ADCSS - EDS

18/10/2016

Electronic Data Sheet - EDS

History

Developed from CCSDS work on SOIS

Shall provide a system in which entrepreneurs can offer software tools that exploit information in EDS to reduce cost of design, of physical integration and of operation

Overall objective

- Capture relevant information about an equipment
- Increase development efficiency
- Enable higher degree of reuse
- Smoother integration of units/building blocks
- Mitigate error prone human typed/interpreted ICDs

SOIS- Spacecraft Onboard Interface Services

CCSDS – Consultative Committee for Space Data Systems

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SOIS EDS (SEDS) have the ambition to address automation on many of development process steps, ie :

- Efficient exchange of information (easing maintainability, enforcing consistency)
- Enable development process to be partly automated

Use cases currently focusing on data interfaces but the definition of terms is not limited – could include mass properties, thermal aspects, radiation, electrical connectors, pin allocation etc

EDS opportunities - Development phases

Mission Design Team:
- Selecting parts/equipment – searching suppliers → modelling your spacecraft
- Configuring your SC – resource allocation
- Simulation activities with configured data
  - Attitude
  - Power
  - Thermal
- Analyzing interfaces
  - Identifying constraints or topics to be resolved
- Generating Flight Software
  - Device drivers
  - State machine transfers
  - Generation of tests for communication
- SC data-pool relations
- Mission Control Center
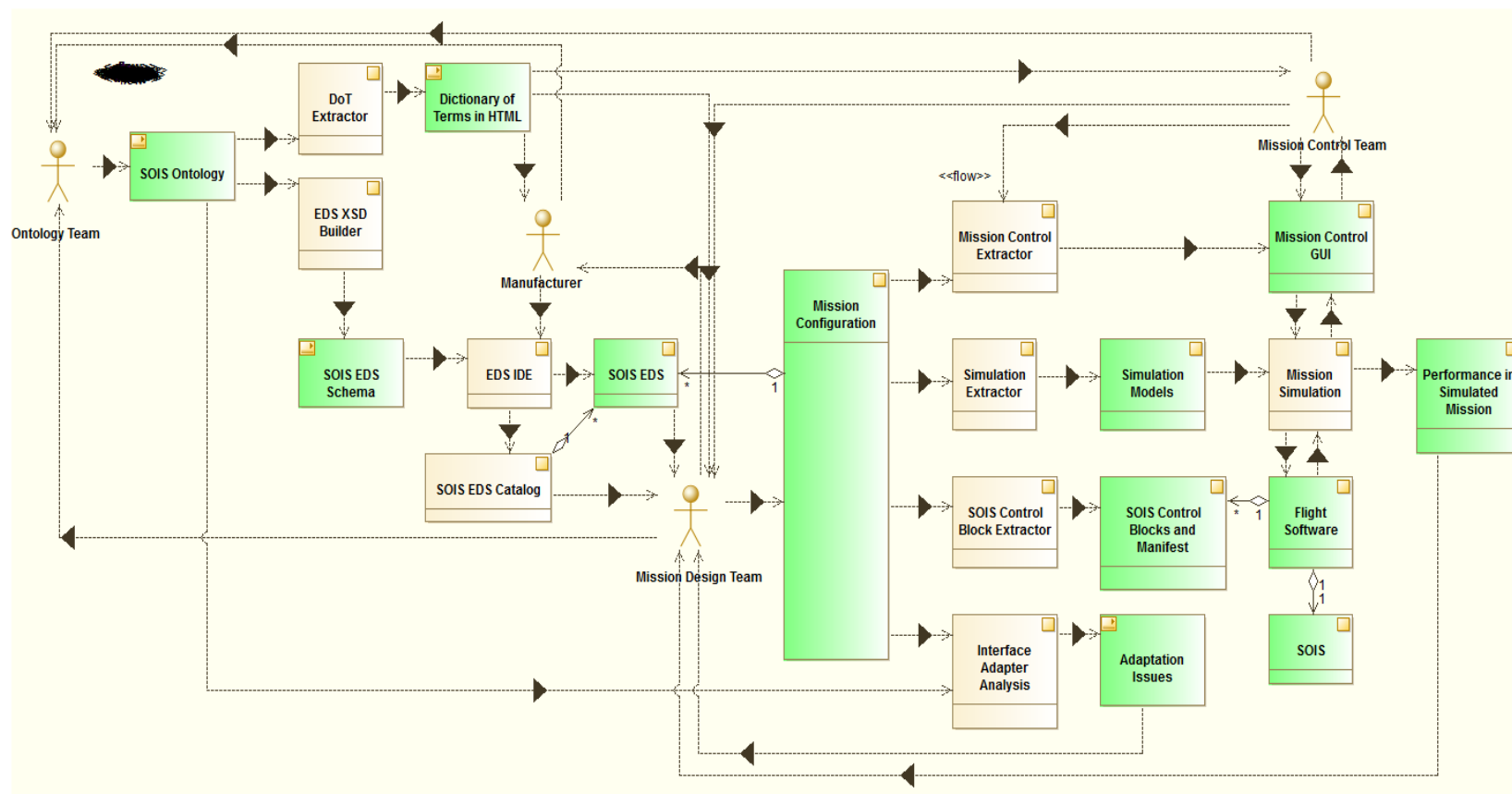- Generation of documentation artefacts

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Figure: CCSDS 870.1-G-0

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SEDS can describe interfaces at various points in a spacecraft system.

Devices/equipments and Data concentrator interfaces of physical devices

Device Handler: Device Access Service, Device Virtualization Service:

SW Bus adapter interface

Figure: CCSDS 876.0-R-2
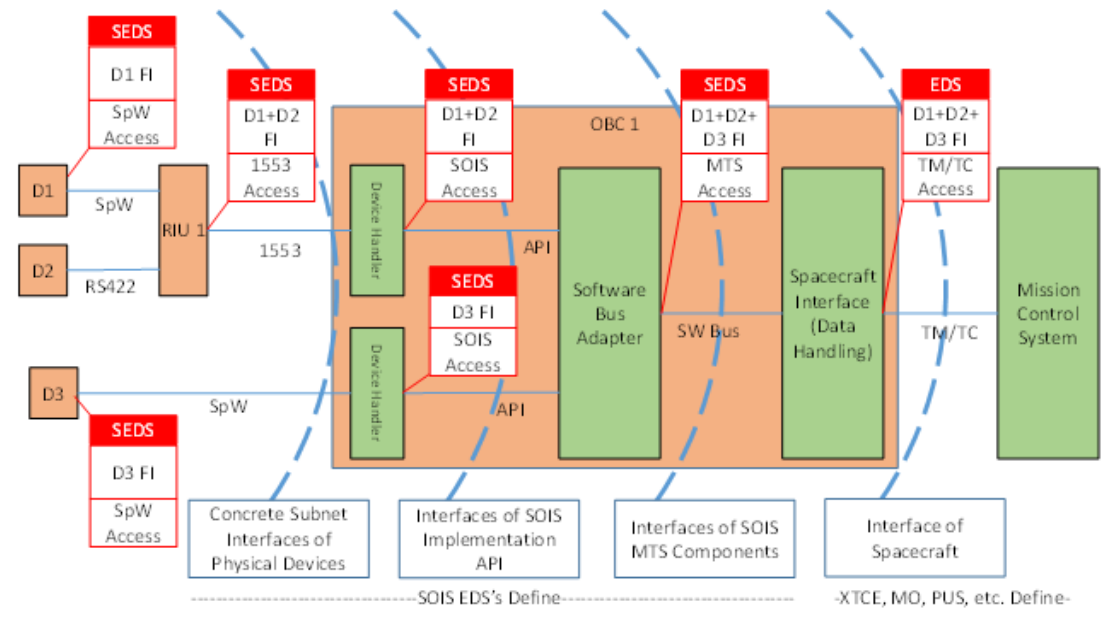
SEDS defined with the context of the overall SOIS architecture

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SEDS is intended to replace the traditional user manuals, specifications, and data sheets that accompany a device and are necessary to determine the operation of the device and how to communicate with it

Operability

SEDS to be machine-understandable mechanism describing onboard components

SEDS to replace todays ICDs and proprietary data sheets

Operability requires standardization

Standardization

CCSDS specification uses free and open standards, W3Cs:

XML – Extensible Markup Language defines set of rules encoding docs which are human and machine-readable

XSD – XML Schema definition, specifies how to formally describe elements in XML

Xinclude – allows construction of data sheets from multiple files

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A full **SEDS** for a device specifies:

- the Device-Specific Functional Interface

- the Device-Specific Access Interface

- the Device Abstraction Control Procedure which maps the virtual device interface onto the physical interface

- the Device-Specific Access Protocol which maps physical device interface onto SOSI subnetwork services as appropriate

- information specifying the use of subnetwork by the device plus constraints

- Ancillary information

❑ A device interface may be composed of multiple interface definitions, some or all may be standardized. Implementing additional interfaces, or by extending standard interfaces, vendor specific functions can be defined without compromising compatibility.

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The structure of EDS

Figure: CCSDS 876.0-R-2
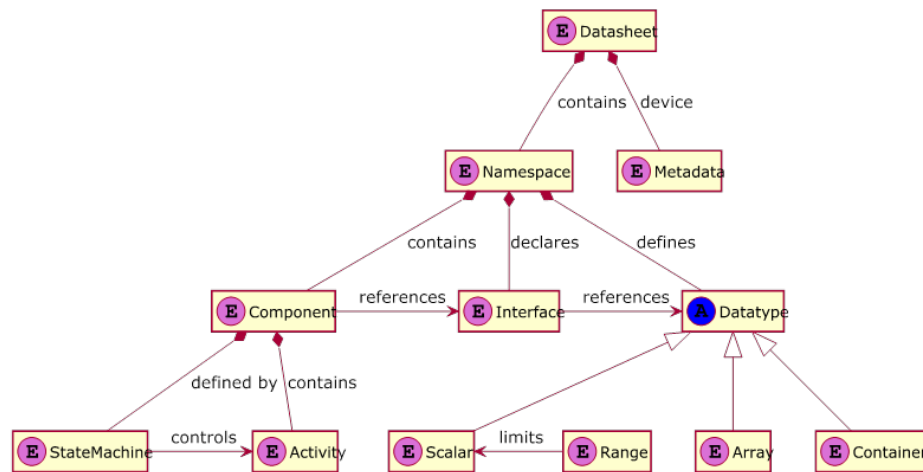
Datasheet (Metadata Namespace)

A complete language for Datatypes

Components can reference interfaces (provided/required)

Components are defined by a set of State machines describing behavior of component.

Components controls execution of a set of activities

Activities e.g. calls, assignments, conditions, calibrations, math operations, send parameters, send commands.

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Ongoing or past Activities

EDS Proof of concept performed, presented in 2014

Verification of Computer Controlled Systems activity – fostering the use of State machines to represent software behavior, exploring code translator tool chain →supporting the EDS specification

Deploying Plug and Play Avionics – exploring EDS for enabling technology "plug and play" avionics → demonstrating the process and tools with supplier provided EDS

EDS extension to SAVOIR Communication Architecture – industrial assessment of the EDS technology and the proposed CCSDS EDS standard.

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Planned Activities:

Automatic generation of HW/SW Integration Test based on EDS → tool support for test generation based on equipment's EDS

EDS Device Simulator → using the electronic data sheets to generate a device interaction layer simulator based on its EDS. Investigate options to use the current SEDS standards for this purpose and propose extensions to support executable device model based on its EDS.

Deployment of EDS – implement and deploy EDS on existing spacecraft equipment

SEDS Toolset upgrade

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CCSDS Working Group activities, currently in review:

EDS Red Books:

      SOIS XML Specification for Electronic Data Sheets (876x0r2)

      SOIS EDS Dictionary of Terms (876x1r2)

Red – a draft CCSDS technical recommendation assessed to be technically mature

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EDS way forward:

Standardization activities continued to be supported

Automation needs toolchain support – use cases to be further developed

Enabling future growth of EDS – toolchains

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