Software Engineering

System Models

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System modeling

- System modeling is the process of developing abstract models of a system, with each model presenting a different view or perspective of that system.
- System modeling has now come to mean representing a system using graphical notation, which is now almost always based on notations in the Unified Modeling Language (UML).
- System modelling helps the analyst to understand the functionality of the system and models are used to communicate with customers.

Existing and planned system models

- **Models of the existing system**
  - used during requirements engineering.
  - help to clarify what the existing system does and can be used as a basis for discussing its strengths and weaknesses.
  - lead to requirements for the new system.

- **Models of the new system**
  - used during requirements engineering
  - help to explain the proposed requirements to other system stakeholders.
  - Engineers use these models to discuss design proposals and to document the system for implementation.

System perspectives

- **An external perspective,**
  where you model the context or environment of the system.

- **An interaction perspective,**
  where you model the interactions between a system and its environment, or between the components of a system.

- **A structural perspective,**
  where you model the organization of a system or the structure of the data that is processed by the system.

- **A behavioral perspective,**
  where you model the dynamic behavior of the system and how it responds to events.

UML diagram types

- Class diagrams, which show the object classes in the system and the associations between these classes.
- Use case diagrams, which show the interactions between a system and its environment.
- Sequence diagrams, which show interactions between actors and the system and between system components.
- Activity diagrams, which show the activities involved in a process or in data processing .
- State diagrams, which show how the system reacts to internal and external events.

Use of graphical models

- As a means of facilitating discussion about an existing or proposed system
- As a way of documenting an existing system
- As a detailed system description that can be used to generate a system implementation

Types of System Models

- Context models
- Interaction models
- Structural models
- Behavioral models

Context models

used to illustrate the operational context of a system - they show what lies outside the system boundaries.

- **Social and organisational concerns may affect the decision on where to position system boundaries.**
- **Architectural models show the system and its relationship with other systems.**
- **Context models simply show the other systems in the environment, not how the system being developed is used in that environment.**

Process perspective

Process models reveal how the system being developed is used in broader business processes.

- **UML activity diagrams may be used to define business process models.**

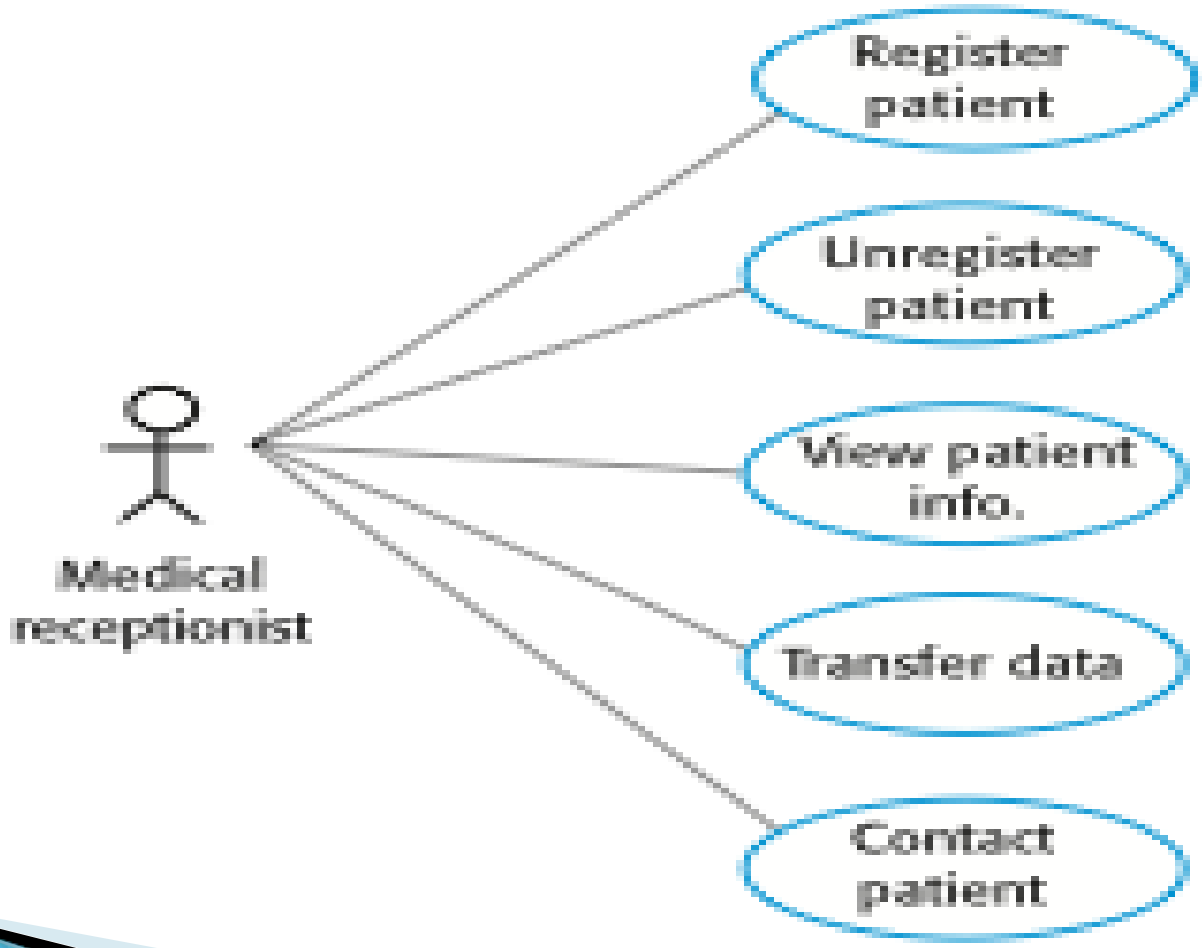
Interaction models

- Modeling user interaction is important as it helps to identify user requirements.
- Modeling system-to-system interaction highlights the communication problems that may arise.
- Modeling component interaction helps us understand if a proposed system structure is likely to deliver the required system performance and dependability.
- Use case diagrams and sequence diagrams may be used for interaction modelling.

Use case modeling

- Use cases were developed originally to support requirements elicitation and now incorporated into the UML.
- Each use case represents a discrete task that involves external interaction with a system.
- Actors in a use case may be people or other systems.
- Represented diagrammatically to provide an overview of the use case and in a more detailed textual form.

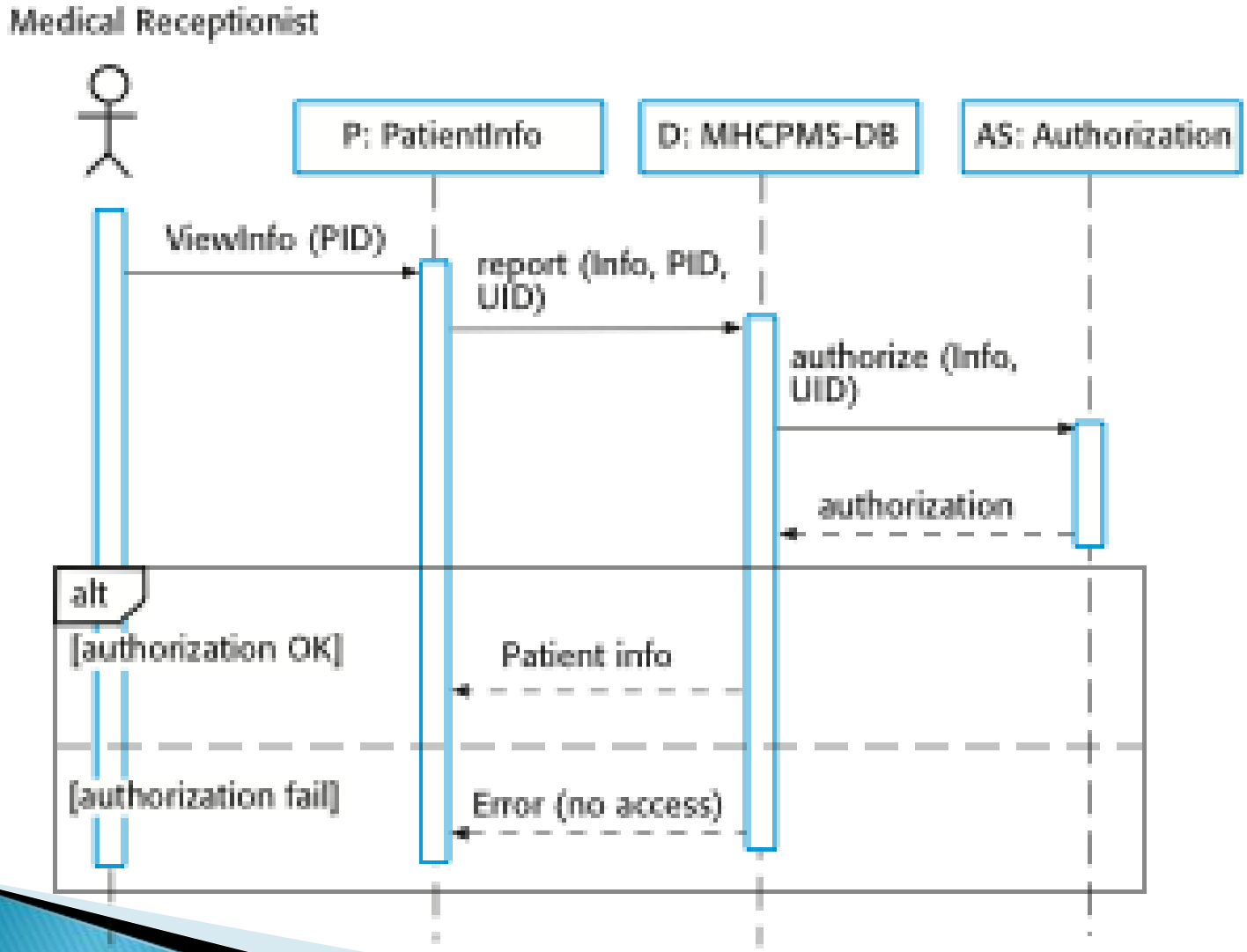
Use cases represent the role of 'Medical Receptionist'



Sequence diagrams

- Sequence diagrams are part of the UML and are used to model the interactions between the actors and the objects within a system.
- A sequence diagram shows the sequence of interactions that take place during a particular use case or use case instance.
- The objects and actors involved are listed along the top of the diagram, with a dotted line drawn vertically from these.
- Interactions between objects are indicated by annotated arrows.

Sequence diagram for View patient information



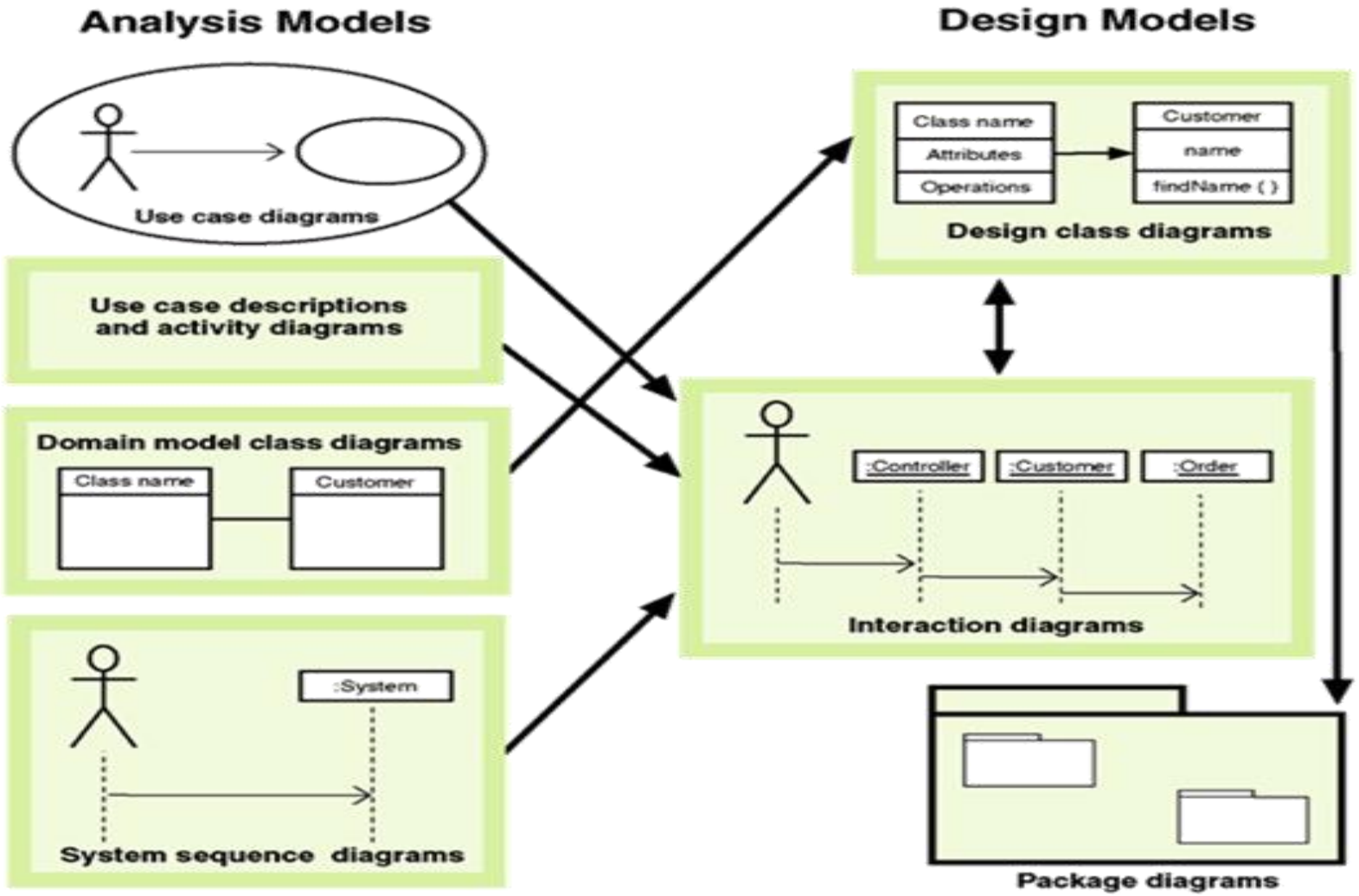
Structural models

- Structural models of software display the organization of a system in terms of the components that make up that system and their relationships.
- Structural models may be static models, which show the structure of the system design, or dynamic models, which show the organization of the system when it is executing.
- You create structural models of a system when you are discussing and designing the system architecture.

Class diagrams

- Class diagrams are used when developing an object-oriented system model to show the classes in a system and the associations between these classes.
- An object class can be thought of as a general definition of one kind of system object.
- An association is a link between classes that indicates that there is some relationship between these classes.
- When you are developing models during the early stages of the software engineering process, objects represent something in the real world, such as a patient, a prescription, doctor, etc.

Software Engineering



Questions