3V-SG with ASAM

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ASAM Association for Standardization of Automation and Measuring Systems

Agenda

1	3V-SG (Virtual Verification & Validation using vECU Study Group)
2	Collaboration on ASAM XCP
3	ASAM XCP for Integrated ECU
4	Summary

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1	**3V-SG (Virtual Verification & Validation using vECU Study Group)**
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1. 3V-SG (Virtual Verification & Validation using vECU Study Group)

Background: **Challenges - Development of Automotive software in CASE movement.**

- The function of the car has greatly improved in the recent trend of CASE. The scope of verification and evaluation in its development has expanded dramatically.
- It is even more important to improve the efficiency of development for a wide range of verifications and evaluations.
- From its predecessor (active from April 2019), "vECU-MBD WG", to activities that widely target "virtual verification method" as a means of verification and evaluation.

3V-SG (Virtual Verification & Validation using vECU Study Group)

- **Objective**
  Widely research "virtual verification methods" as a means of verification and evaluation. And provide and widely disseminate proposals on technologies and development methods for realizing the development and efficiency of mobility systems.

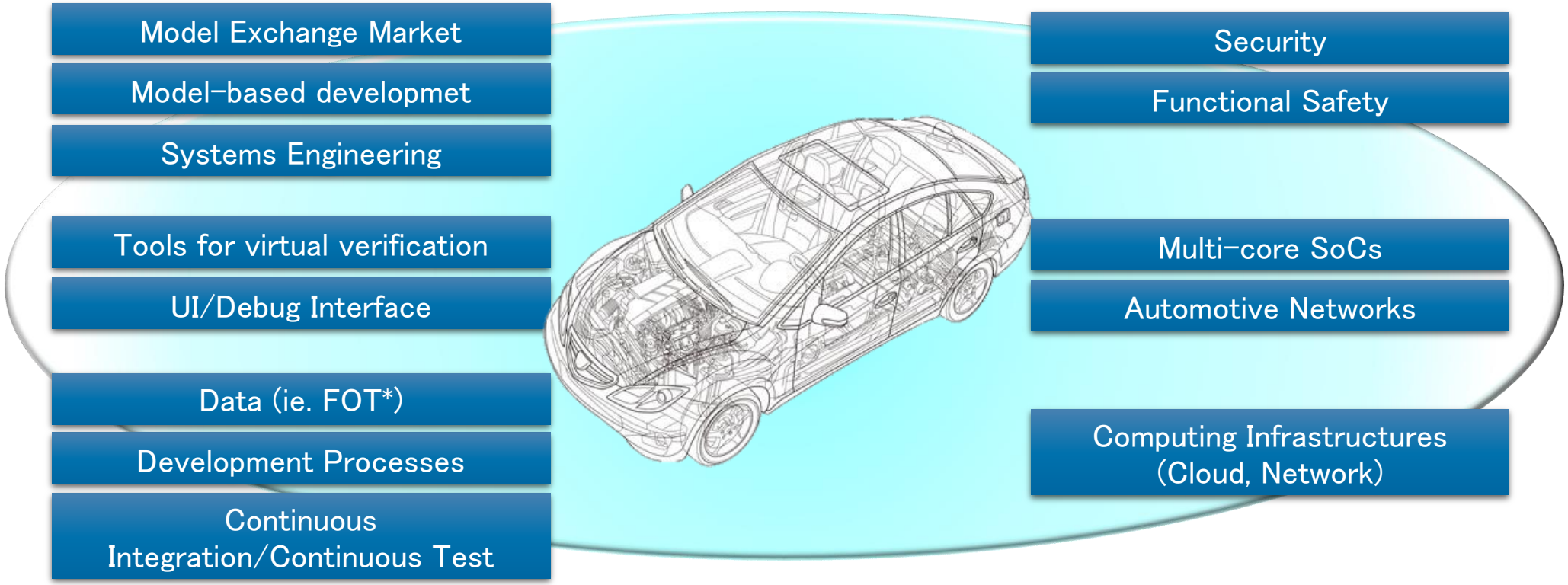
- **Members**
  Cross domain industries from OEMs, Suppliers, Semiconductor companies, Tool companies, and SIers who are relate to development of ECUs using virtual verification methodologies.

- **Web**
  https://www.3vsg.org

3V-SG : Area of interest

Widely researches "virtual verification method" as a means of interest verification / evaluation

- Technologies and development methods to improve the efficiency of mobility system development.



*) FOT: Field Operational Test

3V-SG : Activities

- Investigation, verification, and verification of common technologies and standard technologies related to virtual verification methods.
- Proposal and verification of new methods related to virtual verification methods, standardization proposals.
- Dissemination and enlightenment of virtual verification.

3V-SG : Task Forces (TF)

TF name	Description	TF reader (affiliation)
FMI[*1] Collaboration TF	Study the FMI standard and tools supporting the standard. Investigate how to utilize the standard.	Dai Araki (Toshiba)
METI-SPILS[*2] TF	Study a fault injection methodology which is independent from target systems	Yutaka Funabashi (Renesas Electronics)
Systems Thinker TF	Study a platform to exercise in virtual environment which is applicable to find out systems-thinkers.	Isao Matsuda (GAIO Technology)
ASAM Collaboration TF	Study ASAM XCP applying to virtual ECUs through proof-of-concept. Examine if the standard is applicable as well as in physical environment, study merits, if there are any notices.	Akira Watanabe（Nissan）

- These TFs' activities will be shown at JSAE Forum 2022 held on July 11th - 14th.

*1) FMI: Functional Mock-up interface
*2) METI-SPILS: METI(Ministry of Economy, Trade and Industry), SPILS(Software based Processor in the loop simulation

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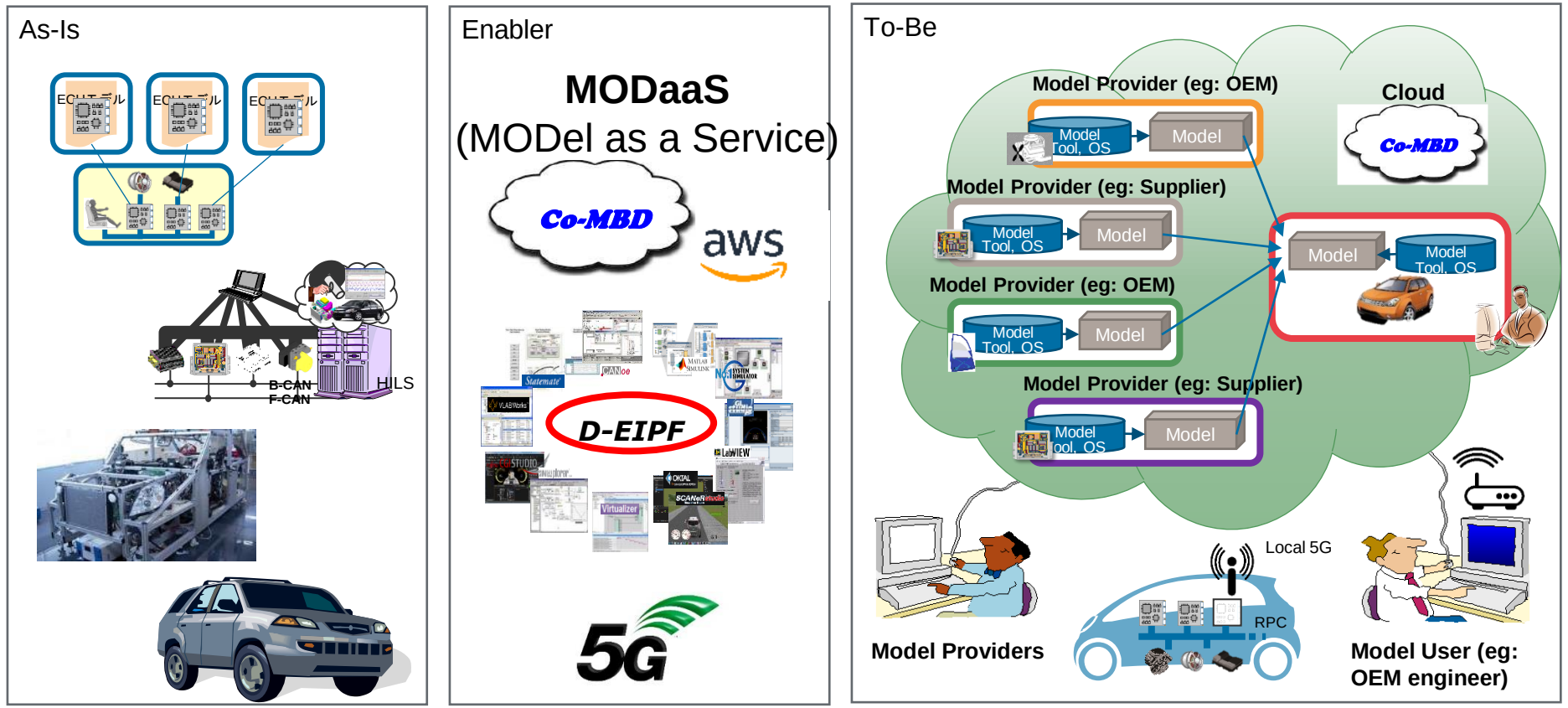
2. Collaboration on ASAM XCP

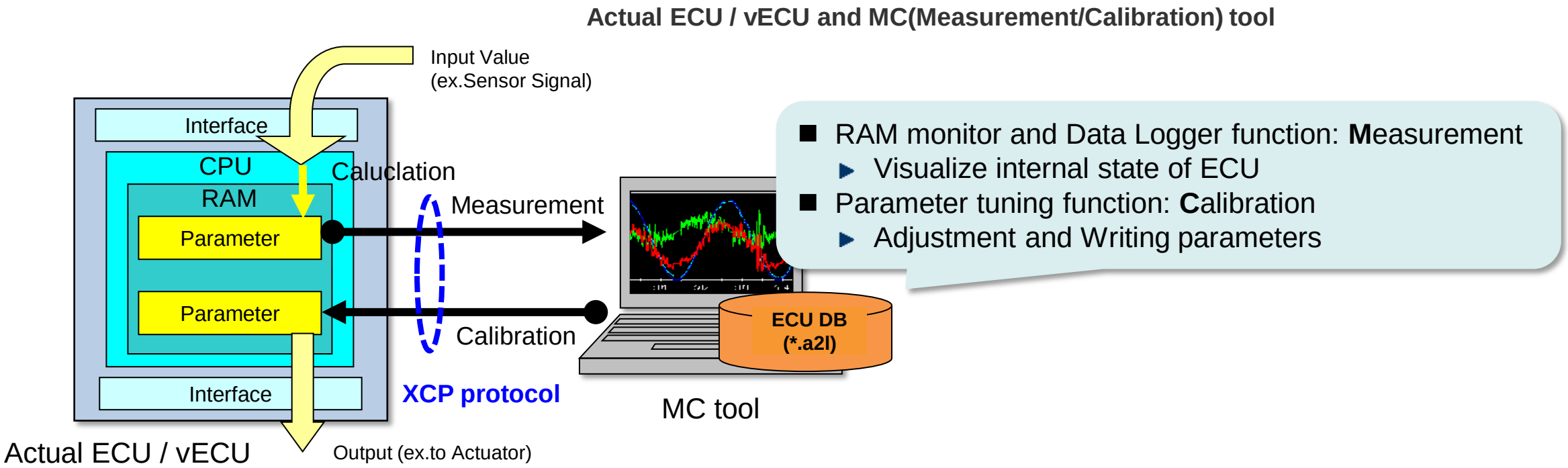
Co-MBD using virtual-HILS on Cloud



Background and Issue

3V-SG and ASAM MCD-1 XCP

- ASAM XCP compliant MC tools are widely used for ECU's monitor and calibration. And It is expected reducing cost of tool and reducing time for engineering training by applying MC tools to vECU as well as actual ECU.
- However, it is not clear if there are any restrictions and difference of usability because the assumption of ASAM XCP is actual ECU, not for vECU.

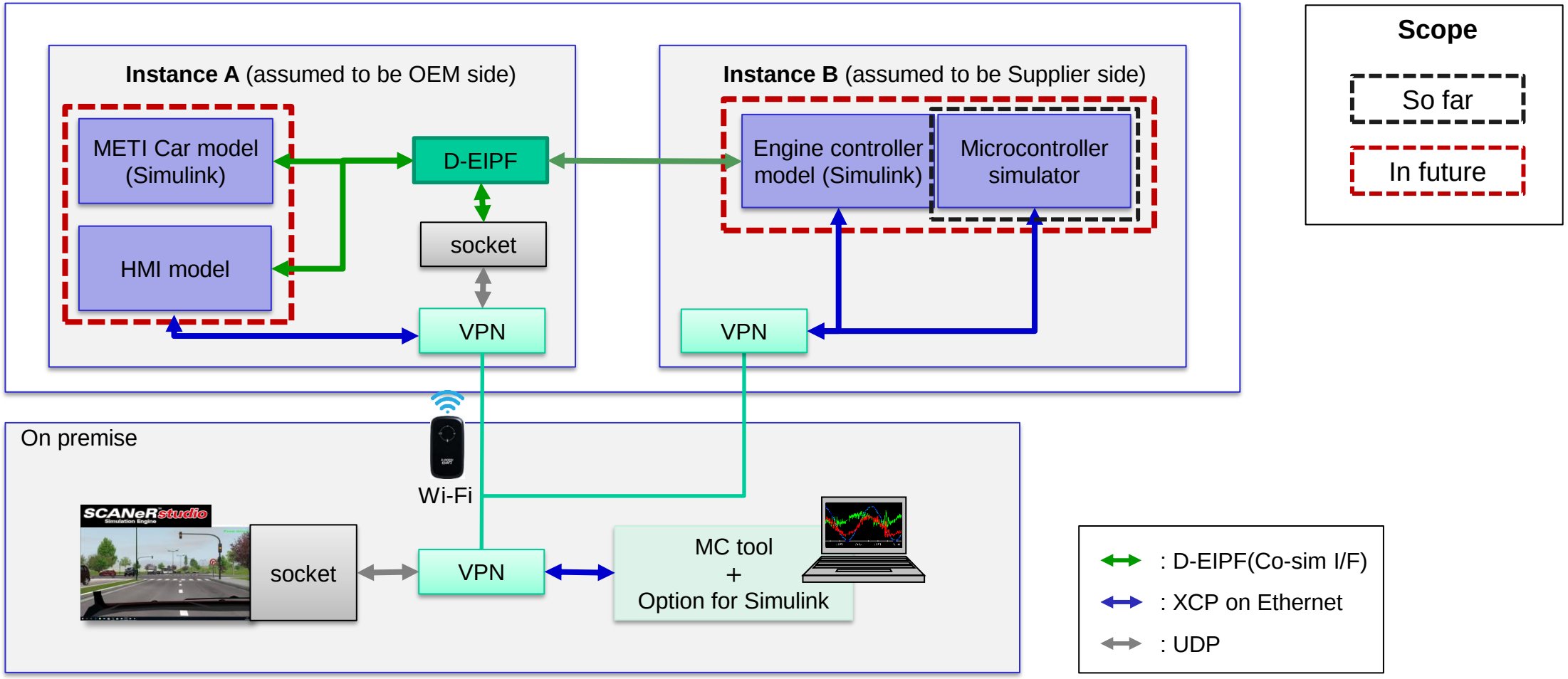


Objective and Approach

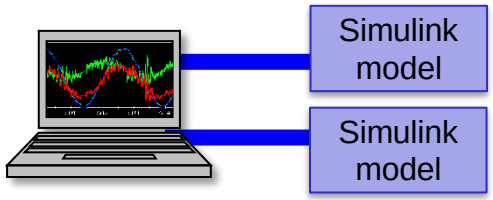
- **Objective**
  Making clear whether it can be used in the same way as a real ECU, and the merits, issues, and precautions when applying it to a virtual ECU.
- **Approach**
  Study if there are any restrictions and difference in usability through PoC using vECU and MC tools.
  In the future, we will organize the findings to user guide and give feedback to ASAM as needed.

A goal image of PoC environment

Scope of PoC is expanded to include not only SPILS but also **MILS**.
We will study the use case for MILS and verify whether we can use MC tool in the same way as real ECU or SPILS environment.

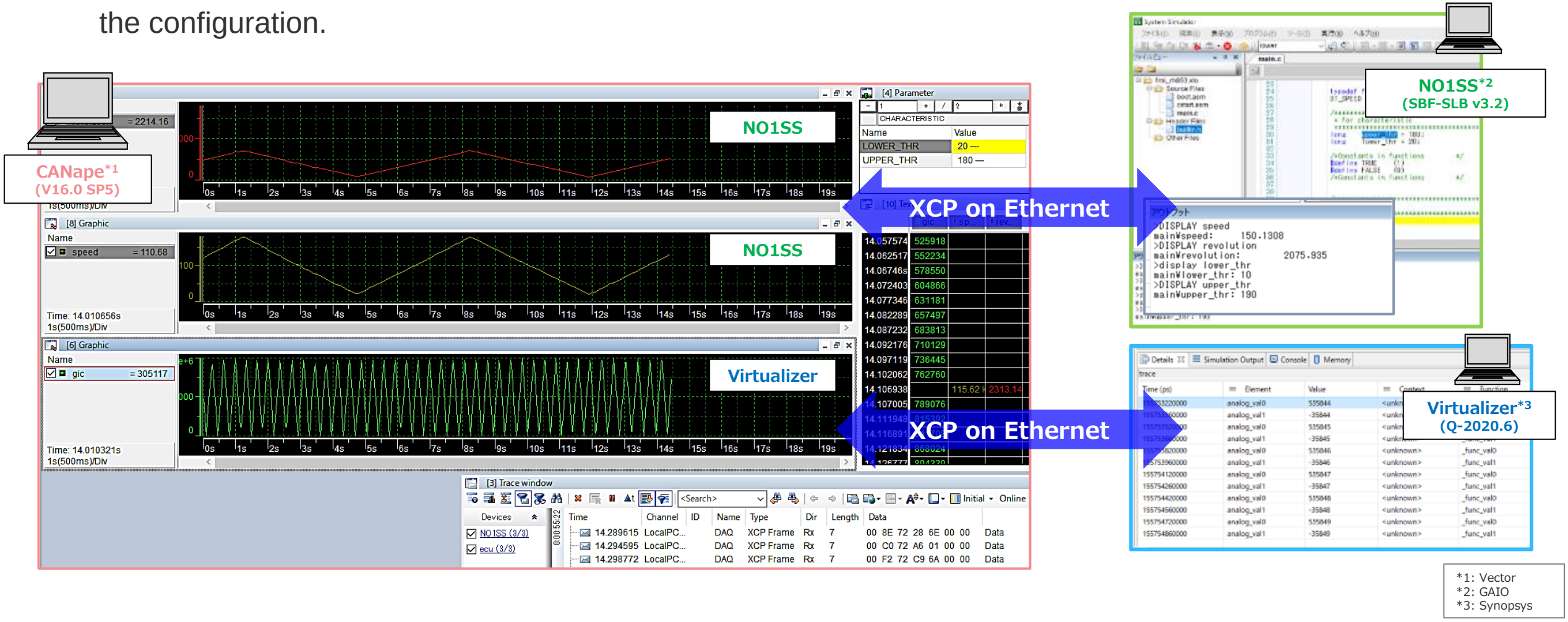


Schedule

Configuration	FY22 April -	July -	Sep -	Jan -
SPILS MC tool x1 vs. Microcontroller model x2 	Trial on going			
MILS MC tool x1 vs. Simulink model x2 		Set up	Trial	
Cloud environment (TBD)			Set up (TBD)	

Trial status -SPILS

- SPILS : MC tool x1 vs. Microcontroller model x2
  It is confirmed that MC tool can measure both models simultaneously with the configuration.

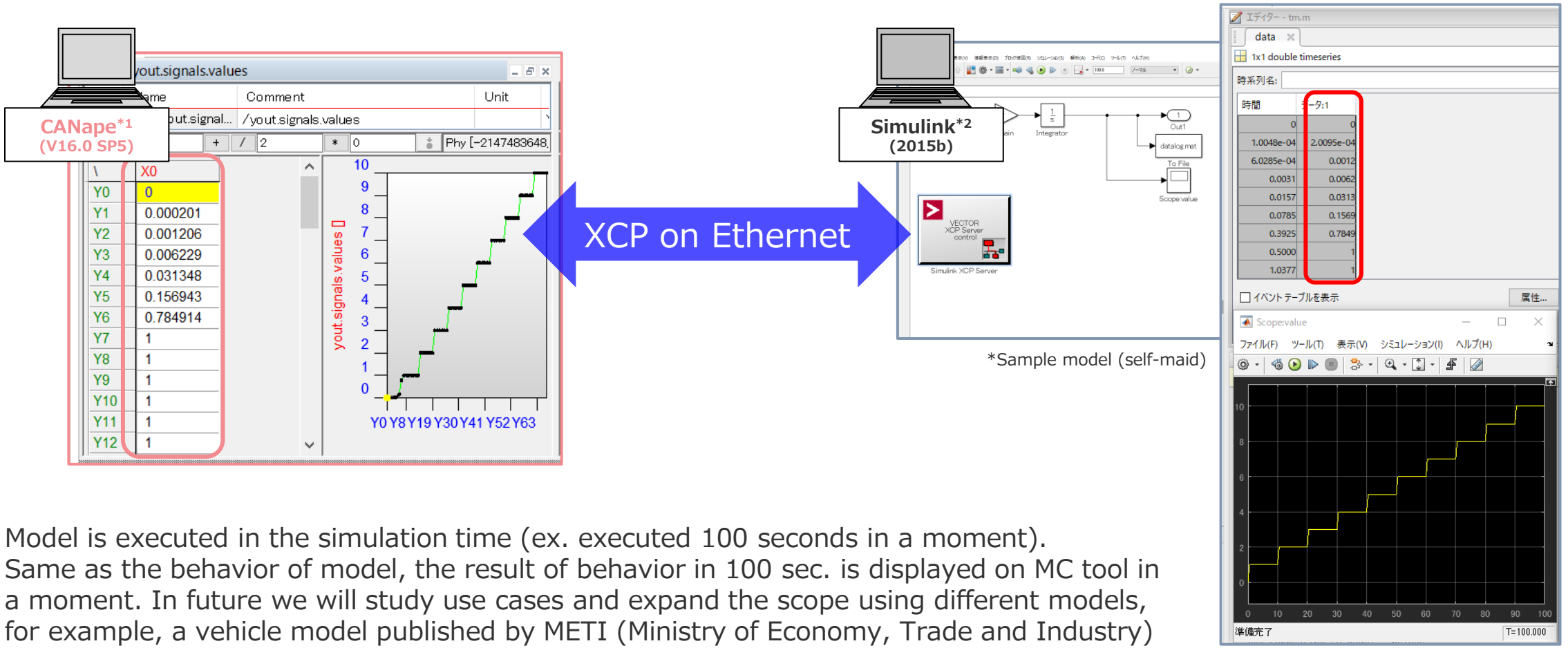


*1: Vector
*2: GAIO
*3: Synopsys

Trial status -MILS

- MILS : It is confirmed that MC tool can read/write the values of Simulink model.

*1: Vector
*2: MathWorks



Model is executed in the simulation time (ex. executed 100 seconds in a moment).
Same as the behavior of model, the result of behavior in 100 sec. is displayed on MC tool in a moment. In future we will study use cases and expand the scope using different models, for example, a vehicle model published by METI (Ministry of Economy, Trade and Industry)

Collaboration on ASAM XCP

Participating Organizations

- ASAM Japan (observer)
- Australian Semiconductor Technology Company K.K.
- dSPACE Japan K.K.
- ETAS K.K.
- GAIO TECHNOLOGY Co., Ltd.
- Nihon Synopsys G.K.
- Nissan Motor Co., Ltd.

In the future

We would like to give feedback about findings gotten through 3V-SG to ASAM standards.

Relevant standards

- MCD-1POD
- MCD-1XCP
- MCD-2MC

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3. ASAM XCP for Integrated ECU on 1 SoC

Monitor Calibration for Integrate ECU using vECU

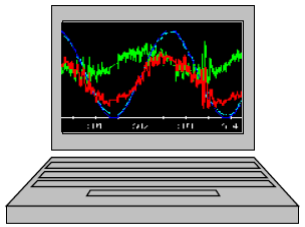
Emulator of 1 SoC multiple OSs

1. Assume emulator which runs multiple OSs in single SoC are available.

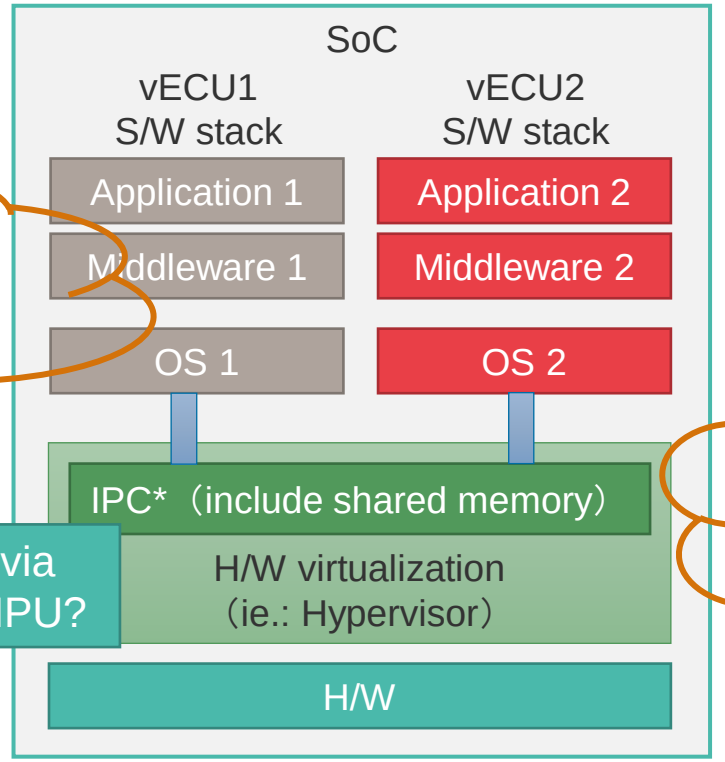
A SoC which implements integrated ECUs and monitor-calibration for the SoC

MCD-1 XCP

2. I/F between MC tool and ECU/emulators;
   - Conventional framework using memory addresses will be suitable?
   - CAN, Ethernet or any other transport layer..?



MC tool



MCD-2 MC (ASAP2/A2L)

3. How to create A2L DB file ? It is needed as much as number of VMs ? Hypervisor also needs DB file.. ?

*）IPC：Inter Process Communication

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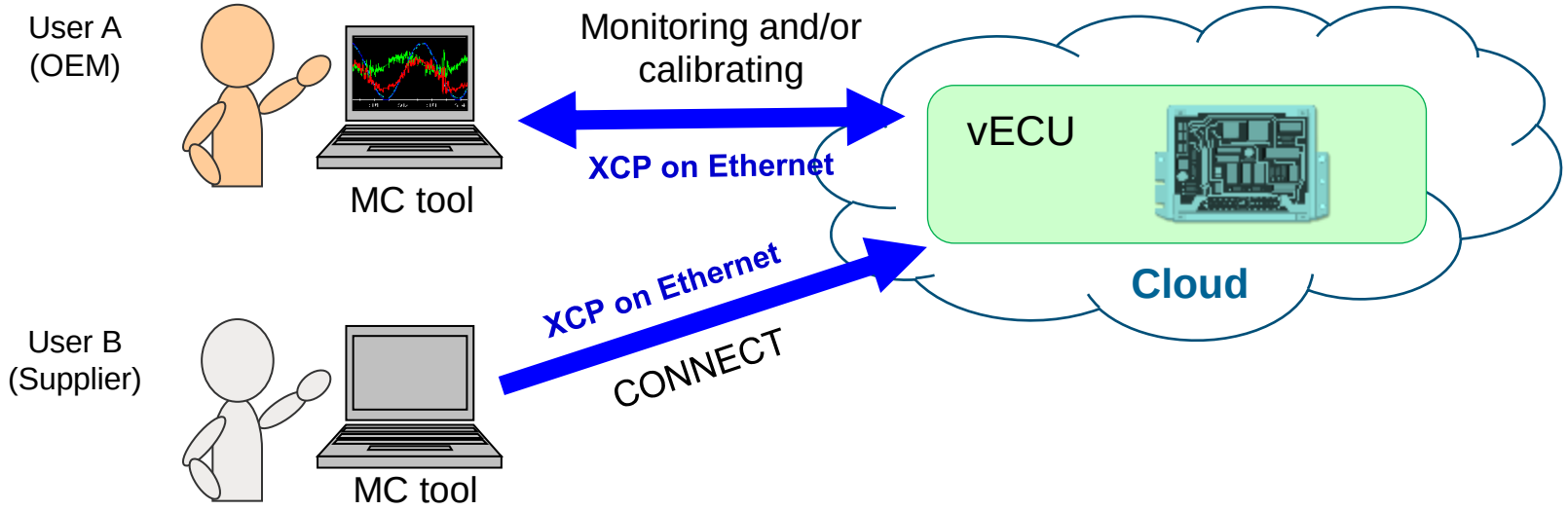
- Collaboration on ASAM XCP
  Study ASAM XCP applying to virtual ECUs through proof-of-concept. Examine if the standard is applicable as well as in physical environment, study merits, if there are any notices.

- ASAM XCP for Integrated ECU
  Investigate applying ASAM XCP to integrated USCs in a virtual environment.

Backup Slide

Concern about multi-master connection in cloud environment

Ex. During user A (OEM) is monitoring and/or calibrating of vECU, user B (supplier) connects.



From ASAM Office;

- MCD-1 XCP does not define a behavioral specification of multi-master connection.
- When multiple masters send CONNECT command with the same IP address and port, slave (vECU) cannot identify the user for each commands.
- Slave will respond to CONNECT commands even if multiple times. However, measurement may stop by command sequence error dependent on what command will be sent from users.
- Need to implement exclusive control mechanism to vECU.

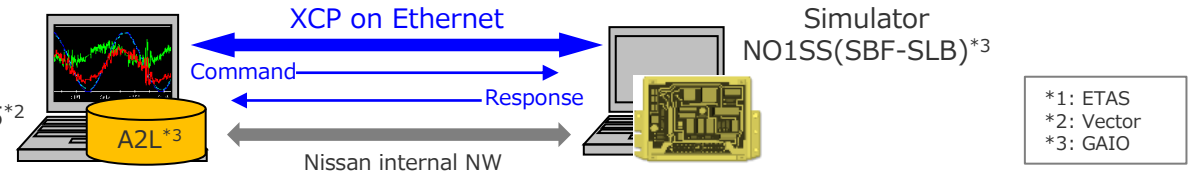
Anyway we will plan to include this case to verification scenario, and study to give feedback to ASAM if there is use case multi-master connection is necessary

Ex. There might be a case that OEM user would like to share with supplier in real time the transition of variables associated with calibration.

Concern No.9: Timeout setting

Environment

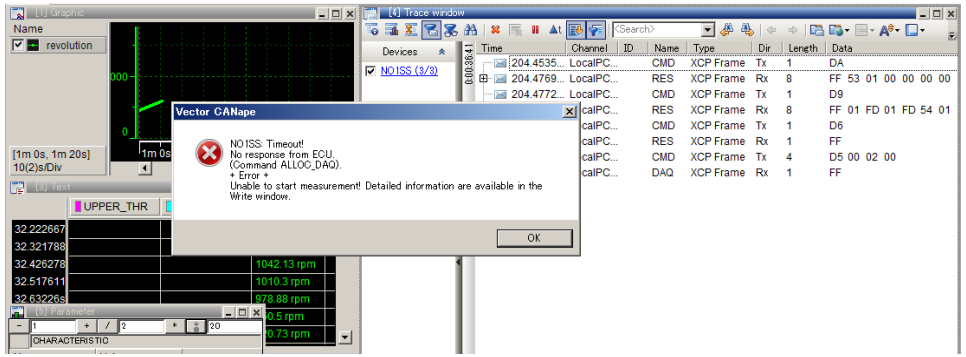
MC tool
- INCA V7.2.5*1
- CANape V16.0 SP5*2



*1: ETAS
*2: Vector
*3: GAIO

Timeout error occurred.

- XCP communication between MC tool and simulator was disconnected.
- Timeout error was displayed on the screen of MC tool.
- Timing of disconnection was indefinite.



Findings

Issue was avoidable by changing the command−response timeout to the larger.

- When setting to 10ms, 100ms : Timeout error occurred.
- **When setting to 1000ms : No error**