Functional Data Exchange (FDX)

An important step for integrated process chains in virtual vehicle development
Increasing use of simulation in vehicle development

Previous Process

1st Real Prototype Phase  2nd Real Prototype Phase  Pre-Series

Increasing use of Simulation

1st Real Prototype Phase  2nd Real Prototype Phase  Pre-Series
Increasing use of simulation

1st Virtual Prototype

1st Virtual Prototype Phase  2nd Real Prototype Phase  Pre-Series
Component Tests  Increasing use of simulation

Prototype-free Development

1st Virtual Prototype Phase  2nd Virtual Prototype Phase  Pre-Series
Component Tests
Virtual development needs data

Data Types:
- Geometry Data
- Functional Data
- Physical Data
- Model Data

Data Requirements:
- Availability
- Reliability
- Consistency
- Traceability
- High-Quality
Virtual development needs data

Today: A variety of data formats
Virtual development needs data

**Physical Prototype Process**

- Spezification Prototype Parts → Ordering Prototype Parts → Manufacturing Prototype Parts → Delivery Prototype Parts → Incoming Parts Inspection & Storage → Build & Testing Physical Prototypes

**Virtual Prototype Process**

- Spezification Data & Models → Ordering Data Delivery → Data Generation → Execution Data Delivery → Incoming Data Inspection & Storage → Build & Testing Digital Prototypes

**Need for action:** Uniform data format

**Result:** Standardized data exchange format

**uniform data flow**

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Working Group

Aim

Elaboration of a recommendation for functional data exchange

Members

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Scope of work

- Definition of the application area
  - Requirements
  - Process and use cases
- Definition of the underlying standards
- Elaboration, maintenance and further development of the technical data model
  - Overall attribute list
  - Component-specific attributes
- Provision of software tools to exchange functional data between OEMs and suppliers

Project Duration

2019 2020 2021
Requirements

Supplier:
- Protection of intellectual property
- Efficient creation of exchange objects
- High process quality / security
- Internationalization
- Low operating costs
- Consistent use by OEMs

OEM:
- Consistent component description
- Process quality / security
- Flexibility and expandability
- Low operating costs
- Acceptance from suppliers

Data Model:
Definition of a data model based on the industry standards ASAM-ODS and openMDM

Data Exchange Format:
Use of the XML-based industry standard ASAM ATFX

Software Tool:
Provision of an editor for data entry and process support
Process and use cases
Underlying standards

Defined data **names, attributes and values**, specified by FDX Working Group

Derived **application model** for managing test data, specified by openMDM Eclipse Working Group

Generic **base data model** for describing test data, specified by ASAM*)

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*) Association for Standardization of Automation and Measuring Systems
Data Model - Features

- Representation of extensive information on components, measurements and payload data
- Representation of different types of components in the same data model
- Generic description of values, maps and curves
- Representation of rule-based dependencies between attributes and values of attributes
- Data model for data request and data delivery
- Expandability through OEM-specific information blocks
- Divisibility of an overall data transmission into several sub-scopes
Data Model – main categories and subcategories

Functional Data Exchange File

- Measurement Order

Order or Delivery

- Order Meta Data
- Component Specific Additional Information

Data Set Target or Data Set Measurement

- Functional Meta Data
- Data Set Meta Data
- Unit Under Test
- Test Equipment
- Test Sequence

- Content Data

- Functional Data
- Derived Characteristics

- Functional Data
- Derived Characteristics

- Part Status
- Part Identification
- Part Modification
- Pre Test
- Inertia Data
- Static Measurement
- Dynamic Measurement
Data Exchange Format

The exchange file is an archive (ZIP) which has either "FDX" (= normal files) or "FDT" (= template) as file extension.
Structure of the Recommendation

Part 1: Main document

Part 2: Component Overall

Part 3-1: Rubber Mounts

Part 3-2: Shock Absorbers

Part 3-x: Further Components

Attribute list
Software support

- OEM: Ordering, Data Delivery
- Supplier: Execution, Data Delivery
- OEM: Data Management

Standardized exchange format: FDX

Benefits:
- Process Reliability
- Process Automation
- Process Quality