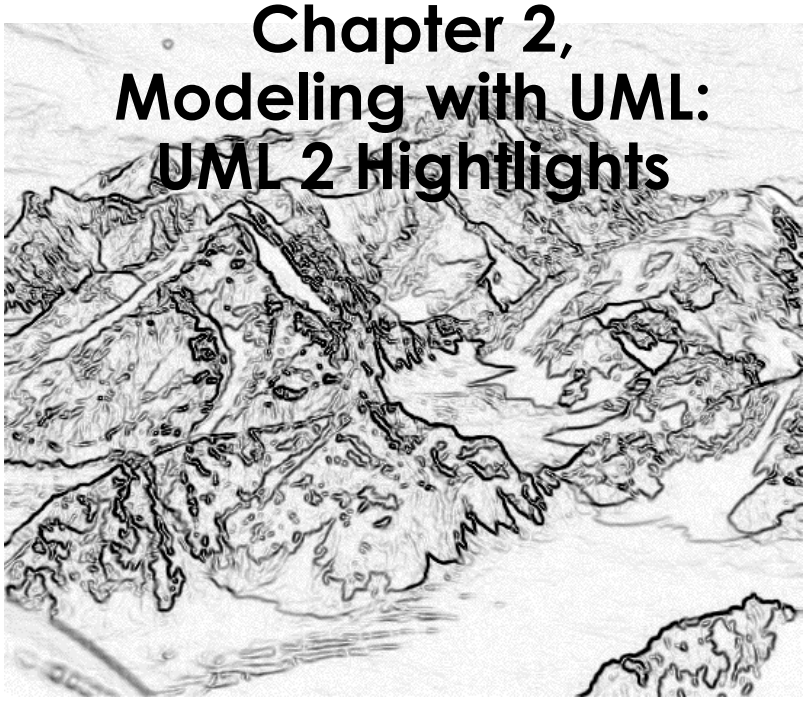
Object-Oriented Software Engineering
Using UML, Patterns, and Java

Chapter 2, Modeling with UML: UML 2 Hightlights



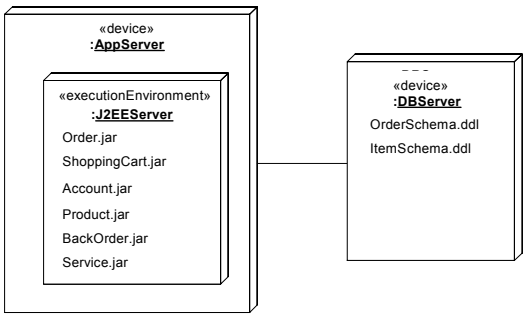
Outline for this class

- ✓ Overview of important changes in UML 2
  - ➢ Deployment diagrams
  - • Sequence diagrams

UML 2 Deployment Diagrams

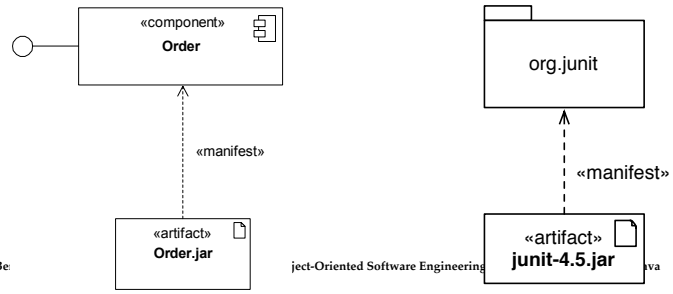
Two node types:

- Device
  - a physical computational resource with processing capability upon which artifacts may be deployed for execution.
- Execution environment
  - a node that offers an execution environment for specific types of components that are deployed on it in the form of executable artifacts.



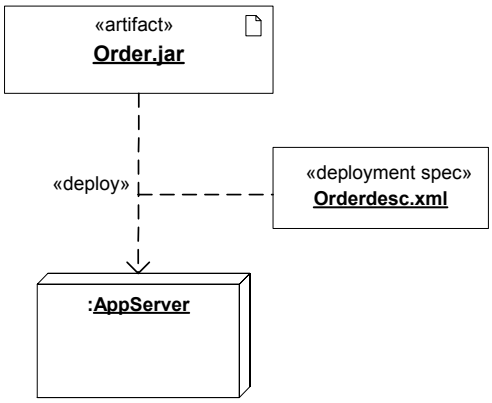
Deployment Diagram Changes II

- Artifacts can now manifest any packageable element, not just components
  - An artifact is the specification of a physical piece of information that is used or produced by a software development process, or by deployment and operation of a system.
- Manifestation (the concrete physical rendering of one or more model elements by an artifact) is shown by a dependency with keyword «manifest»



Deployment Diagram Changes III

- A deployment diagram can have a deployment specification



Interaction Diagrams

Interaction Diagrams

- New concept of **interaction fragments**
- Before we go into detail with interaction fragments, let's cover the concept of an **interaction.**

Interaction Diagrams

- Four types of interaction diagrams:
  - Sequence diagrams
  - We will not study the following (by now at least):
    - Communication diagrams
    - Interaction overview diagrams
    - Timing diagrams
- The basic building block of an interaction diagram is the interaction
  - An interaction is a unit of behavior that focuses on the observable exchange of information between connectable elements

Example of an Interaction: Sequence Diagram

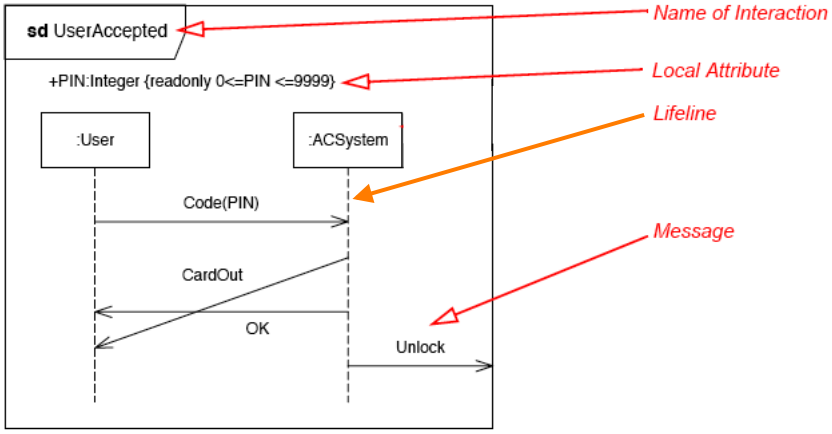


Figure 14.16 - An example of an interaction in the form of a Sequence Diagram

Interaction Fragment

- Interaction Fragment
  - Is a piece of an **interaction**
  - Acts like an interaction itself
- Combined Fragment
  - Is a subtype of interaction fragment
  - defines an expression of interaction fragments
- An expression of interaction fragments is defined by

  ⇨ an interaction operator and interaction operands.

Interaction Operators

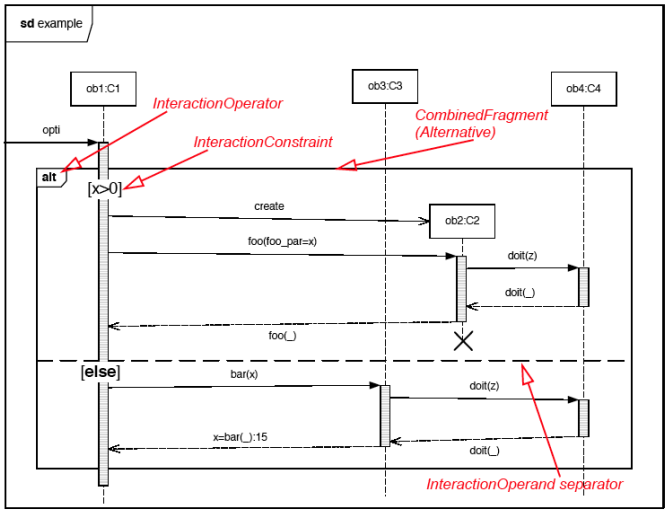
- The following operators are allowed in the combination of interaction fragments:
  - alt
  - opt
  - par
  - loop
  - critical
  - neg
  - assert
  - strict
  - seq
  - Ignore
  - consider

Alt Operator

- The interaction operator **alt** indicates a choice of behavior between interaction fragments
  - At most one interaction fragment (that is, an InteractionOperand) is chosen
  - The chosen interaction fragment must have an explicit or implicit guard expression that evaluates to true at this point in the interaction
    - A guard can be
      - a boolean expression (called InteractionConstraint)
      - `else` (a reserved word)
  - If the fragment has no guard expression, `true` is implied.

Example of a Combined Fragment using the alt operator

- The interaction operator alt indicates a choice of behavior between interaction fragments



Opt and Break Operators

option:

The interaction operator **opt** designates a choice of behavior where either the (sole) operand happens or nothing happens.

break:

The interaction operator **break** represents a breaking scenario: The operand is a scenario that is performed instead of the remainder of the enclosing interaction fragment.

Parallel and Critical Operator

par

The interaction operator **par** designates a parallel merge between the behaviors of the operands of a combined fragment.

critical

The interaction operator **critical** designates that the combined fragment represents a critical region.

Example of a Critical Region

Problem statement: The telephone Operator must make sure to forward a 911-call from a Caller to the Emergency system before doing anything else. Normal calls can be freely interleaved.