

# MBD Guaranteed for Compatibility and Distribution by International Standard - General Remarks -

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With the introduction of simulation to automotive system development, the way of the system design is about to change greatly; from a method that requires real things to a method that can be processed only with virtual things by utilizing digital space on a computer. Therefore, the real design process is gradually being replaced with verification / certification in virtual digital space by simulation, and this tendency is expected to improve automotive development flexibility for the left side of the V-shape development. In this side, there are no hardware restrictions and ideal advanced numerical techniques can be applied to this virtual test or experiment.

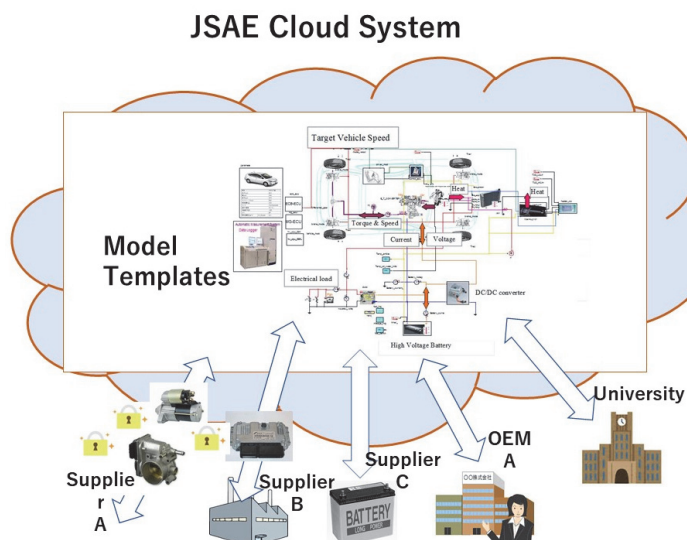
For example, this virtual test can be applied to get fuel consumption data. When a vehicle model and a specified driving mode are given, only a set of engine load test data is enough to compute the fuel efficiency data. Furthermore it is possible to get data for any combinations of vehicle with appropriate dimensions, engine data, and specified driving modes. Actual tests may have some fluctuations which are inevitable due to natural environments. However virtual tests can avoid such fluctuations and they can be performed under ideal conditions and the results are comparable between specified different parameter conditions. Virtual tests are being applied to wider situations.

In order to practically introduce the above simulation and virtual tests into automotive system development, it is necessary that the target system must be configured in combination only with exchangeable and reusable component models. It is appropriate to describe a model in a general-purpose standard language, and it is important to unify the model description data format early in the direction of compliance with, for example, international standards.

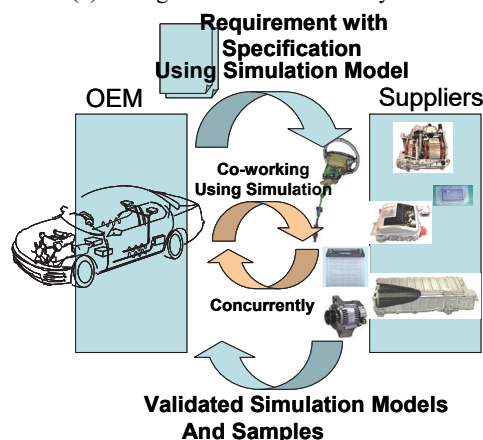
Therefore, the technical committee on MBD by international standard description in JSAE was established in March 2012. The committee has investigated MBD mainly using IEC 61691-1 and IEC 6169 1-6, commonly known as VHDL-AMS. Recently, the committee has developed a cloud system and tried to distribute template models in order to facilitate collaboration between OEMs, suppliers, and academic organizations as in Fig.1. Utilizing the cloud system, the committee developed, for example, EV models to improve electricity costs and to estimate CO<sub>2</sub> concentrations.

There are three key points to make models compatible and exchangeable. (1) They must be based on a standard which is based on advanced numerical techniques. (2) They can be encrypted for distribution between different organizations. (3) They have no communication time delays among models.

In OSs 13 and 14, extended technical activities in the committee are reported to show application examples for digital experiment and validation which activate manufacturing and improve efficiencies by the cloud system.



(a) Image of our JSAE cloud system



(b) Model specification and distribution

Fig.1 Model exchange image by JSAE cloud system.