

Status of Electronic Data Sheets

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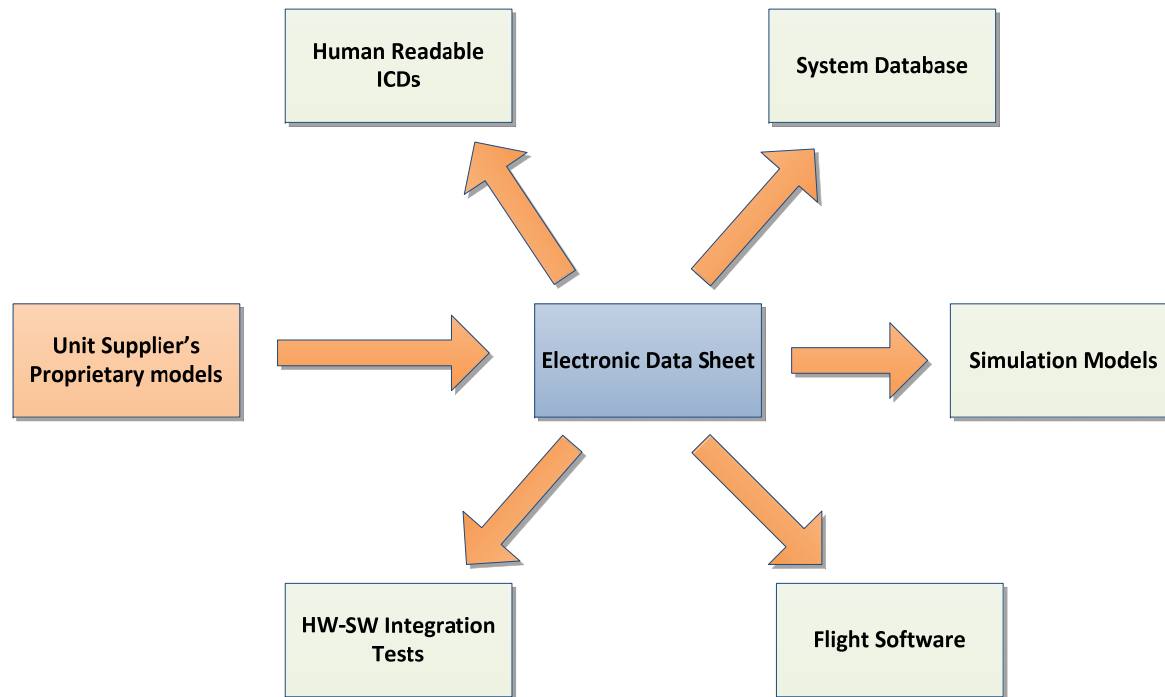
Electronic Data Sheets (EDS) – What is it?



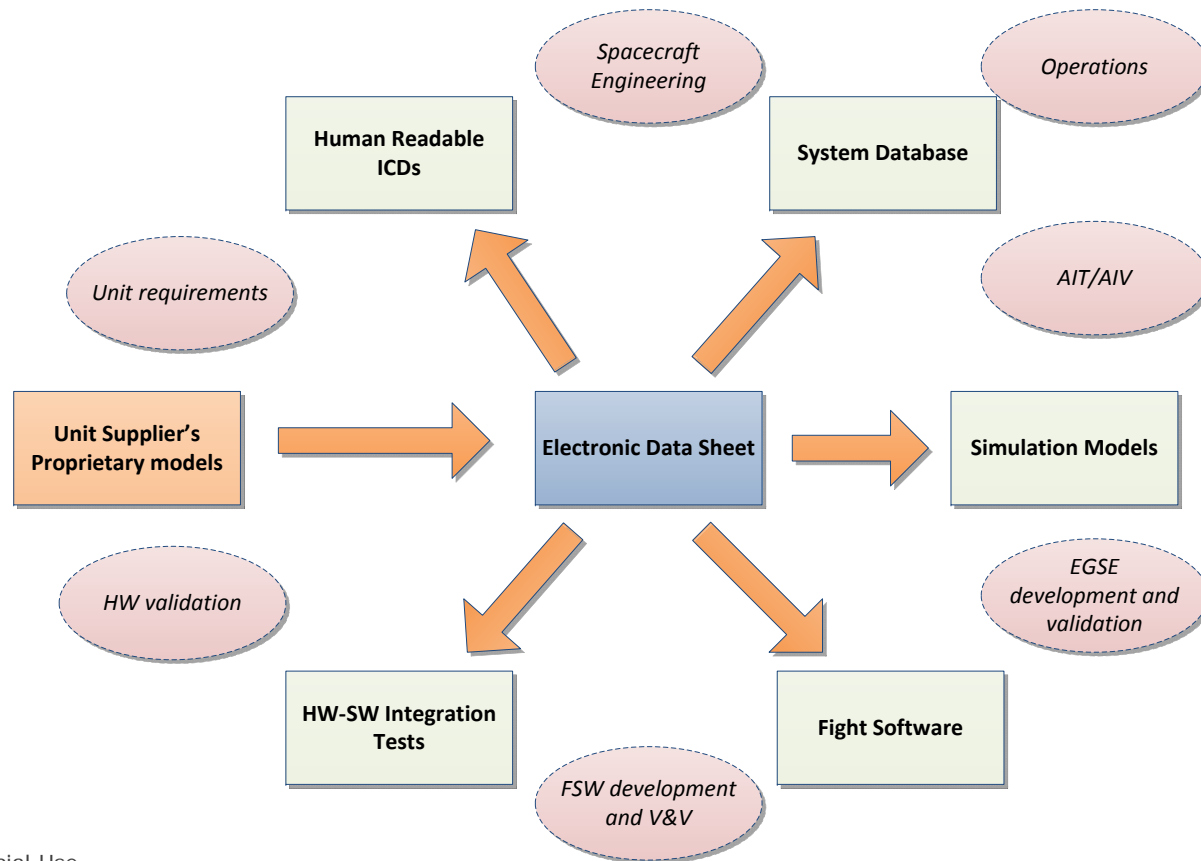
- **Machine-understandable mechanism for describing interfaces of electronic units onboard spacecraft**
 - Sensors, actuators
 - Other units (PCDU, RTU, MMU)
 - Instruments
- **Intended to replace the ICDs and data sheets which accompany each device and are necessary to determine the device operation and how to communicate with it**
 - Initially functional/data handling (i.e. TM/TC ICD)
 - But gradually also electrical, thermal, mechanical



Electronic Data Sheets – Use Cases



Electronic Data Sheets – Multiple Domains



Electronic Data Sheets – Status Today



- **ESA conducted several studies in 2013-2016**
 - Understanding requirements, process, tools, format, use, semantics
 - Contributing to CCSDS XML Spec for EDS
 - Focus mostly on FSW generation and data handling
 - Focus on SOIS architecture (Device Access Service, Device Virtualization Service)
 - EDS of some avionics units (developed with the help of unit suppliers)
 - Jena Optronics Astro APS star tracker
 - Sodern Hydra star tracker
 - TAS UK MEMS Rate Sensor (MRS)/SiREUS
 - FOG Astrix 120 Gyro
 - NPAL Camera



Electronic Data Sheets – Status Today



- (continuation)
 - Improving ESA's reference EDS tool chain
 - EDS validation
 - FSW code generation (C language)
 - HTML generation
 - EDS verification using communication log produced by real HW
 - Checking telecommands and telemetry, checking protocol using state machines
 - Using the star tracker EDS with the star tracker simulator
 - Checking commands, checking responses, injecting commands
 - Automatically generating HTML documentation
 - ICD
 - Test report, including TM/TC coverage



Electronic Data Sheets – Status Today



- **Standardization in CCSDS with other agencies (NASA primarily)**
 - **End of 2016: Finished agency review of two EDS books**
 - XML Specification for Electronic Data Sheets for Onboard Devices and Software Components (876.0)
 - Specification for Dictionary of Terms for Electronic Data Sheets for Onboard Components (876.1)
 - **CCSDS plan for 2017-2018**
 - Updating “Electronic Data Sheets and Common Dictionary of Terms - Overview and Rationale” Green Book (870.1)
 - Prototyping
 - Interoperability tests
 - Interoperability test plan
 - Two interoperable prototypes



Electronic Data Sheets – Planning



- **GSTP study “SAVOIR Electronic Data Sheets Definition” in preparation**
 - June 2017 published on EMITS (proposals deadline end of September 2017)
 - Prepared/planned with heavy involvement of ESA Primes
 - Planned KO end of 2017
 - Broader system-level view
 - User requirements, reference process
 - Focused primarily on Data Handling and Electrical ICD
 - SAVOIR EDS Data Model definition
 - SAVOIR EDS Common Toolset development
 - A number of use cases and prototypes
 - Generation of engineering/V&V/simulation artifacts
 - Feedback to standardization (CCSDS)



Will EDS succeed? When? Why?



- **It is doable!!!**
 - Simple “semi-formal” models, model transformations
 - The key thing is to standardize (contents and format)
 - ... but not everything!
 - FSW framework proprietary
 - SRDB proprietary
 - Tools as well!
- **Increasing interest in industry**
 - Making life easier (automatic flow of engineering data, inherent consistency, data validation)
 - Saving time/money/resources by reusing engineering data
 - Technology is available to do this
 - Evolution towards Digital spacecraft engineering is ongoing



Gathering momentum

- **Different parts of ESA interested**

- E.g. SIMULUS operations simulator models derived from EDS
- Possibility to use EDS for programmable RTU
- Possible use in early Concurrent Design Facility studies

- **International partners interested**

- NASA, CNSA, CNES, DLR, ...
- Provides a great tool for interoperability (within the same spacecraft, spacecraft to spacecraft, system of multiple spacecraft)

Interfaces described in standardised machine understandable unambiguous format

Proprietary tools available to support system engineering on both sides without necessity to use the same architecture/standards (e.g. PUS encoded in EDS)

- **We need unit suppliers to get involved even more**

- Making life easier (unambiguous ICD)
- Such models already exist today but they are proprietary
- Competitive advantage (provide units accompanied with standardized electronic ICDs)

THANK YOU



Questions?

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