AIAA S-133-9-2013

Standard

Space Plug-and-Play Architecture Standard

SpaceWire Subnet Adaptation

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Sponsored by

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Abstract

This document specifies the means by which the SPA features of networked component registration, and message routing to endpoints on a SpaceWire network are facilitated. Accomplishing this requires low-level messaging on the SpaceWire network to provide the “convergence functions” to allow the common SPA messages to be transported. This document does not discuss physical details of SpaceWire related to signal levels, harnessing, and so forth. Those Specifications are expressed in the SpaceWire standard document ECSS-E-50-12C.

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Foreword

This document was developed by the Space Plug-and-Play Architecture (SPA) Standards Working Group as one of a series describing the various components of the standard. The SPA standards were recorded in earlier documentation. This document set separates content along logical boundaries to better organize the volumes (so that developers or domain experts need only reference the documents applicable to their needs) and to avoid duplication of content between documents in the standard series. This 2013 AIAA standard supersedes all previous documentation of the SPA standards.

This particular volume of the SPA SpaceWire (SPA-S) Subnet Adaptation 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 Standard
- SPA Physical Interface Standard
- SPA 28V Power Service Standard
- SPA System Timing Standard
- SPA Ontology Standard
- SPA Test Bypass Standard
- SPA System Capability Guide

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

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Scott Cannon	Utah State University
Ken Center	PnP Innovations
Don Fronterhouse*	PnP Innovations
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The above consensus body approved this document in August 2012.

The AIAA Standards Executive Council (VP-Standards, Laura McGill, Chairperson) accepted the document for publication in November 2012.

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Introduction

Space Plug-and-Play Architecture (SPA) embraces and implements a collection of standards designed to facilitate rapid constitution of spacecraft systems using modular components.

The data portion of the standard is based on a data-centric model in which components self-describe their interfaces when they register with the system. This self-description is facilitated by an XML byte string called an extensible transducer electronic data sheet (xTEDS). The xTEDS defines the identity of the component, and the organization of its data interfaces.

SPA is a networked data exchange model. One of the premises of SPA is that there is no distinction between a hardware device that supports a data interface and a software application that does the same—thus all endpoints in a SPA network, physical or virtual, are referred to as “components”.

Other components may use queries to express their data consumption needs. These queries are based on the specification of data “kind” with “qualifiers” that provide additional context to focus the search. When matches are found, the consumer may subscribe to messages of providers that meet their search criteria. As such, SPA systems dynamically bind their data at runtime.

1 Scope

This document specifies the means by which the SPA features of networked component registration and message routing to endpoints on a SpaceWire network are facilitated. Accomplishing this requires low-level messaging on the SpaceWire network to provide the “convergence functions” to allow the common SPA messages to be transported.

This document does not discuss physical details of SpaceWire related to signal levels, harnessing, and so forth. Those specifications are expressed in the SpaceWire standard document ECSS-E-ST-50-12C.

The role of a SPA subnet manager (SM-x) implemented for any transport protocol is to abstract the peculiarities of the subnetwork away, so that SPA core components and clients of those components need not know specific details to target components in the subnet for communication. To date, SPA common messaging has been bridged to several transport flavors, including USB, SpaceWire, and I2C. Research is in progress to develop the standard for optical transport as well.

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.

ECSS-E-ST-50-12C	SpaceWire – Links, nodes, routers and networks
AIAA S-133-2-2013	*Space Plug-and-Play Architecture Standard Networking*