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A proposal for the total suppression of the re-advertisement of IDRP routes over the A/G links

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SUMMARY

The enhancement ICS3-08 aimed at resolving the problem of the regular re-advertisement of IDRP routes that may result from changing mobile connectivity when an aircraft has more than one adjacency with the same A/G router via different mobile subnetworks.

In the current Draft of the edition 3 of the SubVolume V, the objective of ICS3-08 is met partially only.

This paper proposes a solution and the associated SARPs changes, which could allow the complete resolution of this problem.

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1 Introduction

The enhancement ICS3-08 aimed at resolving the problem of the regular re-advertisement of IDRP routes that may result from changing mobile connectivity when an aircraft has more than one adjacency with the same A/G router via different mobile subnetworks.

In the current Draft of the edition 3 of the SubVolume V, the objective of ICS3-08 is met partially only. With the current ICS3-08 changes, the re-advertisement of routes in case of changing mobile subnetwork connectivity is suppressed only if the changing connectivity is/was of the same ATSC class as the other existing/remaining mobile subnetwork connectivities. However, if the changing connectivity has a different ATSC class from the one of the other existing connectivities, the re-advertisement of IDRP routes is not suppressed.

Thus, for example, if the AMSS and VDL2 subnetworks are not classified at the same ATSC class level, then the following scenario may occur: if an aircraft has an adjacency with an Air/Ground router over AMSS and also comes into contact with the same A/G router through a VDL subnetwork, the A/G Router will re-advertise the routes that it had previously uplinked to the aircraft. Should the aircraft then go out of contact with the VDL subnetwork then another re-advertisement of the routes should also be expected.

This paper proposes a solution and the associated SARPs changes, which could allow the complete resolution of this problem.

2 Background

The problem is due to the SARPs requirement 5.3.5.2.10.6. This paragraph requires an A/G router to re-advertise to an airborne router all routes affected by the change in subnetwork connectivity.

A proposal to remove this requirement was made in WP520. In that Working Paper, it was observed that thanks to the ISH PDU subnetwork capability parameter (introduced in edition 2 to resolve PDR 98060006), it was from now on possible to uplink the security characteristics of the subnetwork with the ISH PDU. It was then considered that the re-advertisement by the A/G BIS of the IDRP routes could be suppressed, because the aircraft can rebuild by itself the IDRP routes, from the routes received previously and from the information on the security characteristics of the subnetworks that is now conveyed in the ISH.

This proposal was rejected at IDG2. An exception case was found that impacted on the proposal to remove the requirement 5.3.5.2.10.6. This exception case is described below.

Suppressing the re-advertisement of IDRP routes over the A/G links is not possible because the security information conveyed in an IDRP UPDATE PDU, is not limited to the simple aggregate/composition of the security characteristics of the existing mobile subnetwork connectivities. The security information conveyed in an IDRP UPDATE PDU encompasses the following:

- The security characteristics of the GROUND PART of the route, and this being aggregated/combined with
- The security characteristics of the existing mobile subnetwork connectivities.

By non re-advertising the IDRP routes over the A/G links, all information on the security characteristics of the GROUND PART of the routes may not be uplinked to the aircraft, and this may result in invalid routing decisions made by the airborne routers. An example of such error cases is presented below:

Example:

Let us assume that an A/G BIS is connected to a Mode S subnetwork and a VDL subnetwork. The Mode S subnetwork is assumed to be permitted for ATSC traffic only, whereas the VDL

subnetwork is permitted for all categories of traffic. Let us additionally assume that the A/G BIS knows the following 2 routes, and that have to be advertised to the aircraft:

- an ATSC-only route to a given destination A
- a route to a given destination B, that is available for both ATSC and non-ATSC traffic

When an aircraft establishes a first contact with that A/G BIS via the Mode S subnetwork, the A/G BIS advertises both routes to A and B as ATSC-only routes (route to B is not declared available for non-ATSC traffic because the Mode S subnetwork is not permitted for non-ATSC traffic).

If a mobile VDL subnetwork connection becomes then available between that aircraft and the A/G BIS, the airborne router knows thanks to the ISH PDU subnetwork capability parameter that the mobile connectivity with the A/G router is available for both ATSC and non-ATSC traffic. However, in the absence of IDRP routes update, the airborne router cannot ascertain that the routes to A and B are available end-to-end for both ATSC and non-ATSC traffic. The airborne router only knows the security characteristics of the mobile links, but not of the routes in their entirety.

Then, if the airborne router assumes that routes to A and B have become available to both ATSC and non-ATSC traffic, it makes a wrong assumption with respect to the route to A. This may potentially create a black hole for all the non-ATSC traffic sent by the Airborne router toward A (the A/G router will discard the non-ATSC traffic to A, since the ground component of the route is permitted for ATSC traffic only).

On the other hand, if the airborne router assumes that routes to A and B remain unavailable to non-ATSC traffic, it makes a wrong assumption with respect to the route to B.

In order to avoid this kind of problem, it was decided at IDG 2 no to remove the requirement 5.3.5.2.10.6.

3 Proposed solution

The core reason that prevents suppressing the re-advertisement of IDRP routes in case of changing mobile subnetwork connectivity is the following: the security restrictions that may exist on the ground segment of the routes are hidden to the airborne routers. The airborne routers receive IDRP routes which security information has already been filtered/updated by the A/G router in function of the security restriction and characteristics of the mobile subnetwork connectivity that exists at the time the IDRP route is advertised. This is due to the fact that A/G routers are required (§ 5.8.3.2.4) to perform the update/filtering of the security information of the routes received from adjacent ground BIS, before advertising these routes to airborne routers.

Should the airborne routers know the ground characteristics of the routes, they would be able to perform by themselves the update/filtering of the security information and thereby derive the actual end-to-end security characteristics of the routes.

Hence, the basis of the proposed solution is to modify the SubVolume V so that, over IDRP connections established between edition 3 compliant airborne and A/G BISs, the A/G BIS is not charged anymore to update the security information of the routes advertised to the airborne routers: the update of the security information becomes a function of the airborne router. With such a change it would not be necessary anymore for the A/G BIS to re-advertise the route when the mobile connectivity changes and the objective of ICS3_08 could be completely fulfilled.

It must be noted that the A/G BIS procedure for the update of the IDRP security information has already been partly reduced in the draft third edition of the SubVolume V. Notably, A/G routers do not uplink anymore the A/G subnetwork security tag within IDRP update PDUs advertised to edition 3

compliant airborne routers. What is proposed in this paper, should then be considered as an extension to the changes already agreed.

4 Proposed changes to the SARPS

The SARPs changes implied by this proposal would be well contained:

1. In § 5.8.3.2.4.2.1, replace the first sentence ("When a route is advertised to an adjacent BIS, then:") by:

"When a route is advertised to an adjacent ground or air/ground BIS or to an adjacent airborne BIS which has not signalled its capability to support the Mobile Subnetwork Capabilities Parameter (see 5.8.2.1.3), then:"

2. Add the following new paragraph:

5.8.3.2.4.2.8 When a route is advertised by an A/G BIS to an adjacent airborne BIS which has signalled its capability to support the Mobile Subnetwork Capabilities Parameter (see 5.8.2.1.3), then:

- a) if the route has been originated locally (i.e. within the same Routing Domain) and is required by the local security policy to be available for ATSC traffic then, an ATSC Class security tag shall be added to the route which identifies the ATSC class(es) supported by the route, as defined by the local security policy, without being downgraded to the ATSC Class(es) temporarily supported by the adjacency.
- b) If the route has been received from another BIS, the ATSC Class Security Tag shall not be modified.

3. In § 5.8.3.2.4.2.1, add the following new clause f) and g)

f) if the route

- 1) has been received from an A/G router by an Airborne router over an adjacency supported by one or more subnetworks approved for ATSC traffic, and
- 2) includes an ATSC Class Security Tag, then

the ATSC Class(es) of the route shall be downgraded, as specified below, to the ATSC Class(es) supported by the adjacency.

Note.- The Airborne router knows the ATSC class(es) supported by the adjacency from the information contained in the Mobile Subnetwork Capability Parameter of the ISH PDUs received from the adjacent A/G BIS.

g) if the route

- 3) has been received from an A/G router by an Airborne router over an adjacency supported by subnetworks that are not approved for ATSC traffic, and
- 4) includes an ATSC Class Security Tag, then

the ATSC Class security tag shall be removed from the route.

4. After paragraphs 5.3.5.2.10.6, and 5.3.5.2.13.7.a).3) insert the following new note:

Note.- When a change in the mobile subnetwork connectivity occurs over an adjacency with an airborne router that has signalled its capability to support the Mobile Subnetwork Capabilities Parameter, the security path attribute's security information of the routes contained in the Adj-RIB-Out associated with the remote ATN Airborne Router is not updated (see 5.8.3.2.4.2.8). As a consequence, these routes are not affected by the changes and do not need to be re-advertised to the airborne router.