Review Feedback: SpaceWire-PnP Protocol Specification, Draft A Issue 2.1.

[This document attempts to capture feedback given on the SpaceWire-PnP Draft Protocol Specification at the 15th SpaceWire Working Group Meeting (20th October 2010). The review comments have been captured, as closely as possible, from slides or comments made during the meeting. In some cases I have added further information about the comment to provide extra background or explanation. It was not my intention to answer the comments or state my own opinion in any way – PDM.]

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No.	Section	Description
1.	3.2.4	Network Size • 2Mbps link speed is expected for deep space applications • Millisecond order of response time might have to be allowed for wide range of applications. *The maximum network size is defined to permit the definition of a timeout value when waiting for replies from a target. This is necessary during network discovery, to detect a node without plug-and-play capability, and during normal operation, for fault detection. In order to determine a maximum response time from a network size, a minimum link speed must be assumed, and the protocol specification chooses 10Mbps. This is clearly not sufficient for some applications and this response time should be revisited.*
2.	3.5.1	Device Identification • Character code for large character set should be used as option. • Many characters are unified in UTF-8 regardless of the meaning of each character. • (ex.) TRON character set has 1.5 million code space and 180 thousand codes have already been used, and it is impossible to convert all code into UTF-8. *The protocol specification permits a device to contain human-readable strings to allow description of the vendor and device. These are mainly intended for lab equipment but could be used in any device. UTF-8 was chosen as it supports Unicode characters and is backwards compatible with ASCII. UTF-8 makes many simplifications and attempts to unify characters with some similarities, such as those from some Chinese and Japanese alphabets, but which can have very different meanings. The use of UTF-8 is therefore inadequate. It is proposed to have a field indicating the character set in use so that the most appropriate character set may be selected for a given device.*
3.	3.5.4	Router Configuration • The primitive operation set for watchdog timer had better be

		defined, and the operation set for SpW-10X is useful to show an example. *The protocol specification aims to reflect the features of devices specified by the SpaceWire standard, plus a few other features commonly implemented or considered good practice. A router watchdog timeout is permitted as this is good practice and is expected to appear in the forthcoming revision of the SpaceWire standard. The watchdog feature found in the SpW-10X device is an example of this feature. However, the current standard does not describe the operation of a router watchdog, and nor does the SpaceWire-PnP protocol specification in any normative section. The document does describe the operation of the watchdog in an informative section (3.5.4) but in terms of specified behaviour this leaves the expected operation of this feature undefined.* *This feature is especially important should loss of FCTs occur. Please see presentation made by H. Hihara to the 13th SpaceWire Working Group.*
4.	5.2.2.5.2	Capability Records Field • An example of "transported" is expected *The protocol specification permits a device to describe its capabilities in terms of the SpaceWire protocols it supports. To permit layering and/or extended information, these capabilities use the concept of one protocol "transporting" another. Section 5.2.2.5.2 (a normative section) does not define this concept properly. The concept of "transporting" is explained in an informative section (3.5.1) but the description is short and not sufficient.*
5.	-	Service Primitive Parameter Descriptions • Are additional error code supported in indications applicable for RMAP protocol itself? *The service interface specifies error conditions to be indicated to the user. It is not clear if these error conditions are purely for conveying over the service interface, or if they are to be contained in the status field of the underlying RMAP packets.*
6.	5.3.5.9	NMS_DISCOVER_NETWORK.request • Breadth-first algorithm is specified as standard for network discovery? *The protocol specification states that a breadth-first algorithm shall be used for network discovery as research has shown that in most network topologies it results in less network traffic. However, in some network topologies this will not be true and there does not seem to be any technical requirement for the specification of a breadth-first search.*

7.	5.4.2.2.3	Reference Rate Field • How can users find out whether a rate is supported or not supported? *The reference rate field forms part of the abstract model for the control of link rate. The field can be set to any value and will assume the nearest supported value if the selected value is not supported by the hardware. However, without trying all possible values there is no way to find out the rates supported by the device.*
8.	5.5.2.1.1	Watchdog Timeout Field • The definition for "immediate" should be defined. • How can user use maximum timeout value 0xFFFFFFFF as real number? *The watchdog timeout field allows the period of the routing watchdog timer to be specified. The specification uses the term "immediate" which is ill-defined in terms of behaviour. The specification also reserves the value 0xFFFFFFFF (the maximum value) to represent infinity. This does not permit the use of 0xFFFFFFFF to represent a real value.*
9.	5.5.2.1.3	Time-Code Counters Field • Is optional number of time-code not required? *The time-code counters field provides access to the current time-code counter value for four different "channels", interpreting the top two bits of the time-code as a channel indication. At the time the document was written this was one possible interpretation of the SpaceWire standard. If this interpretation is used then channels other than zero may not be optional.*
10.	5.5.5.18	RCS_READ_ROUTING_TABLE_ENTRY.indication • An explanation of "Spill_If_Not_Ready" and its necessity is expected. *Spill if not ready, as defined in 5.5.2.2.3, is not strictly part of the SpaceWire standard and, as such, it is not clear why it should be included in SpaceWire-PnP. No reasoning is given.*
11.	7.3.4.11	SRC_READ_INITIATOR_CONFIG.indication • An explanation for "Lease_Timeout" is expected *Although the lease timeout is defined in 7.3.1.2.7, its purpose is not clear and is not discussed anywhere.*
12.	3.2.3	It would be useful to show a permitted network topology in addition to not-permitted network topologies.
13.	3.3.2	The definitions for level 1 and level 2 networks are not clear.
14.	7.0	Is it possible to show the following items as capabilities included in the capability list for legacy interface used through a SpaceWire protocol

		bridge? • Pulse command generation • Serial command generation • Active bi-level telemetry attribute • Passive bi-level telemetry attribute • Analogue telemetry attribute
15.	7.0	What is the recommended way to show that the interface has a specific interface capability? • E.g. A telemetry and telecommand interface capability for legacy satellite applications as presented on the final slide

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No.	Section	Description
1.	All	All features required for routers as specified in the SpW standard are supported by various PnP services. In addition some features not in the standard that have been determined as very useful have been included in PnP. They are optional. Both above categories of services suffer from one main problem: the way and to what extent they are implemented is not dictated by a standard. Thus there will always be a potential problem with some parts of a feature being covered by PnP but still requiring a custom control protocol for full utilisation. *SpaceWire-PnP defines that all non-essential functions are optional. In addition, SpaceWire-PnP defines mandatory and optional parameters. These two things are not consistent. Furthermore, where a function is supported by SpaceWire-PnP, but the implementation is more fully featured, it is not clear how the extra functionality should be exposed and how this is to be kept consistent with the SpaceWire-PnP parameters.*
2.	5.4.2.3.4	The Time-Code enable field is link specific and enables transmission. The AG router currently has a bit affecting both reception and transmission. It also has additional features such as control flag filtering. *How can these extra features be reconciled with SpaceWire-PnP?*
3.	5.5.2.1.1	From the specification: "The Watchdog Timeout field shall contain the current value of the non-blocking protection watchdog timer. This shall be a 32-bit value (where bit 0 is the least significant). A value of zero shall indicate immediate timeout; a value of 0xFFFFFFFF shall indicate an infinite timeout (watchdog timeout disabled). All other values shall indicate the period of the watchdog timeout in microseconds."

		The AG router has a global prescaler which generates ticks used by individual counters for each port. This can clearly not be controlled completely through the current PnP services again requiring another means of control. *Again, how can this feature be reconciled with SpaceWire-PnP?*
4.	5.4.2.3.2	The standard specifies credit errors while in PnP there are both receive credit error and transmit credit error bits. If a core does not distinguish between them there should be a separate credit error bit. Mapping it to either of the existing ones can potentially be problematic.
5.	5.4.2.3.2	The AG router has three different port types as shown in the feature list; the Atmel/Dundee 10x has two. PnP distinguish between SpaceWire links and external ports using one bit mainly to show whether link configuration features are available. However, there can potentially be more port types in new routers. One approach is to have one bit determine whether that port should be followed for network discovery and one bit for determining if the SpaceWire link configuration service can be used for it. If configuration is needed for the other port types separate drivers would be needed.

SUAI

[These issues are extracted from questions sent to me. The questions that merely required clarification are not included here. Those that raise potential issues in SpaceWire-PnP I have paraphrased as issue descriptions. With the permission of SUAI, I could provide the original questions together with my responses – PDM.]

No.	Section	Description
1.	3.2.4	The network size restrictions seem overly restrictive.
2.	5.5.2.1.1	SpaceWire-PnP specifies a watchdog timer for routers. What if the device does not support timers?
3.	5.5.2.2	SpaceWire-PnP specifies for a router that "the supported range [of logical addresses] must be contiguous starting from the lowest permissible address, which is 32 for local addresses". Why does the device need to support as continuous set of addresses?