SOFTWARE ARCHITECTURE

Escuela de Ingeniería Informática

Universidad de Oviedo

# Lab 2

Ovierview of UML

PlantUML

Introduction to Arc42

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## Architecture is more than code

The code doesn't tell the whole story

Questions the code doesn't answer

- How the software fits into existing system landscape?
- Why were the technologies chosen?
- What's the overall structure of the system?
- Where are the components deployed at runtime?
- How do the components communicate?
- How and where to add new functionality?
- What common patterns and principles are used?
- How the interfaces with other systems work?
- How security/scalability/… has been achieved?
- . . .

Note:
This slide appears also in the theory classes

# Goal of documentation

Main goal: communicate the structure

- Understand the *big picture*

Create a **shared vision**: team and stakeholders

- Common vocabulary

**Describe** what the sofware is and how is being built

- Focus for **technical** conversations about new features
- Provide a **map** to navigate the source code

**Justify** design decisions

**Help** new developers that join the team

Note:
This slide appears also in the theory classes

# Documentation requirements

- Understandable by different stakeholders
    - Technical and non-technical stakeholders
- Reflect the reality
    - Be careful of the model-code gap
- Move fast and adapt to changes
    - Adapt to agile projects
    - Evolutionary architecture

Note:
This slide appears also in the theory classes

# Rules for good documentation

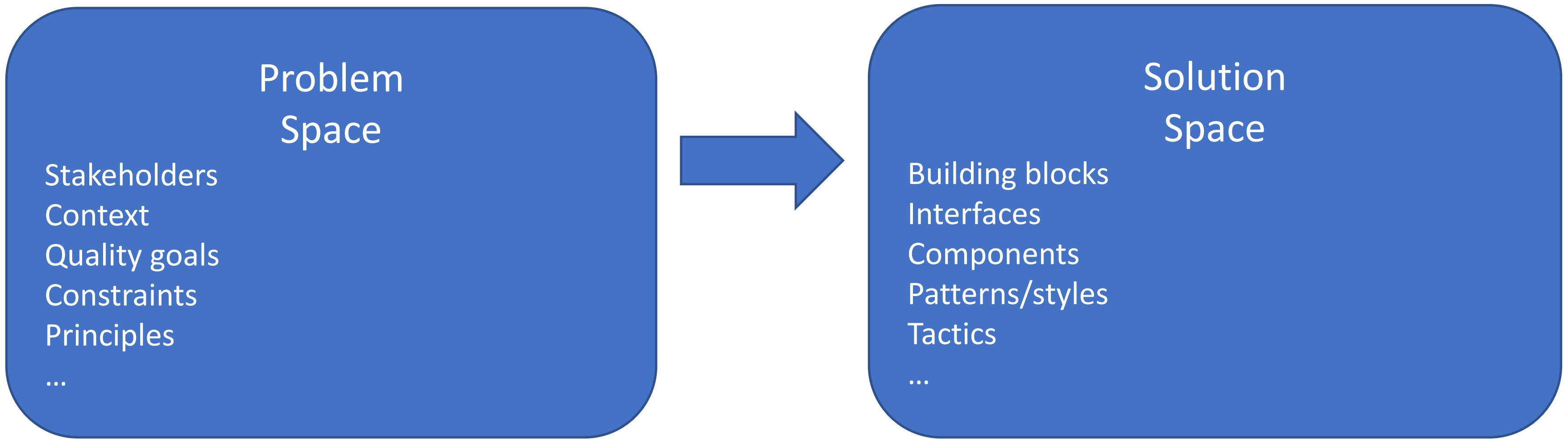
- Write documentation from reader's point of view
  - Find who will be the readers and their expectations
- Avoid unnecessary repetition (DRY principle)
- Avoid ambiguity
  - Explain the notation (or use a standard one)
  - For diagrams, use legends
- Use a standard organization or template
  - Add TBD/To do when necessary
  - Organize for easy of reference/links
- Record rationale
- Keep documentation current

Note:
This slide appears also in the theory classes

## Problem vs Solution space

Software architecture = path from problem to solution

- Understand the problem
- Design a solution
  - Rationale for the solutions proposed
  - Record different design alternatives

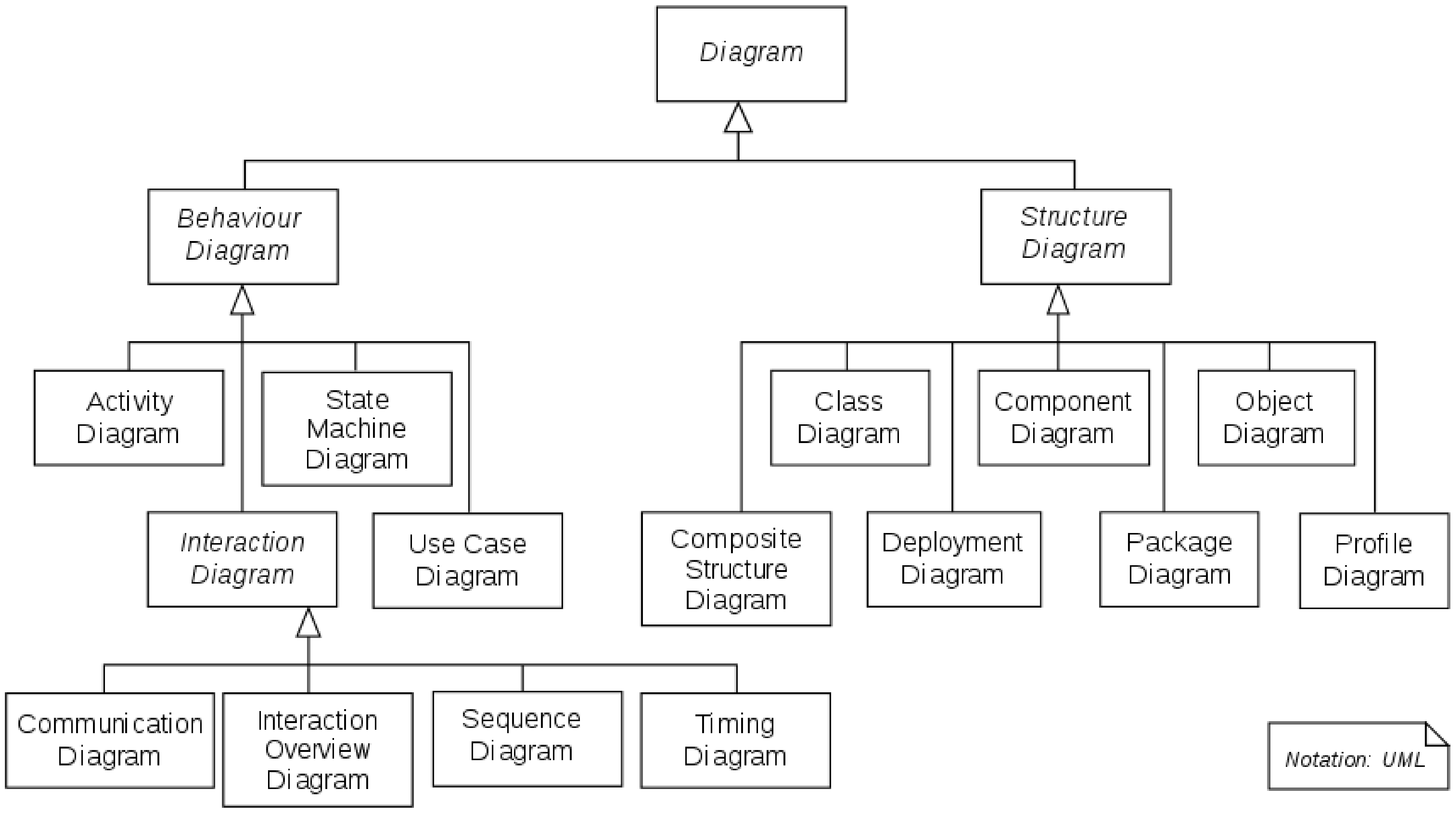


Note:
This slide appears also in the theory classes

## UML

- Unified Modeling Language
  - Before UML there were several proposals
  - UML notation unifies them
  - Proposed by OMG (Object Management Group)
  - Current version UML 2.5.1 (2017)
- Model = abstraction of a problem
  - It can have different diagrams
  - Diagram = partial graphic representation of a model
- OCL = Object Constraint Language
  - Constraints between objects using formal language

## 14 UML Diagram types



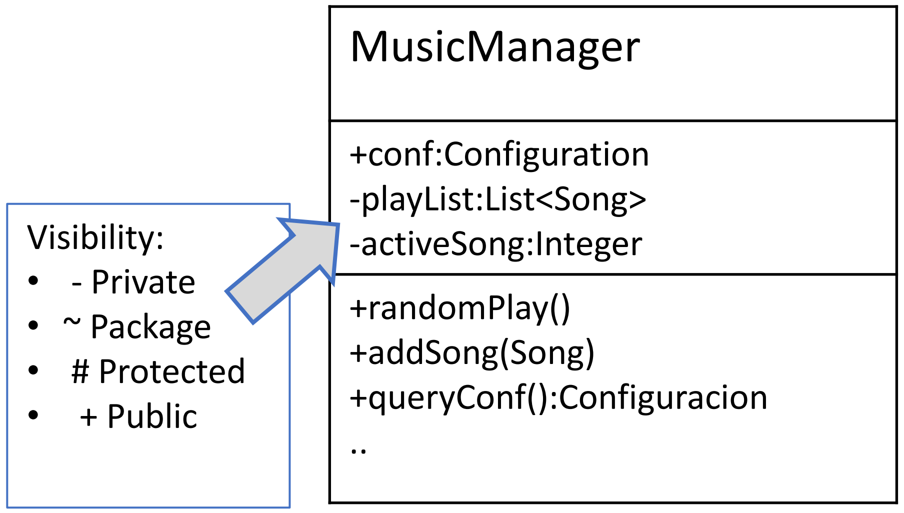
Fuente: Wikipedia

## Class diagrams

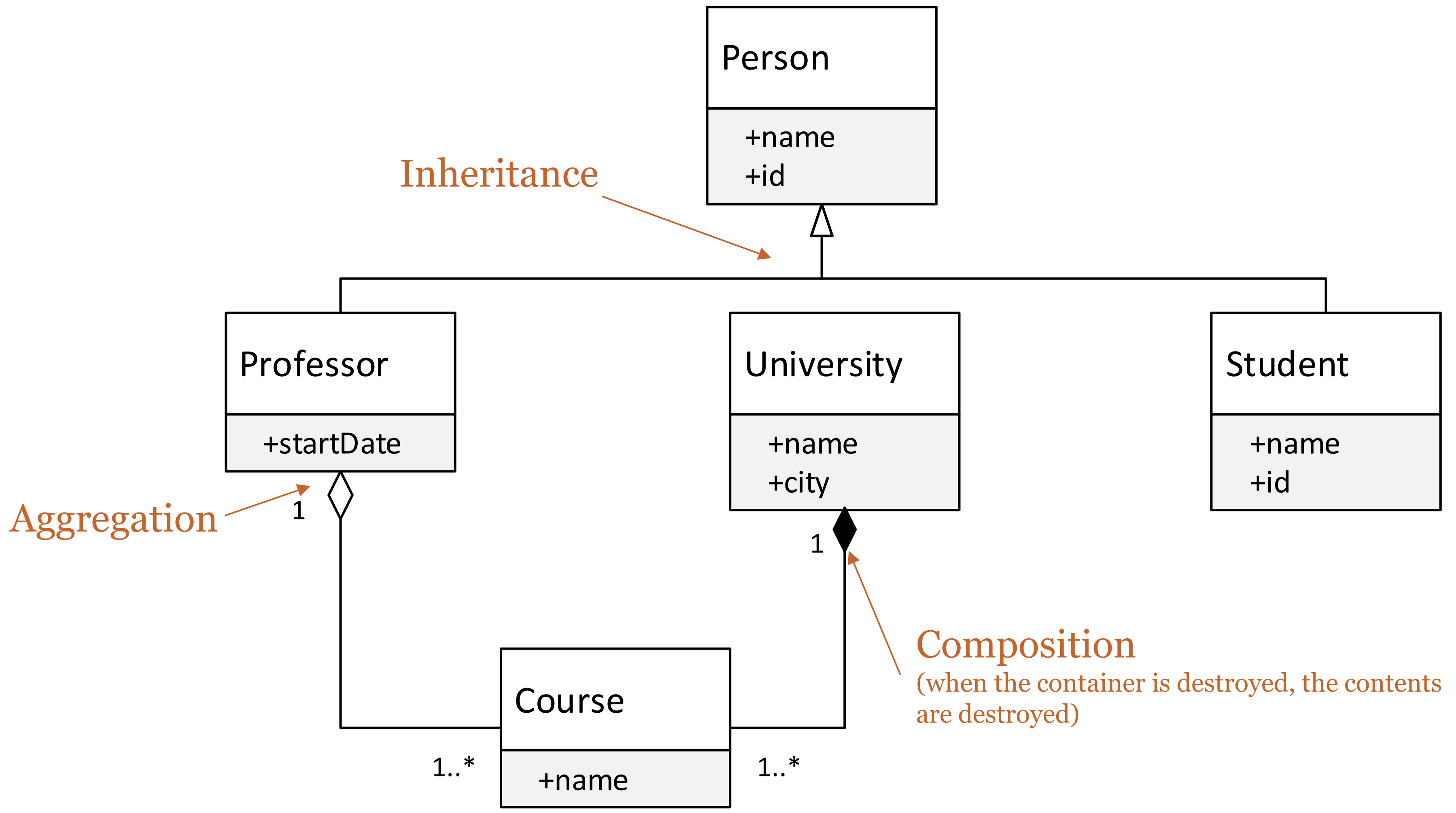
Models the static part of the project, without taking into account the time aspect

Explains the relationships between the different classes.

Arc42: 8-Concepts

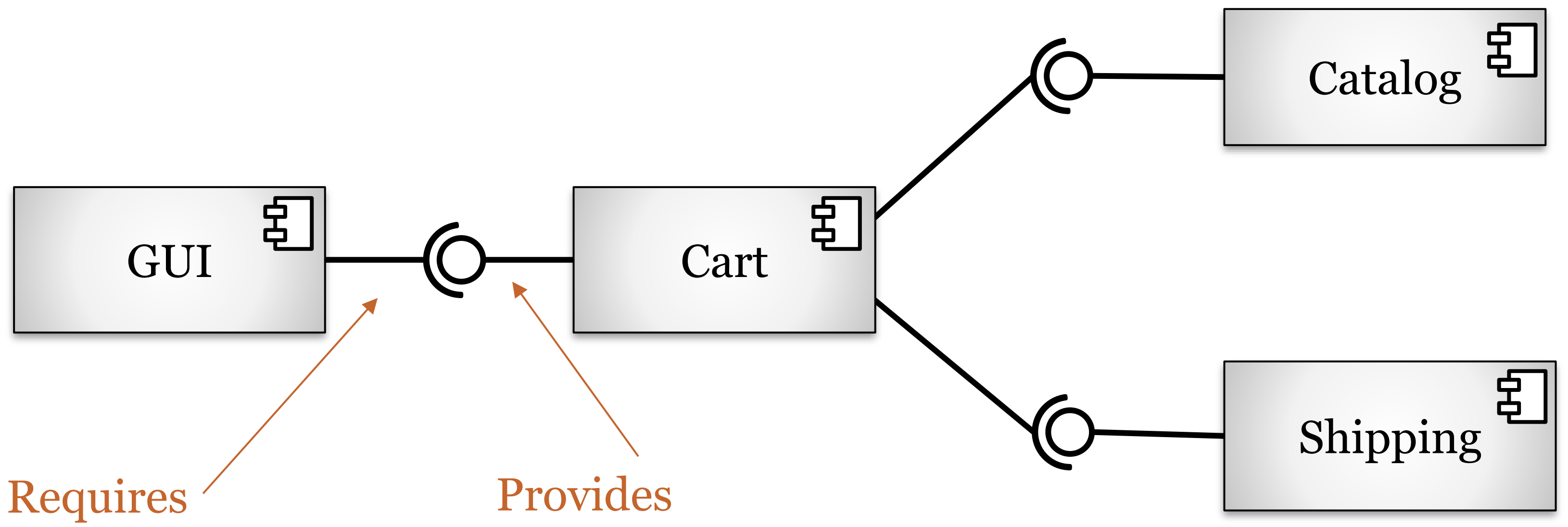


## Example


Person
+name
+id
Inheritance
Professor
+startDate
University
+name
+city
Student
+name
+id
Aggregation
1
1
Composition
(when the container is destroyed, the contents are destroyed)
Course
+name
1..*
1..*

## UML Component diagram

Component digram represents components relationships
Useful for Complex Systems with many components
Interface is usually represented with lollipop notation

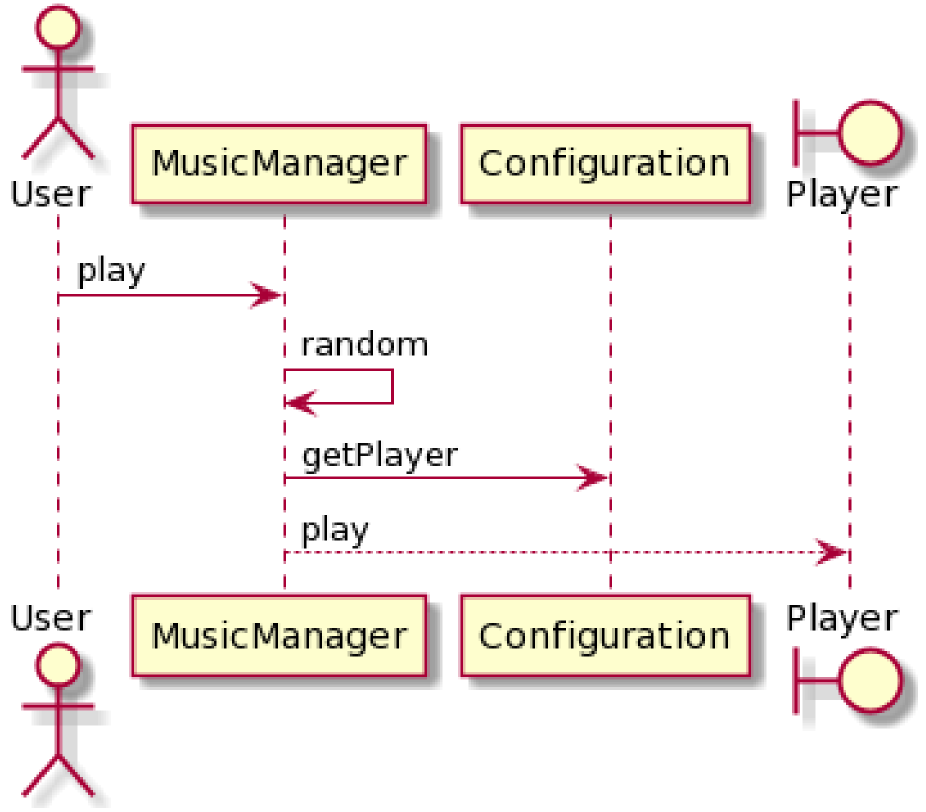


## Sequence diagram

Models communication between some objects at a given time

Objects can send two types of messages: synchronous or asynchronous

Arc42:6-RuntimeView



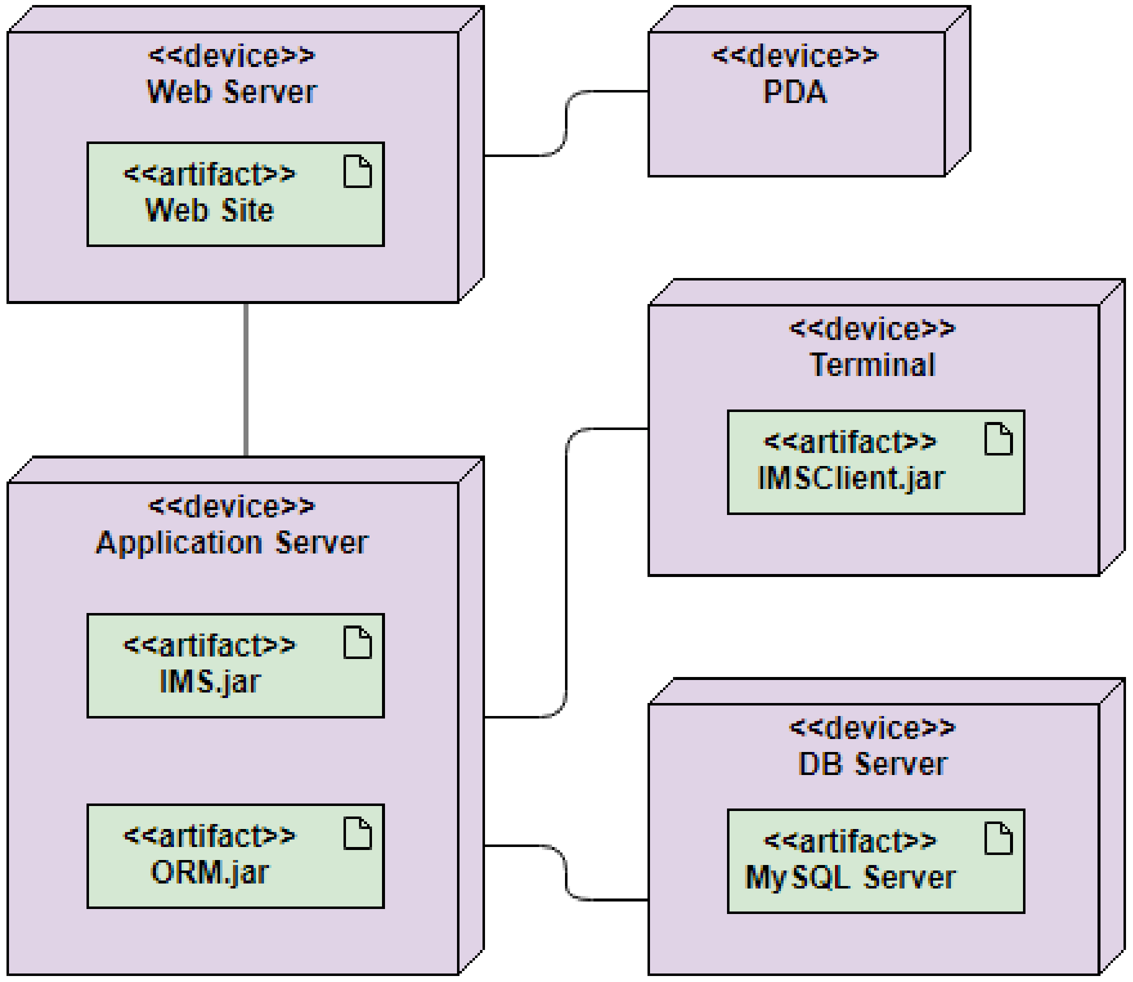
# Deployment diagrams

Represents the final location of the components in an app

Elements:

- Nodes , Components, relationships

Arc42: 07.DeploymentView

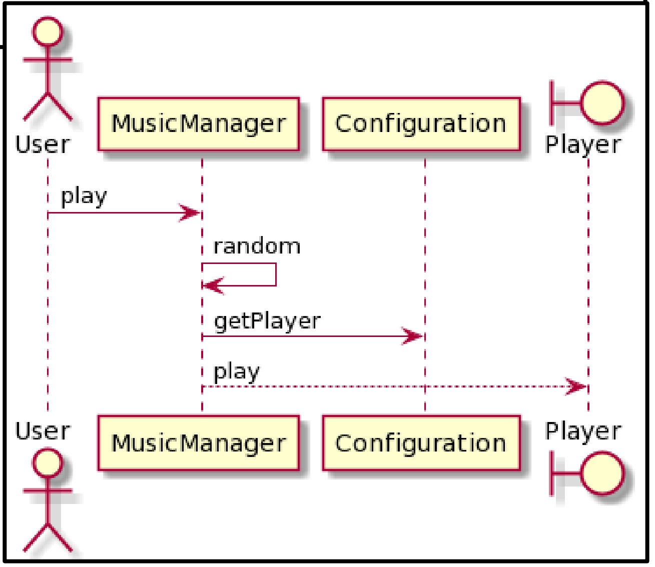


Source:VisualParadigm

# Text-based tools

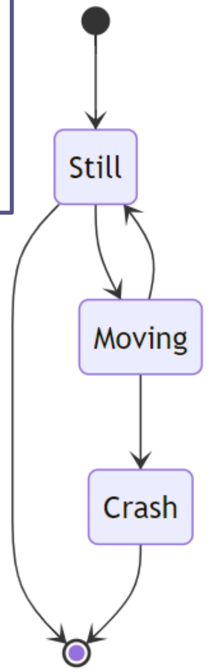
## PlantUML

```
@startuml component
actor User
participant MusicManager
participant Configuration
boundary Player
User -> MusicManager: play
MusicManager -> MusicManager: random
MusicManager -> Configuration : getPlayer
MusicManager --> Player : play
@enduml
```



## Mermaid

```
stateDiagram-v2
    [*] --> Still
    Still --> [*]
    Still --> Moving
    Moving --> Still
    Moving --> Crash
    Crash --> [*]
```



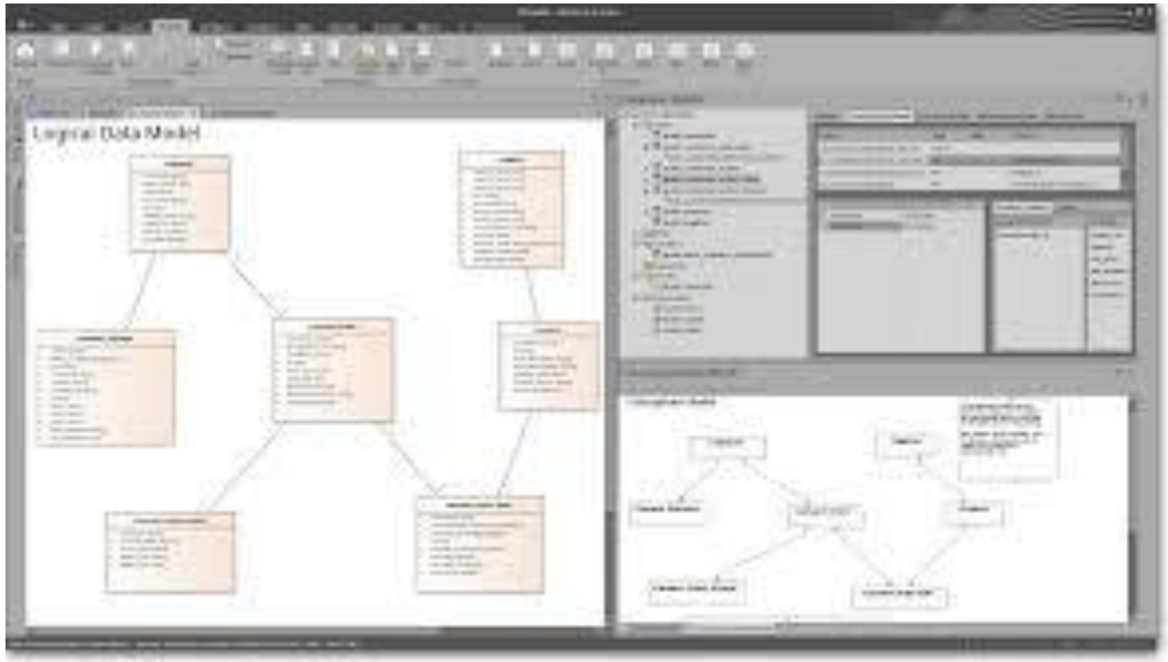
## Drawing tools

Powerpoint
MsVisio
UMLet (https://www.umlet.com/)

## CASE tools

EnterpriseArchitect

- Reverse Enginering with Java/C++
- Oracle connection for relational databases
- Word, HTML templates



MagicDraw

- Java based
- UML diagrams
- Reverse Engineering Java , C++

Visual Paradigm

- Commercial (student license)

Modelio

- Open source
- Java based
- Reverse Engineering Java , C++

## Diagramming the architecture

Video:

https://www.youtube.com/watch?v=wgpSdpny-0c

Checklist:

https://c4model.com/assets/software-architecture-diagram-review-checklist.pdf

## Arc42 templates

Arc42

https://arc42.org/

WIQ already follows the template:

https://arquisoft.github.io/wiq_0/

Generation of docs (locally):

```
$ cd docs
$ npm install      (only first time)
$ npm run build
```

## GitHub Pages

GitHub supports creating websites

Useful por personal – project/repository

Branch **gh-pages**

## GitHub Pages - examples

- Organization level
  - Repository:
    - https://github.com/Arquisoft/Arquisoft.github.io
  - Deployed:
    - https://arquisoft.github.io/
- It can be very useful for personal web pages
  - http://pglez82.github.io

## Documentation deployment

Documentation is deployed using GitHub Pages

- GitHub Pages allows users to publish a simple website directly on GitHub
- Generated website will be pushed to the branch **gh-pages**
- npm package **gh-pages** pushes doc website to gh-pages branch
- Everything is automatized with the following command:

```
$ npm run deploy
```

GitHub Pages