System Modeling

Lecture # 22

Lecture by Engr. Sidra

Objectives

- The aim of this chapter is to introduce some types of system model that may be developed as part of the requirements engineering and system design processes. When you have read the chapter, you will:
  - understand how graphical models can be used to represent software systems;
  - understand why different types of model are required and the fundamental system modeling perspectives of context, interaction, structure, and behavior;
  - Have been introduced to some of the diagram types in the Unified Modeling Language (UML) and how these diagrams may be used in system modeling;

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.

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.

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

- 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.

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.

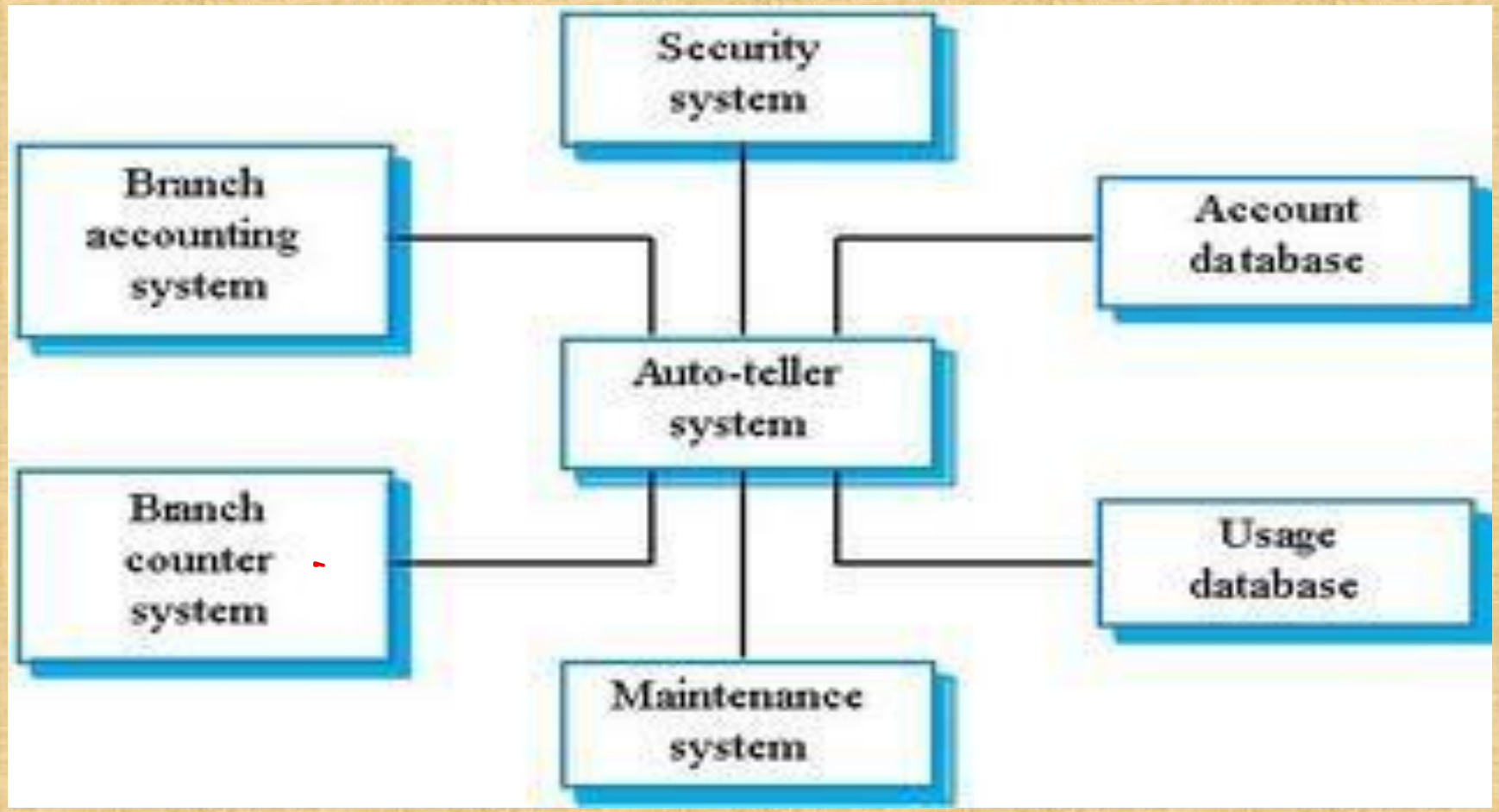
Context Models

- Context models are used to illustrate the operational context of a system - they show what lies outside the system boundaries.
- Context models normally show that the environment includes several other automated systems.
- However, they do not show the types of relationships between the systems in the environment and the system that is being specified.
- Therefore, simple context models are used along with other models, such as business process models. These describe human and automated processes in which particular software systems are used.

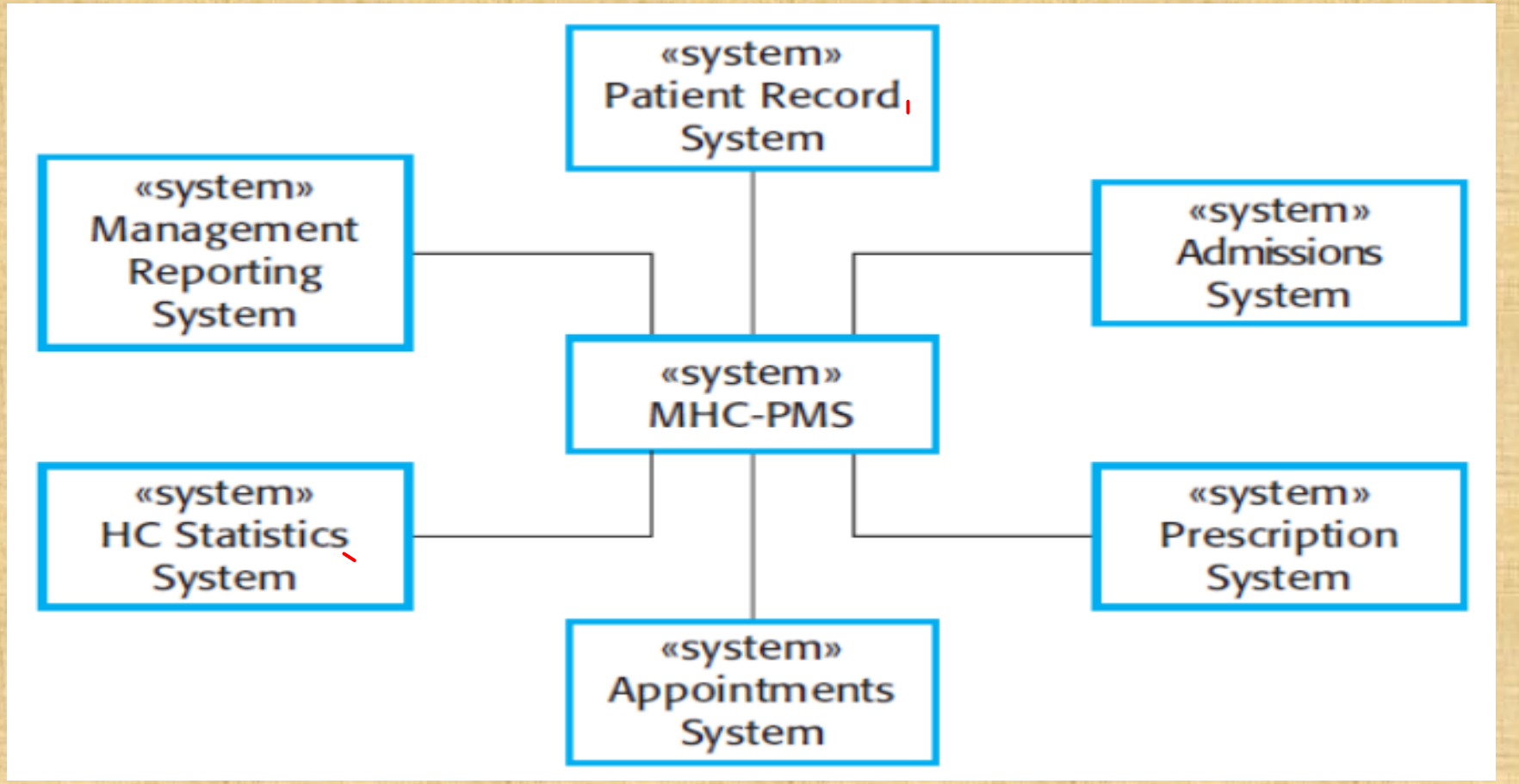
System Boundaries

- 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.
- Social and organizational concerns may affect the decision on where to position system boundaries.
- 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

Example: Context of ATM



Example: MHC-PMS



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.