

# Course Descriptions

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TBD

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## Abstract

This book bundles the course descriptions of courses based on the Gaudi systems architecting material. The courses address systems architecting, stakeholders and requirements engineering.

### **Distribution**

This article or presentation is written as part of the Gaudí project. The Gaudí project philosophy is to improve by obtaining frequent feedback. Frequent feedback is pursued by an open creation process. This document is published as intermediate or nearly mature version to get feedback. Further distribution is allowed as long as the document remains complete and unchanged.

All Gaudí documents are available at:  
<http://www.gaudisite.nl/>

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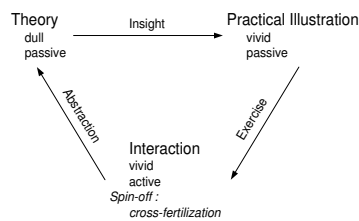
# Introduction

This book bundles the descriptions of courses based on the Gaudí material. The most up to date version of the course descriptions can always be found at [18]. The same information can be found here in presentation format and all the course material also.

The descriptions can be read as autonomous units.

# Chapter 1

## SARCH Course System Architecture



### 1.1 Course Goals

The goal of this course is to enable system architects to mature faster, by giving a wide overview. For non system architects the objective is to improve the cooperation between the system architect and other roles, such as project leader, marketing manager and technology manager.

### 1.2 Program

The program purposefully alternates process, business and technology views, see Figure 1.1. The timing of the program can be adapted to the amount of information and interaction that is needed per subject. However the alterations of subjects will be followed more strictly, because the change in viewpoint is essential for understanding the whole picture.

The structure of the course is shown in figure 4.2. In other words the theory of the course is that theory, illustration and interaction will alternate.

This alternation follows the general timing as presented in figure 2.3.

Session 1 Positioning the System Architecture Process, Product Creation Process
Session 2 Role and Task of the System Architect
Session 3 Requirements Capturing
Session 4 System Architect Toolkit
Session 5 Roadmapping
Session 6 Product Families, generic developments
Session 7 Documentation, reviewing and other supportive processes; The role of Software in complex products
Session 8 BoM presentation
Session 9 Psycho Social side
Session 10 Wrap up, Expectations, How to continue, Evaluation

Figure 1.1: Program of the course

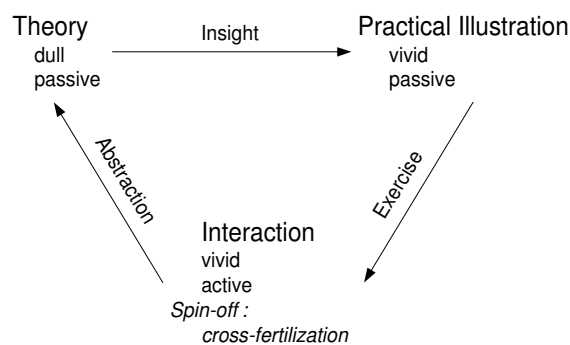


Figure 1.2: Alternation of theory, illustration and interaction will be used to maximize the educational effect

The first step is an interactive exploration of the subject. This exploration is followed by a "broadcast" lecture in which theory and illustration are given. The amount of illustration is "experimental", due to the Philips wide target group; Examples will be based on experience of the trainer, while it is hoped that during the interaction the attendants will bring forward illustrations from their own environment

The interaction is done in 2 steps: an interactive discussion with the entire class and a work session in smaller groups. The instruction for the group work is given during the interactive discussion.

The entire subject is closed by a short collective session with conclusions and evaluation.

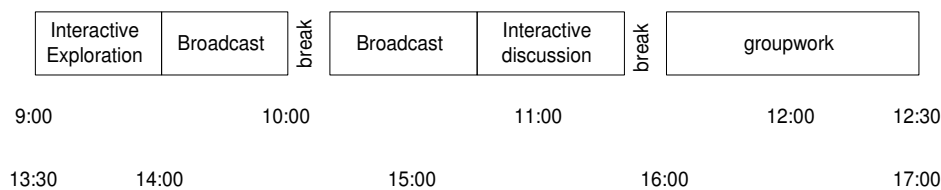


Figure 1.3: Timing per subject of the alternating theory, illustration and interaction

### 1.3 Rules during the course

The rules of the broadcast part are:

- Please write your questions/remarks/statements on yellow stickers and attach them at the end on the P-flip.  
*These will be used in the interactive section for discussion and to increase insight.*
- Short clarification questions are welcome,  
*discussion will take place in the interactive part.*
- Stupid questions don't exist. Learning is based on **safe** and **open** interaction.  
*Very individual oriented questions can be referred to a break or after the session.*

The rules of the interactive and the practice part are:

- Your contribution is essential.
- Don't monopolize the time, everyone also the quiet people should have the opportunity to contribute;  
*The facilitator will intervene if the contribution is limited to a small group of participants.*
- Respect the contribution of others;  
*Opinions can't be wrong, difference of opinion is normal and called pluri-formity.*
- The course format is highly experimental and based on improvisation, constructive proposals are welcome;  
*it is your course! Regular evaluations will give the opportunity to influence the rest of the course.*

## 1.4 Evaluations

Basic part of learning is the evaluation of what has been done. The course will use 3 types of evaluations:

- Personal expectations
- Benefit and Concerns on a regular base
- The CTT evaluation form

The personal expectations are recorded at the very beginning of the course. At the end we look back at these initial expectations. This has a two-way evaluation effect:

**Personal** Did you start with the right expectation level? Was it realistic? Did you achieve the learning goals formulated in this expectation?

**Trainer and CTT** Did we communicate the right information to enable people to select this course? Do we apply the right selection criteria?

The benefit and concern evaluation method is based on the basic feedback method, which prescribes to start with formulating the strong points, before addressing the weaker issues. The idea is that improvement is based on building on the strong points and to change with respect to the weaker issues. A side effect is that everyone is forced to think also about the positive aspects, not only about the negative.

The benefit and concern evaluation is done regular, in the beginning with a high frequency, to be able to adapt the course directly.

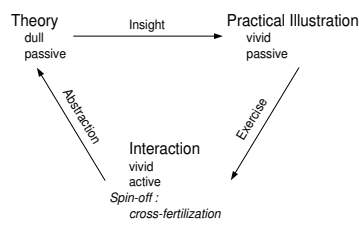
The benefits and concerns are collected by a brainstorm or on yellow stickers. The rule is that one should always start with a benefit before mentioning a concern.

The benefit and concern method is widely used by CAP Gemini employees, often called B&C or Beer&Chips.

The CTT evaluation form is the "standard" CTT evaluation form which evaluates the different aspects of the course.

## Chapter 2

# Course System Architecting for Management Teams



### 2.1 Course Goals

The goal of this course is to enable managers and management teams to implement an effective system architecting activity by giving a wide overview of processes, architecting and the role and task of the system architect. The second objective is to improve the cooperation between the system architect and other roles, such as project leader, marketing manager and technology manager.

### 2.2 Program

The program purposefully alternates process, business and technology views. The timing of the program can be adapted to the amount of information and interaction that is needed per subject. However the alterations of subjects will be followed more strictly, because the change in viewpoint is essential for understanding the whole picture.

The structure of the course is shown in figure 4.2. In other words the theory of the course is that theory, illustration and interaction will alternate.

This alternation follows the general timing as presented in figure 2.3.

session	subject
day 1 morning	positioning the System Architecture Process Product Creation Process  product families, generic developments
day 1 afternoon	role and task of the system architect profile of the system architect  documentation, reviewing and other supportive processes
day 2 morning	requirements capturing, roadmapping
day 2 afternoon	HRM aspects; selection, appraisal, career path, etcetera wrap up, expectations, how to continue, evaluation

Figure 2.1: Program of the condensed SARCH

The first step is an interactive exploration of the subject. This exploration is followed by a "broadcast" lecture in which theory and illustration are given. The amount of illustration is "experimental", due to the Philips wide target group; Examples will be based on experience of the trainer, while it is hoped that during the interaction the attendants will bring forward illustrations from their own environment

The interaction is done in 2 steps: an interactive discussion with the entire class and a work session in smaller groups. The instruction for the group work is given during the interactive discussion.

The entire subject is closed by a short collective session with conclusions and evaluation.

## 2.3 Exercises

The exercises for the 4 sessions are:

- 1 Make a map of the operational organization, from portfolio down to components, with specific products, names and roles; Discuss the relations in one of the core teams.
- 2 Role play, marketing manager + projectleader + system architect + observer; prepare initial product definition (=business relevance+specification+critical design issues+plan indication)
- 3 Determine Requirements and key drivers and show the relationship

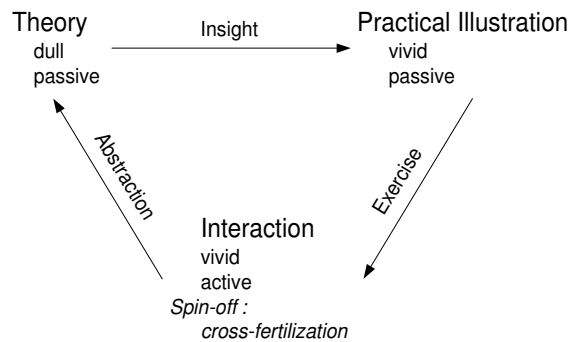


Figure 2.2: Alternation of theory, illustration and interaction will be used to maximize the educational effect



Figure 2.3: Timing per subject of the alternating theory, illustration and interaction

- 4 Show the roadmap as far as known now

## 2.4 Rules during the course

The rules of the broadcast part are:

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- The course format is highly experimental and based on improvisation, constructive proposals are welcome;  
*it is your course! Regular evaluations will give the opportunity to influence the rest of the course.*

## 2.5 Evaluations

Basic part of learning is the evaluation of what has been done. The course will use 3 types of evaluations:

- Personal expectations
- Benefit and Concerns on a regular base
- The CTT evaluation form

The personal expectations are recorded at the very beginning of the course. At the end we look back at these initial expectations. This has a two-way evaluation effect:

**Personal** Did you start with the right expectation level? Was it realistic? Did you achieve the learning goals formulated in this expectation?

**Trainer and CTT** Did we communicate the right information to enable people to select this course? Do we apply the right selection criteria?

The benefit and concern evaluation method is based on the basic feedback method, which prescribes to start with formulating the strong points, before addressing the weaker issues. The idea is that improvement is based on building on the strong points and to change with respect to the weaker issues. A side effect is that everyone is forced to think also about the positive aspects, not only about the negative.

The benefit and concern evaluation is done regular, in the beginning with a high frequency, to be able to adapt the course directly.

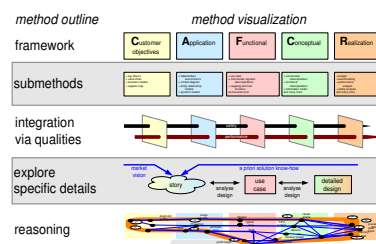
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The benefit and concern method is widely used by CAP Gemini employees, often called B&C or Beer&Chips.

The CTT evaluation form is the "standard" CTT evaluation form which evaluates the different aspects of the course.

## Chapter 3

# Multi-Objective Embedded Systems design, based on CAFCR



### 3.1 Introduction

This course is derived from the PhD thesis “CAFCR: A Multi-view Method for Embedded Systems Architecting; Balancing Genericity and Specificity”[20].

### 3.2 Program

The program purposefully alternates process, business and technology views. The table below shows the program of the stakeholder part. Normally this part of the course is given in a block of and a block of 3 days. The case is weaved into the program.

Time	Subject
Session 1	Method overview
Session 2	Functional View
Session 3	Customer Views
Session 4	Design Views
Session 5	Story telling
Session 6	Qualities
Session 7	Customer Views (2)
Session 8	Functional View (2), Cases
Session 9	Design Views (2)
Session 10	wrap up

The structure of the course is shown in figure 4.2. In other words the theory of the course is that theory, illustration and interaction will alternate.

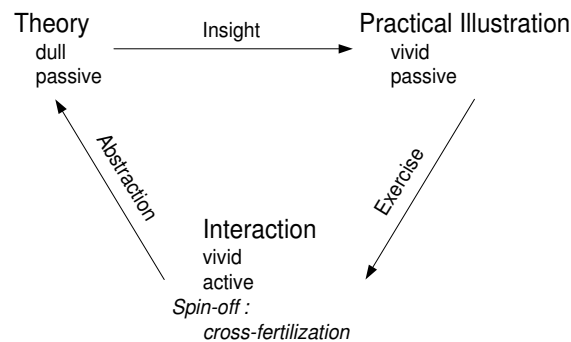


Figure 3.1: Alternation of theory, illustration and interaction will be used to maximize the educational effect

This alternation follows the general timing as presented in figure 3.2.

The first step is an interactive exploration of the subject. This exploration is followed by a "broadcast" lecture in which theory and illustration are given. The amount of illustration is "experimental", due to the industry wide target group; Examples will be based on experience of the trainer, while it is hoped that during the interaction the attendants will bring forward illustrations from their own environment.

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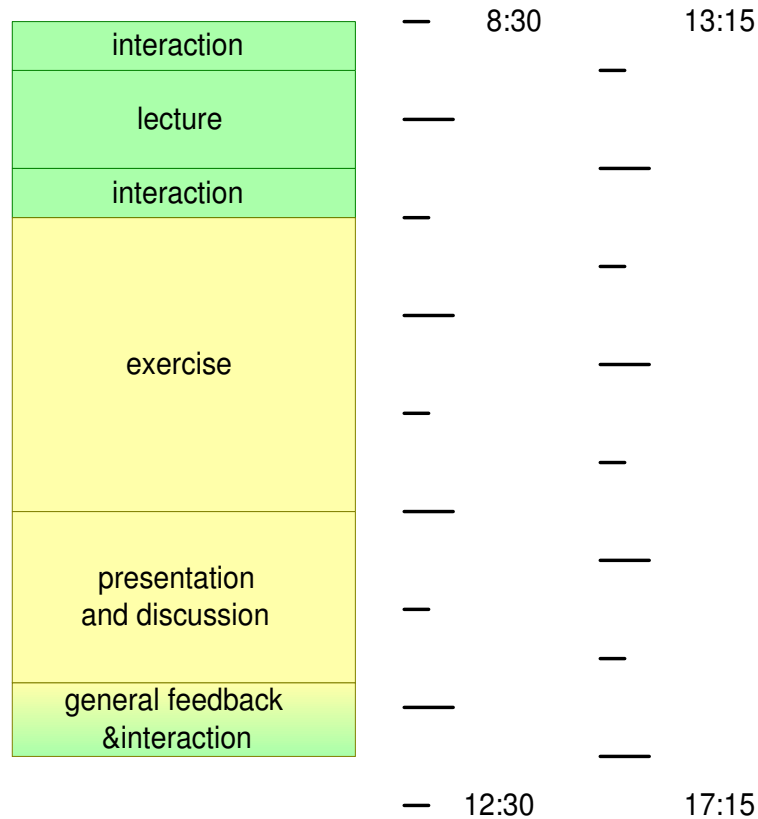


Figure 3.2: Timing per subject of the alternating theory, illustration and interaction

### 3.3 Rules during the course

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The benefit and concern evaluation method is based on the basic feedback method, which prescribes to start with formulating the strong points, before addressing the weaker issues. The idea is that improvement is based on building on the strong points and to change with respect to the weaker issues. A side effect is that everyone is forced to think also about the positive aspects, not only about the negative.

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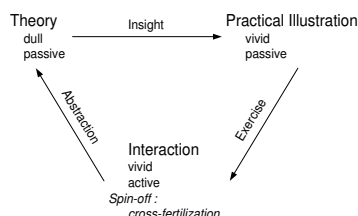
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The benefit and concern method is widely used by CAP Gemini employees, often called B&C or Beer&Chips.

The CTT or ESI evaluation form is the "standard" evaluation form which evaluates the different aspects of the course.

## Chapter 4

# ESA Course, Stakeholders Part



### 4.1 Introduction

The Embedded Systems Institute, ESI, organizes an Embedded Systems Architecture Course, the so-called 4S course, see [5]. The 4 subjects of the course are: Silicon, Software, Systems and Stakeholders. This document describes the Stakeholder part of the 4S course.

### 4.2 Program

The program purposefully alternates process, business and technology views. Figure 4.1 shows the program of the stakeholder part. Normally this part of the course is given in a block of and a block of 3 days. The case is weaved into the program.

The structure of the course is shown in figure 4.2. In other words the theory of the course is that theory, illustration and interaction will alternate.

This alternation follows the general timing as presented in figure 2.3.

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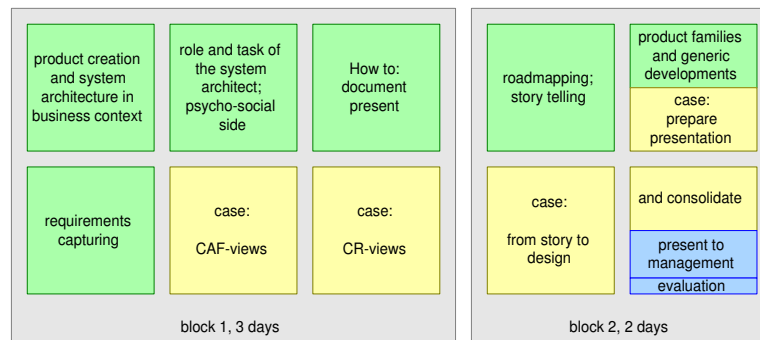


Figure 4.1: Program of the stakeholder part of the ESA course

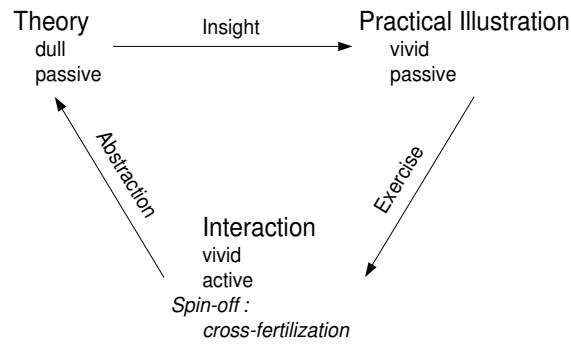


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The interaction is done in 2 steps: an interactive discussion with the entire class and a work session in smaller groups. The instruction for the group work is given during the interactive discussion.

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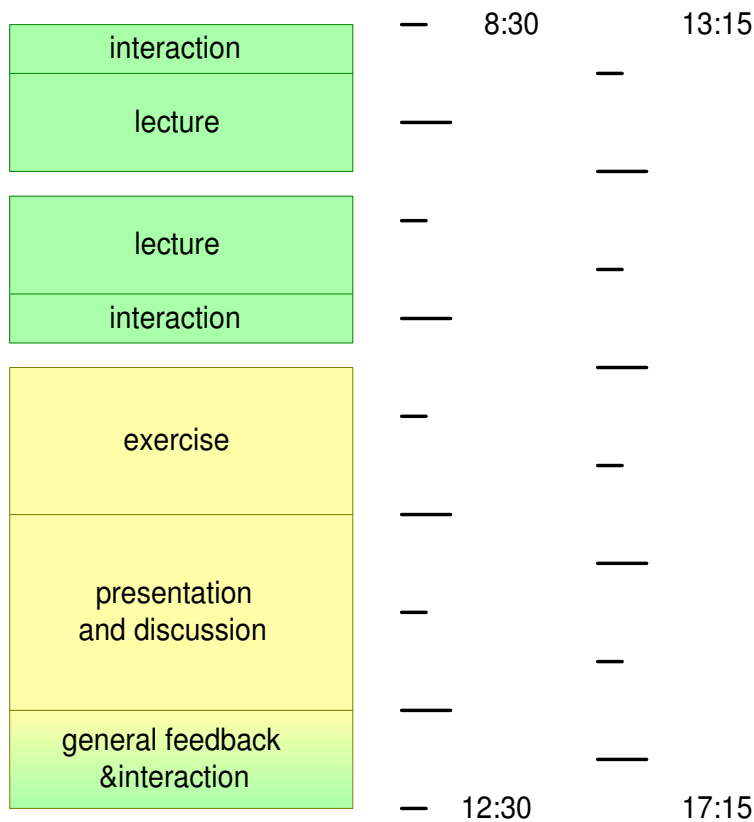


Figure 4.3: Timing per subject of the alternating theory, illustration and interaction

*Discussion will take place in the interactive part.*

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The CTT evaluation form is the "standard" CTT evaluation form which evaluates the different aspects of the course.

## Chapter 5

# Lecture Requirements Engineering

block 1: teacher provides case	
What are requirements, black box, SMART	1/2 day
homework: make requirement specification	
Customer and Application view, Story telling	1/2 day
homework: improve requirement specification	
Discussion of requirement specification per team	1/2 day

block 2: actual current case of OOTI education	
Financial viewpoint, Presentation to management	1/2 day
homework: make presentation outline	
Documentation How-to	Coaching and discussion
homework: make presentation	
Presentation project case to management team	1/2 day
individual report	

### 5.1 Introduction

This article describes the Requirements Engineering session part of the Software Engineering block in the OOTI curriculum of the Technical University Eindhoven. Trainer is the author of this article Gerrit Muller.

The focus of this course is on capturing and managing requirements. The notion of key drivers will be introduced as a means to capture and manage. A case is used as learning vehicle. The students have to perform the requirements analysis in this case. The findings of the requirements analysis have to be presented to a management team and then to be written down in a requirement specification.

### 5.2 Program

The lecture program is:

time	subject
Session 1	What are requirements, black box, SMART
Session 2	Customer and Application view, Story telling
Session 3	Discussion of requirement specification per team
Session 4	Financial viewpoint, Presentation to management
Session 5	Documentation How-to, Coaching and discussion session
Session 6	Presentation of project case to management team

The time in between lectures is to be used to perform a case study. The case study will be explained on the first half day. Half a day must be used to explore the case, During the next half lecture day the status of the case will be discussed and clarifications will be given. At the end of the block the case should be finished and the results will be presented and discussed. The course is closed by writing a summary of the case findings (per group) and lessons learned per individual, see section 5.4. Figure 5.1 shows the schedule of the course on a timeline.

### 5.3 Case Description

A video content distribution company is planning to deliver video which can be transferred to a local box in the house of the consumer via satellite. Figure 5.2 shows a diagram of the system.

### 5.4 Instruction for the case

The case is performed in 4 groups of 3..5 people, working together on the same problem. Instructions for the case:

1. Block 1 session 1: Make an initial requirements specification
2. Block 1 session 2: Improve and complete requirements specification
3. Block 2 session 4: Make an outline of a presentation of maximum 10 minutes, target audience: management team of your company
4. Block 2 session 5: Prepare and exercise presentation
5. Block 2 session 6: Write an individual report reflecting on: requirement specification, management presentation, lessons learned and how to do it next time.

Recommended way of working:

1. Make a black box view of the system

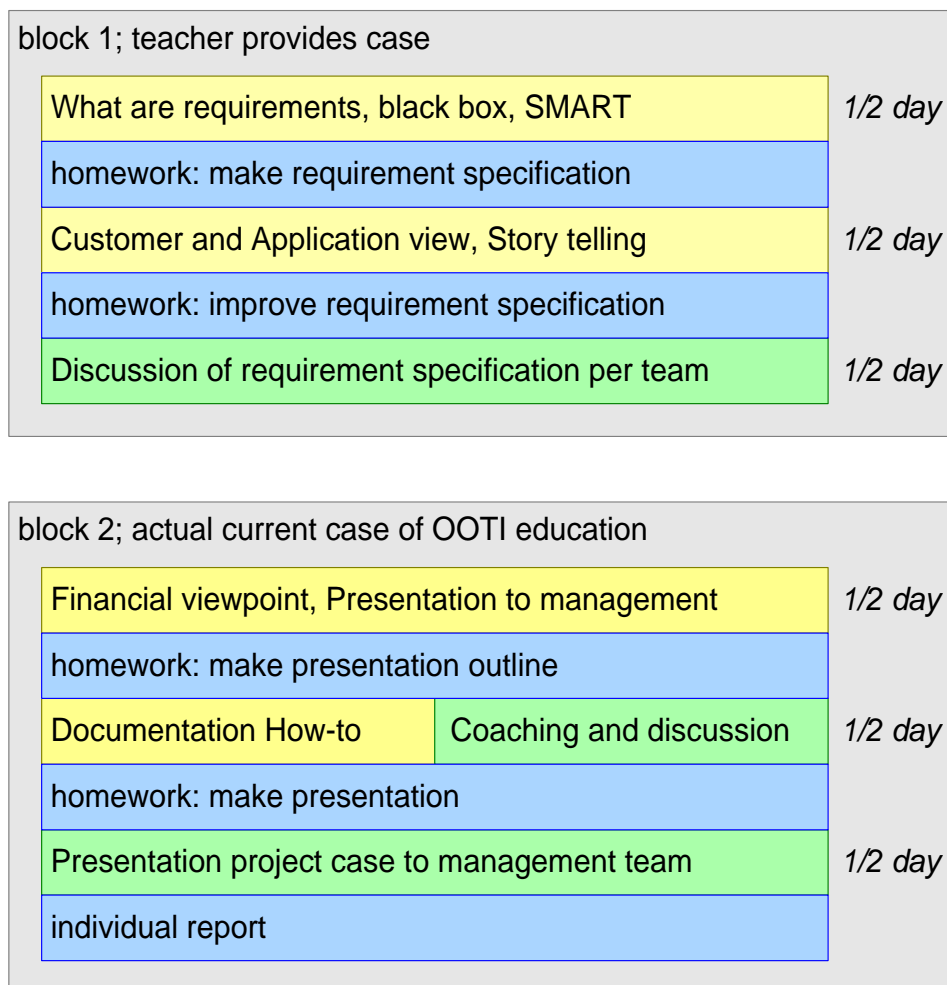


Figure 5.1: Schedule of the course

2. Make some initial drafts and designs to explore the problem.
3. Make a story which helps to understand the products, make sure to use the criterions for a story.
4. Look from all stakeholder points of view towards the problem and identify what they need and what they expect.
5. Analyze the information obtained so far and extract the underlying requirements.
6. Abstract the key drivers behind the requirements.

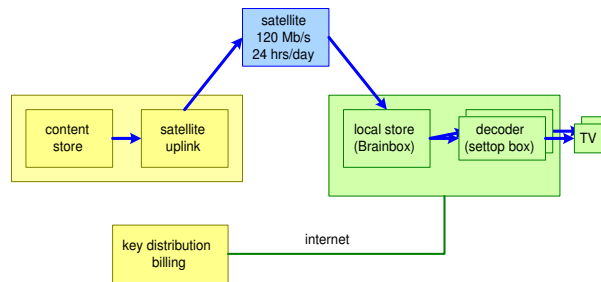


Figure 5.2: The block diagram of the Cyber Video company system

## 7. Make a top-down description of the requirements.

Every group will present its findings on day 5, followed by a short discussion. This presentation is to the management team of the company which will make these products and some invited lead customers.

Create a *Requirement specification* which can be used as the starting point of the design. On day 6 a coaching session is held to discuss the results so far, on day 7 the requirement specifications are reviewed.

Write an individual summary of the entire process, maximum 2 A4's, touching the following questions:

- What are the most important lessons you learned from these exercise (requirement specification, management presentation)?
- Which roles did the members of the group play during the exercise?
- How would you approach such a problem the next time?
- Which stakeholders understand your group presentation? Are they happy with the presentation?

Don't answer all these questions perfectly, finish the summary in at most half a day.

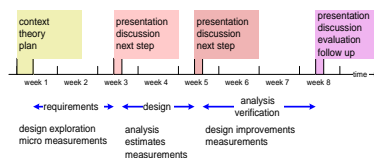
## 5.5 Acknowledgements

The case used in this course is derived from the case defined by Sjir van Loo for use in the course SW architecture. The case defined by Sjir is further reduced in this course to stimulate the students in the requirements exploration, reflecting real-life situations which often start rather ill-defined.

I thank Sjir van Loo for providing his course material. I also thank Dieter Hammer and Harold Weffers for the initial discussions and for the suggestion to use this case.

# Chapter 6

## Course Execution Architecture



### 6.1 Introduction

The architect designing an embedded systems has to address many different stakeholder concerns and design aspects. For some reason SW design tends to focus on functionality. Performance and real time behavior are the (arbitrary) outcome, mostly determined by the execution architecture.

This course focuses on fulfilling performance and real time requirements by designing an execution architecture. The main target of the course are the practical day to day issues of designing an execution architecture. The course is for a great deal hands on work, in the normal product environment on the normal product. During the course the participants should analyse, measure, explore and try requirements (problem side) and implementations (solution side). On a regular base the results are presented and reviewed, then a follow up plan for the next period is made and discussed.

A minimum of 2 persons per team are needed, to stimulate and enable the participants to make sufficient progress in the limited course time frame. Those 2 persons together should be able to cover the understanding of the most critical product needs, the existing hardware design (and its opportunities and constraints) and the existing software design. On top of that they should be able to modify the software design and run the modified design, to measure and to obtain results.

## 6.2 Program

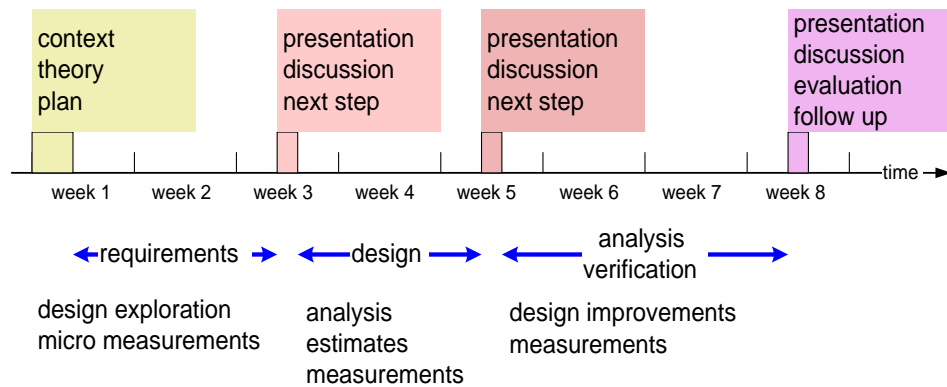


Figure 6.1: Program of the Execution Architecture Course

## 6.3 Rules during the course

The rules of the broadcast part are:

- Please write your questions/remarks/statements on yellow stickers and attach them at the end on the P-flip.  
*These will be used in the interactive section for discussion and to increase insight.*
- Short clarification questions are welcome,  
*Discussion will take place in the interactive part.*
- Stupid questions don't exist. Learning is based on **safe** and **open** interaction.  
*Very individual-oriented questions can be referred to a break or after the session.*

The rules of the interactive and the practice part are:

- Your contribution is essential.
- Don't monopolize the time. Everyone, also the quiet people, should have the opportunity to contribute.  
*The facilitator will intervene if the contribution is limited to a small group of participants.*

- Respect the contribution of others.

*Opinions can't be wrong, difference of opinion is normal and called pluri-formity.*

- The course format is highly experimental and based on improvisation, constructive proposals are welcome.

*It is your course! Regular evaluations will give the opportunity to influence the rest of the course.*

## 6.4 Evaluations

Basic part of learning is the evaluation of what has been done. The course will use 3 types of evaluations:

- Personal expectations
- Benefit and Concerns on a regular base
- The CTT evaluation form

The personal expectations are recorded at the very beginning of the course. At the end we look back at these initial expectations. This has a two-way evaluation effect:

**Personal** Did you start with the right expectation level? Was it realistic? Did you achieve the learning goals formulated in this expectation?

**Trainer and CTT** Did we communicate the right information to enable people to select this course? Do we apply the right selection criteria?

The benefit and concern evaluation method is based on the basic feedback method, which prescribes to start with formulating the strong points, before addressing the weaker issues. The idea is that improvement is based on building on the strong points and to change with respect to the weaker issues. A side effect is that everyone is forced to think also about the positive aspects, not only about the negative.

The benefit and concern evaluation is done regular, in the beginning with a high frequency, to be able to adapt the course directly.

The benefits and concerns are collected by a brainstorm or on yellow stickers. The rule is that one should always start with a benefit before mentioning a concern.

The benefit and concern method is widely used by CAP Gemini employees, often called B&C or Beer&Chips.

The CTT evaluation form is the "standard" CTT evaluation form which evaluates the different aspects of the course.

## 6.5 Acknowledgements

This course is a joint effort of Ton Kostelijk and Gerrit Muller, making it together has been very inspiring.

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## History

**Version: 0.1, date: July 2, 2004 changed by: Gerrit Muller**

- added Execution Architecture, Multi-Objective Embedded Systems Design
- Version: 0, date: June 13, 2002 changed by: Gerrit Muller
- Created very preliminary bookstructure, no changelog yet