**Detailed RID comments for CCSDS 734.2-R-3**

1. RID

ESA-FF-01

Change made in document

1. RID

ESA-FF-02

Change made in spreadsheet

1. RID

ESA-FF-03

Concur but will not change, discussion in spreadsheet

1. RIDs

ESA-GPC-01

ESA-GPC-02

**1.5 REFERENCES (page 1-6)**

[11] *Encapsulation Service*. Issue 2. Recommendation for Space Data System Standards (Blue

Book), CCSDS 133.1-B-2. Washington, D.C.: CCSDS, October 2009.

**2 OVERVIEW**

**2.1 GENERAL (page 2-1)**

The Bundle Protocol uses the ‘native’ local protocols for communications within a given network. The interface between the Bundle Protocol and a specific lower-layer protocol suite is known as a convergence layer. Figure 2-1 shows an example configuration in which the Bundle Protocol and a convergence layer (CL A) running above a transport protocol (intended to be interpreted in the context of the Internet stack) on the left, and running directly over a Data Link Layer on the right. The ‘CL B’ on the right could, for example, be the interface to the Licklider Transmission Protocol with the ‘Link B1’ representing LTP, the CCSDS Encapsulation Service (reference [**~~H2~~11**]) and underlying CCSDS Data Link Layer protocols. Alternatively BP could be used to connect together two internets that may exist, such as an onorbit (or lunar) network and a ground network.

**ANNEX B (page B-3)**

**B5 CCSDS ENCAPSULATION SERVICE CONVERGENCE LAYER ADAPTER—**

**ENCAPSULATION OF BUNDLES VIA THE CCSDS ENCAPSULATION**

**SERVICE**

When sending/receiving bundles using the CCSDS Encapsulation Service (reference [**~~H2~~11**]) at the convergence layer, bundles shall be encapsulated via the Encapsulation Service specified in the SANA Protocol Identifier for Encapsulation Service Registry (reference [5]) as follows:

**ANNEX E (page E-1)**

**E1.2 INTRODUCTION**

A core principle of the design of the Internet architecture is the ‘End to End Argument’ first articulated by Salzer, Reed, and Clark in 1981 (reference [H2~~3~~]). The Argument, in essence, is that functionality required by the applications at the endpoints of a data exchange should normally be provided by mechanisms implemented at those endpoints rather than at intermediate points in the end-to-end path. This is not only because it is inefficient to impose the costs of those mechanisms on all applications (by requiring that shared intermediate nodes support them) when only a subset benefit from them, but also because no standard infrastructural mechanisms can be guaranteed to offer all required levels of performance to all imaginable applications, so the mechanisms will in some cases need to be implemented at the endpoints anyway.

**ANNEX H (page H-1)**

**INFORMATIVE REFERENCES**

**(INFORMATIVE)**

[H1] *Rationale, Scenarios, and Requirements for DTN in Space*. Issue 1. Report Concerning

Space Data System Standards (Green Book), CCSDS 734.0-G-1. Washington, D.C.:

CCSDS, August 2010.

~~[H2]~~ *~~Encapsulation Service~~*~~. Issue 2. Recommendation for Space Data System Standards (Blue~~

~~Book), CCSDS 133.1-B-2. Washington, D.C.: CCSDS, October 2009.~~

[H2~~3~~] J.H. Saltzer, D.P. Reed, and D.D. Clark. “End-to-End Arguments in System Design.” In

*Proceedings of the 2nd International Conference on Distributed Computing Systems*

*(April 8-10, 1981, Paris, France)*. 509-512. Los Alamitos, CA, USA: IEEE Computer

Society, 1981.

[H3~~4~~] *Organization and Processes for the Consultative Committee for Space Data Systems*.

Issue 3. CCSDS Record (Yellow Book), CCSDS A02.1-Y-3. Washington, D.C.:

CCSDS, July 2011.

1. RID

JAXA-PRA1416-01

**1.3 ORGANIZATION OF THIS RECOMMENDED STANDARD (page 1-2)**

– Annex B contains the Convergence Layer Adapters (CLA).

**5.2 UNDERLYING COMMUNICATION SERVICE REQUIREMENTS**

**5.2.2** Each convergence layer ~~protocol~~ adapter is expected to provide the following services to the BP agent:

**C2 ECOS BLOCK FORMAT (page C-3)**

NOTE – The significance of the flow label is an implementation matter. Notionally, the flow label is intended to be used to convey quality-of-service information to the convergence layer ~~protocol~~ adapter.

1. RIDs

JAXA-PRA1416-02

Change made in document

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**RID NASA-01 Statement**

There are numerous know problems with RFC5050. Many are documented in the paper "Bundle of Problems". These and others were recently presented here by Scott Burleigh, author of the Bundle Protocol: http://www.ietf.org/proceedings/90/slides/slides-90-dtnwg-5.pdf. The two biggest however are: 1) there is no way to terminate routing loops except with bundle expiration time. This is very very serious. In fact, depending on how the protocol is implemented, one may not enter the bundle expiration check route before forwarding. So that may not even terminate a routing loop. 2) The system requires loose time synchronization. If a system loses clock, it may not be able to send or receive bundles as from the future or from the past. There is nothing in the documentation RFC 5050 or other that indicates what a bundle agent is to do with such bundles. One assumption is to silently drop as these could be DOS attacks.

**Response** – Each item iterated here is true. It is anticipated however that DTN will support space missions or systems that are communication-resource poor and are subject to long latencies and/or temporary network partitions typical of the type of system constrained by physics and geometry, regardless of complexity. This specification exists to utilize the underlying service of various internetworking protocols both onboard and in transit between ground and space-based assets. As such this Standard is intended to be applied to all systems that claim conformance.

This standard represents an initial issuance and embodies in it the capabilities inherent with DTN capabilities. Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document will occur and the addition of new capabilities will be included. The two areas in the RID statement are viewed as limitations that are applicable to the use and deployment of the capability much as UDP or TCP has limitation for their uses. It is also recognize that a great deal of work is being done across IETF and space community (to include NASA) to expand the applicability of DTN across a wider range of applicability.

These specific issues have been recognized as limitation on the problem space which will not inhibit early adopters from reaping benefits. Specifically item 1 relates to routing loops. This is a problem *even in non-DTN* environments and after 40 years, solutions have been devised that do not rely on TTL. However this has not inhibited robust creation of the internet. At the DTN level, current implementation do allow for the ability beyond TTL to limit routing loops through the use of such mechanisms as an External Router” in DTN2. Item 2 relates to the loss of time synchronization of a node in the DTN system. Such a node under this standard would be considered a failed node and subject to remediation. A second and implied condition is with a node having only relative time. This is beyond the scope of this standard but is anticipated to be addressed at a later date.

**RID NASA-02 Statement**

RFC5050 states that extension blocks are optional and can be ignored. This document defines some extension blocks but it is unclear whether the CCSDS Bundle Protocol Specification requires such implementation. One would expect that these extension blocks MUST be implemented in any CCSDS Bundle Protocol implementation. Failure to make these a MUST will lead to interoperability problems and render the recommended extensions useless.

**Response –** This standard addresses the use of extension blocks as define in RFC 5050 section 4.6. In Appendix A.6 under basic requirements is a mandatory requirement to fulfill section 4.6 requirements as to the handling of extension blocks. For a router that receives a bundle which and extension block is undefined, the router will do no processing based on the extension block and forward the bundle to the next BP node with the "Block was forwarded without being processed" flag set. Intermediate nodes need not comply with extension block processing but it is incumbent that the source and destination nodes comply.

|  |  |  |  |
| --- | --- | --- | --- |
| bpExtnBlk Implementation | supports extension  blocks | RFC 5050: section 4.6 | <bpBundle>::M |

**RID NASA-03 Statement**

The wording in this section is very confusing. The document references the bundle security protocol RFC6257 but does not state where or not use of RFC6257 is required. This appears to be intentionally wishy washy.

**Response –** Correct, it is wishy washy and was intentionally created that way since BSP is inoperable, is being refactored and other methods will probably be used in the interim. The basic block definitions will probably remain (though possibly renamed). CCSDS members are engaged in the effort and updates will be applied as available.