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A New Solution to PDR 98060006

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SUMMARY

At the Utrecht meeting of ATNP/WG2, PDR 98060006 was considered and Flimsy #3 drawn up as the preferred solution. However, a second Flimsy – Flimsy #2 – was also prepared that outlined an alternative solution that was part of a more general mechanism for introducing new capabilities in a backwards compatible manner. The Flimsy #3 solution was preferred at the meeting and documented in detail because it implied the smallest change to the ATN Internet SARPs.

Since the meeting both flimsies have been considered by implementers and States. The opinion has been expressed that both solutions have a similar implementation cost and thus that Flimsy #2 should be preferred. This paper reviews Flimsies #2 and #3 from the Utrecht ATNP/WG2 meeting, and proposes a change to the proposed resolution of PDR 98060006.

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1.   Introduction

1.1   Background

At the Utrecht meeting of ATNP/WG2, PDR 98060006 was considered and Flimsy #3 drawn up as the preferred solution. However, a second Flimsy – Flimsy #2 – was also prepared that outlined an alternative solution that was part of a more general mechanism for introducing new capabilities in a backwards compatible manner. The Flimsy #3 solution was preferred at the meeting and documented in detail because it implied the smallest change to the ATN Internet SARPs.

Since the meeting both flimsies have been considered by implementers and States. The opinion has been expressed that both solutions have a similar implementation cost and thus the long term solution should be preferred. Furthermore, the Flimsy #2 approach, it is believed, can be used to eliminate the transfer of IDRP Update BISPDUs when air/ground subnetwork connectivity changes and multiple data links are active. This will give a bandwidth saving and avoid another problem that has been identified in areas of (e.g.) poor VDL coverage, when an aircraft may be going in an out of coverage and, as a result, generating an IDRP Update over another subnetwork (e.g. AMSS) contributing to poor performance on that data link.

It is thus proposed that ATNP/WG2 re-visit this issue and this flimsy has been prepared as input to such a discussion.

1.2   Scope

This paper reviews Flimsies #2 and #3 from the Utrecht ATNP/WG2 meeting, and proposes a change to the proposed resolution of PDR 98060006.

1.3   Purpose of Document

This document has been prepared as input to the Bordeaux meeting of ATNP/WG2.

2.   Review of Utrecht Flimsies #2 and #3

2.1   Flimsy #3

This is a detailed change proposal providing marked-up SARPs text. The proposal aims to solve the problem: how can an Air/Ground Router inform an Airborne Router of the ATSC Class of an air/ground subnetwork interconnecting them.

This is solved by making use of three unused bits in the security tag added to a route to record its passage over an air/ground data link of a given type and any restrictions on the type of traffic that may pass over that data link. These three bits are used to record the ATSC Class of that Air/Ground data link. There being eight such classes, the three available bits are just sufficient.

This procedure works because the ATN Internet SARPs require an Air/Ground Router to uplink an IDRP Update PDU every time a new data link is established between an Air/Ground Router and a given Airborne Router. Indeed, this requirement was added in an earlier attempt to achieve the same objective, which was later found to be insufficient.

The proposal appears to fix the problem and has a limited impact on the SARPs. However, it was also recognised to be limited in future development with no scope to increase the

number of ATSC Classes. Furthermore, it also impacted Ground/Ground Routers and may cause problems with existing Routers which expect these bits to always be set to their reserved values.

2.2 Flimsy #2

This flimsy was really intended to describe a mechanism for adding new capabilities to ATN Routers in a backwards compatible manner. The proposal exploits the ISO/IEC 9542 specification that requires receivers to ignore unrecognised options fields in ISH PDUs but to otherwise correctly process the remaining fields. New custom fields can thus be added to this PDU.

The ISH PDU is only ever sent in the context of a single subnetwork between the systems directly connected to that subnetwork. In particular, ATN Routers will always exchange ISH PDUs as part of the Route Initiation procedures for air/ground data links, and before any other protocol messages are exchanged. This gives the opportunity to define new ISH PDU options fields that can be used to declare new subnetwork and system capabilities without destabilising existing systems. Flimsy #2 gave an example that showed how this feature could be used to determine the IDRP authentication class supported by each BIS and thus to agree on the appropriate and otherwise non-negotiable authentication class before BISPDUs are exchanged. Another example showed how an Air/Ground Router could identify the ATSC Class assigned to the subnetwork over which the ISH PDU was sent and hence for the Airborne Router to be able to identify the ATSC Class of a subnetwork during Route Initiation.

3. Scope of Changes

In order to implement the Flimsy #2 proposal in respect of the advertisement of the ATSC Class of an air/ground data link, the following SARPs changes will be necessary:

	Section	Change
1.	5.8.2	a) A new options parameter to be defined for use with the ISH PDU. This options parameter to convey the ATSC Class of the subnetwork over which the ISH PDU is transferred, and any restrictions on traffic types permitted to pass over the subnetwork.
		b) A new Router capabilities parameter to be added which can be used to declare Router capabilities as a bitstring. The only capability so far defined is the ability to receive information on ATSC class and Traffic Type Restrictions as an ISH PDU options parameter. Routers only process the capabilities bits they understand and ignore the rest.
2.	5.3.5.2.6	c) New requirement on Air/Ground Router to include the ATSC Class options parameter in each ISH PDU that it sends over an air/ground data link, identifying the ATSC class of that data link
		d) New Requirement on Airborne Router to recognise this new options parameter when present and to update its local configuration data to record the actual ATSC Class of the data link as identified by the Air/Ground Router.
3.	5.3.5.2.10.5	This requirement may be modified so that the procedure is not performed if the Airborne Router is able to receive information on ATSC Class, etc as an ISH PDU Options

parameter.

4. 5.8.3.2.4.1.1.(a) The requirement on an Air/Ground Router to advertise Traffic Type restrictions to an Airborne Router as security path attributes is not longer needed when the Airborne Router receives this information on the ISH PDU. The requirement should be modified to effectively delete the "either advertised or" clause when the Airborne Router is able to receive Traffic Type information on the ISH PDU.

4. Recommendations

Working Group Two is requested to reconsider the proposed solution to PDR 98060006 and is recommended to:

1. Reject the originally agreed proposal in Utrecht Flimsy #3 in favour of a solution based on Utrecht Flimsy #2

2. Develop a detailed change proposal based on section 3 of this paper.

<div style="text-align: right;">
Flimsy #2
30 June 1998
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A New Solution to PDR 98060006

1. Introduction

At the Utrecht meeting of WG2, two instances were identified where there was a need to provide for information on capabilities of air/ground data links or of the Routers attached to them. Moreover, it was clear that in the future, as new features were added, there needed to be a framework for extending the SARPs and for allowing for the inter-working of ATN Systems of different vintages. This flimsy proposes such a framework using backwards compatible extensions to the ISH PDU, and uses this framework to solve the existing problems.

2. Current Need to Provide Information on Capabilities

PDR Reference 9806006 reports a problem with the uplink of ATSC Class information. The intended SARPs mechanism only works when there is a single data link supporting the adjacency or when the ATSC Classes supported by multiple data links are identical. When an air/ground adjacency is supported by multiple subnetworks with different ATSC Class assignments, then the Airborne Router has to use *a priori* knowledge to identify the appropriate ATSC Class assignment for each subnetwork. A subnetwork specific mechanism is needed to enable the assigned ATSC Class of an air/ground subnetwork to be reported to an Airborne Router by the Air/Ground Router, if the need to maintain *a priori* information is to be avoided.

WG2/WP450 scopes the work for extending authentication in IDRP to type 2 authentication. However, it leaves outstanding how type 2 authentication compliant Routers interoperate with older type 1 compliant Routers - there being no IDRP mechanism to negotiate the authentication type. It was also proposed in the meeting that it would be desirable to have an optional capability to supply the sender's "Certificate" as an Authentication Data component in the OPEN BISPDU; this was recognised to be the only mechanism by which an Airborne Router could access the certificate of an Air/Ground Router without having to carry an extensive database of Air/Ground Router certificates.

3. Proposed Framework for Reporting Router and Subnetwork Capabilities

When Routers are interconnected over fixed data links, the capabilities of both the data link and the Routers may be configured into both Routers, and referenced when establishing an IDRP adjacency and when applying routing policy decisions. However, when a mobile data link is used, the large numbers of Routers that may be interconnected makes configuring in and managing such information an impracticable long term strategy for the ATN. It will be desirable for there to be a general purpose mechanism for Routers to signal their capabilities to each other over mobile data links, and for Air/Ground Routers to signal mobile subnetwork capabilities to Airborne Routers.

The current SARPs already specify the exchange of ISO/IEC 9542 ISH PDUs when a subnetwork connection is first established. This enables the Routers to identify each other (and hence determine whether they already have an adjacency over another data link), and to determine if the Airborne Router supports IDRP; the SARPs specify an addressing

convention when reporting the Airborne Router's NET in its ISH PDU, in order to signal the optional non-use of IDRP. The ISH PDU exchange precedes the exchange of IDRP OPEN BISPDUs and is sent explicitly on a per subnetwork basis. It is thus suitable for exchanging other Router and subnetwork capabilities.

However, extending the addressing convention to signal other capabilities, is not thought to be desirable. The bandwidth (for information transfer by this method) is limited (by the eight bit SEL field of the NET) and there is very limited scope for signalling different combinations of capabilities. It is thus not thought to be a practicable mechanism for proving a general framework for signalling Router and subnetwork capabilities.

On the other hand, the ISO/IEC 9542 ISH PDU structure itself was designed to be extensible. The ISO standard requires implementations to ignore optional PDU parameters with parameter codes that it does not understand, which means that new parameters can be created and used without destabilising existing implementations. It is thus possible to define new optional parameters which can declare information on the sending Router's capabilities, or on the capabilities of the subnetwork over which the ISH PDU is sent. Such parameters will be ignored by older systems. When an ISH PDU is transmitted by an older system, a receiving system that can understand the new parameter may interpret the absence of the parameter as implying the capabilities of a Router compliant with Edition 1 of the SARPs; subnetwork capabilities, in the absence of any parameter declaring subnetwork capabilities, will need to be determined from *a priori* knowledge, or some other existing mechanism.

The only drawback with this approach is that ISO has not set aside a mechanism for non-ISO specification of parameter codes. If the ATN SARPs define new ISO/IEC 9542 ISH PDU parameters then it may do so, but their future use by an ISO standard cannot be ruled out. However, the current standard only uses eight bit parameter codes with bits 6 and 7 set to one, and there is no reason to suppose that parameter codes with either bit 6 or bit 7 set to zero (both bits set to zero are not permitted by the ISO standard) are likely to be defined. The ATN SARPs may thus make use of parameter codes in these ranges with a high probability that they will never be used by ISO.

It is thus proposed that information on Router and subnetwork capabilities is exchanged using new ISH PDU option parameters. A new parameter code should be defined for each related set of capabilities. Initially, the following new parameters should be defined:

1. Router support of IDRP (to include use/non-use of IDRP, authentication type supported, and algorithm,and whether a certificate needs to be supplied in the Authentication Data).

2. Subnetwork Capabilities (for use by an Air/Ground Router over a mobile data link and to include traffic types supported over the data link, and the ATSC Class of the data link).

Further parameters may also be added in the future to signal (e.g.) Systems Management Capabilities.