ASAM HMS V1.0.0
Technical Seminar

Representative of ASAM Japan
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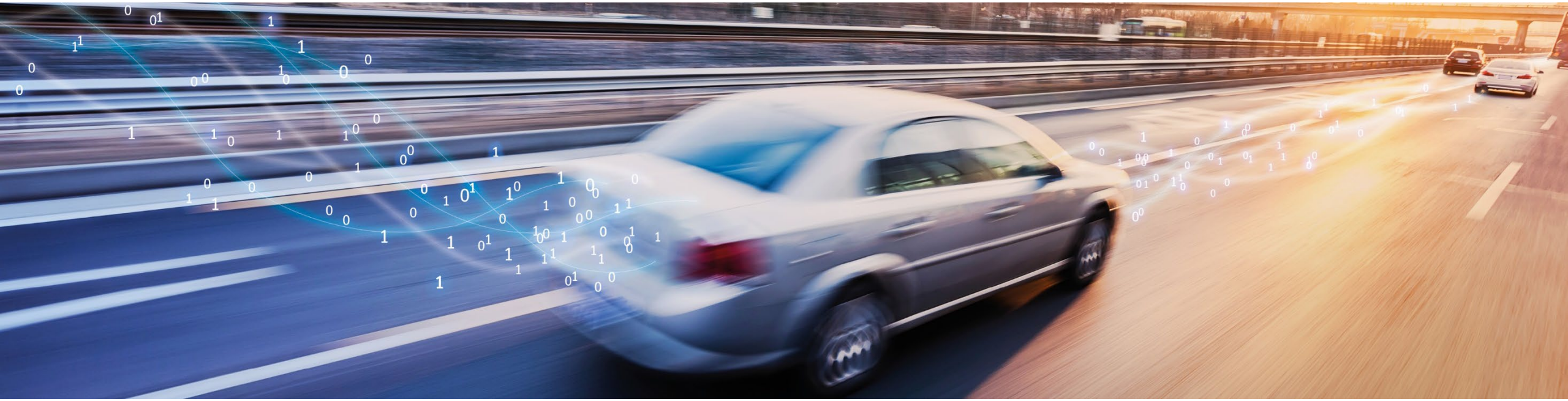
October 8th, 2020
Zoom meeting

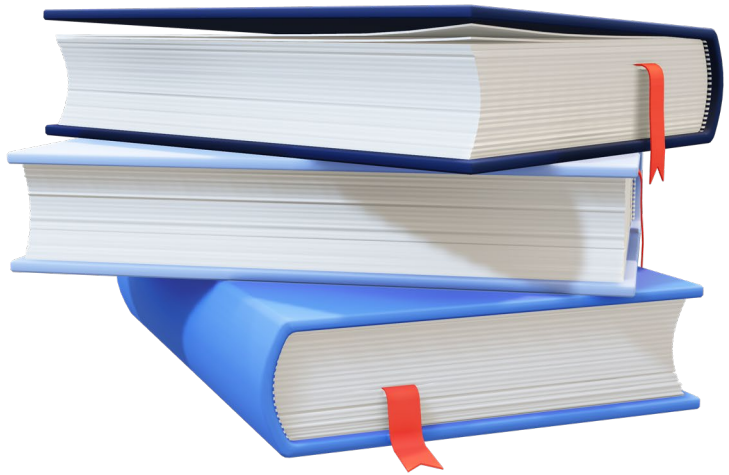


ASAM
Association for Standardization of
Automation and Measuring Systems

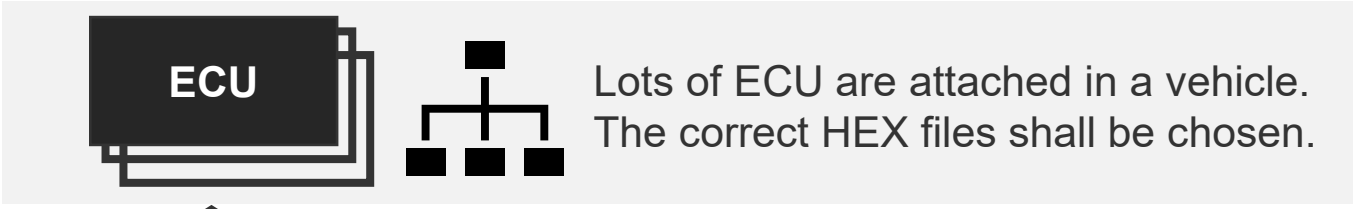
Introduction

- ASAM HMS (HEX-File Management Service) is a new standard in ASAM.

- The below contents are explained.
  - **Motivation**: Answer to why the standard is needed?
  - **Standardization**: Answer to how standardized domains are determined?
  - **Technology**: Answer to what kind of technologies are used in the standard.
  - **Implementation**: Answer to how the standard is delivered?
  - **Conclusion**: Summary of standard activities is explained.



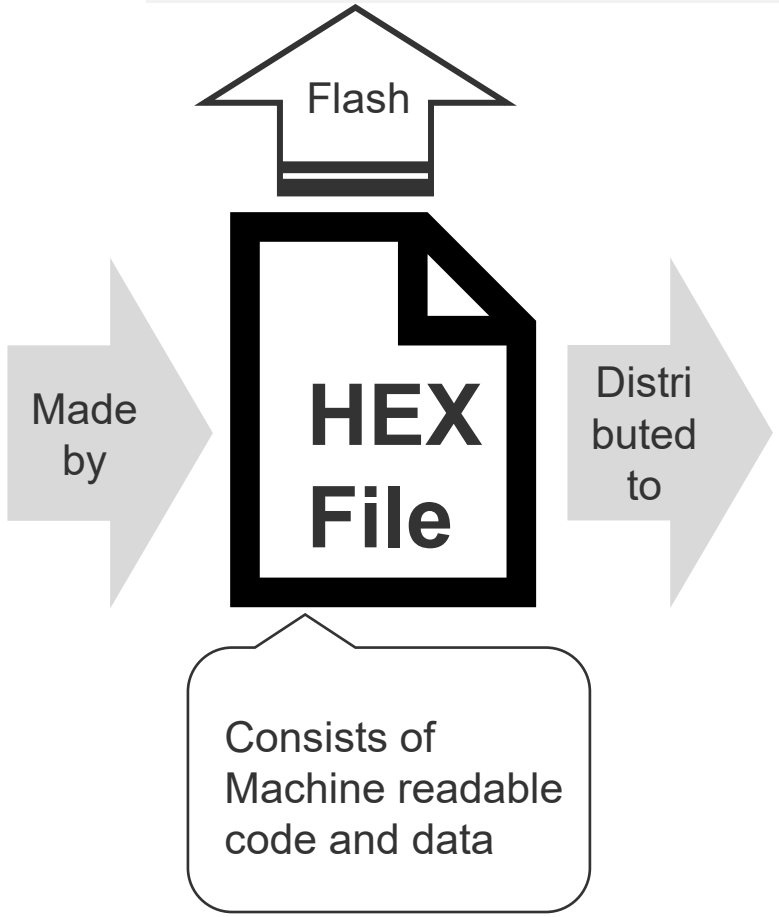
HEX file and relations



Lots of ECU are attached in a vehicle.
The correct HEX files shall be chosen.

What HEX file made by

- Source files
- Models
- Other software tools
- Architecture design tool
- Product requirements
- Product management
- Business requirements
- Business management



Testing by the requirements
Results:
> Measurement file (e.g. ASAM MDF).
> Test report

Calibration with management process
Results:
> Parameter set to the HEX
> Document for verifications
> Progress reports

Motivation: What is issue?

The correct HEX files shall be chosen for vehicle development. However,

- HEX file is never recognized to the right one by itself.
- HEX file is just binary data stream which consists of machine-readable code and data.
- Sometimes HEX file is just delivered without any source file by ECU supplier.

Moreover,

- HEX file depends on each other (e.g. ADAS, minimization of energy consumption).
- In the future, degree of the dependency is more (e.g. Autonomous vehicle).
- It is mandatory that correct HEX file is absolutely chosen.

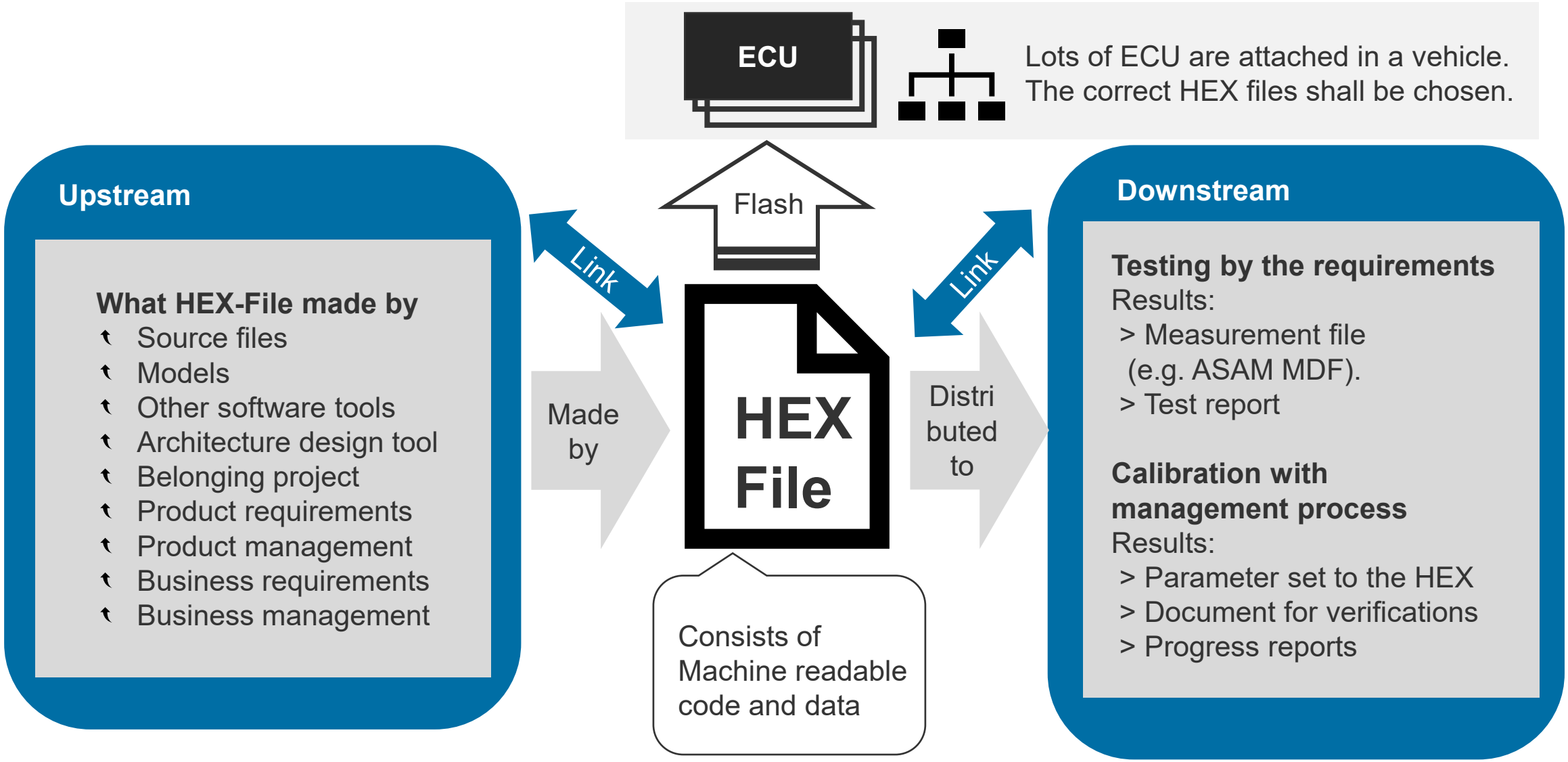
Overcome the issue: HEX-File Management

Examples relation of HEX file in the other words

- Location: Where HEX-Files are in all ECU of a vehicle, what kind of component is belonged.
  - ECU is made by source files and/or model files.
- Results: What kind of result are earned by the HEX-File.
  - Measurement files are earned by vehicle test process.
- History: What is the origin of the HEX-File.
  - Requirements lead to ECU implementation.

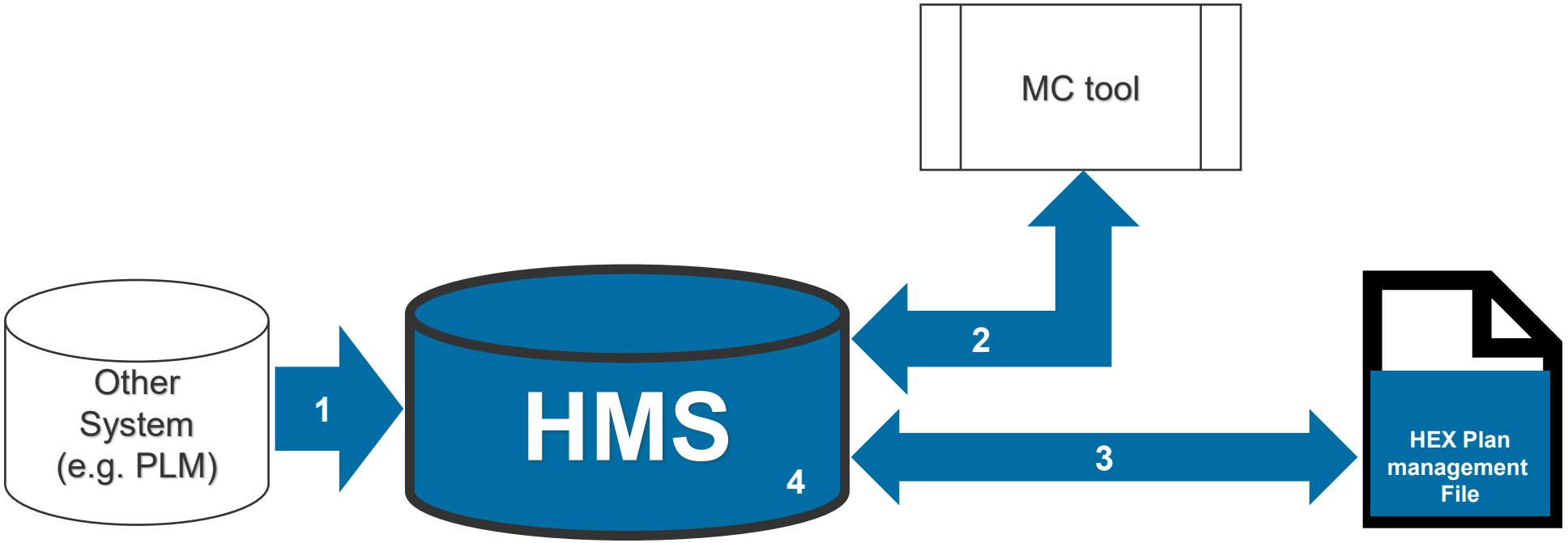
→ To manage relation of HEX file is to overcome the issue

HEX file and link: HEX-File management



Standardized domain

1. Interface of External systems to skim metadata of HEX file (e.g. product information is skimmed via PLM system)
2. Interface of MC tool: It is successor of eCDM interface.
3. Interface of HEX Plan Management File
4. Data model of ASAM HMS interface



Technology of the standardized interfaces

- Web API is taken up in the interface.
  - Connections via network are estimated for implementation.
  - The data exchange with a Web API is done by a simple request & response.
- REST is used in the Web API.
  - Generally, represents a unique URI to contents (resources) on a network.
  - Uses HTTP requests such as GET, POST, PUT, DELETE and receives the response in XML or JSON format.
  - The URI of a REST request is often nominal because the URI is associated with resources.
  - Used for delivering data with limited input parameters or for search services that target a wide variety of users.
- OpenAPI Specification (https://github.com/OAI/OpenAPI-Specification) version 3.0, an industry standard for REST API specification is used to define JSON Object schemas

Technology of the standardized interfaces

API description

- Standardized API for the interface are described:

4.3.3.3 Create Project

POST /v1.0/projects

Purpose

This method will create a new Project with the provided data.

The HTTP Request Body

- Content Type: application/json

Table 58 Projects POST API Request Body

Parameter Name	Data Type	Required	Description
filename	string	true	The import file name.
file	binary	true	The content of the import file. The API should only accept Project Metadata File Format files.

The HTTP Response Body

- Content Type: application/json

Table 59 Projects POST API Response Body

Parameter Name	Data Type	Description
-	Project	The created Project in a json format.

Technology of the standardized interfaces

Parameter description

- JSON schema is described for parameter of object in the APIs.

Schema

```
1  "Project": {
2      "type": "object",
3      "properties": {
4        "id": {
5          "type": "string",
6          "description": "The id of the Project.",
7          "example": "507f1f77bcf86cd799439011",
8          "readOnly": true
9        },
10       "milestones": {
11         "type": "array",
12         "items": {
13           "$ref": "#/components/schemas/Milestone"
14         },
15         "description": "A list of Milestones."
16       },
17       "projectAttr": {
18         "type": "array",
19         "description": "A list of Project attributes.",
20         "items": {
21           "$ref": "#/components/schemas/ProjectAttr"
22         }
23       }
24     }
25   }
```

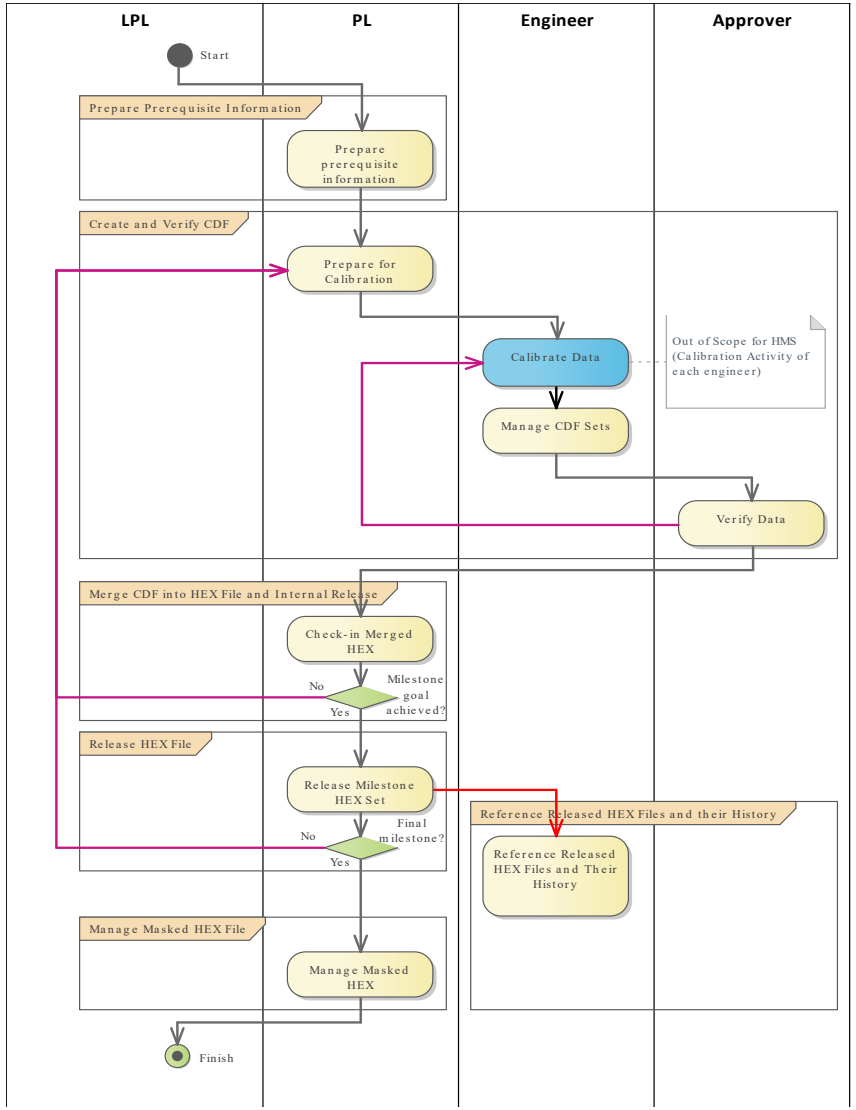
Deliverables

UML models

- UML Class diagrams
  - HMS Interface Data Model
    Instanced HMS Object is also described.
  - HMS User Data Model
    Instanced HMS Object User is also described.
- UML Sequence diagrams
  - Overview diagram
  - Subsidiary diagrams of the overview

  Diagram and where the standardized interface is located are described.
- Use case diagrams
- HEX File lifecycle process overview (right picture).

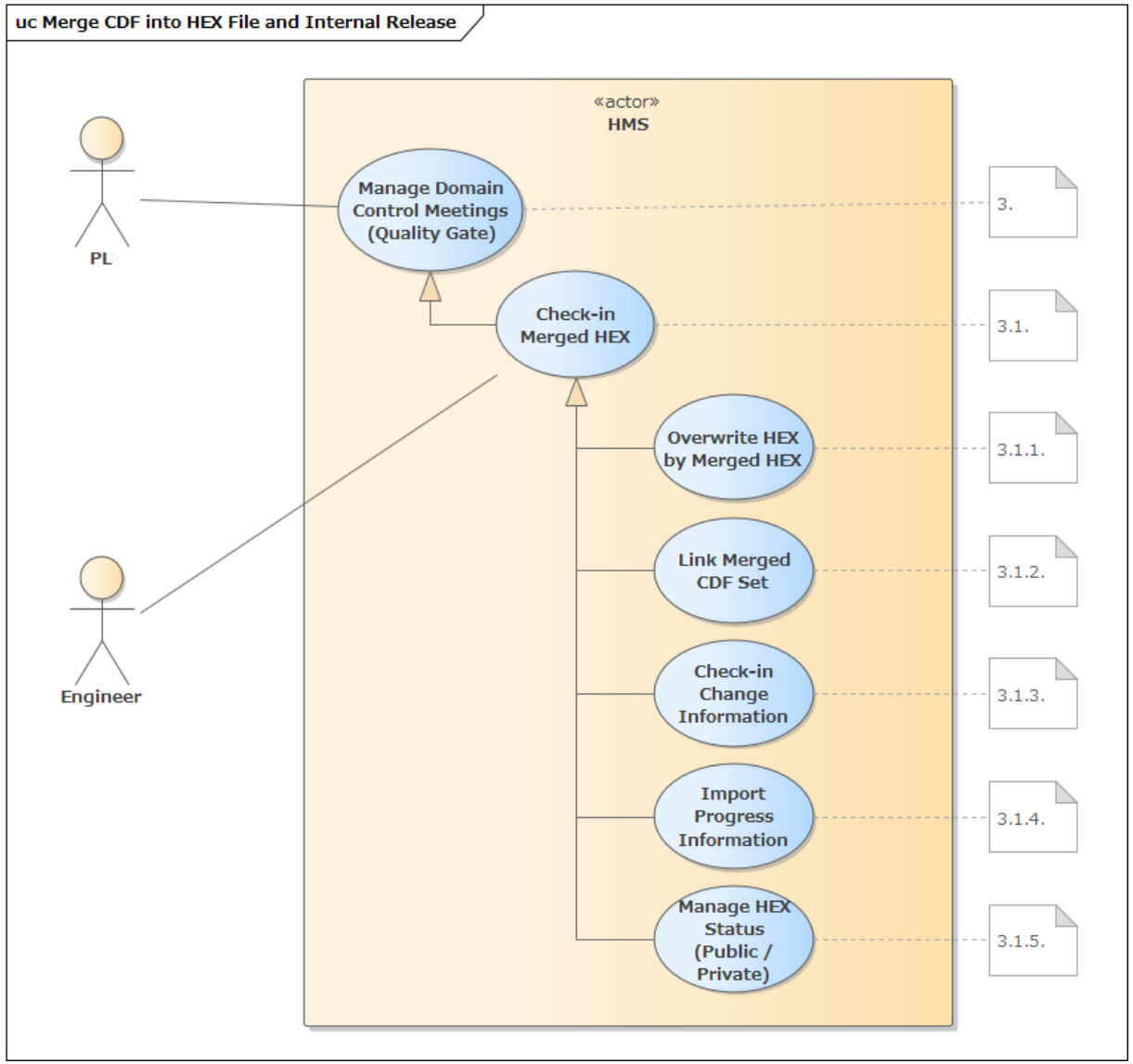
- The UML is delivered by PDF and .EAP file.



Deliverables

Use cases

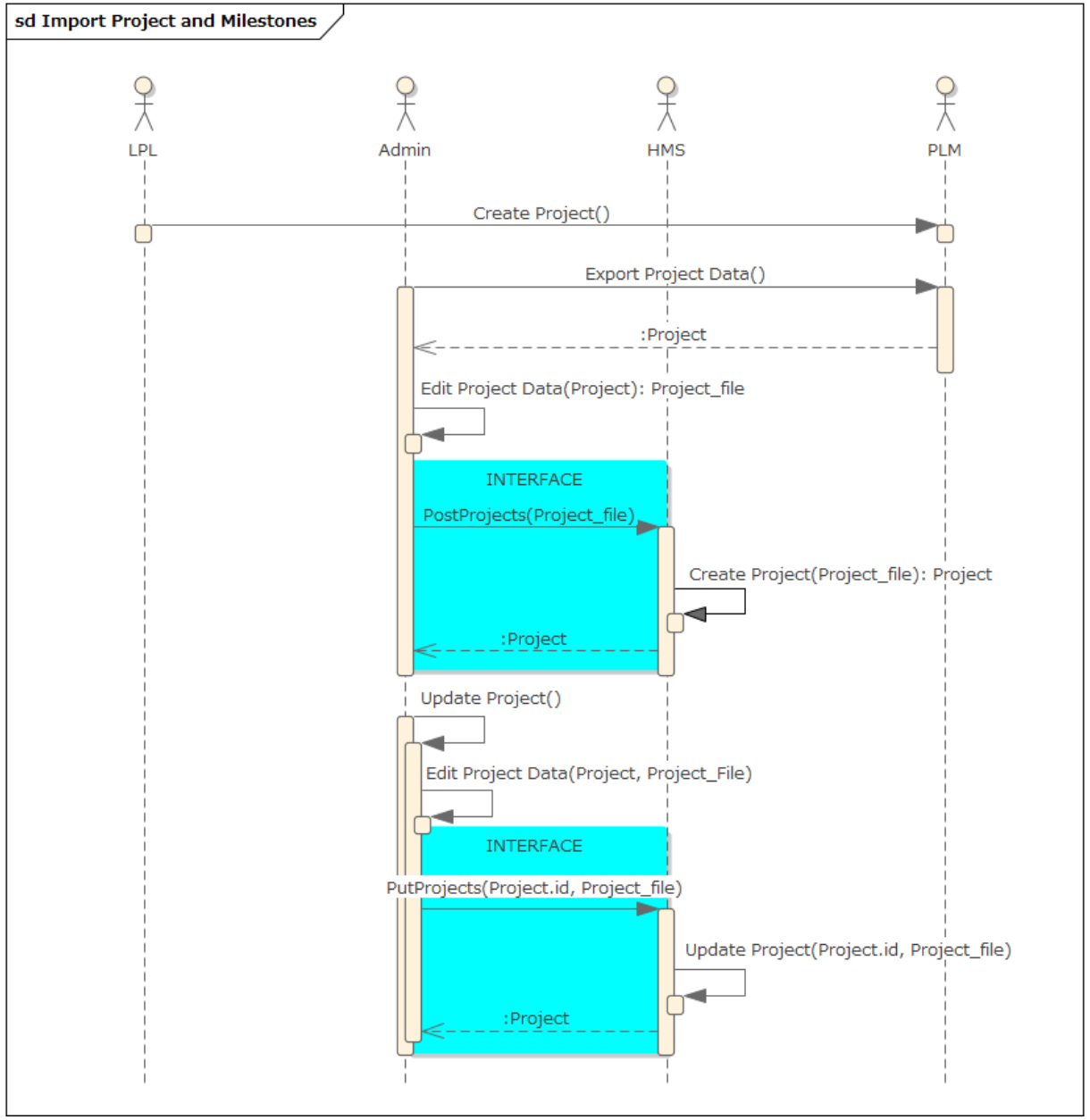
- Overview of Hex-file lifecycle and related use cases are described in the standard specification.
- Six use cases are described in ASAM HMS.
- The right pictures is one of the use cases. Detailed description is also shown in the specification.
- It leads to easy understand for the specification.



Deliverables

Sequence diagrams

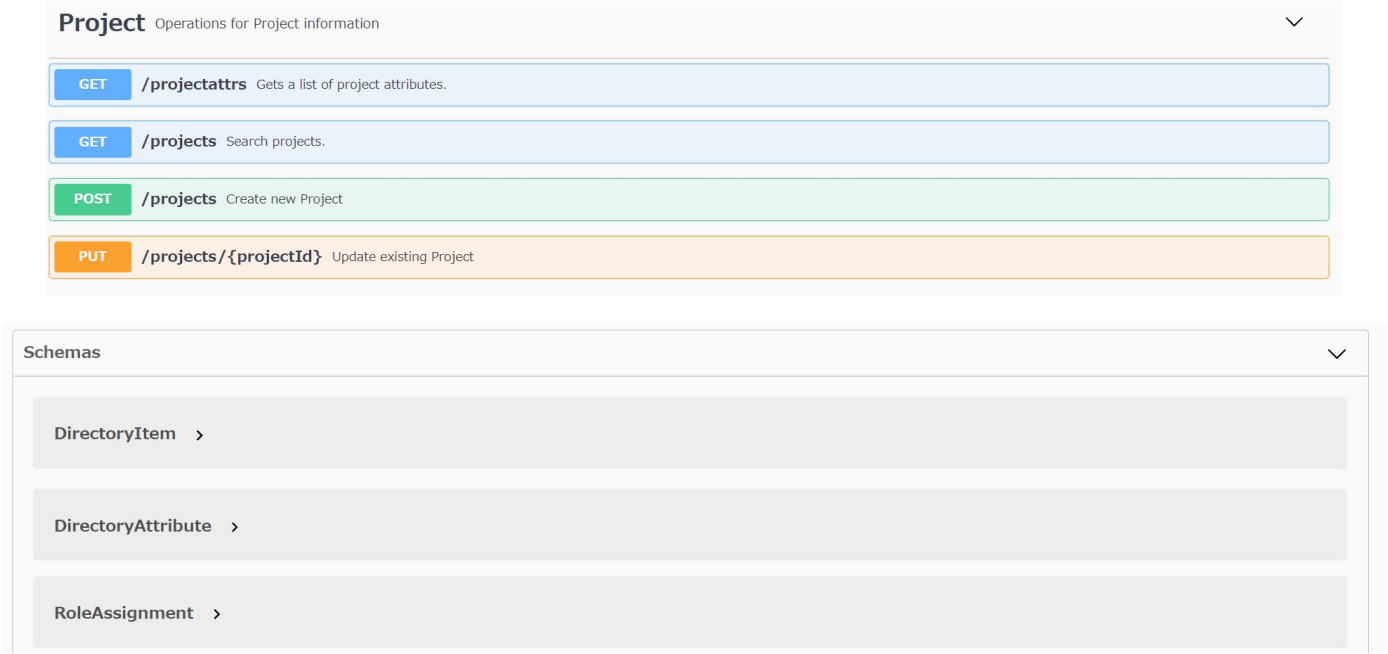
- Sequence diagram around the interfaces is described in the specification.
- The right picture shows relation between “import project and milestones sequence” and the corresponding APIs.



Deliverables

YAML for standard related development

- YAML of the specification is delivered. API and schemas can be found through Swagger.
- It is very useful for the development of the standard related tools.
  - Manual description of the interface is not needed.
  - The interface can be tested by Mock server.



Summary

- HEX file and its dependency is critical in vehicle development process. Thus, management is needed.
- ASAM HMS standardizes interfaces for HEX-file management. The interfaces work for connection between HMS server and other existing systems.
- Web API by REST is used for the interfaces.
- Machine readable specification is delivered. It is useful to develop standard related of tool.

Expectation:

- When the new connection is needed, ASAM HMS will be expanded.
  Example: Stored recorded data with OpenLABEL

Thank you!

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