Requirements Analysis and Negotiation

Software Engineering and Databases Group

Department of Computer Languages and Systems

University of Seville

November 2015

Requirements Analysis and Negotiation

1. Requirements analysis goals
2. Situation in the RE process
3. Analysis tasks
4. Software system models
5. Problem management
6. Unified Modeling Language

- **Learning objectives**
  - Know the objectives, products and **requirements analysis** processes.
  - Know the basics of **modeling** software systems.
  - Know the basics of **conflict** management and requirements **negotiation**.
  - Know the common elements of **UML**.

Requirements Analysis and Negotiation

- ## Requirements analysis goals

  - Detecting **problems** in the requirements at the **beginning** of the project, when they are much more inexpensive to solve.

  - The most usual way of analysis is the development of a **model** of a software system satisfying product requirements, i.e. of the system to be developed.

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- ## Situation in the RE process

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Requirements Elicitation

Elicited Information

Requirements documentation

Requirements [Draft]

Conflicts [Solved]

Requirements Negotiation

Requirements [Versioned]

Requirements Management

Conflicts [Pending]

Requirements [Validated]

Defects

Requirements Analysis

Requirements [Analyzed]

Requirements Verification

Requirements [Verified]

Requirements Validation

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- Requirements analysis tasks
  - Develop a **model** from the documented goals and requirements, taking also into account business models, glossaries of terms, etc..
  - Register **problems** identified during model development for later resolution.
  - It is increasingly common during analysis to propose an initial **system architecture** considering **nonfunctional requirements**.

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- Software system models
  - The system offers **services** to the actors.
  - The system **state** are the objects and their links.

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- **Software system models**
  - **Updating services** make the system state change.

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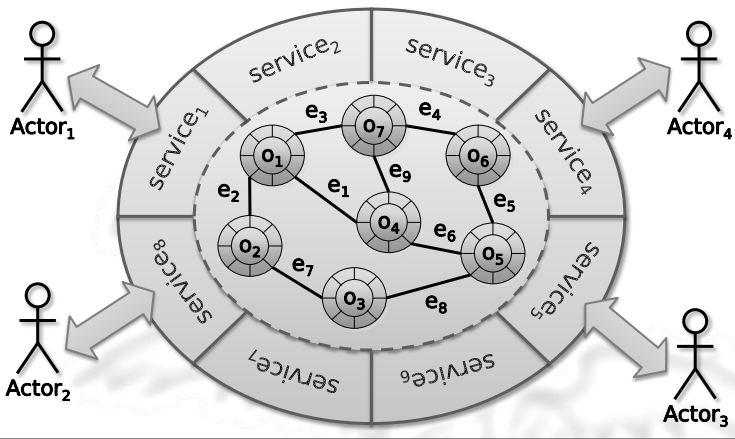6. Unified Modeling Language

- **Software system models**
  - **Query services** do not change the system state.

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- ### Software system models
  - #### Regarding **information system functions**...
    - **Memory function**: system environment state ≈ system state.
    - System state is kept synchronized with the environment by the updating services.

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Requirements Analysis and Negotiation

- ### Software system models
  - #### Regarding **information system functions**...
    - **Informative function**: provided by the query services.
    - To be useful, system state must be synchronized with the environment state.*

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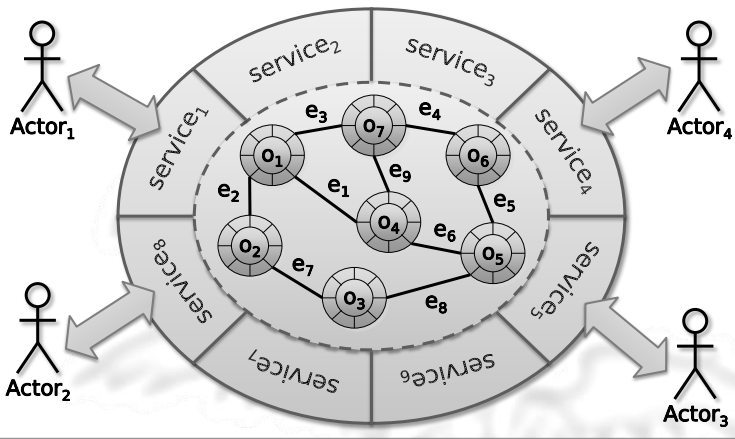6. Unified Modeling Language

* It does not have to be synchronized immediately, there may be a lag and still be useful for actors.

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- **Software system models**
  - Regarding **information system functions**...
    - **Active function**: provided through interaction with users and with other systems (actors in general).
    - Interaction with other systems is performed by invoking their services.

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- **A software system model includes...**
  - A **static model** (conceptual model)
    - Describes the structure and constraints of the information representing the system state.
  - A **behavior model**
    - Describes how the system interacts with actors and how its state evolves as a result of the interactions.

$$Model = \begin{cases} Static\ model = \begin{cases} Structure \\ + \\ Constraints \end{cases} \\ + \\ Behavior\ model = \begin{cases} External\ interactions \\ + \\ Internal\ evolution \end{cases} \end{cases}$$

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- **Requirements problems management**
  - **Small problems** such as lack of information or clarification needs can be solved consulting with customers and users in a relatively **informal** way (e.g. a phone call, an email, or a video conference).

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- **Requirements problems management**
  - If **conflicts** requiring nontrivial solutions are detected, **Requirements Negotiation** is needed.

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- ## Requirements negotiation process
  - The common **process** is usually the following:
    1. Record the conflict (usually with a tool).
    2. Identify affected requirements.
    3. Analyze the conflict impact (using requirements traceability).
    4. Identify relevant sources (stakeholders).
    5. Prepare and conduct a negotiation meeting.
    6. Incorporate the conflict solution.

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- ## Unified Modeling Language (UML)
  - Object Management Group (OMG) standard for modeling software systems.

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Timeline:

	Aug 2007	Nov 2007	Feb 2009	May 2010	Mar 2010	Aug 2011
2005 UML 2.0	UML 2.1.1	UML 2.1.2	UML 2.2	UML 2.3	UML 2.4	**UML 2.4.1**

		Sep 1997	June 1998	Mar 2000	Sep 2001	Mar 2003
Jan 1997 UML 1.0	UML 1.1	UML 1.2	UML 1.3	UML 1.4	UML 1.5	

June 1996 UML 0.9

October 1995 Unified Method 0.8   OOSE

Booch'93   OMT-2

Booch'91   *Other methods*   OMT-1

UNIFIED MODELING LANGUAGE

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- **Unified Modeling Language (UML)**
  - Widely used in software industry and supported by many software tools.
  - It defines 14 types of diagrams for modeling software systems (version 2.4.1, August 2011)
  - We will use ...
    - Use case diagrams
    - Class diagrams
    - Object diagrams
    - State diagrams
    - Sequence diagrams

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- **Organization of UML models**
  - In UML, models are organized in **packages**, which may include other packages.
  - Packages should group semantically close items that tend to change together.
  - There are some special packages:
    - «system»: it corresponds to the system being modeled.
    - «subsystem»: it represents a part of the system being modeled.

| Name | <<subsystem>> Name | <<system>> Name |

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- **Common UML elements**
  - **Notes**
    - They are represented as boxes with a folded corner and can be associated with any element.
    - They can contain either **comments** (any combination of text and graphics) or **constraints**.
  - **Comments**
    - They are displayed inside **notes** associated with the element to which the comment refers to.

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- **Common elements of UML**
  - **Constraints**
    - They represent **conditions** to be held by the elements to which it is associated to. They are expressed by text in braces and can appear within elements or inside **notes**.

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- Bibliography
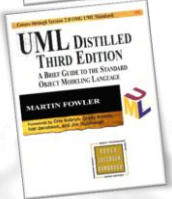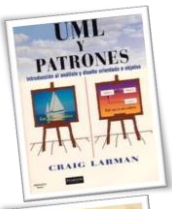 - C. Larman, **UML y Patrones**. Ed. Prentice-Hall, 1999.
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    - Chapters 10 to 12
  - M. Fowler, **UML Distilled (3rd edition)**. Ed Addison-Wesley, 2004.
    - Chapter 3

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- Comments, suggestions, …

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