ICSC 2013
IDAJ CAE Solution Conference
New Value in CAE & CFD Industry

GT-SUITE
MBDプロセスでのGT-SUITEの活用

Proposal of solutions from the Systems Engineering to Real Time Execution using GT-SUITE

IDAJ co.,Ltd.
Tomomi Ejima

Agenda

- Using SysML in V-Process
- Linkage with SysML and SCADE System/SUITE
- GT-SUITE Data Management
- Co-Simulation
- Real Time execution
- GT-SUITE/SCADE/xMOD Tool Chain

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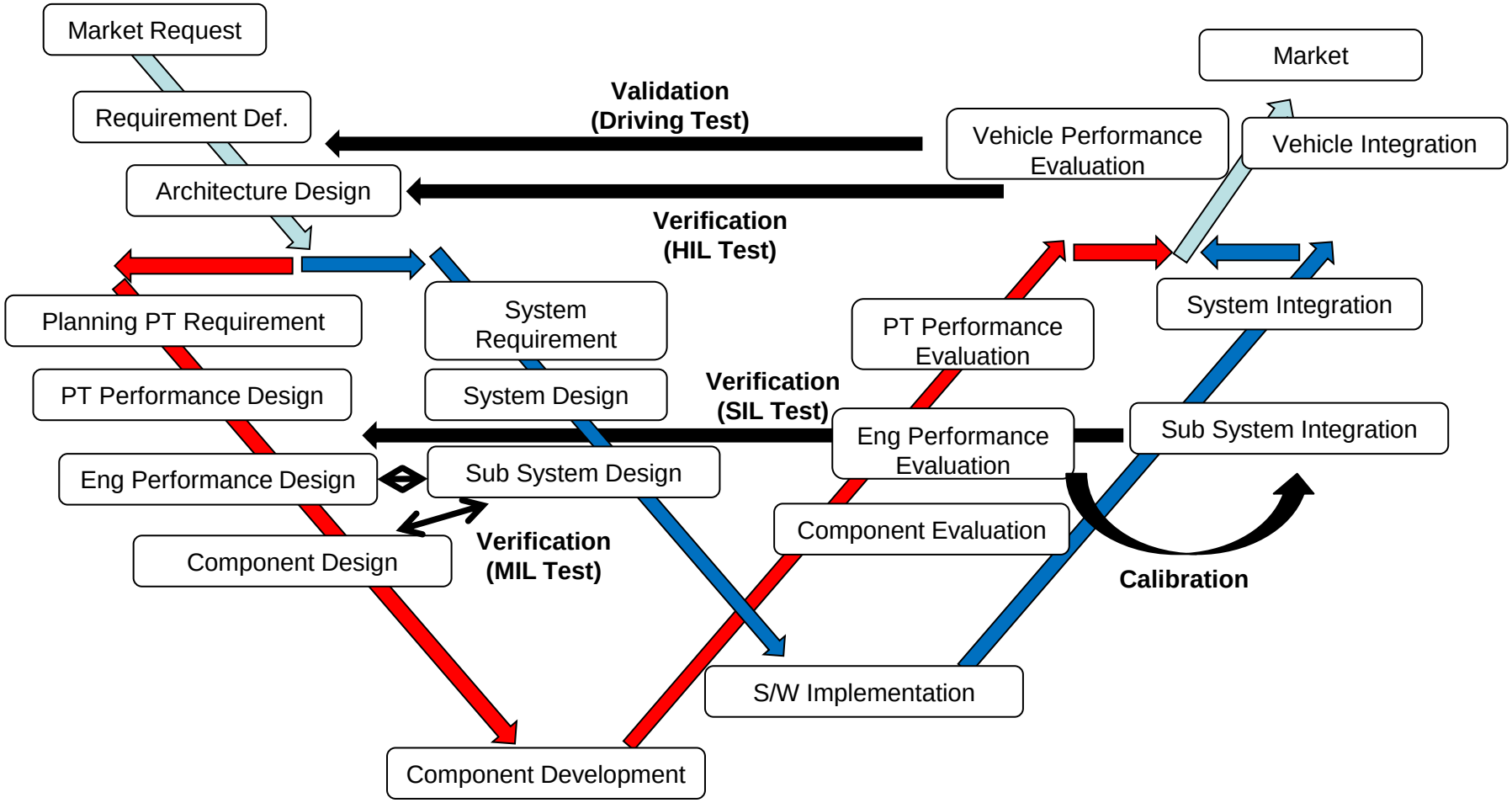
Using SysML in the V-Process



Using SysML in the V-Process

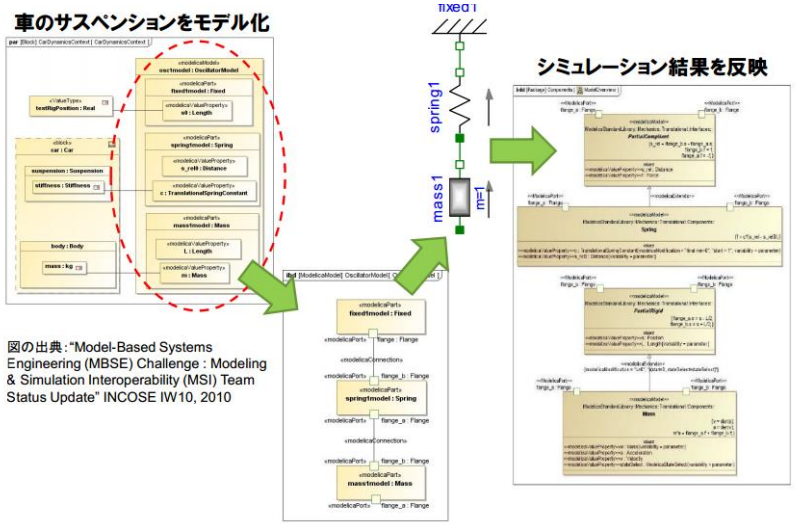
- A lot of interaction occurs between H/W and S/W from the early phase of development
- Important to clarify the requests for performance and function, and necessary to verify and validate.
- Necessary to manage the requests and test results.
- Need common language to understand the structure of H/W and S/W system and I/O between engineers.

Using SysML in the V-Process

- What is SysML（System Modeling Language）？
  - SysML has been released as a formal specification by OMG(Object Management Group). It is a general purpose modeling language.
  - SysML supports the analysis, design and verification of complex systems including H/W,S/W, personnel, procedure, and facilities in a graphical notation.
  - SysML is designed to be a common language for mechanical engineers and software engineers.
  - SysML is developed in order to verify function and performance to the complex and large-scale system such as automobile and aircraft.

Using SysML in the V-Process

- Simple physical model can be described by SysML
- MbSE（Model base System Engineering）:Model driven development



- SysML（+Modelica etc.）can simulate simple physical model . But how can I build engine model by SysML???
- It is necessary to use GT-SUITE to simulate engine and vehicle system!!

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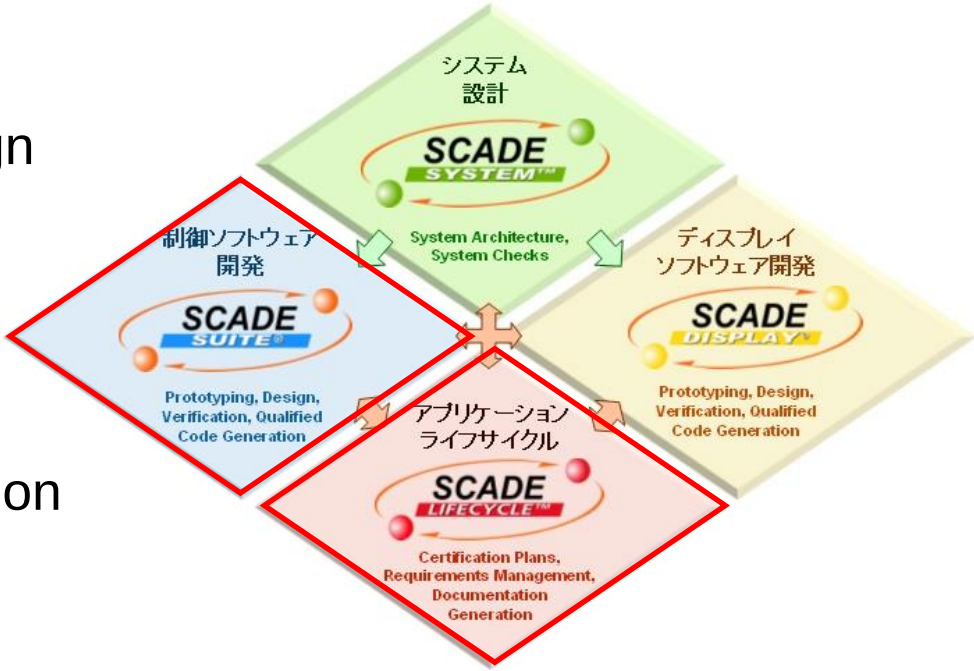
Linkage with SysML and SCADE System/SUITE

- SCADE has been developed specifically to address mission and safety-critical embedded applications
- SCADE has been used in various industries aviation,nuclear,rail and automobile

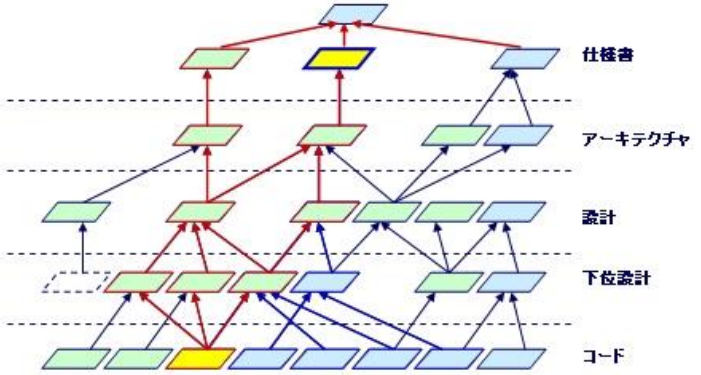
SCADE Products：

- SCADE System(System Design Environment by SysML)
- SCADE Suite(Model-Based development environment to critical embedded software)
- SCADE Lifecycle(The integration of processes and product data management)

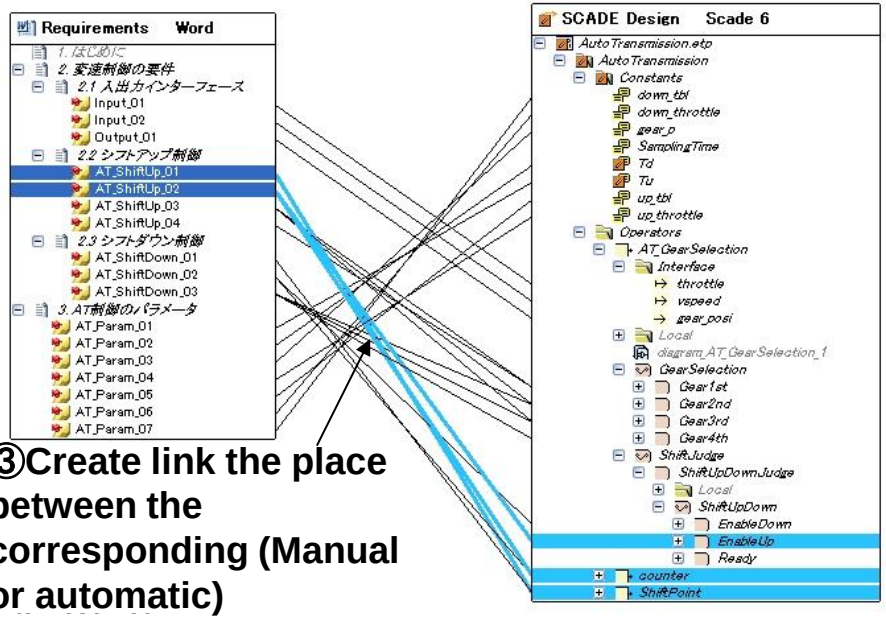


Linkage with SysML and SCADE System/SUITE

- Secure and Mange “Traceability”
  - Mechanism for where the design requirements were implemented in design and verify the implementation throughout the development cycle.
  - Basic mechanism of making not elaborated a bug and error.



①From the specifications of the AT shift control that is written in Word, It automatically retrieve documents linking the target (requirement).



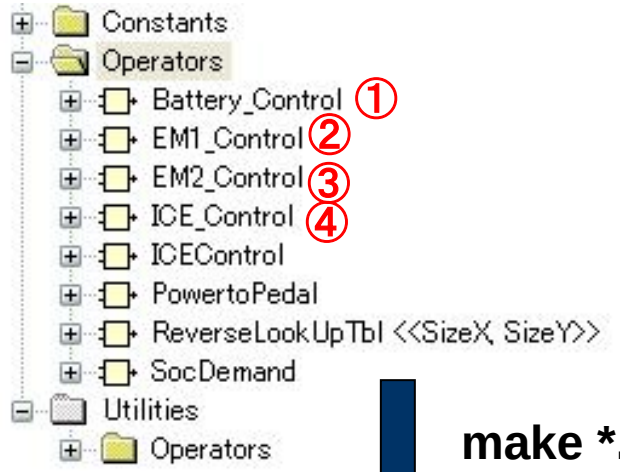
③Create link the place between the corresponding (Manual or automatic)

②The automatically retrieve each model element AT shift control models created based on the specifications.

Linkage with SysML and SCADE System/SUITE

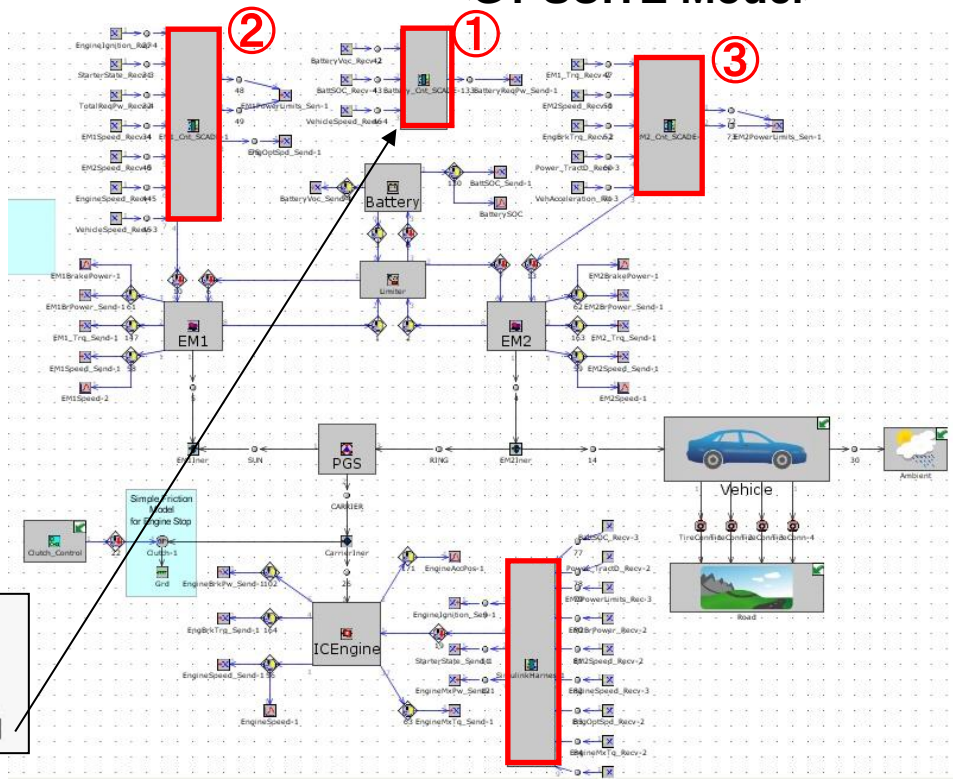
- Coupling with SCADE control model and GT-SUITE physical model

<SCADE Model>



make *.dll

<GT-SUITE Model>



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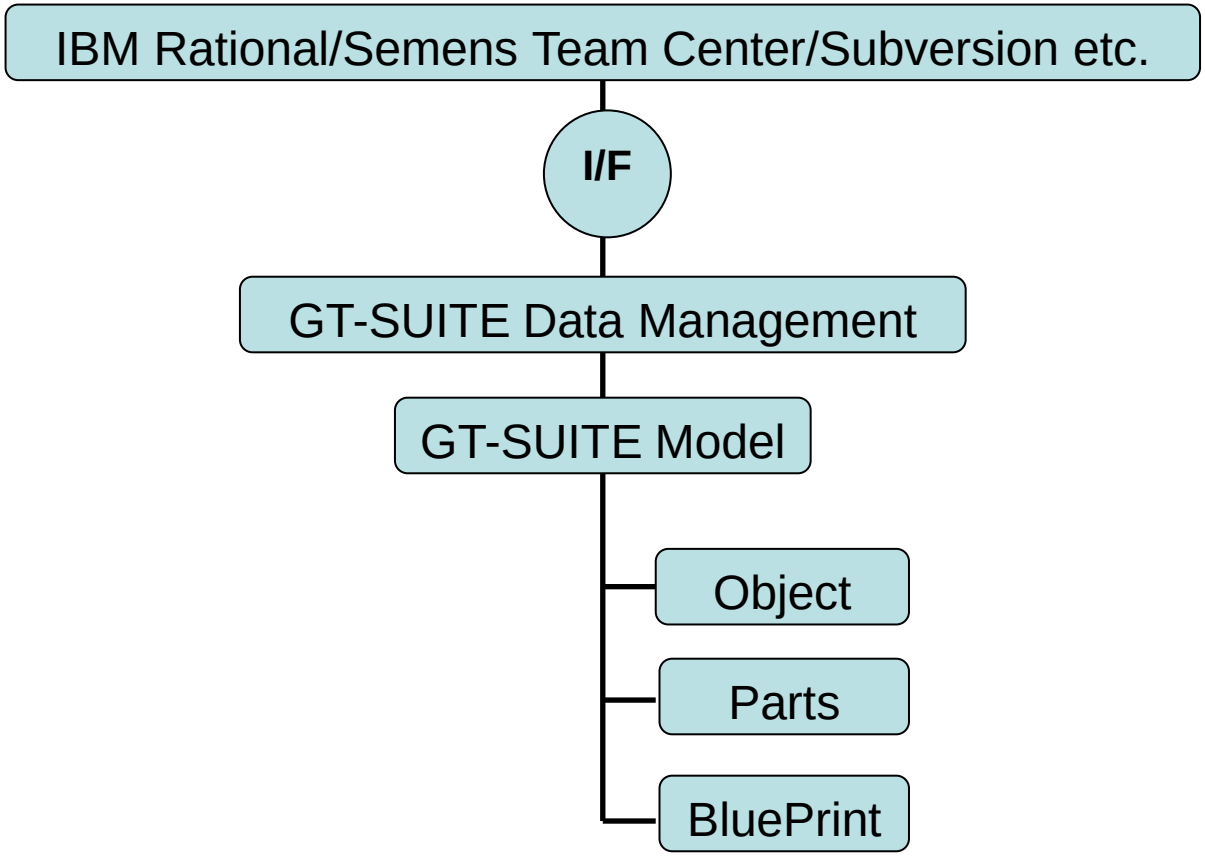
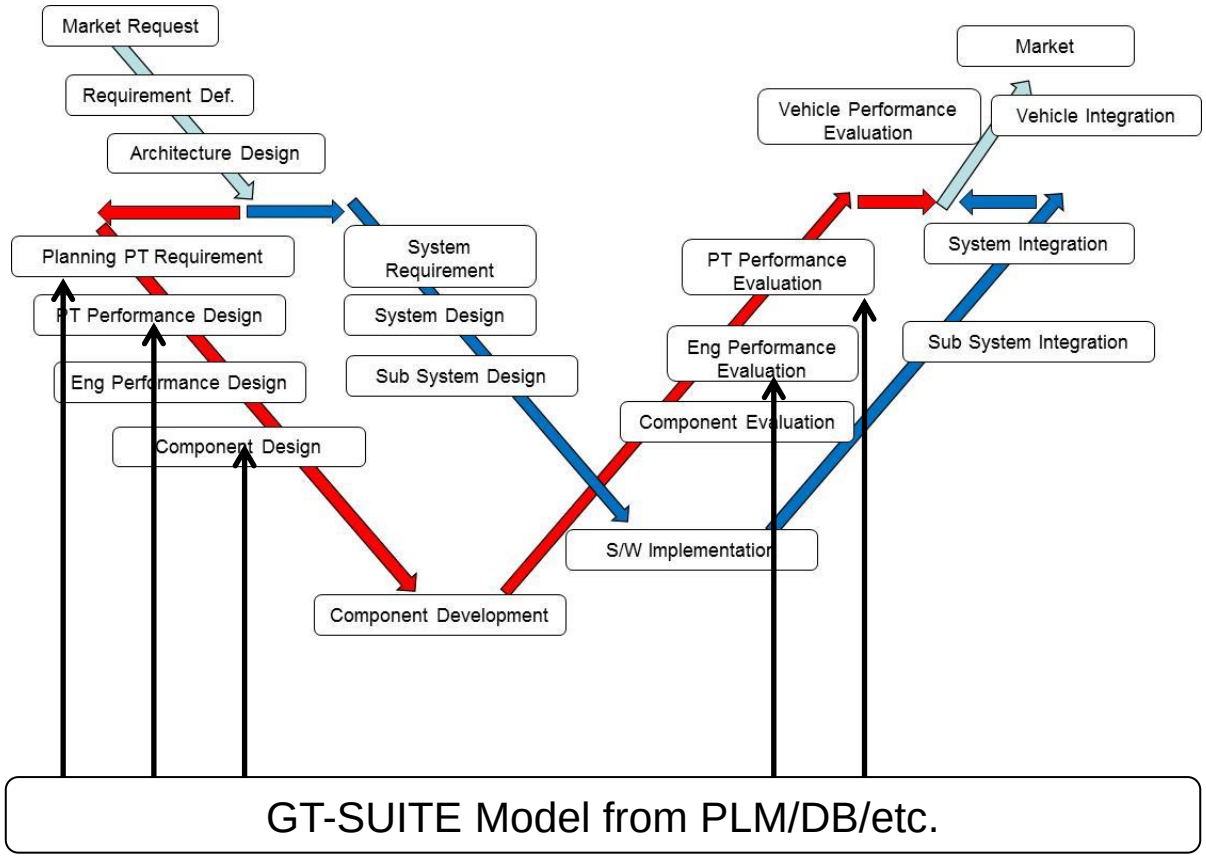
GT-SUITE Data Management

- GTI is developing general I/F for PLM and D/B system.
- It can manage GT-SUITE model, object , parts and some data sheets.



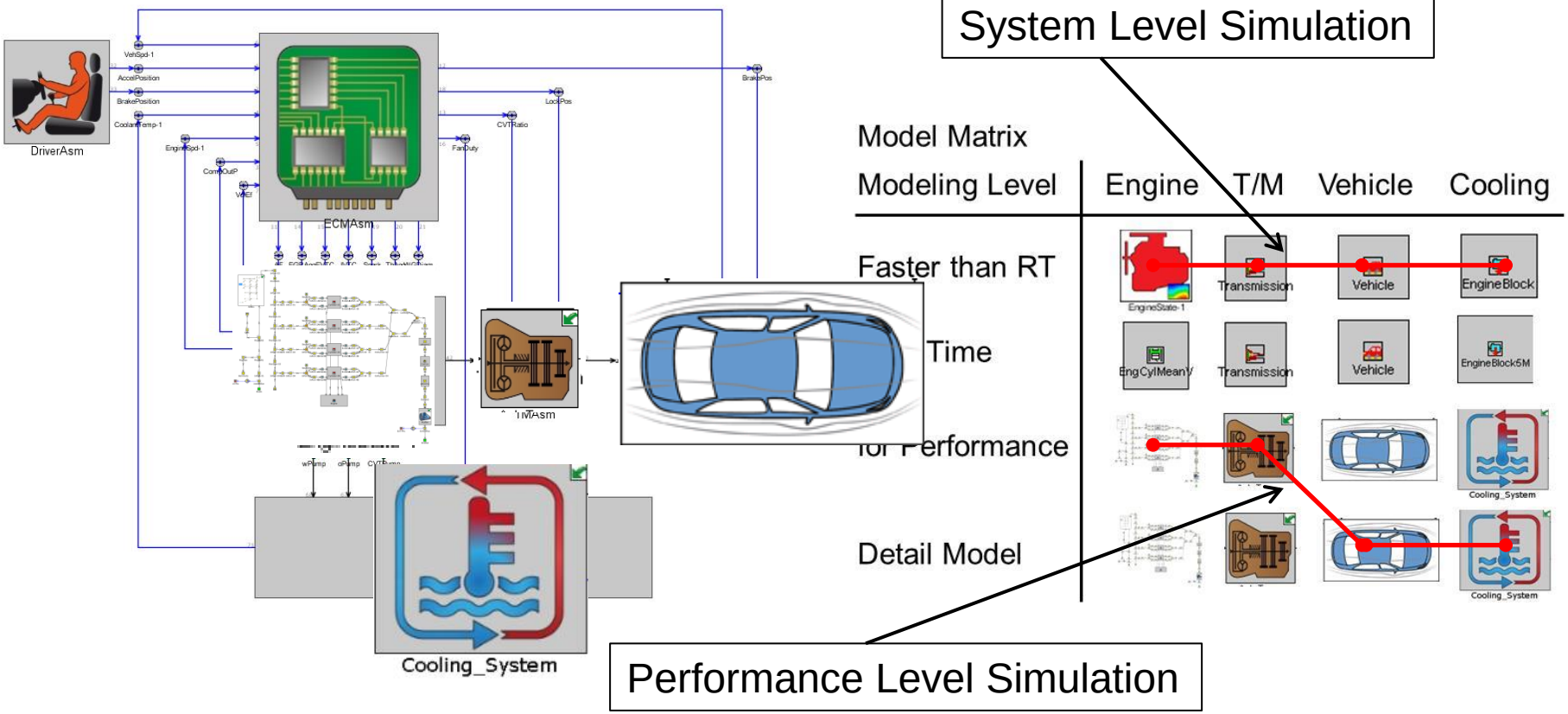
GT-SUITE Data Management

- Useful to manage the various “level” of GT-SUITE model



GT-SUITE Data Management

- Select component model and integrate these to whole system model.
- Select the “level of detail” to meet the purpose



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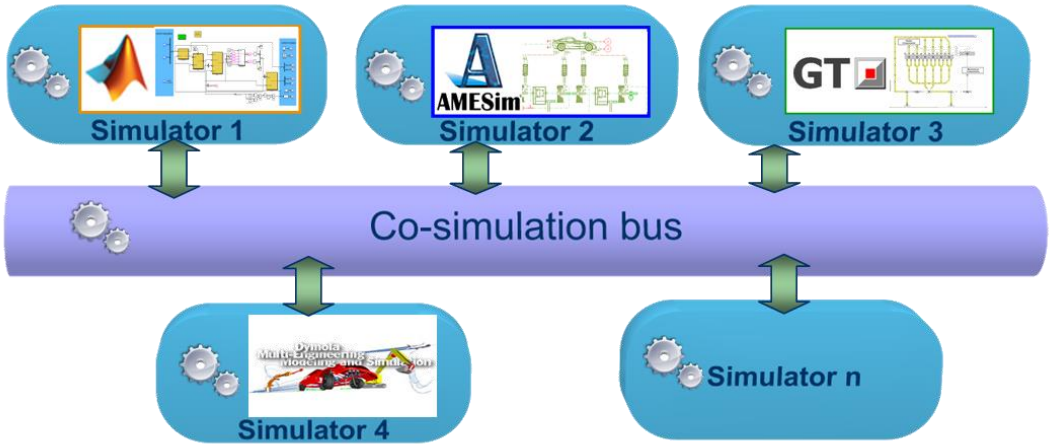
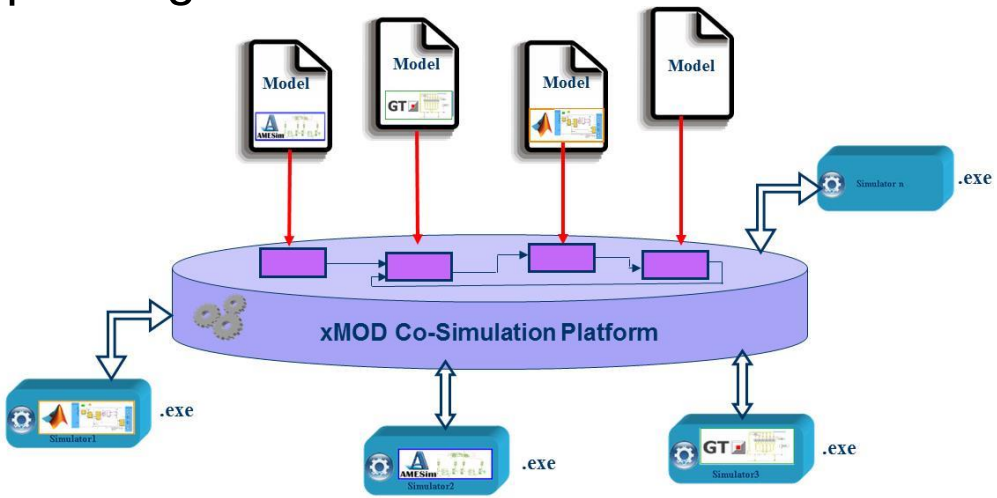
Co-Simulation

- In the V-Process, need to co-simulate with physical/control model
- For the physical modeling, need to couple various tools other than GT-SUITE(Simulink, AMESim,SimulationX etc.)
- It needs to optimize(parallelize) complex model execution
- Need a platform to collaborate and manage a data exchange between various tools and models.



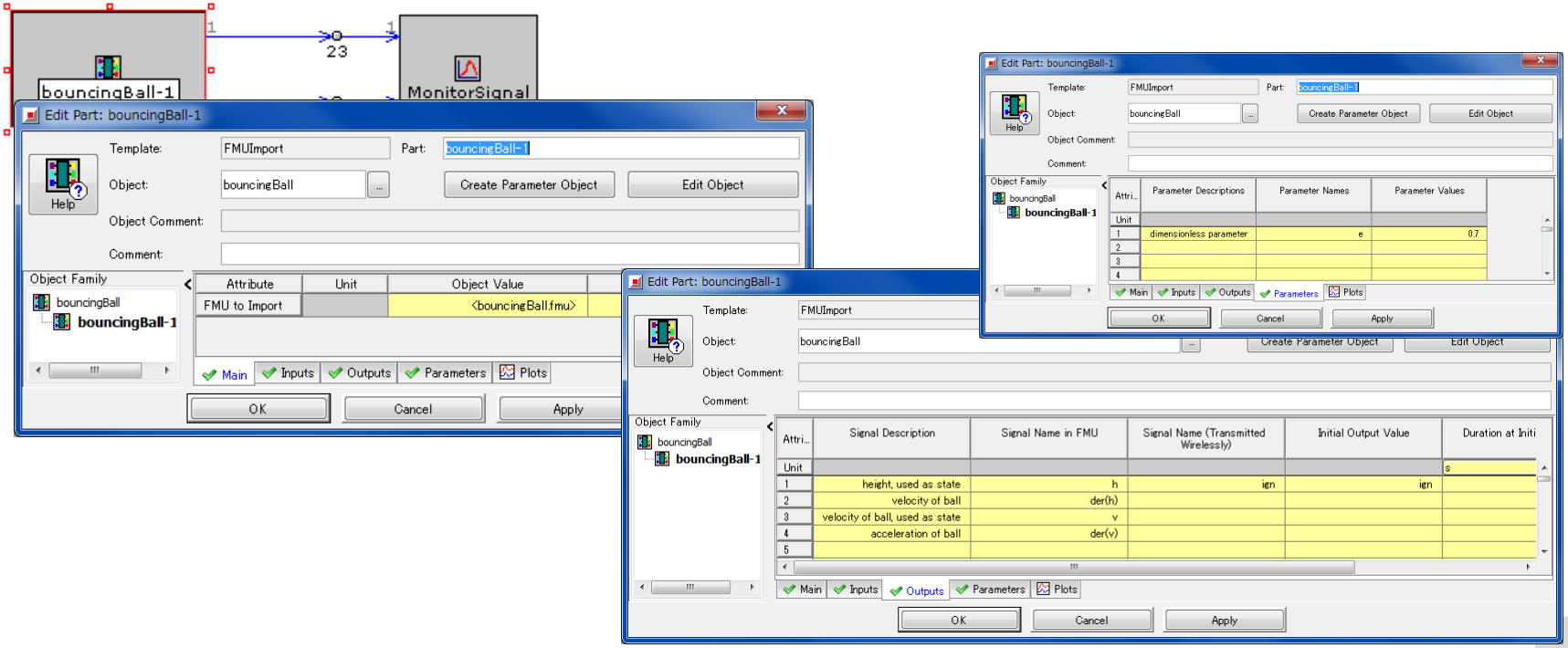
Co-Simulation

- The corresponding Co-Simulation Platform for GT-SUITE
  - MATLAB/Simulink
  - xMOD/CoSiMate/TISC etc.
- xMOD
  - Co-Simulation platform developed by D2T in France
  - IDAJ provide xMOD in Japan
  - Corresponding for GT-SUITE/Simulink/AMESim/FMI etc.



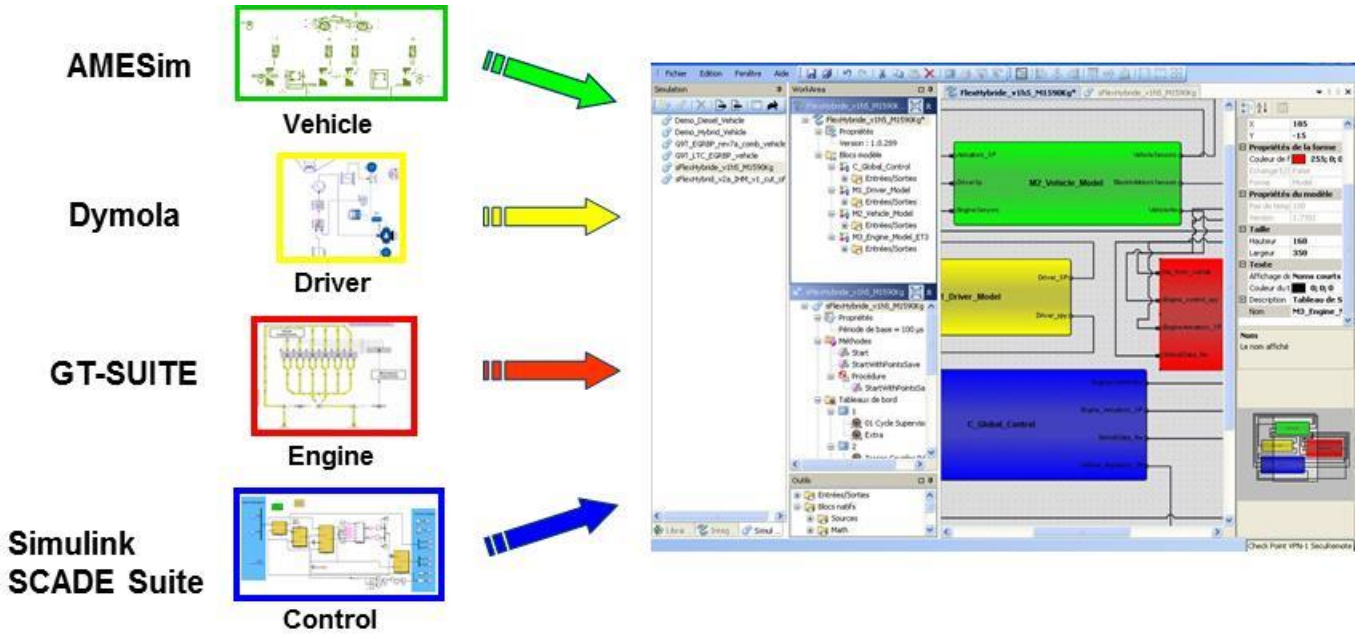
Co-Simulation

- GT-SUITE FMI support
  - FMU（Co-Simulation mode）Import (GTmaster) v7.4 B1～
  - GT-SUITE FMU export (GTslave) v7.4 B2 or B3～



Co-Simulation

- xMOD offer a real efficient collaborative and exchange environment for simulation
  - Coupling heterogeneous models
  - Optimizing complex model execution



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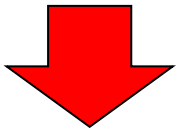
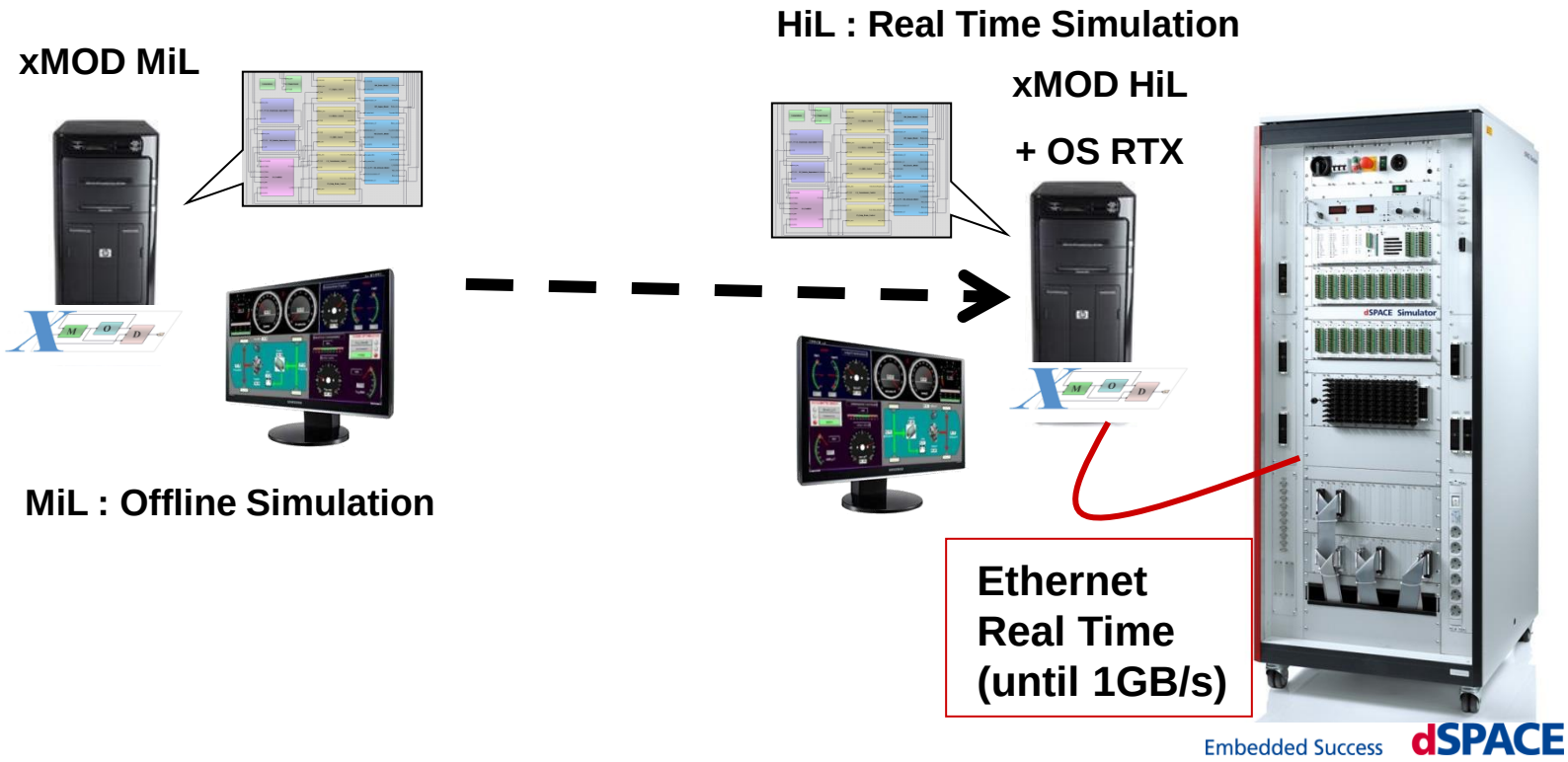
Real Time Execution

- The problems in HIL (Hardware In the Loop) System
  - Rack of CPU performance for complex and detailed model
  - Limitation of software version
  - Different platform (CPU/version) from MIL/SIL environment



- xMOD can support from MIL/SIL simulation to HIL simulation
  - Run various simulation model in latest powerful CPU (low cost to update CPU)
  - via UDP, HILS and xMOD can communicate control signal and simulation data
  - HILS can process only data I/O between ECU, don’t need to run complex plant model in HIL system

Real Time Execution



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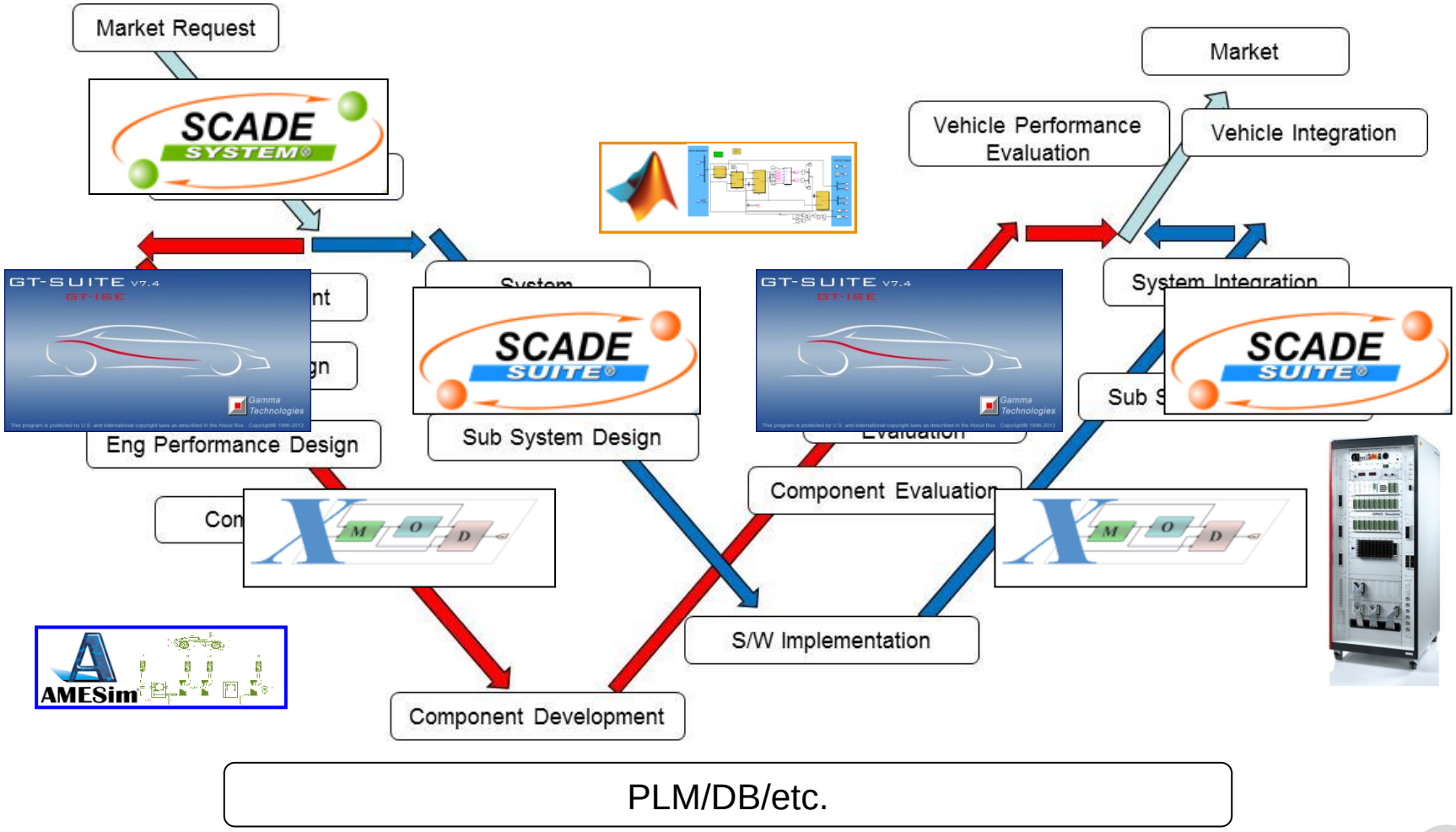

GT-SUITE/SCADE/xMOD Tool Chain

- Tool chain of GT-SUITE/SCADE/xMOD have possibilities to help to process V-development process from planning phase to design phase, control design phase and verification phase.

- In additional, combination with PLM and D/B system can manage requests, test and simulation results. That means, secure the traceability of development process.