openMDM® for aerospace - because why stop at cars?

5/24/2022 / Fabian Bayerlein, Andreas Putz
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Agenda

1. Data in Aerospace
2. MDM @MTU
3. Itinerary
Data in Aerospace
Who We Are and Where Our Data Comes From

MTU Is an Indispensable Partner in the Engine Value Chain:

System Manufacturers / OEMs

Engine Subsystem-Partners

Engine Component Suppliers

Material Suppliers

Program

<table>
<thead>
<tr>
<th>Program</th>
<th>V2500</th>
<th>PW1000G</th>
<th>GEnx</th>
<th>GE9X</th>
<th>GP7000</th>
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</thead>
<tbody>
<tr>
<td>MTU OEM Partner</td>
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| Program Share | 16 % | 15 – 18 % | 6.6 % | 4 % | 22.5 % |

Data Sources

- Involvement in various engine programs → test data, pass-off data
- World’s largest independent engine MRO provider → MRO data
- Engine Trend Monitoring Service → in-flight data
What Kind of Data Are We Dealing With in Aviation?

Kind of data
- Gas path measurements (low frequency)
- Vibration measurement data (high frequency)
- Steady-state measurements at different operating points
- Transient measurements of maneuvers

Data source
- Measurement data acquisition on the test bench (engine/rig)
- Simulation results (prediction)

Location of data acquisition
- MTU-internal
- External at partners

Characteristics of our measurement data
- A LOT of channels (approx. 15,000)
- Large amount of single-scan steady-state measurements
- Long transient measurements (measurement time may span over multiple days)
MDM @MTU

Why MDM? Why open? Why openMDM?
Motivation

Measured Data Management according to ASAM ODS

- Overcome unnecessary technical hurdles for data access and usage of each individual type of data (“data silos”)
- Established standard, wide adoption, stable
- Ongoing work with eg. BigData

Open Source Software (OSS)

- Debugging (Analysability*)
- QuickFixes (Modifiability)
- Understanding of Code Intent (Learnability)
- Transparency, eg. Code Quality (Analysability)
- Adjusting UX to “Corporate Design” (Adaptability)
- Adding “proprietary features” if necessary (Adaptability)
- Transparency of changes (Authenticity, Integrity)
- No vendor Lock-in (Replaceability)

Multi-domain handling
Accessible API
Free (Gratis, OSS)
Catalogs & Templates
(enforce structure, allow evolution)
Webclient included

openMDM

*Criteria acc. to ISO25010 - Software Product Quality
Benefits today

- Standardization of metadata & physical storage
- Harmonization of metadata per domain, semantic metadata
- Unified interface, both GUI and API
- Efficient and convenient global search and navigation
- Flexible navigation via query trees
- Consistent unit system (i.e., unit conversion as a central service)
- Scalable architecture & simple deployment
- Multi-platform usage with familiar feel, quick access
Itinerary

For us @MTU

- Heterogeneous, domain specific data with unified interface
- Necessary integrations for advanced analytics, eg. BigData
- "Data as a service", ie. *if there is a use case and the authorization, allow an analyst to work in hours/days not weeks*

For openMDM

- Wide range of industry adopters, more aerospace?
- Active community & close collaboration to enable the best solutions to generic problems
- Increased robustness
- Additional backends?
- Referencing of measurements
- Simple analytics on the platform (eg. simple trend plots)

For ODS

- Non-homogeneous timestamps
- Native, efficient version handling, eg. with incremental diffs for external components
- Enhanced validity flags
Vielen Dank für Ihre Aufmerksamkeit. / Thank you for your attention.
Für Fragen stehen wir Ihnen gerne zur Verfügung. / Please contact us if you have any further questions.

MTU Aero Engines AG
Dachauer Str. 665
80995 Muenchen
Germany

Fabian Bayerlein
Andreas Putz