EN
English

Universidad de Oviedo

School of Computer Science

Architecture techniques

SOFTWARE ARCHITECTURE

Course 2020/21

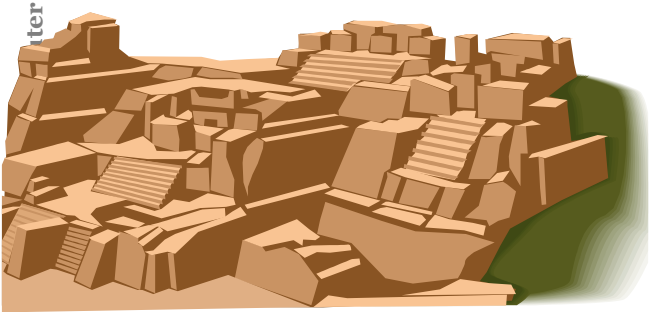
Jose E. Labra Gayo

Software architect

Discipline evolves

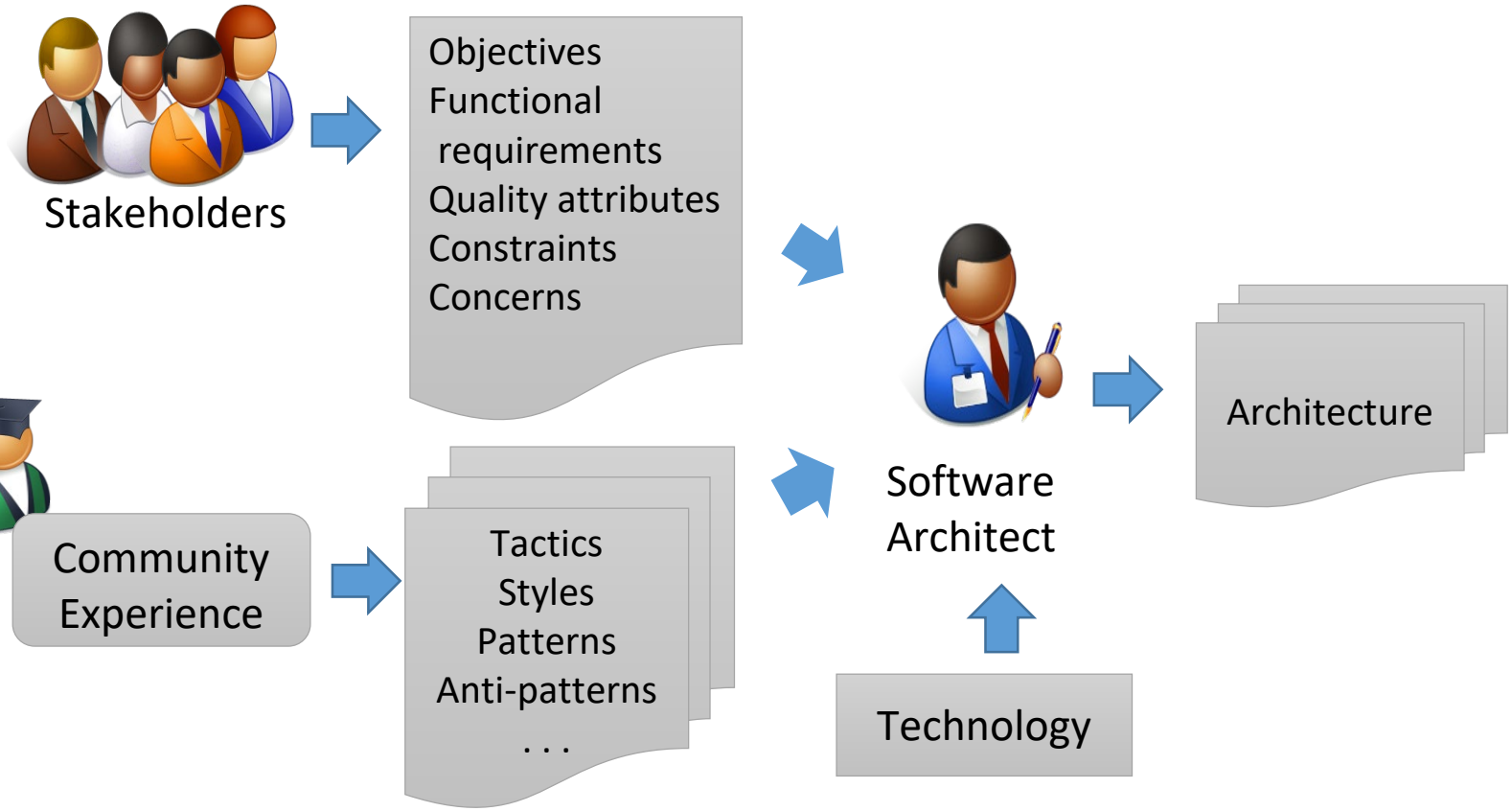
Architect must be aware of

- New development techniques
- Styles and patterns
  - Best tool = experience (*no silver bullet*)
    - Self experience
    - Experience from community



Architect

Role of software architect



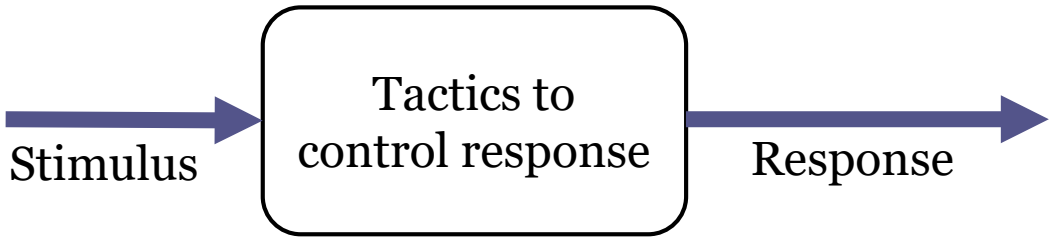
Tactics

Design techniques to achieve a response to some quality attributes

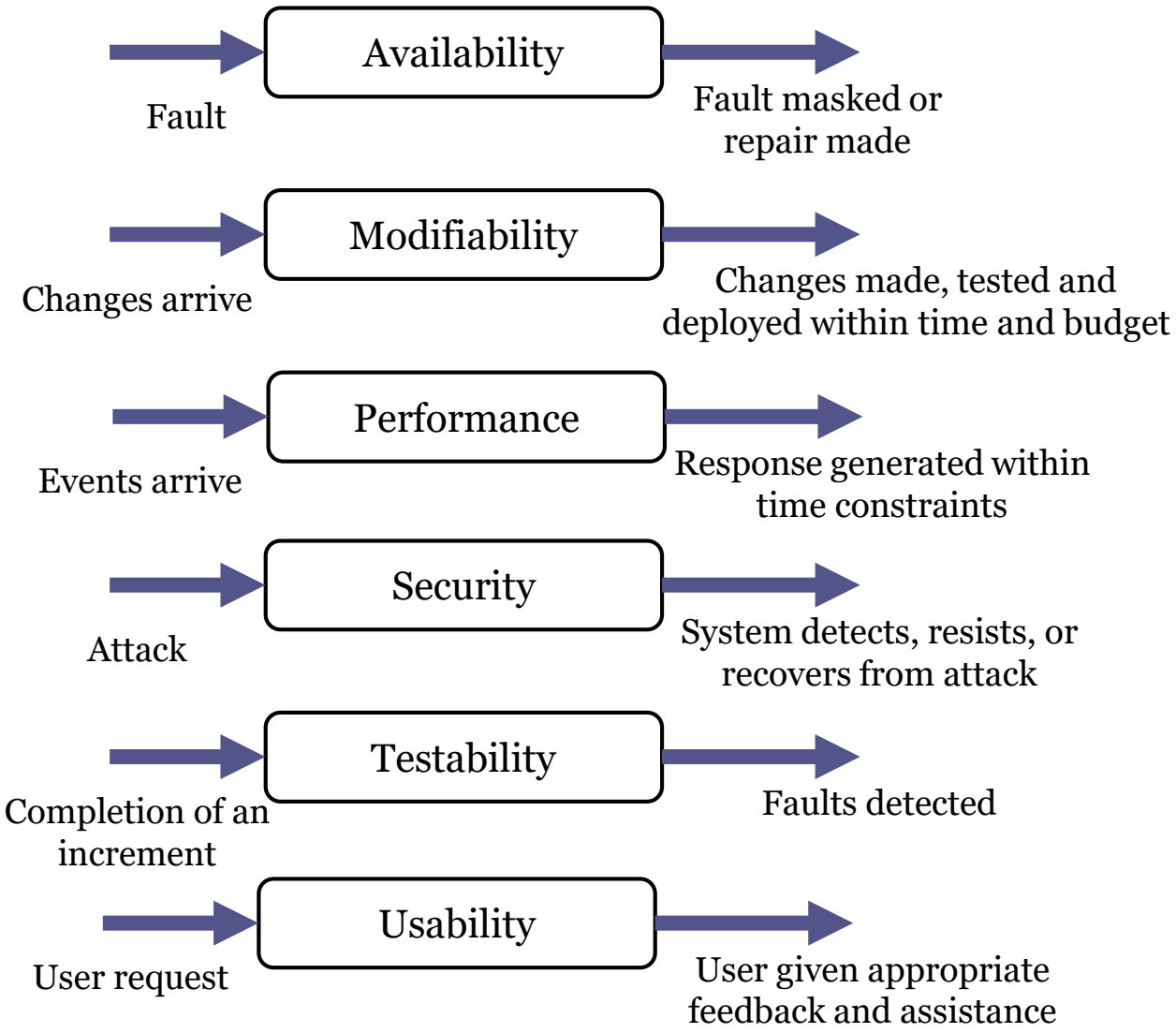
Tactics focus on a single quality attribute response

They may compromise other quality attributes

Tactics are intended to control responses to stimuli

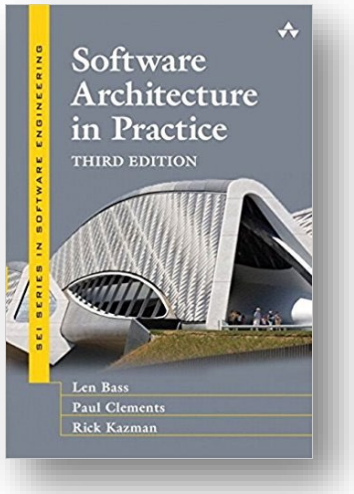


Tactics depend on QA



Where can we find tactics?

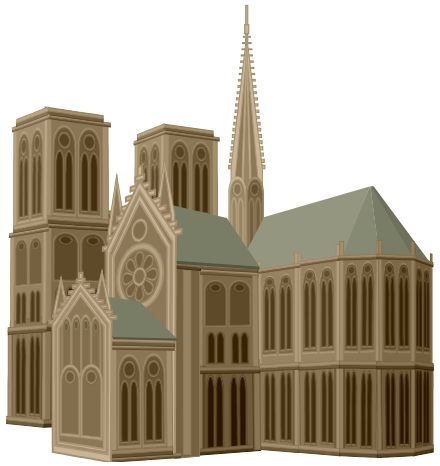
- Architect's own experience
- Documented experience from community
  - Books, conferences, blogs,...
- Tactics evolve with time and trends
  - Book "Software architecture in practice" contains a list of tactics for some quality attributes



http://www.ece.ubc.ca/~matei/EECE417/BASS/ch05lev1sec1.html
https://www.cs.unb.ca/~wdu/cs6075w10/sa2.htm

Architectural styles

- Define the general shape of a system
  - They contain:
    - Elements: Components that carry out functionality
    - Constraints: define how to integrate elements
    - List of attributes:
      - Advantages/disadvantages of a style



Are there pure styles?

Pure styles = idealization

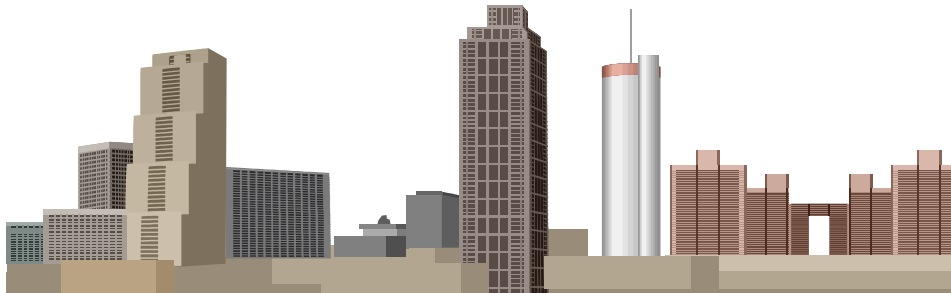
In practice, pure styles rarely appear

Usually, systems deviate from pure styles...

...or combine several architectural styles

It is important to understand pure styles in order to:

- Understand pros and cons of a style
- Assess the consequences of a deviation from the style



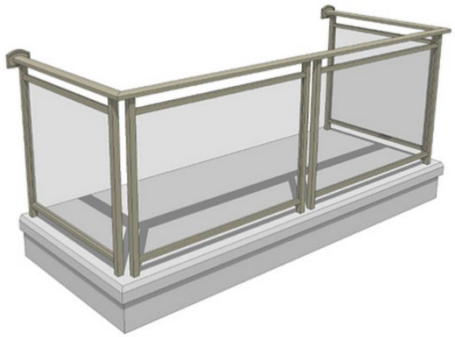
Architectural pattern

Reusable and general solution to some recurring problem that appears in a given context

- Important parameter: **problem**

3 types:

- Structural: Build time
  - Example: Layers
- Runtime (behaviour)
  - Example: Pipes & filters
- Deployment
  - Example: Load-balanced cluster



Pattern vs style

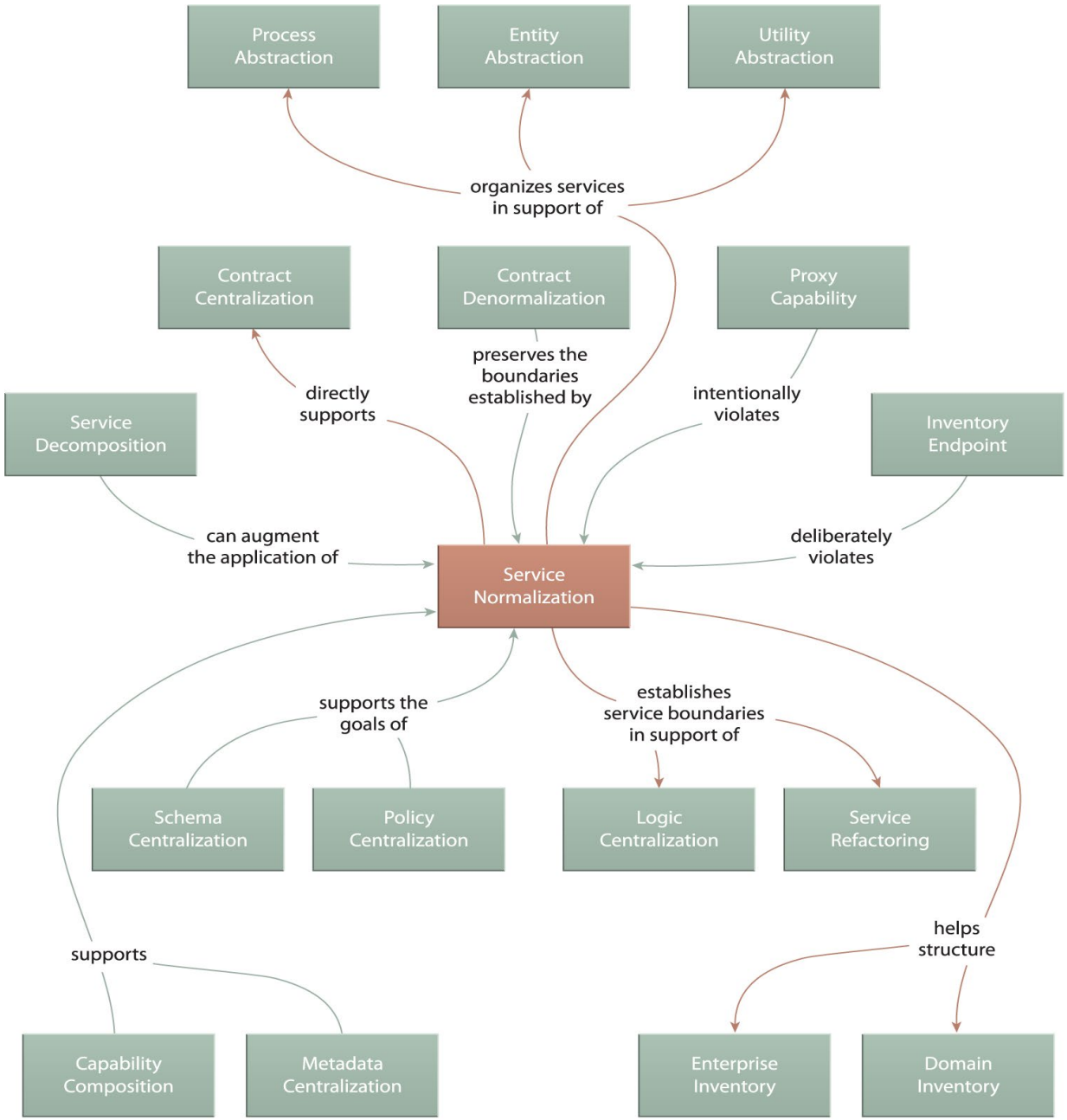
- Pattern = solution to a problem
  - Style = generic
    - Does not have to be associated with a problem
- Style defines general architecture of an application
  - Usually, an application has one style
    - ...but it can have several patterns
  - Patterns can appear at different scales
    - High level (architectural patterns)
    - Design (design patterns)
    - Implementation (idioms)
    - . . .

Pattern vs Style

- Styles, in general, are independent of each other
- A pattern can be related with other patterns
  - A pattern composed of several patterns
  - Interactions between patterns

Pattern languages and catalogs

- Pattern catalog
  - A set of patterns about a subject
  - It does not have to be exhaustive
- Pattern language
  - A full pattern catalog about some subject
    - Goal: document all the possibilities
    - They usually include relationships between patterns
      - Graphical map



Example of pattern language
Source: "SOA with REST" book

Build vs reuse

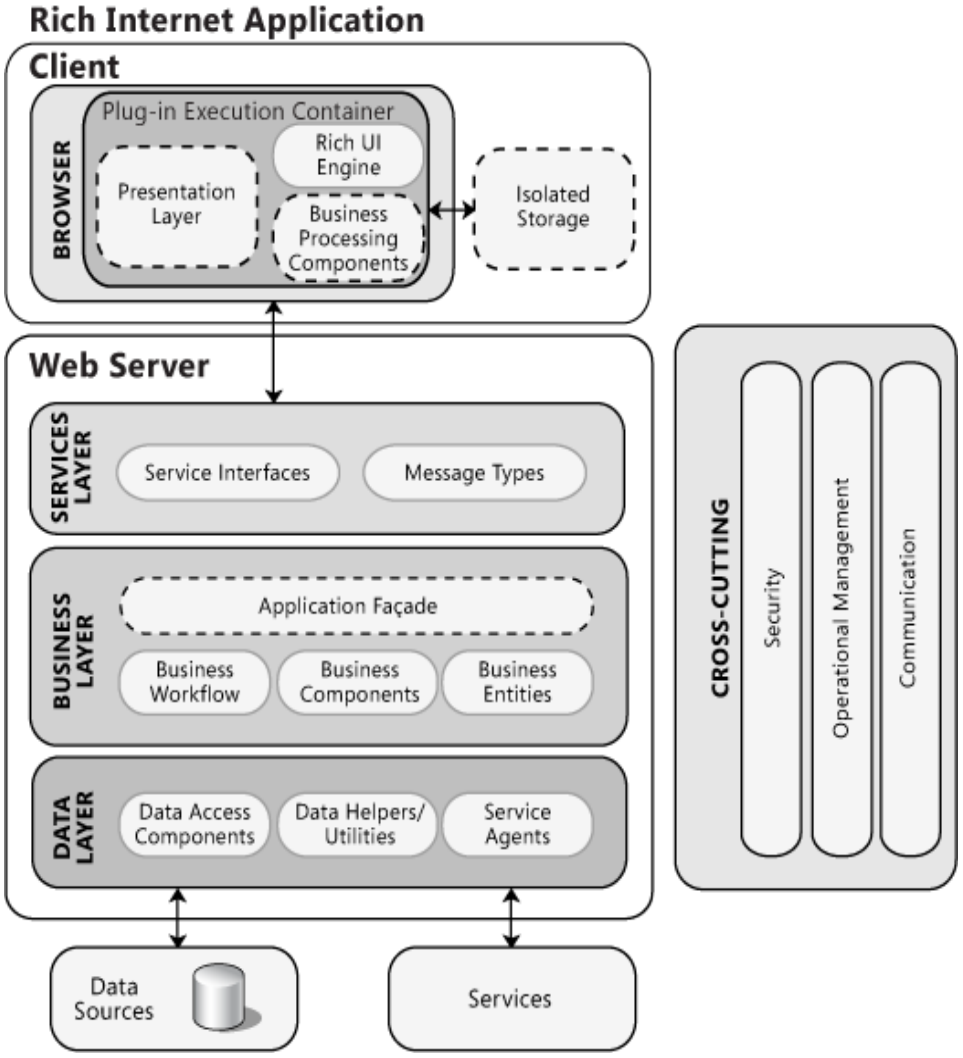
In some domains, reusing existing architectures may be more eficient

- Reference architectures
- Externally developed components

Reference architectures

Blueprints that provide the overall structure for particular types of applications

- They contain several patterns
- Can be the de-facto standard in some domains



Fuente: Microsoft Application Architecture Guide, 2nd Ed.

Domain Specific Software architecture

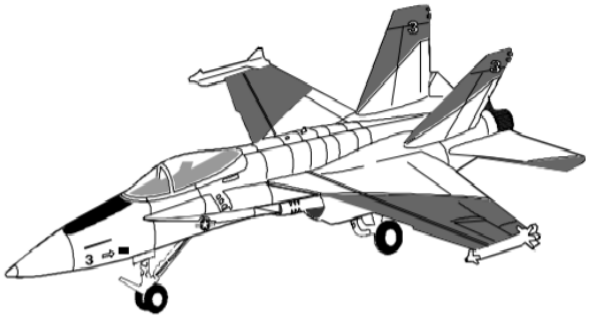
Combination of:

- Reference architecture for an application domain
- A library of components for that architecture
- A method of choosing and configuring components to work within an instance of the reference architecture

Specialized for a specific domain

Examples:

ADAGE, MetaH



Externally developed components

- Technology stacks or families
  - MEAN (Mongo,Express,Angular,Node), LAMP (Linux,Apache,MySQL,PHP),...
- Products
  - COTS: Commercial Off The Self
  - FOSS: Free Open Source Software
    - Be careful with licenses
- Application frameworks
  - Partial implementation of a specific area of an application
  - Very popular for UIs
- Platforms
  - Complete infrastructure to build & run applications
    - Example: JEE, Google Cloud