

41951- ANÁLISE DE SISTEMAS

Visual Modelling with UML

Ilídio Oliveira | v2023/02/14

Learning objectives for this lecture

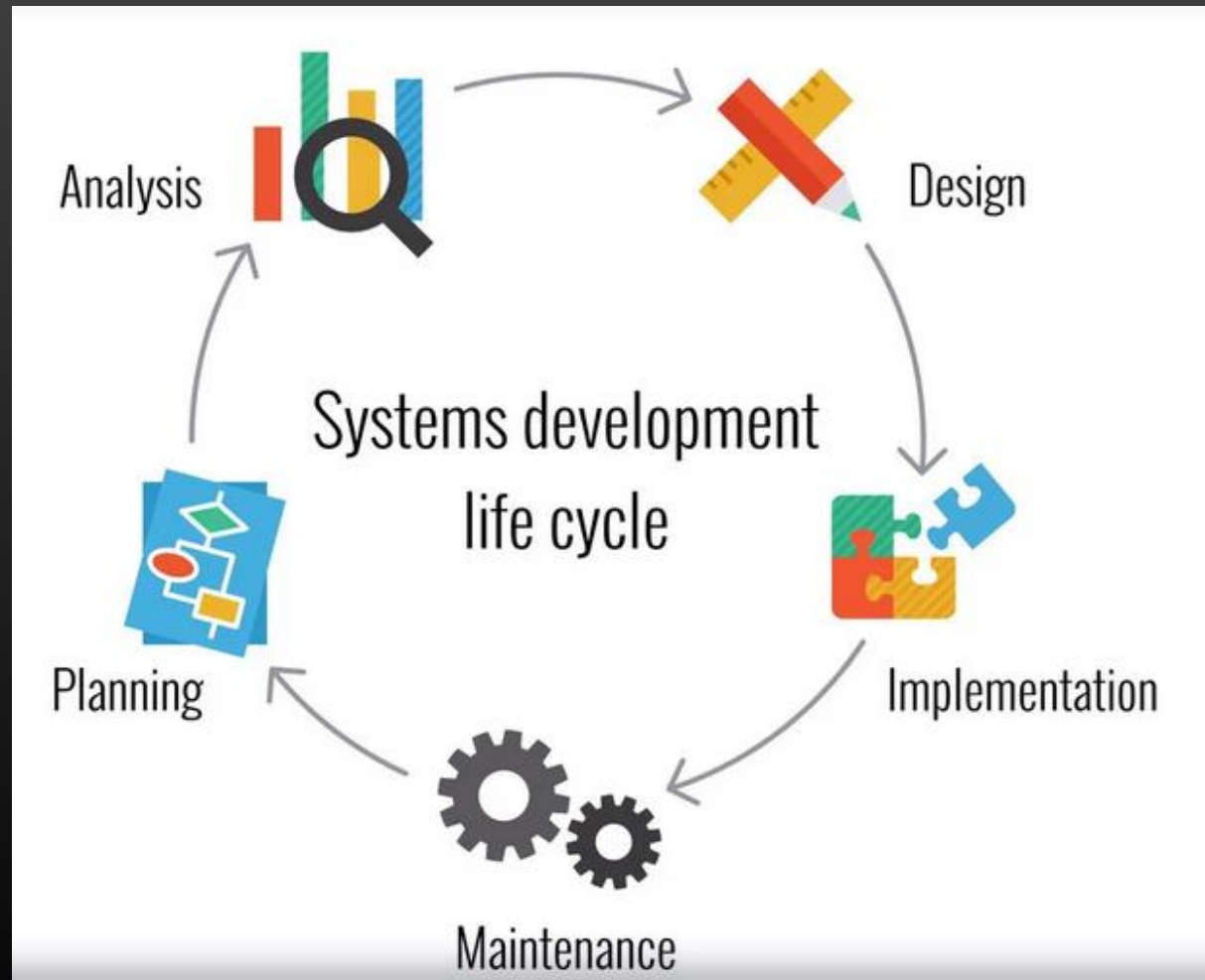
Justify the use of models in systems engineering

Enumerate advantages of visual models

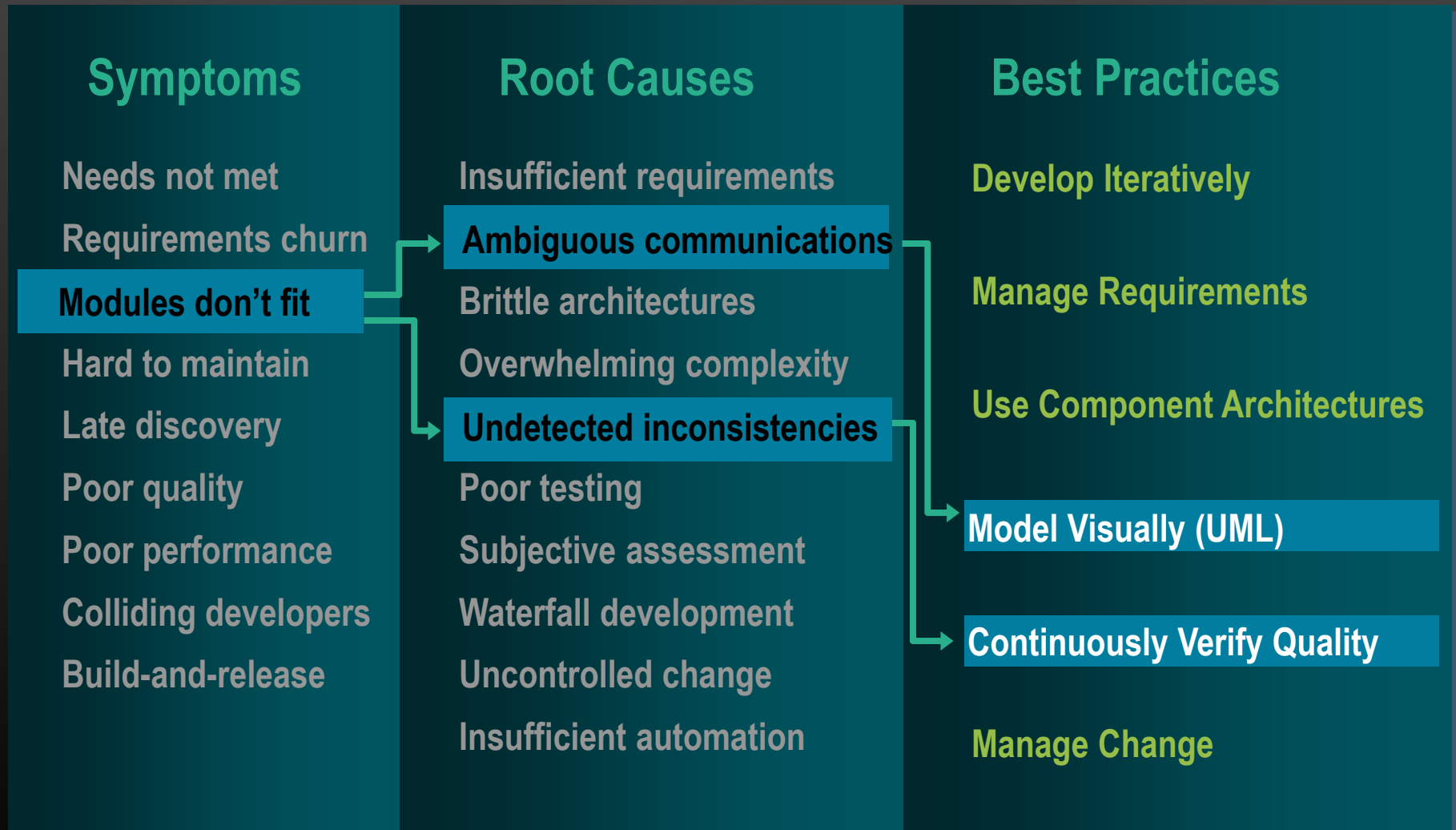
Explain the organization of the UML

Identify the main diagrams in UML and their modeling viewpoint

Systems development lifecycle (SDLC)



Problems and solutions in the SDLC (a Rational Unified Process perspective)



Modeling

UML as a visual specification language



Usamos modelos visuais para captar partes do mundo/realidade

D Trumpet Version

Allegro Assai
from
Brandenburg Concerto #2
J. S. Bach
arranged by Mark Adler

Allegro assai *tr*
mf

Trumpet

Allegro assai
mf

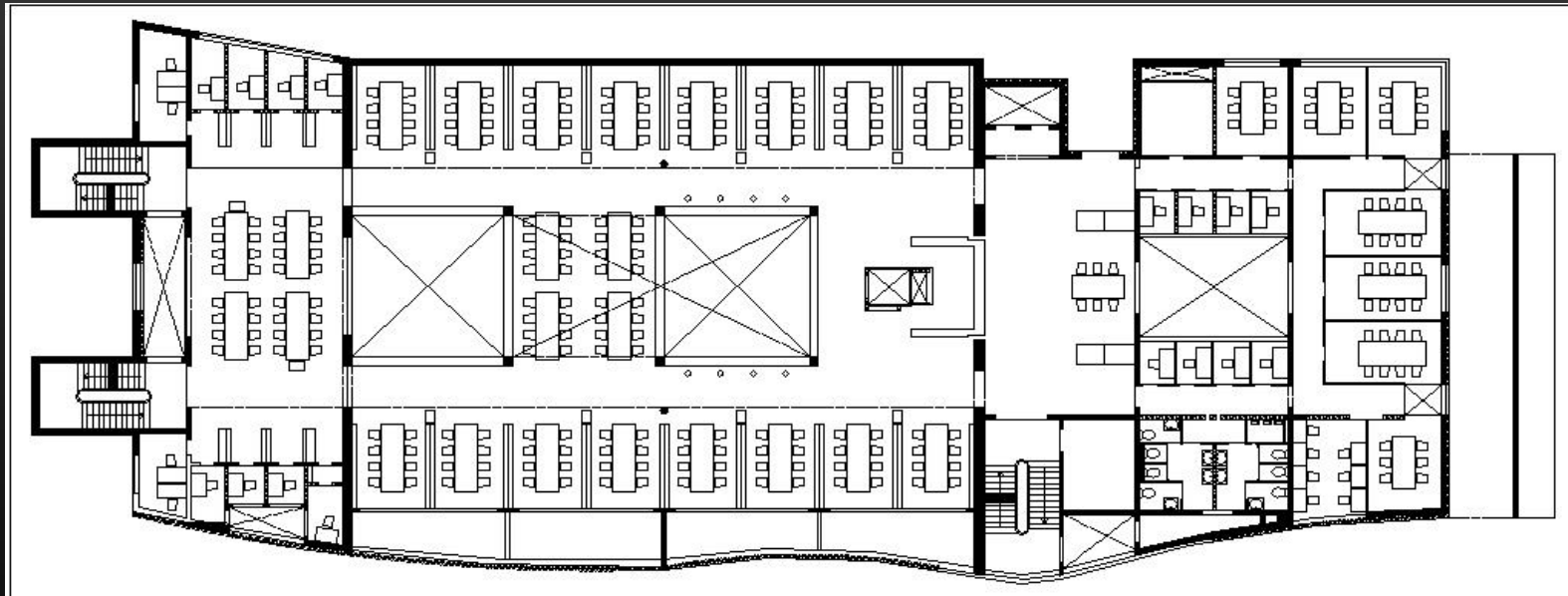
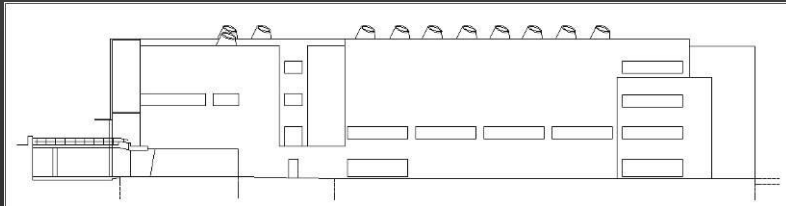
Organ



- Uma linguagem comum (escrever, ler)
- Especificações visuais são mais inteligíveis
- Compor: aplicar talento e disciplinas técnicas
- Orquestra: a prova que os modelos funcionam!



Um modelo é uma simplificação da realidade



Os modelos ajudam a gerir a complexidade

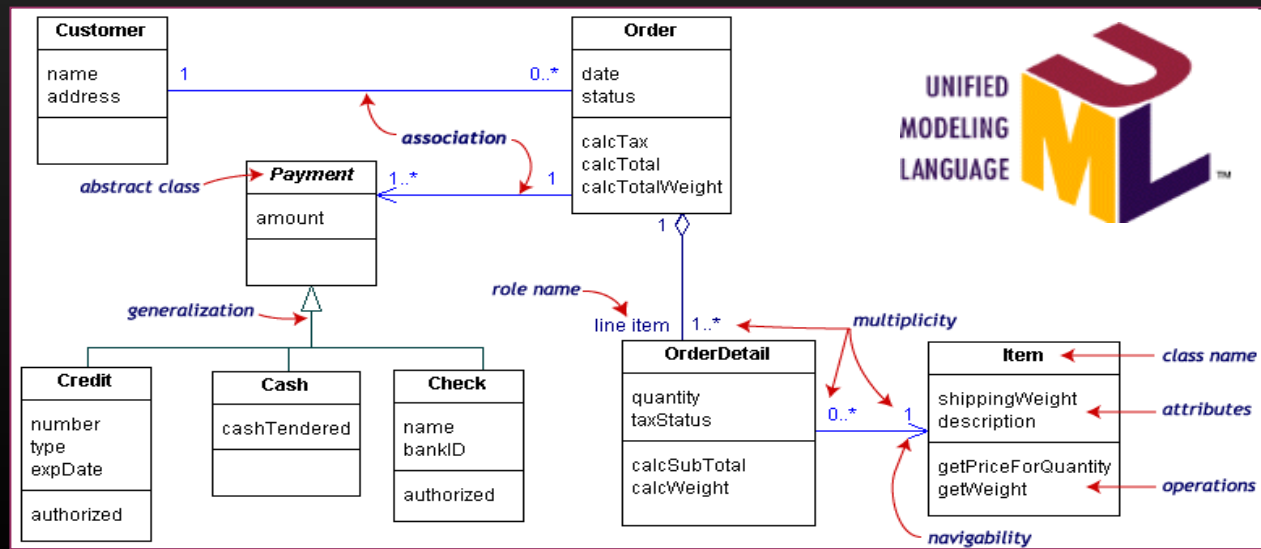
4 razões para usar modelos (G. Booch):

Ajudar a **visualizar** um sistema (*high-level*)

Especificar/documentar a **estrutura e o comportamento** do sistema (antes de implementar)

Serve como **referência** para orientar construção (“planta”)

Documentar as decisões (de desenho) que foram feitas



Modelação visual no desenvolvimento

UML 2: Unified Modeling Language

Linguagem de modelação normalizada

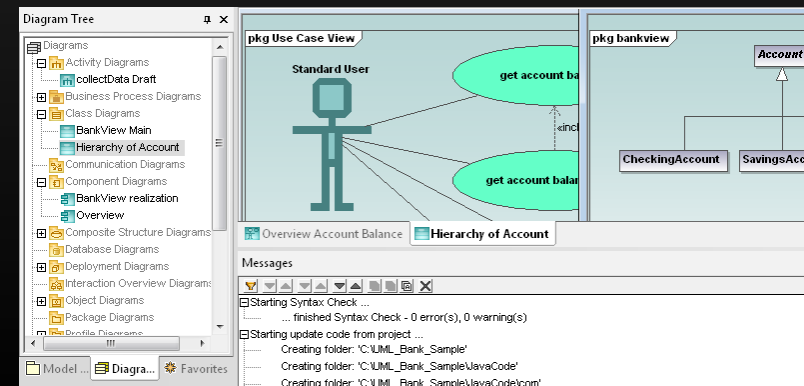
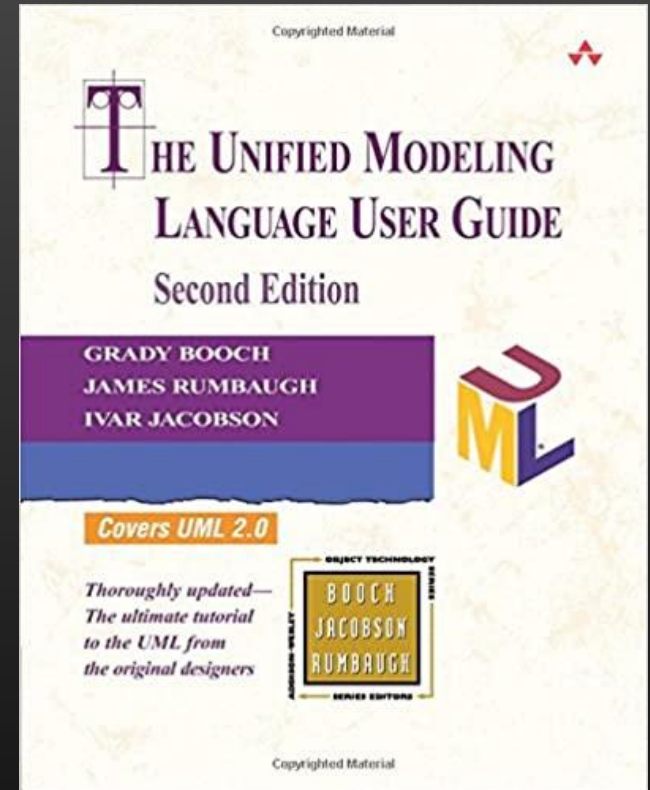
Benefícios

Promover a comunicação mais clara e sucinta

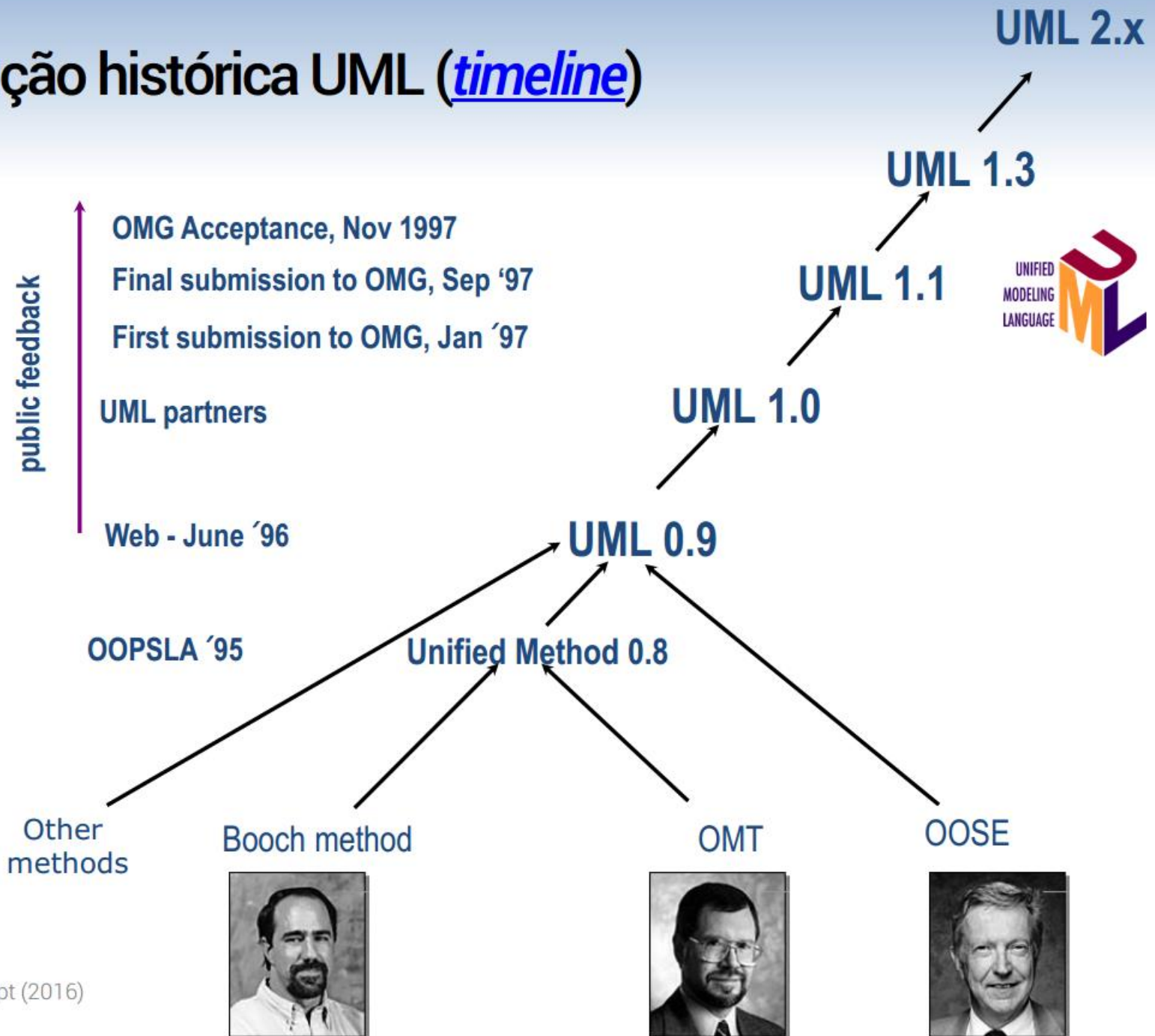
Manter o desenho (planeamento) e a implementação (construção) coerentes

Mostrar ou esconder diferentes níveis de detalhe, conforme apropriado

Pode suportar, em parte, processos de construção automática (gerar a solução a partir do modelo)



Evolução histórica UML (timeline)



"Three Amigos"

I. Jacobson: thinking in use-cases...



G. Booch: thinking in OO development process...

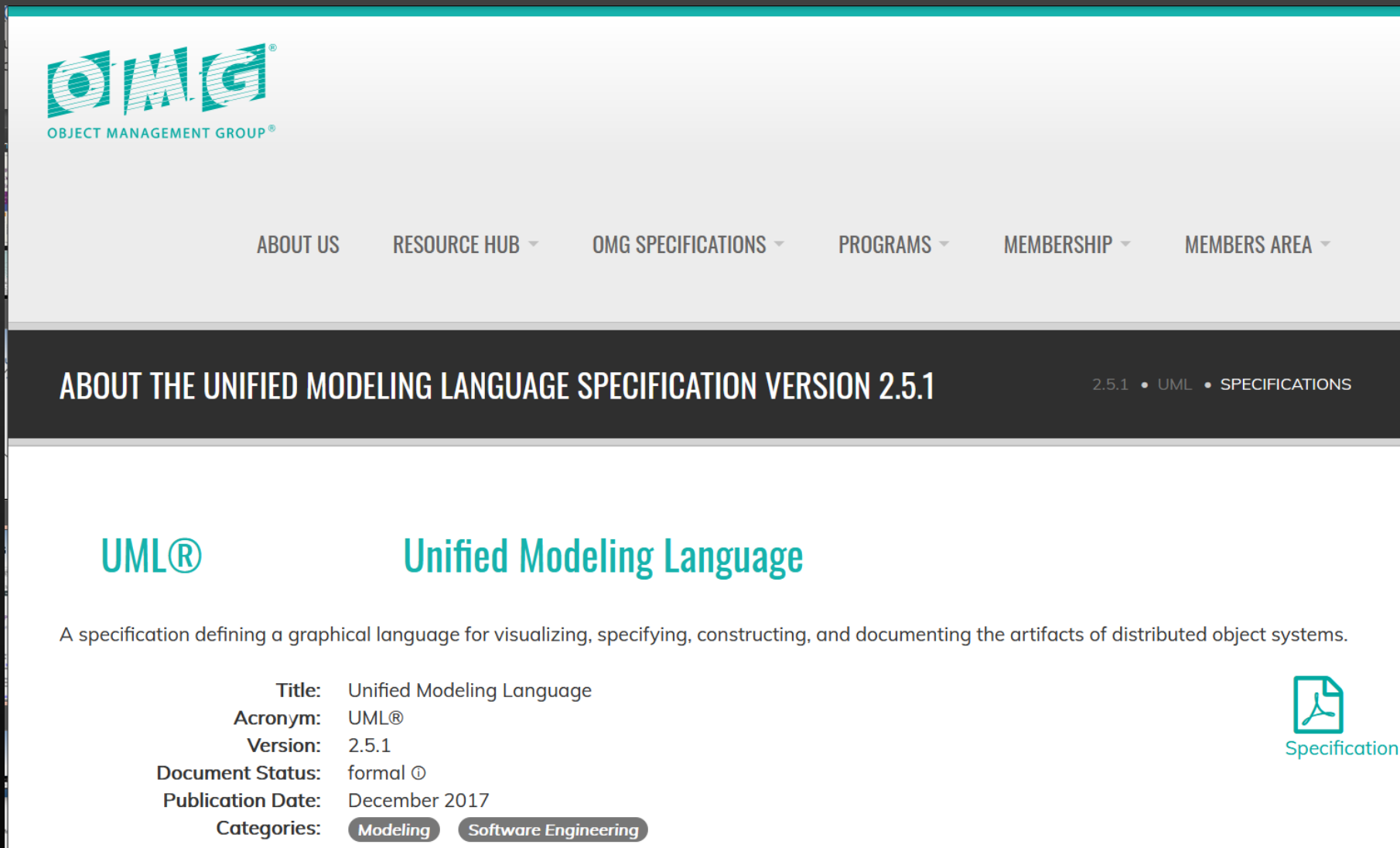


J. Rumbaugh: thinking in classes modeling...



The UML effort started officially in October 1994, with the version 0.8 draft being released in October 1995. The Three Amigos, as they are sometimes referred to (Booch, Rumbaugh, and Jacobson) had successfully unified semantics and notation, ultimately meaning that users could focus on their own work and worry less about the specifics of a given method.

UML é uma especificação do OMG



The screenshot shows the top portion of the Object Management Group (OMG) website. At the top left is the OMG logo with the text 'OBJECT MANAGEMENT GROUP®'. A navigation bar contains links: 'ABOUT US', 'RESOURCE HUB ▾', 'OMG SPECIFICATIONS ▾', 'PROGRAMS ▾', 'MEMBERSHIP ▾', and 'MEMBERS AREA ▾'. Below this is a dark banner with the text 'ABOUT THE UNIFIED MODELING LANGUAGE SPECIFICATION VERSION 2.5.1' on the left and '2.5.1 • UML • SPECIFICATIONS' on the right. The main content area features the 'UML®' logo and the title 'Unified Modeling Language'. A paragraph describes UML as 'A specification defining a graphical language for visualizing, specifying, constructing, and documenting the artifacts of distributed object systems.' Below this is a list of metadata: Title (Unified Modeling Language), Acronym (UML®), Version (2.5.1), Document Status (formal ⓘ), and Publication Date (December 2017). Categories are listed as 'Modeling' and 'Software Engineering' in rounded buttons. On the right, there is a PDF icon and the word 'Specification'.

OMG
OBJECT MANAGEMENT GROUP®


ABOUT US RESOURCE HUB ▾ OMG SPECIFICATIONS ▾ PROGRAMS ▾ MEMBERSHIP ▾ MEMBERS AREA ▾

ABOUT THE UNIFIED MODELING LANGUAGE SPECIFICATION VERSION 2.5.1 2.5.1 • UML • SPECIFICATIONS

UML® **Unified Modeling Language**

A specification defining a graphical language for visualizing, specifying, constructing, and documenting the artifacts of distributed object systems.

Title: Unified Modeling Language
Acronym: UML®
Version: 2.5.1
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Publication Date: December 2017
Categories: **Modeling** **Software Engineering**

 **Specification**

Também reconhecida como um standard internacional ISO



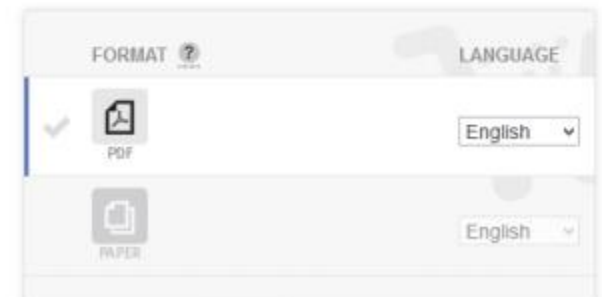
ISO/IEC 19505-1:2012[®]

Information technology -- Object Management Group Unified Modeling Language (OMG UML) -- Part 1: Infrastructure

Abstract

[Preview ISO/IEC 19505-1:2012](#)

ISO/IEC 19505-1:2012 defines the Unified Modeling Language (UML), revision 2. The objective of UML is to provide system architects, software engineers, and software developers with tools for analysis, design, and implementation of software-based systems as well as for modeling business and similar processes.



Aplicações principais da UML

Análise e desenho de sistemas de software

Estrutura e comportamento de sistemas baseados em software

- Elementos do modelo representam entidades do mundo do software

Especialmente adequada para o desenvolvimento por objetos (*object-oriented*)

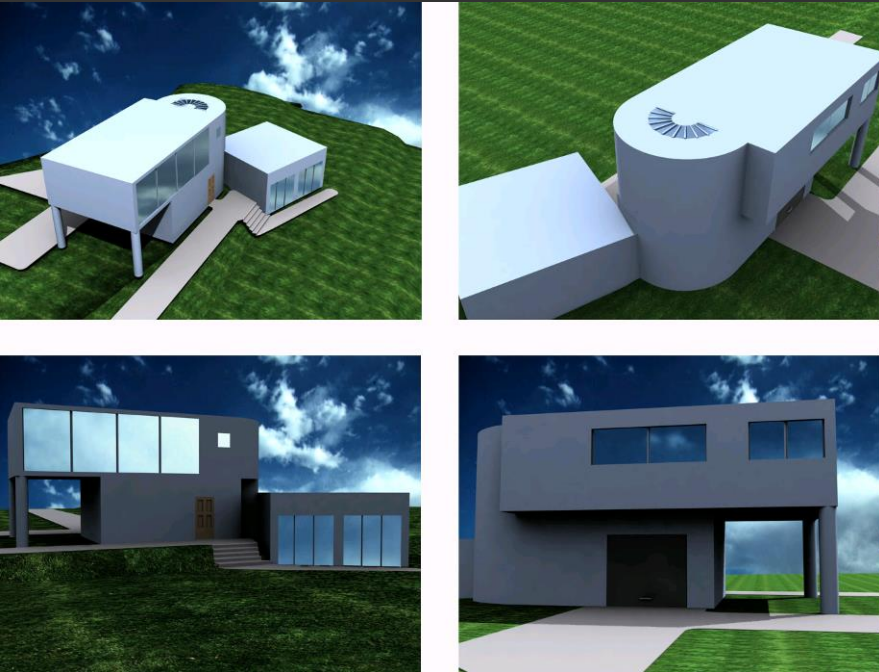
Domínio do problema (processos de trabalho,...)

Especificar ou documentar o domínio de aplicação/negócio

- Elementos do modelo representam entidades do negócio

Não implica ou assume uma implementação em software

Não há uma vista única, mas várias e complementares



Para que serve o sistema?

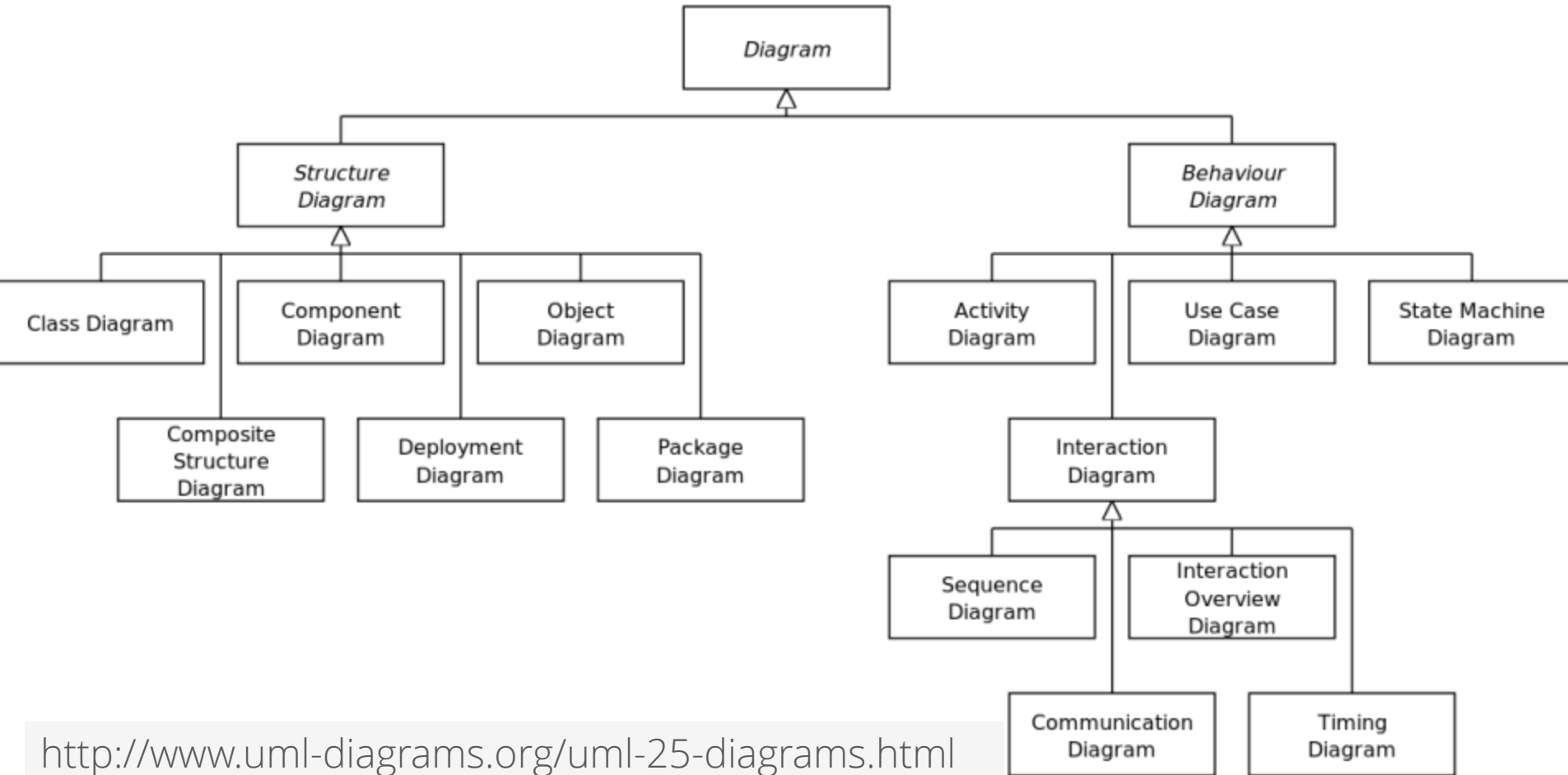
Quais são as estruturas de informação?

Decomposição funcional de atividades complexas

Visualizar a organização do software em partes e as suas interações

Etc.

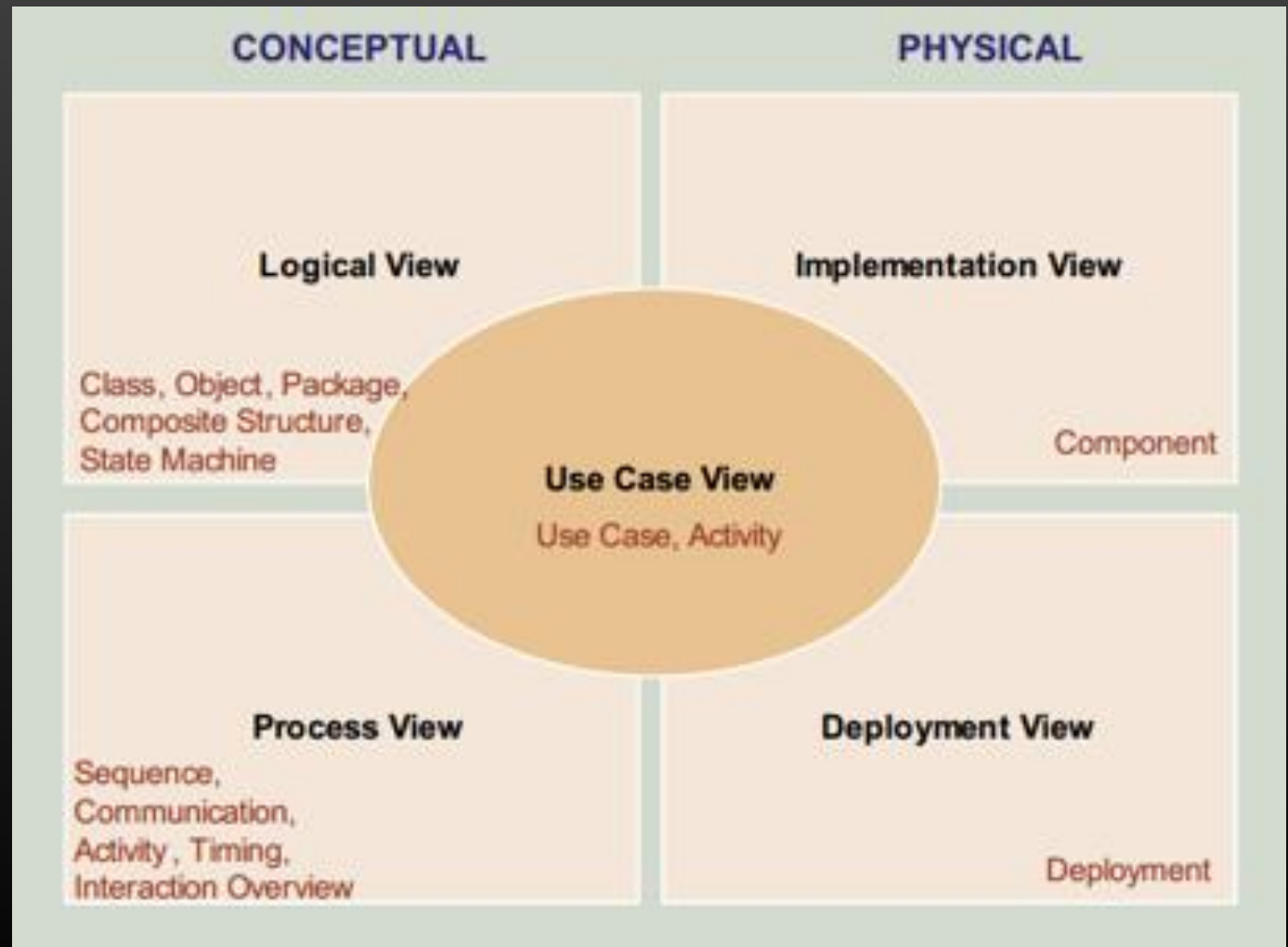
Diagramas da UML 2.x



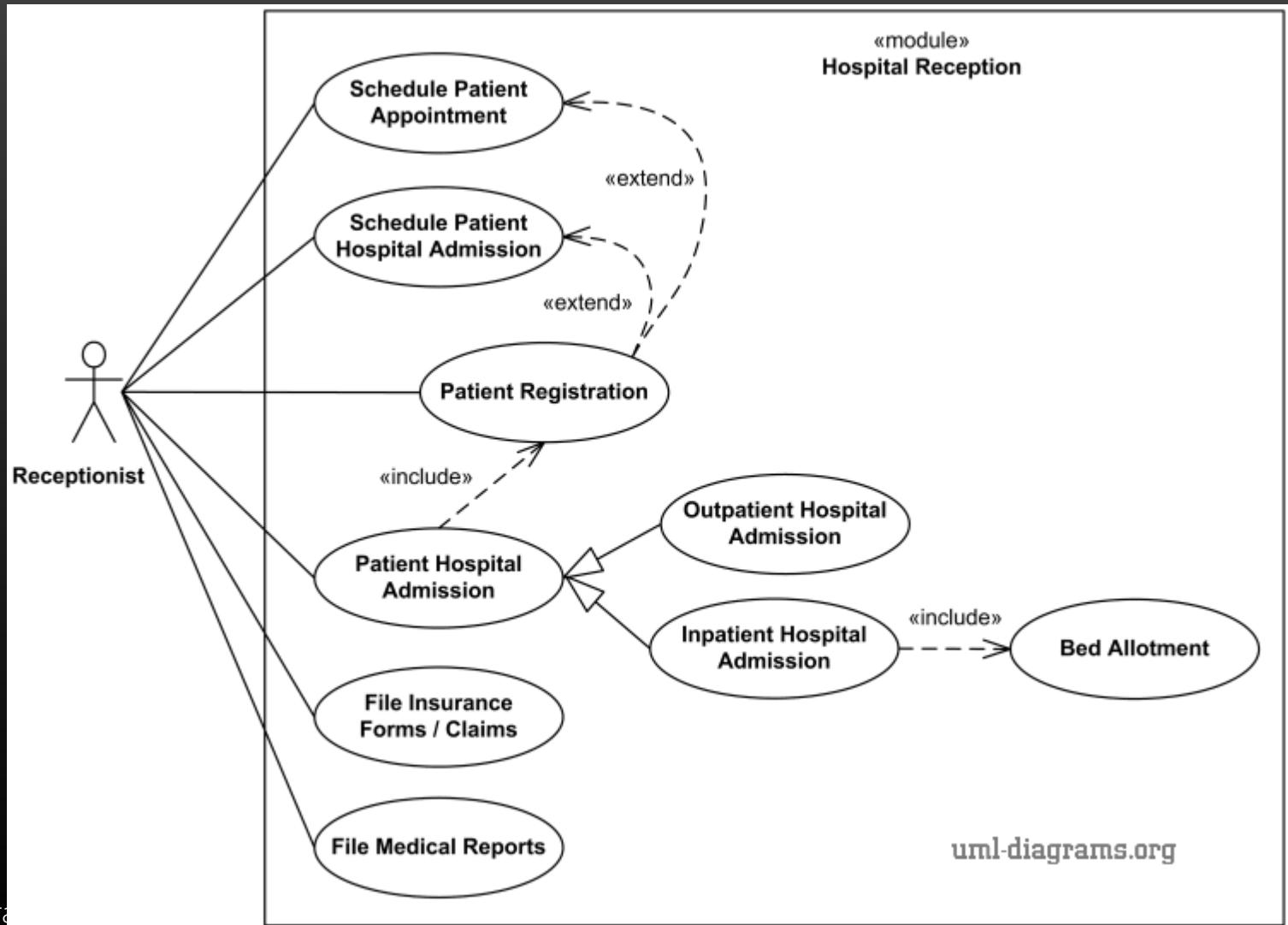
APLICAÇÃO DA UML AO LONGO DO PROCESSO DE DESENVOLVIMENTO

ILÍDIO OLIVEIRA ico@ua.pt
v2017-06-02

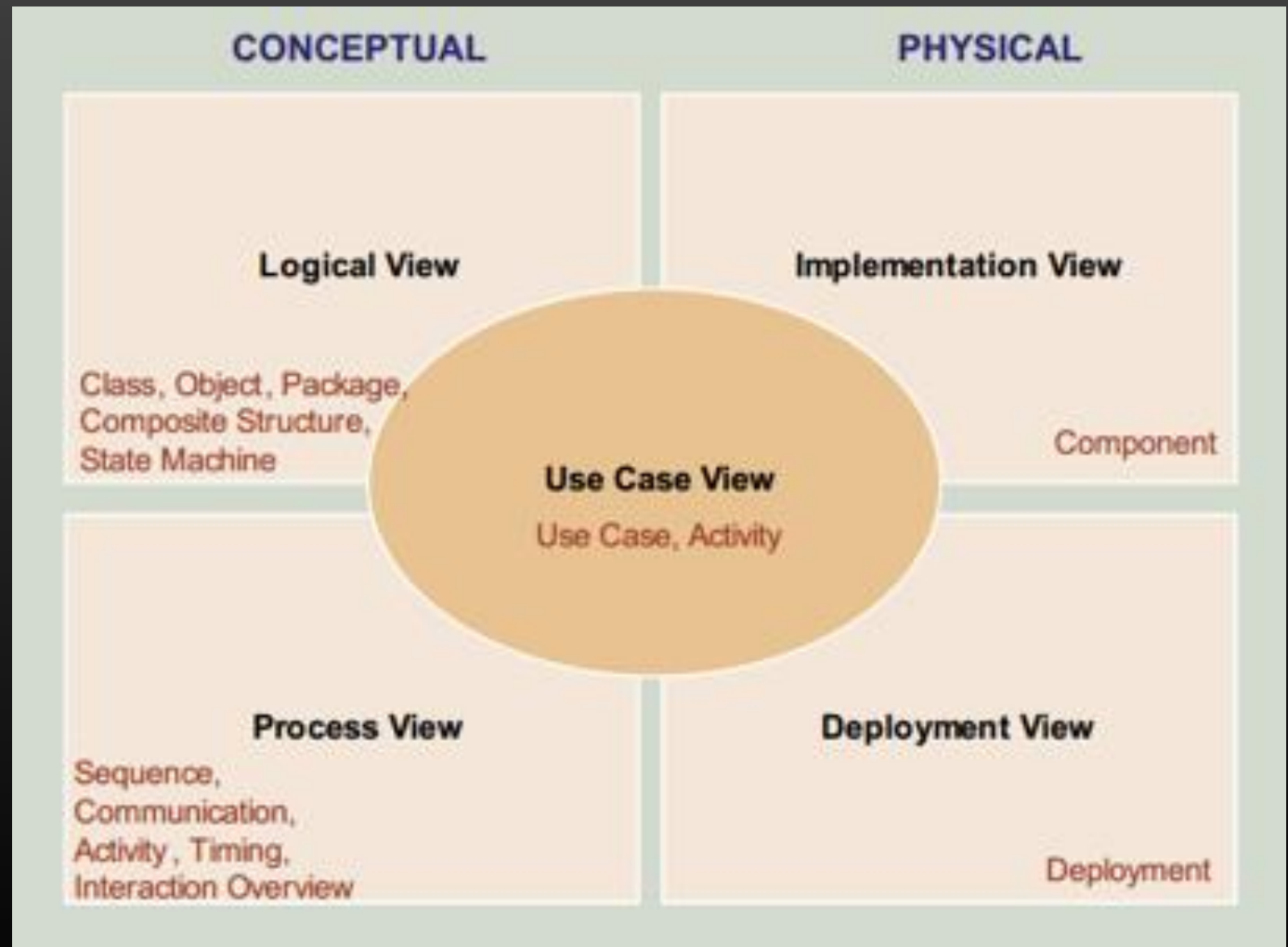
Diversos diagramas para abranger diferentes perspectivas de análise



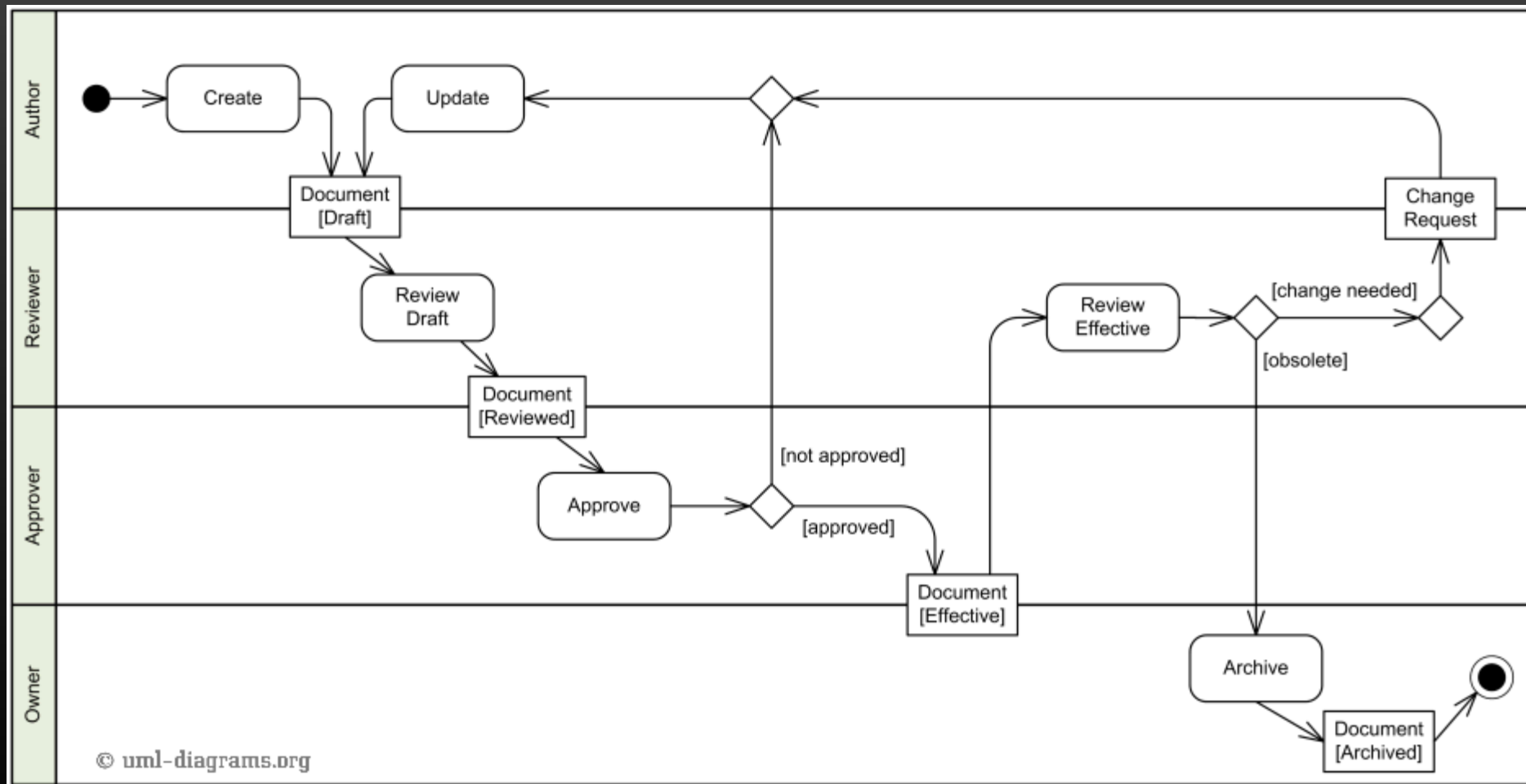
CaU do Sistema: organizar a funcionalidade do sistema em episódios de utilização



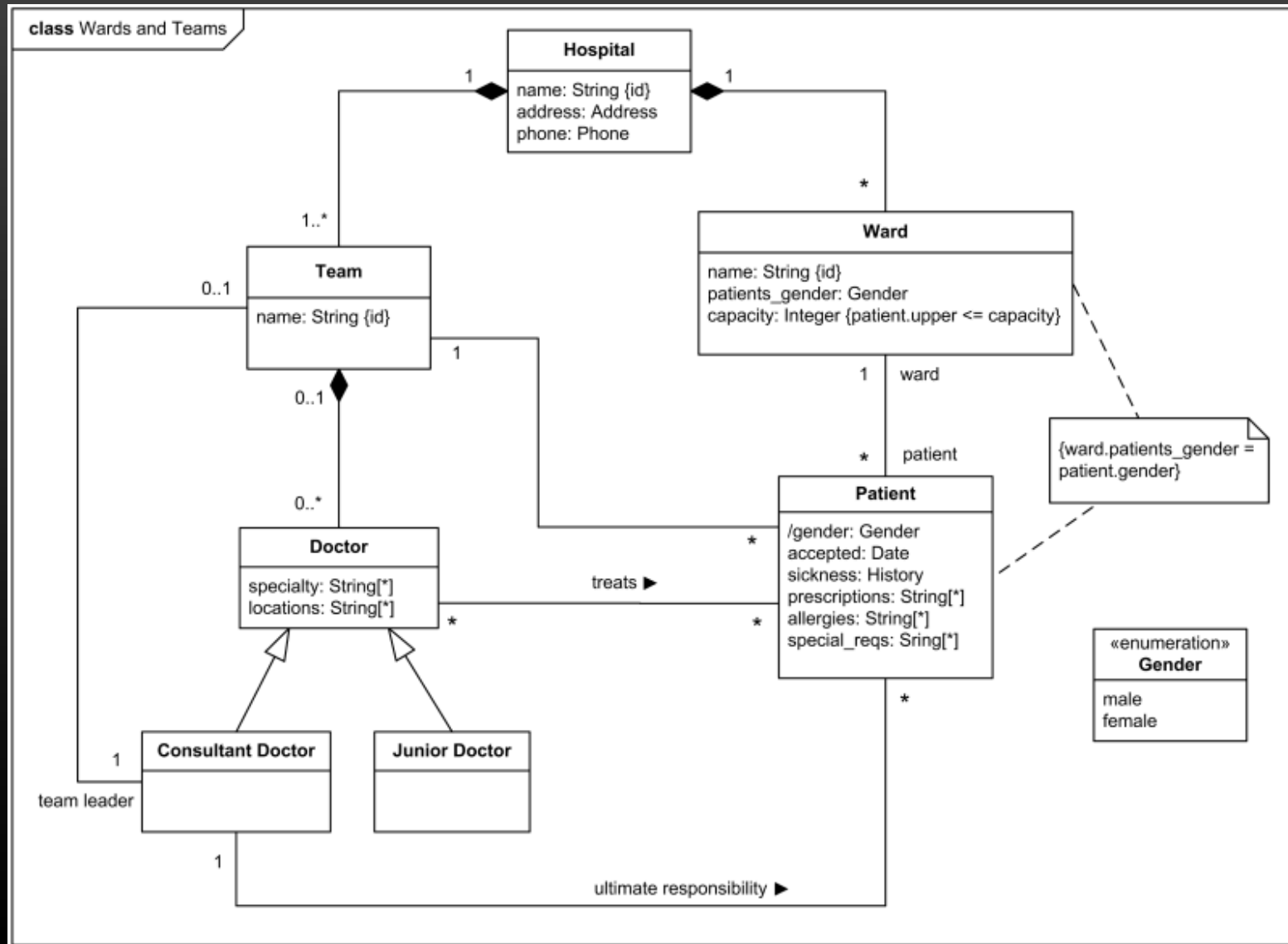
Diversos diagramas para abranger diferentes perspectivas de análise



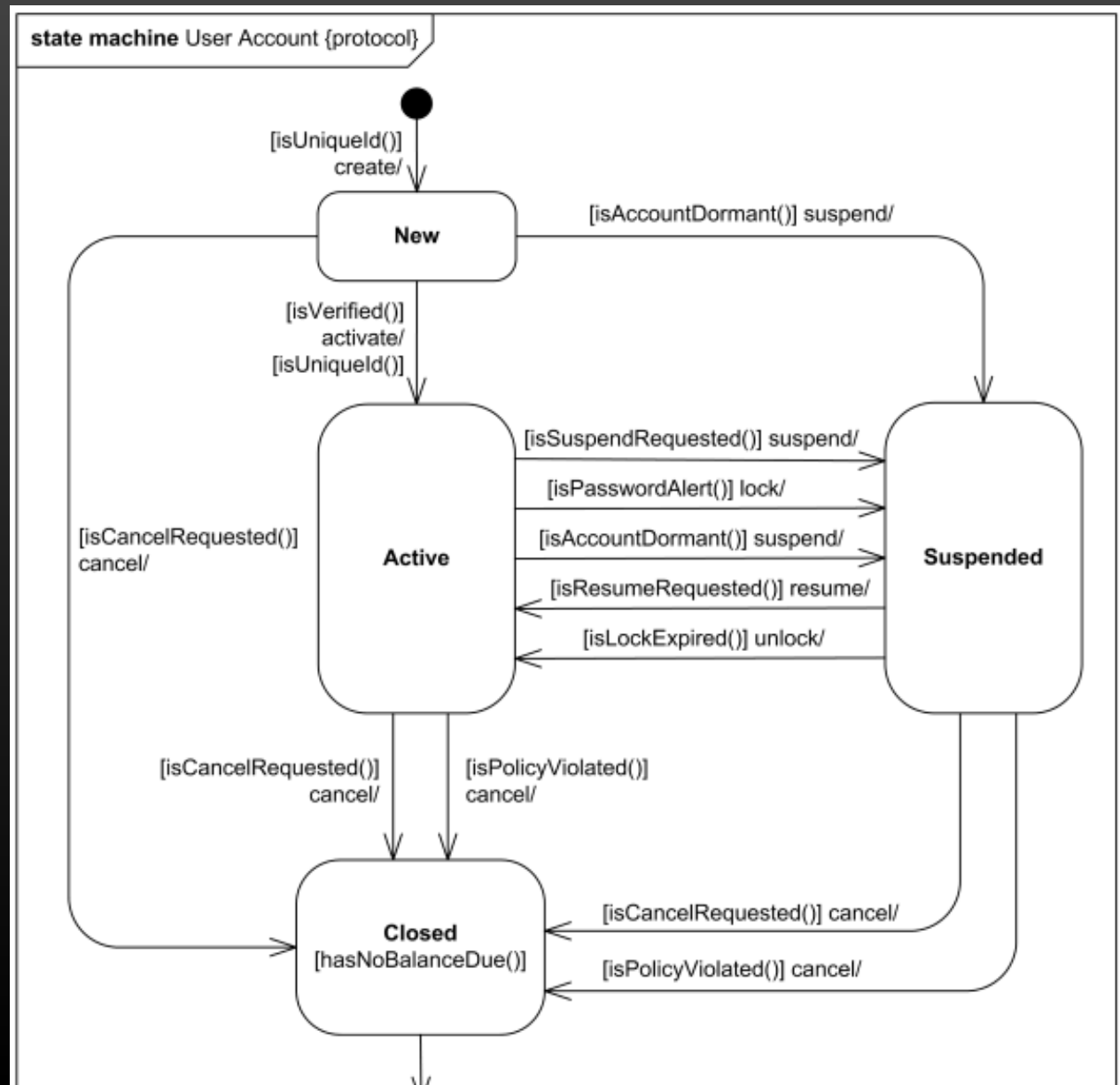
Diagramas de atividades para explicar procedimentos do domínio



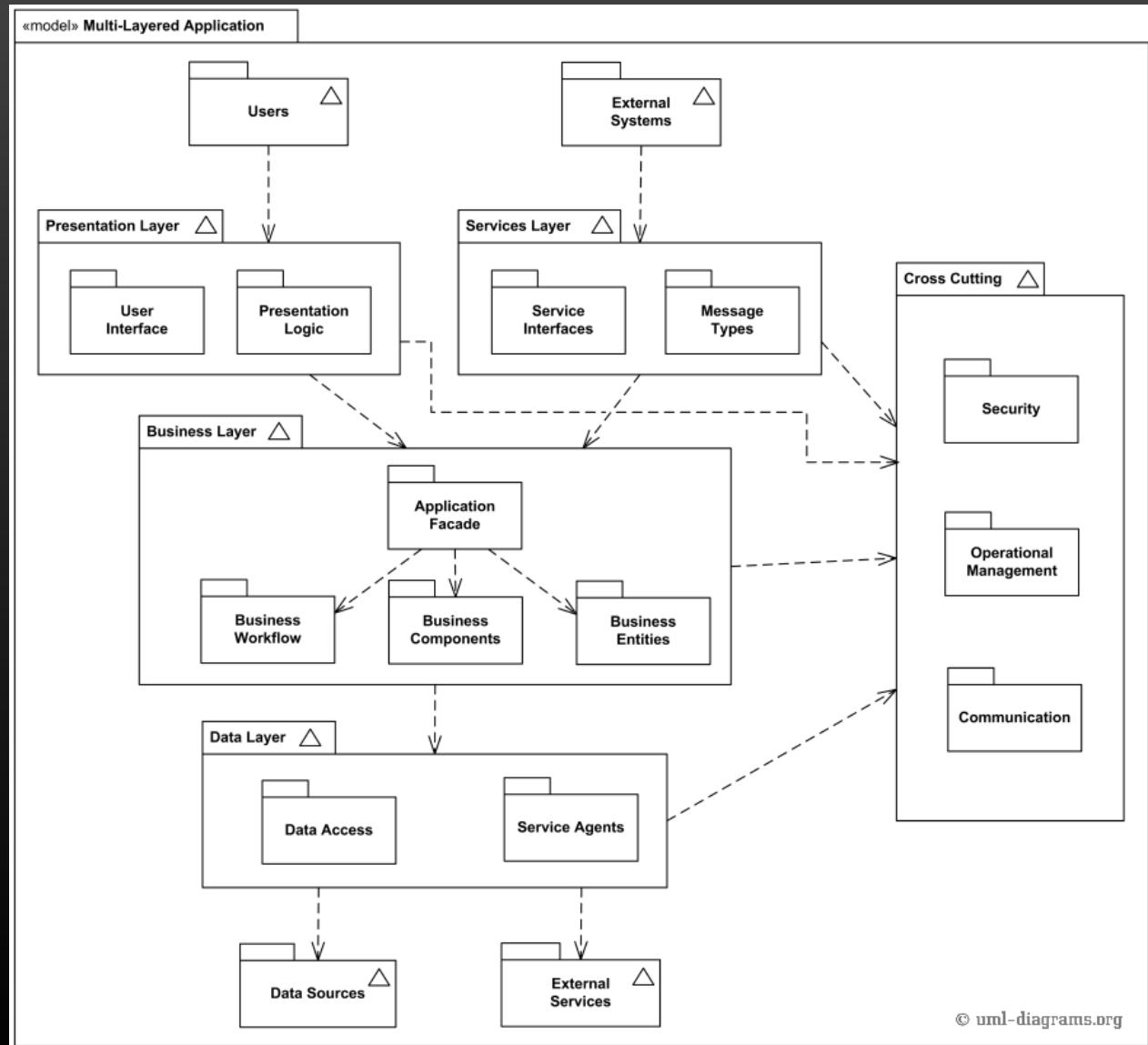
Classes para representar os conceitos da área do problema (modelo do domínio)



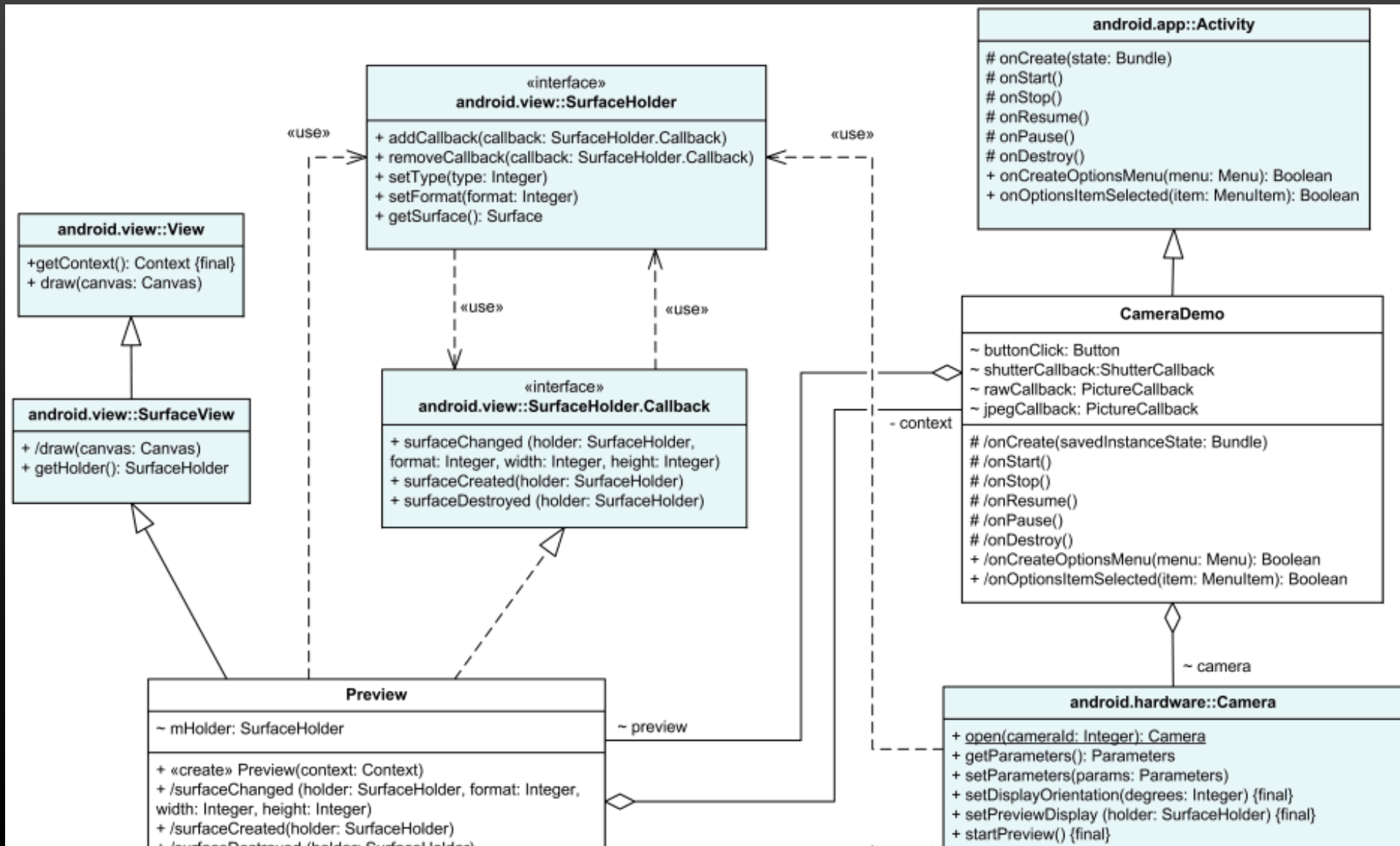
Máquina de estados de entidades/objetos



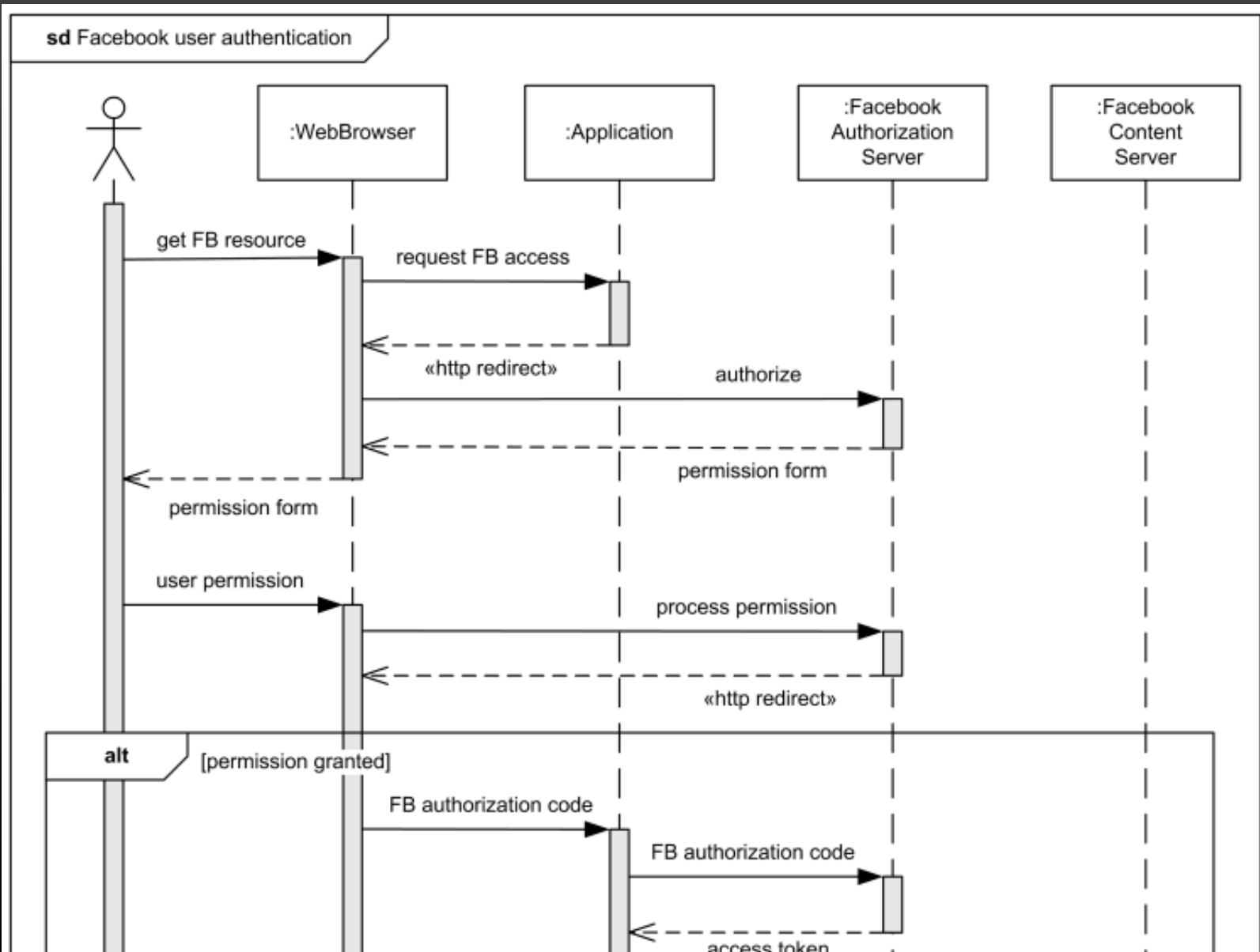
Visualizar a arquitetura lógica com D. Pacotes



Classes para visualizar objetos de um linguagem de programação

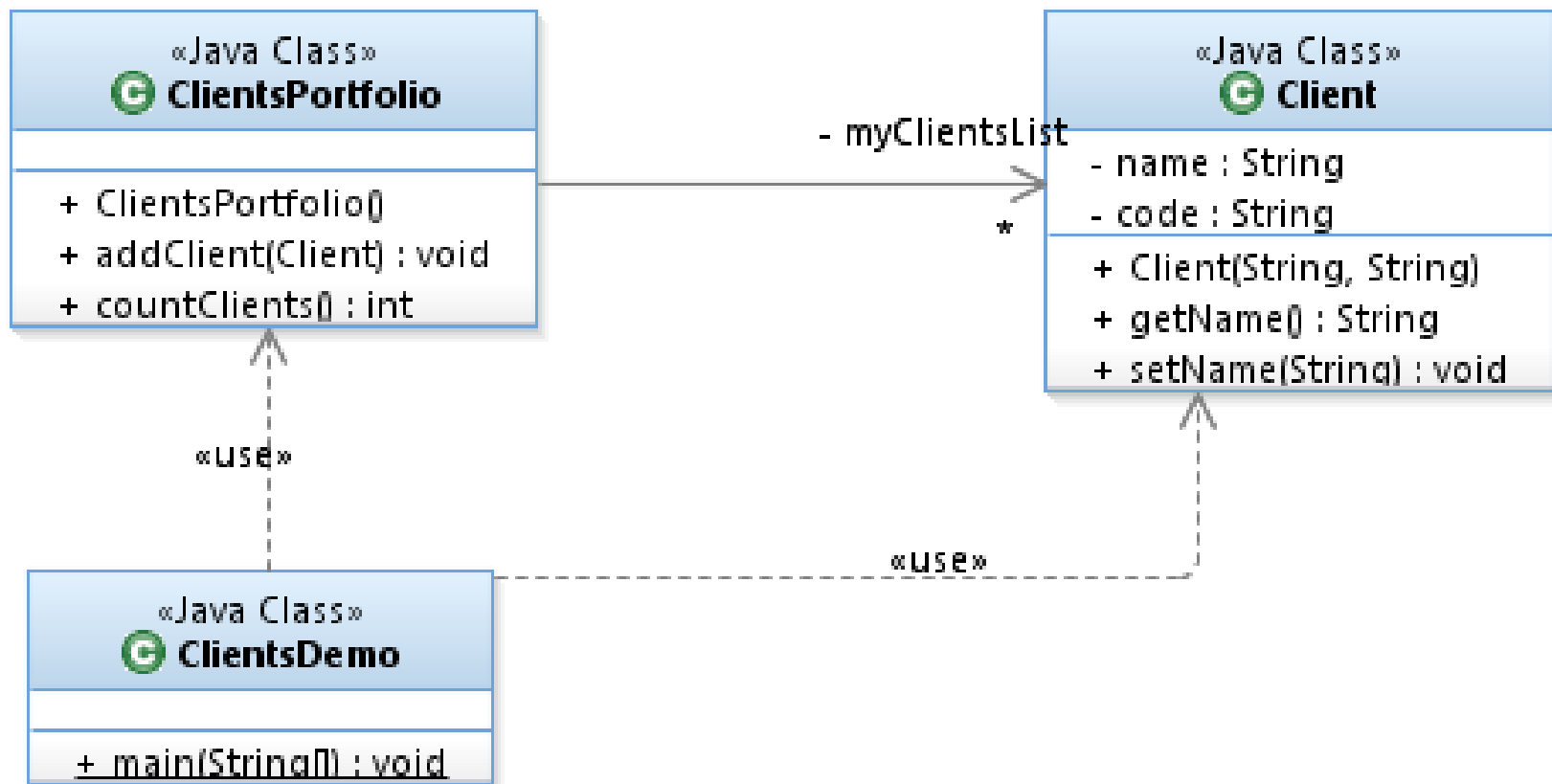


Interações entre componentes do software

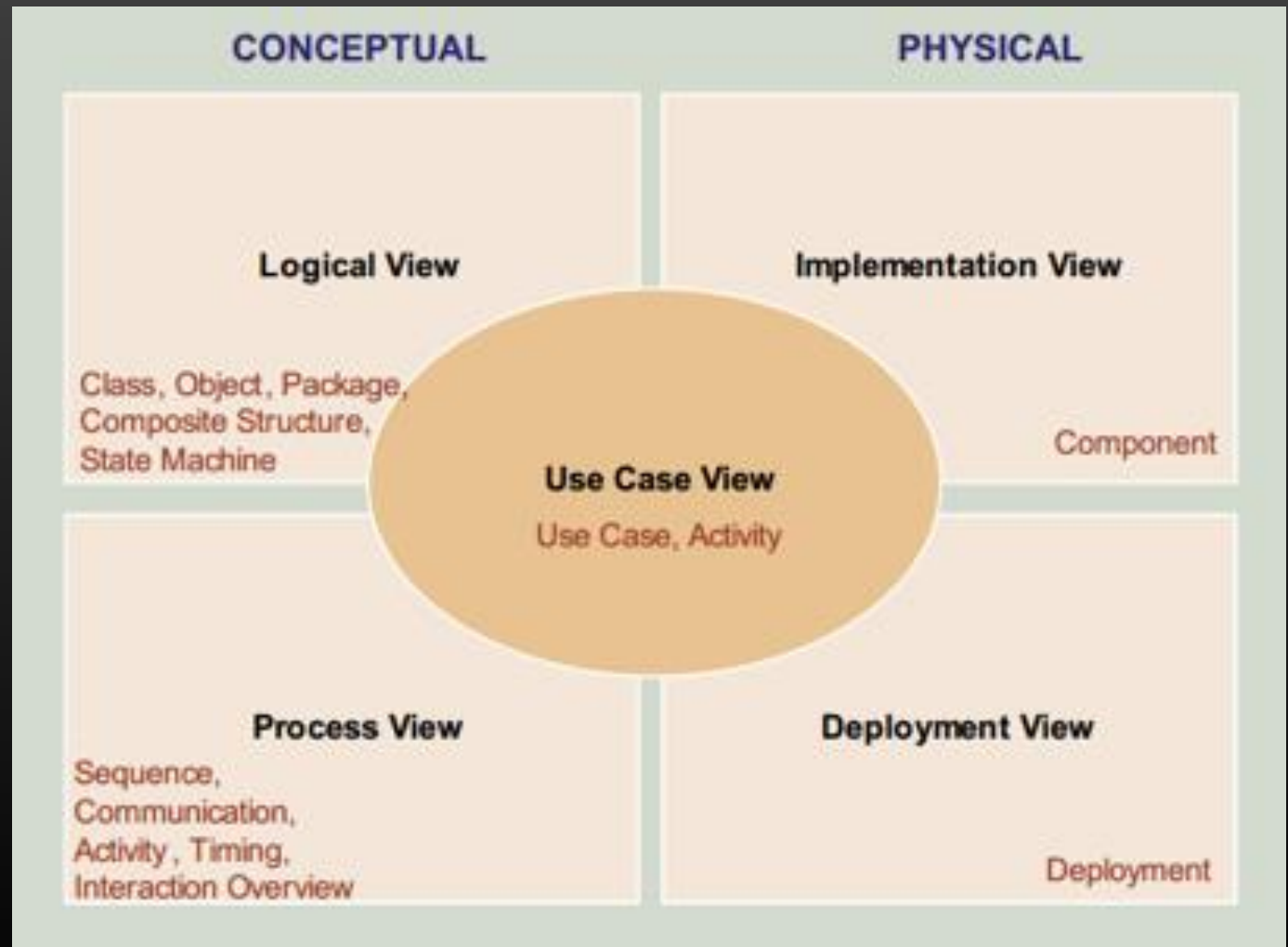


Objetos em código

```
public class ClientsPortfolio {  
    private ArrayList<Client> myClientsList;  
  
    public ClientsPortfolio() {  
        myClientsList =new ArrayList<>();  
    }  
    public void addClient(Client newClient) {  
        this.myClientsList.add(newClient);  
    }  
    public int countClients() {  
        return this.myClientsList.size();  
    }  
}
```



Diversos diagramas para abranger diferentes perspectivas de análise



Readings & references

Core readings	Suggested readings
<ul style="list-style-type: none"><li data-bbox="150 411 705 464">• [Dennis15] – Chap. 1	<p data-bbox="962 411 1758 714">[LAR'12] Larman, C. (2012). <i>Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development</i>. Pearson Education.</p> <p data-bbox="962 785 1477 842">→ chap. 10, chap. 15.</p>