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Functional Architectures with SysML

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We believe in a world, in which people with restricted hearing can communicate again without limitations thanks to advanced technology.

Jesko Lamm works at Bernafon, a Swiss manufacturer of hearing instruments. As a Senior Systems Engineer, he is responsible for the processes in system architecture and for working as a system architect in development projects, based on model-based systems engineering with SysML.

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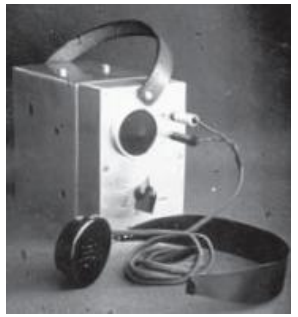
Consulting and Training
Headquarter Hamburg, Germany

Tim Weilkiens, managing director of the German consultancy oose GmbH, is a member of INCOSE MBSE Challenge Team SE^2 (Telescope modeling). He is also an active member of the OMG working groups about SysML and UML and has written sections of the SysML specification.

Same functionality – evolving components: “Produce Sound”



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Same functionality – evolving components: “Produce Sound”

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Same functionality – evolving components: “Produce Sound”

Users want functionality

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Functional descriptions of a system can be re-used

Function
“Produce Sound”

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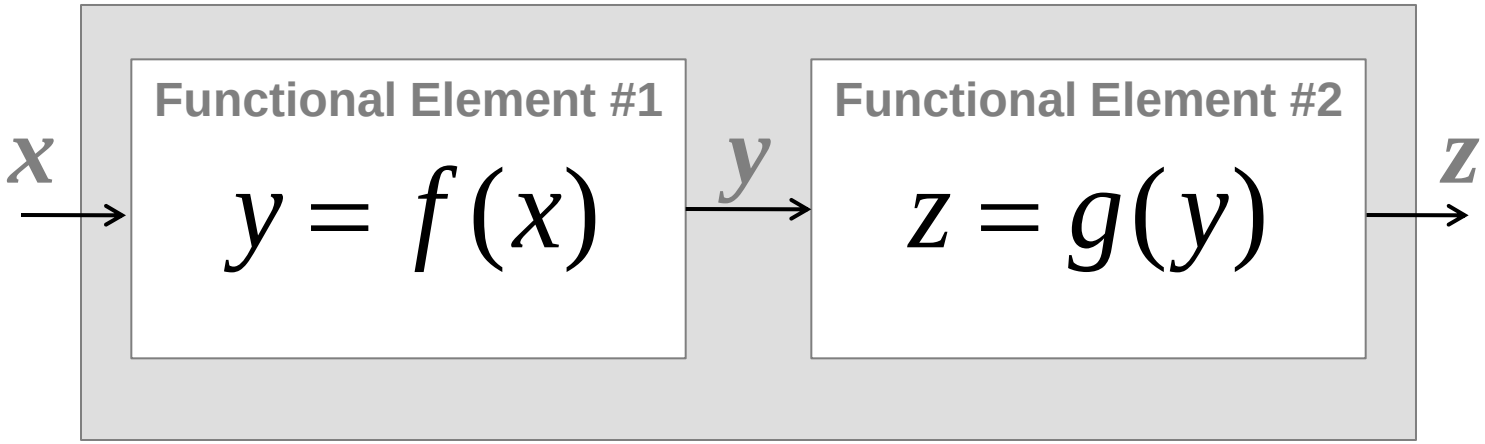
What is Functional Architecture?

- **Architecture**
  identifies the elements of a system and relates them to each other.
- **Functional Architecture**
  is based on functional elements
  whose input and output are related to each other via a function.



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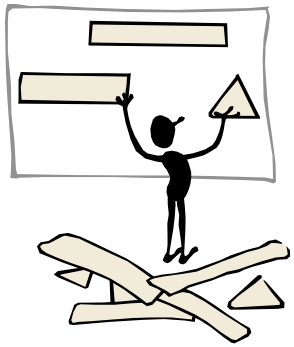
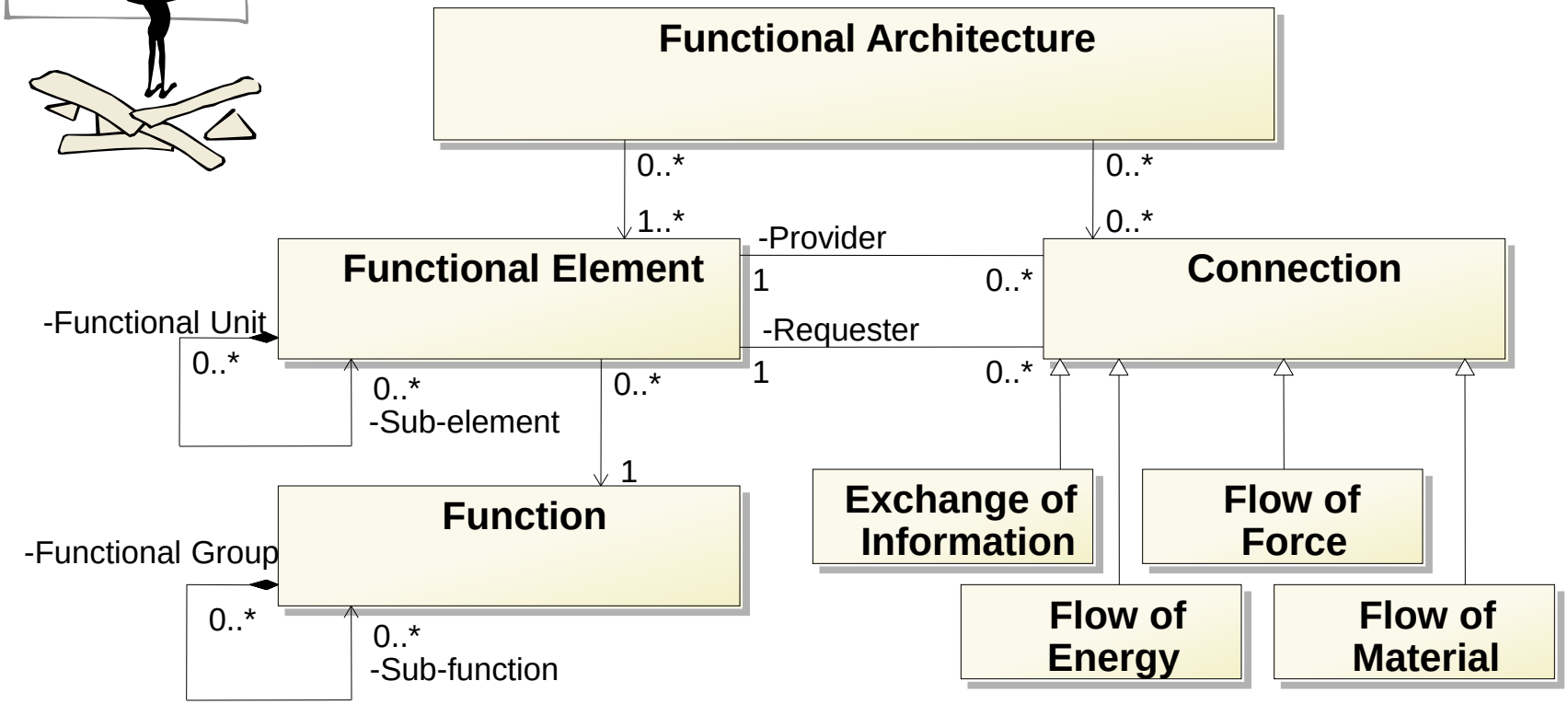
Information model





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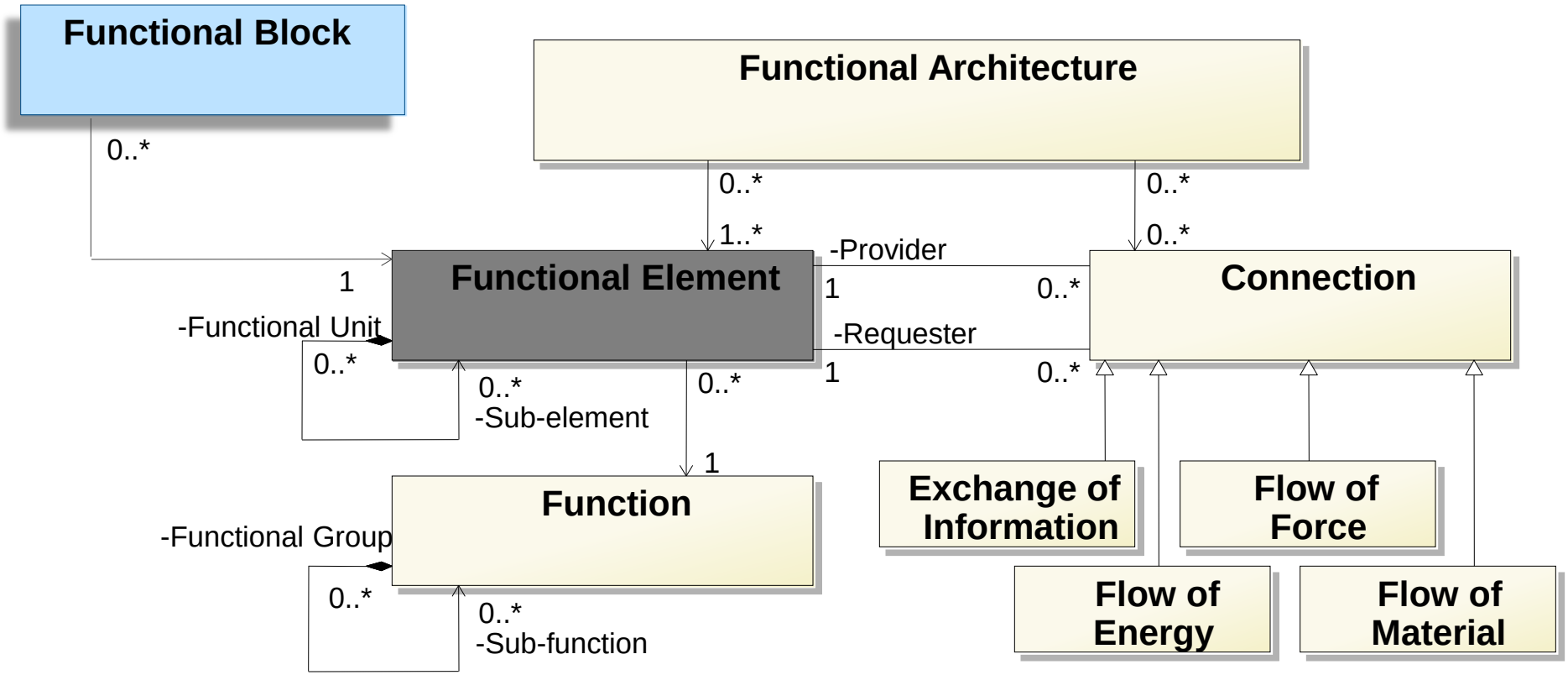
Modeling Functional Architecture



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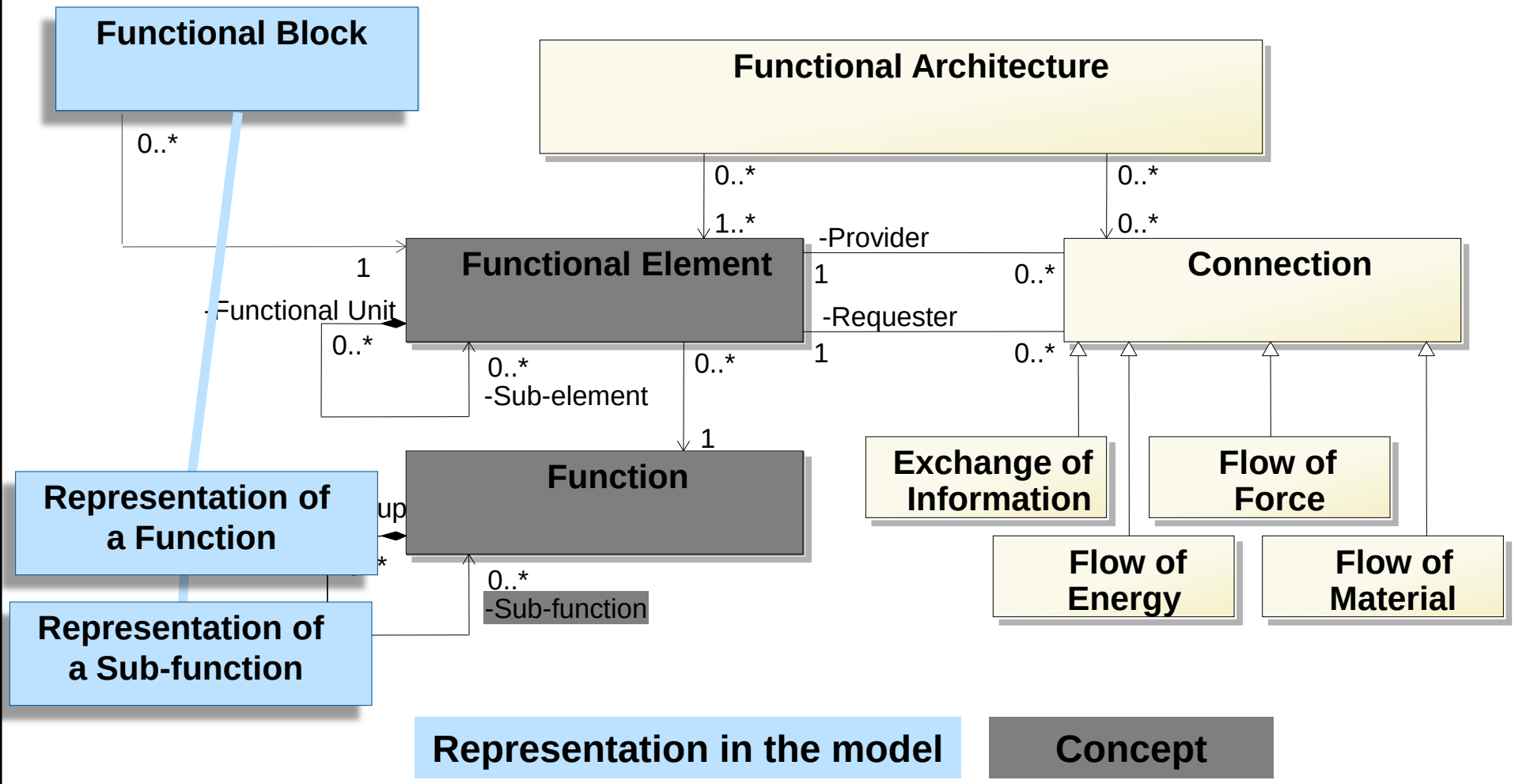
Modeling Functional Architecture



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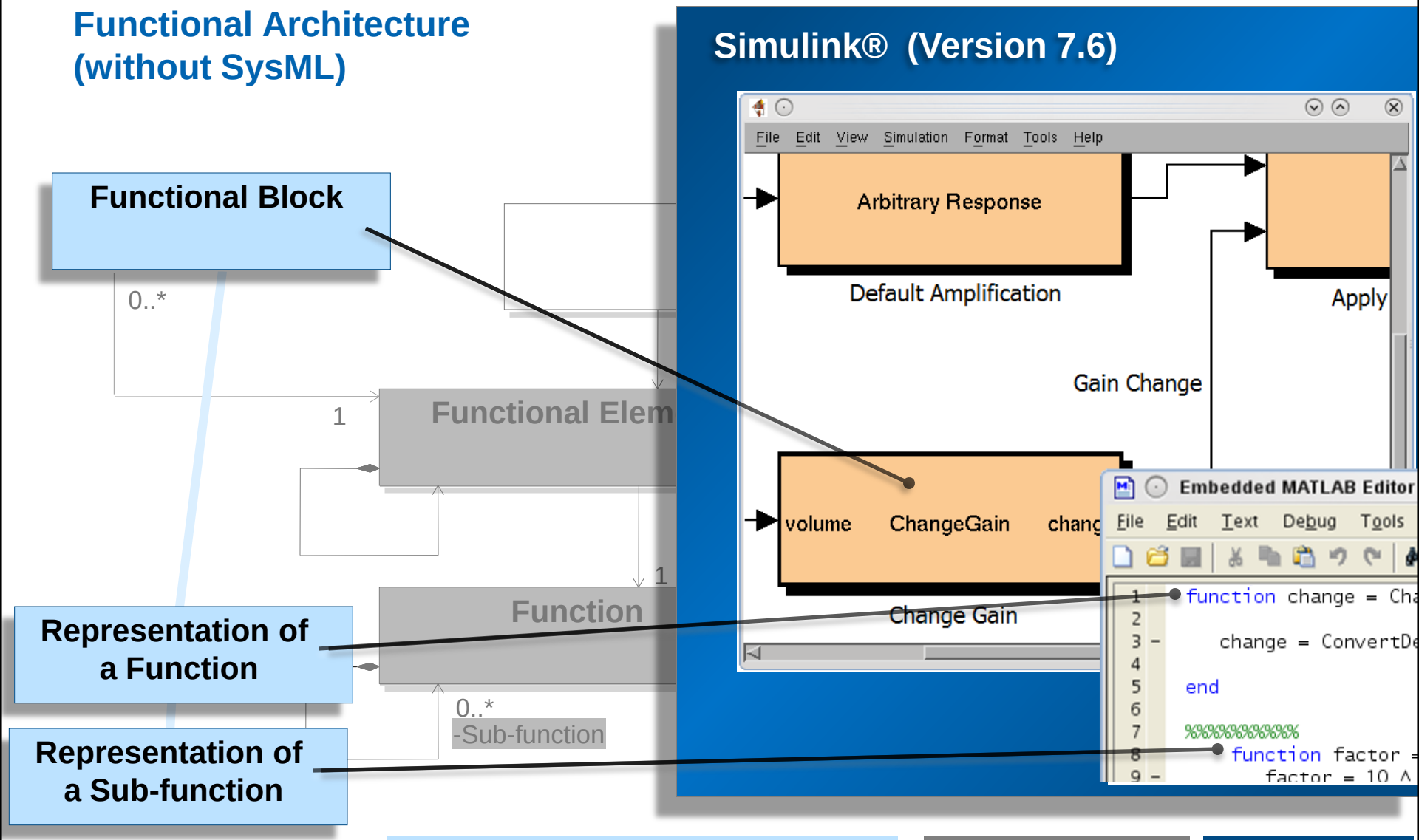
Functional Architecture (without SysML)



Representation in the model | **Concept** | **Example**

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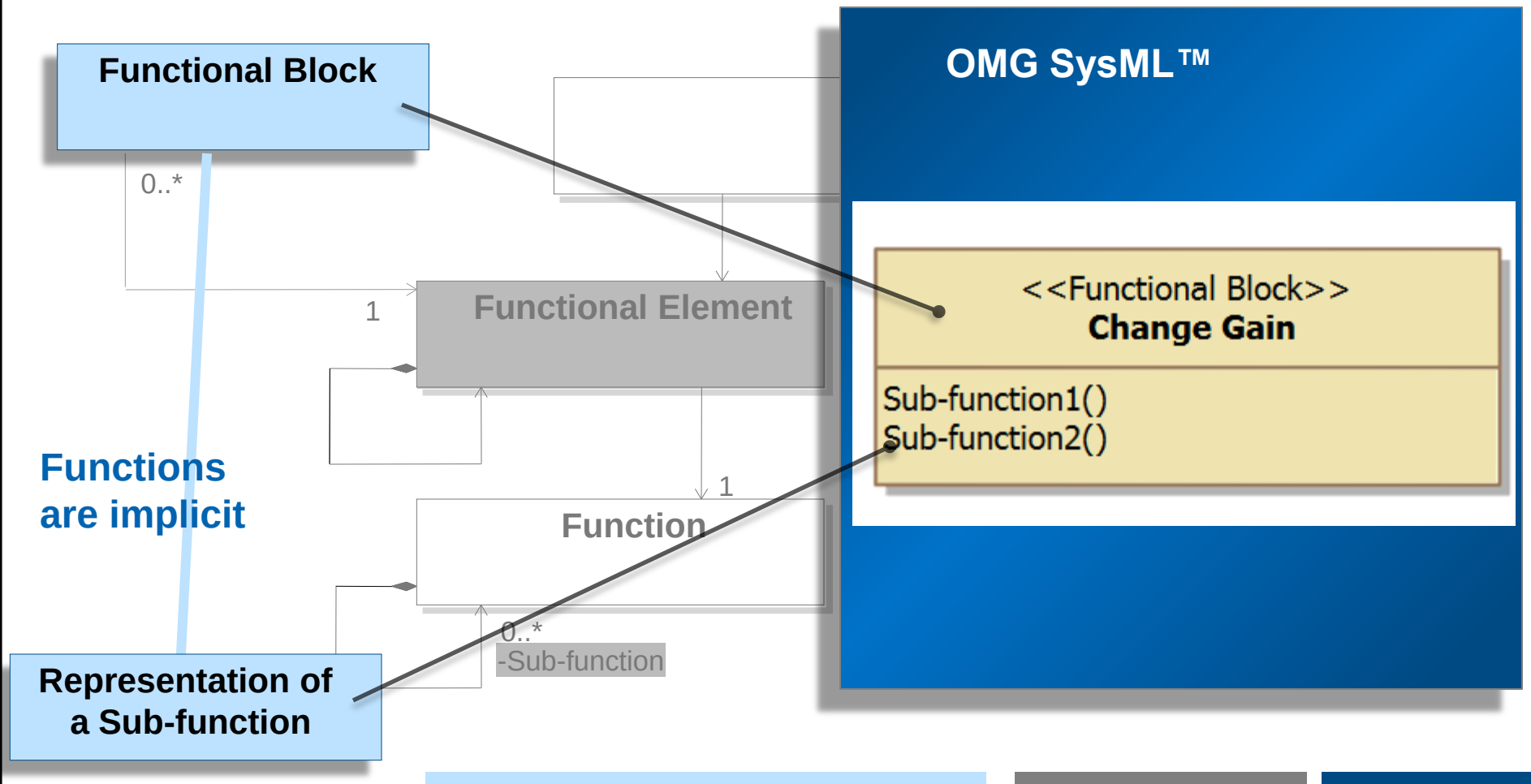
Functional Architecture (SysML representation)



Representation in the model | Concept | Example

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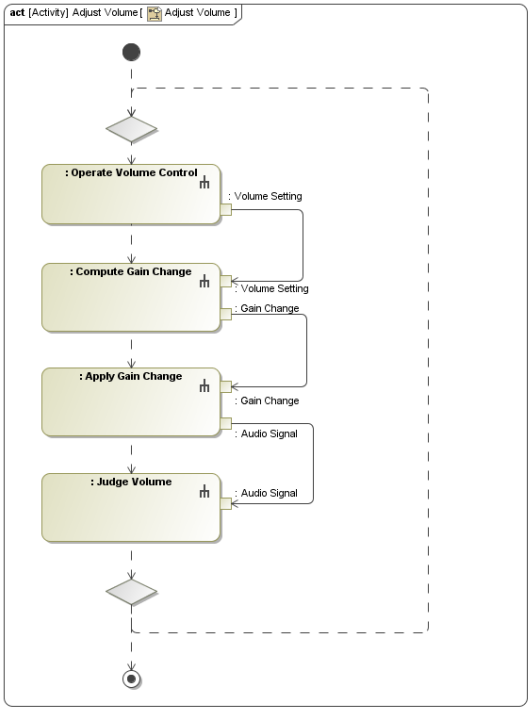
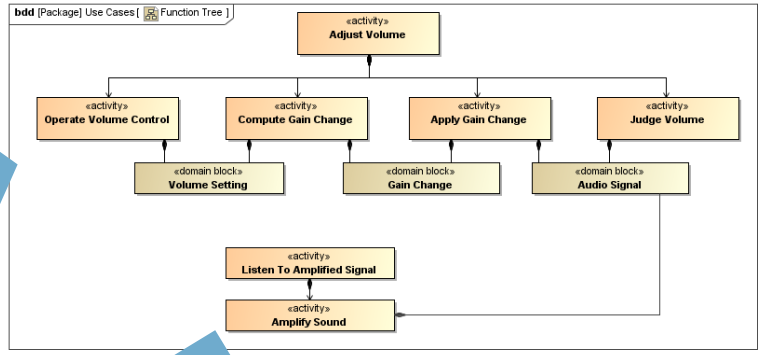
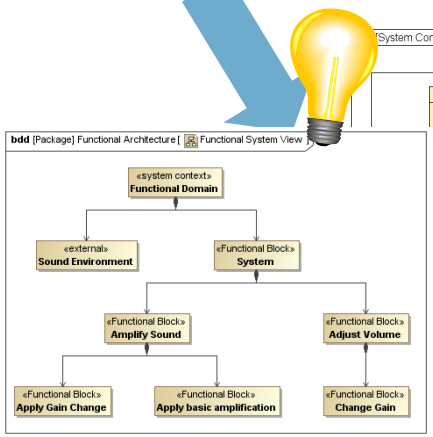
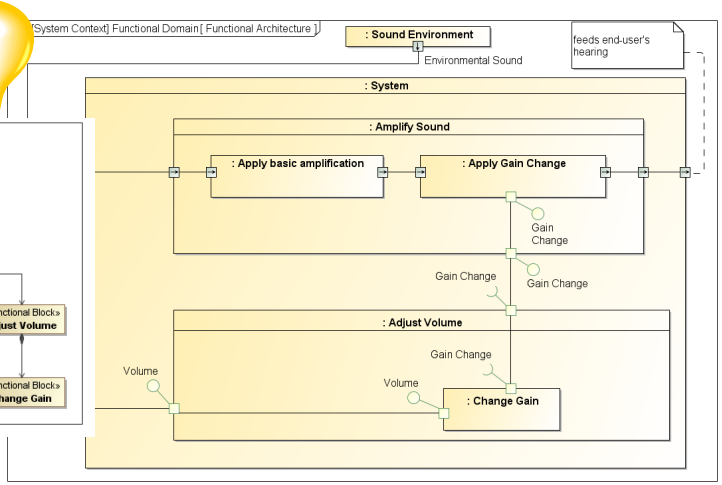
Method for Creating Functional Architectures









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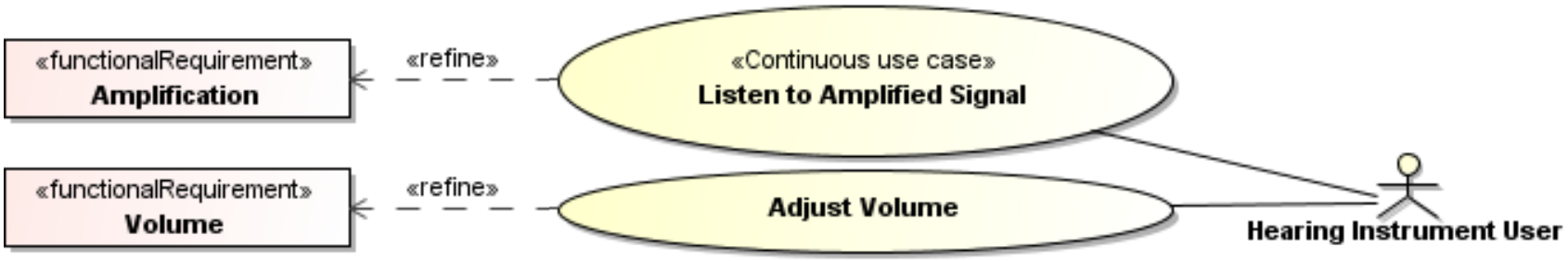
Functional Requirements vs. Use Cases



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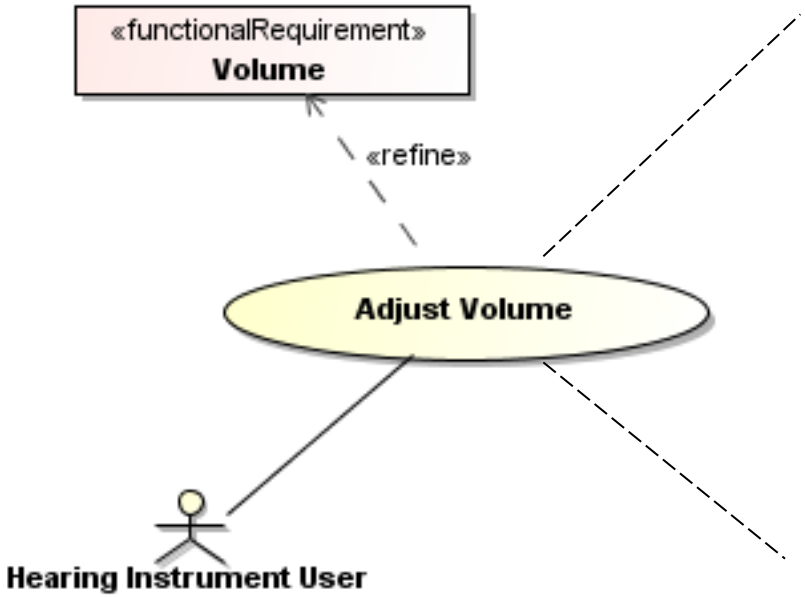
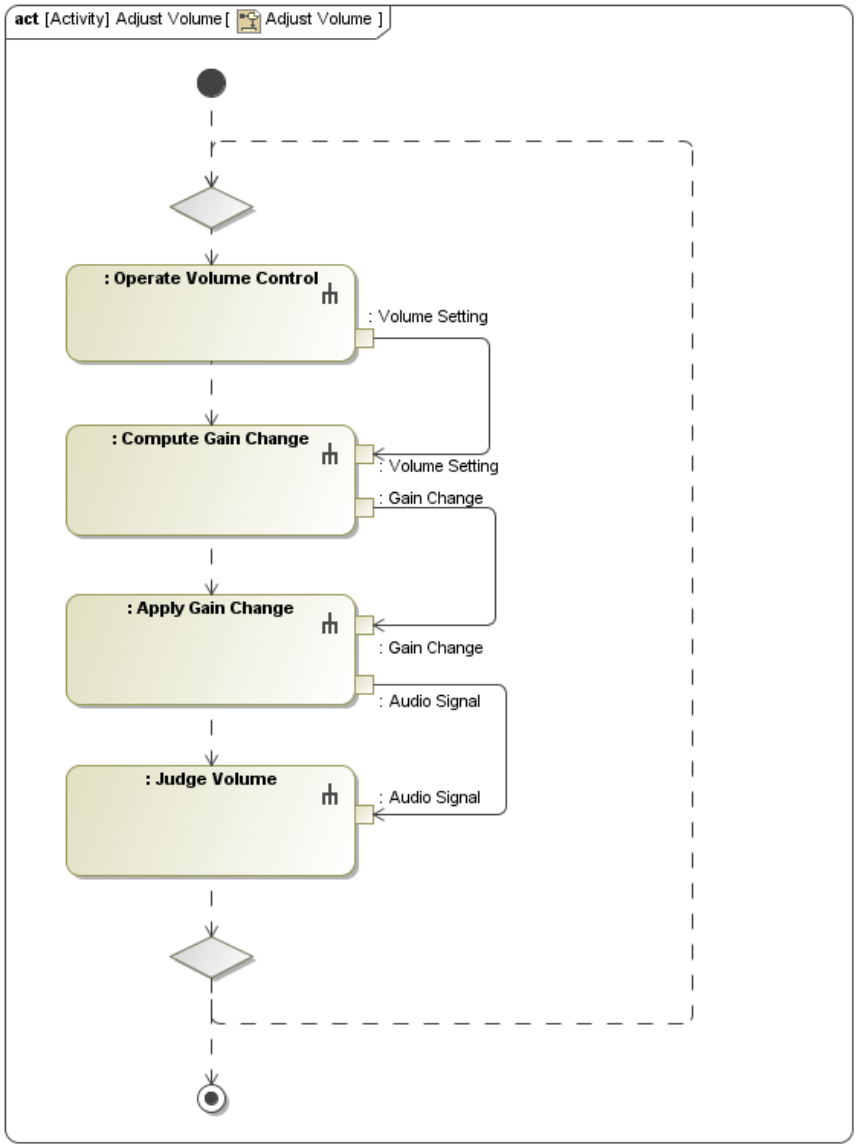
Create Activity Diagrams





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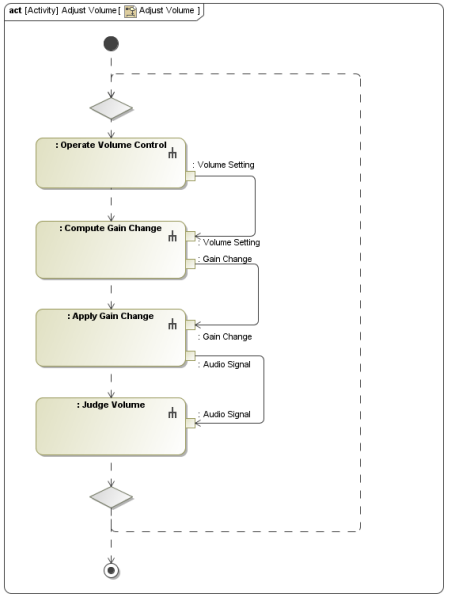
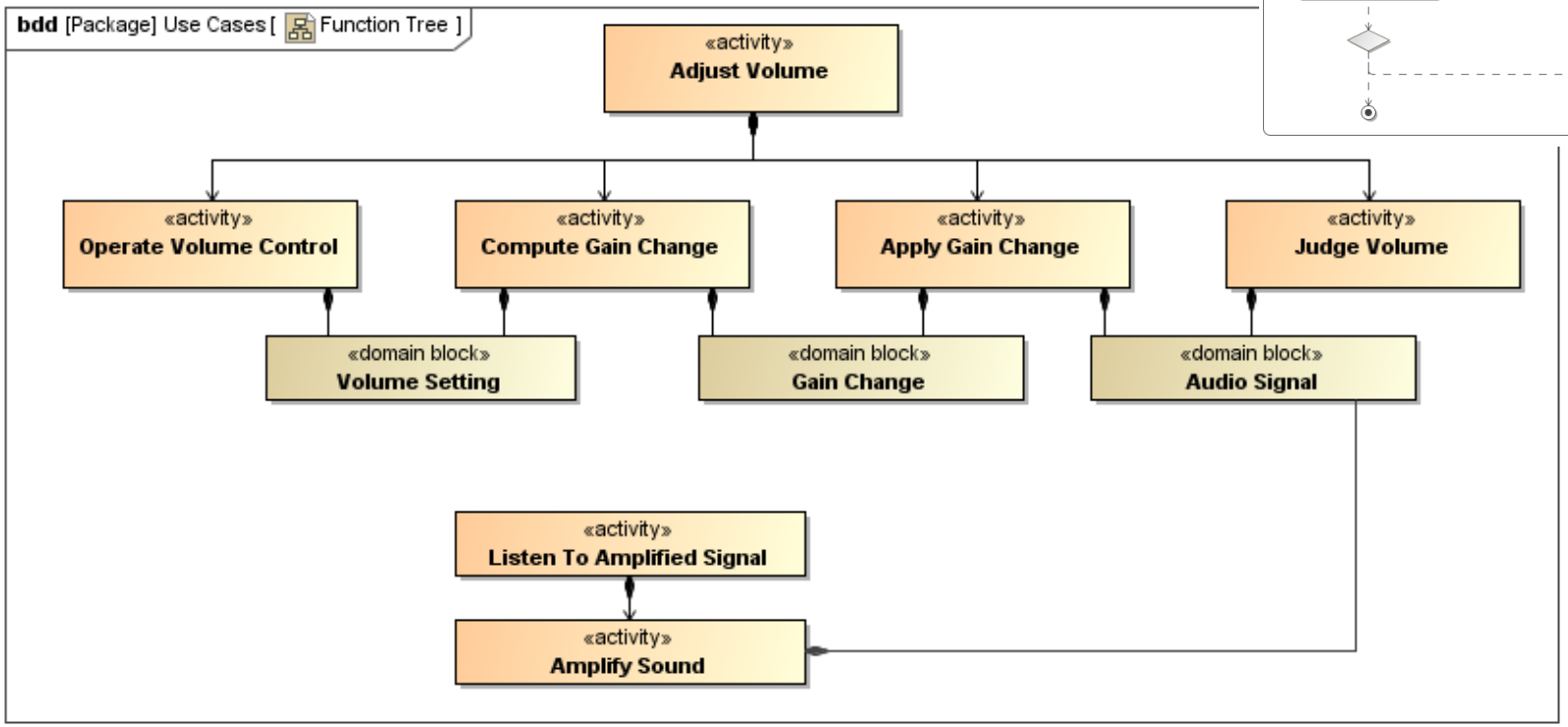
Activity Trees* of Use Cases





* also called „Function Trees“

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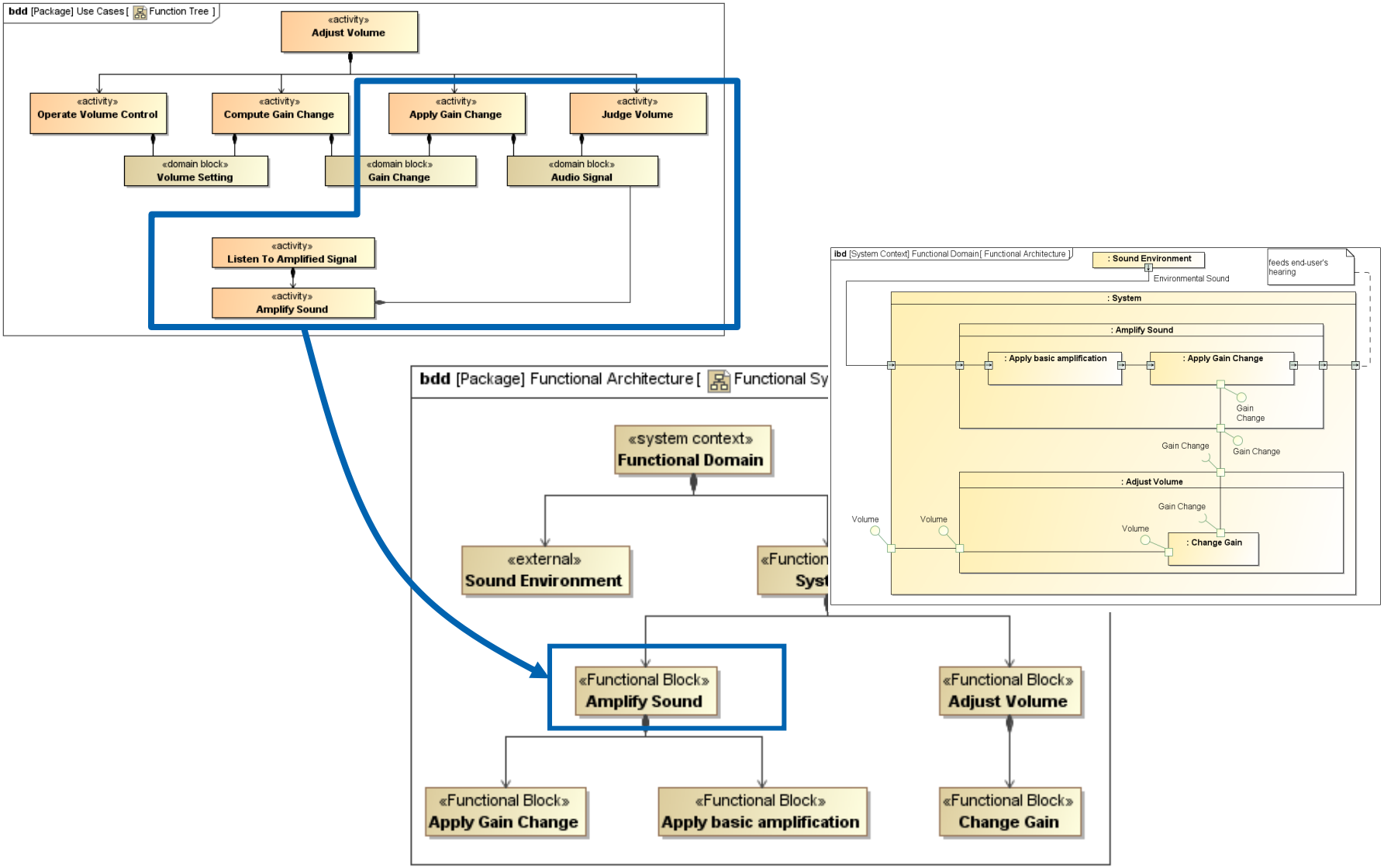
Heuristics for Grouping Activities



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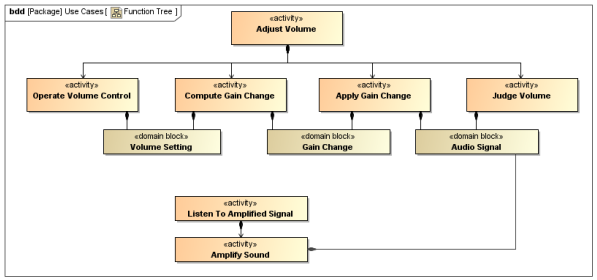
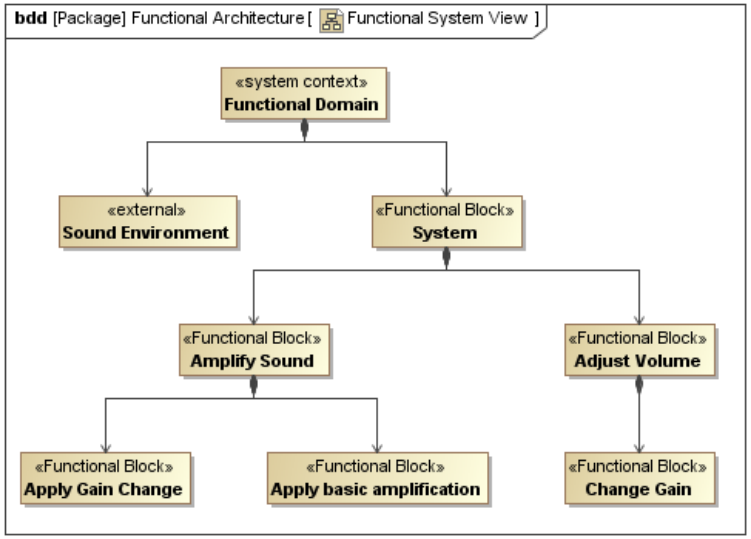
Heuristics to Derive Functional Blocks





- Use grouping criteria of existing groups
- Abstract and secondary use cases define a functional group
- One functional group takes the functions that are related to system actors
- Function calls imply cohesion
- Functions that share data can be grouped

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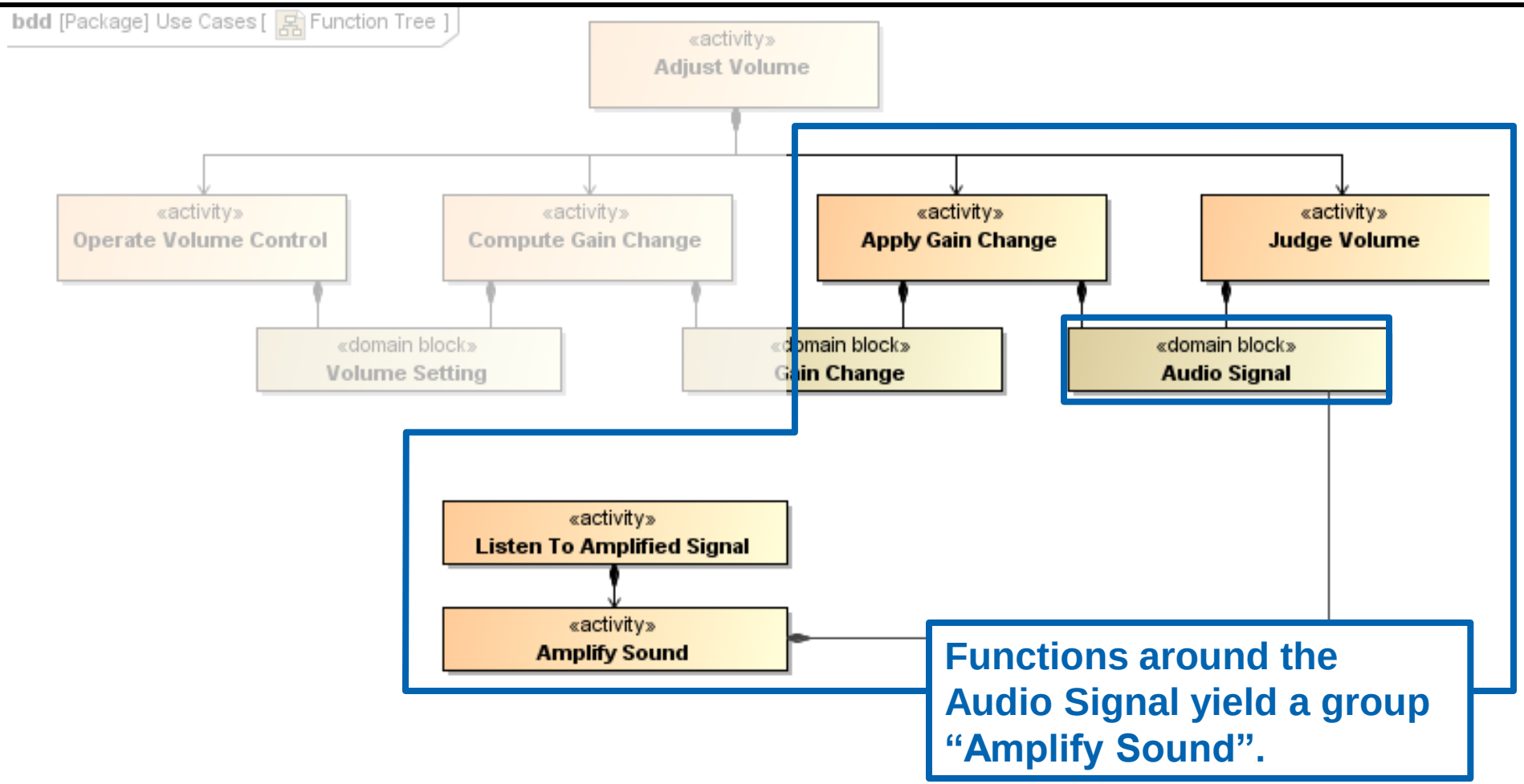
Example: Functions that Share Data Can Be Grouped



The remaining functions yield a group “Adjust Volume”.

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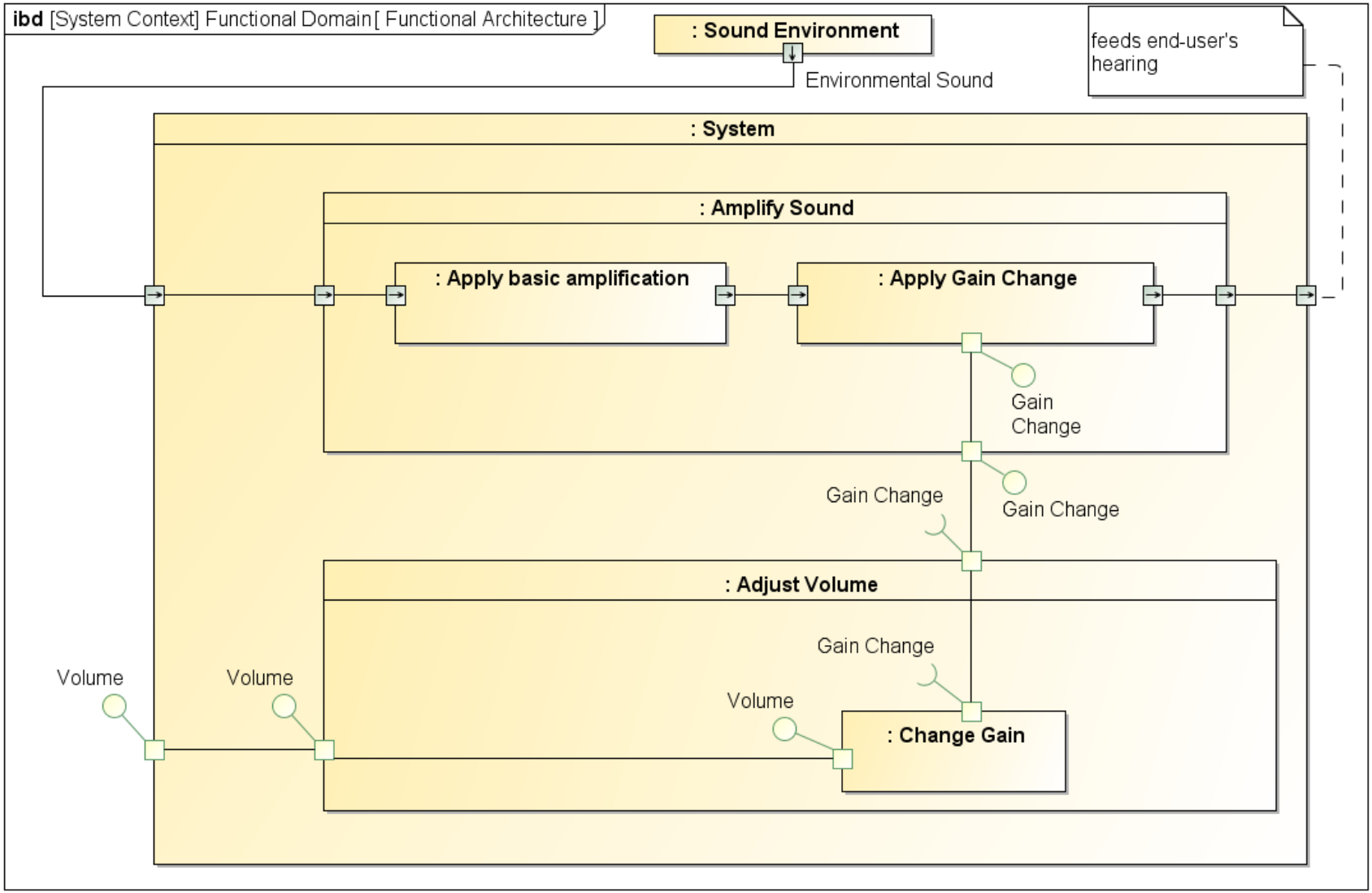
Example: Functional Architecture



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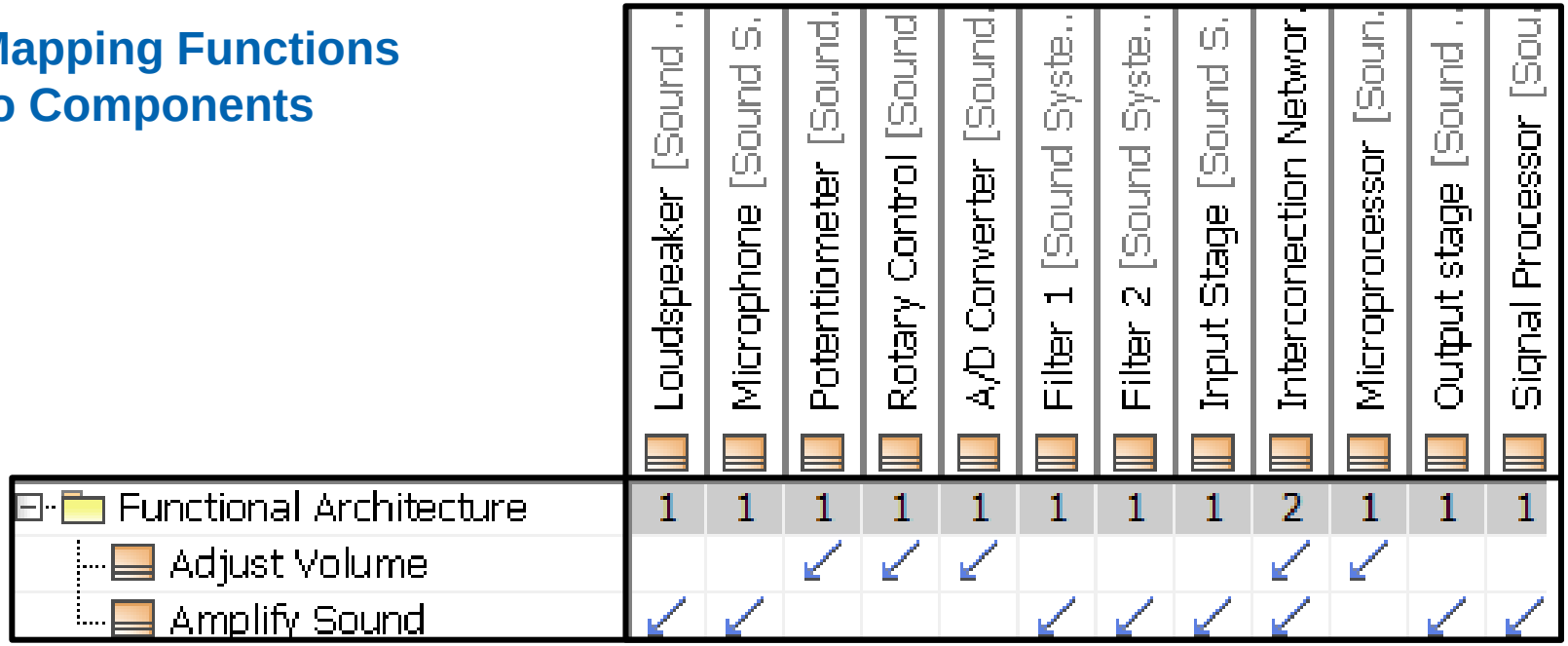
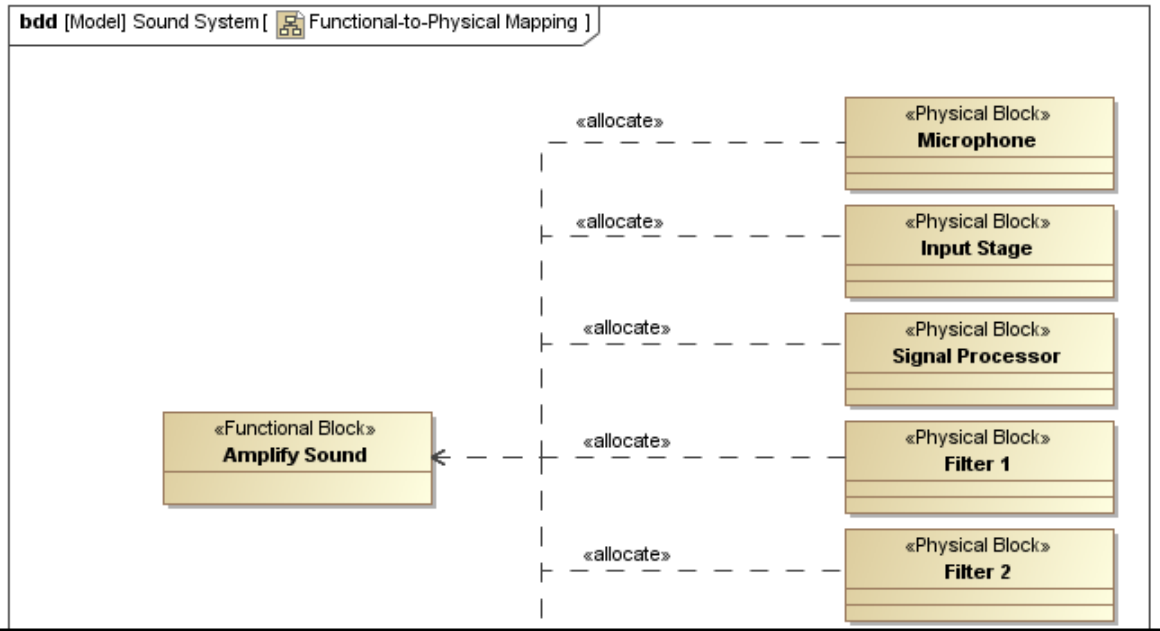
Mapping Functions to Components





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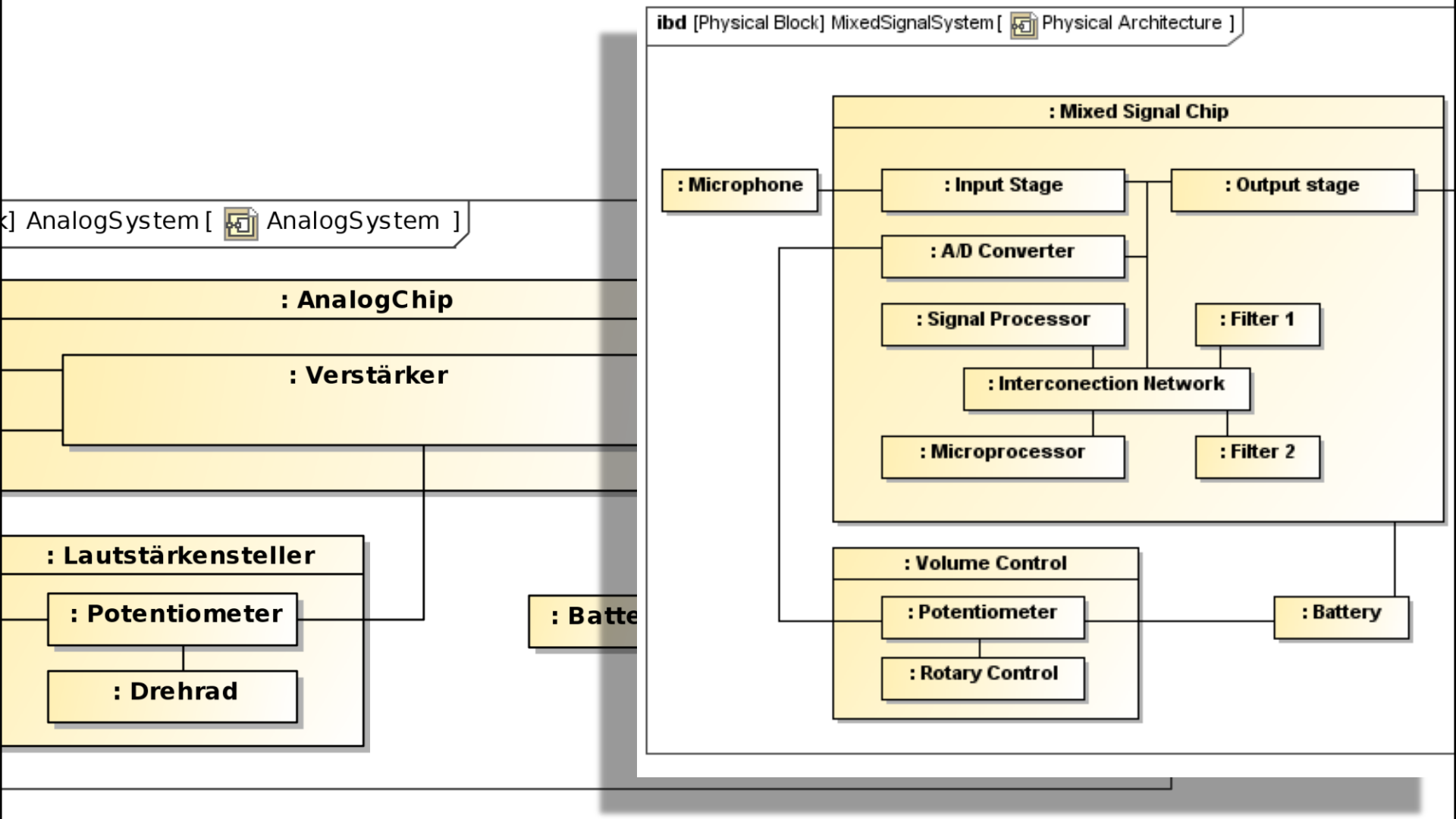
Functional Architectures Live Longer Than Technologies



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Conclusion

Functional Architecture ...

- represents the purpose of the system.
- is independent from the technical solution.
- focuses the user.

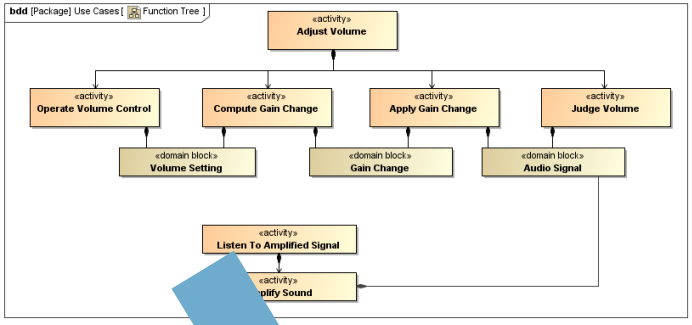
- is stable.
- does not impose technical solutions.
- can be re-used across product families and product generations.

- reduces development effort.
- increases customer benefit.
- enables innovative solutions.

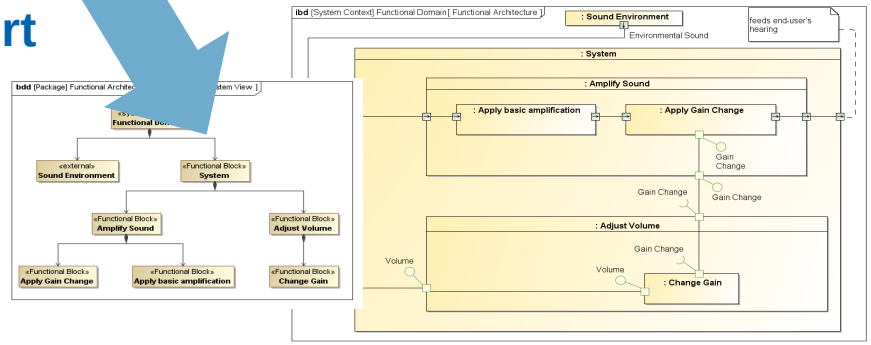
Outlook: Tool support

- Tool support can facilitate the creation of functional blocks
- A first study* with Artisan Studio has been done
- A MagicDraw plugin is under development

News: www.fas-method.org



Tool Support



* Korff, Lamm, Weilkiens, Talk at the German Systems Engineering Conference “TdSE”, Nov. 2011 (http://www.oose.de/fileadmin/Dateien/Publikationen/2011_TdSE_AutoFAS_english_version2.0.pdf)

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