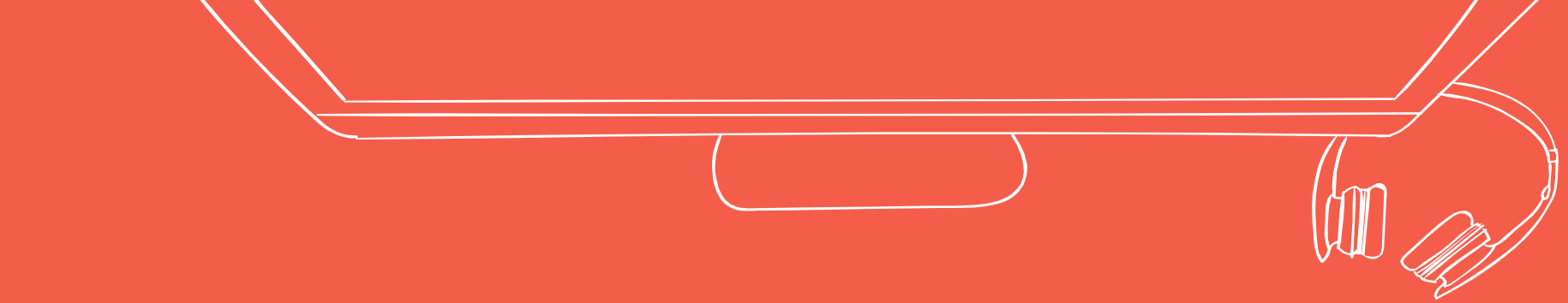


Software Architecture

Session 2:
Introduction to Software Architecture

Instructor: Perla Velasco-Elizondo

Objectives

a) Understand the definition of software architecture

b) Recognize the concept of business goal

c) Understand the relation of the concept of business goal to software architecture

d) Understand the relevance of software architecture

Outline

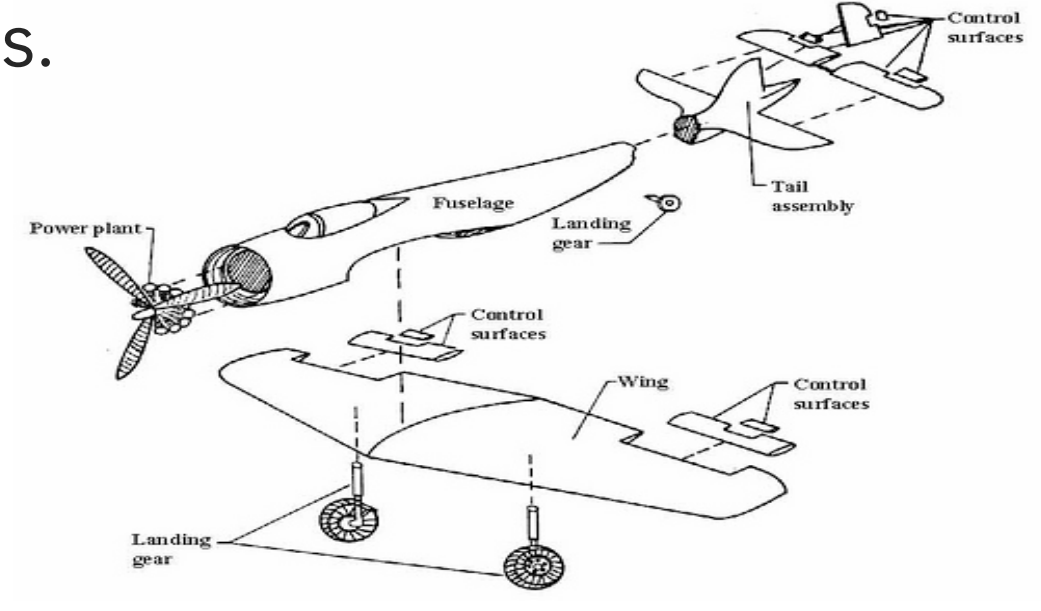
1. Software Architecture Defined
2. Architectural Structures
3. Business Goals
4. Relevance of Software Architecture
5. Summary

What is software architecture?

Software Architecture

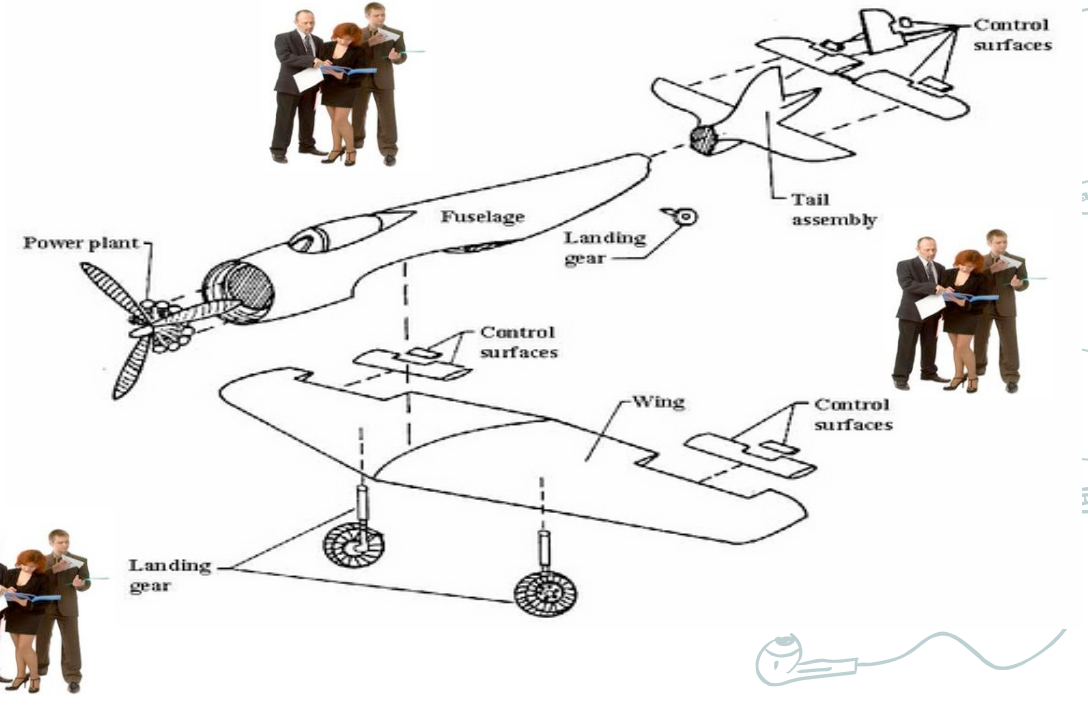
- Early partitioning of a complex system.
- This "early partitioning" is not really exclusive of software systems.

¿ Why this early partitioning is good ?



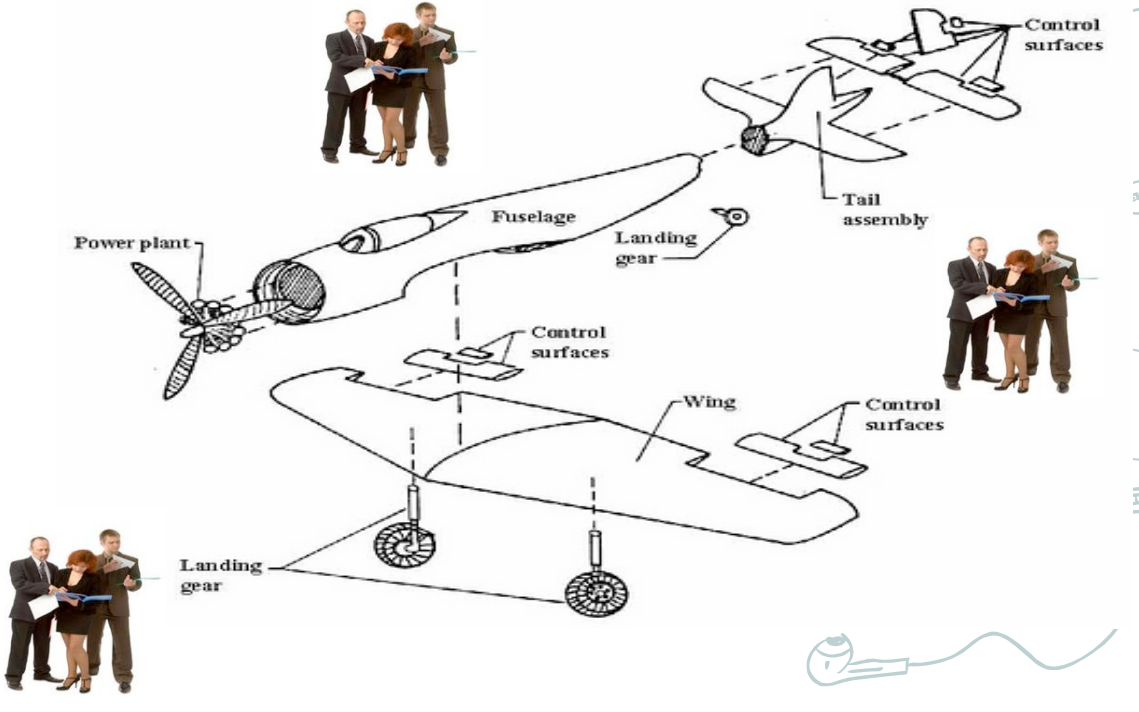
Software Architecture

- Modularity: "divide and conquer"
- Time to market: parallel development



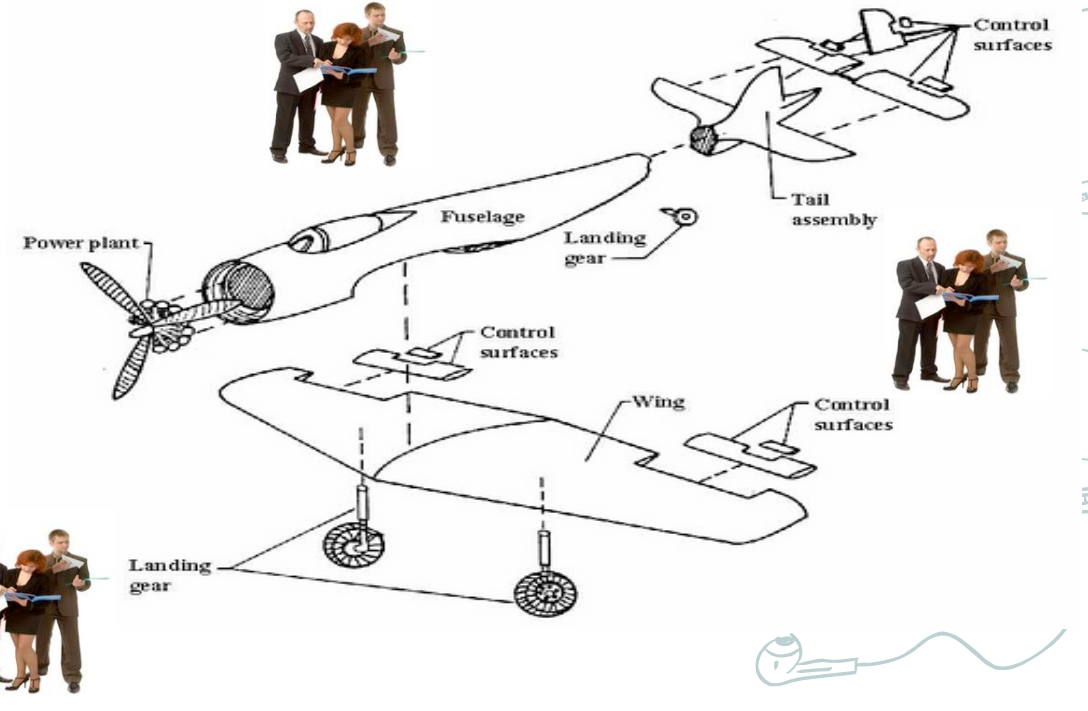
Software Architecture

One can talk about properties of individual parts, e.g. wings modifiability.



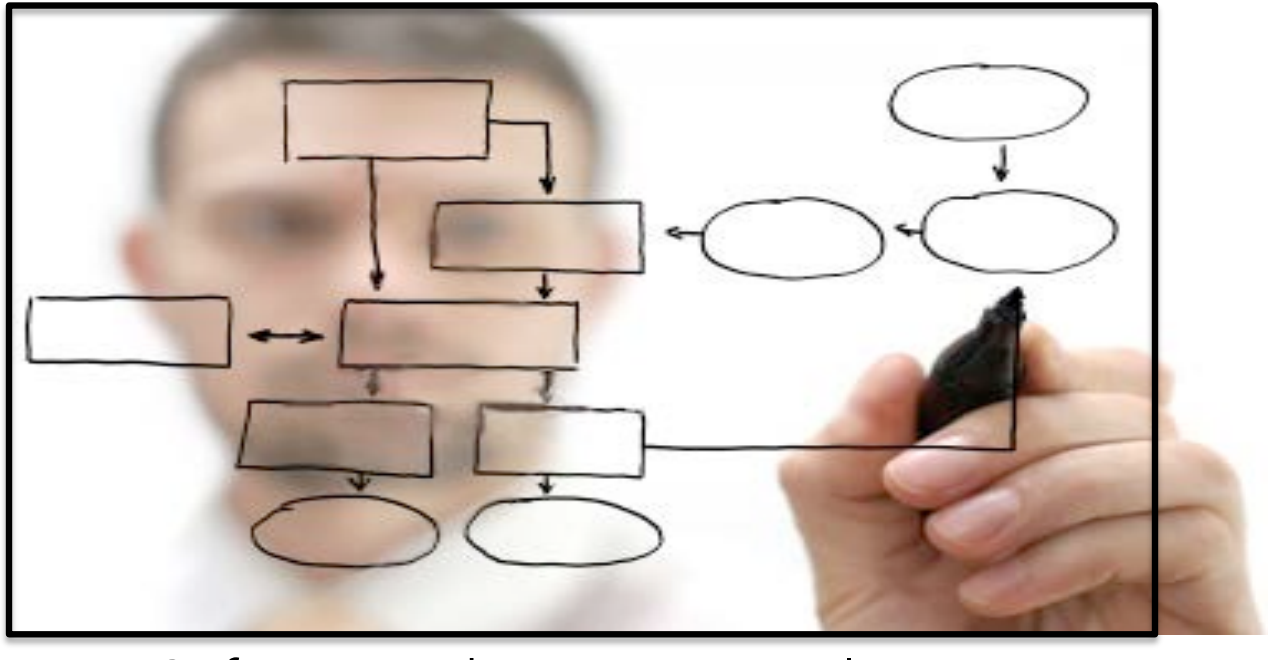
Software Architecture

Detailed design can be performed later by individual development teams.



Software Architecture

System



Software architecture is simliar …

Software Architecture

- Architecture is involved with the higher level of description structures and interactions in a system.
- It is concerned with **decision making** about the skeleton of the system, involving not only its functional but also its organizational, technical and quality attributes.

Software Architecture Defined

*"The software architecture of a system is the **set of structures** needed to reason about the system, which comprise **software elements**, **relations** among them, and **properties** of both."*

Len Bass, Paul Clements, and Rick Kazman.
Software Architecture in Practice (3rd ed.). Addison-Wesley Professional, 2012.

Let's analyze this definition

Software Architecture Defined

"The software architecture of a system is the ***set of structures*** *needed to* ***reason about the system****, which comprise* ***software elements****,* ***relations*** *among them, and* ***properties*** *of both."*

Len Bass, Paul Clements, and Rick Kazman.
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Software Architecture Defined

*"The software architecture of a system is the **set of structures** needed to reason about the system, which comprise **software elements**, **relations** among them, and **properties** of both."*

There are several possible types of software elements:
E.g. subsystems, modules, layers, processes, services,...

Software Architecture Defined

*"The software architecture of a system is the **set of structures** needed to reason about the system, which comprise **software elements**, **relations** among them, and **properties** of both."*

There are several possible types of relations:
E.g., RMI, http, https, broadcast, multicast, ...

Software Architecture Defined

*"The software architecture of a system is the **set of structures** needed to reason about the system, which comprise **software elements**, **relations** among them, and **properties** of both."*

Example:

Software Element: server module.

Properties: # of concurrent connections, average response time, availability rate, ...

Software Architecture Defined

*"The software architecture of a system is the **set of structures** needed to reason about the system, which comprise **software elements**, **relations** among them, and **properties** of both."*

Example:

Relation: bus component

Properties: # of supported connection, type (e.g., serial or parallel), ...

Outline

1. Software Architecture Defined
2. Architectural Structures
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Architectural Structures

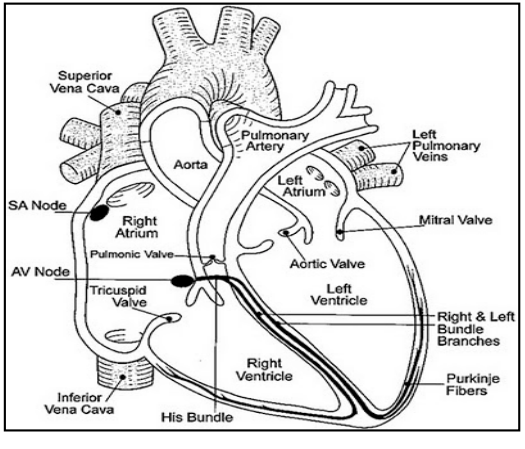
"The software architecture of a system is the ***set of structures*** *needed to* ***reason about the system****, which comprise* ***software elements****,* ***relations*** *among them, and* ***properties*** *of both."*

- There are various types of structures.
- These structures occur in different moments (execution time, development time, deployment time).

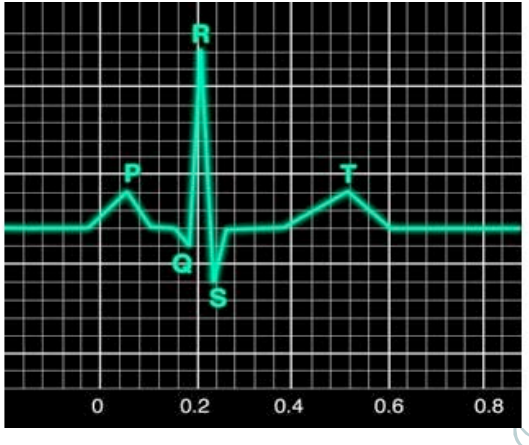
Structures and Perspectives

Lets revise this analogy …

Human body comprised of multiple real structures



A **static view** of one human structure



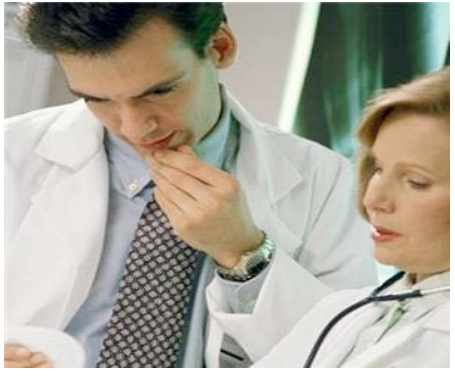
A **dynamic view** of the same structure

Structures and Perspectives

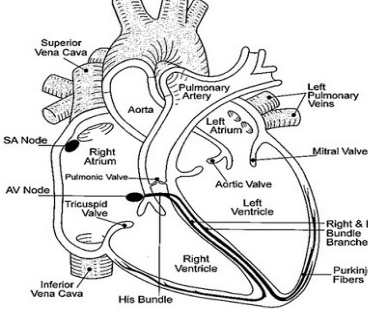
Different stakeholders have different perspectives of the system and are interested in different structures.

Structures and Perspective

These views are needed by the cardiologist



… but will these views work for the orthopedist?



Structures and Perspective

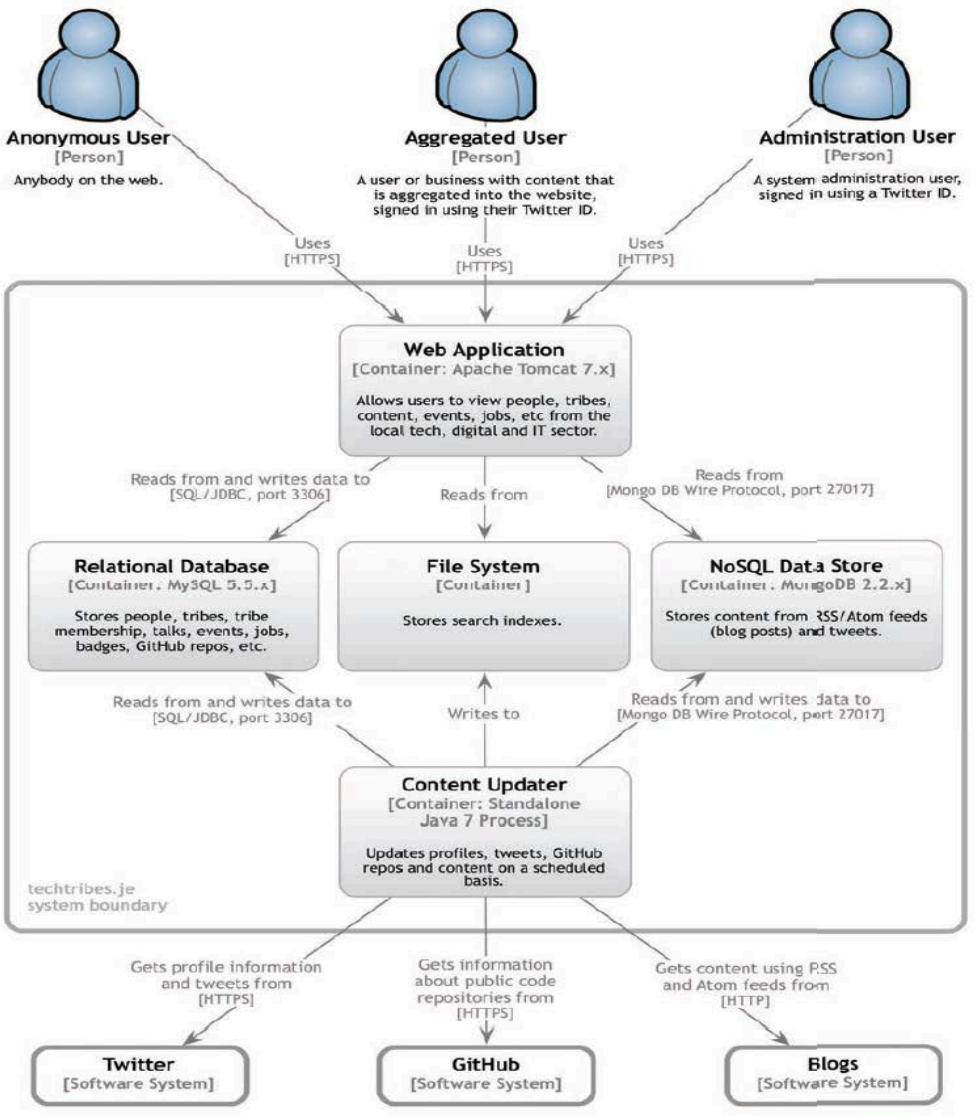
- Different stakeholders have different perspectives of the system and are interested in different structures.
- **Views** must represent the structures that the stakeholders are interested in.

¿What are these views?

Structures and Perspective

Static, Module, Logic View

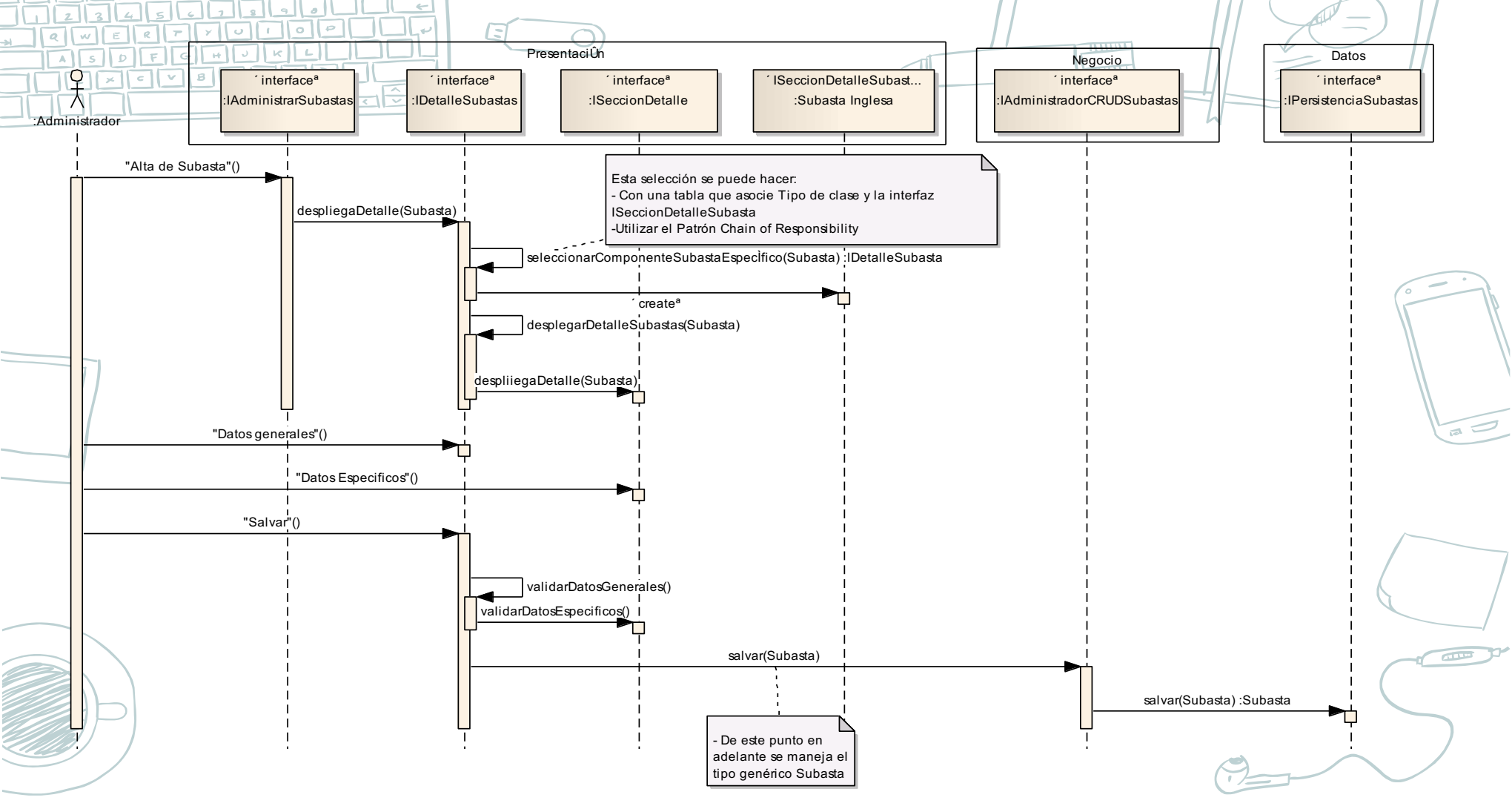
Structures with elements and relationships that exist in development and correspond to implementation units.


Anonymous User
[Person]
Anybody on the web.
Aggregated User
[Person]
A user or business with content that is aggregated into the website, signed in using their Twitter ID.
Administration User
[Person]
A system administration user, signed in using a Twitter ID.
Uses [HTTPS]
Uses [HTTPS]
Uses [HTTPS]
Web Application
[Container: Apache Tomcat 7.x]
Allows users to view people, tribes, content, events, jobs, etc from the local tech, digital and IT sector.
Reads from and writes data to [SQL/JDBC, port 3306]
Reads from
Reads from [Mongo DB Wire Protocol, port 27017]
Relational Database
[Container: MySQL 5.5.x]
Stores people, tribes, tribe membership, talks, events, jobs, badges, GitHub repos, etc.
File System
[Container]
Stores search indexes.
NoSQL Data Store
[Container: MongoDB 2.2.x]
Stores content from RSS/Atom feeds (blog posts) and tweets.
Reads from and writes data to [SQL/JDBC, port 3306]
Writes to
Reads from and writes data to [Mongo DB Wire Protocol, port 27017]
Content Updater
[Container: Standalone Java 7 Process]
Updates profiles, tweets, GitHub repos and content on a scheduled basis.
techtribes.je
system boundary
Gets profile information and tweets from [HTTPS]
Gets information about public code repositories from [HTTPS]
Gets content using RSS and Atom feeds from [HTTP]
Twitter
[Software System]
GitHub
[Software System]
Blogs
[Software System]

Structures and Perspective

Dynamic, Components & Connectors View

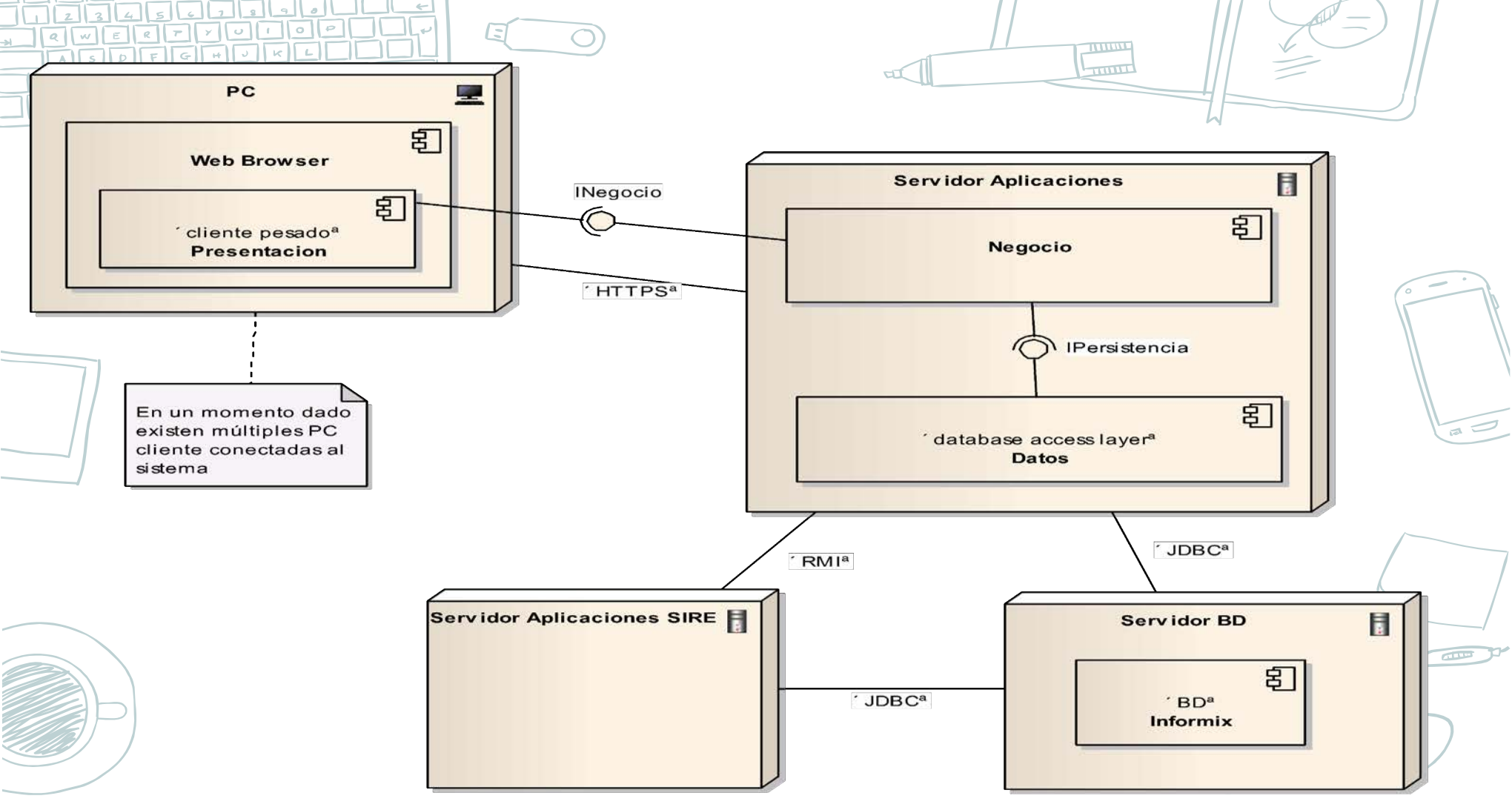
Structures with elements and relationships that exist in execution time.


PresentaciÛn
Negocio
Datos
:Administrador
´interfaceª
:IAdministrarSubastas
´interfaceª
:IDetalleSubastas
´interfaceª
:ISeccionDetalle
´ISeccionDetalleSubast...
:Subasta Inglesa
´interfaceª
:IAdministradorCRUDSubastas
´interfaceª
:IPersistenciaSubastas
"Alta de Subasta"()
despliegaDetalle(Subasta)
Esta selección se puede hacer:
- Con una tabla que asocie Tipo de clase y la interfaz ISeccionDetalleSubasta
-Utilizar el Patrón Chain of Responsibility
seleccionarComponenteSubastaEspecÍfico(Subasta) :IDetalleSubasta
´createª
desplegarDetalleSubastas(Subasta)
despliegaDetalle(Subasta)
"Datos generales"()
"Datos Especificos"()
"Salvar"()
validarDatosGenerales()
validarDatosEspecificos()
salvar(Subasta)
salvar(Subasta) :Subasta
- De este punto en adelante se maneja el tipo genérico Subasta

Structures and Perspective

Physical, Allocation View

Structures with elements and relationships that exist in deployment time.


PC
Web Browser
´cliente pesado´
Presentacion
INegocio
´HTTPS´
Servidor Aplicaciones
Negocio
IPersistencia
´database access layer´
Datos
En un momento dado existen múltiples PC cliente conectadas al sistema
´RMI´
´JDBC´
Servidor Aplicaciones SIRE
´JDBC´
Servidor BD
´BD´
Informix

Outline

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Why do we expend resources in this project?

Business Goals

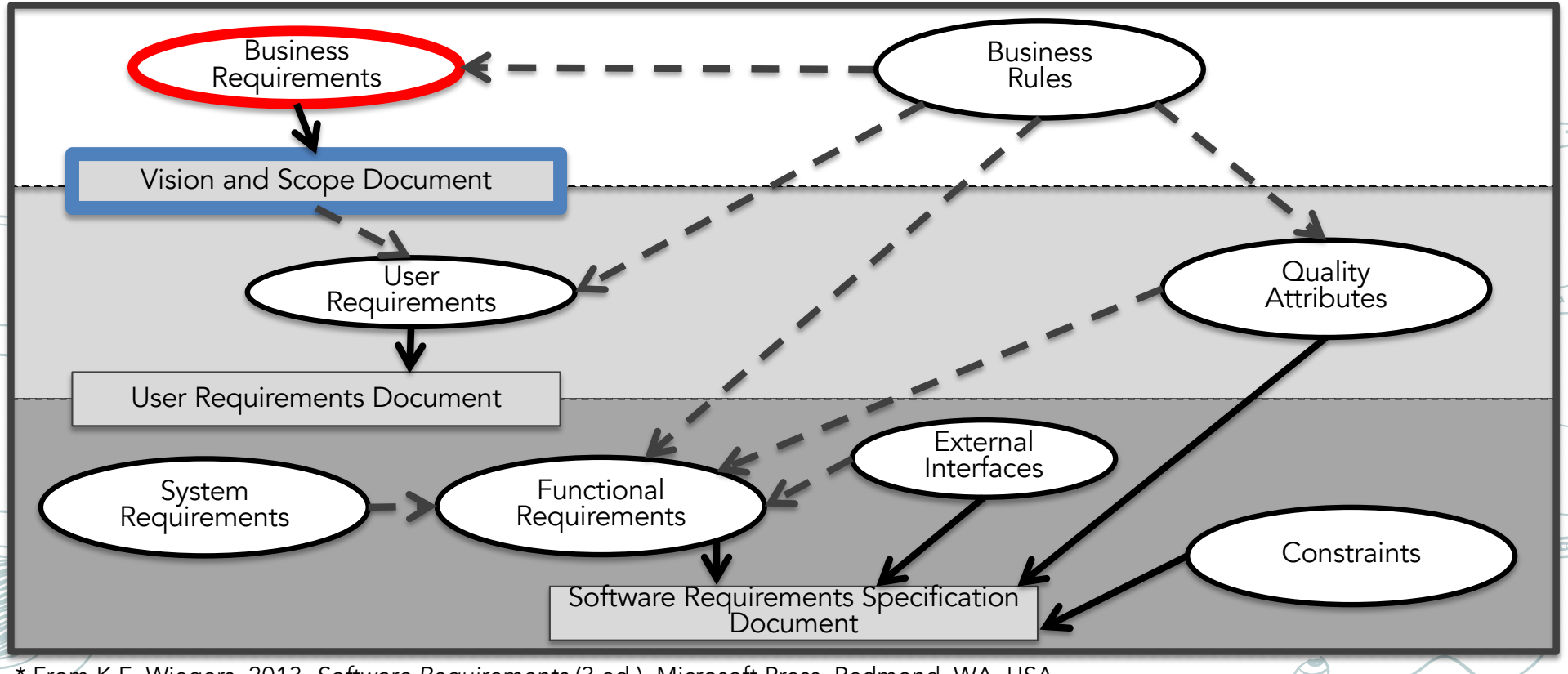
- A.k.a. Business objectives
- When you want to develop a software system, **you must first identify the business goals** to be achieved in the system.
- They are the foundation on which software systems are justified, analyzed, and built.

Business Goals

Examples of business objectives include:

- Financial benefits
- Time enhancements
- Strategic / competitive positioning
- ….

Requirements Types



* From K.E. Wiegers. 2013. *Software Requirements* (3 ed.). Microsoft Press, Redmond, WA, USA.

Business Requirements

- Business requirements must be identified before specifying other requirements.
- Organizations should not initiate any software development project without a clear understanding of the value it will add to the business.
- Set measurable targets with business objectives, and then define success metrics that allow you to measure whether you are on track to meet those objectives.

Business Goals

Examples

- Increase the number of sales
- Increase customer satisfaction
- Reduce development costs
- Reduce process time

Are these good examples of business goals?

Business Goals

Examples

- Expand the company sales to new markets

  by 20% regarding last year.

- Increase customer satisfaction

  Reduce bug fixing time to 4 hours

- Reduce development costs

  by 20% regarding last year.

- Reduce process time

  Reduce process time to .5 min per transaction

Business Goals

- Business goals are the *raison d'être* of a system.
- The architect should be clear about these goals before beginning the system design process ...

  … because particular characteristics of the software architecture help to achieve business goals.

Architectural Requirements

- (Often) These system characteristics correspond to architectural requirements (a.k.a. architectural drivers/requirements).
- Architectural requirements should drive design decisions.

Relevance of Software Architecture

- Business goal:
  Expand the company sales to new markets
- Software architecture characteristics:
  Web, Internationalization, …
- Design decision related:
  To choose a web development framework that allows easy language configuration …

Another example?

Business Goals

Architecture is a "bridge" between the business objectives of the system and the system itself.

Business Goals

Architecture is a "bridge" between the business objectives of the system and the system itself.

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Relevance of Software Architecture

Software architecture is important for a wide variety of technical and nontechnical reasons:

1. An architecture will inhibit or enable a system's driving quality attributes (e.g. security, performance).
2. The decisions made in an architecture allow you to reason about and manage change as the system evolves.
3. The analysis of an architecture enables early prediction of a system's qualities.

Relevance of Software Architecture

4. A documented architecture enhances communication among stakeholders.
5. The architecture is a carrier of the earliest and hence most fundamental, hardest-to-change design decisions.
6. An architecture defines a set of constraints on subsequent implementation.
7. The architecture dictates the structure of an organization, or vice versa.
8. An architecture can provide the basis for evolutionary prototyping.

Relevance of Software Architecture

10. An architecture can be created as a transferable, reusable model that forms the heart of a product line.
11. Architecture-based development focuses attention on the assembly of components, rather than simply on their creation.
12. An architecture channels the creativity of developers, reducing design and system complexity.
13. An architecture can be the foundation for training of a new team member.

Voting/Discussion

Analyse the list of thirteen points discussed before.

a) Choose the points that could promote the use of architecture in your projects/organization. Why you choose them?

a) For the not chosen points take a contrarian position. Propose a set of circumstances under which architecture is not necessary to achieve the result indicated.

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Summary

- Software Architecture Defined
- Architectural Structures
- Business Goals
- Relevance of Software Architecture

Questions?
Comments?