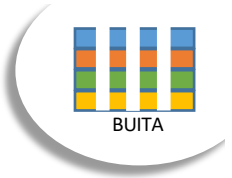


IT-architecture and user driven software design (BUITA)

The software architect

6. September 2018

Magnus RP Hansen

About me

- Research into user's changing expectations
- Practice oriented research
- Focus on designing usable artefacts
- Love to teach:
  - Organizational Systems Development
  - Project Management
  - Process Improvement
  - Pratice-based evaluation of technology

"Love to learn from those I teach"

Role of the architect

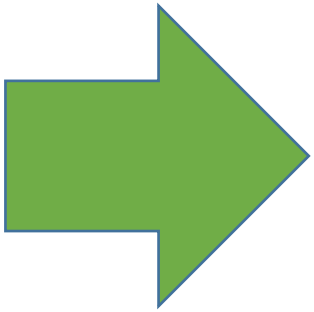
Architectural concepts

Status on groups and projects

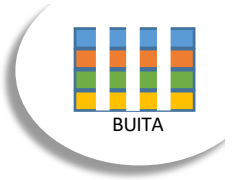
Learning goals

- Know the role and the work process of a software and systems architect
- Know the core concepts of software and systems architecture such as *architecture, candidate architecture, elements, stakeholders, viewpoints, perspectives and architecture description*
- Be able to discuss and reflect on strengths and limitations of the above mentioned concepts

Course book: Software Systems Architecture

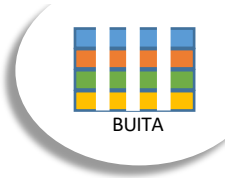


- Part I: fundamentals (ch. 2-5)
- Part II: the process of software architecture (ch. 6-14)
- Part III: the viewpoint catalog (ch. 15-23)
- Part IV: the perspective catalog (ch. 24-29)
- Part V: putting it all together (ch. 30)

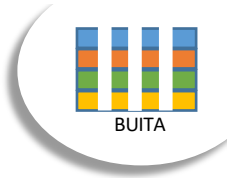


Role of the software architect

Engage organisational change as a system architect



- Defining the project and scope
- Engaging stakeholders in the organisation
- Building understanding between multiple stakeholders (e.g.):
  - Top management, middle management, users and developers
  - Sales people, business analysts, and technical operations
  - Network architecture, database management, software suites and graphical user interface design
  - Being the design authority, team manager and tester of the new architecture



The architect's role

- Identify and engage stakeholders
- Understand and capture stakeholders' concerns
- Create and take ownership of the definition of an architecture
- Take a leading role in the realization of the architecture

Architecture definition
problem space – solution space

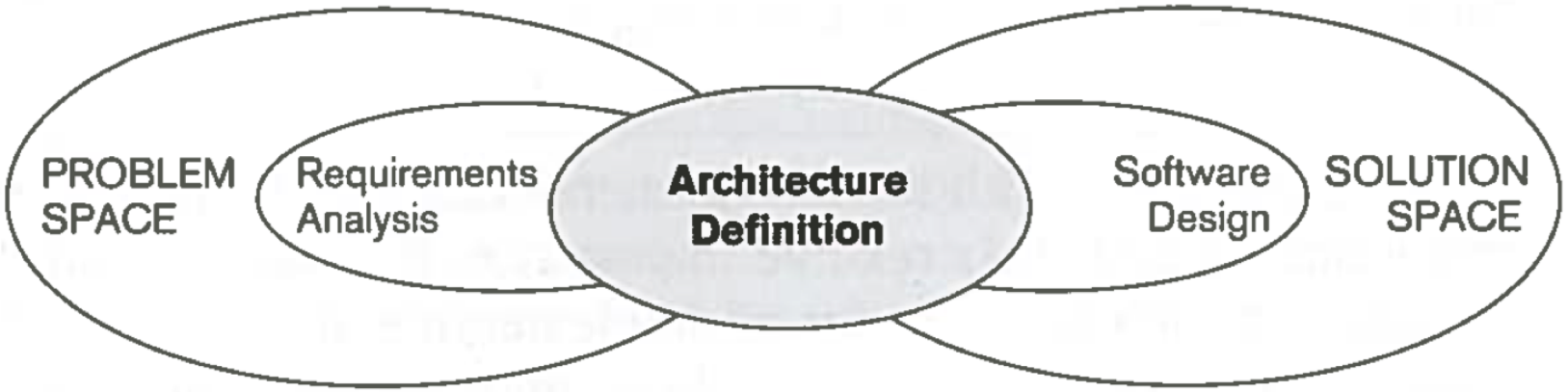


FIGURE 5–1 ARCHITECTURE DEFINITION, REQUIREMENTS ANALYSIS, AND SOFTWARE DESIGN

The architect's involvement

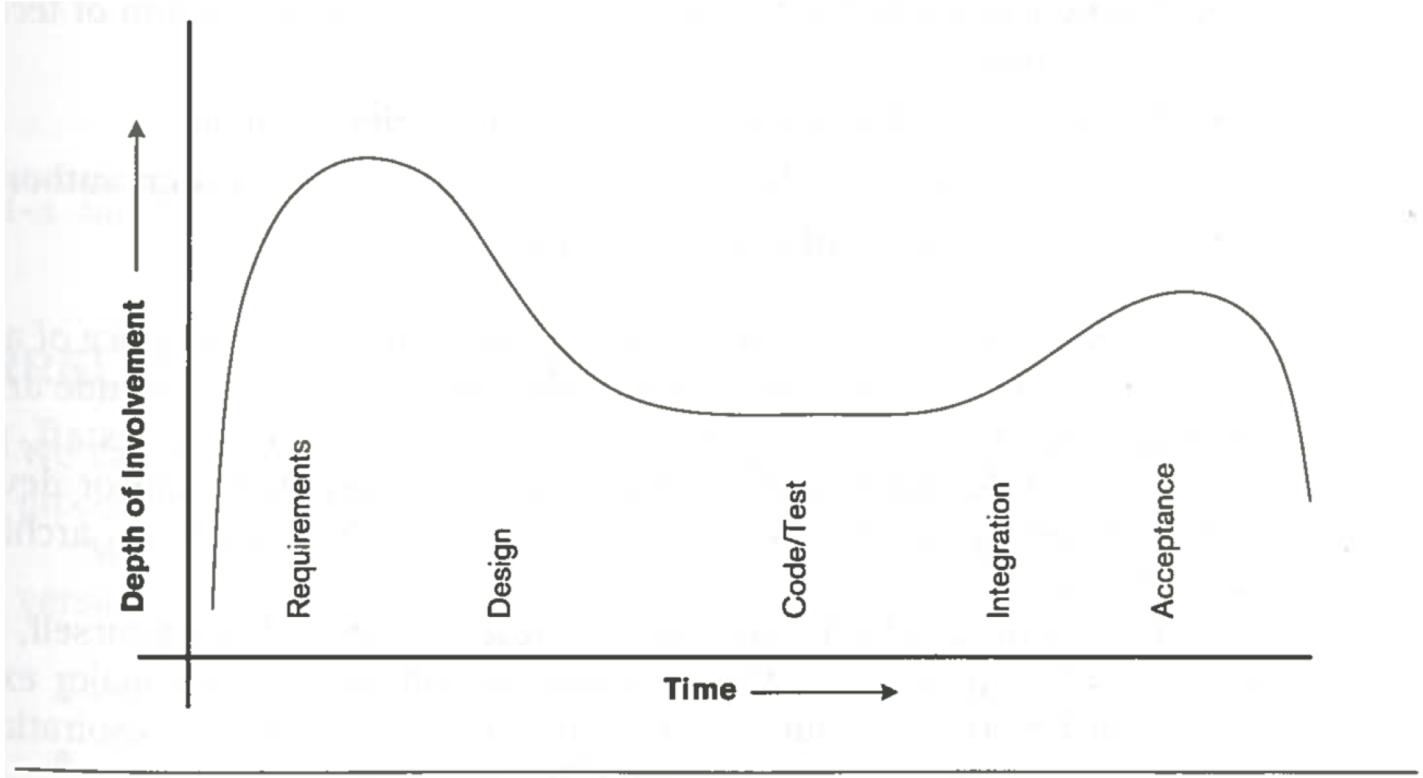


FIGURE 5–2 THE ARCHITECT'S INVOLVEMENT

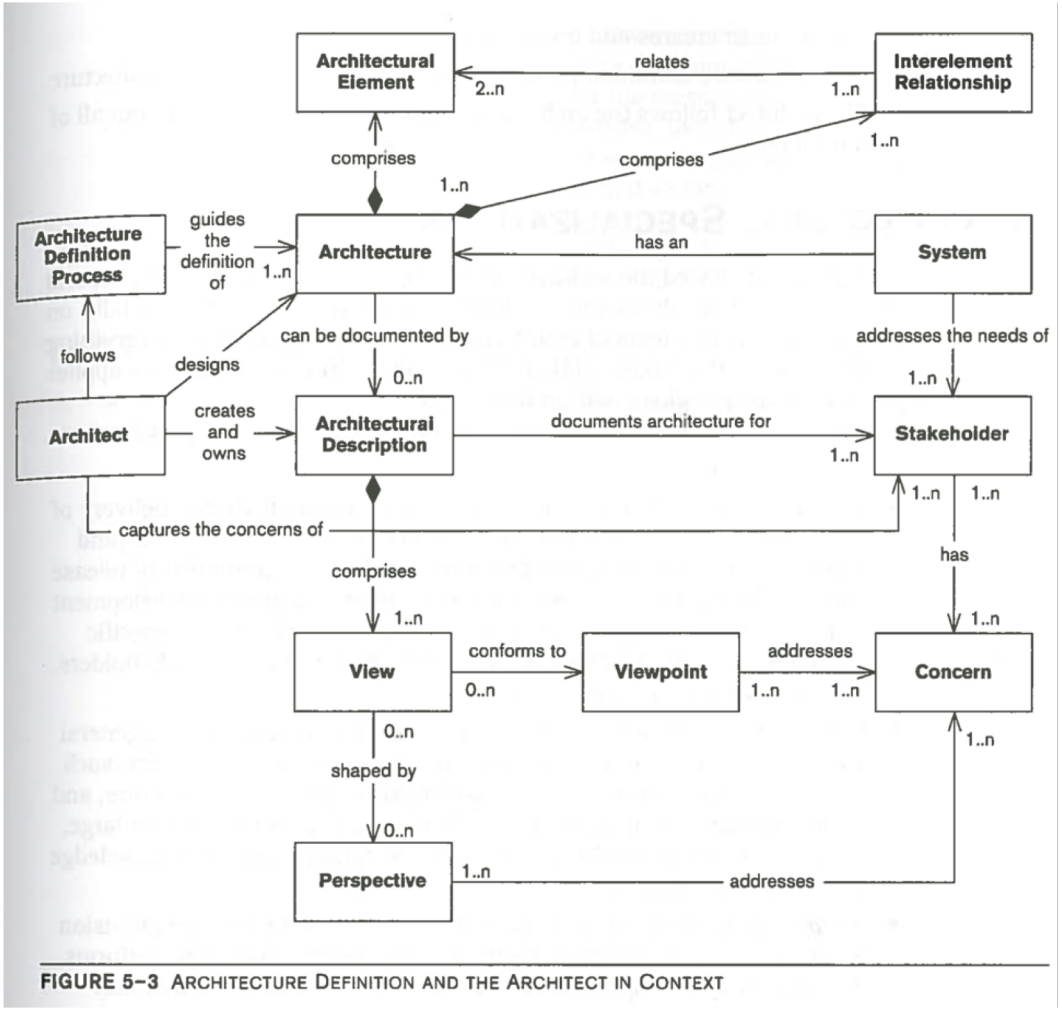


FIGURE 5–3 ARCHITECTURE DEFINITION AND THE ARCHITECT IN CONTEXT

Architectural concepts

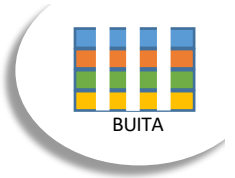
Architectural concepts

DEFINITION The **architecture** of a system is the set of fundamental concepts or properties of the system in its environment, embodied in its elements, relationships, and the principles of its design and evolution.

The elements that constitute a system and the relationships between them define the structure of the system that contains them. There are two types of structures that are of interest to the software architect: *static structure* (organization of design-time elements) and *dynamic structure* (organization of runtime elements).

DEFINITION The **static structures** of a system define its internal design-time elements and their arrangement.

DEFINITION The **dynamic structures** of a system define its runtime elements and their interactions.



The fundamental properties of a system manifest themselves in two different ways: *externally visible behavior* (what the system does) and *quality properties* (how the system does it).

DEFINITION The **externally visible behavior** of a system defines the functional interactions between the system and its environment.

DEFINITION A **quality property** is an externally visible, nonfunctional property of a system such as performance, security, or scalability.

DEFINITION An **architectural element** (or just element) is a fundamental piece from which a system can be considered to be constructed

Key attributes

- Defined set of responsibilities
- Defined boundary
- Defined interfaces

E.g. A database server, the .NET framework

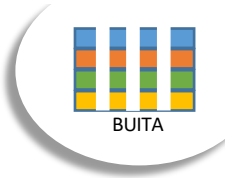
(Allows the system to be more easily understood and encourages extensions to be made in a consistent way)

DEFINITION A **candidate architecture** for a system is a particular arrangement of static and dynamic structures that has the potential to exhibit the system's required externally visible behaviors and quality properties.

Exercise - architectures

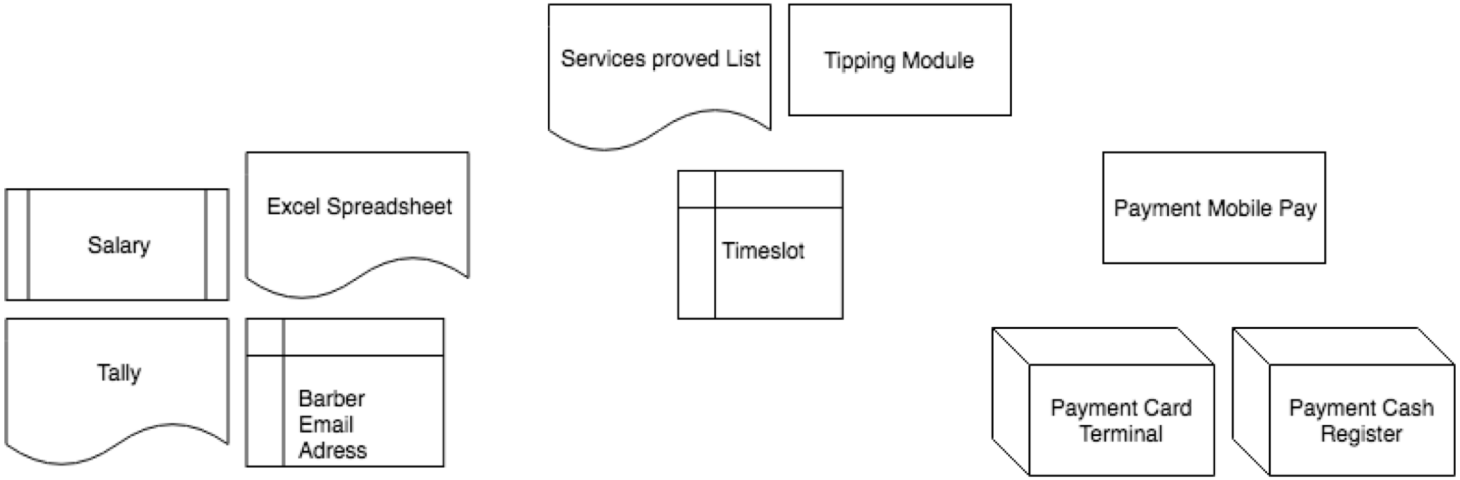
1. In small groups, compare the two architectures for the airline booking system (figure 2.2 and figure 2.3 at p. 17 and p. 18)
2. Explain advantages and disadvantages of each architecture for selected quality properties

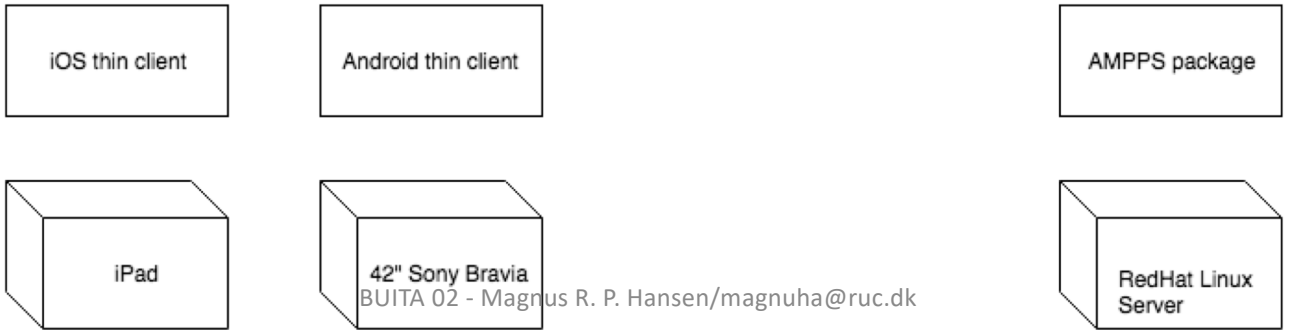
Exercise – identifying elements of the architecture

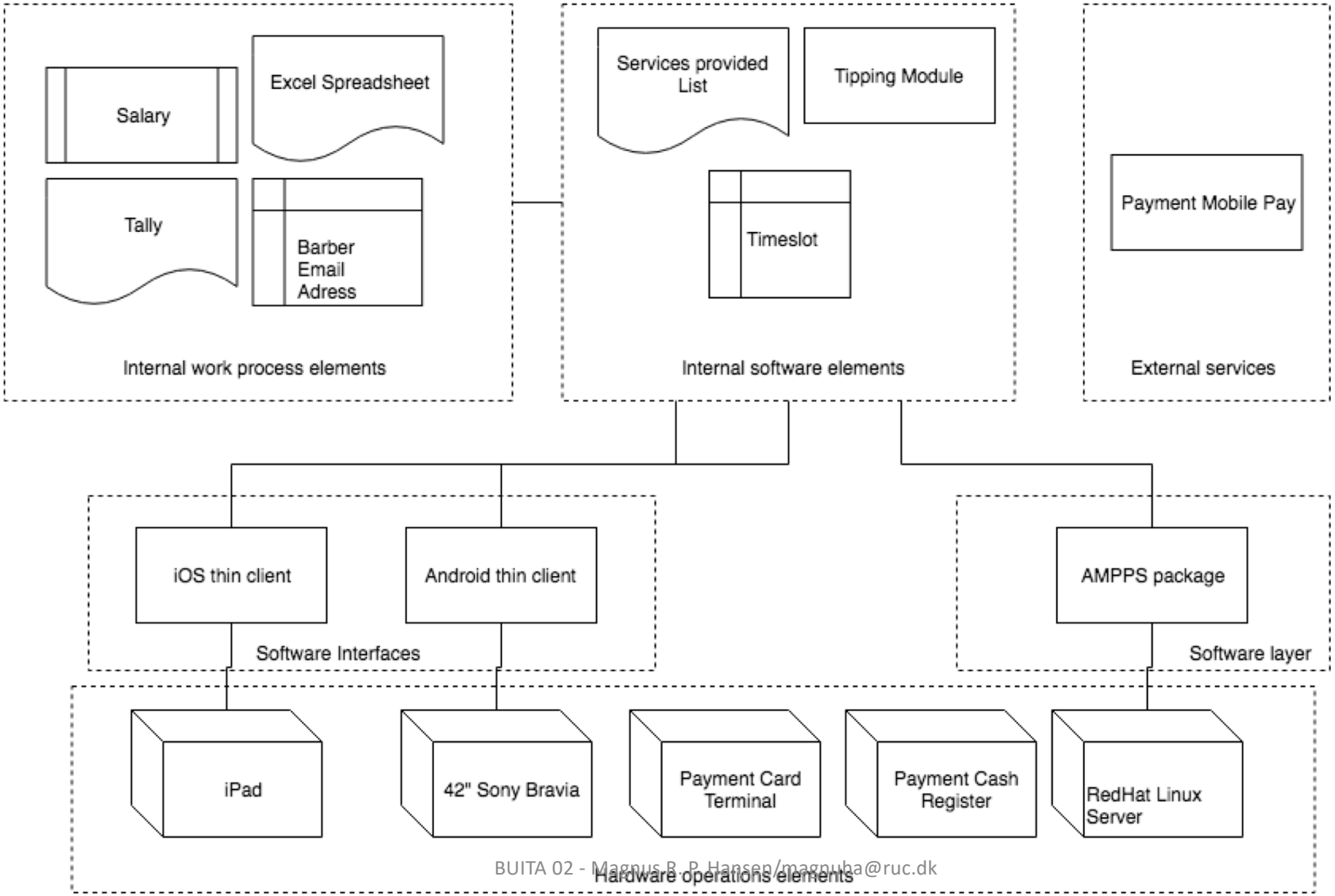


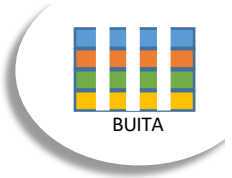
- In small groups, read through the CUT N MOVE description
- Identify *static elements* and type out the various architecture elements used for this **on post-its**
- Identify relationships between them
- Try to group the elements
- Where do you need more information?


iOS thin client
Android thin client
RedHat Linux Server
iPad
42" Sony Bravia
AMPPS package
Service list
Tipping Module
Services Provided List
Payment Cash Register
Payment Mobile Pay
Payment Card Terminal
Salary
Tally
Excel Spreadsheet
Barber Email Adresses


Services proved List
Tipping Module
Salary
Excel Spreadsheet
Timeslot
Payment Mobile Pay
Tally
Barber
Email
Adress
Payment Card
Terminal
Payment Cash
Register


iOS thin client
Android thin client
AMPPS package
iPad
42" Sony Bravia
RedHat Linux
Server

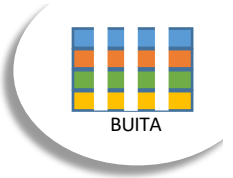

Salary
Excel Spreadsheet
Tally
Barber
Email
Adress
Internal work process elements
Services provided List
Tipping Module
Timeslot
Internal software elements
Payment Mobile Pay
External services
iOS thin client
Android thin client
Software Interfaces
AMPPS package
Software layer
iPad
42" Sony Bravia
Payment Card Terminal
Payment Cash Register
RedHat Linux Server
Hardware operations elements



Stakeholders

- A person (or a group of persons) with something ***at stake***
  - ***stake, interest, concern***
  - ***users, developers, testers, maintainers, sponsors, suppliers/contractors, QA***

- Users – at many levels
  - Management user
  - Daily user, end-user
  - Indirect user



DEFINITION A **stakeholder** in the architecture of a system is an individual, team, organization, or classes thereof, having an interest in the realization of the system.

DEFINITION A **concern** about an architecture is a requirement, an objective, a constraint, an intention, or an aspiration a stakeholder has for that architecture.

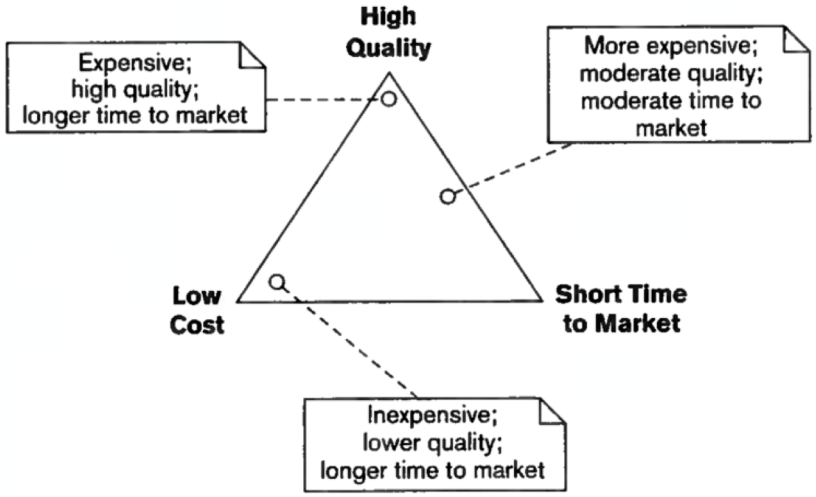
Specifying the architecture is a key opportunity for the stakeholders to direct its shape and direction. You will find, however, that some stakeholders are more interested in their roles than others, for a variety of reasons that have little to do with architecture. Part of your role, therefore, is to engage and galvanize, to persuade people of the importance of their involvement, and to obtain their commitment to the task.

Exercise - stakeholders and *dynamic* elements

1. In small groups, read through the CUT N MOVE description
2. Extrapolate/speculate on possible stakeholders
3. Identify *dynamic* elements
4. Identify concerns for the top three stakeholders

PRINCIPLE Architectures are created solely to meet stakeholder needs.

PRINCIPLE A good architecture is one that successfully addresses the concerns of its stakeholders and, when those concerns are in conflict, balances them in a way that is acceptable to the stakeholders.



THE QUALITY TRIANGLE

PRINCIPLE A good architectural description is one that effectively and consistently communicates the key aspects of the architecture to the appropriate stakeholders.

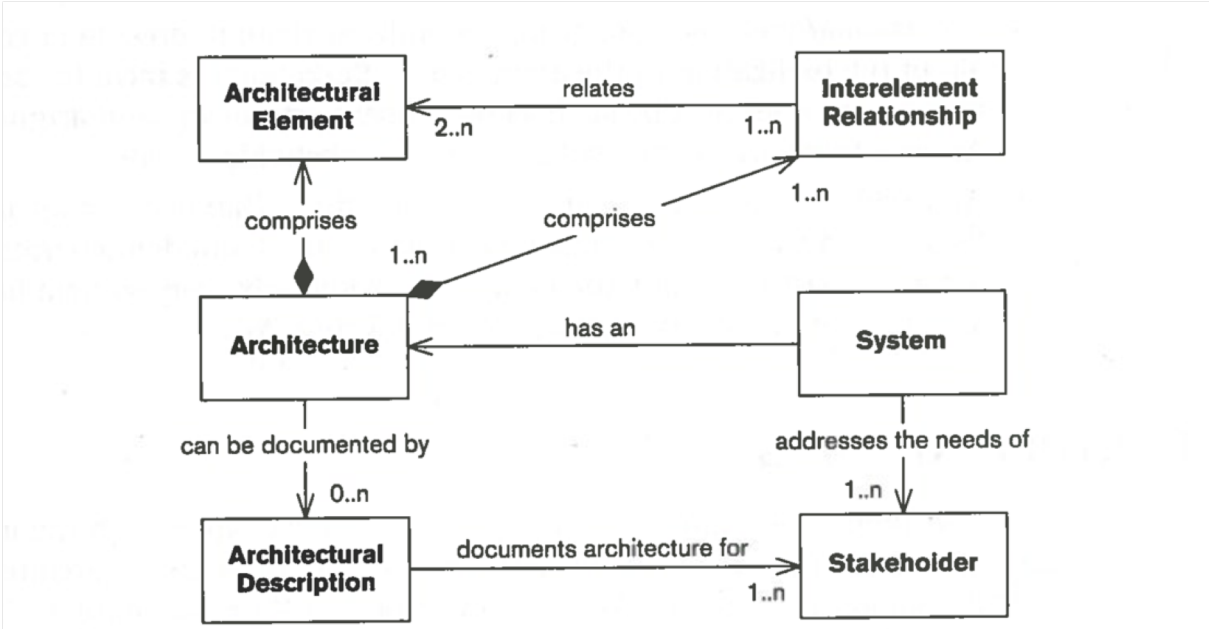


FIGURE 2–5 CORE CONCEPT RELATIONSHIPS

Viewpoints and views

PRINCIPLE It is not possible to capture the functional features and quality properties of a complex system in a single comprehensible model that is understandable by, and of value to, its stakeholders.

A widely used approach – the only successful one we have found – is to attack the problem from different directions simultaneously … the AD is partitioned into a number of separate but interrelated views, each of which describes a separate aspect of the architecture (p. 33)

Viewpoints and views

DEFINITION A **viewpoint** is a collection of patterns, templates, and conventions for constructing one type of view. It defines the stakeholders whose concerns are reflected in the viewpoint and the guidelines, principles, and template models for constructing its views.

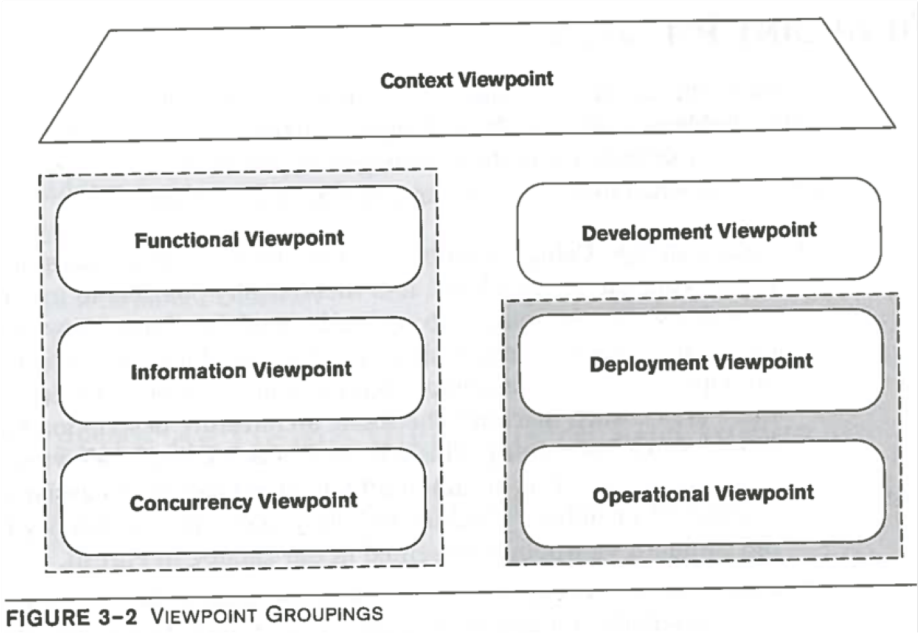


FIGURE 3–2 VIEWPOINT GROUPINGS

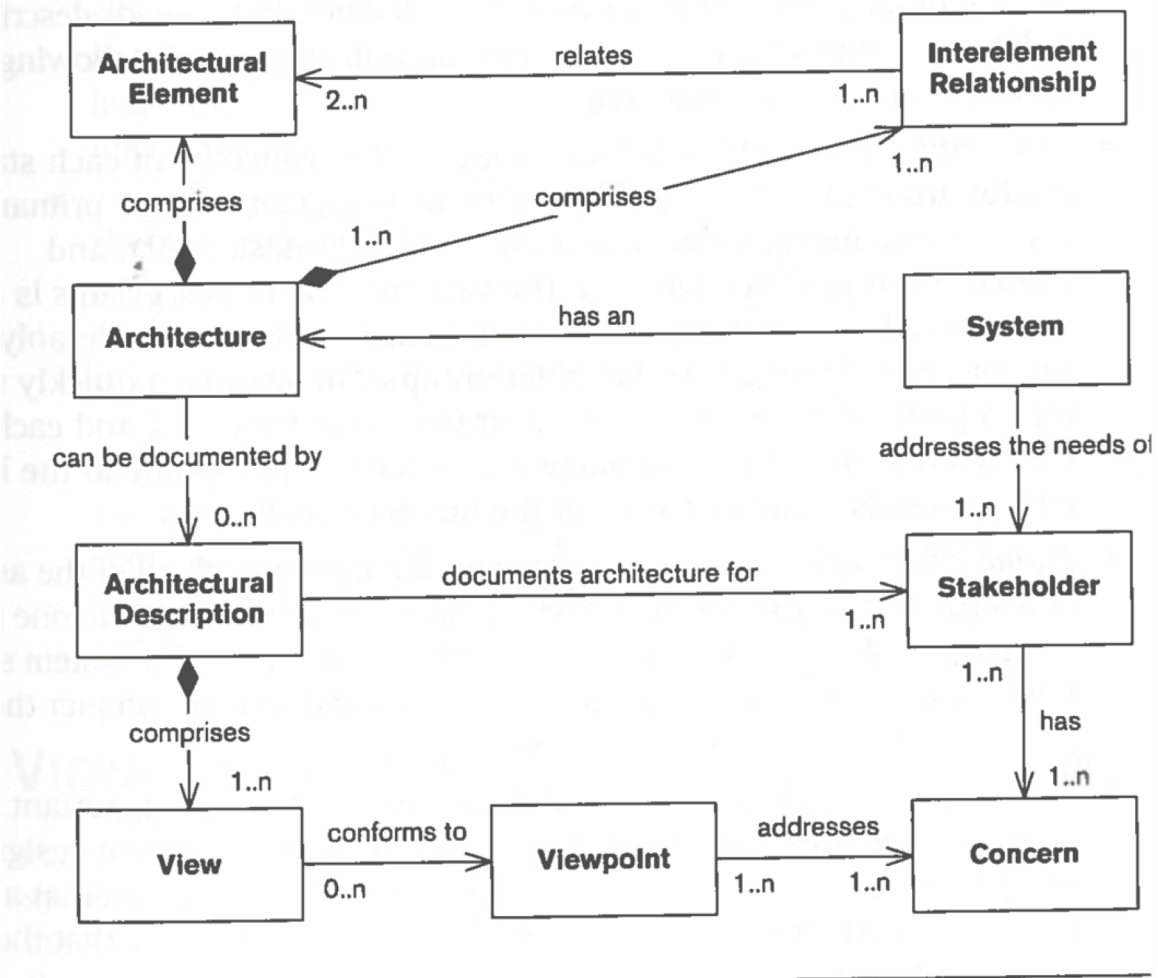
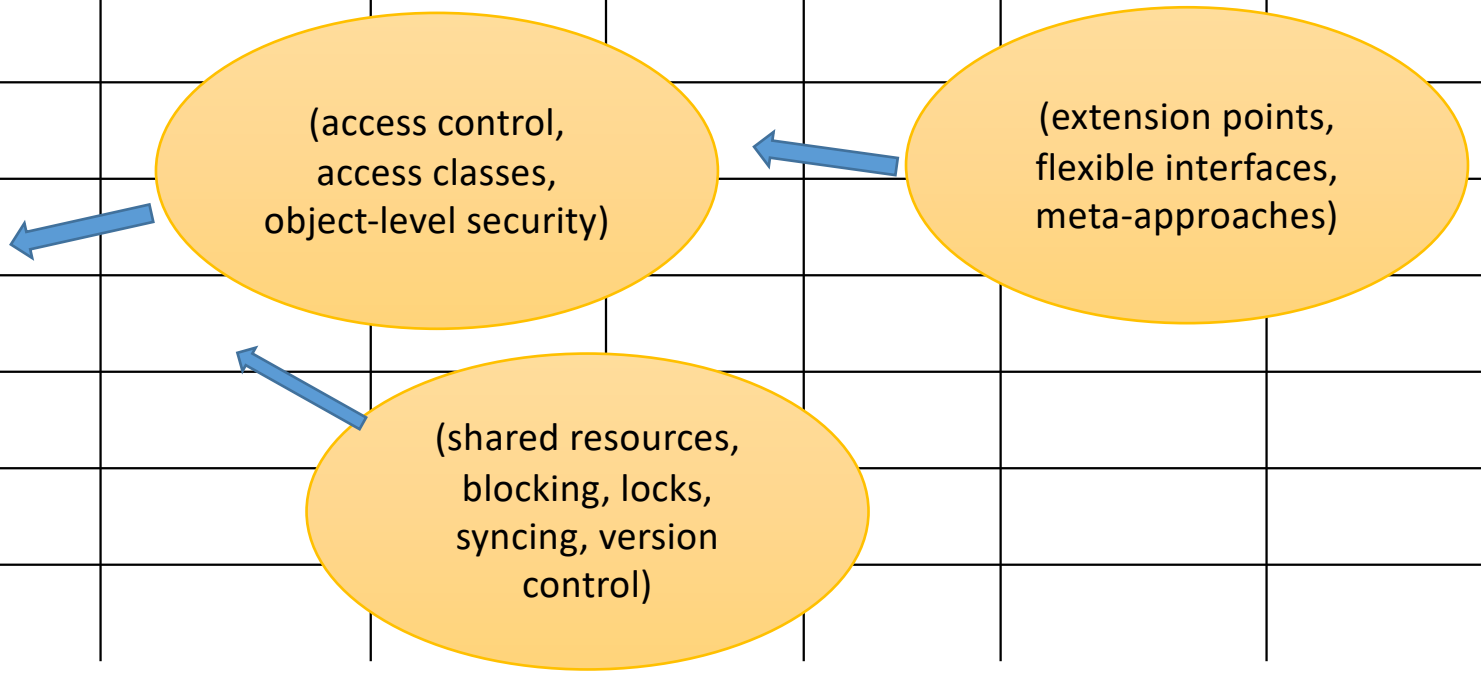


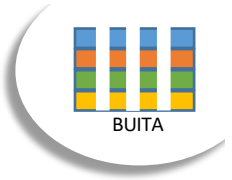
FIGURE 3–1 VIEWS AND VIEWPOINTS IN CONTEXT

Viewpoints and perspectives

Perspectives/ Viewpoints	Security	Performance+ Scalability	Availability Resilience	Evolution	Location	Development resouce	Internalization
Context							
Functional							
Information							
Concurrency							
Development							
Deployment							
Operational							



Exercise – choosing viewpoints for different types of systems



- Discuss Table 3.2 (p. 42) with your neighbor(s)
- See if you can identify relevant viewpoints and/or perspectives based on the InfoScreen case!

Learning goals

- Know the role and the work process of a software and systems architect
- Know the core concepts of software and systems architecture such as *architecture, candidate architecture, elements, stakeholders, viewpoints, perspectives and architecture description*
- Be able to discuss and reflect on strengths and limitations of the above mentioned concepts

Role of the architect

Architectural concepts

Status on groups and projects