ASAM | Association for standardisation of automation and measuring systems

Release Presentation

ASAM AE XIL-MA 2.0.2

Generic Simulator Interface for Simulation Model Access

2016 / 02 / 22

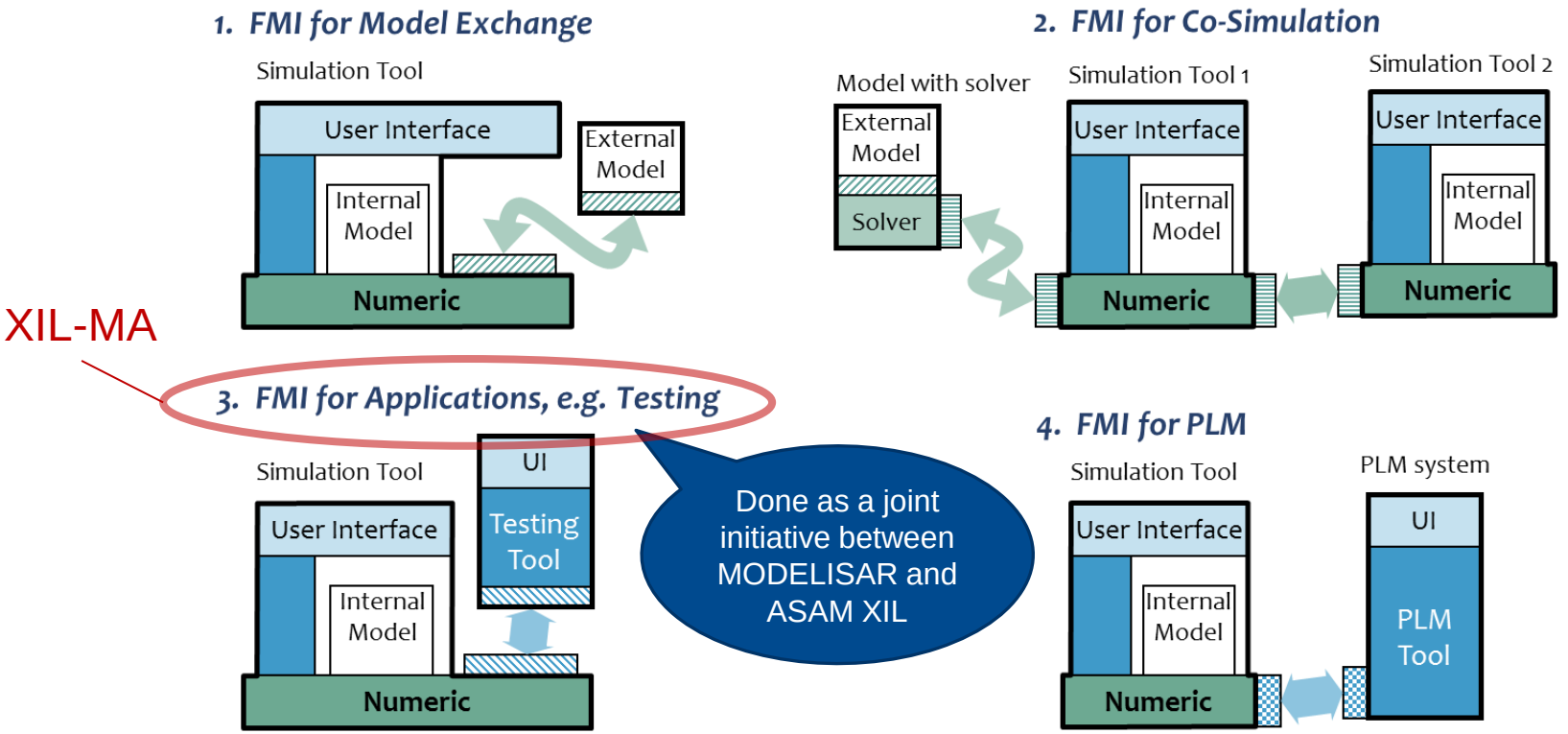
Agenda

- Motivation and Background of XIL-MA
- Introduction and General Concepts
- What's New?
- Deliverables
- Compatibility

Motivation for XIL-MA

Cooperation of ASAM XIL and ITEA 2 Project MODELISAR

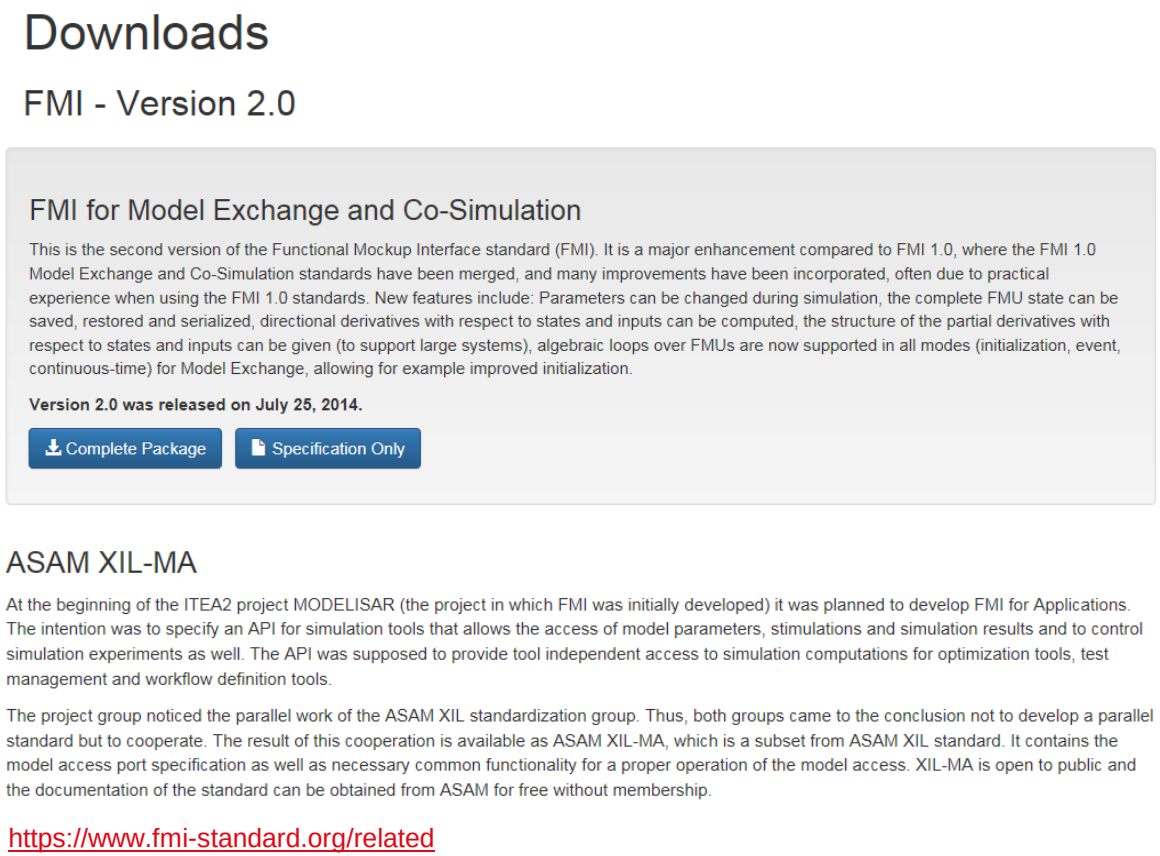
- European Project MODELISAR (2008 – 2011)
  was setup to develop a set of open interface standards for simulators



Background on FMI (1)

Result of MODELISAR: Functional Mockup Interface FMI

- Open standard
  - Free downloads on FMI web page: https://www.fmi-standard.org/downloads



Downloads

FMI - Version 2.0

FMI for Model Exchange and Co-Simulation

This is the second version of the Functional Mockup Interface standard (FMI). It is a major enhancement compared to FMI 1.0, where the FMI 1.0 Model Exchange and Co-Simulation standards have been merged, and many improvements have been incorporated, often due to practical experience when using the FMI 1.0 standards. New features include: Parameters can be changed during simulation, the complete FMU state can be saved, restored and serialized, directional derivatives with respect to states and inputs can be computed, the structure of the partial derivatives with respect to states and inputs can be given (to support large systems), algebraic loops over FMUs are now supported in all modes (initialization, event, continuous-time) for Model Exchange, allowing for example improved initialization.

Version 2.0 was released on July 25, 2014.

Complete Package | Specification Only

ASAM XIL-MA

At the beginning of the ITEA2 project MODELISAR (the project in which FMI was initially developed) it was planned to develop FMI for Applications. The intention was to specify an API for simulation tools that allows the access of model parameters, stimulations and simulation results and to control simulation experiments as well. The API was supposed to provide tool independent access to simulation computations for optimization tools, test management and workflow definition tools.

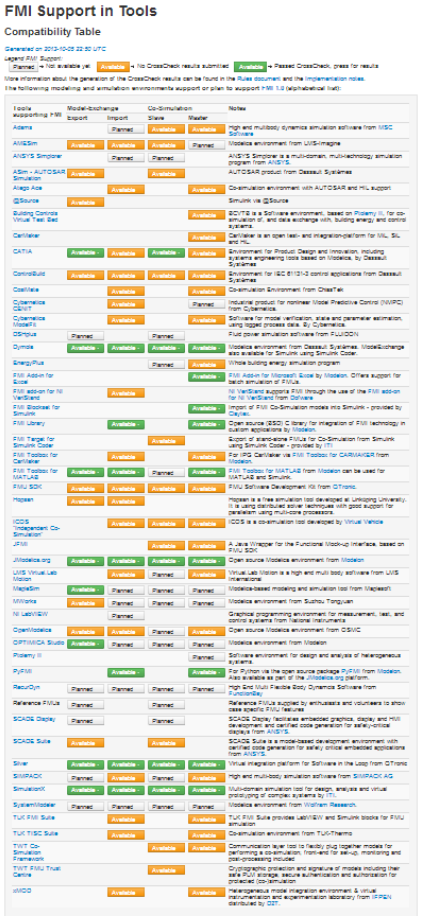
The project group noticed the parallel work of the ASAM XIL standardization group. Thus, both groups came to the conclusion not to develop a parallel standard but to cooperate. The result of this cooperation is available as ASAM XIL-MA, which is a subset from ASAM XIL standard. It contains the model access port specification as well as necessary common functionality for a proper operation of the model access. XIL-MA is open to public and the documentation of the standard can be obtained from ASAM for free without membership.

https://www.fmi-standard.org/related

Background on FMI (2)

Functional Mockup Interface standard is going its way

- Broadly supported by simulation tools, see FMI web page: https://www.fmi-standard.org/tools
- Continuous development on future releases by a group as a Modelica Association Project
  - Members include Dassault Systems, Siemens, dSPACE, ETAS, Bosch, Daimler
- ProSTEP project to utilize FMI as standard exchange format between OEMs and suppliers
  - Members include BMW, Bosch, Conti, Daimler, Ford, MAN, several tool vendors
- Global Automotive Advisory Group for PLM support the ProSTEP initiative
  - OEM Members include BMW, Chrysler, Daimler, FIAT, Ford, GM, Nissan, Renault, VW,



Basic idea of the joint initiative between MODELISAR and the ASAM XIL group

- Don’t develop competing standards
  - Bring together the HIL and MIL/SIL environments
  - Project proposal addresses the idea

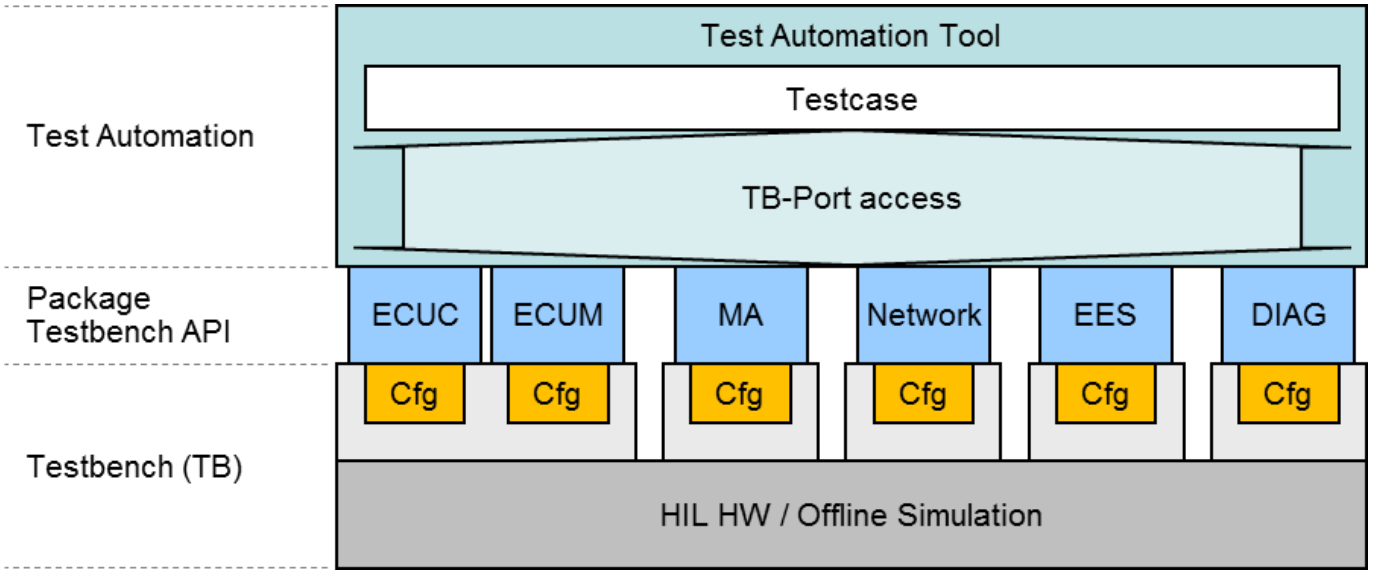
> Several companies, participating in the ITEA-2 project MODELISAR have contacted the ASAM HIL API 1.0 project team meanwhile. It had been evaluated that ASAM HIL API 1.0 functionality could and should also be used for the offline simulation scenarios of the MODELISAR use cases.
>
> Especially the simulator control API commands, which should be extended in this project will be aligned with already existing MODELISAR results.

taken from project proposal ASAM HIL 2.0.0, 2011

  - Daimler entered the ASAM HIL API project to connect the two groups
  - No effort on FMI for Application within MODELISAR
- Common understanding that results concerning offline simulation can be released as FMI for Applications
  - freely available to non-ASAM-members

General Concepts of XIL (1)

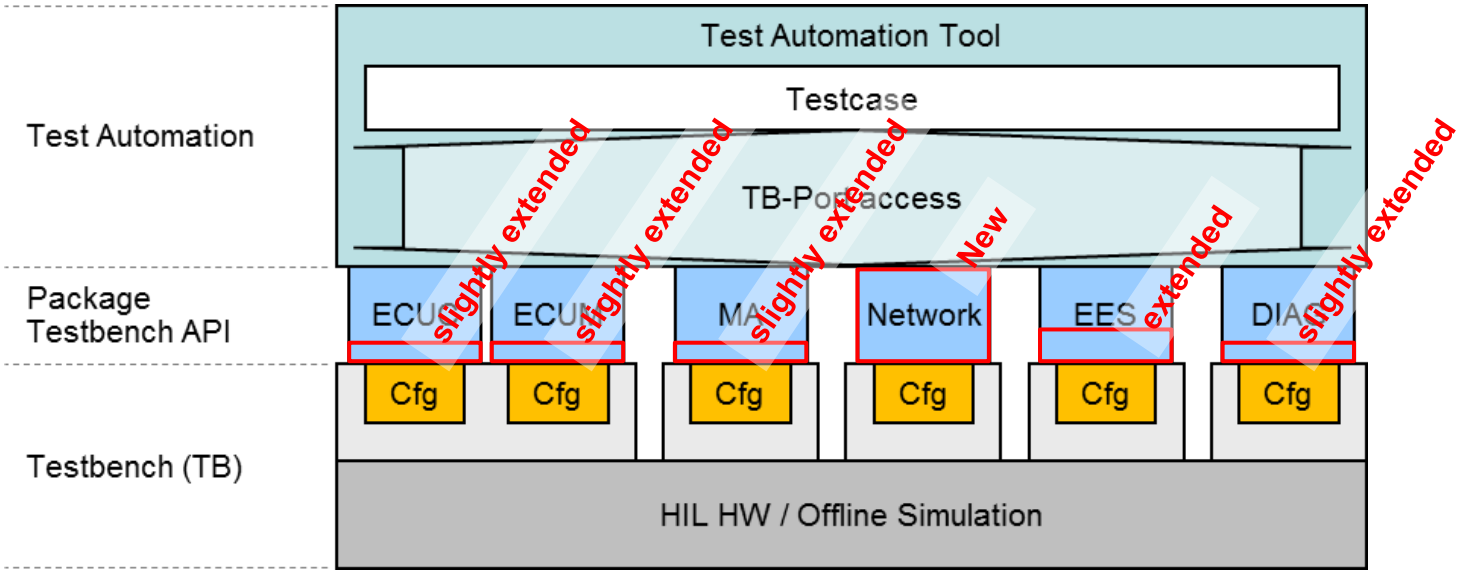
Testbench-based Access (as in HIL 1.0.2)



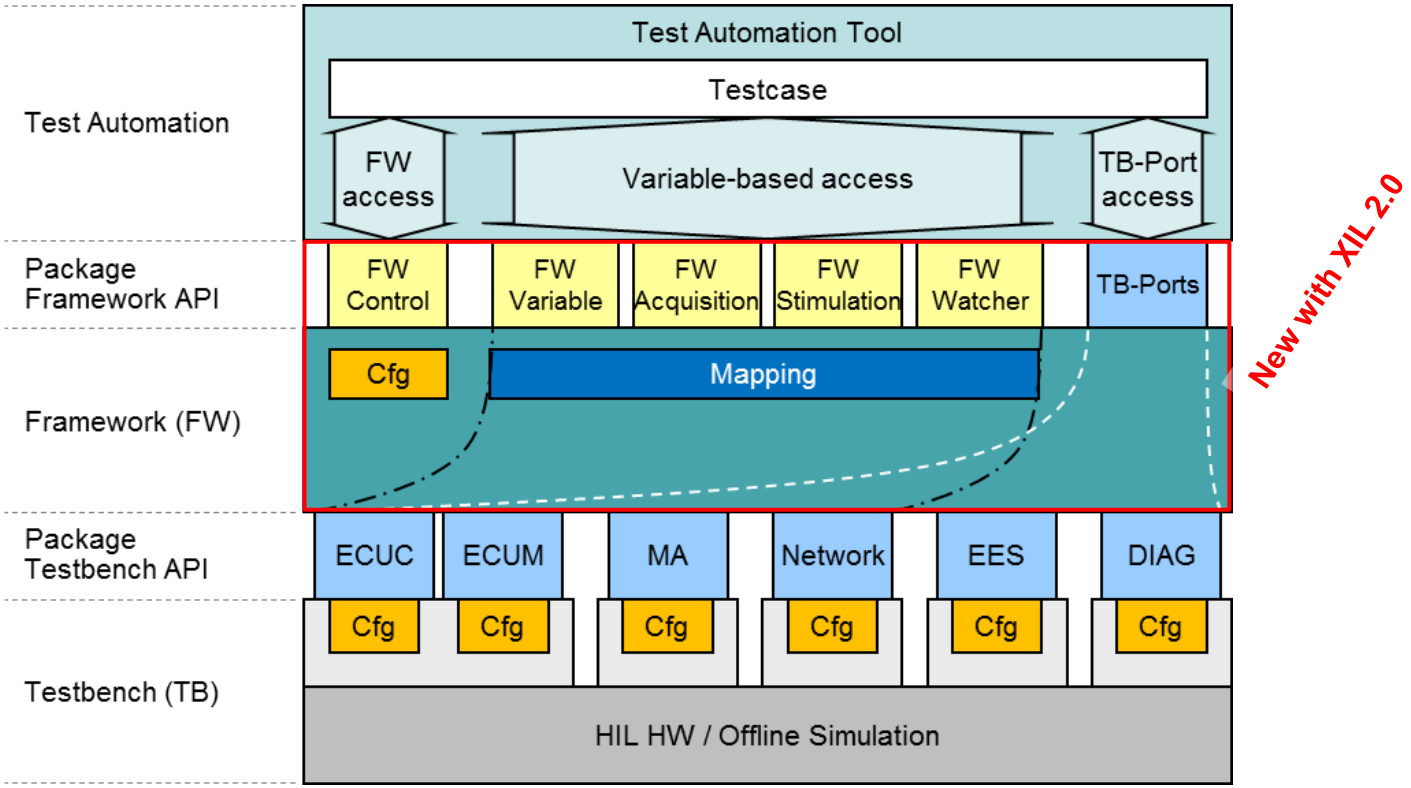
- Drawbacks of HIL 1.0.2:
  - Testcase has to implement start and shutdown of ports
  - Dealing with vendor-specific start and shutdown methods (not standardizedin 1.0.2)
  - Port-specific variable identifiers and data types
  - Missing overall concepts for measuring and stimulating accross different ports

General Concepts of XIL (2)

Testbench Extensions with XIL 2.0

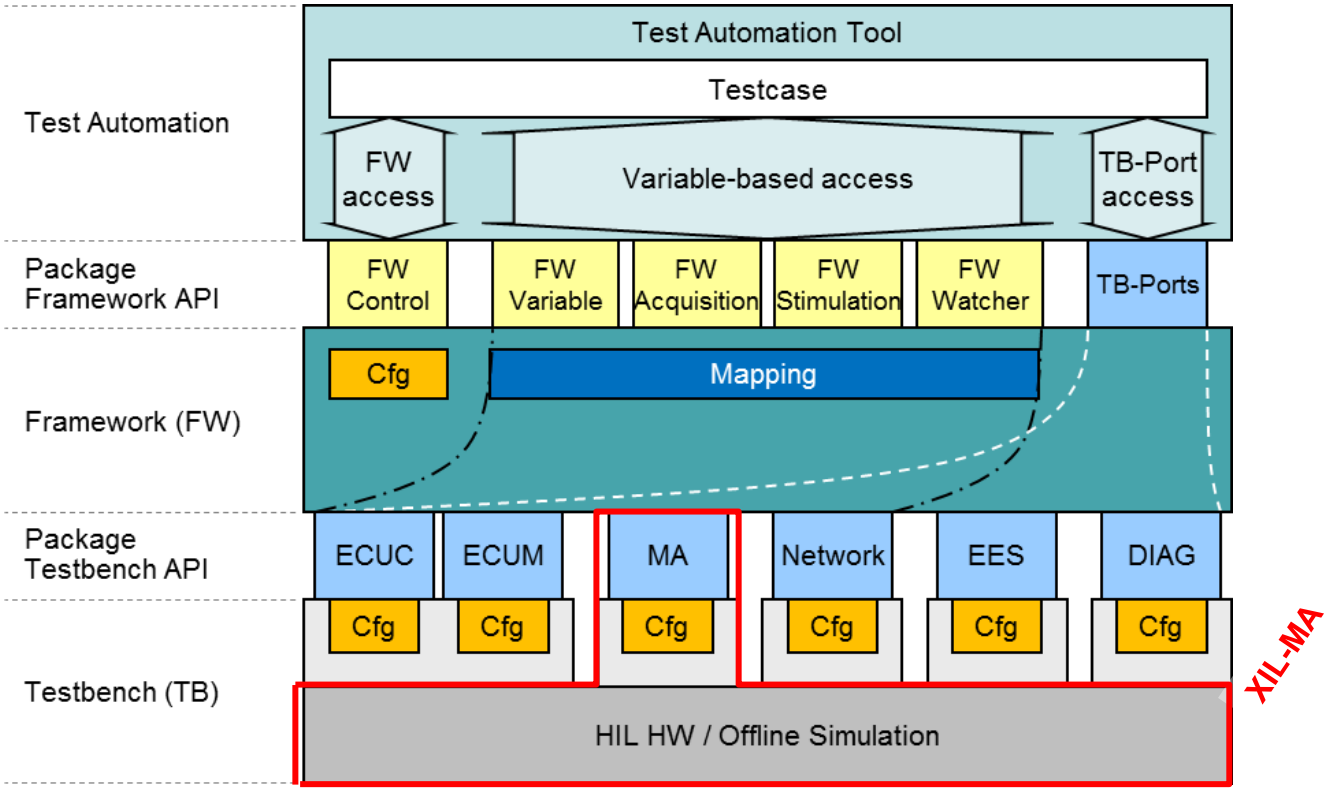


Framework-based Access (with XIL 2.0.0)



- Major Benefits:
  - Port independence of testcases by using an object-oriented access to variables
  - Framework starts and shuts down ports in a configured order
  - Test Developer can use both: Testbench Port access and Variable-based access
  - FW Variables provide access to the underlying Testbench Port

XIL-MA



- MAPort for Simulation Model Access
  - can be used in single testautomation applications
  - can be integrated into the XIL Framework together with other ports to benefit from the full Framework functionality.

XIL-MA: What's New?

- ASAM releases an additional document:
  "Generic Simulator Interface for Simulation Model Access"
  - Contains only relevant parts **for implementation of MAPort**
  - **Freely available** for anyone as a download
  - **ASAM XIL standard remains "master"** description, Testbench Model Access Port and Common Functionalities
- Future releases of ASAM XIL
  - Extract the same scope of content
  - The **FMI group** should be invited to **send representatives** into XIL to contribute their experience (also non ASAM members)

Not included in XIL-MA but in XIL

Benefits of XIL-MA

- Open ASAM Document
  "Generic Simulator Interface for Simulation Model Access
  - Broadens scope of XIL standard to non-ASAM / non-HIL vendors
  - Consistency of specification is maintained by XIL group
  - ASAM ownership and copyright

Compatibility

- XIL-MA is a subset of XIL.
- The parts that are available in both standards are absolutely identical.

Deliverables

Package Standard
Directory Specification
ASAM_AE_XIL-MA_AS_V2-0-1.pdf

Directory Generic UML Model
ASAM_AE_XIL-MA_AS_V2-0-1.EAP (view of test case developer)

Package Implementation Support (ASAM software parts)
Directory Templates and Directory Template Example
- Stimulus Signal Description (*.xsd, *.sti and *.stz example)
- ImplementationManifest (ImplementationManifest.xsd; xml example)

Directory Technology Reference Interfaces
Sub Directory Python contains
- Mapping_Rules
  (ASAM_AE_XIL_Generic-Simulatior-Interface_BS-3-4_Python-API-Technology-Reference-Mapping- Rules_V2-0-1)
- Python Interfaces (py files)

Sub Directory C# contains
- Mapping_Rules (ASAM_AE_XIL_Generic-Simulatior-Interface_BS-2-4_C#-API-Technology-Reference-Mapping-Rules_V2-0-1)
- Interfaces (cs files)
- Sample Code (restricted for MA-Port)

Changes in Maintenance XIL-MA 2.0.1

based on XIL-MA 1.0.0

- Bugfixing of some workblockers, that have been detected during implementation phase, such as scalar was returned instead of a list of scalars;
  Signal generator factory now returns the correct ISignalGeneratorSTZWriter instead of ISignalGeneratorSTZReader;
  added missing value 'eDATAFILE' to SegmentTypes enum.
- Definition of Initial values to avoid invalid object creation of the new DataFileSegment class.
- Added some missing error codes and post conditions
- Added a new MAPort method GetTaskInfos to get information about existing tasks (eTimerDriven, eEventDriven, Sample Period)
- Added some functionality for simultanious read access of multiple clients and threads to the Testbench Manifest File (contains vendor-specific information about the Testbench)
- Capture now derives from Interface IDisposable to enable explicit instance destruction of Capture (to free system resources, e. g. real-time service code)
- Correction of errors in documentation (Guide and UML Model, e. g. SetStartTriggerCondition)
- Introduction of the correct short name in all documents:
  "XIL - Generic Simulator Interface" instead of “XIL - API for ECU Testing via XIL“

Changes in Maintenance XIL-MA 2.0.2

based on XIL-MA 2.0.1

Data Capturing (motivated by MAPort)

- VariableInfoObject now contains AvailableTasks
- Trigger Time Stamps added to Capture Result (eSTARTTRIGGER, eSTOPTRIGGER)
- Data Frame Time Stamps added to Capture Result (eDATAFRAMESTART, eDATAFRAMESTOP)

Improvements & Convenience

- Various improvements in documentation and examples (e. g. Trigger with start and stop delay)
- Missing factory method added (SignalGeneratorFactory.CreateSignalGenerator)
- Missing Post Conditions added (for better error handling)