Basic Methods

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Abstract

The challenge for the architect is to cover a wide range of subjects, with many unknowns and uncertainties, while decisions are required all the time. The basic working methods, such as viewpoint hopping, modelling, handling uncertainties and WWHWW questions are described.

Distribution

This article or presentation is written as part of the Gaudí project. The Gaudi 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.

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status: finished
version: 1.2
Many viewpoints

- security
- operator
- ease of use
- financial manager
- cost of ownership
- differentiation
- sales manager
- street price
- data model
- SW engineer
- functions
- adjustments
- power
- RF engineer
- tools
- space
- manufacturing
- project leader
- fte's
- balance
- integration
- timing
- problem
- architect
- stakeholder
- concern
- operator
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- problem
- architect
- stakeholder
- concern
triggered by: financing costs, part of cost of ownership, are determined by street price.

triggered by: lowering street price and time to market are conflicting. How much margin do we have in timing?

triggered by: timing of the product is determined by SW. A trade-off is possible between functionality and timing.
Scanning modes of the architect

**open perceptive scanning**

**scanning while structuring and judging**

*drunkard's walk*

the world is full of interesting needs, technologies, ...

*straight for the goal*

ignore everything that is not contributing directly to the goal
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TBWMAdynamicRange

metric # entities

1

10^3

10^6

10^9

10^{nmmm}

hardware
system
subsystems
components
connections, building blocks
wires, gates, transistors
states

software
core function
system functions
subsystem functions
lines of code
bytes
states
Successive quantification refinement

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BWM quantification steps
Quantified understanding of waferstepper overlay
Architect focus on important issues

- 80% architecting time
- 20% all other issues
- 10% most important/most critical issues
- 90% new/solved
A model is a simplified representation of part of the real world used for:

communication, documentation analysis, simulation, decision making, verification
Some examples of models

**formal analytical model**

\[ t_{\text{processing}} = t_{\text{overhead}} + n_{\text{rows}} \cdot t_{\text{row}} + n_{\text{row}} \cdot n_{\text{col}} \cdot t_{\text{pixel}} \]

**synchronization model**

Required position (time) → position control

Actual position

Feedback frequency: 4 kHz (0.25 msec)

**value chain model**

Consumer → retail → box-maker → semiconductor supplier → service provider → content provider

**mockup**

Wooden model

**model of coordinate system**

6 degrees of freedom
## Types of models

<table>
<thead>
<tr>
<th>Mathematical</th>
<th>Visual</th>
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<tbody>
<tr>
<td>Linguistic</td>
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<td>Accurate</td>
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<tr>
<td>Executable</td>
<td>Read Only</td>
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- **Rational** → **Intuitive**
Why broadens scope, How opens details

Why
What
How

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Why
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system
context
subsystem

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BWMArercurisonWWH
Flow from problem to solution

1. Problem understanding by exploration and simple models

2. Analysis by
   + exploring multiple propositions (specification + design proposals)
   + exploring decision criteria (by evaluation of proposition feedback)
   + assessment of propositions against criteria

3. Decision by
   + review and agree on analysis
   + communicate and document

4. Monitor, verify, validate by
   + measurements and testing
   + assessment of other decisions

vague problem statement

conflicting other decision

insufficient data

no satisfying solution

invalidated solution

vague problem statement

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TORdecisionFlow
| throughput | 20 p/m | high-performance sensor |
| cost | 5 k$ | high-speed moves |
| safety | | additional pipelining |

**low cost and performance 1**

| throughput | 20 p/m | high-performance sensor |
| cost | 5 k$ | high-speed moves |
| safety | | 300 ns |
| | | 10 m/s |

**low cost and performance 2**

| throughput | 25 p/m | high-performance sensor |
| cost | 7 k$ | high-speed moves |
| safety | | additional collision detector |
| | | 200 ns |
| | | 12 m/s |

**high cost and performance**
Recursive and concurrent application of flow

1. Problem understanding
2. Analysis
3. Decision
4. Monitor, verify, validate

system level

subsystem level

component level

atomic level

legend

decision flow

analysis flow