Software Architecture

Laurea Magistrale
in Informatica

Paolo Ciancarini

Goal

The course “**Software Architecture**” studies the form of software systems as the product of social design activities. Software Architecture extends Software Engineering to System Engineering and Organizational Engineering.

Prerequisites

- Prerequisites:
  - Be able to program with an o-o language like Java
  - Know the generic structure of an operating system and of a compiler
  - Basic notions of software engineering: software process, design principles
  - Basic notions of UML: class and seq diagrams
  - **IMPORTANT**: you should be able to recognize and use the main software design patterns

Effort and scheduling

- Effort : 6 cfu
- Course duration: from sept to december
- Class hours:
  - Mon 16.30-18.30 room Ercolani 3
  - Wed 8.30-11.30 room Ercolani 3

Software and architecture

Software industry: born in the ’60, so still young and with unique problems

Software systems are large and complex: Google is 2 billions LOC

Architecture: ancient design discipline

Software Architecture: a new discipline, different from Software Engineering

From Quora

A software engineer executes a plan that is created by a software architect.

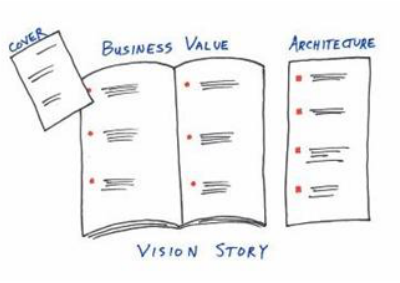
A software architect creates a blue print of the software to create. The software architect creates also a plan that has provisions for different business and technical requirements.

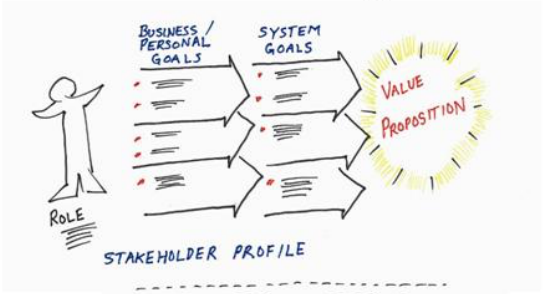
A software engineer reads the plan or the design created by software architect and starts implementing in the language of choice most suitable to the plan. The resulting software is the one that finally serves users in achieving their objectives.

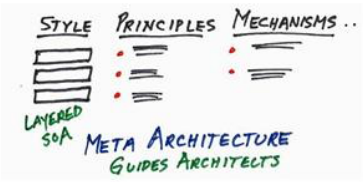
A software engineer has to understand requirements, read high level design, create low level design, unit tests, code, and any relevant documentation.

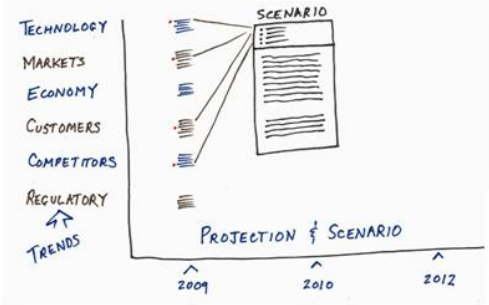
Software architect's job responsibilities are reading requirements, adding technical requirements, understanding long term vision, creating high level design, creating testing strategy, doing code review and explaining overall approach to stakeholders.

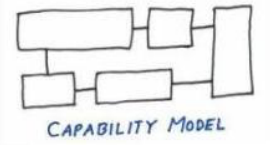
The Visual Architecting Process

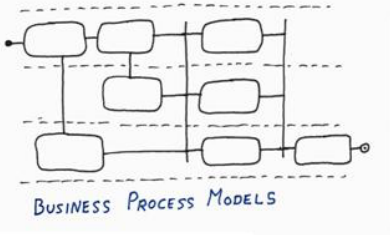


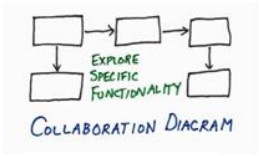


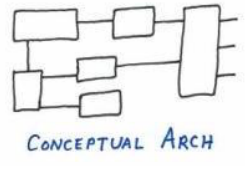


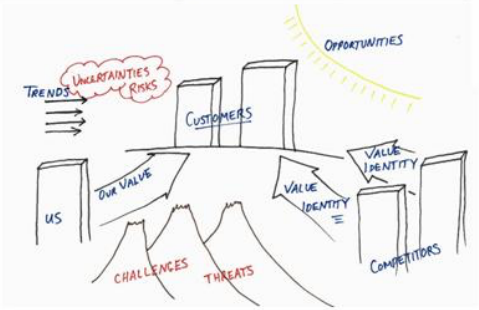


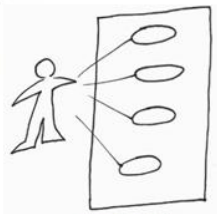


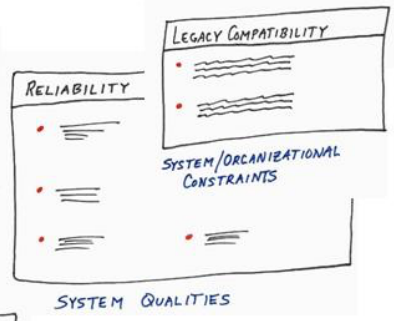


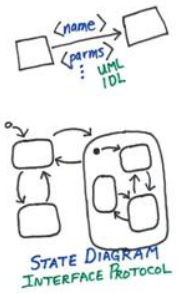


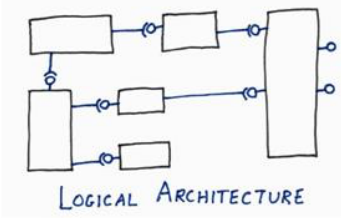


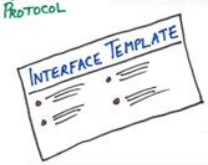


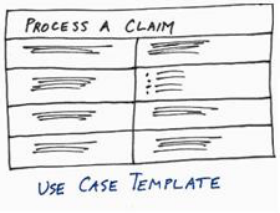


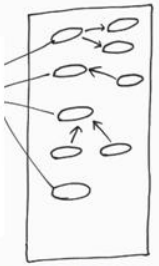


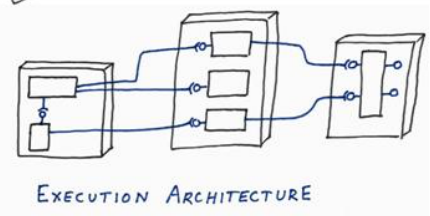


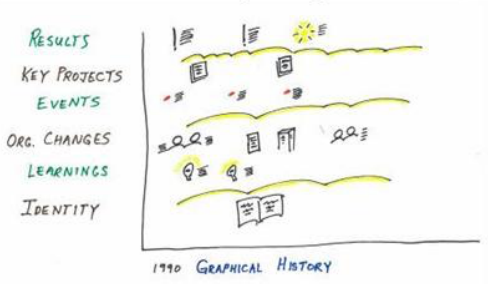












THE EVOLUTION OF

SOFTWARE ARCHITECTURE

1990's

SPAGHETTI-ORIENTED
ARCHITECTURE
(aka Copy & Paste)

2000's

LASAGNA-ORIENTED
ARCHITECTURE
(aka Layered Monolith)

2010's

RAVIOLI-ORIENTED
ARCHITECTURE
(aka Microservices)

WHAT'S NEXT?

PROBABLY PIZZA-ORIENTED ARCHITECTURE

By @benorama

Syllabus

- Software: engineering *vs* architecting
- The qualities of software systems
- Describing software architectures
- Architecting with agile methods
- Languages for software architecting
- Architectural styles
- Special styles: interactive, distributed, cloud
- Model Driven Architecture
- Enterprise architecture
- Evaluating a software architecture

Exam

- Attending class 10%
- Report on a sw architecture topic 50%
- Presentation of the report 40%

- **Warning**: students who cannot attend my class (eg. student workers) will receive additional tasks (they have to ask me for them)

Additional tasks

- Additional readings and written summaries

Channels

- **Web**: `www.cs.unibo.it/~cianca/wwwpages/archsw.html`
- **Twitter**: `@paolociancarini`
- **Telegram**: `@paoloci`
- **Facebook page** *Software Architecture UNIBO*

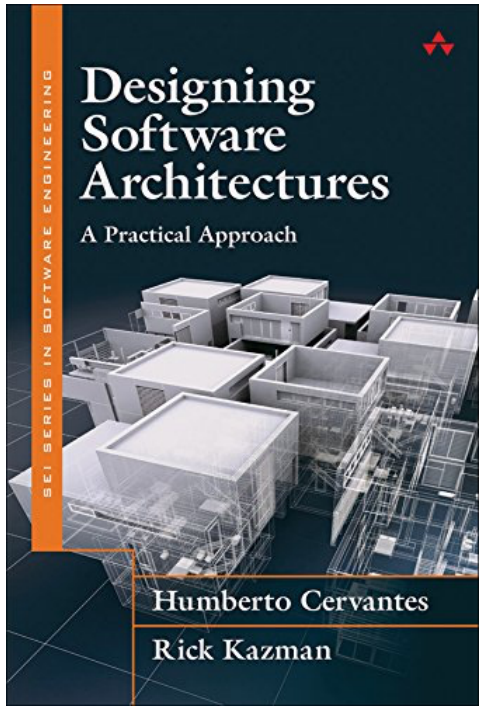
- **Dropbox**
- **Linkedin**

Textbook

Main

H.Cervantes & R. Kazman, *Designing Software Architectures*, AddisonWesley 2016

Additional material will be distributed during the course



Other books

- AA.VV., *The architecture of Open Source applications*, aosabook.org
- Bass et al., *Software Architecture in Practice*, 3rd ed., AddisonWesley, 2013
- Clements et al., *Documenting Software Architectures*, 2nd ed., AddisonWesley, 2010
- Rozanski & Woods, *Software Systems Architecture*, 2nd ed., AddisonWesley, 2012
- Taylor, Medvidovic, and Dashofy, *Software Architecture: Foundations, Theory, and Practice*, Wiley, 2009 www.softwarearchitecturebook.com

Main sources for papers

Google scholar `scholar.google.com`

IEEE Transactions on Software Engineering

ACM Transactions on Software Engineering and Methodology

IEEE Software

WICSA/ECSA: Conference on Software Architecture

SATURN Sw architecture conference www.sei.cmu.edu/saturn

Useful web sites

Major web sites:
`www.sei.cmu.edu/architecture/`
`www.handbookofsoftwarearchitecture.com`
`www.bredemeyer.com`

Blogs
`blog.softwarearchitecture.com`
IASA (int. assoc. of sw architects): `www.iasahome.org`

Background references

on software engineering:
Bruegge & Dutoit, *OO Sw Engineering*, Pearson, 3ed., 2010
Pressman, *Software Engineering*, 8° edition, 2015

on modeling software:
Arlow & Neustadt, *UML2 and Unified Process*, McGraw Hill, 2007

Questions?