Abstract

Philips Research is looking for ways to improve the software productivity. The business rationale for this research are the needs of semiconductor customers, the creators of consumer appliances. Technological developments, such as miniaturization and convergence have a strong impact on the form, function and content of consumer appliances. The appliance makers are struggling with the consequences, especially with the exponential increasing SW effort. The customer and the semiconductor viewpoint are shown. Strategic questions for semiconductors are identified and discussed, such as the need for architecture, legacy and scoping.
Software productivity and components research goals

- define
- vary
- create
- integrate
- test
- maintain

- to create products faster with less effort

- methods
- tools
- integration technology

- component technology

- by means of
- better functional
- more reliable
- safer

- to achieve products

- and/or

- by means of

- semiconductor software strategy

version: 0
September 9, 2018
Customer viewpoint
Convergence -> Integration and Diversity

from PSAVAT 2001; "Light Weight Architectures; The way of the future? "

Semiconductor Software Strategy
4 Gerrit Muller
Exploring problem space and solution ingredients

Problem space

Programmability, flexibility
Increase supplier content
Competitive Performance / cost / power

Solution ingredients

Configurability

from PSAVAT 2001; "Light Weight Architectures; The way of the future? "

Semiconductor Software Strategy
version: 0
September 9, 2018
SSSfromStakeholderToQualities
Dominant customer concerns

- **Time to Market**
  - Infrastructure: 1 month
  - Application: 10 months

- **Effort**
  - Digital TV: 1000 man-years
  - GSM: 100 man-years

Semiconductor Software Strategy

Gerrit Muller

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September 9, 2018
SSScustomerProblem
Trends in hardware and software

**direct product costs** mostly determined by **hardware**

how about **software** license costs?

**development costs** : **software** becomes more expensive than **hardware**

**time to market** : **software** is limiting factor

**software** often synonymous with **integration**

**product value** mostly determined by **software**

SW is integrating technology

SW implements functional behavior
Semiconductor viewpoint
Changes in semiconductor country in the last decade

- analog $\rightarrow$ digital
- single function $\rightarrow$ multiple functions
- $\text{mm}^2$ Si $\rightarrow$ "system" solution
- small team $\rightarrow$ large team
- separate markets $\rightarrow$ convergence markets

- deverticalization
- software ?!
Strategic questions for Semiconductor company

How to protect customers SW investments?

How to enable SW application reuse across domain boundaries?

Which software architecture?

Which software to make?
How and with whom to partner?

How to do all of this fast enough?

Thomson, TI, Intel, Samsung, ...
Which architecture?

How to protect customers software investments?

How to enable application reuse across domain boundaries?
Simplistic Architecting: Digital TV

### Analog TV

<table>
<thead>
<tr>
<th>TV applications</th>
<th>TV computing Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV domain platform</td>
<td>Computing HW</td>
</tr>
</tbody>
</table>

| TV domain HW | Computing HW |

### Set Top Box

<table>
<thead>
<tr>
<th>3rd party stack(s)</th>
<th>Set Top Box functions</th>
<th>MHP</th>
</tr>
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### Digital TV

<table>
<thead>
<tr>
<th>Digital TV UI</th>
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| Set Top Box Platform |

| Digital Video Platform SW |

| TV domain HW | Set Top Box domain HW | Computing HW |

Digital Video Platform SW

| TV domain HW | Set Top Box domain HW | Computing HW |

Semiconductor Software Strategy

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September 9, 2018

ARdigitalTelevisionSimplisticArchitecture
Available Code Assets

Digital TV UI

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<tr>
<td></td>
<td>&gt;200 Myr</td>
<td></td>
<td>&gt;100 Myr</td>
<td></td>
</tr>
<tr>
<td>TV domain platform</td>
<td></td>
<td>glue</td>
<td></td>
<td>&gt;100 Myr</td>
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Digital Video Platform SW

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<th>TV domain HW</th>
<th>Set Top Box domain HW</th>
<th>Computing HW</th>
<th>&quot;Legacy&quot; code &gt; 500 Myr</th>
</tr>
</thead>
</table>

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Merge problems

Architectural mismatch:
wrappers, translators, conflicting controls

additional code
and complexity,
no added value

Poor performance;
additional resource usage

Problems → Architecture → non problem

Duplication
Existing SW stacks

- DVP
- MHP
- STB
- TV
- VCR
- DVD
- GSM
- 3G
- Bluetooth
- Wireless LAN
- 1394

- Customer specific
- Domain specific applications
- Domain specific infrastructure
- Generic infrastructure
But there are much more domains and stacks:

- Car infotainment
- Security
- Home control
- Webcam
- Video cam
- Audio
- MP3, ...
- CD, SACD, DVD, ...
- Radio
- Jukebox, HD, ...
- Games
- Mediascreen
- PDA
- Webpad
- PC's
- Modem cable, ADSL, ...
- Firewall
- Residential gateway
- Homeserver
Ideal homogeneous situation?

long term dream

Reference Architecture + Sample implementation of Framework and Components
Today’s reality?

huge amount of glue

customer specific
domain specific applications
domain specific infrastructure
generic infrastructure
Achievable solution?

- internal efficiency: fine grain components
- inter-application glue
- 3rd party generic infrastructure
- Enable components "in the large" nuggets

- framework specialization guidelines for integrating concept reference decomposition/allocation interface, format, protocol standards prototyping, development environments
Which software to make?
Core, key or base technology?

Core
Key
Base

Technology life cycle

Own value IP
Critical for final performance
Commodity

make
outsource
buy
refer customer to 3rd party

Partnering

Total Product
Streaming: one of Philips’ core strengths

Software size

"control"

number crunching operations/sec

streaming
Our territory?

customer specific

domain specific applications

domain specific infrastructure

generic infrastructure

year x

year x+2

year x+4

enabling, supporting

consolidation standardization
Summary

large application
reuse

efficient development
of single stack

where to start, where to stop

component technology
software technology
software architecture
system architecture
business strategy