Space Plug-and-Play Architecture (SPA) and SpaceWire

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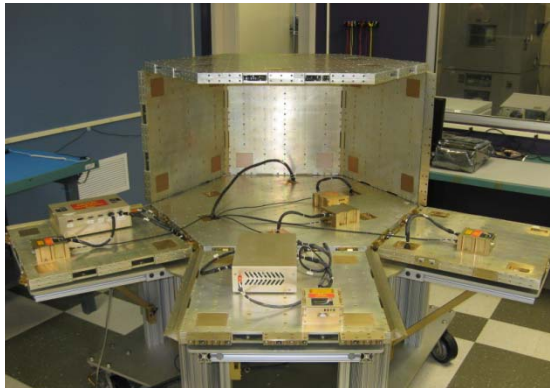
SPA Development

SPA was developed for many of the reasons that SpaceWire was created:

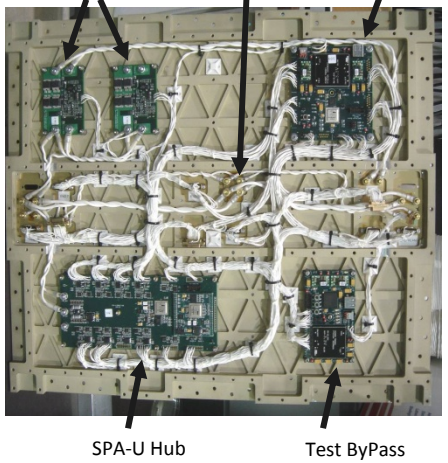
- Increase compatibility of components and systems
- Reduce the amount of non-recurring engineering required
- Decrease overall design, build, integration, and test time

In SPA, this is done through the use of
- standard interfaces for hardware and software components
- self-identification of components and component functions
- standard messaging protocols

SPA interface chip – ASIM
(Appliqué Sensor Interface Manager)



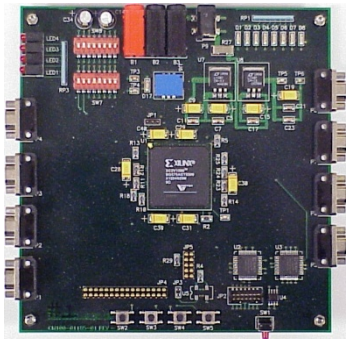
A SPA satellite under construction



Interior of a SPA structural panel

SPA and SpaceWire

The majority of SPA demonstration systems have incorporated SpaceWire. The SPA development group is interested in coordinating standards development efforts to resolve any conflicts and maximize the benefit of all standards by making the complimentary where possible.



SpaceWire router for SPA-S

- We are currently looking to develop a standard registration and network mapping process for SPA and SpaceWire in general.

- **We would also like to request a protocol ID for the SPA protocol running on SpaceWire**

SPA and SpaceWire

Based on a review of current SPA practices and the *SpaceWire PnP* proposal by the University of Dundee the SPA development group will adopt the approach for network discovery and mapping outlined in the University of Dundee's paper.

We would like to recommend that the SpaceWire Committee consider adopting the following practices from the proposal:

NETWORK DISCOVERY& NETWORK MAPPING

- Router interrogation Response
- Number of ports on the router
- Which ports are in the Run state
- Router port number for the interrogation response (which router port number the request arrived on)

Additionally, the nice-to-have features would include additional network configuration features, such as setting individual link speeds.

NETWORK CONFIGURATION

- Ability to determine supported link speeds
- Ability to program link speeds

SPA Concepts

The SPA standards (now in draft) are based on the following services:

Component detection - A SPA system automatically detects hardware or software components that are added to the system.

Components provide ICD – SPA components provide information about their functions and use to the system. This may be done directly or the device may provide a pointer to information stored elsewhere.

Components register – SPA components register with the network, informing the system as to the data the component produces, and (as an option) the data that it will consume.

Reconcile resource dependencies - Components will subscribe to other available data sources as needed.

Publish/subscribe messages – SPA components publish data through messages. SPA components can subscribe to data messages as needed.

Component detects dependency failure - SPA components detect or are notified when a component that they are subscribed to is unable to provide the data requested.

System detects component failure – A SPA system detects component failures.

System provides common time to component – A SPA system must provide common time to the system components.

Standard mechanical and electrical interfaces – SPA systems provide standard mechanical and electrical interfaces for hardware components.