

ASAM MC HMS Project

Regional Meeting Japan 2020

DATE June 25, 2020
Location Via Zoom, Japan

HMS: HEX-file management service

HONDA Motor Co., Ltd.
DXC Technology Japan, LLC



Agenda

| | |
|---|----------------------------|
| 1 | Introduction |
| 2 | Standardization Activities |
| 3 | Implementation Example |
| 4 | Value of HMS |
| 5 | Today's Summary |

Introduction

Introduction

We are working to standardize our management system for HEX files, which are our company's assets. The goal of HEX file management is to correctly select and distribute all HEX files for a vehicle. In order to do this, it is important that the HEX files are correctly aligned with the various information required. It is also important to consider the tracking of daily changes in calibration data.

The ASAM MC HMS project aims to standardize (I/F) potential common part between OEMs for HEX file management. (Not to optimize them separately.)



Standardization Activities

HEX-file Management Challenges

1. Business Changes Big Changes in the Automotive Industry

Connectivity

Autonomous

Honda is targeting **2025** for the introduction of vehicles with "Level 4" highly-automated driving systems installed.

Sharing

Electrification

Honda is going to "Electrify" 2/3 of Models by 2030

2. Product Complexity increasing Hardware & Software

Localization

Driver state monitoring

current software code

Action plan

External sensing

Vehicle control Function redundancy

HMI

future software code

3. Separated management systems Need to breakaway from individual management

Limit of domain local management
Management systems can't keep up with product complexity

4. Digital Infrastructure which can support Business Challenges in Information Collaboration

Information coordination infrastructure (overall optimization)

← The most downstream
HEX File Information

Test Data Information

Optimized IT Architecture & Data Model

HMS Project Member



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[Submitter]

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[Service Provider]

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Yoshinori Nishi



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Tadamasa Sato



Masaya Fukuda

Yoshihiro Tagami



Tomomi Ebisu

(in alphabetical order)

The ASAM MC HMS Standardization has been implemented once a month by 14 members from 8 companies

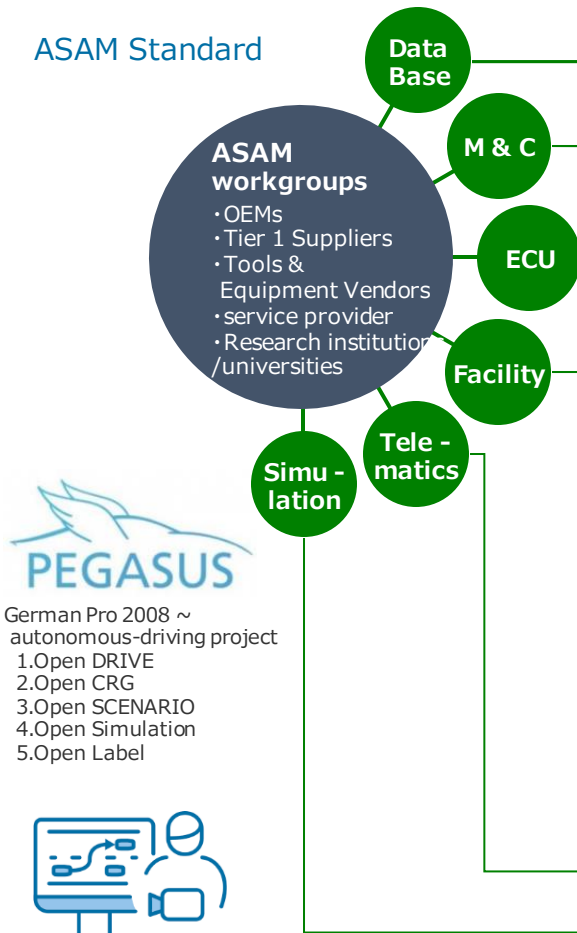
ASAM Standards Portfolio & Scope

Standardization policy

ASAM is a forum type standardization committee

ASAM finds commonalities and define standard I/F based on each OEM 's challenges and use cases

ASAM Standard

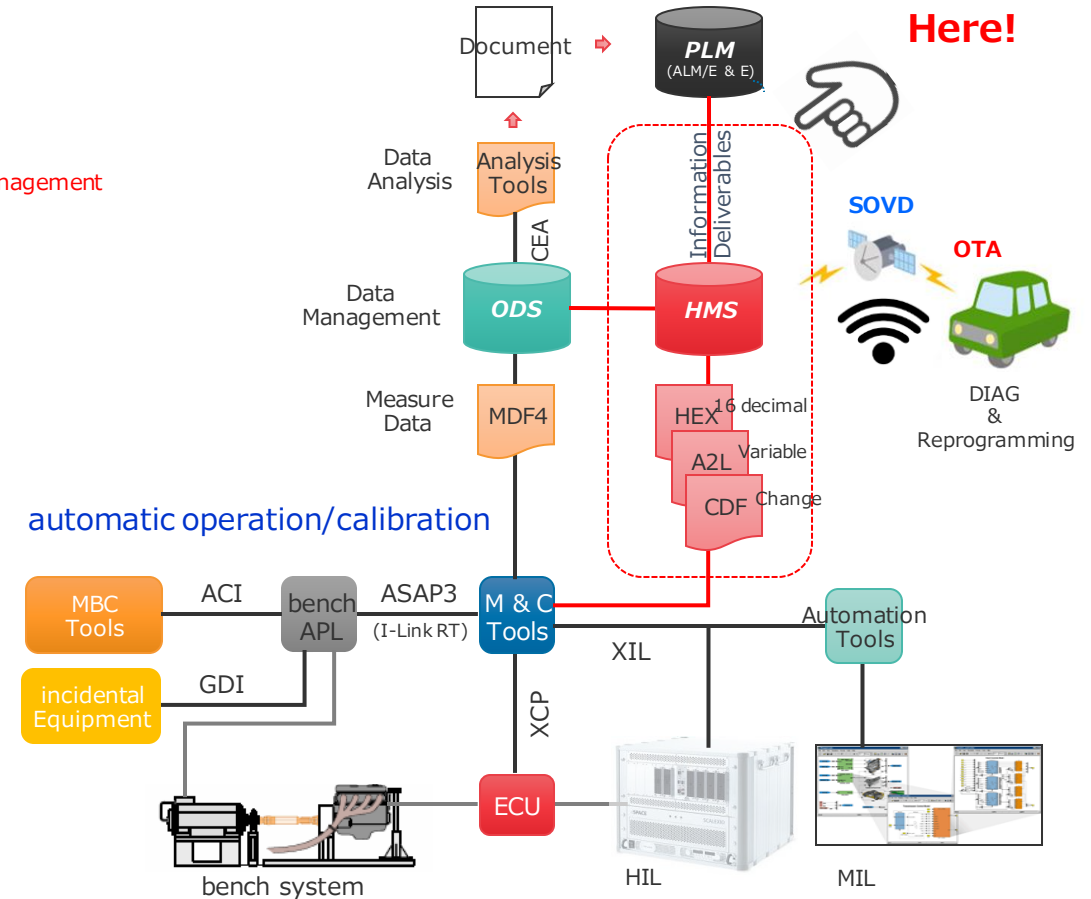


Standard I/F

- ASAM ODS
Database and Metadata I/F for Management and Storage of Measurement Data Files
- ASAM CEA
Data Analysis and ODS API
- ASAM ODX
Management and interface description of E & E architecture, vehicle diagnostic data and structure
- ASAM OTX
ISO 13209 enhancements describe diagnostic operations and improve interoperability
- ASAM HMS
API with database, metadata I/F and MC tools for HEX file management
- ASAM MDF
measurement data file format
- ASAM MCD -2 A2L
AUTOSAR Compliant ECU Data Variable File Format
- ASAM CDF
Calibration data reflection file format
- ASAM CPX
Standardized description of the sequence of calibration steps
- ASAM MCD -2 CERP
Data exchange of calibration expert knowledge
- ASAM MCD -1 XCP
Communication protocol between the ECU and the MC tool
- ASAM MC2NET
Communication protocol between ECU and ECU
- ASAM POD
Driver for high-speed communication device between ECU and MC tool
- ASAM MCD -3 ASAP3
Communication protocol between equipment and MC tool
- ASAM ACI
API between equipment and automatic calibration tool
- ASAM GDI
Communication protocol between facilities
- ASAM XIL
API between MIL, CIL, HIL and VIL tools
- ASAM SOVD (Service Oriented Vehicle Diagnosis)
Bi-Directional Remote Communication on the Cloud
- ASAM Open Star (AD Simulation's)
Simulation for automatic operation

Operation

ASAM guarantees connection even if the manufacturer is different!



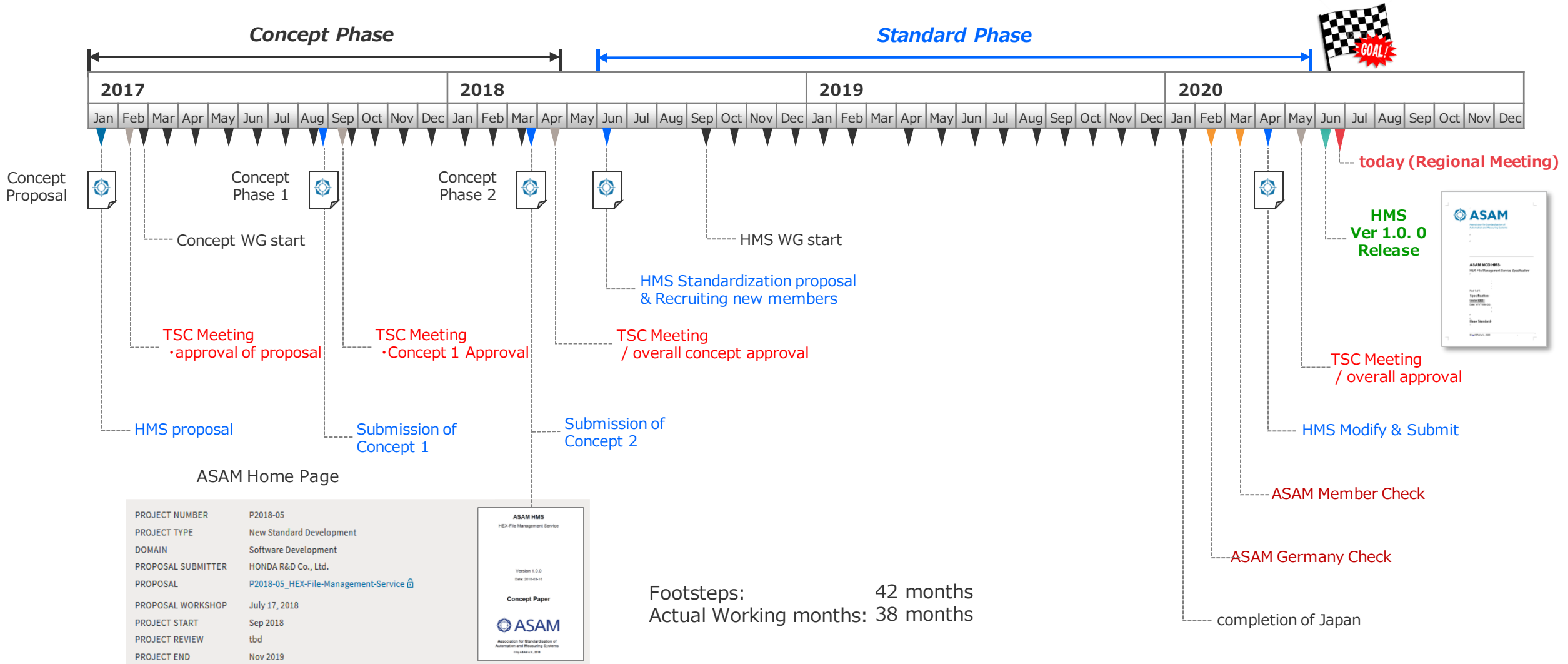
German Pro 2008 ~ autonomous-driving project

1. Open DRIVE
2. Open CRG
3. Open SCENARIO
4. Open Simulation
5. Open Label



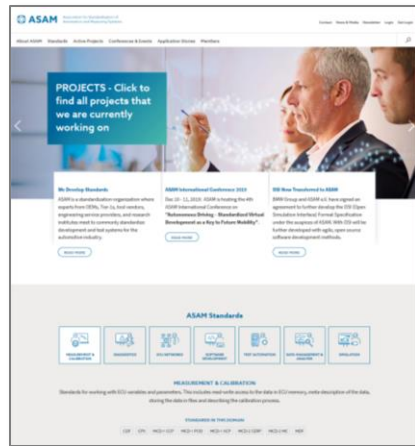
ASAM defines I/F for toolchain

HMS History



The project started in 2017, ended in May 2020, and we were able to release version 1.0.0

HMS Deliverables



ASAM Home Page (<https://www.asam.net>)

ASAM Standards



ASAM NEWS
Hohenkirchen, June 2020

MEASUREMENT & CALIBRATION

Standards for working with ECU variables and parameters. This includes read-write access to the data in ECU memory, meta-describing the data in files and describing the calibration process.

Add Here

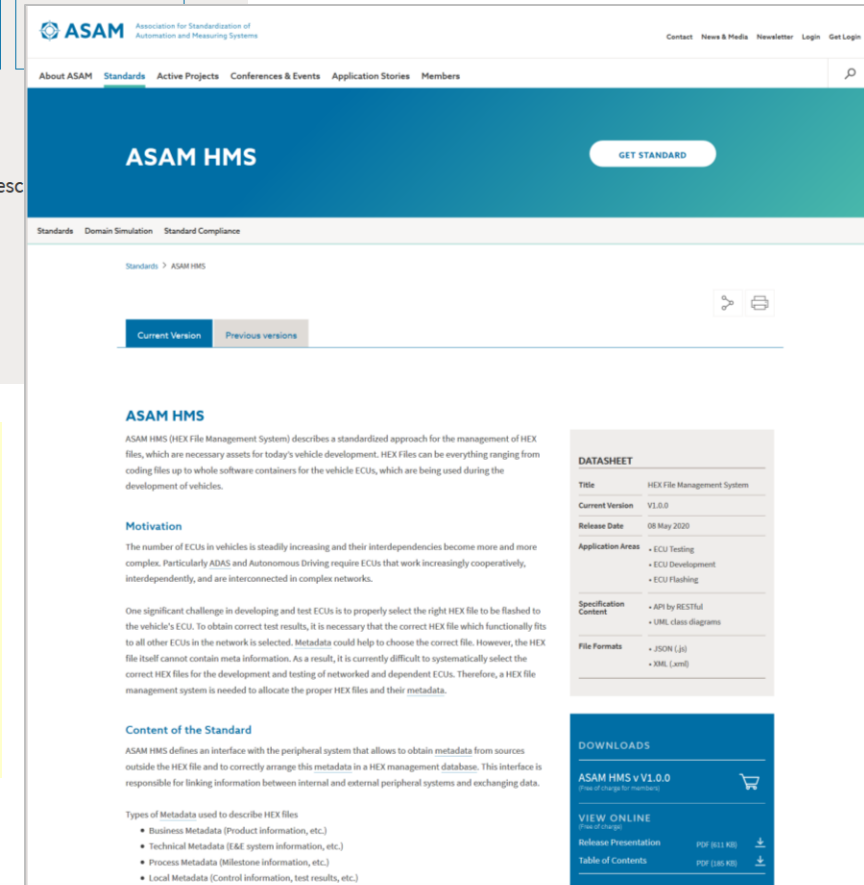


STANDARDS IN THIS DOMAIN



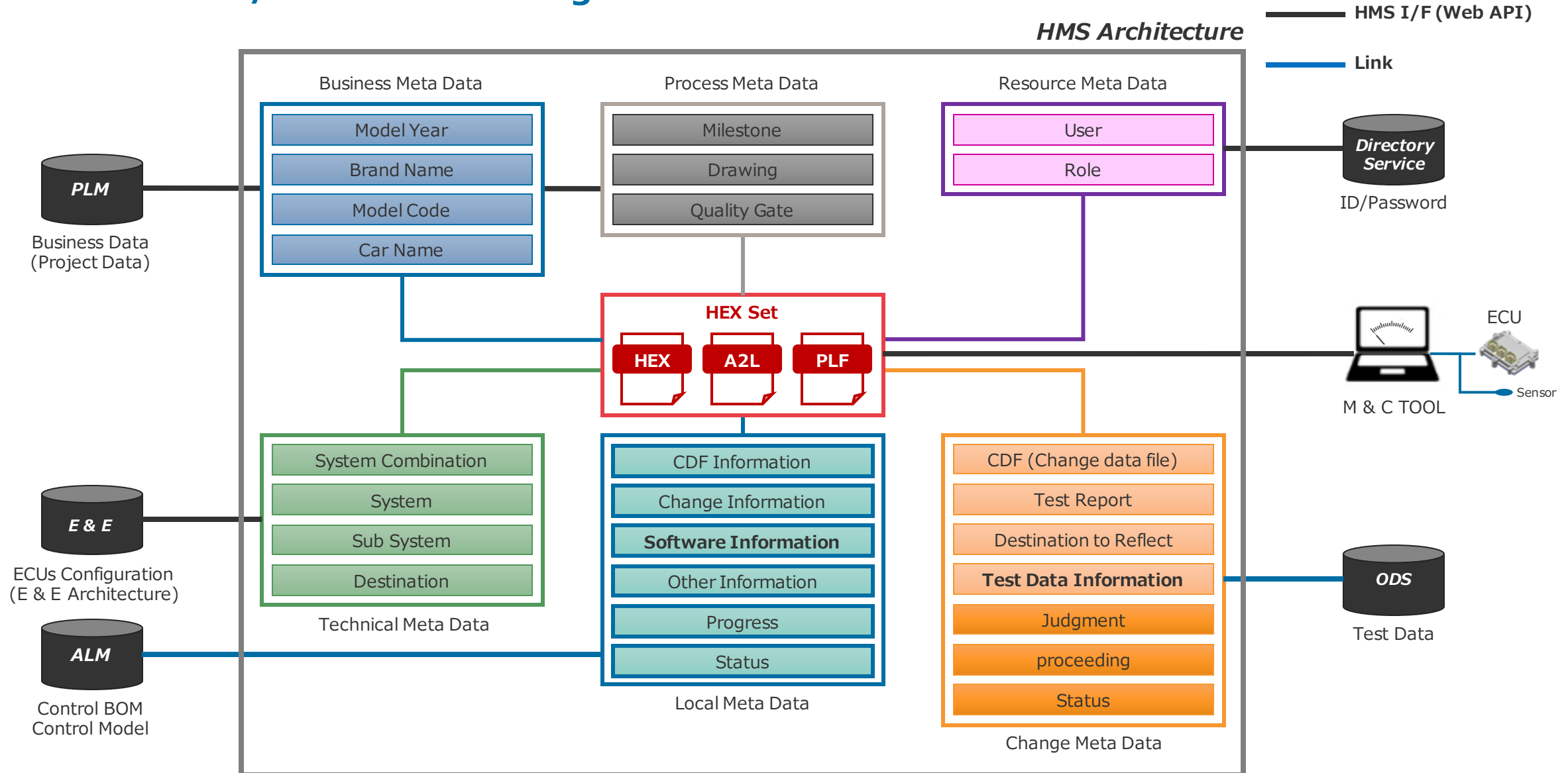
~ Deliverables ~

- 1.HMS Release Presentation (PowerPoint)
- 2.ASAM MCD HMS Ver 1.0. 0 (Word)
- 3.HMS UML Model (Enterprise Architect)
- 4.HMS UML Model (pdf)
- 5.HMS API (Swagger "http:// http")
- 6.Swagger Instructions (PowerPoint)



You can check the HMS standard link here→ <https://www.asam.net/standards/detail/hms/>

HMS Standard/Standard Coverage



The black line part has defined as ASAM standard
 HMS can not work by itself only, support of other system is also required.

Implementation Example

What is DXC Technology?

DXC was created to accelerate your digital innovation

- ▶ One of the three largest independent IT services companies in the world.
- ▶ DXC Technology provides true global delivery
- ▶ Are you building or operating systems on a global scale?
Please contact us if you would like to be introduced the world's most advanced technology.

Top 3 in the World (dedicated IT services)

70+

Service Areas



6000

Customers

130+

thousands

Employees around
the world



\$25B

Annual sales

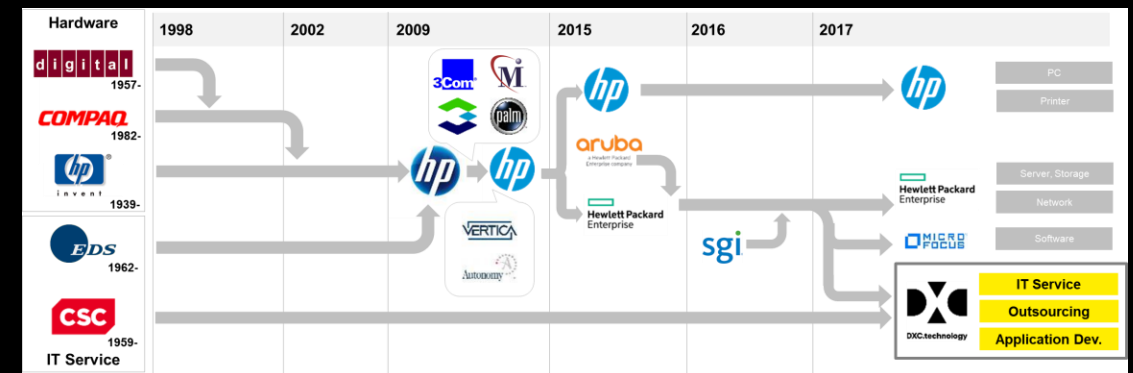
60+ years

Services and
history of innovation

200+

Wide
Partner Network

HP/DEC/COMPAQ/TANDEM/EDS / CSC/LUXOFT Services Integration



DXC Technology Japan

For the automotive industry

Major Initiatives

HEX Data Management

A software package based on industry standards (ASAM) that can manage increasing quantity and complexity of embedded software for ECU (HEX)



Telematics

By leveraging our development experience for mobile phones, We also support software maintenance on navigation and infotainment



IMDS

De facto standard service for management of environmentally hazardous substances used by all OEMs



Robotic Drive

Handle increasing of Automation drive's test data regardless of location or format dramatically reduce development time



Autonomous Driving map

Develop a easily accessible single web page application (without screen transitions) that can draw / edit 3D high-definition map data

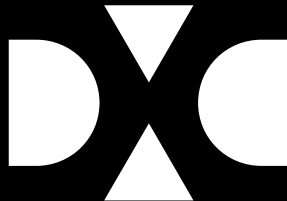


UI and SW development

Acquired LUXOFT in 2019 for development of digital cockpits, as a next-generation interface and embedded software

Acquired CMORE in 2020 for autonomous driving under LUXOFT

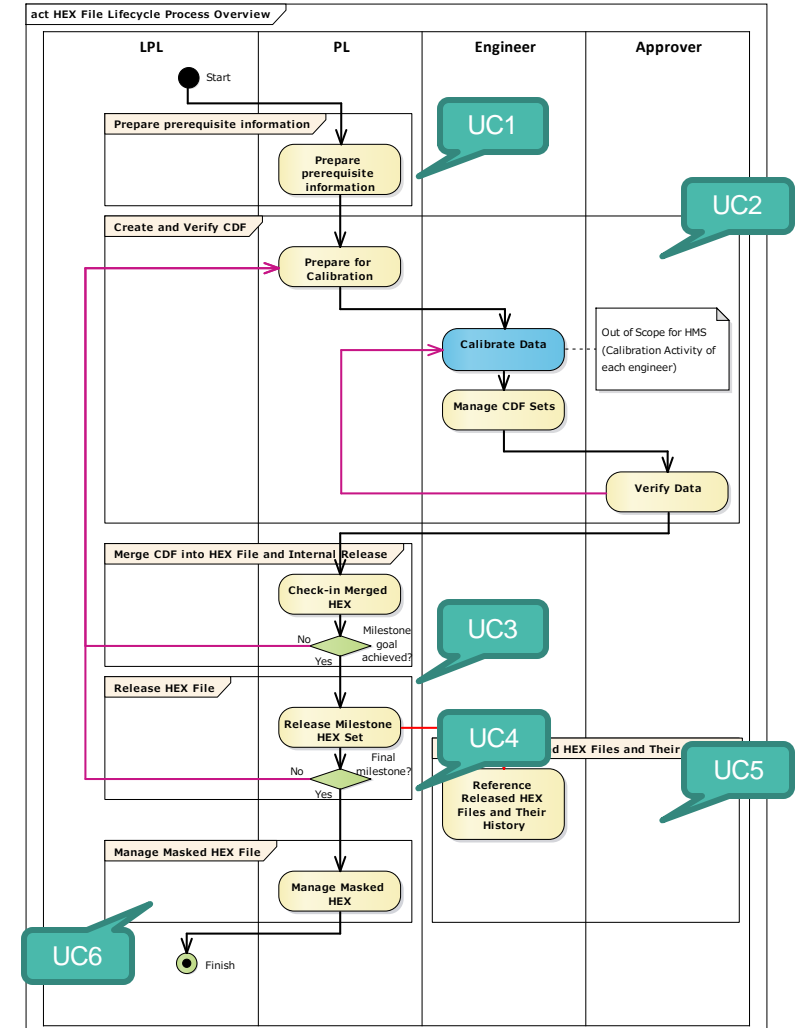
LUXOFT/CMORE are both members of ASAM



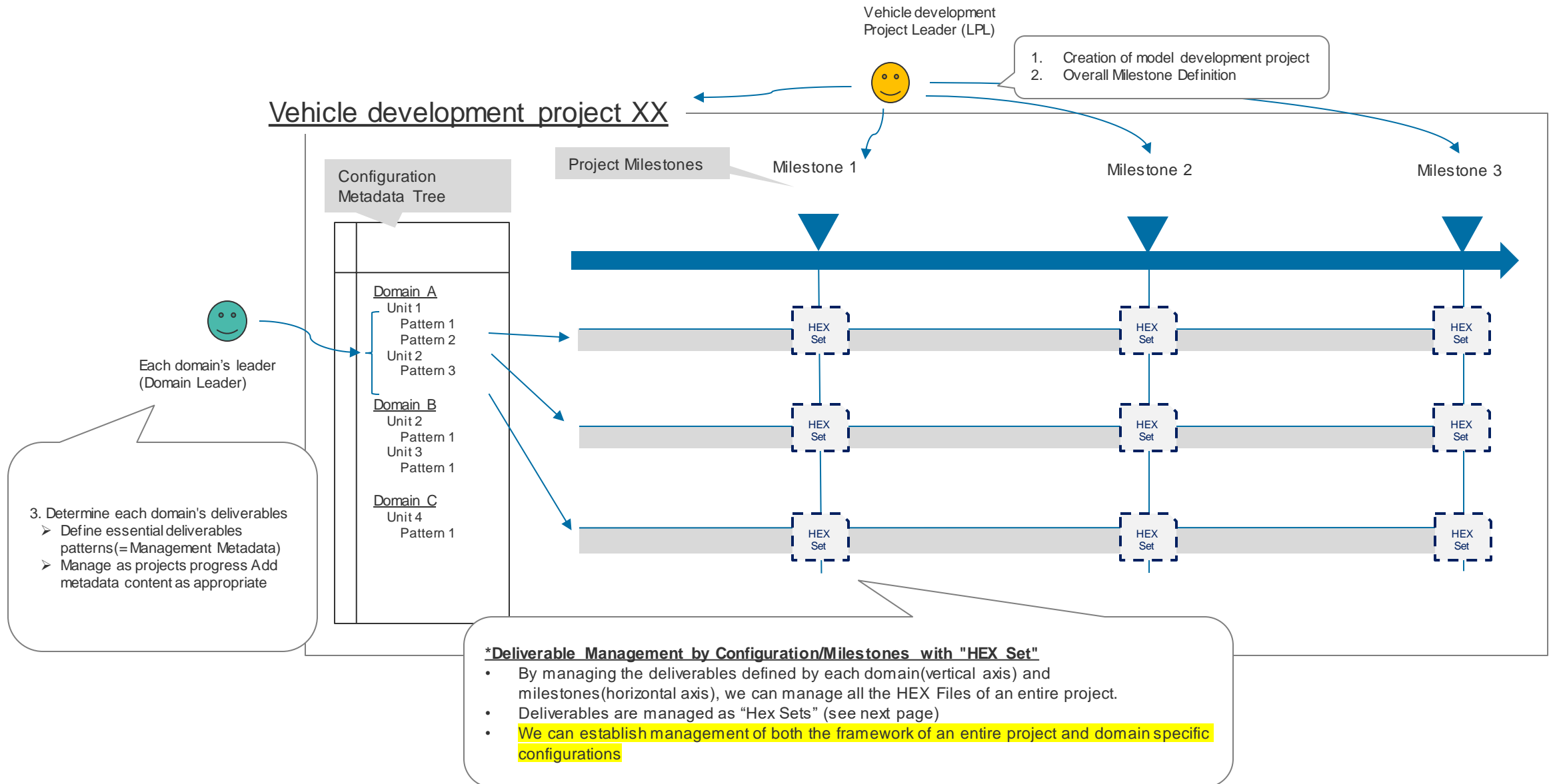
HMS HEX Management Use Cases

HMS use case overview defined in Specification Version 1.0.0

| Use Case Name | Description |
|--|---|
| 1 Prepare Prerequisite Information | Make the necessary preparations to manage the HEX file <ul style="list-style-type: none"> • Metadata (Model information, milestones, and model composition) definitions • Defining User Information • Import Compliance Plan |
| 2 Create and Verify CDF | Conduct adaptation activities and evaluate and share results <ul style="list-style-type: none"> • Preparation of calibration work (Share HEX Set) • Manage calibration results (CDF) • Evaluate calibration results |
| calibration work (Out of Scope) | Perform calibration using MC Tool. |
| 3 Merge CDF into HEX File and Internal Release | Merge Approved calibration Results (CDF) into the HEX set |
| 4 Release HEX File | Release the HEX set as a milestone deliverable |
| 5 Reference Released HEX Files and their History | Check the change history by referring to the registered HEX set. |
| 6 Manage Masked HEX File | Manage masked HEX set for mass production |

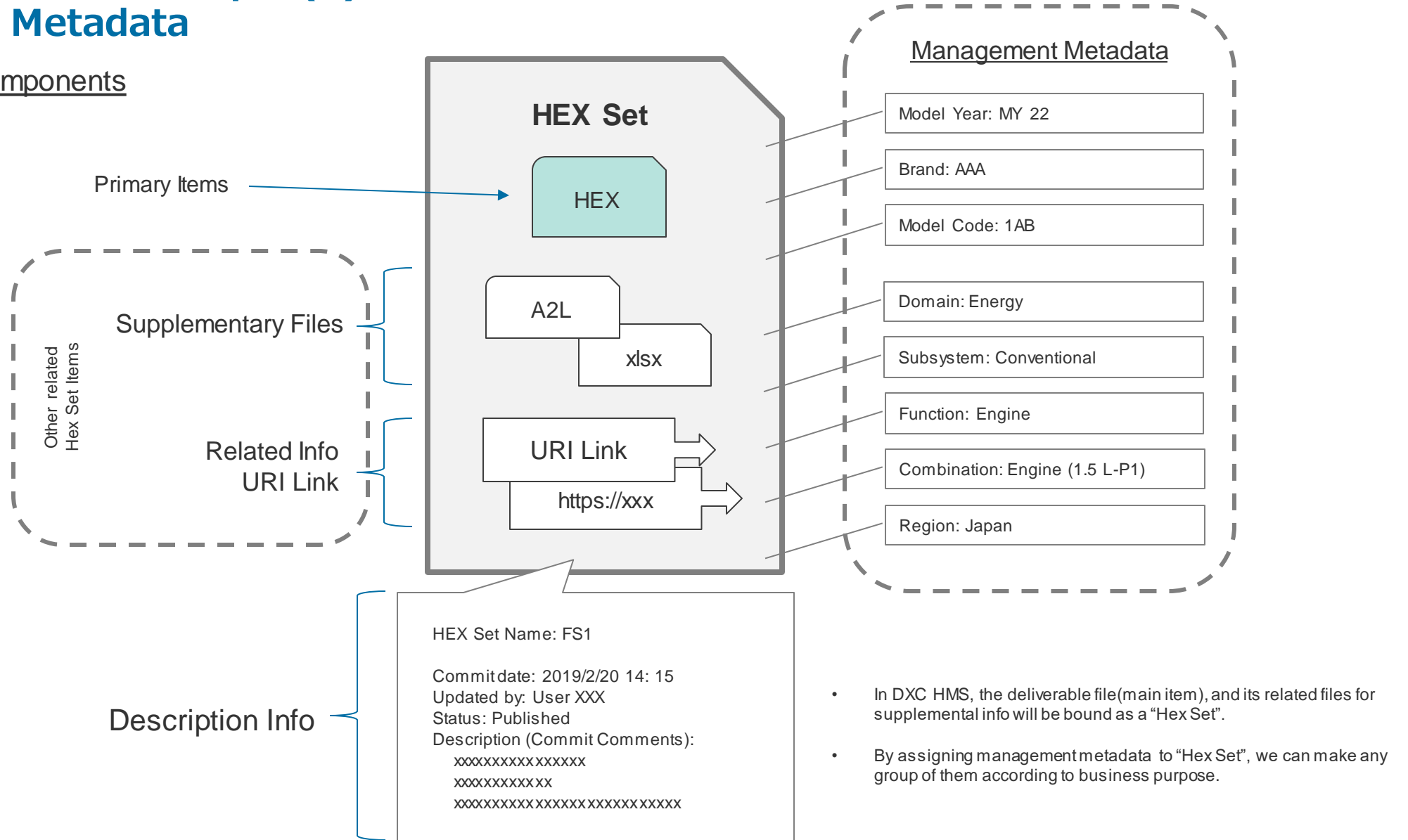


The Concept of HEX Management (1): "Vertical Axis" and "Horizontal Axis" for HEX Management



HEX Management Concepts (2): HEX Set and Metadata

HEX Set Components



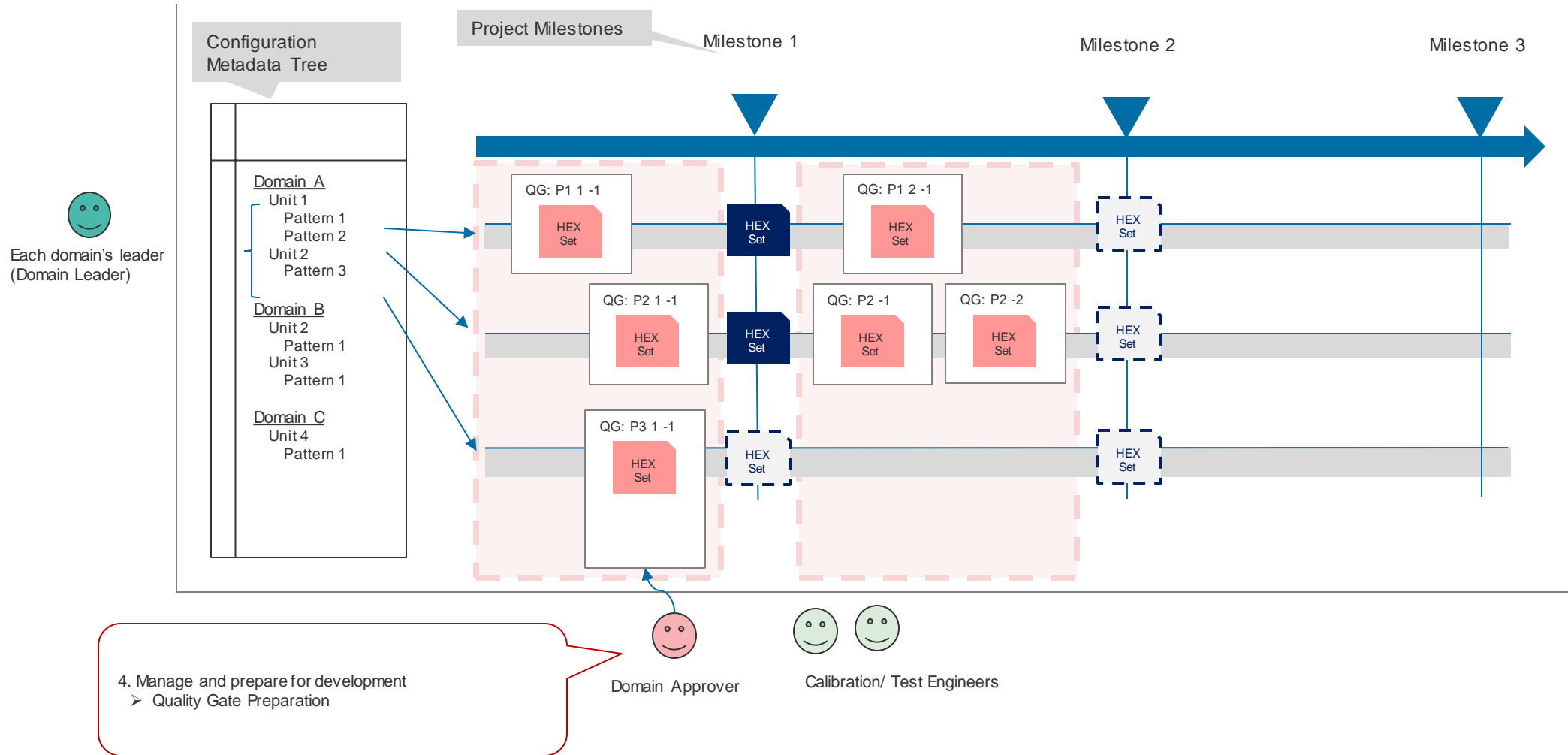
- In DXC HMS, the deliverable file(main item), and its related files for supplemental info will be bound as a "Hex Set".
- By assigning management metadata to "Hex Set", we can make any group of them according to business purpose.

Concept of HEX Management (3): Managing Incomplete Deliverables in Quality Gate

Activities within each domain, Management of WIP deliverables

Vehicle Development Project Leader (LPL)

Vehicle development project XX



DEMO1 HMS Screen Overview

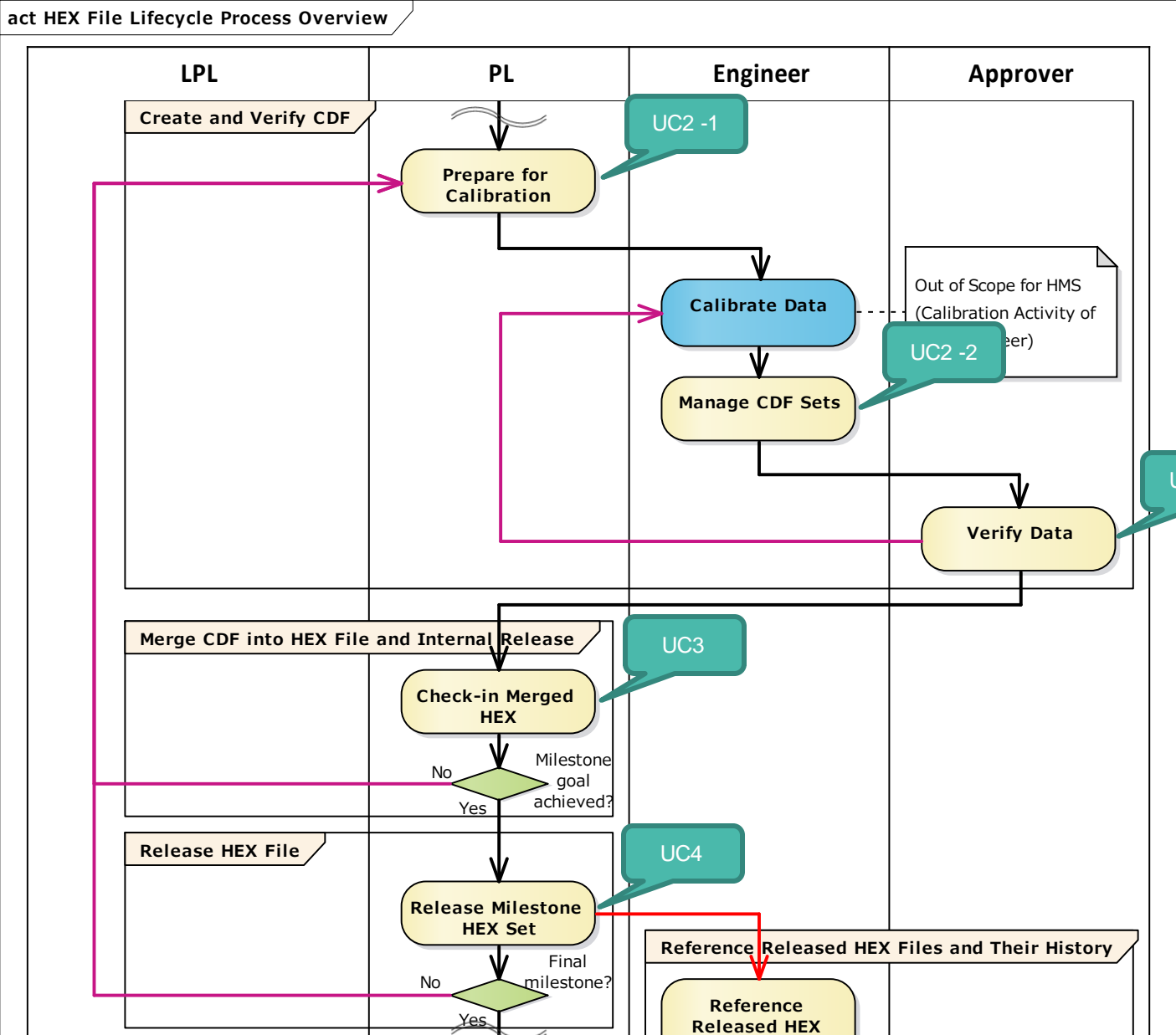
| Introduction | |
|--------------|-----------------------------|
| UC0-1 | Login to HMS |
| UC0-2 | Screen overview |
| UC0-3 | Select deliverables to show |

DEMO2 Calibration Work with HMS

| Introduction | |
|--------------|---|
| UC2-1 | Creating a Quality Gate (Events) and prepare Base HEX |
| UC2-2 | (Calibration complete) - > CDF /Supplementary Files management |
| UC2-3 | CDF Confirmation, Record discussion minute |
| UC3 | Store output HEX (CDF merged), Add details(changes) description, and publish |
| UC4 | Release HEX (Link Deliverables to Milestones) |

- History information will be generated from the operations in this DEMO. History information can be validated in the DEMO3 "Operation Logs and System Management" .

Calibration Use Cases for HMS



DEMO3 Using Management Metadata and Operation Logs

Introduction

| | |
|--------|--|
| UC5 -1 | Change grouping by configuration tree operation |
| UC5 -2 | Business operation log Operations history / Derivation of Hex Set |

DXC HMS will continue to improve with customer's voice...

The screenshot displays the DXC HMS web application interface. On the left, a navigation sidebar shows the project hierarchy: MY22, DXC_TEST, 1AA, Configuration, Domain: Energy, and View: Domain Trees. The main content area is titled 'Scope Control' and includes a 'Create Quality Gate' button. Below this, there are controls for 'Milestone Artifacts' (QualityGate Artifacts) and 'Show Latest'. A breadcrumb trail shows the path: Open > A1 > A2 > A3 > B1 > B2 > Production. A 'QualityGate' dropdown is set to 'Domain Control Meeting1'.

The 'FileSets' section contains a table with the following data:

| Type | Name | ConfigPath | Progress | Modified By | Revisions | Status |
|------|---------------|--|----------|-------------|-----------------------|---------|
| HEX | HEX Fileset 1 | Energy/Engine/Engine(1.5L-P1)/Conventional/Japan | 30% | User-A | 2020/06/08 18:37 (v2) | Private |
| CDF | CDF Fileset A | Energy/Engine/Engine(1.5L-P1)/Conventional/Japan | | User-B | 2020/06/08 18:34 (v1) | OK |
| CDF | CDF Fileset B | Energy/Engine/Engine(1.5L-P1)/Conventional/Japan | | User-C | 2020/06/08 18:34 (v1) | NG |
| CDF | CDF Fileset C | Energy/Engine/Engine(1.5L-P1)/Conventional/Japan | | User-D | 2020/06/08 18:34 (v1) | Tested |

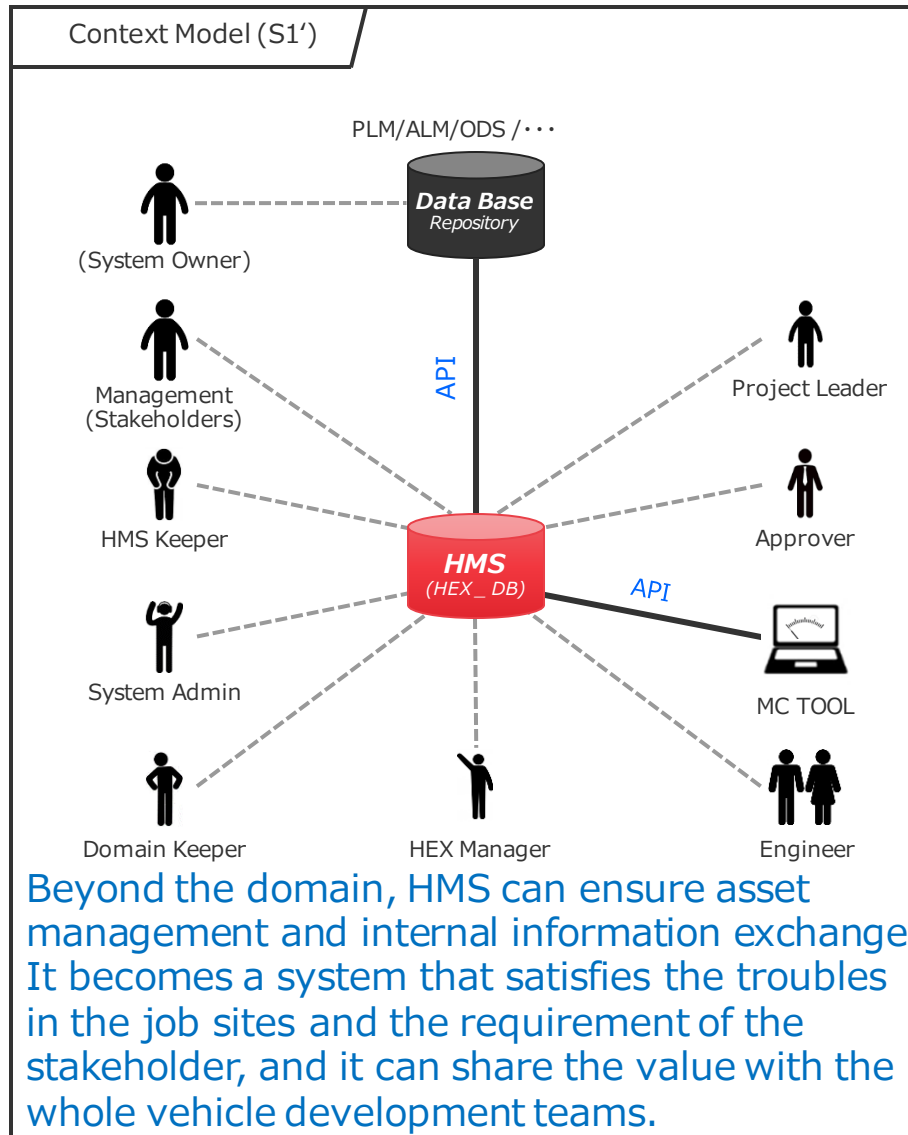
Below the table, there are tabs for 'Information', 'Contents', 'History', 'Progress', and 'Attribute'. The 'Information' tab is active, showing details for 'Revision: 2020/06/08 18:37 (v2)'. It includes fields for 'Status' (Private), 'Announcement' (Domain), 'Commit Title' (Initial HEX), and 'Commit Comment' (Initial HEX for Calibraion). Buttons for 'Revert' and 'Commit' are visible.

On the right, there are 'Released Milestones' controls with 'Release Milestone' and 'Cancel Release' buttons, and a table with columns: ProjectPath, ConfigPath, Milestone, and MaskFixed.

A 'History Tree' diagram is shown, illustrating the relationship between milestones A1, A2, and A3. Milestone A1 is highlighted with a red box and contains 'Domain Control Meeting1', 'HEX Fileset 1', and '2020/06/08 18:37 (v2) H M S ユーザー -- S A'. Milestone A2 contains 'Domain Control Meeting2' and '2020/06/08 18:43 (v1) H M S ユーザー -- S A'. Milestone A3 contains 'Domain Control Meeting.' and '2020/06/08 18:45 (v1) H M S ユーザー -- S A'. Arrows indicate dependencies between these milestones.

Value of HMS

HMS Value1



With the HMS system

We can store the HEX file ...

HEX files can be managed and kept with history, based on rules.
(Model/System Information/Milestone Information/Person Information /...)

We can find the HEX file ...

We can find the HEX files when you need them.
(Model Information/System Information/Milestone Information/Output Information/Progress Information /...)

We can understand the HEX files ...

It is possible to determine whether the HEX file matches the purpose.
(Destinations/Local Information/Ver & Rev Information/Minutes/Progress Information /...)

We can carry on HEX file management ...

Capable to "Continue and maintain HEX management activities" into the future.
(Governance/Roles/Meta Information Maintenance/Documentation/Education/DB Maintenance/SLA ...)

HMS Value2

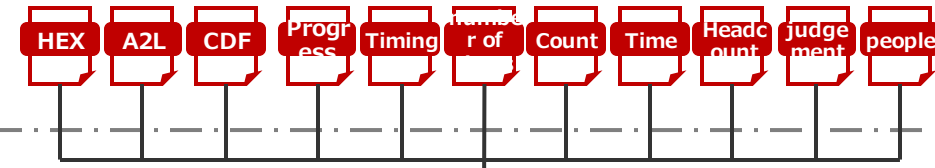
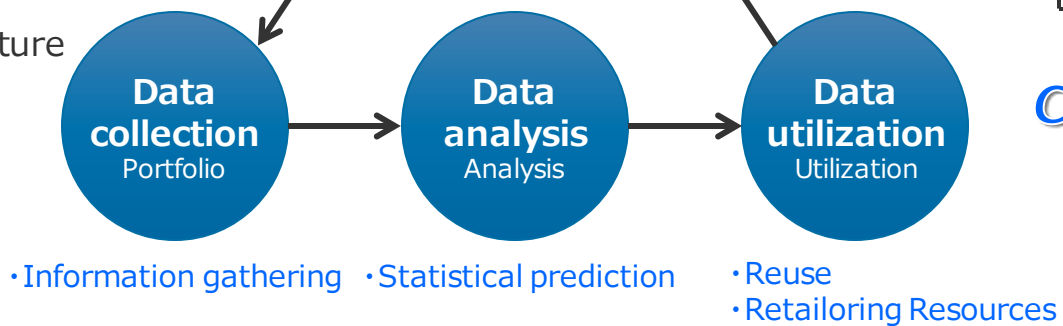
- ✓ Concept for standardization
 - Standardize OEM's common operations
 - + ASAM Standard
 - Architecture Model
 - Data Model
 - File Format
 - Web API
 - Glossary



*Managing HEX files leaves a lot of data (Log)!

- IT tool as a monitoring instrument to steer operations and make decisions
- IT tool to help sharing knowledge and improve accuracy of planning and progress management
- HEX files + A2L files = Data ⇒ HMS = Big Data

- ✓ Concept for the future
 - **Lifecycle Management**



Collect and visualize various data

Business improvement

*digitizing skill
*management skill

- Take past successes (Information/Data) and make them available for reuse in projects.
- By capturing data across multiple project situations and characteristics (Progress, Resources, and Operation Log), we can evaluate Team / Project / Person correctly.

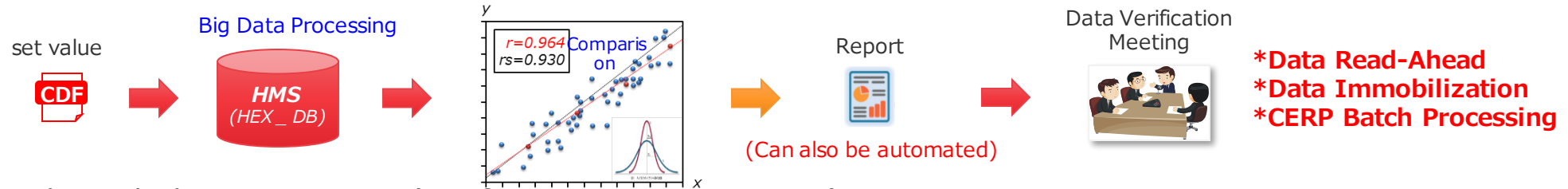
By managing HEX files with HMS, we can improve business operation.

Reuse of Data

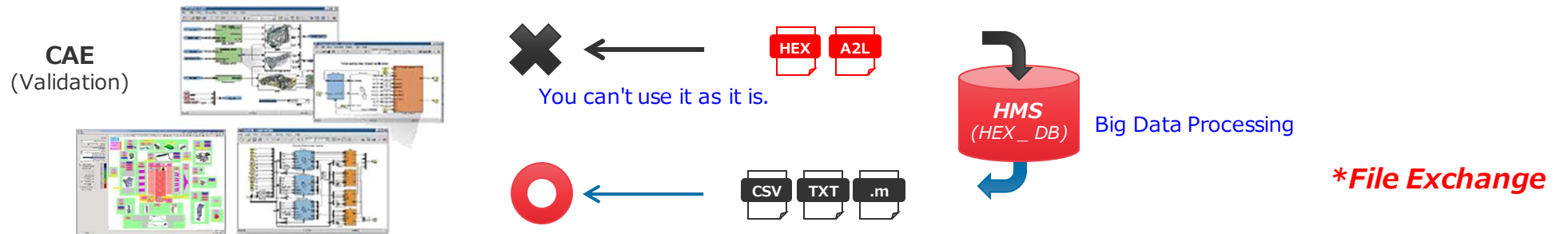
*Due to internal processing of Data Base, out of scope for ASAM



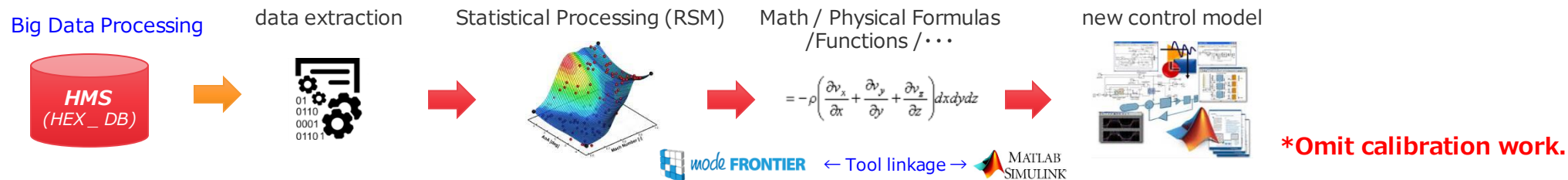
1. Accuracy assurance by comparison with past data ⇒ Machine learning can be possible in the future



2. Efficiency through data conversion (reinforce upstream process)



3. Study of new control model based on past data



By turning files into data, improve its reusability, and we can use data in various ways.

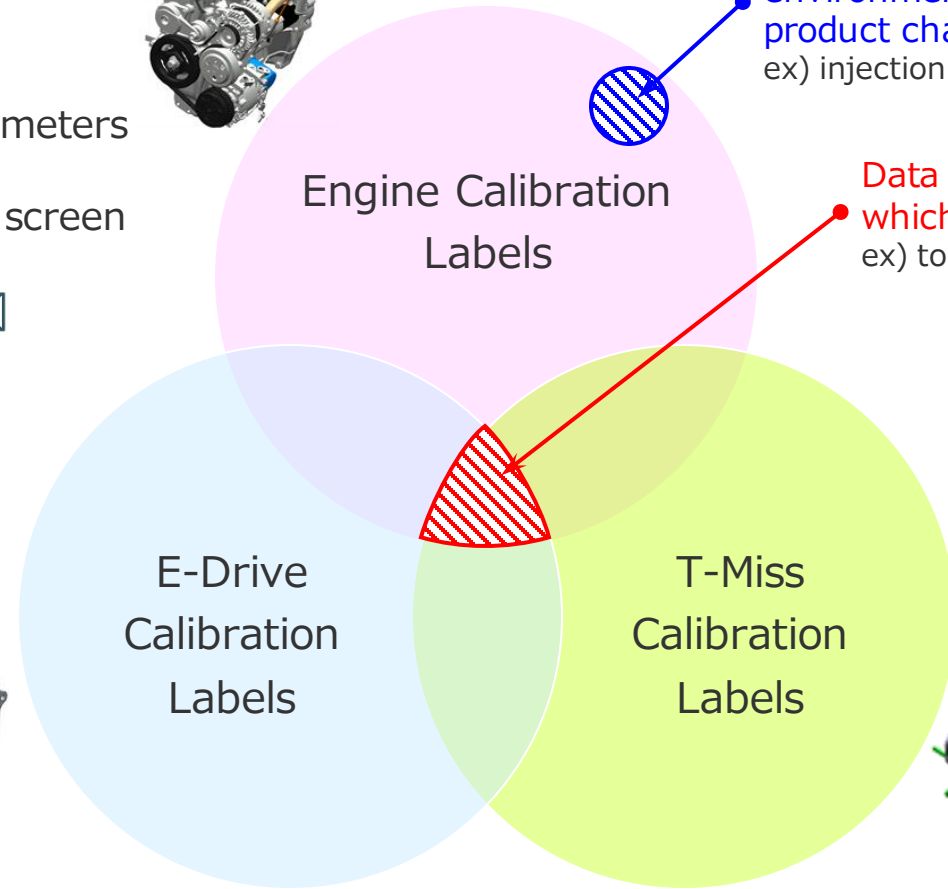
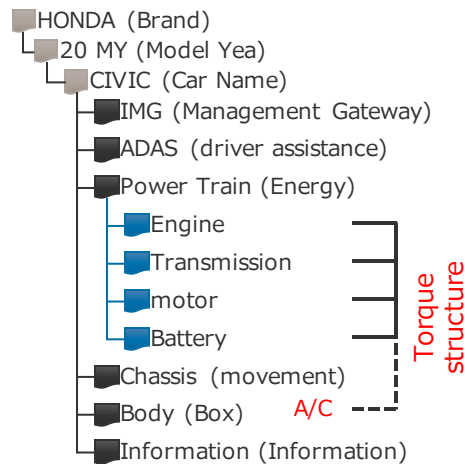
! Data Collaboration Management (system dependency)

*Due to internal processing of Data Base, out of scope for ASAM



When a critical parameter is changed, the function generates "Alerts"

- In advance, set dependency to critical parameters
- Common HEX Administration Web Pages
 - Alerts appear on the project management screen
 - Mail directly to the administrator



Data Labels for environmental factor, product characteristic factor
ex) injection data

Data Labels which has dependency
ex) torque structure data

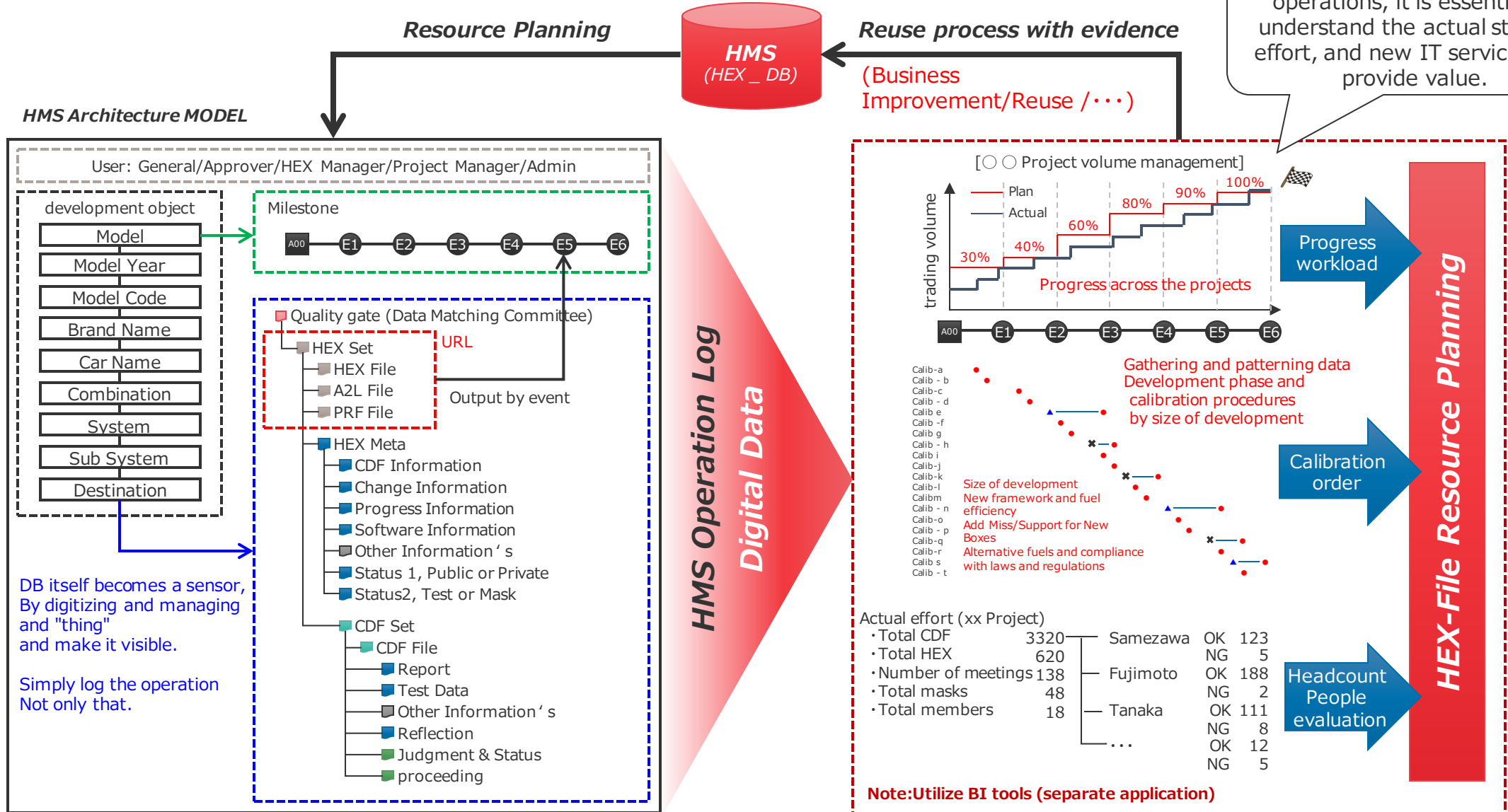


Maximize benefit of managing whole vehicle data (Handle increasing future complexity)

Lifecycle Engineering

*Due to internal processing of Data Base, out of scope for ASAM

In order to improve business operations, it is essential to understand the actual state of effort, and new IT services can provide value.

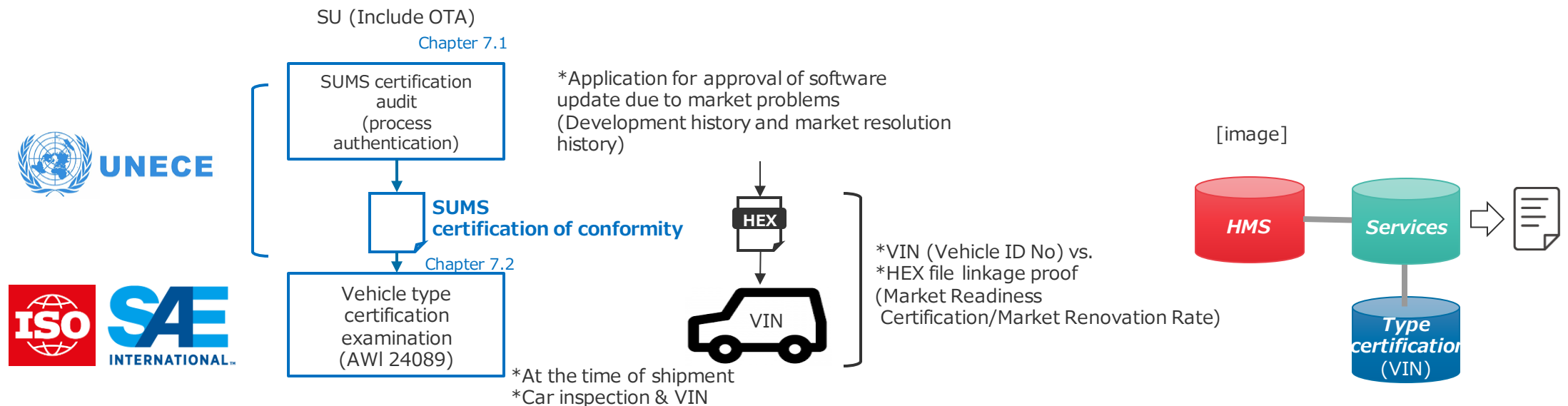


Summary

Today's Summary

Summary

- ✓ Although it took time, we have released HMS Version 1.0.0 with the cooperation of the members.
- ✓ HMS (HEX DB) has solved the problem of HEX file management.
It will also solve business resource management related to calibration work.
- ✓ The automobile industry has a lot of problems to solve.
- ✓ The upcoming SUMS law is also a major challenge. (Investigating/Next OEM Meeting Agenda)



One company can solve only limited problem.
The framework for standardization (ASAM) is becoming very important,
so we would like to ask for your understanding and cooperation.

Thank you very much. Thank you!

Hiroshi Samezawa

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