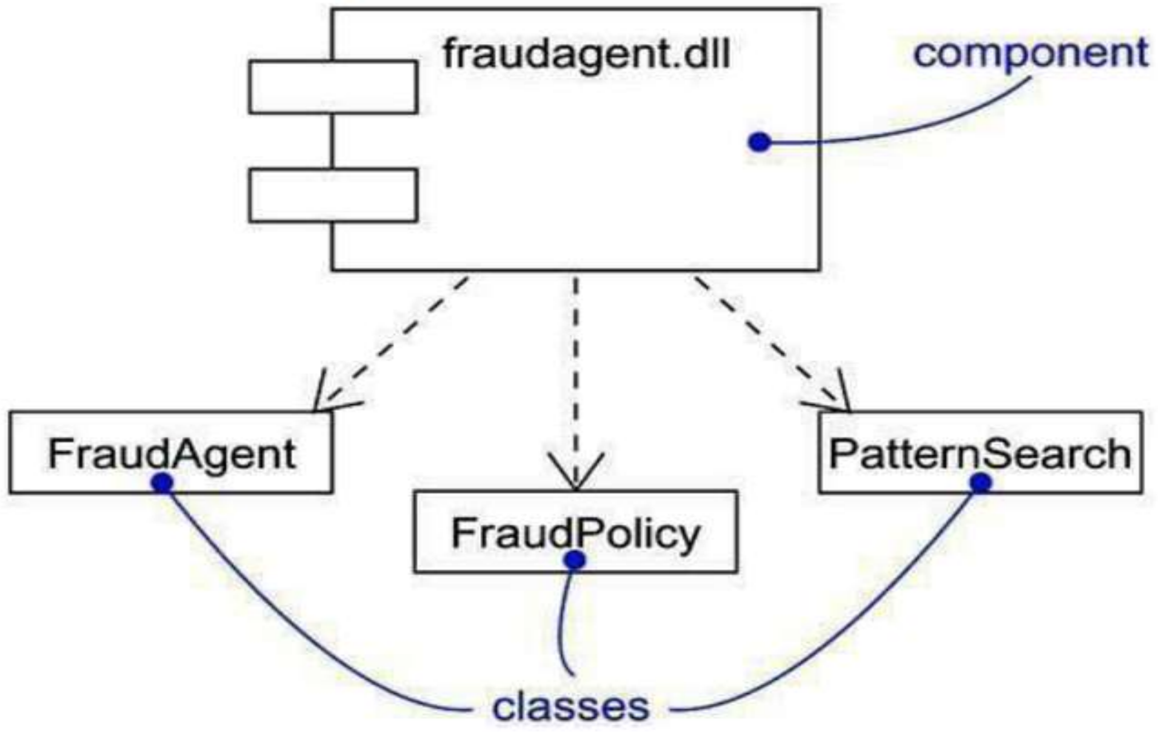
Components and Classes

- In the multiple perspectives, *components* are considered like classes:
- Having distinguished names; realizing a collection of interfaces; participating in different relationships such as dependency, association, and generalization; nested properties; having instances; and participating in interactions.

Figure Components and Classes



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The are some significant differences also between classes and components.

- A Class represents logical abstractions, however, a component represents physical entities of the real world.
- A Class may comprise different operations and attributes directly, nevertheless a component only comprises operations accessible only through it's interfaces.

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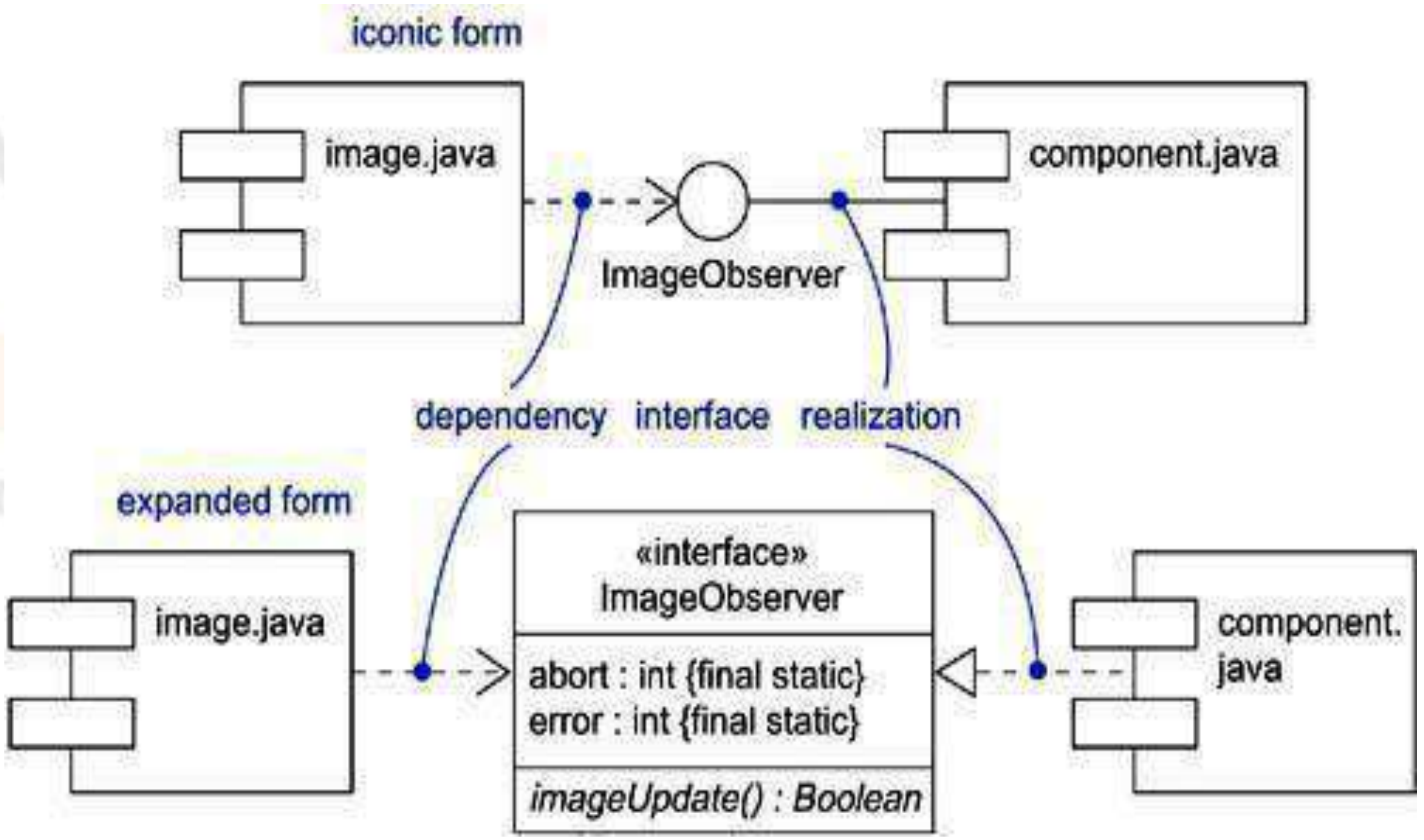
Components and Interfaces

- An interface is considered as a set of operations those are utilized for specific services of different classes or components.
- An interface, realized by a component is called an *export interface* and the interface called by a component is considered as a *import interface*.



Types of Components

There may be three types of components:

- First, the ***deployment components,*** such as executables (EXEs) and dynamic libraries (DLLs).
- Second type may be for ***work product components,*** such as data files and source code files.
- Third type is ***execution components*** as a consequence of an executable systems, like a COM+ object that can be instantiated through a DLL.

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Organizing Components

The UML defines five standard stereotypes that apply to components:

1. **executable**	Specifies a component that may be executed on a node
2. **library**	Specifies a static or dynamic object library
3. **table**	Specifies a component that represents a database table
4. **file**	Specifies a component that represents a document containing source code or Data
5. **document**	Specifies a component that represents a document

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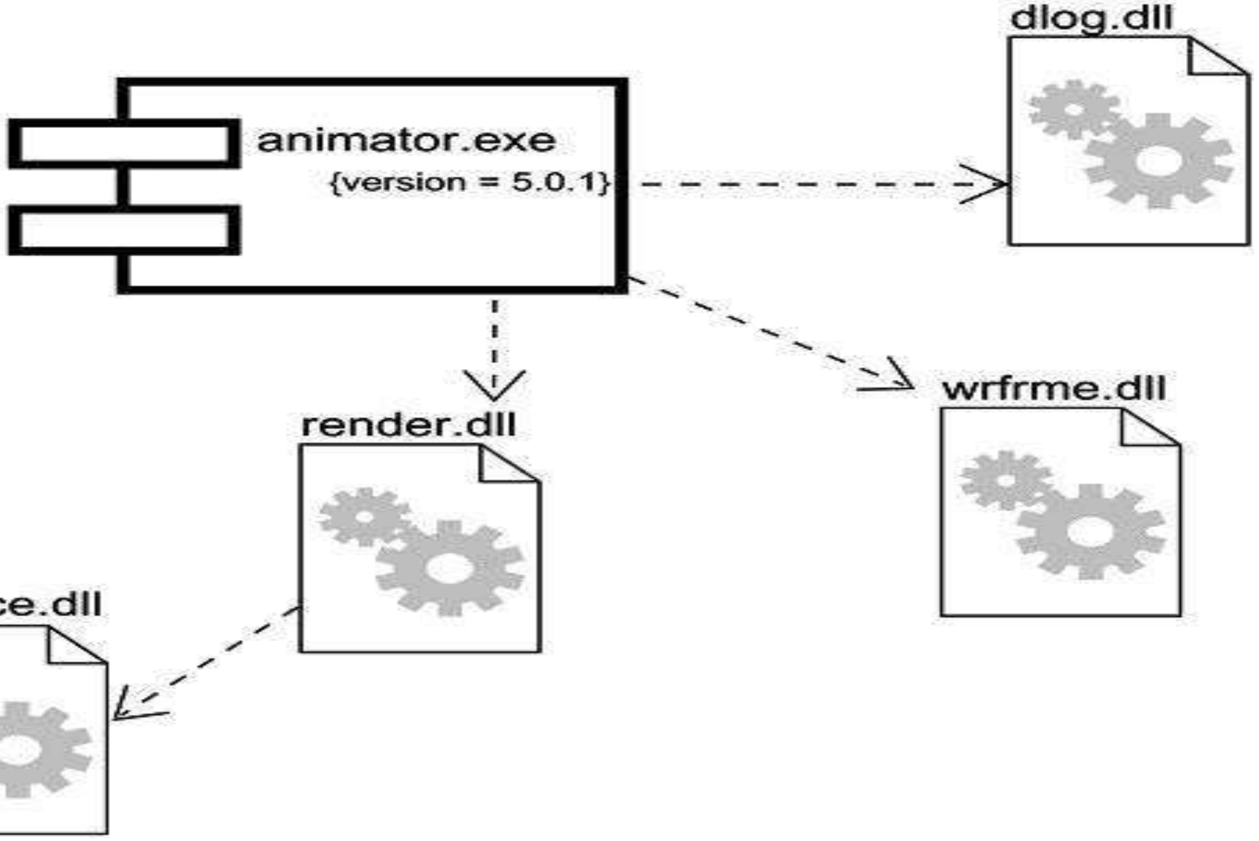
Common Modeling Techniques

Modeling Executables and Libraries



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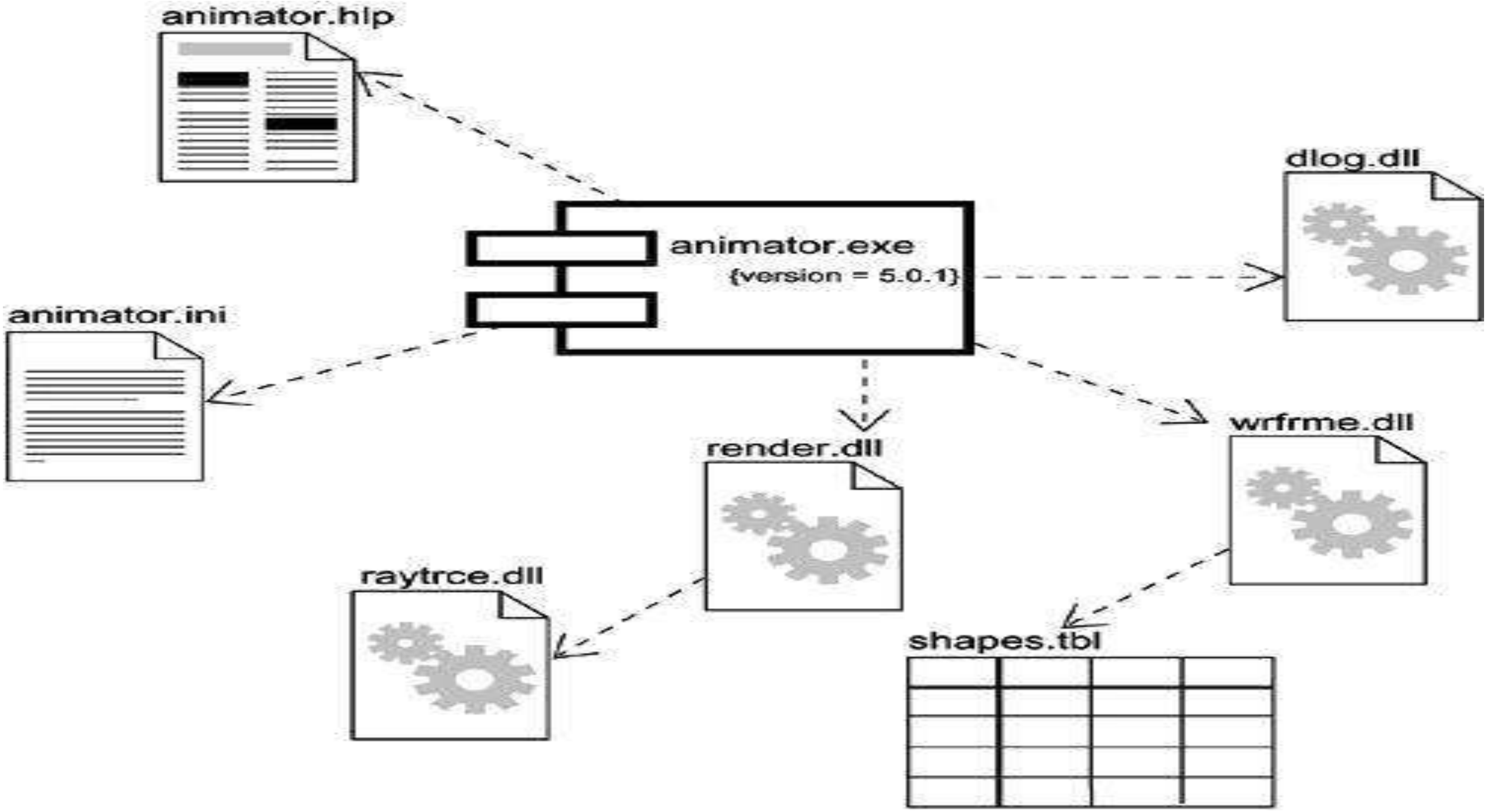
Modeling Documents, Files, and Tables



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Deployment

- ***Nodes*** are considered as real world elements those exist at run time and different computational resources are represented by them.
- Nodes are generally considered for having some memory and so the processing capability.
- In UML a node is represented as a cube.
- All the nodes comprises a distinguished names which differentiate them from others.

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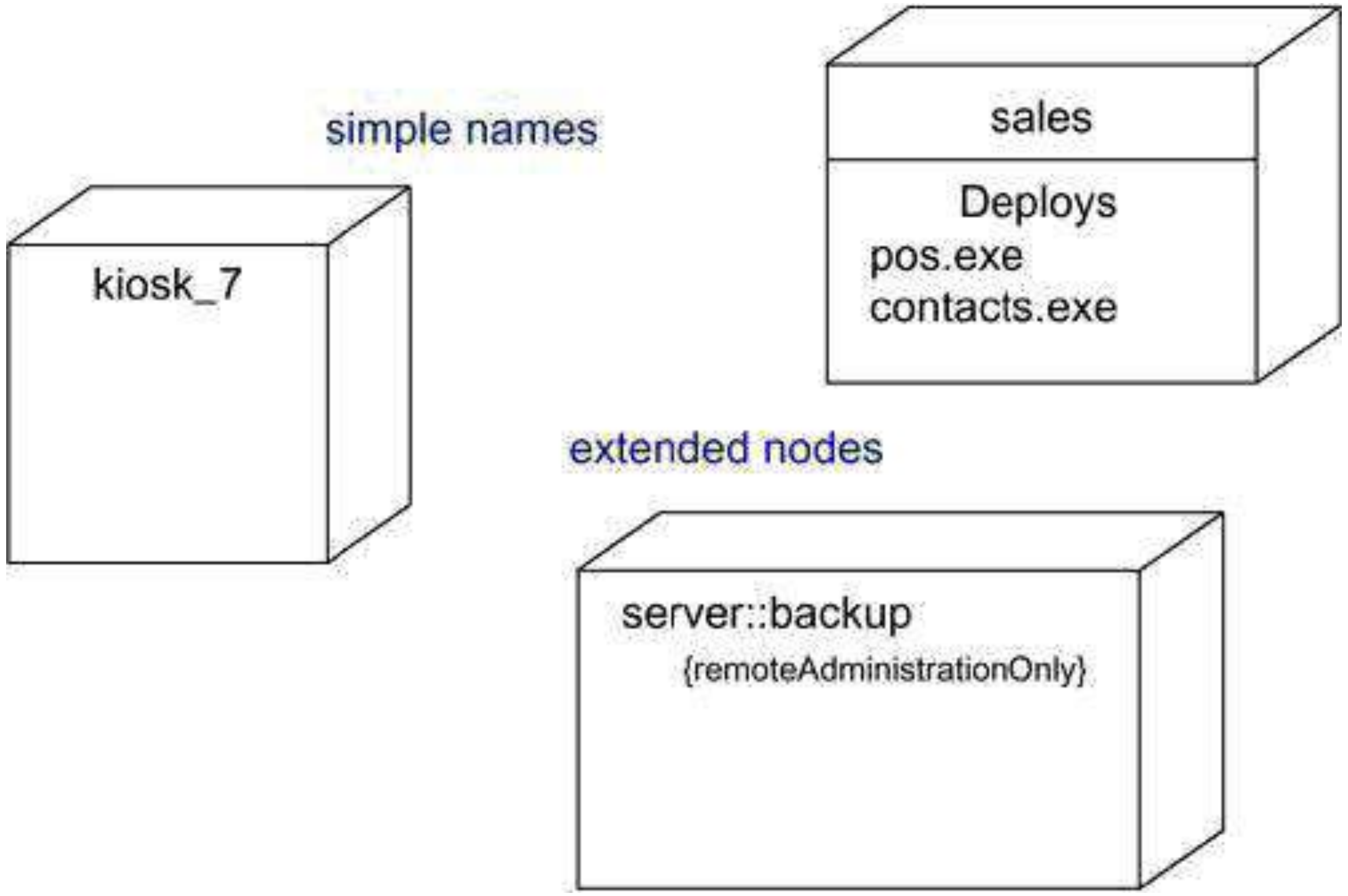
Simple and Extended Nodes



Nodes and Components

- In many ways, nodes are a lot like components: Both have names; both may participate in dependency, generalization, and association relationships; both may be nested; both may have instances; both may be participants in interactions.
- However, there are some significant differences between nodes and components.
  - Components are things that participate in the execution of a system; nodes are things that execute components.
  - Components represent the physical packaging of otherwise logical elements; nodes represent the physical deployment of components.

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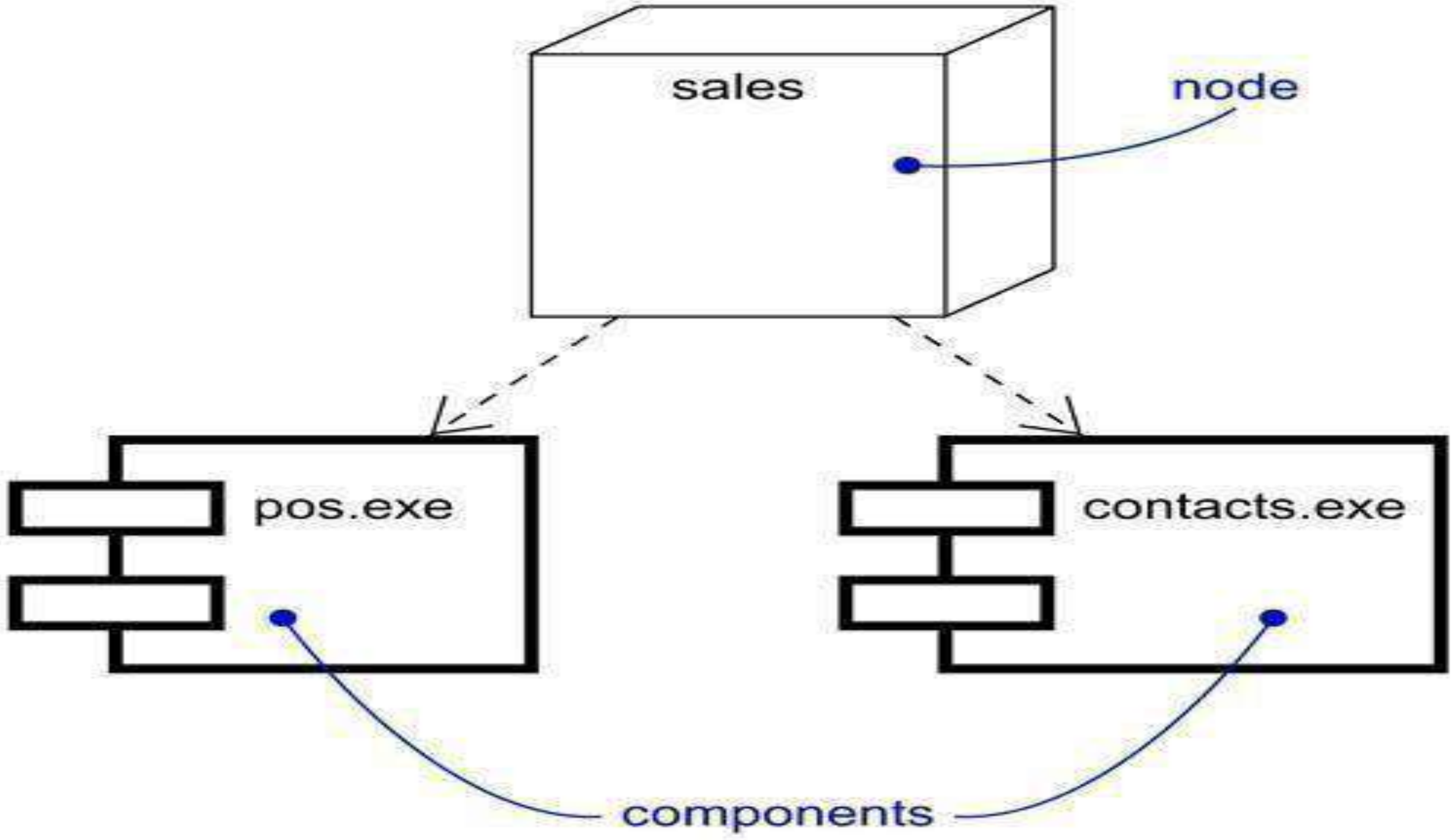
Figure: Nodes and Components



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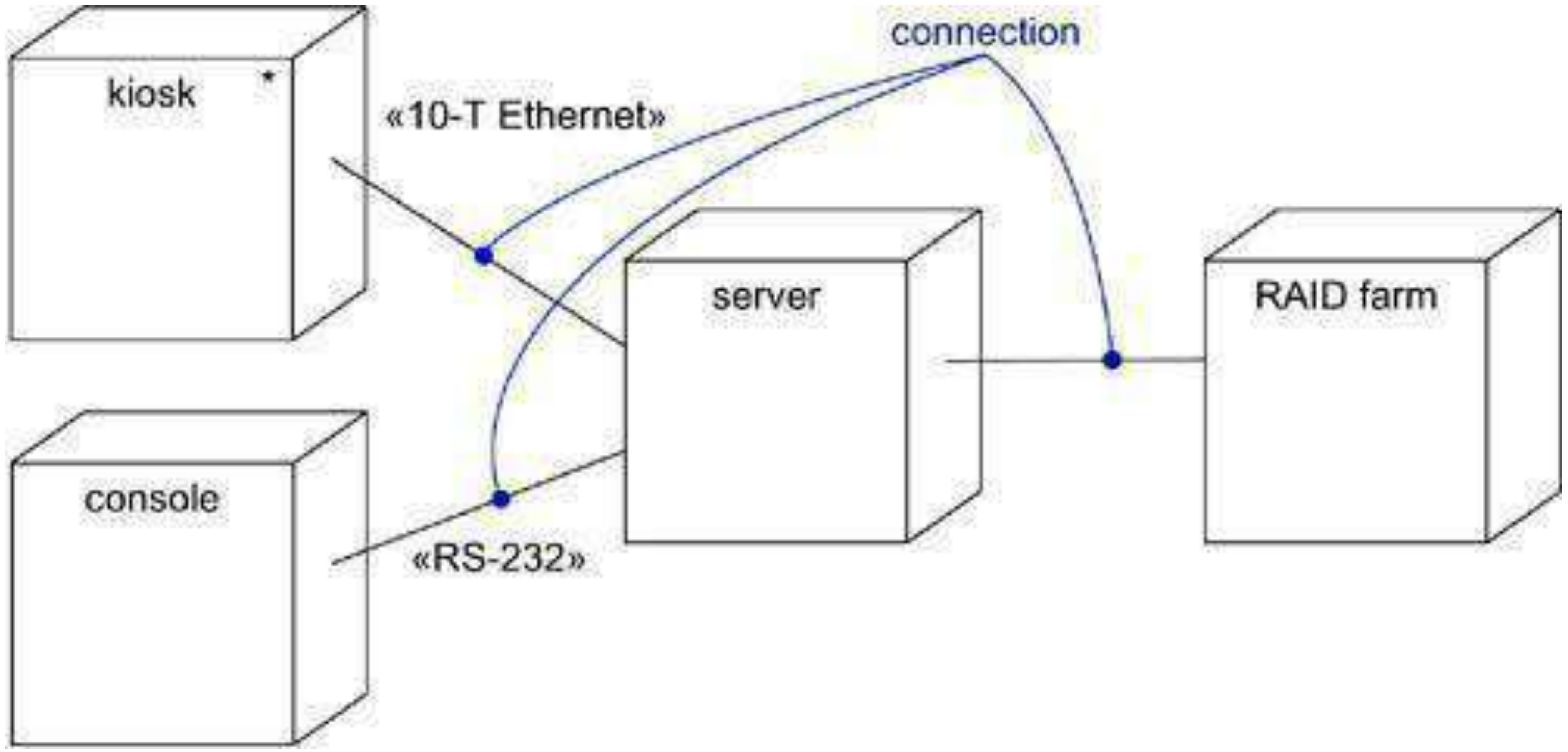
Connections among Different Nodes



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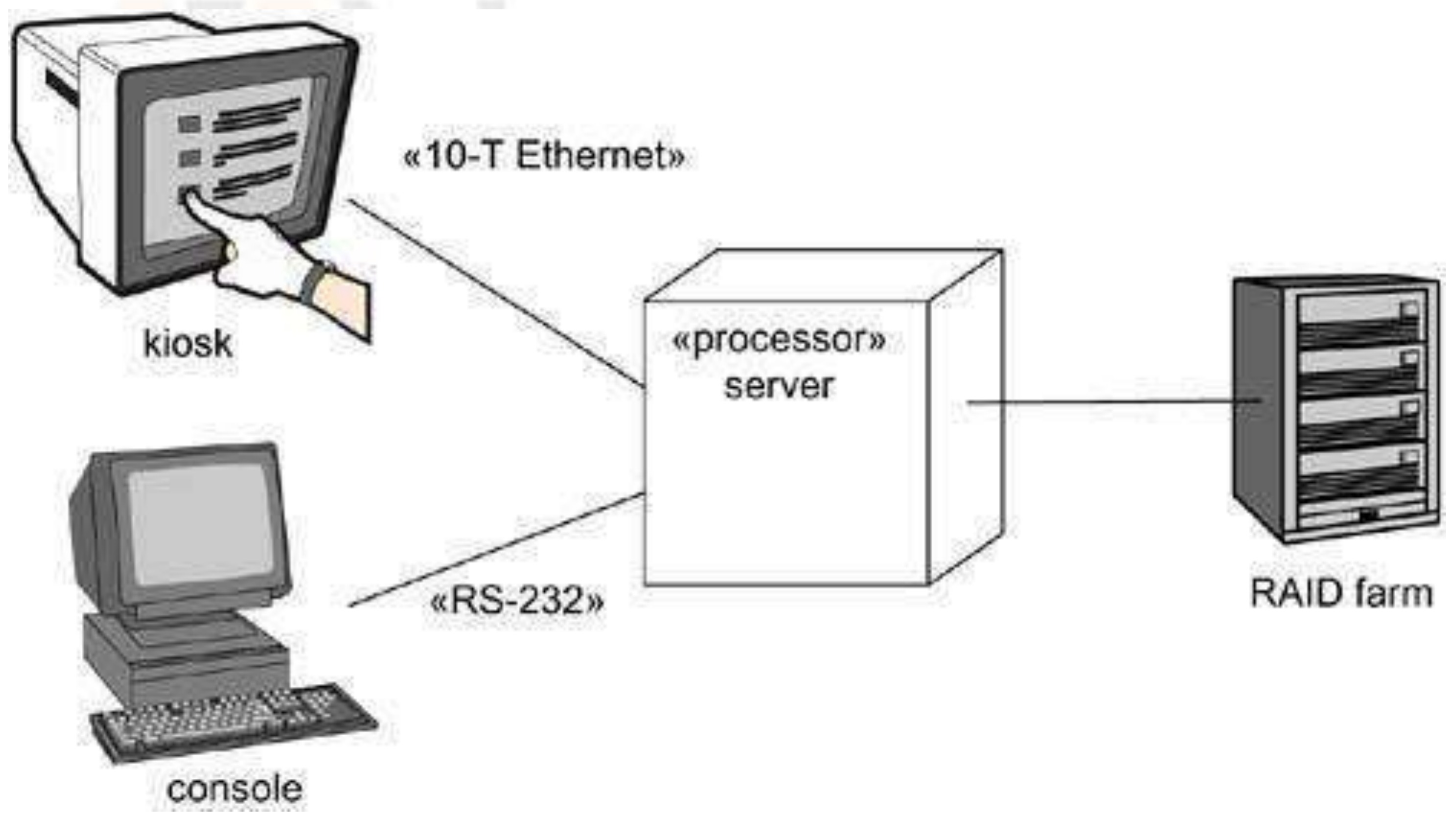
Common Modeling Techniques

Modeling Processors and Devices



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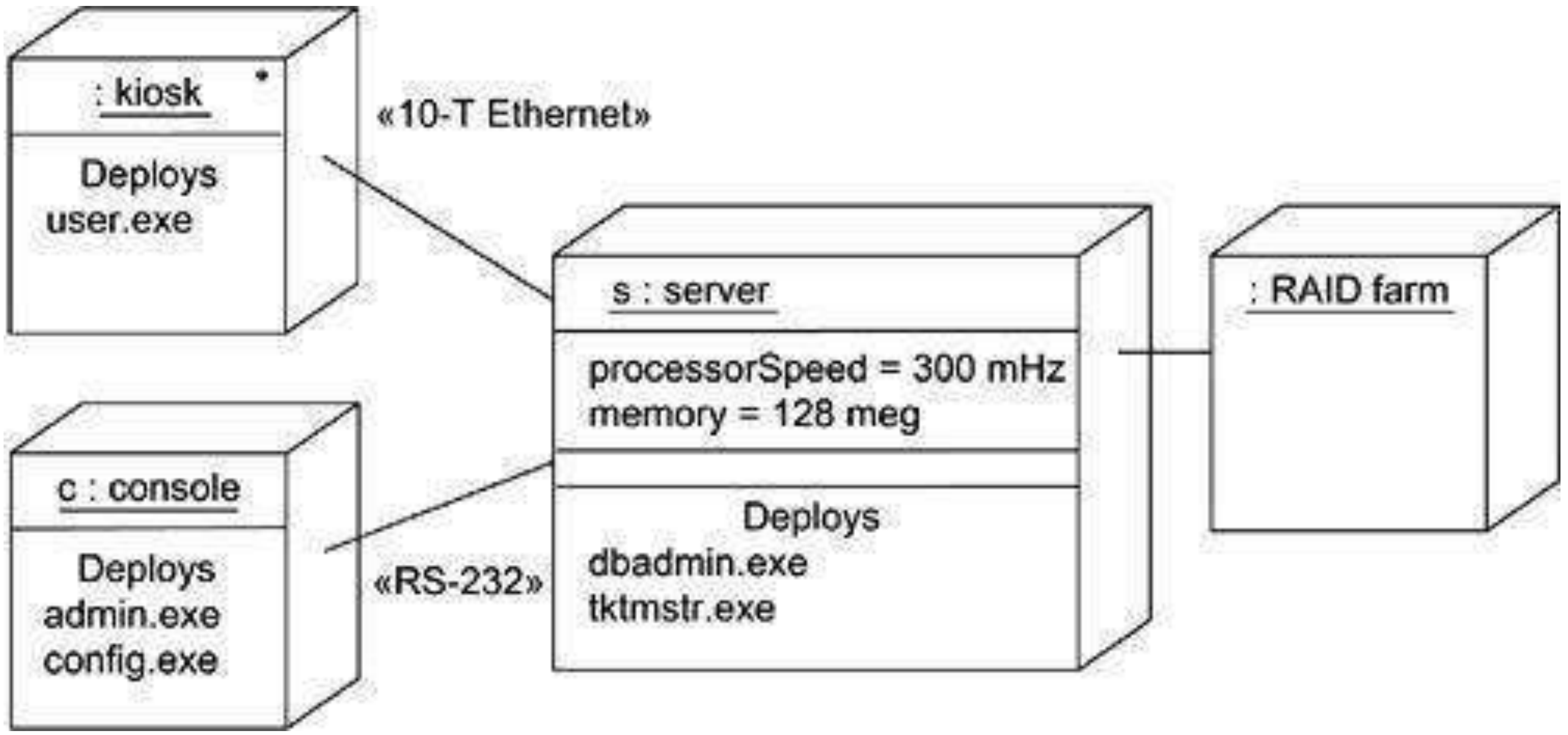
Modeling the Distribution of Different Components



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Component Diagrams

- ***Component diagram*** represent a set of components along with the relationships among them.
- In the UML, component diagrams are a set of vertices and arcs.

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Common Uses

- Component diagrams are generally use in one of the four ways.

1. For modeling source codes
2. For modeling executable releases
3. For modeling physical databases
4. For modeling acceptable systems

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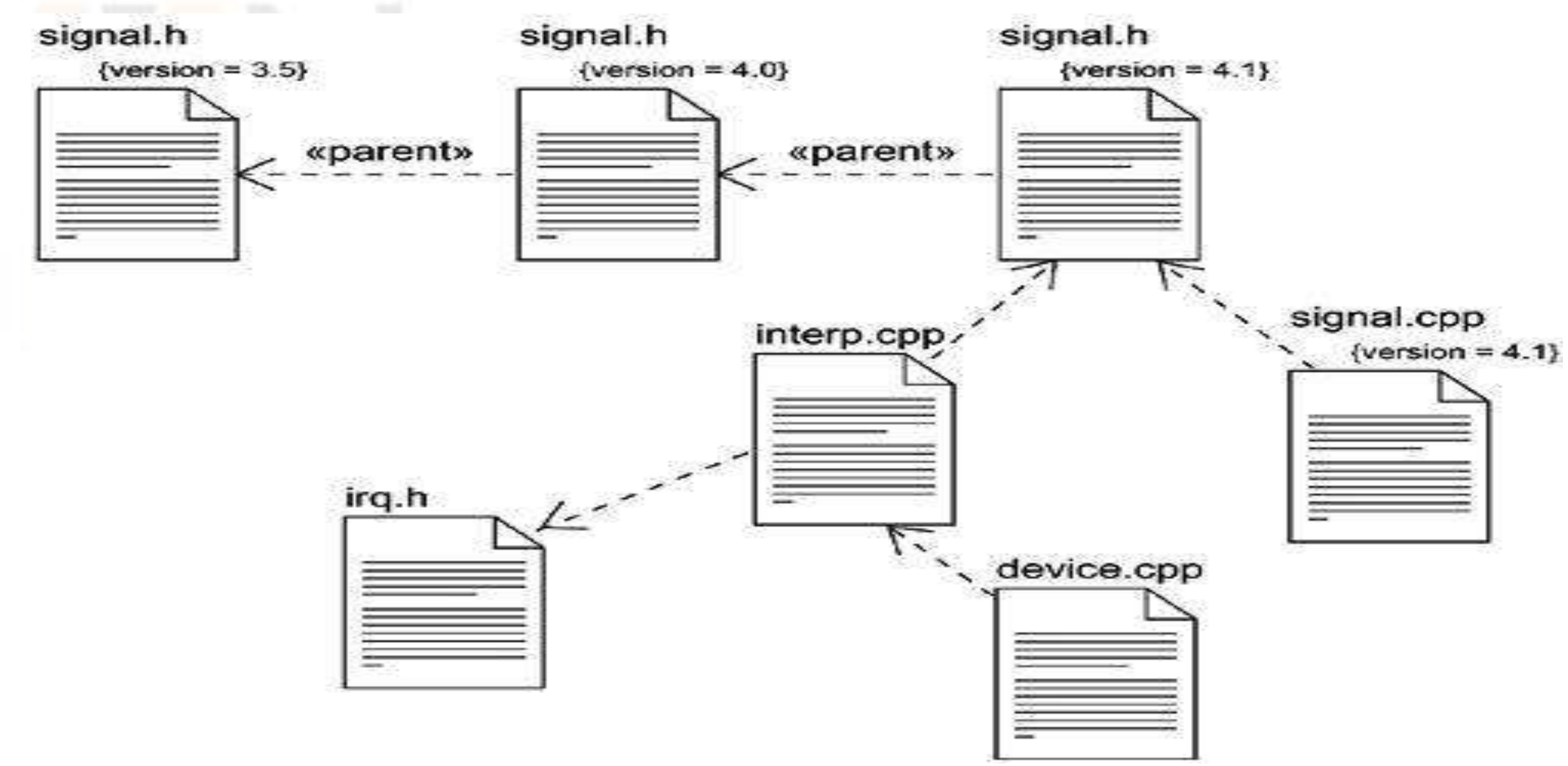
Common Modeling Techniques

Modeling Source Codes



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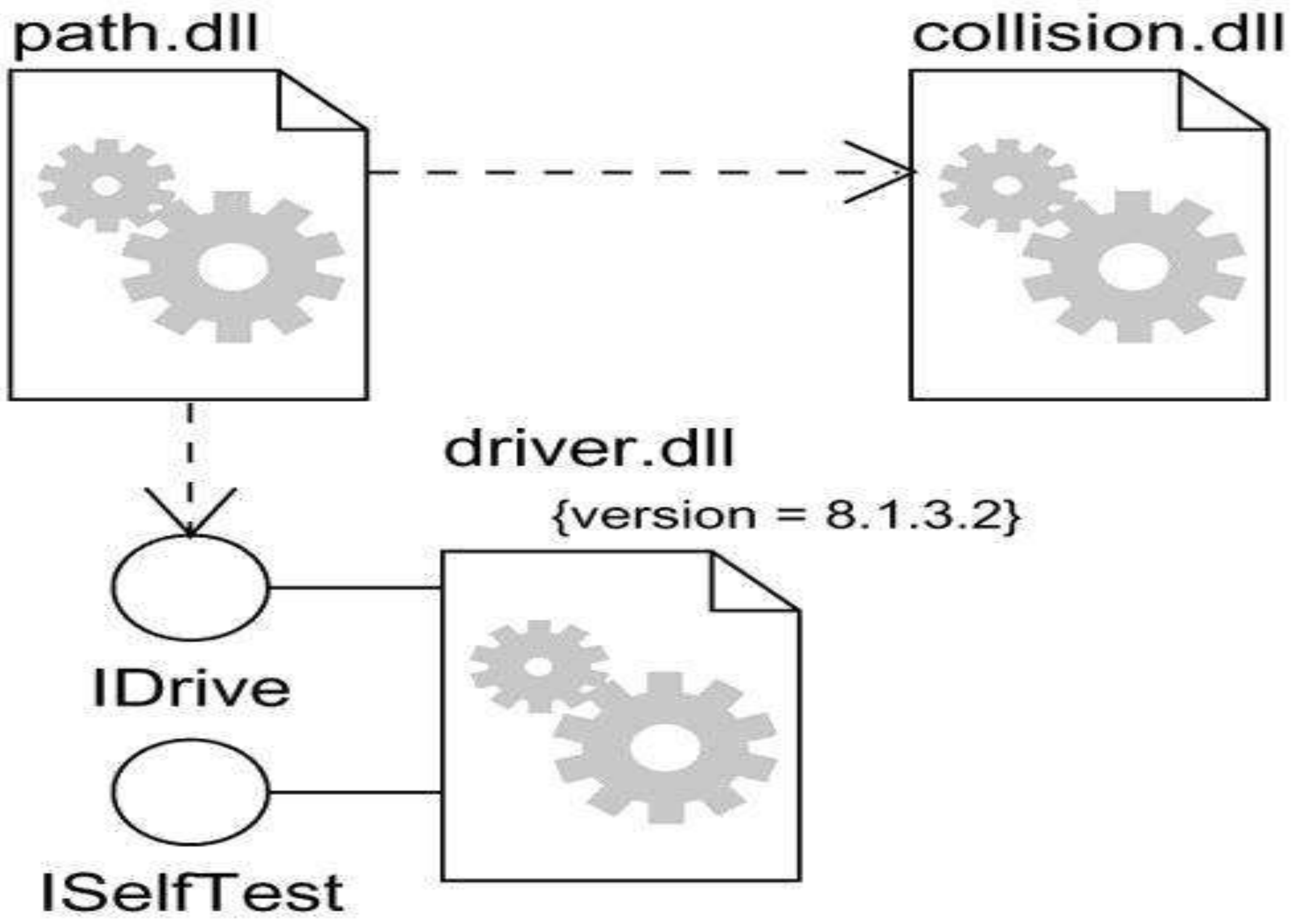
Modeling an Executable Release



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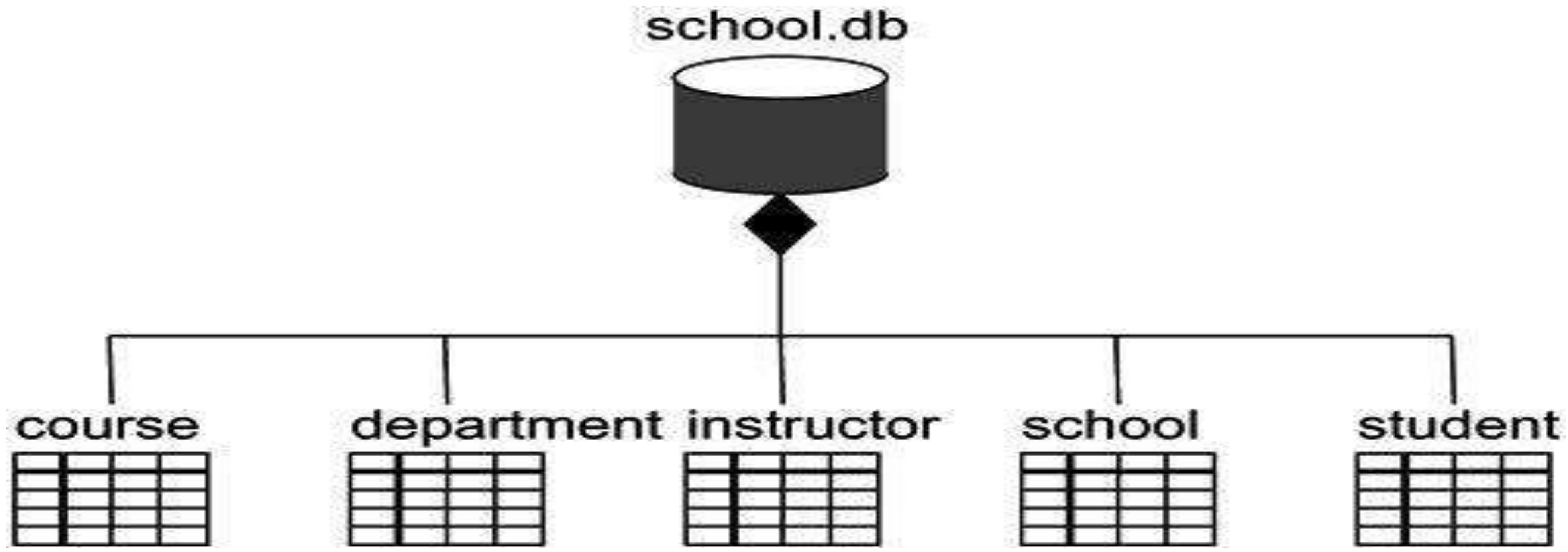
Modeling a Physical Database



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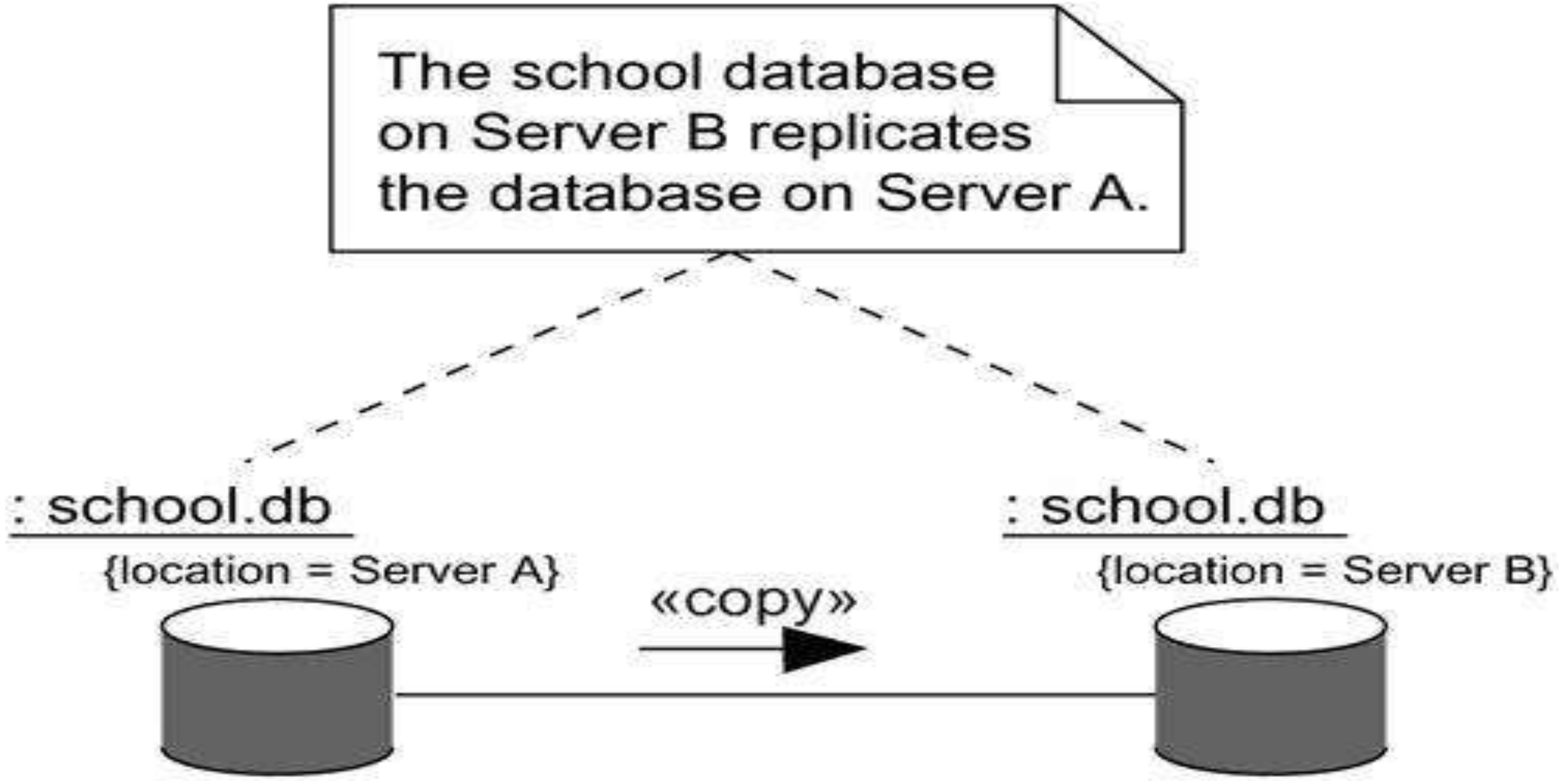
Modeling Adaptable Systems



Deployment Diagrams

- Deployment diagrams are considered to represent the arrangement of node in run time processing on the real time basis.
- In the UML, deployment diagrams are considered as a set of vertices and edges.

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Common Uses

- While modeling the static deployment perspectives of a system, we generally, consider the deployment diagram in one of the following three ways.

  1. For modeling the embedded systems
  2. For modeling the server/client systems
  3. For modeling fully distributed systems

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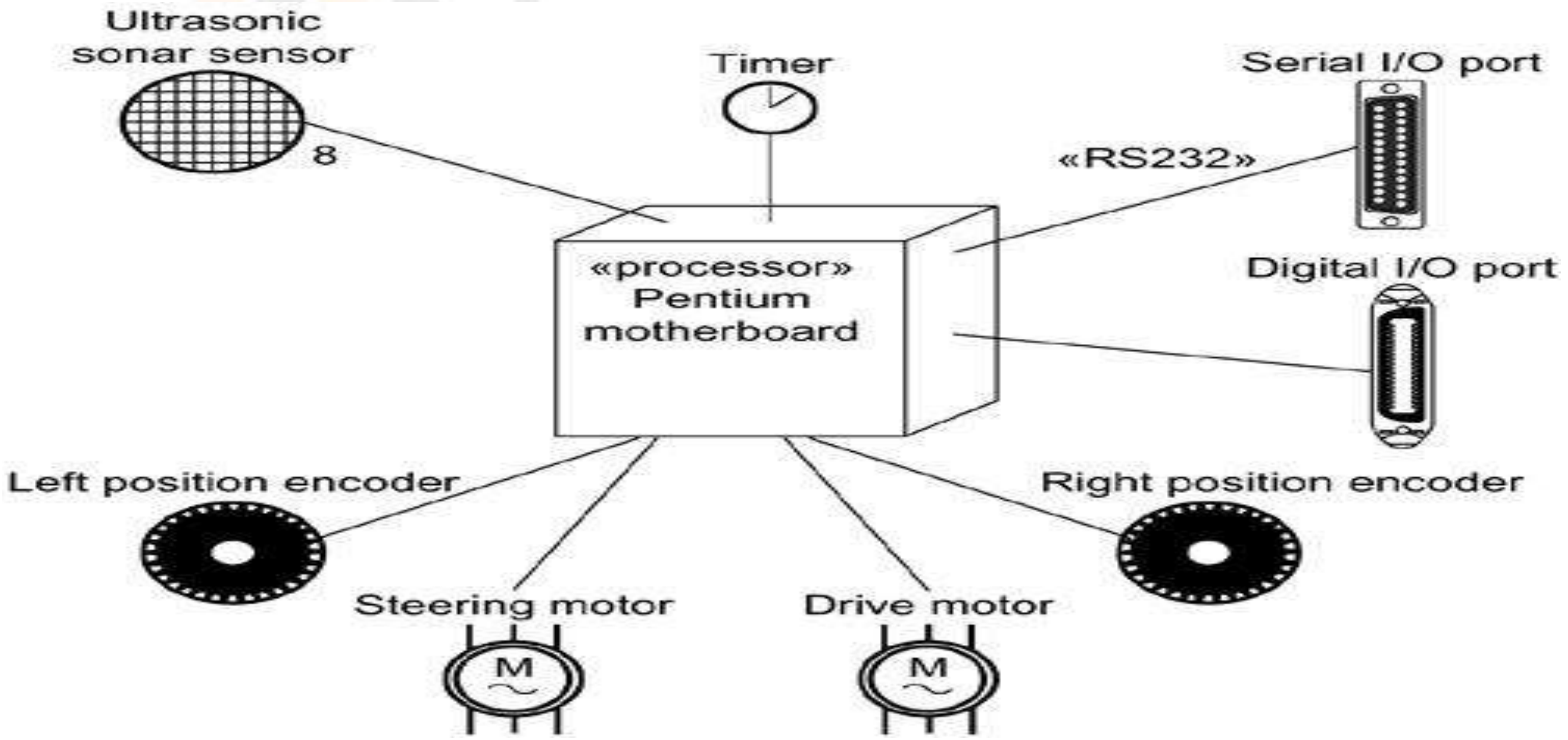
Common Modeling Techniques

Modeling an Embedded Systems



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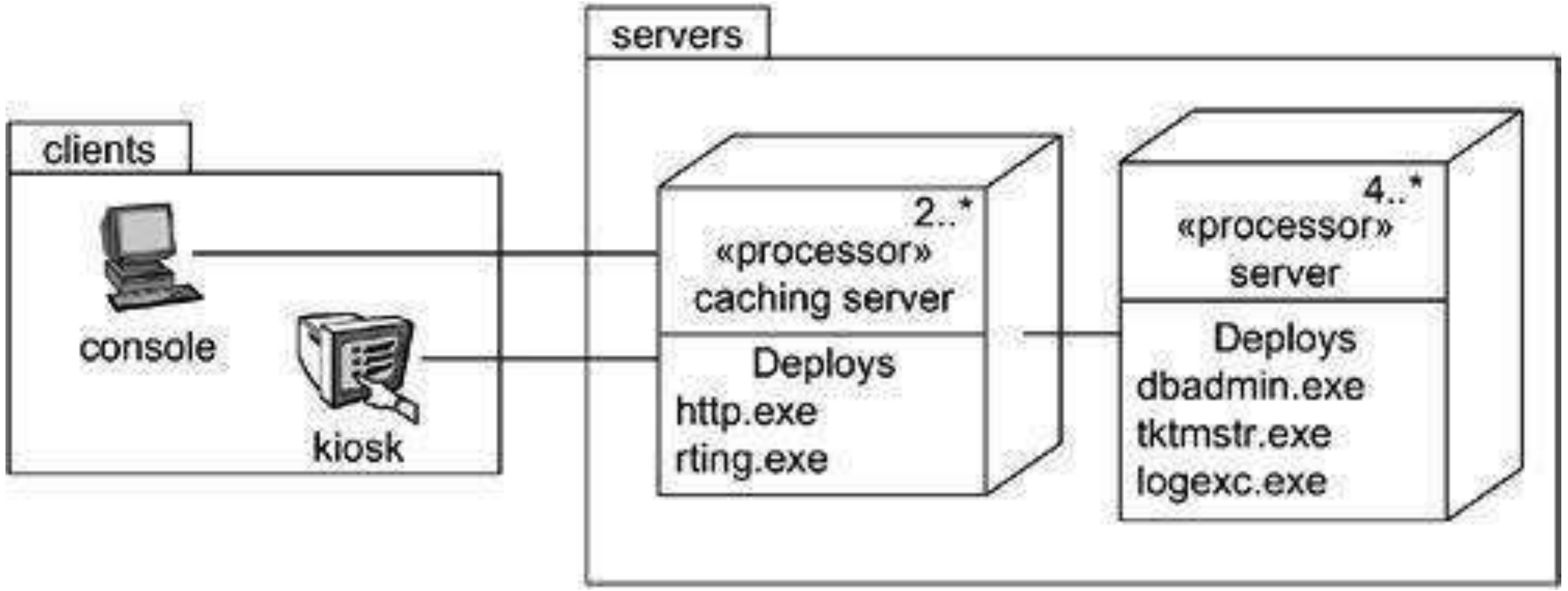
Modeling a Server/Client System



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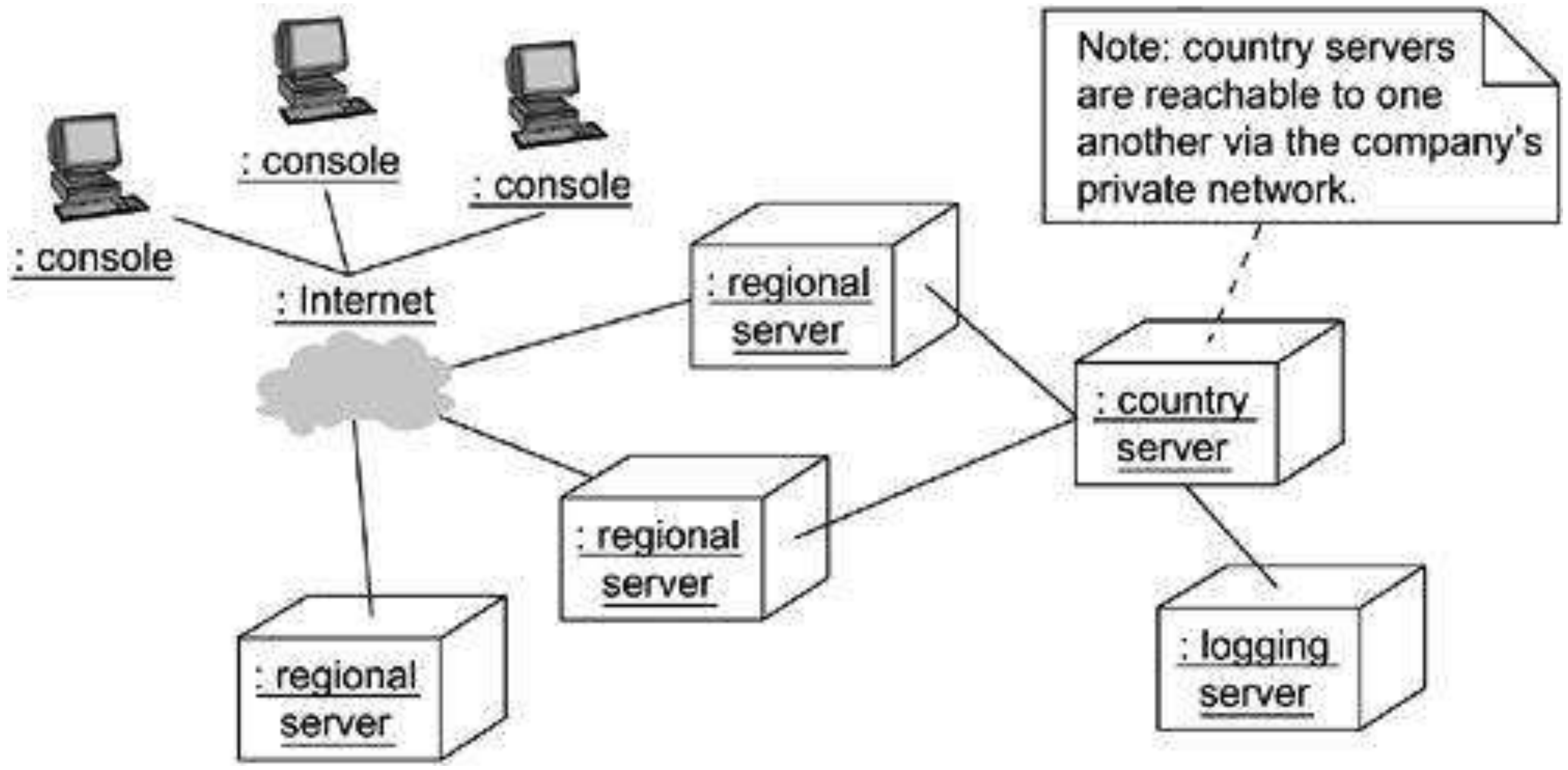
Modeling a Fully Distributed System



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Self Assessment Question

1. _________ represents the acknowledgement of an operation, an initiation in a business or a business process as whole93.

   a. Interaction

   b. State machine

   c. Use case

   d. Activity

Answer: d

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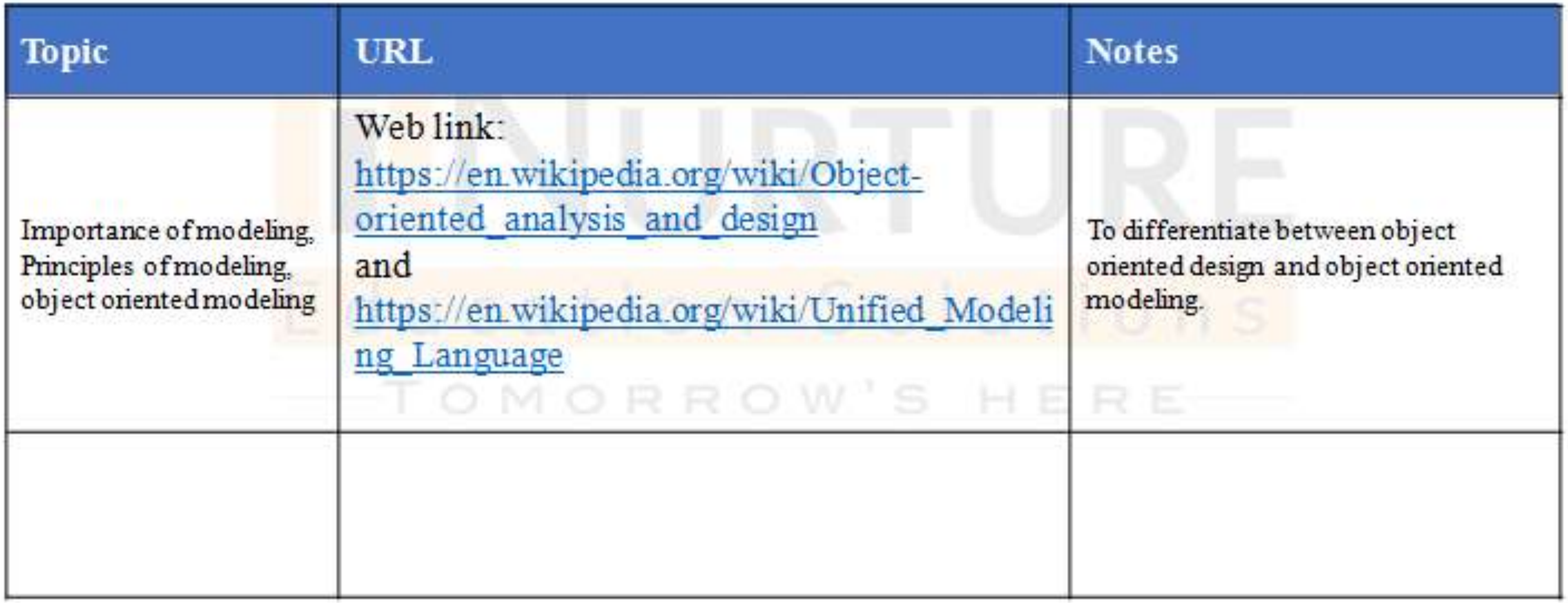
Document Link



Topic	URL	Notes
Importance of modeling, Principles of modeling, object oriented modeling	Web link: https://en.wikipedia.org/wiki/Object-oriented_analysis_and_design and https://en.wikipedia.org/wiki/Unified_Modeling_Language	To differentiate between object oriented design and object oriented modeling.

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Video Link

Topic	URL	Notes
	Video link https://www.linkedin.com/learning/programming-foundations-object-oriented-design-3/learn-object-oriented-design-principles?u=92695330	Basic concepts and principles of object oriented analysis and design
	Video link: Software Design: Modeling with UML https://www.linkedin.com/learning/software-design-modeling-with-uml/a-picture-is-worth-a-thousand-words?u=92695330	UML, Architecture

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E- Book Link

E-book name	URL
Object Oriented Modeling & Design Using UML	https://www.pdfdrive.com/the-unified-modeling-language-user-guide-second-edition-by-grady-booch-james-d191677284.html
UML 2 Toolkit	https://www.pdfdrive.com/uml-2-toolkit-d158470306.html