

Software Modeling

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Contents



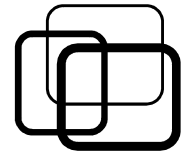
- Modeling Concepts.
- Business Model.
- Requirements Model.
- Data Model.

Contents



- **Modeling Concepts.**
- Business Model.
- Requirements Model.
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Modeling Concepts



■ View concept:

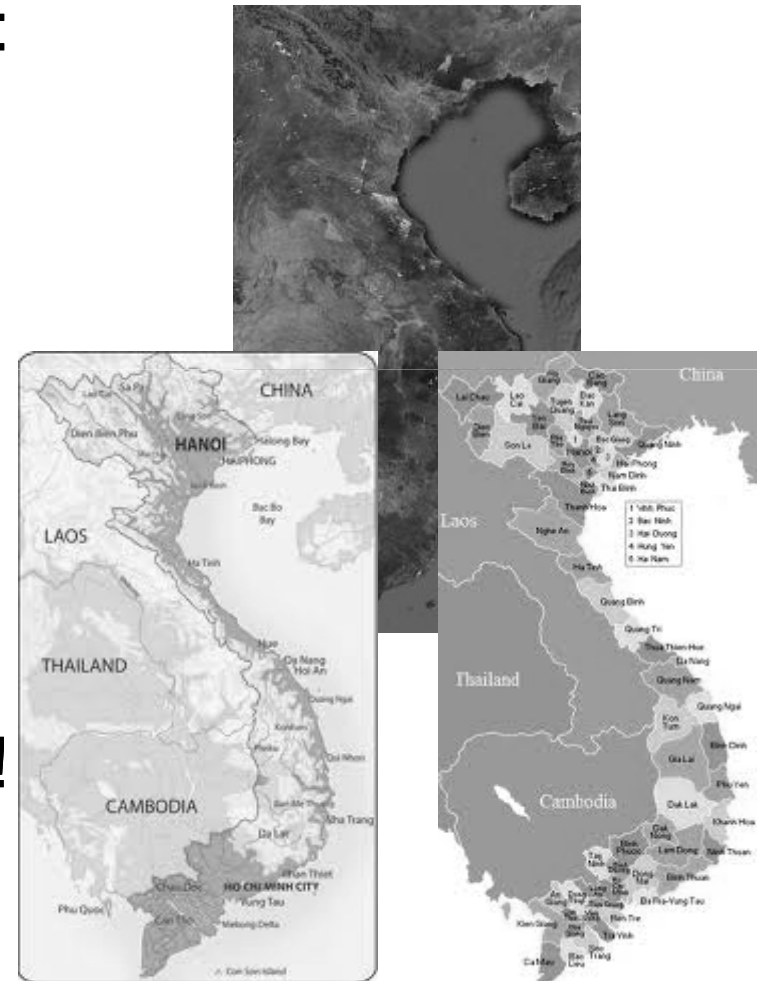
■ General description problem:

- Describe in reality.
- No details.
- No focus on particular feature.

■ View description:

- Simulation of reality.
- Describe one aspect.
- Focus on detail & feature.

➔ More efficient on complex thing!

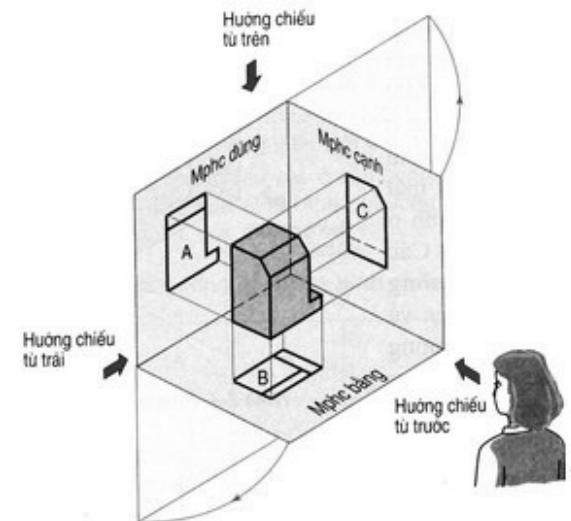


Modeling Concepts



■ Software model:

- A view description of software system.
- Describe one aspect.
- Focus on one particular feature.
- Software modeling: describe based on models.
- Analysis models vs. Design models.
- Model Driven Development.





- Modeling language:

- Natural language: free but wordy.

- Formal language:

- Psedo-code, equations: constraint but precise.

- Diagram + specifications.

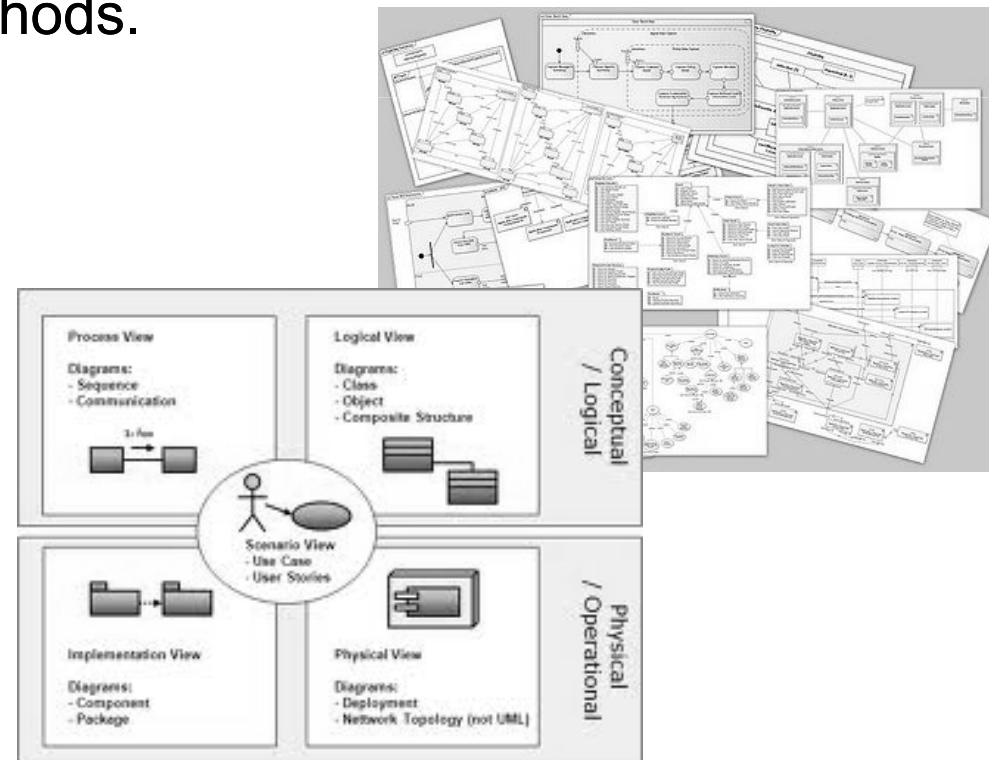
Modeling Concepts



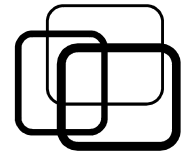
■ Modeling language:

■ UML (**U**nified **M**odelling **L**anguage):

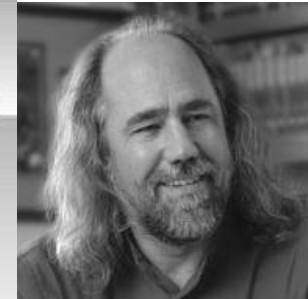
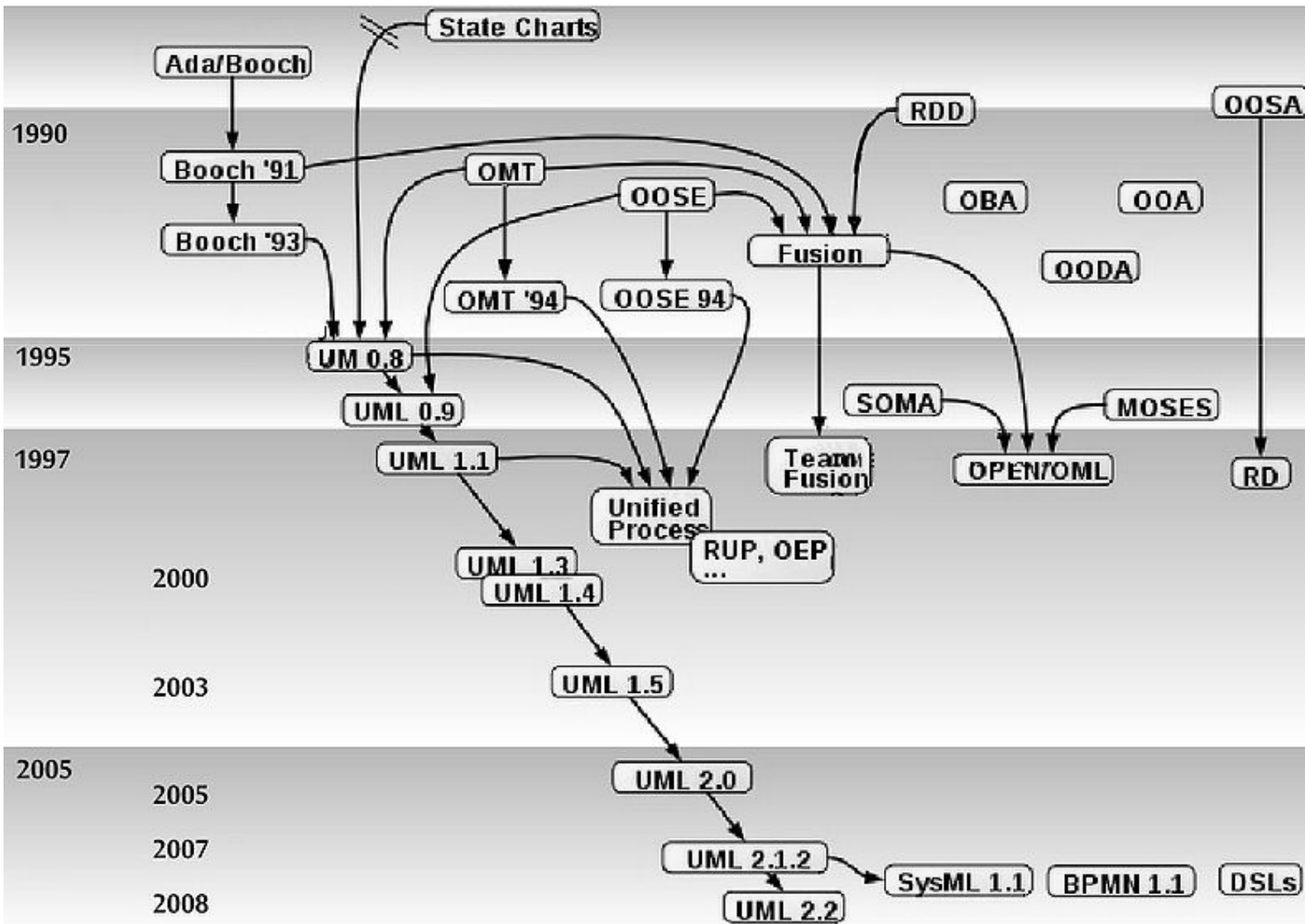
- Semi-formal language: diagram + specifications.
- Standard for software modeling.
- Use object oriented methods.
- 4+1 views, 9 diagrams:
 - Use Case View.
 - Process View
 - Logical View.
 - Physical View.
 - Deployment View.



Modeling Concepts



■ History of UML:



Grandy Booch



James Rumbaugh



Ivar Jacobson

Contents



- Modeling Concepts.
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■ Applications:

- Describe business terms & process.
- Clarify business problem.
- ➔ Suitable for business projects.

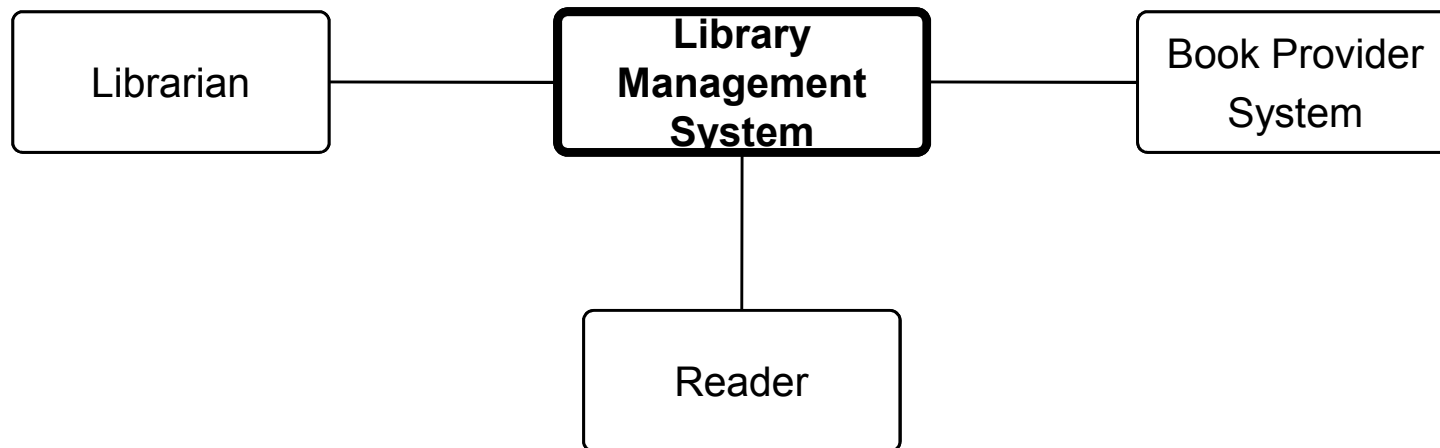
■ Diagrams:

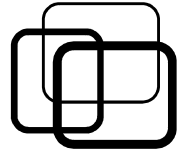
- Context diagram.
- Activity diagram.
- State-chart diagram.



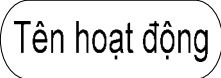
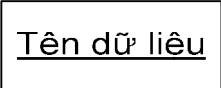

■ Context diagram:

- Software vs. Externals.
- Describe outside factors interact with software.
- Usage:
 - Identify software stakeholders.

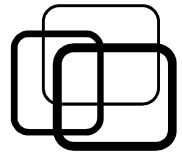




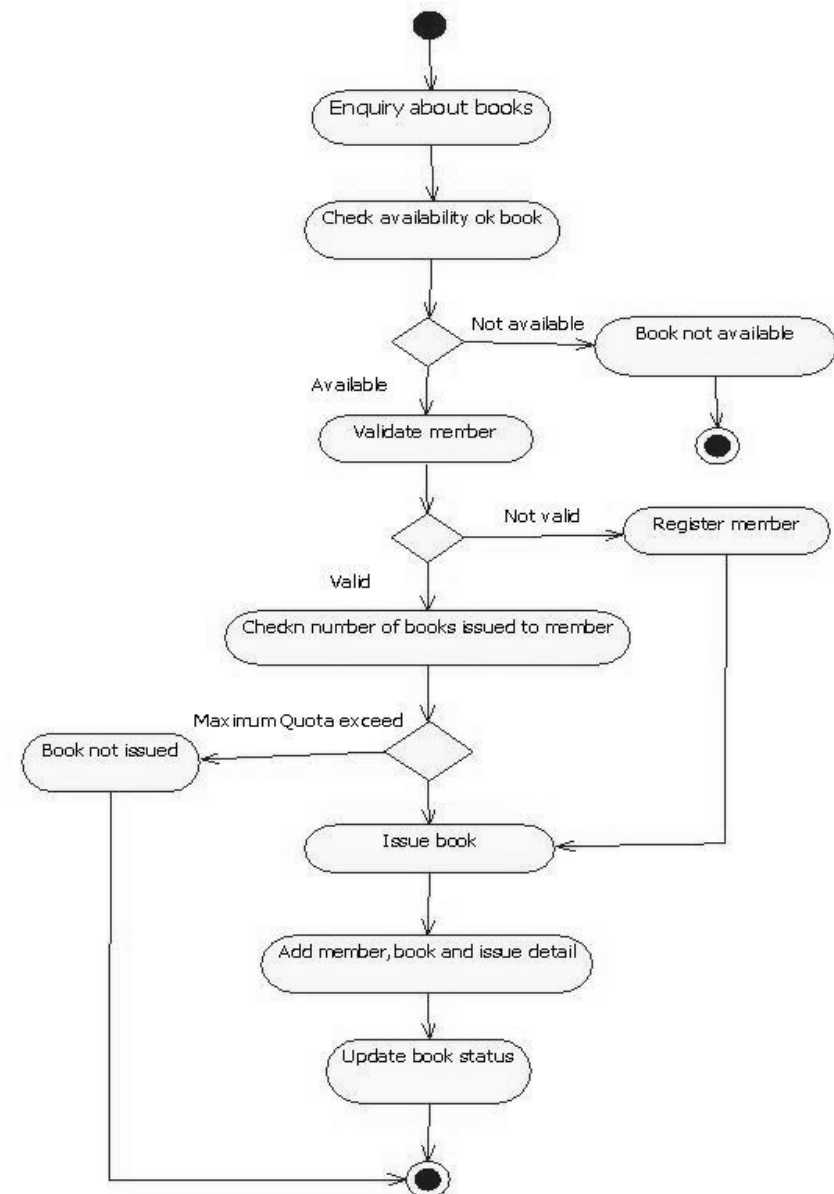
- Activity diagram:
 - Describe activities in workflow.
 - Usage:
 - Describe business process.
 - Explain algorithm.
 - Notations:

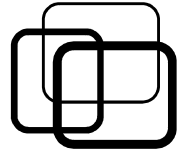
Notation	Description
	-An activity or work.
	-Input or output data.
	-Condition. -Branching.

Business Model



■ Activity diagram “Borrow books in library”:





■ State-chart diagram:

- Describe states & changes of states of thing.


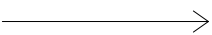
- Usage:

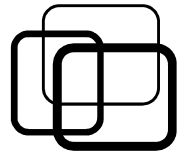
 - Tracking states and transitions of:

 - Controlling device object.

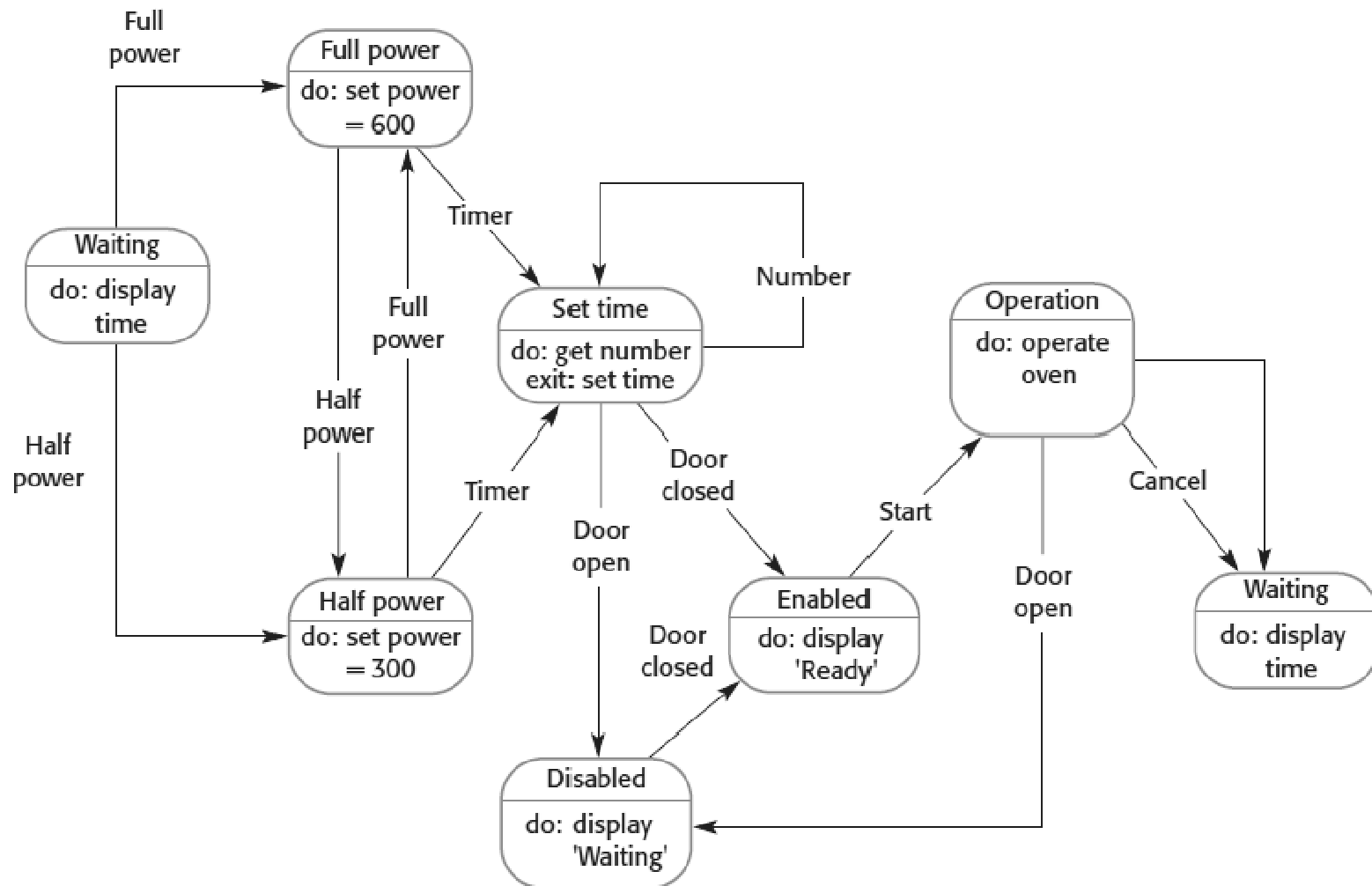
 - Business data.

- Notations:

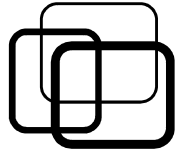
Notation	Mô tả
	-A state.
	-Transition of state.



■ State-chart diagram “Microwave oven”:



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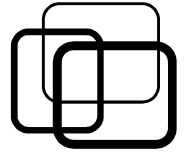
■ Applications:

- Analyze requirements.
 - Identify stakeholders.
 - List user requirements.
 - Describe system requirements.

■ Diagrams:

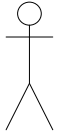

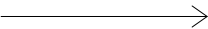
- Use Case diagram:
 - Based on Use Case Analysis.
 - List stakeholders & user requirements (actors & use case).
- Sequence diagram:
 - Describe system requirements (screenplay).

Requirements Model



■ Sơ đồ Use Case:

■ Notations:

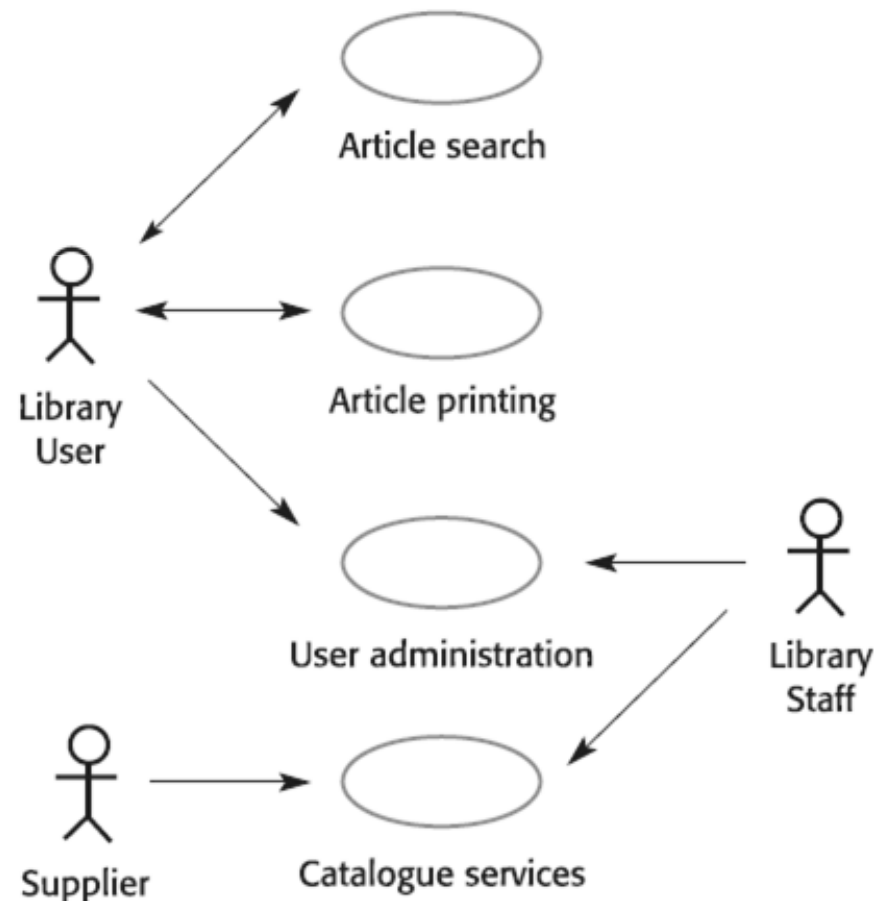
Notations	Meaning	Mô tả
 Tên diễn viên	Actor	-System stakeholders. -Stay outside the system. -Use/interact the system.
 Chức năng	Use Case	-Features, functional requirements. -Scene: actor vs system.
	Interaction	-Relationship of actors and scenes.
Usecase Specifications	Screenplay Descriptions	-Screenplay for scenarios in each scene.

Requirements Model

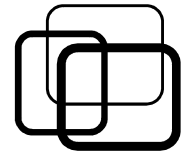


■ Use Case diagram:

■ Example: Library Management System.



Requirements Model



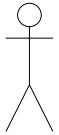
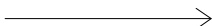
■ Use Case specification “Article Search”:

Use Case	Article Search
Brief Descriptions	Chức năng này bắt đầu khi độc giả muốn tìm sách trong thư viện dựa vào tên sách, tên tác giả, hoặc nhà xuất bản.
Main Flow	<ol style="list-style-type: none">1. Hệ thống đề nghị cung cấp một trong số các thông tin tra cứu (tên sách, tác giả, nhà xuất bản).2. Độc giả cung cấp các thông tin cần thiết.3. Độc giả ra lệnh tìm sách.4. Hệ thống thực hiện tìm kiếm sách theo thông tin độc giả cung cấp.5. Hệ thống đưa ra những quyền sách tìm được.
Alternative Flows	<p>3a. Thông tin tra cứu không hợp lệ</p> <ol style="list-style-type: none">1. Hệ thống thông báo những thông tin nào không hợp lệ.2. Hệ thống đề nghị cung cấp lại thông tin. <p>4a. Không tìm thấy sách</p> <ol style="list-style-type: none">1. Hệ thống thông báo không tìm thấy sách theo thông tin cung cấp.2. Hệ thống đề nghị cung cấp lại thông tin.
Pre-conditions	Độc giả phải đăng nhập thành công vào hệ thống
Special Requirements	<ul style="list-style-type: none">-Giao diện tra cứu phải dễ dùng với độc giả lần đầu tiên sử dụng.-Thời gian phản hồi tra cứu không quá 1 phút.

Requirements Model



- Sequence diagram:
 - Describe interactions.
 - In chronological order.
 - Usage: Use Case specification (screenplay).
 - Notations:

Notation	Meaning	Description
 Tên diễn viên <div><u>:Tên đối tượng</u></div>	Actor	-Analysis phase: user & related systems. -Design phase: objects.
	Interaction	-Analysis phase: interactions & actions. -Design phase: programming functions.

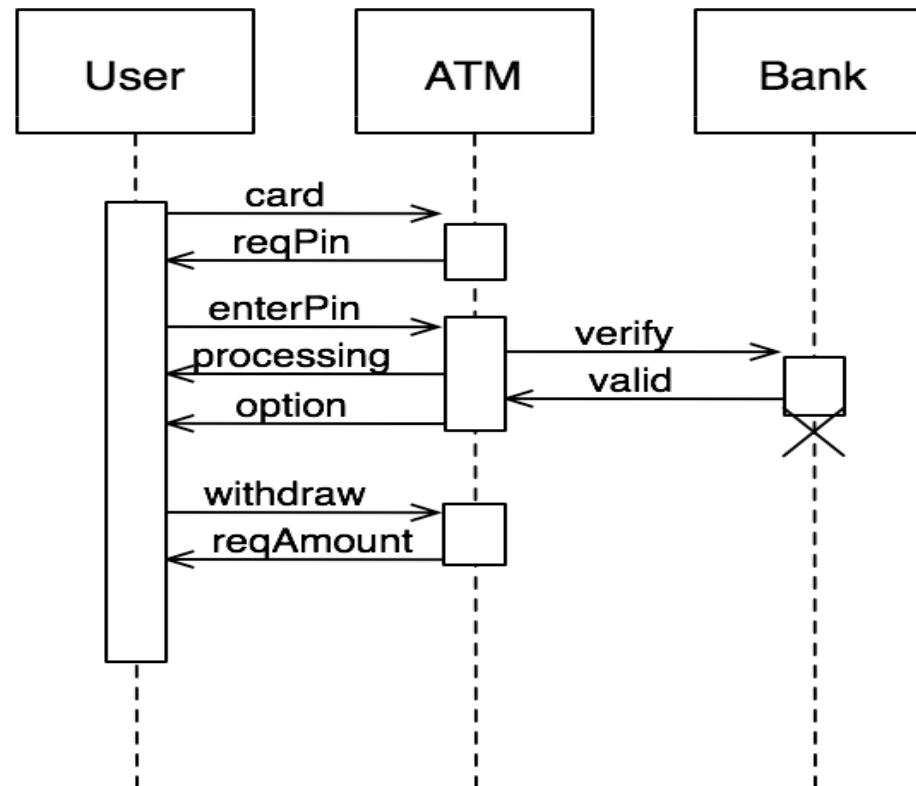
Requirements Model



■ Sequence diagram:

■ Example 1: ATM System.

- Use Case: Withdraw Money.
- Main-flow: successful.

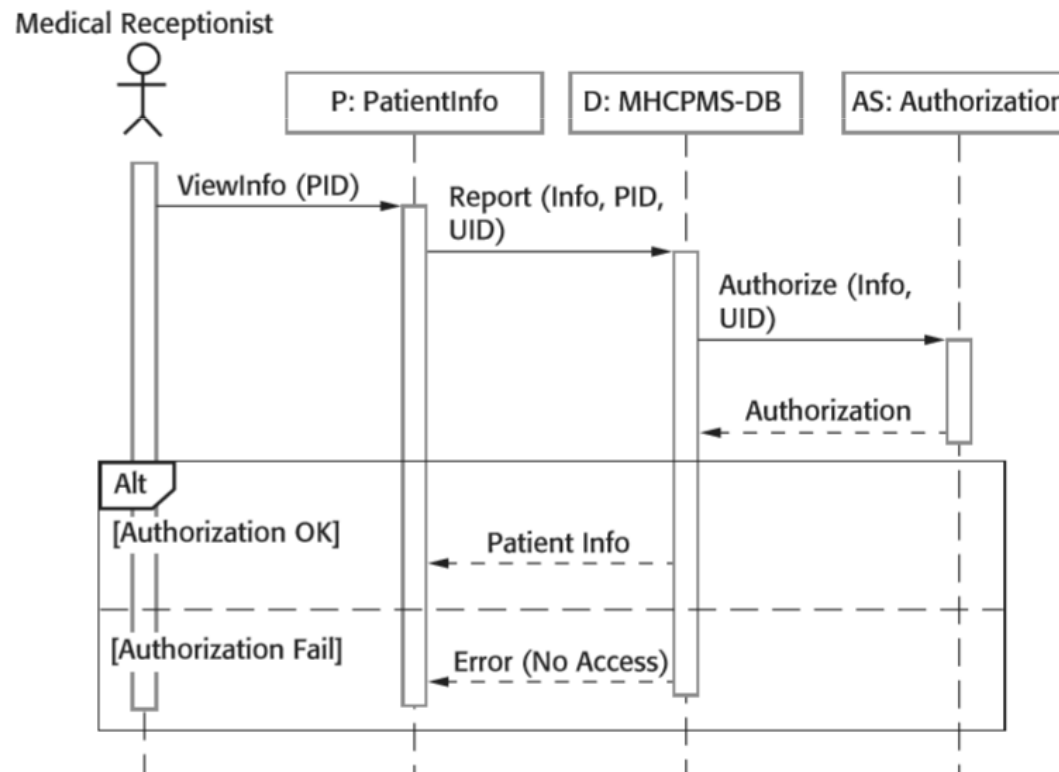


Requirements Model

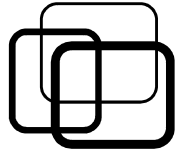


■ Sequence diagram:

- Example 2: Hospital Management System.
 - Use Case: Login.
 - Main & Alternative flows: successful & failed.



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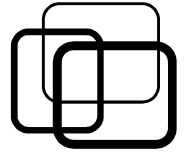


■ Applications:

- A static picture of system.
- Describe storage data units.
- Identify business/domain objects.

■ Diagrams:

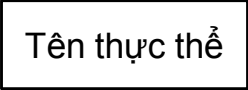
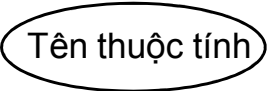
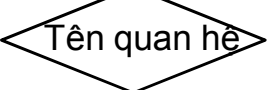
- ER diagram.
- Class diagram.

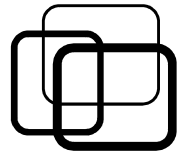


■ Entity Relationship Diagram (ERD):

- Peter Chen, 1976.

- Notations:

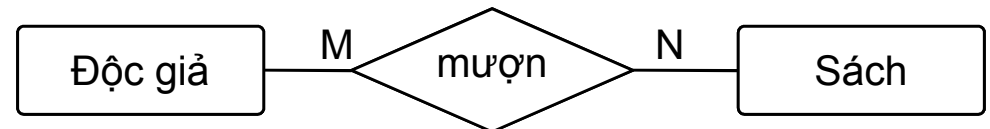
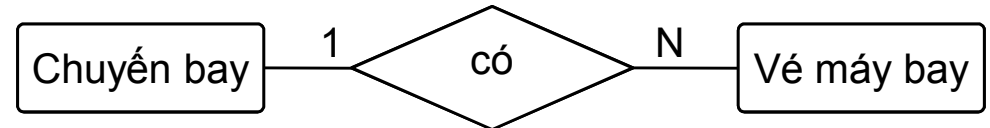
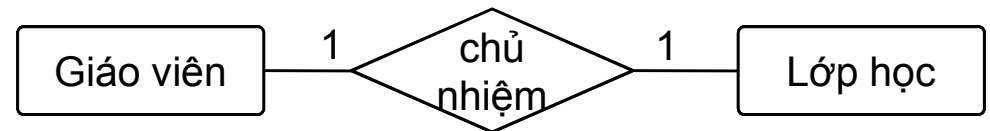
Notation	Meaning	Description
	Entity	-Business object. -Data unit.
	Attribute	-Entity information. -Data property.
	Relationship	-Relation between entity.



■ ER Diagram:

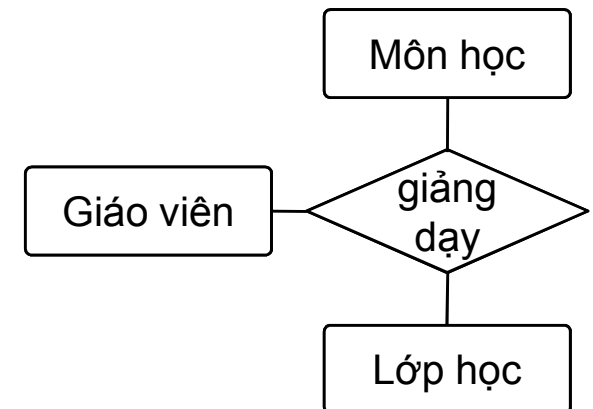
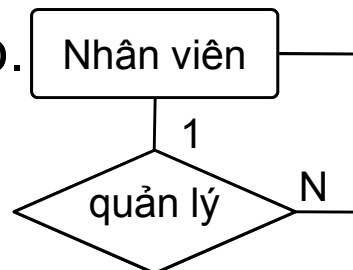
■ Relationship:

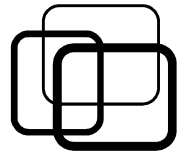
- 1 – 1.
- 1 – N.
- M – N.



■ N-nary:

- Unary relationship.
- Binary relationship.
- Multiple relationship.

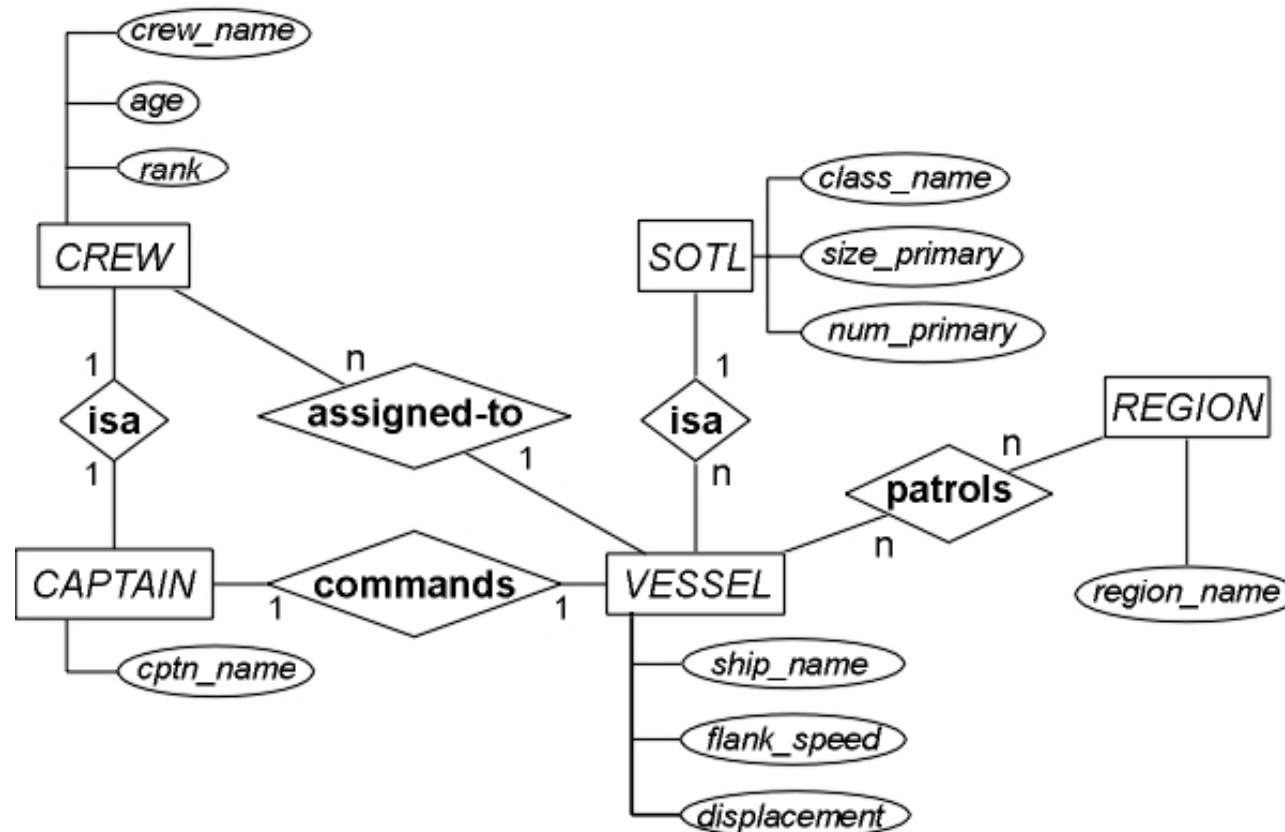


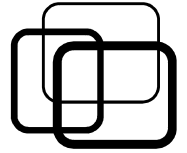


■ ER Diagram:

■ Example: Shipping Management System.

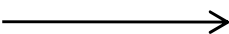
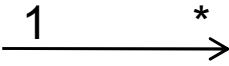
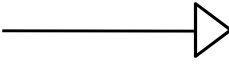
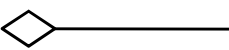
Figure 1: Entity-Relationship Diagram Example



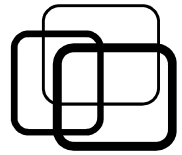


■ Class diagram:

■ Notations:

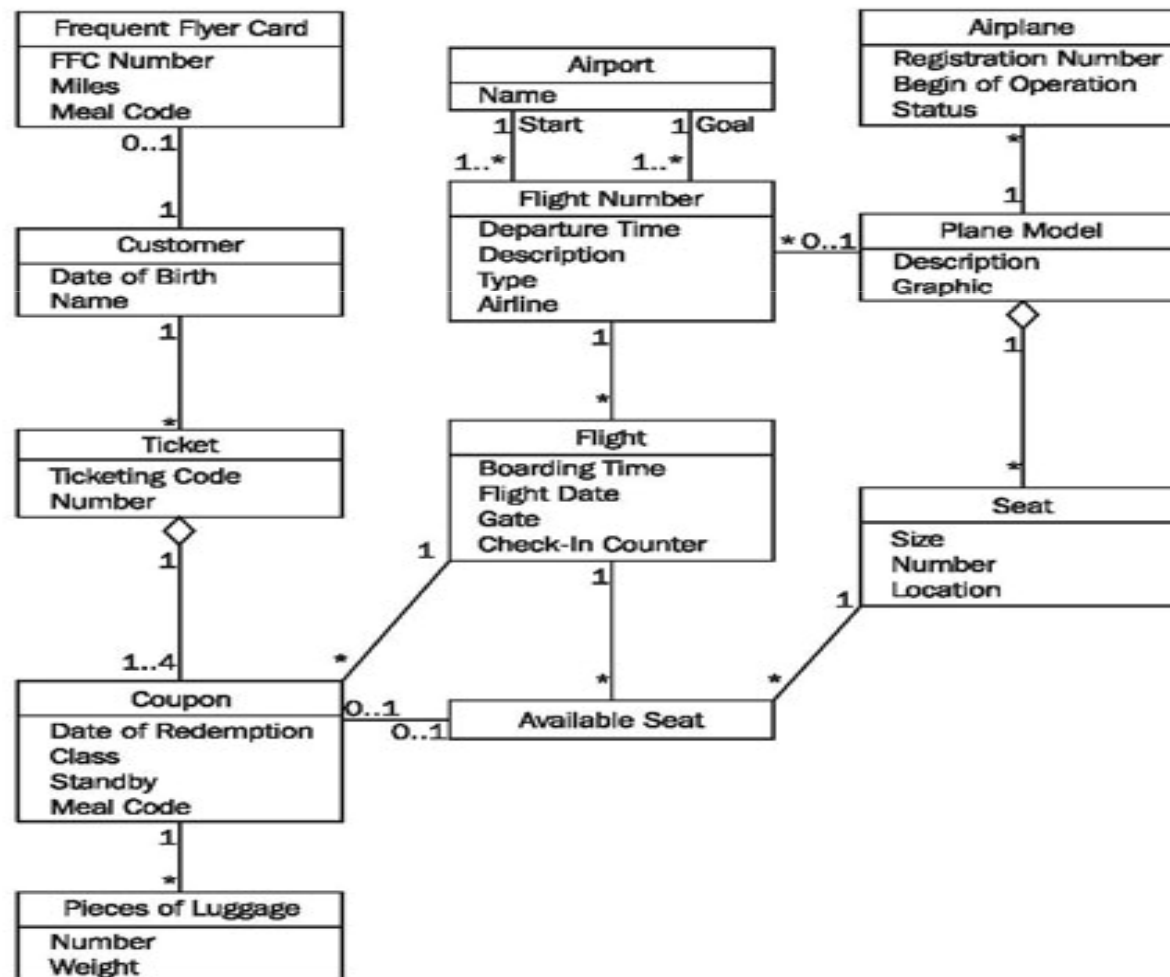
Notation	Meaning	Description			
<table><tr><td>Tên thực thể</td></tr><tr><td>Danh sách thuộc tính</td></tr><tr><td>Danh sách hành động</td></tr></table>	Tên thực thể	Danh sách thuộc tính	Danh sách hành động	Entity/Object	-Business object. -Data unit.
Tên thực thể					
Danh sách thuộc tính					
Danh sách hành động					
	Relationship	-Relationship between objects.			
	Multiplicity				
	IS-A Relationship				
	HAS-A Relationship				

Data Model



■ Class diagram:

■ Example: Flight Ticket Management System.





■ Software Modeling:

■ Project “Online Bookstore”.

■ Tasks:

➤ Business Model:

- Context diagram for whole system.
- Activity diagram for “Customer buy books” process.
- State-chart diagram for “Order” object.

➤ Requirements Model:

- Use Case diagram for whole system.
- Sequence diagram for use case “Check-out Order”.

➤ Data Model:

- ER diagram for whole system.

