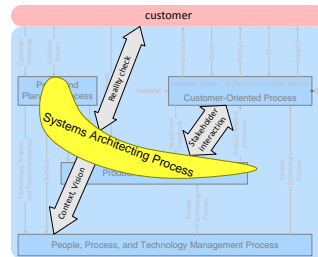# The System Architecture Process

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Gerrit Muller

USN-SE

Hasbergsvei 36 P.O. Box 235, NO-3603 Kongsberg Norway

gaudisite@gmail.com

This paper has been integrated in the book "Systems Architecting: A Business Perspective", `http://www.gaudisite.nl/SABP.html`, published by CRC Press in 2011.

Abstract

The System Architecture Process is positioned in the business context. This process bridges the gap between the Policy and Planning Process and the Product Creation Process.

The purpose of the System Architecture Process is to provide the Integral Technical overview and consistency, and to maintain the integrity over time. Subjective characteristics as elegance and simplicity are key elements of a good architecture.

The scope of the system architecture process is illustrated by showing 5 views used in a reference architecture, ranging from Customer Business to Realization.

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1   Introduction

This chapter positions the systems architecting process in a wider business scope. This positioning is intended to help understanding the process itself and the role of the system architect (or team of system architects).

We focus on systems architecting within organizations that create and build systems consisting of hardware and software. Although other product areas such as solution providers, services, courseware et cetera also need system architects, the process structure will deviate from the structure as presented here. See Intermezzo **??** for an elaboration of these other architecting models.

2   System Architecture in the Business Context

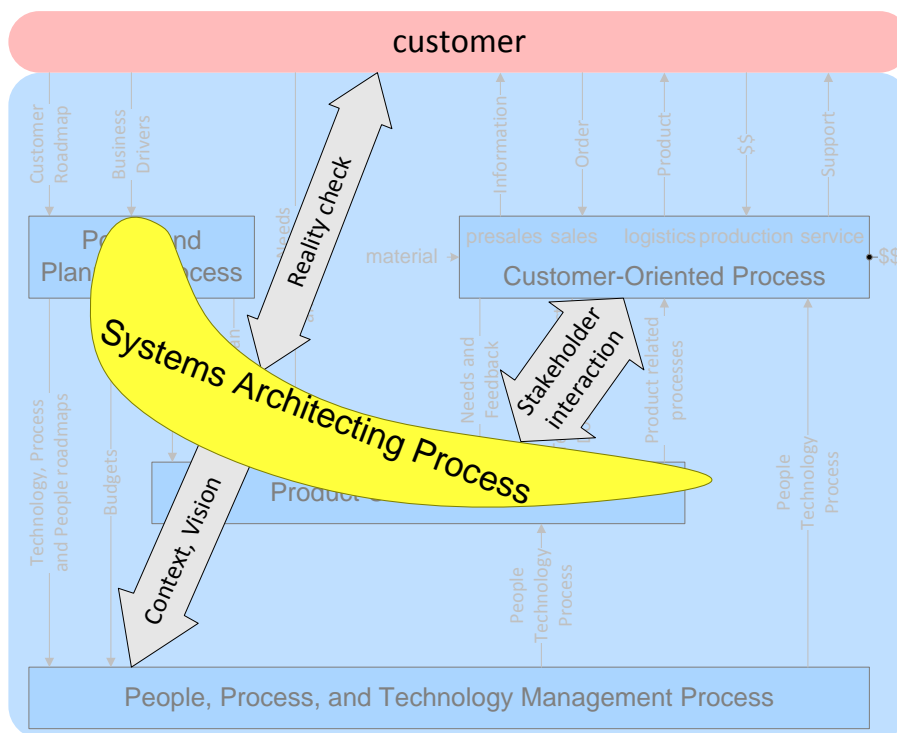Figure 1 shows the main activities of the System Architecting Process as an overlay over the business decomposition.

Figure 1: The main System Architecture activities in the Business Context

Processes are goal oriented, as discussed in Intermezzo **??**. The process decomposition is not orthogonal, several processes are overlapping. The System Archi-

tecting Process is a clear example of such non-orthogonality. Figure 2 shows a map of the System Architecture Process and neighboring processes. Many processes, such as manufacturing engineering, service engineering, have been left out of the map, although these processes also have a high architecture relevance.
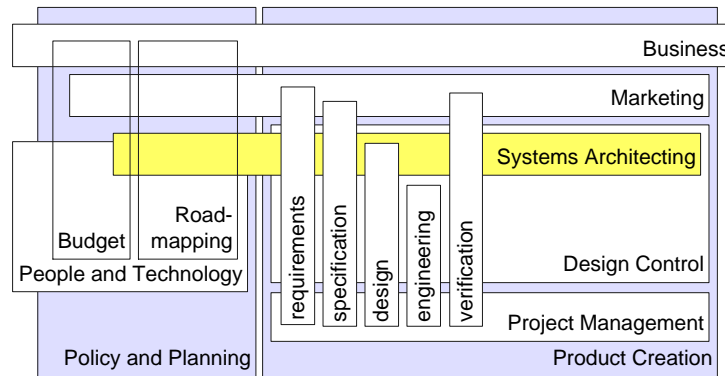

Figure 2: Map of the System Architecture Process and neighboring processes

Both figures make it clear that the System Architecting Process contributes heavily to the Product Creation Process, while it plays also an essential role in the Policy and Planning Process. Both contributions are strongly coupled, see figure 3
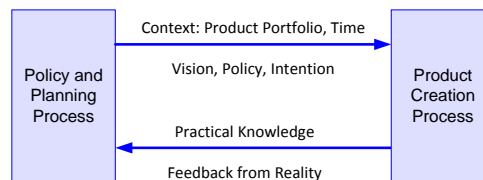

Figure 3: Contribution of System Architecting to the the Coupling of Policy and Planning Process and the Product Creation Process

The System Architecture Process bridges the gap between Product Creation Process and the Policy and Planning Process. In many organizations this link is missing. The absence of this link results in:

- re-inventing a (different) product positioning during the Product Creation Process, with a limited context view

- policies which are severely handicapped by a lack of practicality or realism

The overview created by the System Architecting Process also helps in establishing a technology policy.

3 Purpose of the System Architecting Process

Every business exceeding a few people enables the efficient concurrent work of these people by dividing the tasks in smaller more specialized jobs, the *decomposition principle* in action. This decomposition of responsibilities requires an opposing force integrating the activities in a useful overall business result. Several integrating processes are active in parallel, such as project management, commercial management et cetera.

The System Architecting Process is responsible for:

- the Integral Technical aspects of the Product Creation Process, from requirement to deployment.

- the Integral Technical Vision and Synergy in the Policy and Planning Process.

The System Architecting Process is striving for an optimal overall business result, by creating and maintaining the key issues, such as a balanced and consistent design, selection of the least complex solution, and satisfaction of the stakeholders.

The System Architecture Process is balancing amongst others:

- External and internal requirements

- Short term needs and long term interests

- Efforts and risks from requirements to verification

- Mutual influence of detailed designs

- Value and costs

Such a balance is obtained by making trade-offs, for example *performance* versus *qualities* versus *functionality*, or *synergy* versus *specific solution*

It is the purpose of the System Architecting Process to maintain the consistency throughout the entire system, from roadmap and requirement to implementation and verification. On top of this consistency the integrity in time must be ensured.

An enabling factor for an optimal result is *simplicity* of all technical aspects. Any unnecessary complexity is a risk for the final result and lowers the overall efficiency.

4 The System Architect as Process Owner

The owner of the System Architecting Process is the System Architect or the System Architecting Team. Many other people are involved in the System Architecting Process.

The system architect or the team members spent the majority of their time, about 80%, in the Product Creation Process. From the remaining time the majority

is spent in the Policy and Planning Process. In 2 it is explained that these processes are strongly coupled. This coupling is for a large part implemented by employing the same people in both processes. A small amount of time is spent in People, Process, and Technology Management.

5   System Architecting in Product Creation Context

The Systems Architecting Process is striving for consistency and balance from requirement to actual product.

The amount of people working in product creation can vary from a few to tens of thousands of people. All people working on the creation of a new product have only knowledge of a (small) subset of the information. Inconsistencies and local optimal solutions pop up all the time, caused by lack of knowledge of the broader context.

The Systems Architecting Process has to prevent this natural degradation of the system quality. Systems Architecting acts pro-active by clear and sharp requirements, specification and system design as well as reactive by following up the feedback from detailed design, implementation and test.

During the Product Creation Process many specification and design decisions are taken. Quite often these decisions are taken within the scope of that moment. Consecutive decisions can be in contradiction with previous decisions. For instance, a decision is taken to add memory to the product to increase performance, while one month later the amount of memory is decreased to lower the cost. The Systems Architecting Process maintains the integrity over time, by looking at decisions from a broader perspective.

6   Acknowledgements

References

[1] Gerrit Muller. The system architecture homepage. `http://www.gaudisite.nl/index.html`, 1999.

History

Version: 2.3, date: June 17, 2010 changed by: Gerrit Muller
- changed Architecture in Architecting
- integrated lists in the text
- textual updates
- removed the section reference architecture; CAFCR is explained better in other papers. Also the term reference architecture is used somewhat different in the Reference Architecture Primer.

Version: 2.2, date: April 9, 2002 changed by: Gerrit Muller
- minor changes only

Version: 2.1, date: December 18, 2001 changed by: Gerrit Muller
- minor changes only

Version: 2.0, date: February 13, 2001 changed by: Gerrit Muller
- added an abstract
- adapted to latest layout
- integrated the footnote in the section "Business Context" in the text
- made the table with "balance goals" and "trade-offs" more specific
- added annotations to the figure "Reference architecture"

Version: 1.0, date: March 17, 2000 changed by: Gerrit Muller
- Simplified the diagram of the system architecture in the business context
- visualized the relation between PPP and PCP
- added a section "Purpose of the System Architecture Process"
- updated the figure with concurrent system architecture activities

Version: 0, date: March 8, 2000 changed by: Gerrit Muller
- Created by taking the relevant sections of the article "Positioning the System Architecture Process" and adding more specific information to it.