Software Engineering

Week 7

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Topics

- Context models
- Interaction models

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 some kind of 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.

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Existing and planned system models

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

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

✧ In a model-driven engineering process, it is possible to generate a complete or partial system implementation from the system model.

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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.

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UML diagram types

✧ Activity diagrams, which show the activities involved in a process or in data processing .

✧ 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.

✧ Class diagrams, which show the object classes in the system and the associations between these classes.

✧ State diagrams, which show how the system reacts to internal and external events.

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Use of graphical models

✧ As a means of facilitating discussion about an existing or proposed system
- Incomplete and incorrect models are OK as their role is to support discussion.

✧ As a way of documenting an existing system
- Models should be an accurate representation of the system but need not be complete.

✧ As a detailed system description that can be used to generate a system implementation
- Models have to be both correct and complete.

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Context models

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Context models

✧ Context models are 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.

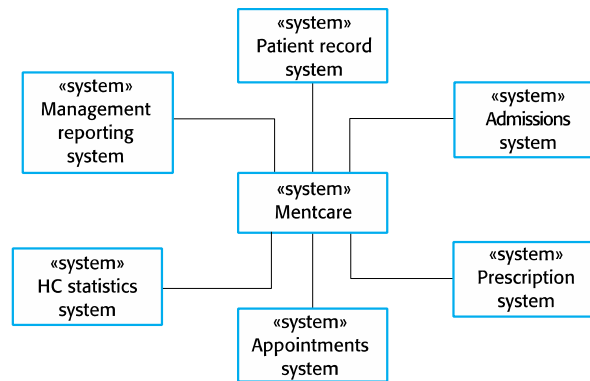✧ Architectural models show the system and its relationship with other systems.

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System boundaries

✧ System boundaries are established to define what is inside and what is outside the system.
  ▪ They show other systems that are used or depend on the system being developed.

✧ The position of the system boundary has a profound effect on the system requirements.

✧ Defining a system boundary is a political judgment
  ▪ There may be pressures to develop system boundaries that increase / decrease the influence or workload of different parts of an organization.

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The context of the Mentcare system

```
                    ┌──────────────┐
                    │   «system»   │
                    │Patient record│
                    │    system    │
                    └──────────────┘
┌──────────────┐                          ┌──────────────┐
│   «system»   │                          │   «system»   │
│  Management  │                          │  Admissions  │
│   reporting  │                          │    system    │
│    system    │       ┌──────────┐       └──────────────┘
└──────────────┘       │ «system» │
                       │ Mentcare │
                       └──────────┘
┌──────────────┐                          ┌──────────────┐
│   «system»   │                          │   «system»   │
│ HC statistics│                          │ Prescription │
│    system    │                          │    system    │
└──────────────┘                          └──────────────┘
                    ┌──────────────┐
                    │   «system»   │
                    │ Appointments │
                    │    system    │
                    └──────────────┘
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Process perspective

♢ Context models simply show the other systems in the environment, not how the system being developed is used in that environment.

♢ 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.

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Process model of involuntary detention
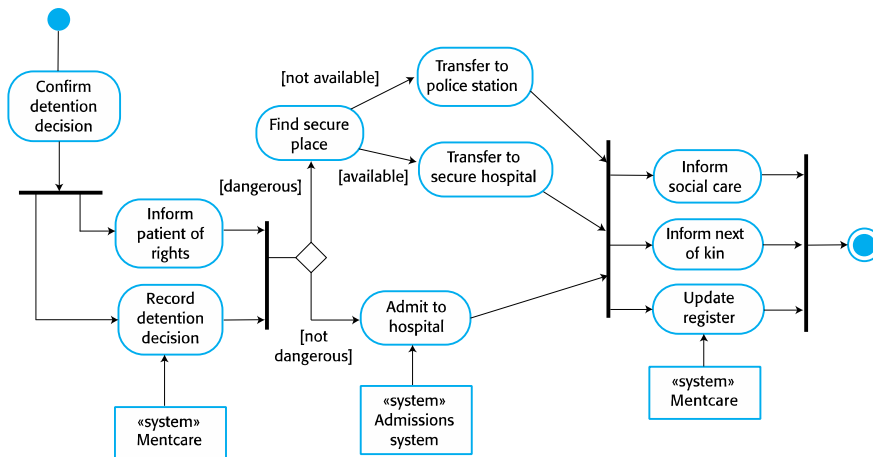
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Interaction models

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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 modeling.

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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 diagramatically to provide an overview of the use case and in a more detailed textual form.

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Transfer-data use case
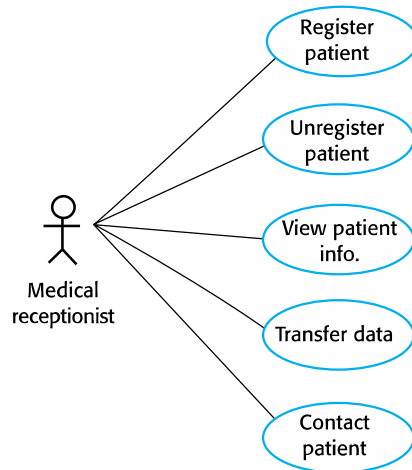
◇ A use case in the Mentcare system

Medical receptionist → Transfer data → Patient record system
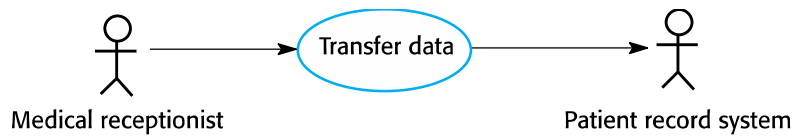
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Tabular description of the 'Transfer data' use-case

MHC-PMS: Transfer data	
Actors	Medical receptionist, patient records system (PRS)
Description	A receptionist may transfer data from the Mentcase system to a general patient record database that is maintained by a health authority. The information transferred may either be updated personal information (address, phone number, etc.) or a summary of the patient's diagnosis and treatment.
Data	Patient's personal information, treatment summary
Stimulus	User command issued by medical receptionist
Response	Confirmation that PRS has been updated
Comments	The receptionist must have appropriate security permissions to access the patient information and the PRS.

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Use cases in the Mentcare system involving the role 'Medical Receptionist'

Medical receptionist

- Register patient
- Unregister patient
- View patient info.
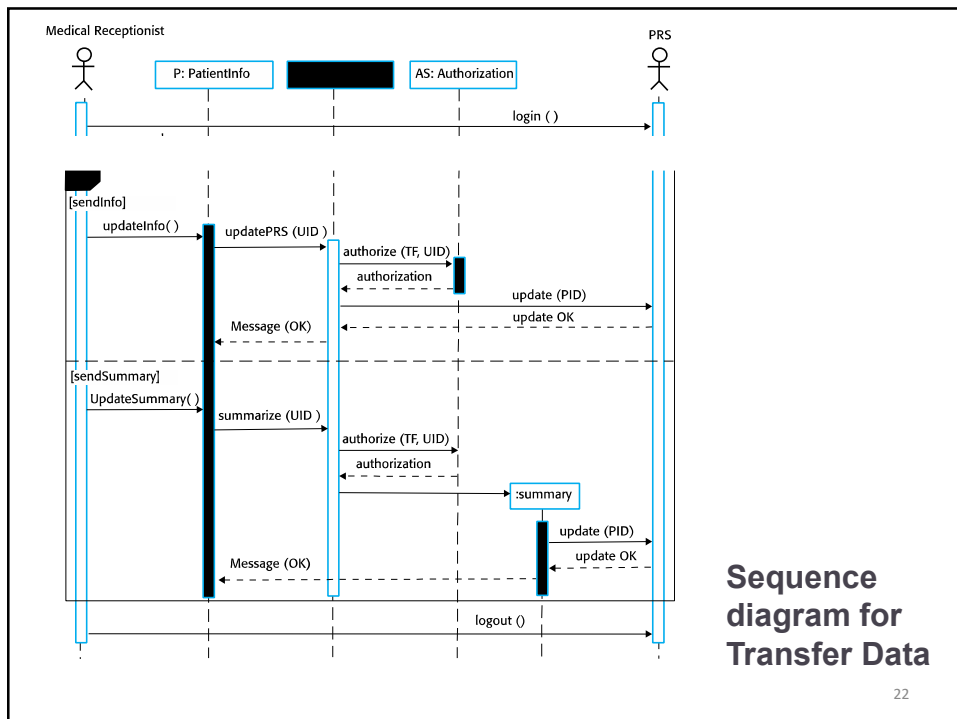- Transfer data
- Contact patient

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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.

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Sequence diagram for View patient information
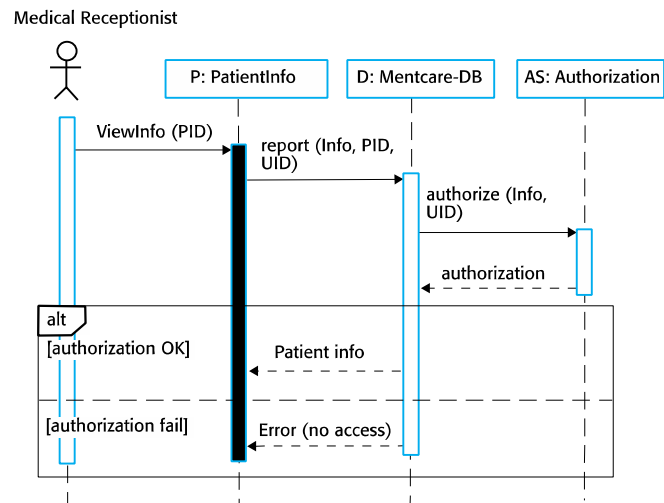
Sequence diagram for Transfer Data

Any Questions

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