Abstract

Describes architecting and the task of the architect, with emphasis on bridging the **why**, **what** and **how** of a product. The memory usage of a medical workstation is used as practical illustration.

The introduction of a system architect in an architecture unaware organisation is described. A metamorphosis takes place from a threatening meddler into an appreciated indispensable team member.
Where is Gerrit in multi-D organisation space?

The System Architect; Meddler or Hero?

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MSorganisation
Who is Gerrit? What is Gaudí?

CT OSS NM X-ray

MR

EasyVision

Gaudi

Philips Medical

1980

1990

2000

ASML

Philips NatLab

Gaudi = consolidation + exploration + application + education consultation facilitation transfer of system architecting
Practical illustration; a medical imaging workstation
Problem: unlimited memory consumption (1992)

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MSmemoryZeroMeasurement
Solution: measure and iterative redesign

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MSmemoryUsageReduction
Method: budget per process

Budget:

+ measurable

+ fine enough to provide direction

+ coarse enough to be maintainable
Integration uncovers hidden problems

Do you have any design issues for the design meeting?
The default answer is: No.

During integration numerous problems become visible

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MSintegration
Architecting scope
Architecture awareness

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MSAwarenessPath
The engineer’s perception of the architect

- How much memory do you use?
  - That is too much!

- asks questions
- uncovers problems
- has nicest job

For many engineers the system architect = threat or menace
Understand the customer to drive design choices

**What**
does Customer need in Product and **Why**?

**Customer**
- **What**: objectives

**Application**
- **How**: 
  - key drivers:
    - throughput
    - diagnostic quality
    - film saving
    - street price 50k$

**Product**
- **What**: 
  - 3 exam rooms per exam:
    - 20 images
    - auto-print on 3 sheets
  - decomposition
  - anti-fragmentation
  - DLL's

- **How**: 
  - measured 200 MB
  - budget 74 MB

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MSeasyVisionCAFCR
How about the **<characteristic>** of the **<component>** when performing **<function>**?

What is the **memory usage** of the **user interface** when **querying the DB**?
Conclusion

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MSmeddlerAndHeroes
Benchmarking

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MSbenchmarking
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Wissink, Getty
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Stut, Wim
Luttikhuizen, Paul
Bruin, Jan
Gooren, Huub
den Dekker, Wim
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Schellingerhout, Nico
Vuigts, John
http://nlww.natlab.research.philips.com:8080/research/swa_group/muller/

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Answers to frequently asked questions
Architecture and research? The technology management cycle

Exploration of new ideas

Application of technology

Consolidation of know how

Research

Exploration of new ideas

Application of technology

Consolidation of know how

Product Division
Is architecting scientific?

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MSarchitectureAndScience
1. Functional Decomposition

2. Construction Decomposition

3. Allocation

4. Infrastructure

5. Choice of integrating concepts
The architect as integrator

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MATcomplementaryExpertises

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The architect maintains technical roots
sheets that didn’t make it into the final presentation
Memory Budget; too detailed

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MSmemoryBudget
Engineers feeling caused by architect's activity illustrated by examples of architect behavior

Which can be nasty, if you don't have any answer

Or worse, a problem is hiding underneath

A judgement is given

Meddling in my backyard, without any substantial know how

While we are busy with detailed bug fixing and maintenance

Every question or problem explodes into an even more extensive set of questions and problems

- Asks questions
- Identifies risks and problems
- Voices opinions
- Does have holes in know how
- Does the nice work
- Does not provide definite answers or solutions

How much memory do you use?

Your functions together use more memory than provided

That is too much

Takes decisions without knowing how memory intensive a hashed dictionary is

Makes a toplevel design, for instance a memory budget

What happens if we have many small images? Or if we have very large images?
Integrating CAFCR; too glossy

**What** does Customer need in Product and **Why**?

<table>
<thead>
<tr>
<th>Customer</th>
<th>Application</th>
<th>Functional</th>
<th>Conceptual</th>
<th>Realization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What</strong></td>
<td><strong>How</strong></td>
<td><strong>What</strong></td>
<td><strong>How</strong></td>
<td><strong>How</strong></td>
</tr>
<tr>
<td>Customer objectives</td>
<td>Application</td>
<td>Functional</td>
<td>Conceptual</td>
<td>Realization</td>
</tr>
<tr>
<td>context understanding</td>
<td>intention</td>
<td>objective driven</td>
<td>opportunities</td>
<td>constraint awareness</td>
</tr>
</tbody>
</table>

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MSintegratingCAFCR
**Engineers perception**

- Asks questions
- Identifies risks and problems
- Voices opinions
- Does have **holes** in know how
- Does the nice work
- Does not provide definite answers or solutions

**Required characteristic of the architect**

Questions are the primary tool of an architect

+ Prevention is valuable
+ Focus, selection is key, which requires vision and choices
+ Sometimes the architect needs to dive in deep
+ There is more nice work needed than we ever can do
+ Keeps repeating the previous actions
How about the \textit{characteristic} of the \textit{component} when performing \textit{function}?
## Architecture Awareness Phases; too complex

<table>
<thead>
<tr>
<th>Phase</th>
<th>Architectural coverage</th>
<th>Number of known problems</th>
<th>Architect appreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Phase 2</td>
<td>10%</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>Phase 3</td>
<td>20%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Phase 4</td>
<td>20%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Phase 5</td>
<td>10%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Mood**
- Phase 1: happy
- Phase 2: problems
- Phase 3: crisis
- Phase 4: troubleshooting
- Phase 5: amazement

**Architecture awareness**
- Phase 1: unaware
- Phase 2: nagging awareness
- Phase 3: threat
- Phase 4: builds up credit
- Phase 5: amazement

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MSphasesArchitectureAwareness