Génie Logiciel Avancé - Advanced Software Engineering

A Brief Revision of UML

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Why UML in a Software Engineering Course ?

❑ It is clearly not perfect

   • very syntactic, very diagrammatic flavour

   • diagrams do not necessarily scale up

   • not everyone in industry uses it (large companies typically have there own development process, reflecting their own «company culture »)

❑ BUT: Many in industry use it,

   • or use similar things (SysML), and most practitioners in industry would understand UML

   • we use it in requirements analysis, design, and for test generation techniques.

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- Syntax and semantics of state machines
  Specify system components for test and verification

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  - ➢ as UML diagrams

The UML offers the advantage ...

❑   ... of being a basis for

   Integrated Development Environments (IDEs)

   (like ArgoUML, Poseidon,
    Eclipse + Papyrus, IBM Rational Rhapsody, MS Visio,
    GenMyModels, MagicDraw, LucidChart,...)

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- ❏   ... is the basis for a whole software-engineering
      paradigm called Model-Driven Engineering (MDE).

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➢ structure composition

➢ communication

➢ packaging

➢ temporal constraints (timing)

The UML 2.4 Diagrams (corresponding to models)

Static View

Architectural View

Dynamic View

Diagram

Structure Diagram

Class Diagram

Component Diagram

Object Diagram

Composite Structure Diagram

Deployment Diagram

Package Diagram

Behaviour Diagram

Activity Diagram

Use Case Diagram

State Machine Diagram

Interaction Diagram

Sequence Diagram

Interaction Overview Diagram

Communication Diagram

Timing Diagram

Principal UML diagram types (1)

❑ **Structure and Visualization**

➢ **Use Case Models and Use Case Diagrams**

➢ **Sequence Models and Sequence Diagrams**

➢ **State Machines and State Charts**

➢ **Class Models and Class Diagrams**

➢ **Object Graphs and Object Diagrams**

In Eclipse, all these Model Elements are described in a UML-document itself, the „Meta-Object-Framework" (MOF)

Bibligraphy

- **UML @ Classroom: An Introduction to Object-Oriented Modeling, Springer, 2015**

- **UML 2.0, Martin Fowler, Campus Press, 2004**

- **UML 2 et les Design Patterns, G. Larman, Campus Press, 2005**

- **http://www.omg.org/gettingstarted/what_is_uml.htm**
  http://www.eecs.ucf.edu/~leavens/JML/
  http://www.junit.org/

Using the UML

- A General Remark:

- The UML can be used in the

    Analysis Phase ("D1 - Documents")

  as well as the

    Design Phase ("D2 - Documents")

- This changes the character of the Models and the resp. Diagrams substantially.

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And now, lets get our hands dirty ...

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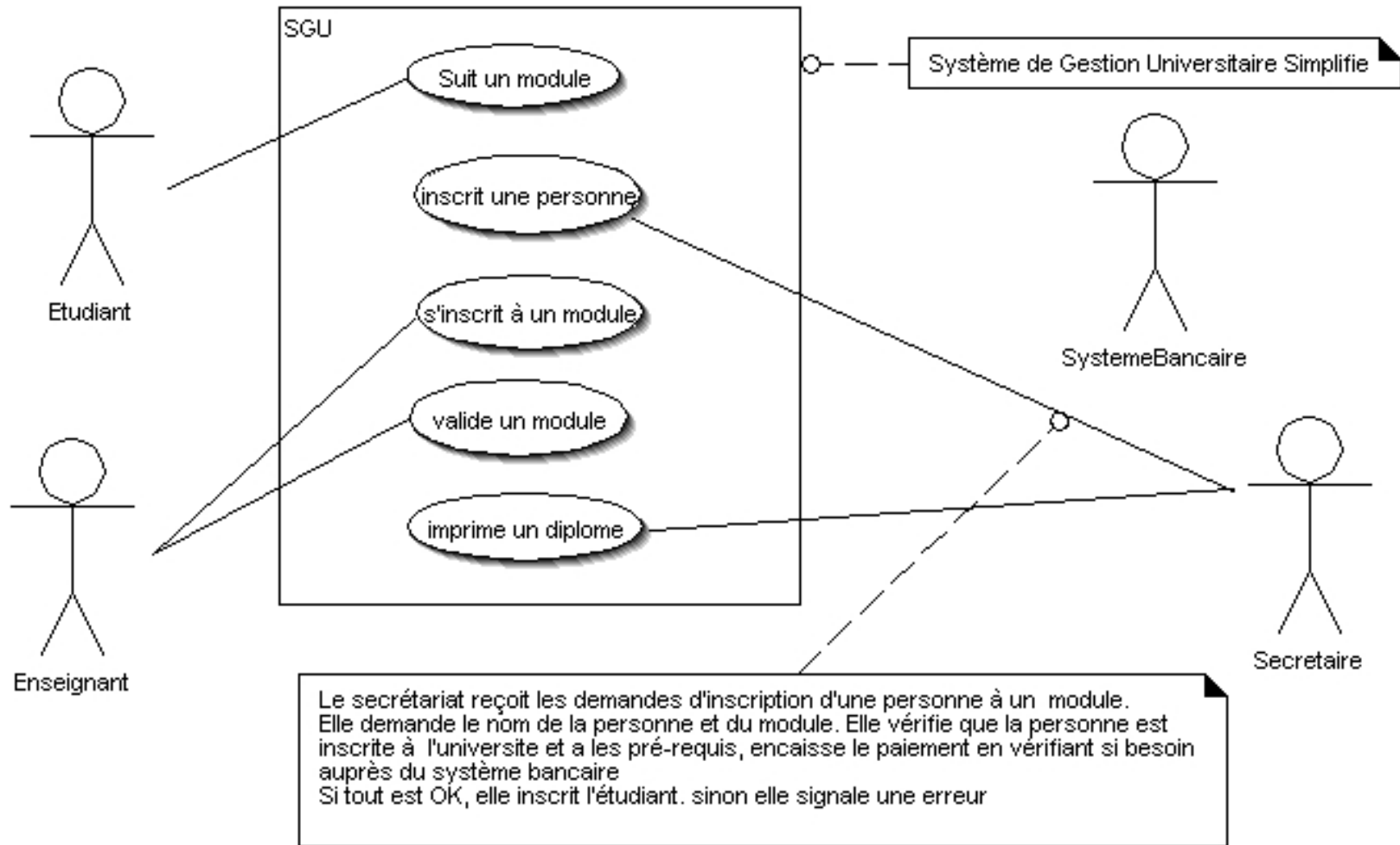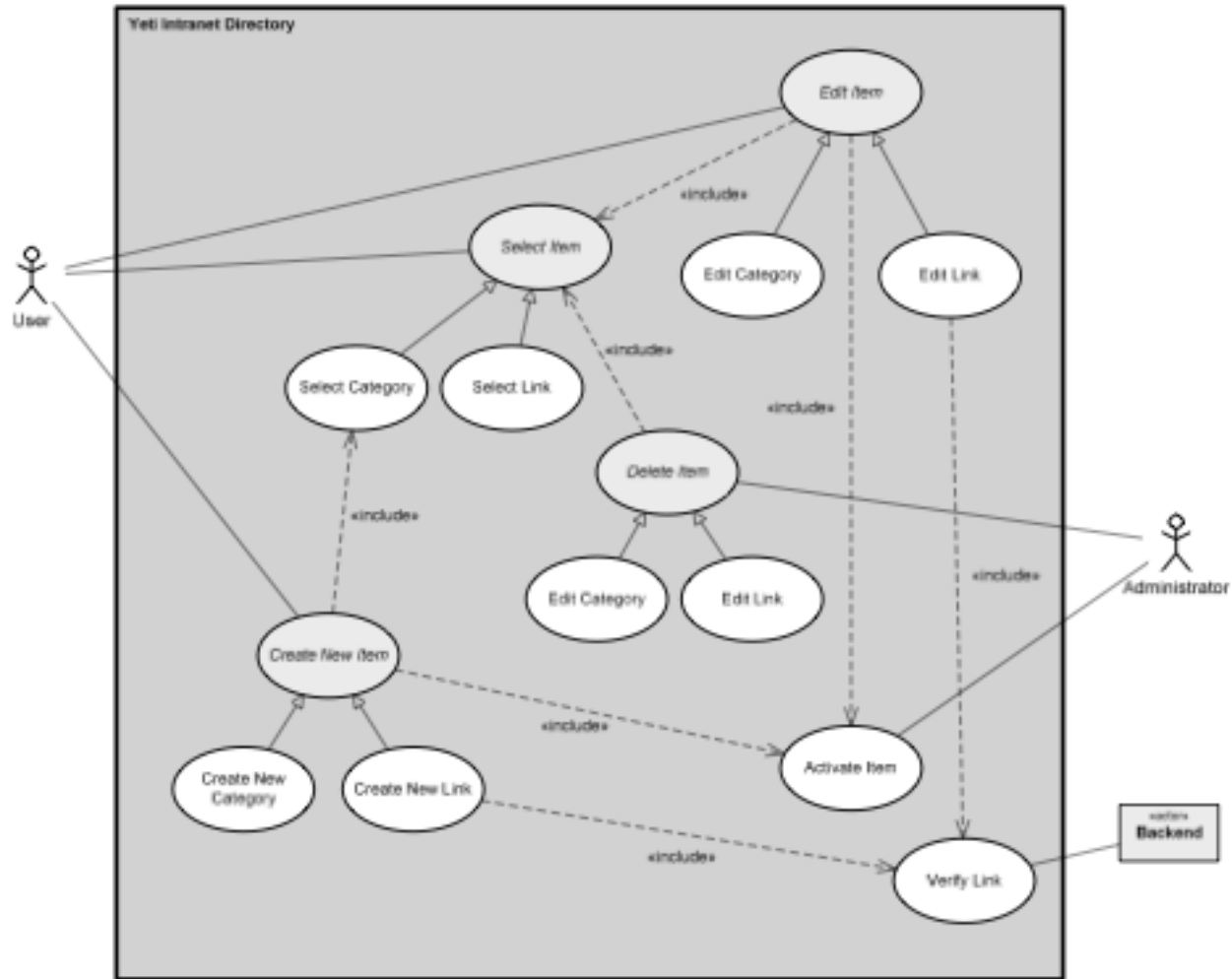
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Emphasis on (top-level) functionality !

Example: Use Case Diagram (Analysis)

SGU

Suit un module

inscrit une personne

s'inscrit à un module

valide un module

imprime un diplome

Etudiant

Enseignant

Système de Gestion Universitaire Simplifie

SystemeBancaire

Secretaire

Le secrétariat reçoit les demandes d'inscription d'une personne à un module. Elle demande le nom de la personne et du module. Elle vérifie que la personne est inscrite à l'universite et a les pré-requis, encaisse le paiement en vérifiant si besoin auprès du système bancaire
Si tout est OK, elle inscrit l'étudiant. sinon elle signale une erreur

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Example: Use Case Diagram (Design)

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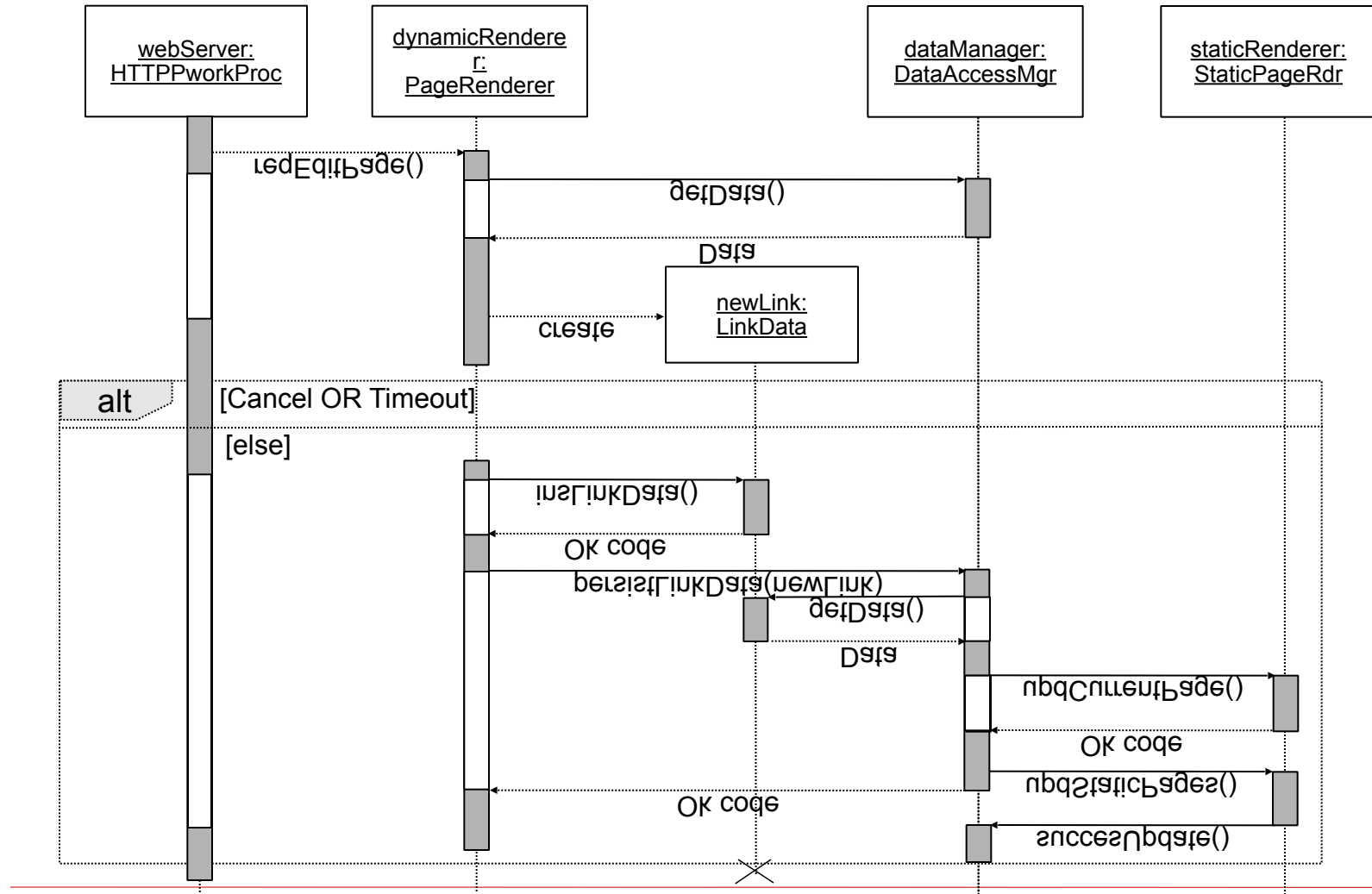
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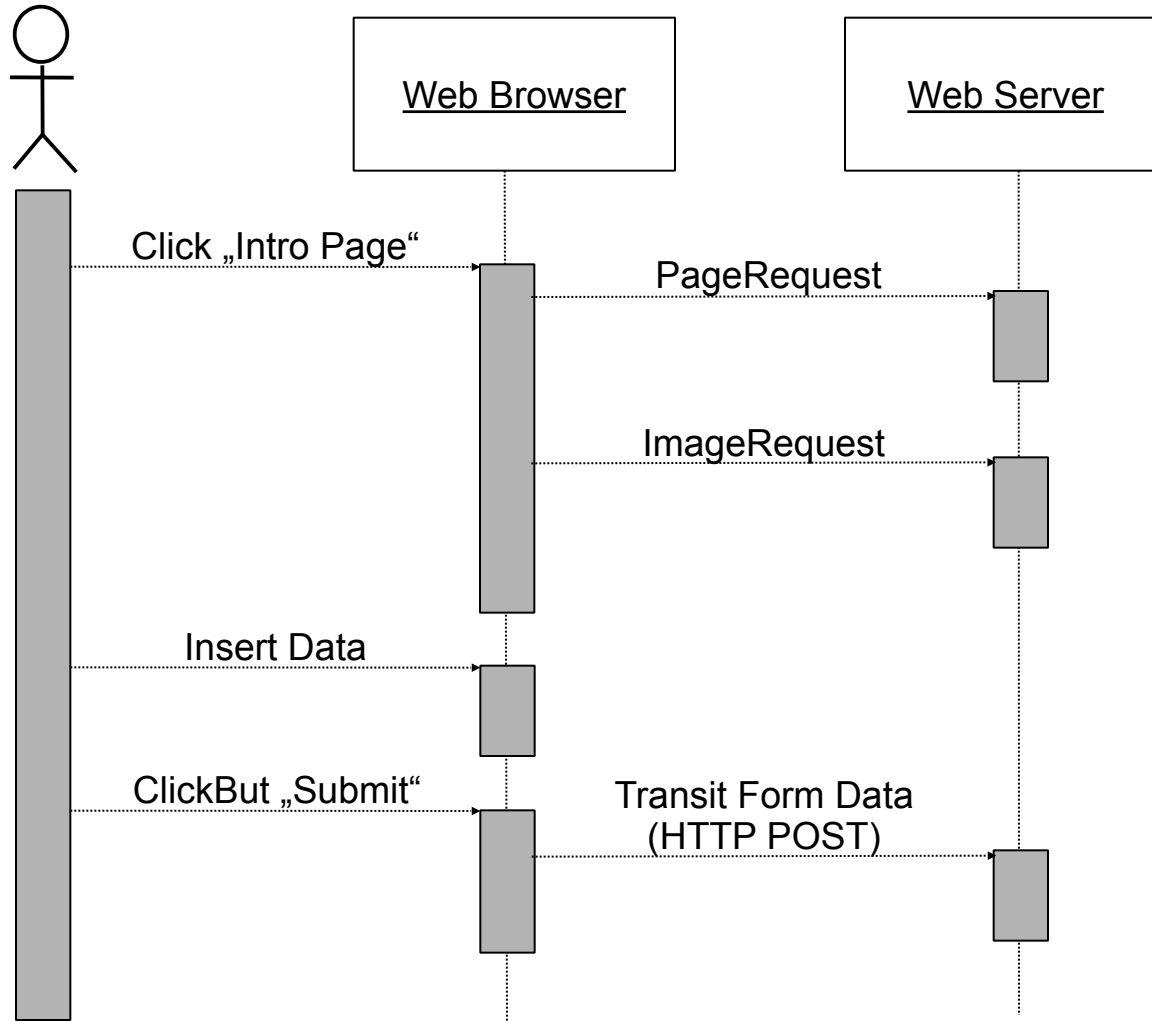
➢ **Collaboration Diagram**: centered around objects and top-level collaborations of them.

Example: Sequence Diagram (design-level)

webServer:
HTTPPworkProc

dynamicRenderer:
PageRenderer

dataManager:
DataAccessMgr

staticRenderer:
StaticPageRdr

reqEditPage()

getData()

Data

create → newLink:
LinkData

alt [Cancel OR Timeout]

[else]

instLinkData()

OK code

persistLinkData(newLink)

getData()

Data

updCurrentPage()

OK code

updStaticPage()

successUpdate()

OK code

Example: Sequence Diagram (analysis-level)

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➢ interesting if an object reacts on
events (asynchronous as well as synchronous)
by the external environment

➢ or if the internal state of an object leads to
a somewhat interesting life-cycle of an object
(transitions between well-characterized states of the
object)

Example: **State Chart (design level)**

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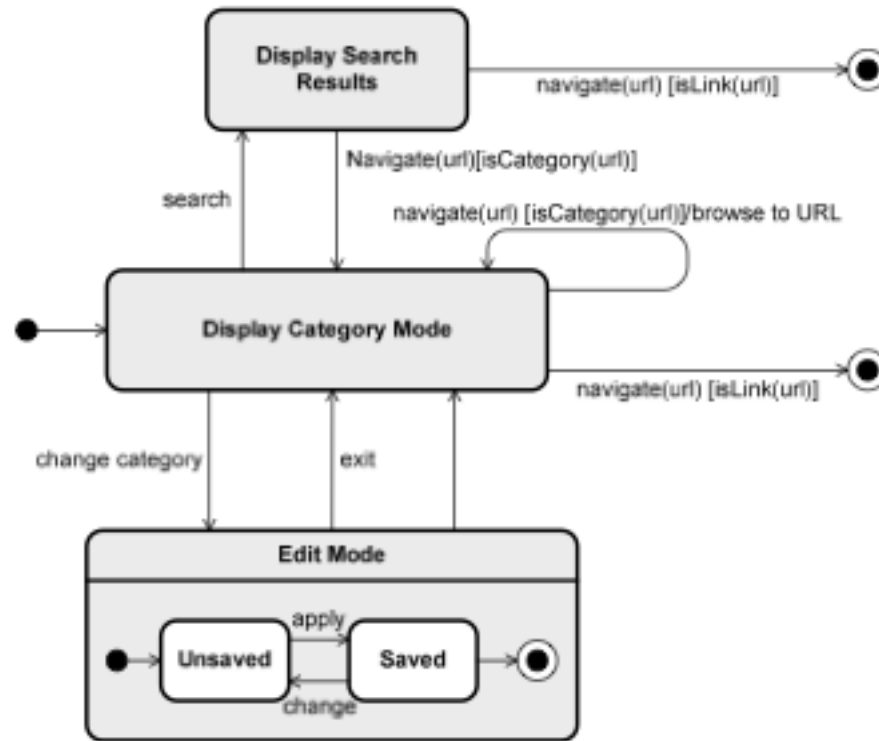
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➢ **Semantics of Diagrams for requirements analysis:**   many.

➢ **Semantics of Diagrams for system design:**   **many**.

Can be interpreted in by automata, process calculi, Labelled Transition Systems (LTL) in several, reasonable ways (depends on context and application).

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 ➢ the attributes and the methods

 ➢ the types, required/defined interfaces …

can be used for top-level views as specific interfaces
for local code …

Example: A Class Diagram

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