# SysML Model to SystemC

One of the interresting areas for this project as describes in the project scope is the transformation from the platform independent modeling language SysML to a platform specification model in SystemC. The most interesting part is which steps is needed, is it always a one-to-one relation between a SysML block and a SystemC module, and how is the notation in SySML to illustrate what goes where. There is not literature about going from SysML architecture to SystemC implementation, though one rapport[[1]](#footnote-1) has been used as inspiration. Whether this article has given us greater insight in the process, will be concluded together with our interpretation of how it could be done.

While SysML is a modeling language for describing system and architecture, including behavior and structure, SystemC is the platform independent implementation language written in C++ that support almost all hardware-software construct.

A lot of work have been done in making software tools that automatically can generate SystemC code from a SySML model by exporting the SySML module to a XML format. Such tools are normally quite large, and just learning the basic would require a long time. Therefore the project members have agreed upon not spending time learning new tools, because learning by doing it manually would benefit more. The process of automatically generating the SystemC template require that SysML modules is notated with both variables, and port type declaration.

The mapping between SysML parts and SystemC is done upon SySML structural diagrams. The mapping process can begin after the bdd are decomposed to a more detailed idb.

* **SysML blocks maps to SystemC modules (sc\_module)(Could be split)**
* **SysML flow ports maps to SystemC port (sc\_ports)**
* **SysML property maps to SystemC fifo/signal (sc\_fifo,sc\_signal)**
* **SysML action maps to SystemC method/thread (sc\_method, sc\_thread)**

The above mapping of structural diagrams can be illustrated by our idb Audio below .

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| **Mapping illustration** | |
| **Audio.h** | **Idb Audio** |
| SC\_MODULE(Audio)  {  // Input/Out decleration  // Initiate modules  ADCSource  DACSource  AudioEncoder  AudioDecoder  AudioSplitter  FeedBackFiltration  AudioControl  } |  |

Above mapping illustration is a one to one mapping, where one block has a corresponding sc\_module. Therby the process of creating header files and implementation files can begin. Each module in the ibd is then created in SystemC with a header file (.h) which must include module definition, port declaration, and process declaration. Then the .cpp file is created which contain all implementation code, that describes the modules behavior.

Audio.h is responsible for instansation clock, signals, and modules, used among all modules in Audio.

SKAL vi vise eksempel på hvordan vores dbb skulle være laves hvis den skulle autogeneres til en systemC template. UML 2.1 extension L4

Hvor har vi beskrevet hvilken idb vi vil beskrive i bybden, skal det ikke være inder system requirements

One can also describe the mapping process though SysML behavior diagrams.

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1. SySML Profile for SoC Design and SystemC Transformation (University of Lugano) [↑](#footnote-ref-1)