AMSS Lecture 6: UML Structural Diagrams

Traian Florin Șerbănuță

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Agenda

1. Object Diagrams
2. Package Diagrams
3. Component Diagrams
4. Deployment Diagrams

Object Diagrams

Object Diagrams

Definition

An object diagram shows a snapshot of the system at a particular time — instances of classes and the links between them.

Purpose

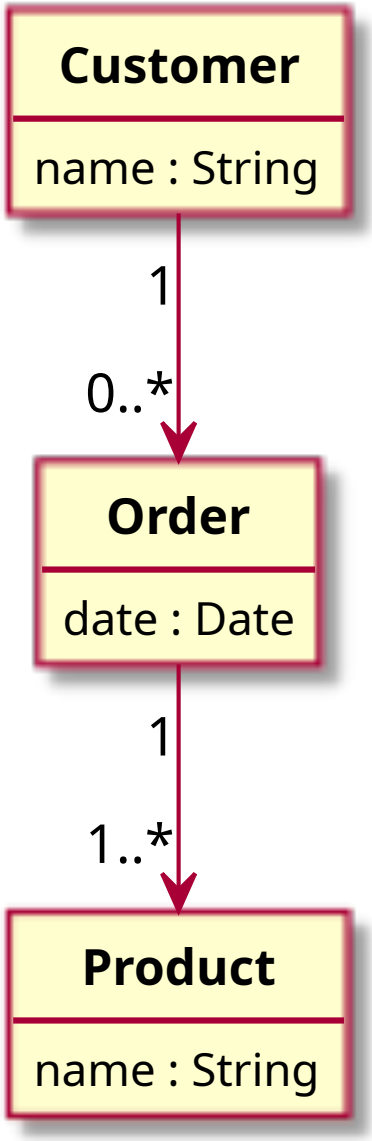
- Visualize examples of how objects are related at runtime.
- Validate class diagrams with concrete examples.

Key Elements

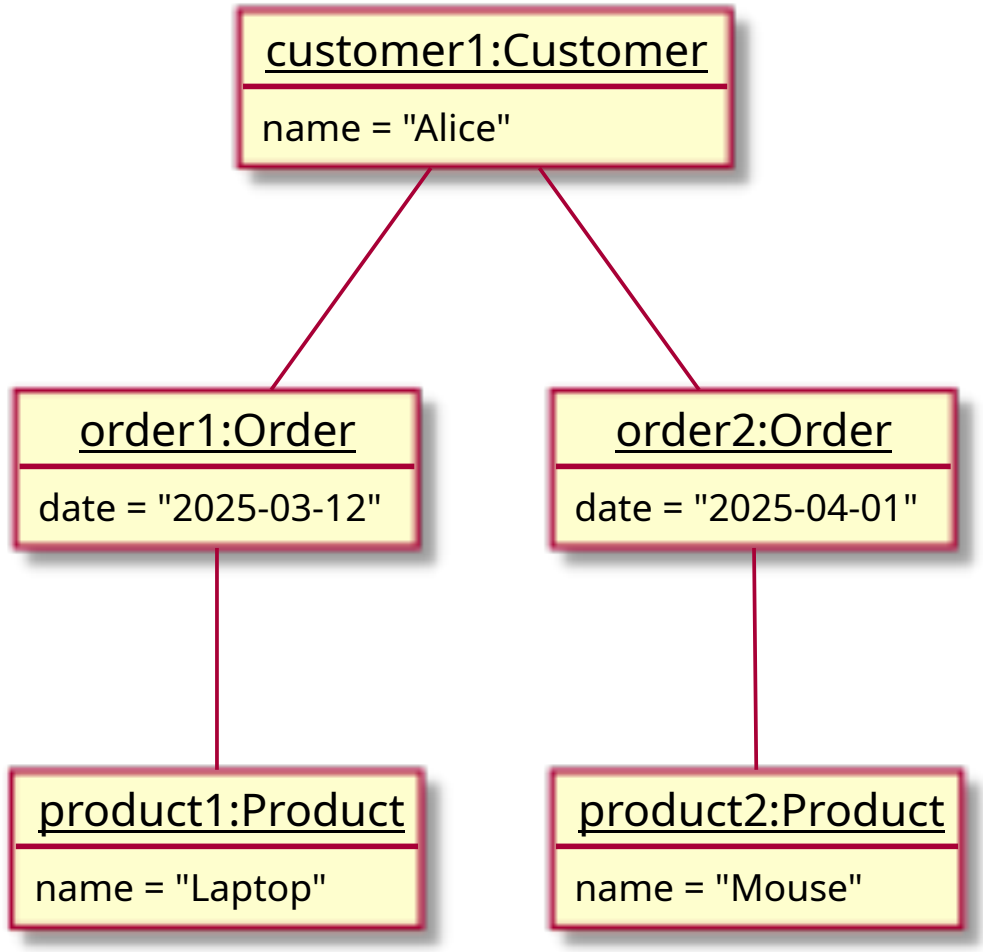
Objects, attribute values, and links.

Example: E-commerce System

Class diagram



Example object diagram



Interactive Task

Given the following class model:

- `Student`, `Course`, `Enrollment`
- Each `Student` can enroll in multiple `Courses` via `Enrollment`.

Tasks

- Draw a class diagram for the given model
- Draw an *object diagram* with 2 students and 2 courses showing their enrollments.

Package Diagrams

Package Diagrams

Definition

Package diagrams organize elements (classes, components, or other packages) into groups.

Purpose

Manage large models and clarify dependencies among system parts.

Key Elements

Packages, dependencies, imports, merges.

Example: E-commerce Application Packages

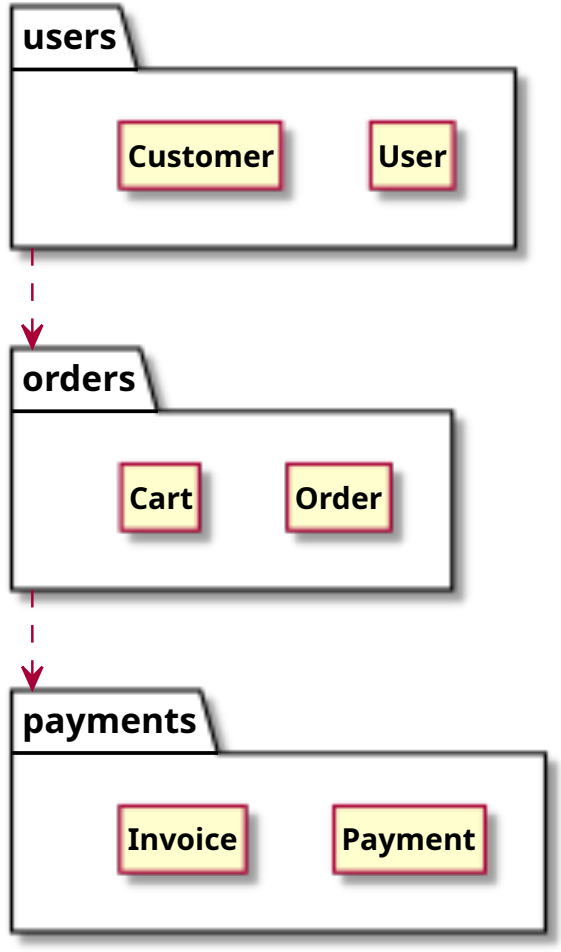


Figure 1: Package structure for an e-comerce app

Example

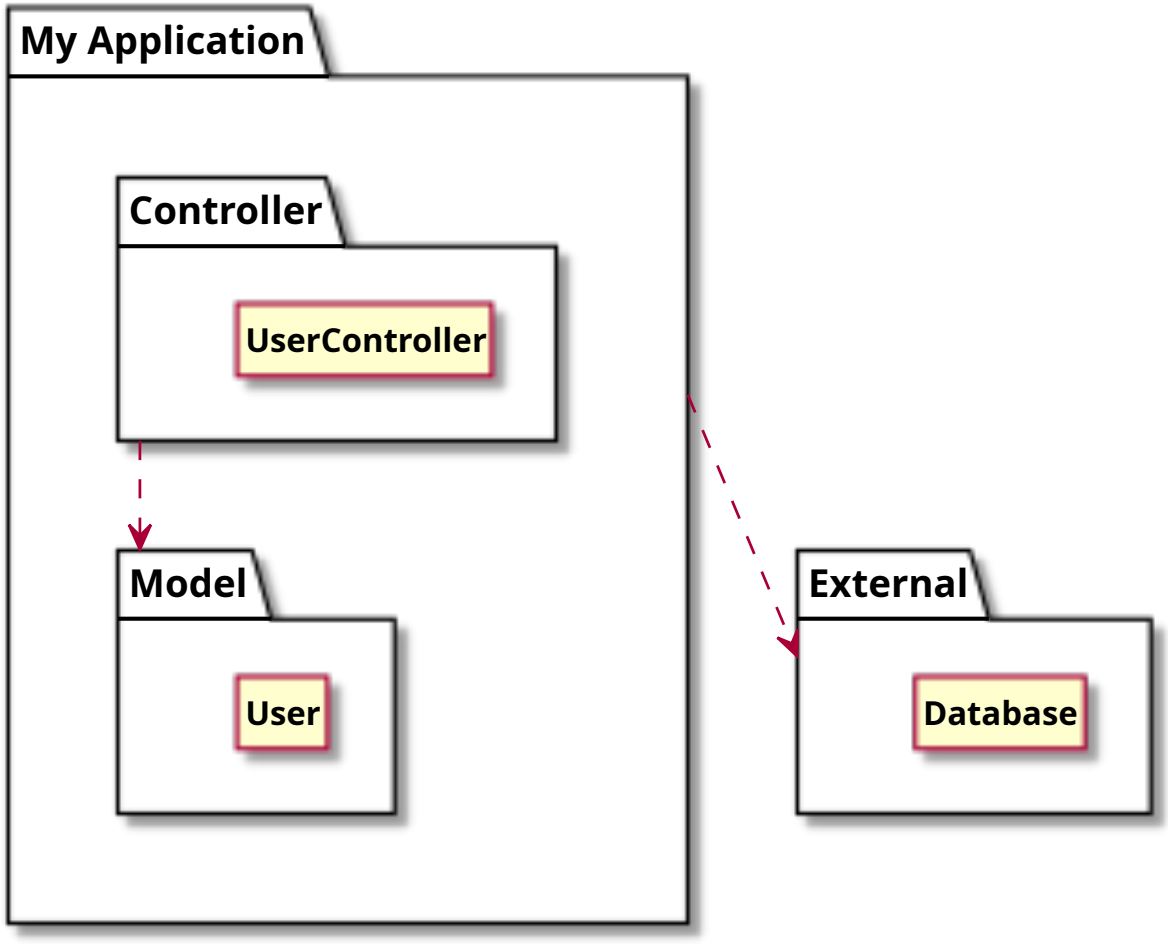


Figure 2: Package structure for a web service

Interactive Exercise

Task: Given several classes (`User`, `Product`, `Payment`, `Review`, `Cart`), propose a modular package structure.
Goal: Reduce coupling and improve clarity.

Component Diagrams

Component Diagrams

Definition

Describe how software components (subsystems, modules, libraries) are connected.

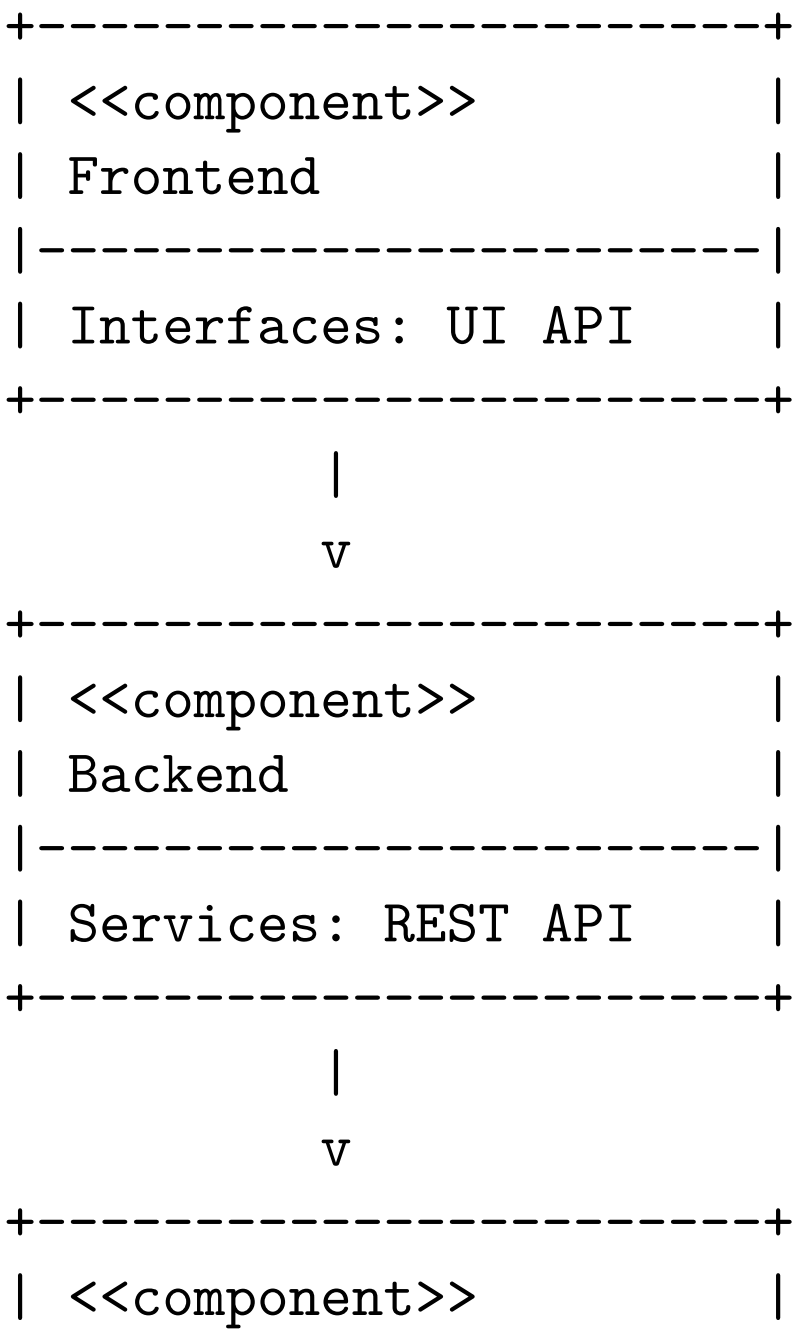
Purpose

Model large-scale structure and interactions between replaceable parts.

Key Elements

Components, interfaces, ports, dependencies.

Example: Web Application



Interactive Task

You are given a system for online learning (students, courses, and grading services).

Identify 3–5 major components and describe their provided and required interfaces.

Deployment Diagrams

Deployment Diagrams

Definition

Represent the physical deployment of software artifacts on hardware nodes.

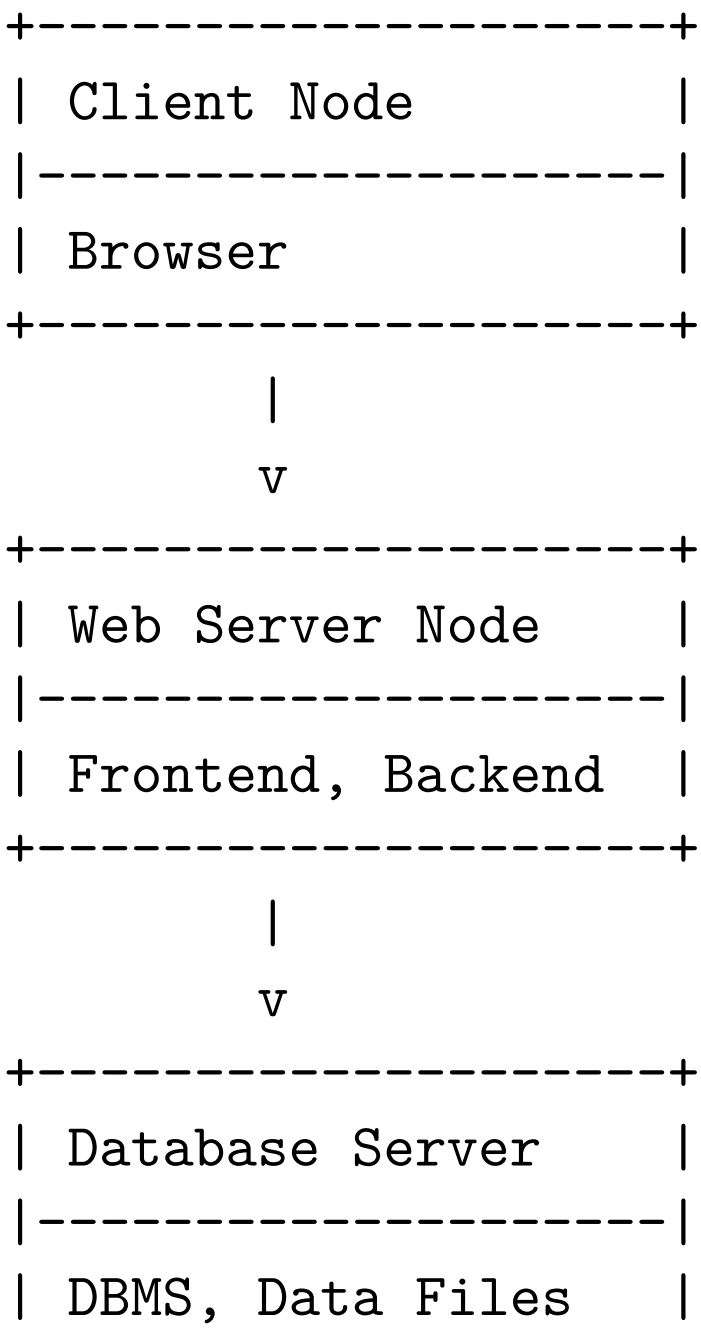
Purpose

Model distributed systems and deployment topologies.

Key Elements

Nodes (devices, servers), artifacts (software units), communication links.

Example: Web Application Deployment



Exercise

Given a system that includes a mobile app, a REST API backend, and a cloud database, create a simple deployment diagram.

Wrap-Up

Diagram Type	What It Models	Typical Use
Object	Instances and links at runtime	Example snapshots
Package	Logical grouping of elements	Modular organization
Component	Subsystem/module structure	Software architecture
Deployment	Physical topology	System infrastructure

Takeaway: Structural diagrams complement behavioral ones by showing the static "shape" of a system.