AIAA S-133-7-2013

Standard

Space Plug-and-Play Architecture Standard

Ontology

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Sponsored by

American Institute of Aeronautics and Astronautics

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Abstract

SPA systems use the XML schema in conjunction with extensible transducer electronic data sheets (xTEDS) to convey information about devices to the system. This document provides details on the use of common electronic data sheet schema for plug-and-play systems.

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Foreword

This standard was developed through a partnership of the Air Force Research Laboratory Space Vehicles Directorate, the Air Force Office of Operationally Responsive Space, numerous government contractor teams, independent contractor teams, and academic experts. The Space Plug-and-Play Architecture (SPA) is a collection of standards developed to facilitate rapid constitution of spacecraft systems using modular components. This document includes specifications for the use of a common XML-based schema for conveying information about components to the system. The intent of this document is to allow SPA designers and manufacturers to provide components and/or subsystems that successfully interface with SPA-enabled spacecraft.

This particular volume of the SPA Ontology Standard contains information not recorded in previous documentation. It is part of a set of 10 documents describing other components of the standard:

- SPA Guidebook
- SPA Networking Standard
- SPA Logical Interface
- SPA Physical Interface Standard
- SPA 28V Power Service Standard
- SPA System Timing Standard
- SPA Test Bypass Standard
- SPA SpaceWire Subnet Adaptation Standard
- SPA System Capability Guide

At the time of approval, the members of the AIAA SPA Committee on Standards were:

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The above consensus body approved this document in June 2013.

The AIAA Standards Executive Council (VP-Standards, Laura McGill, Chairperson) accepted the document for publication in August 2013.

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Introduction

The enabling mechanism for achieving plug-and-play (PnP) capability in SPA systems is the extensible Transducer Electronic Data Sheet (xTEDS). Every hardware device or software application used within a SPA system must have an associated self-describing electronic data sheet that fully explains the component (device or application) to other components in the system. The xTEDS contains descriptions of all component-specific commands accepted, variables produced, and data messages that can be delivered by the component. It fully describes the services or data provided by the component and represents the complete protocol for accessing these services or data.

The xTEDS uses the eXtensible Markup Language (XML) to provide a schema-controlled language for the data sheet.

A common set of terms shared by all SPA applications allows for the creation of xTEDS that can be understood and accessed by components throughout a SPA system. Descriptions of data products within data messages are constructed from a SPA Common Data Dictionary (CDD) of standard terms. Terms used in the CDD must be easily recognized by the system developers, unique for each variable type, and nonduplicating.

The use of an XML Parser and Validator software tool validates the SPA xTEDS against the xTEDS schema. It also tests the xTEDS against the CDD to ensure only registered terms are used.

1 Scope

Two functions are critical in defining an ontology: Naming conventions and relationships between the names. The naming conventions have been selected to cover the complete domain of data elements and characteristics to be addressed by the SPA ontology. A mechanism for expressing the terms relationally, a taxonomy, has also been defined so that the naming is unambiguous and terms cannot be mistakenly used out of context. Specifically, the taxonomy subdivides the problem space into increasingly specialized classes, relationally assigning logical names to precisely defined relational paths within the taxonomy. The SPA Ontology is organized into a set of relational taxonomies to assign names to data and define properties.

This standard establishes the electronic data sheet for SPA for application in the space environment. It establishes the form of a common data dictionary and provides an exemplar.

This standard is applicable to spacecraft with a rapid integration requirement. Guidance on preparing a SPA-compliant xTEDS is the subject of this standard.

2 Applicable Documents

The following documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

AIAA S-133-3-2013	*Space Plug-and-Play Architecture Standard Logical Interface*
AIAA S-133-2-2013	*Space Plug-and-Play Architecture Standard Networking*
AIAA G-133-1-2013	*Space Plug-and-Play Architecture Guidebook*
W3C XML Schema	World-Wide Web Consortium-recommended XML Schema, version 1.0, May 2001

3 Vocabulary

3.1 Acronyms and Abbreviated Terms

AIAA	American Institute of Aeronautics and Astronautics
CDD	Common Data Dictionary
PSVI	Post Schema Validation Infoset
SPA	Space Plug-and-Play Architecture
XML	extensible markup language
XSD	XML schema definition
xTEDS	extensible transducer electronic data sheet