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AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL

WORKING GROUP 2

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Proposed Profile for IDRP over an Air-Ground Datalink

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SUMMARY

Appendix A to this working paper provides an air/ground profile for the use of IDRP over an air/ground data link. This is an asymmetric profile that attempts to be compliant with the ATN Manual while minimising the requirements on the airborne router. The main body of the working paper enumerates a number of further optimisations that may be applied to the profile, but which require changes to the ATN Manual if they are accepted. Working Group 2 is recommended to consider the value of these options.

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1. Introduction

1.1 Background

The ATN Manual 2nd Edition prescribes the use of IDRP over an air-ground datalink for the exchange of routing information. At the Melbourne, FL meeting of ATNP/WG2, it was agreed that IDRP would be used for communicating routing information over air-ground datalinks, in compliance with the ATN Manual. However, the ATN Manual does not specifically provide a profile for IDRP over air-ground data links, but instead provides a single general profile that is a superset of all uses of IDRP in the ATN.

1.2 Scope

This paper provides a profile specifically for use of IDRP over an air-ground data link, while derived from the ATN Manual. It identifies the minimum support requirements for airborne and ground routers. This paper further identifies where simplifications may take place, if changes are made to the ATN Manual. The profile is presented in Appendix A, while the main body of this paper discusses the rationale for the choices made and additional optimisations.

2. Profile Requirements

2.1 ATN Requirements

This will be an asymmetric profile. The requirements on the airborne and ground router are significantly different, with the airborne router potentially supporting much less functionality than a ground router.

The airborne router is located in an End Routing Domain (ERD) (ATN Man. Ref: A6.2.1.4) and hence has a strictly limited need to process routing information; it has no need to provide support for external re-advertisement of routes and, as long as it is assumed that there is a single Boundary Router on board an aircraft, there is no need for internal re-advertisement of routes. Furthermore, the airborne router is contained in the single RDC - the ATN RDC (ATN Man. Ref: A6.2.2) and routes will never enter RDCs nor exit them, when they are processed by an airborne Router. There is no requirement to support route aggregation, as the Airborne Router will never be in a situation where it will be re-advertising routes received from other Routing Domains.

An Airborne Router also has a very limited Routing Policy Requirement (ATN Man. Ref: A6.3.3), requiring only the advertisement of routes to its local Routing Domain. Airlines may wish to add additional policy rules for selecting between routes offered to the Airborne Router by Ground Routers, but the ICAO requirement is very minimal.

In contrast, the Ground Router attached to an air-ground data link has a much fuller set of requirements. Except for the exceptional case of an ATC Authority that does not interconnect with any other, the Ground Router will be in a Transit Routing Domain, and will have to support both internal and external distribution of routing information. It will be nested within several RDCs (ATN Man. Ref: A6.2.2), and will need to support routes which both enter and exit RDCs. Furthermore, it must be able to aggregate routes before they are advertised to an airborne router (ATN Man. Ref: A6.3.4.3). Both support of RDCs and Route Aggregation are essential requirements, otherwise it will not be possible to reduce the routing information sent over an air/ground data link to an acceptable minimum.

A Ground Router also has a much greater requirement for ICAO required Routing Policy Rules (ATN Man. Ref: A6.3.4).

This profile is therefore presented as an APRL with separate columns for Ground and Airborne Routers.

2.2 Compliancy with the ISO Standard

ISO !0747 is arguably over-prescriptive. For example, it always requires support of internal distribution of routes, which ignores the fact that a small scale router designed for use in a Routing Domain with a single Boundary Router, does not need such functionality. Similarly, the use of the distinguishing path attributes is negotiable and, if a Boundary Router never negotiates the use of a particular such attribute, then why should it need to support the recognition of the attribute, which it is required to do. Therefore, in the case of the Airborne Router it is not unreasonable to relax some of the ISO Mandatory Conformance requirements, where it can be shown that the standard is over pre-scriptive.

The following ISO Mandatory Requirements are therefore optional for an Airborne Router:

	ISO Mandatory Requirement	**Justification for non-support**
1.	Internal Update Procedures	Only a single Boundary Router on board an aircraft.
2.	**minRouteAdvertisement** Timer	Aircraft is always an End Routing Domain
3.	Recognition of Next Hop Attribute	No Requirement for Support
4.	Recognition of Residual Error and Priority Distinguishing Path Attributes	Never negotiated for use.

2.3 Potential Optimisations

The profile presented in Appendix A is compliant with the ATN Manual. However, in the discussions that have taken place during the preparation of the CNS/ATM-1 Package, a number of potential optimisations have been identified that can both simplify the operation and implementation of an Airborne Router and reduce the routing overhead for low bandwidth subnetworks. If implemented, these optimisations will require change to the provisions of the ATN Manual and are presented below:

1.	**Optimisation:** Removal of ATN RDC
Impact: 1. No need for Airborne Router to support Entry Markers in RD_Path processing. 2. Reduction of ~15 octets in every UPDATE BISPDU sent air-ground.	
Justification: The ATN RDC was introduced for completeness. It permits the restriction of route distribution to the ATN only. However, no User Requirements are known for this feature at present. The much more important Fixed ATN RDC still exists and can be used to restrict route distribution to the Fixed ATN if required.	

2.	**Optimisation:** Non-support of RIB Refresh
Impact: 1. Removal of requirement to implement code to support this feature in Airborne Router. 2. No need to re-send routes over a low bandwidth subnetwork.	
Justification: RIB Refresh is necessary for long lived adjacencies to prevent a loss of synchronisation of routing information due to internal errors. This is very important in core networks, when adjacencies will last for days, weeks or even months. However, over air-ground subnetworks, an adjacency will last at most for the time of a single flight. The probability of loss of synchronisation is very small in such cases and this feature is not necessary. It should be noted that the ATN Manual does not provide provisions or guidance on the minimum time an adjacency must last before RIB Refresh procedures are activated.	

<table>
<tr><td>3.</td><td>Optimisation:
Non-support of DIST_LIST_INCL and DIST_LIST_EXCL in Airborne Routers</td></tr>
<tr><td colspan="2">Impact:
Removal of requirement to implement code to support this feature in Airborne Router.</td></tr>
<tr><td colspan="2">Justification:
There are no known User Requirements to control the distribution of routes to or from Mobile Systems. Furthermore, these control mechanisms are unlikely to be useable in a Mobile Routing environment, as they depend on the path of a route being predictable and known, in advance. This is not the case with routing to mobiles.</td></tr>
</table>

<table>
<tr><td>4.</td><td>Optimisation:
No Advertisement of Routes by an Airborne Router to a Ground Router (Half-IDRP)</td></tr>
<tr><td colspan="2">Impact:
1. Ground Router has to infer routes that the Airborne Router would have generated, and generate them on the Airborne Router’s behalf.
2. Airborne Router does not have to support the generation of routes, the Adj-RIB-out, and generation of an UPDATE BISPDU.
3. Faster Route Initiation.
4. No bandwidth consumed in the air to ground direction by routing information.</td></tr>
<tr><td colspan="2">Justification:
The aircraft is an End Routing Domain and the routes that it will generate according to the Policy Rules specified in the ATN Manual are totally predictable from the NET of the Airborne Router. This is made known to the Ground Router by the exchange of an ISH PDU already prescribed by the Route Initiation Procedure. The mechanism for inferring such routes was originally proposed as part of the “optional non-use of IDRP” proposed for CNS/ATM-1 Package, and is already being tested in trials.</td></tr>
</table>

5.	**Optimisation:** Single FIB Operation

Impact:

1. No dynamic QoS based Routing
2. Security Type inferred from Addressing Convention
3. Significant reduction in implementation complexity of all ATN Routers
4. Reduction in routing information overhead by a factor of up to fifteen (including the overhead of general communications) over the whole ATN with a consequential cost saving and bandwidth saving on Low Bandwidth air-ground links, as well as fixed ATN data links.

Justification:

There are very significant cost and implementation benefits from moving to a single FIB Operation. It also reduces the risk of a failure of the ATN Specification to pass the validation exercises. This is because for the ATN Specification to be validated, it needs to be shown that the number of routing updates is achievable with current generation routers. Reducing the volume of routing updates by a significant factor clearly lowers the risk of this target not being met. It may also be possible to design the ATN using lower capacity and hence lower cost routers.

The lack of dynamic QoS based Routing is unlikely to be a major problem. Application QoS requirements are primarily met through Network Design and by Routing Policies. Dynamic QoS selection is only useful when the cost of meeting (e.g.) the Transit Delay requirements of a subset of applications is significantly greater than the cost of meeting the Transit Delay requirements of the remaining applications. Only then is the correct solution to make available separate higher cost/lower transit delay routes and to have a means for determining which application data travels over which type of route. That is, the capacity of a network is fixed by the network designer; dynamic mechanisms based on QoS requirements can only apportion resource that already exists; they cannot create new network resources. Dynamic apportionment of resources itself only makes sense when there are real trade-offs to be made (e.g. cost against transit delay) and, if such trade-offs do not exist or are insignificant, then they are not worth implementing.

So far, there do not appear to be differences in application transit delay requirements that have a significant difference in the cost of meeting those requirements. Hence, not providing dynamic QoS selection appears to be justifiable.

Using an addressing convention instead of the explicit Security Type was proposed during the Paris WG2-2 meeting and appears to offer equivalent functionality while being compatible with single FIB Operation.

3. Recommendations

The Working Group is invited to consider the use of the asymmetric profile contained in appendix A and the value of the options proposed above when preparing the draft SARPs.

Appendix A APRL for the Inter Domain Routing Protocol (ISO/IEC 10747) used over an Air-Ground Data Link

1. Compliance Statement

1.1 Airborne Router

An Airborne Router shall implement the ISO 10747 Routing Information Protocol in compliance with the APRL specified in 1.3, and the requirements contained in the remainder of this section.

1.1.1 RIB_ATT Support

A CNS/ATM-1 Package Airborne Router incorporating IDRP shall support the following RIB_Att sets, and shall attempt to negotiate the use of all those RIB_Atts it supports when opening a BIS-BIS connection:

a. The empty RIB-Att

b. SECURITY

Recommendation: A CNS/ATM-1 Package Airborne Router incorporating IDRP should also support the following RIB_Att sets:

a. TRANSIT DELAY

b. EXPENSE

c. SECURITY, TRANSIT DELAY

d. SECURITY, EXPENSE

An Instance of the Security attribute shall be supported for each Security Type supported by the Airborne Router. A CNS/ATM-1 Package Airborne Router shall support the “Operational” and “Network Management” Security Types.

Note: A CNS/ATM-1 Package Airborne Router may also support Security Types for Administrative and General Communications, if corresponding applications are implemented on board the aircraft.

1.1.2 Routing Policy Rules

1.1.2.1 Route Origination and Selection

An Airborne Router shall provide to each adjacent ATN Ground Router to which it is currently connected, one or more routes to the NSAPs and NETs contained within its local RD; a route to the same set of NSAP Address Prefixes shall be advertised to the same Ground Router for each other RIB-Att in common.

Note: rules to select the routes that the router will use, out of those offered by Ground Routers, are at the discretion of the aircraft operator.

1.1.2.2 Network Later Reachability Information

An Airborne Router shall not originate a route containing an NSAP Address Prefix in any of its path attributes or Network Layer Reachability Information, that is not octet aligned.

1.1.2.3 Multiple Subnetwork Paths

When ITU restrictions apply to all subnetworks joining an Airborne Router to a Ground Router, then the Airborne Router shall only advertise routes under those RIB_Atts that include a SECURITY attribute indicating a Security Type that may be transferred over at least one of those subnetworks.

The values of QoS metrics in routes advertised to a ground router shall reflect the “best” subnetwork to use for that metric. e.g. the value of the Transit Delay metric shall reflect the subnetwork joining the Airborne and Ground Router which is both available for use and has the lowest transit delay.

Note: CNS/ATM-1 Package Routers implementing IDRP may be linked by more than one subnetwork path. This situation is viewed by IDRP as still a single adjacency. However, ITU restrictions and their consequences may vary between different air-ground subnetworks, and the available QoS may also be different. These differences need to be reflected dynamically whenever the communications paths between an airborne and a ground router change.

Whenever a new subnetwork connection becomes available between an Airborne Router and a Ground Router that have an existing adjacency, or when a subnetwork connection is lost without losing the adjacency (i.e. another subnetwork connection is still available for use), then the routes to be advertised shall be re-computed according to the above requirements. Any new routes (i.e. made possible through a subnetwork becoming available with fewer restrictions) shall be advertised immediately to the Ground Router. Any routes that had been advertised to the Ground Router, but which are not in the re-computed set (i.e. due to the remaining subnetwork(s) having more restrictions on use than that which was lost) shall be immediately advertised to the Ground Router as withdrawn routes. Any routes for which the QoS metrics have changed, shall be re-advertised to the Ground Router upon expiry of the **minRouteOrigination** timer.

1.1.3 Routing Domain Confederations

An Airborne Router shall be a member of the ATN RDC.

1.2 Ground Router

A Ground Router shall implement the ISO 10747 Routing Information Protocol in compliance with the APRL specified in 0, and the requirements contained in the remainder of this section.

1.2.1 RIB_ATT Support

A CNS/ATM-1 Package Ground Router incorporating IDRP shall support the following RIB_Att sets, and shall attempt to negotiate the use of all those RIB_Atts it supports when opening a BIS-BIS connection:

a. The empty RIB-Att

b. SECURITY

Recommendation: A CNS/ATM-1 Package Ground Router incorporating IDRP should also support the following RIB_Att sets:

a. TRANSIT DELAY

b. EXPENSE

c. SECURITY, TRANSIT DELAY

d. SECURITY, EXPENSE

An Instance of the Security attribute shall be supported for each Security Type supported by the Ground Router. A CNS/ATM-1 Package Ground Router shall support the “Operational”, “Administrative”, “General Communications” and “Network Management” Security Types.

1.2.2 **Routing Policy Rules**

1.2.2.1 **Route Origination and Selection**

An ATN Ground Router shall provide the following routes to each adjacent Airborne RD, and for each RIB-Att in common:

1. A route to NSAPs and NETs contained within the Ground Router’s local RD; the route's destination shall be one or more NSAP Address prefixes common to all NSAP Addresses and NETs in the RD.

2. An aggregated route to NSAPs and NETs contained within the local ATN Island RDC;

3. An aggregated route to NSAPs and NETs contained within all other ATN Islands for which a route is available.

Note: rules to select the routes that the router will use, out of those offered by Airborne Routers, are at the discretion of the ground network operator.

1.2.2.2 **Network Later Reachability Information**

A Ground Router shall not originate a route containing an NSAP Address Prefix in any of its path attributes or Network Layer Reachability Information, that is not octet aligned.

1.2.2.3 **Multiple Subnetwork Paths**

When ITU restrictions apply to all subnetworks joining an Ground Router to a Airborne Router, then the Ground Router shall only advertise routes under those RIB_Atts that include a SECURITY attribute indicating a Security Type that may be transferred over at least one of those subnetworks.

The values of QoS metrics in routes advertised to an Airborne Router shall reflect the “best” subnetwork to use for that metric. e.g. the value of the Transit Delay metric shall reflect the subnetwork joining the Airborne and Ground Router which is both available for use and has the lowest transit delay.

Note: CNS/ATM-1 Package Routers implementing IDRP may be linked by more than one subnetwork path. This situation is viewed by IDRP as still a single adjacency. However, ITU restrictions and their consequences may vary between different air-ground subnetworks, and the available QoS may also be different. These differences need to be reflected dynamically whenever the communications paths between an airborne and a ground router change.

Whenever a new subnetwork connection becomes available between an Airborne Router and a Ground Router that have an existing adjacency, or when a subnetwork connection is lost without losing the adjacency (i.e. another subnetwork connection is still available for use), then the routes to be advertised shall be re-computed according to the above requirements. Any new routes (i.e. made possible through a subnetwork becoming available with fewer restrictions) shall be advertised immediately to the Airborne Router. Any routes that had been advertised to the Airborne Router, but which are not in the re-computed set (i.e. due to the remaining subnetwork(s) having more restrictions on use than that which was lost) shall be immediately advertised to the Airborne Router as withdrawn routes. Any routes for which the QoS metrics have changed, shall be re-advertised to the Airborne Router upon expiry of the **minRouteOrigination** timer, or the **minRouteAdvertisement** time, as appropriate.

1.2.3 Routing Domain Confederations

A Ground Router shall be a member of the ATN RDC, the Fixed ATN RDC and the RDC of the ATN Island(s) of which it is a member. If the local RD is also a Backbone RD, the Ground Router shall also be a member of the appropriate Backbone RDC.

1.3 APRLs

1.3.1 ATN Specific Protocol Requirements

Index	Item	Ground Router	Airborne Router
ATNIDRP1	Does the implementation support ATN Operational Communications?	M	M
ATNIDRP2	Does the implementation support ATN Administrative Communications?	M	O
ATNIDRP3	Does the implementation support General Communications?	M	O
ATNIDRP4	For Operational Communications, does this implementation support propagation and generation of the EXPENSE attribute?	M	M
ATNIDRP5	For Administrative Communications, does this implementation support propagation and generation of the EXPENSE attribute?	ATNIDRP2:M	ATNIDRP2:M
ATNIDRP6	For General Communications, does this implementation support propagation and generation of the EXPENSE attribute?	ATNIDRP3:M	ATNIDRP3:M
ATNIDRP7	For Operational Communications, does this implementation support propagation and generation of the TRANSIT DELAY attribute?	M	M
ATNIDRP8	For Administrative Communications, does this implementation support propagation and generation of the TRANSIT DELAY attribute?	ATNIDRP2:M	ATNIDRP2:M
ATNIDRP9	For General Communications, does this implementation support propagation and generation of the TRANSIT DELAY attribute?	ATNIDRP3:M	ATNIDRP3:M

1.3.1.1 **IDRP General**

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
BASIC	Are all basic BIS functions implemented?	12.1	M	M	M
MGT	Is this system capable of being managed[1] by the specified management information?	11	M	O	O
VER	Does this BIS support Version Negotiation?	7.8	M	M	M
RTSEP	Does this BIS support ROUTE_SEPARATOR attribute?	7.12.1	M	M	M
HOPS	Does this BIS support the RD_HOP_COUNT attribute?	7.12.13	M	M	M
PATH	Does this BIS support the RD_PATH attribute?	7.12.3	M	M	M
CAPY	Does this BIS support the Capacity Attribute?	7.12.15	M	M	M
FSM	Does this BIS manage BIS-BIS connections according to the BIS FSM description?	7.6.1	M	M	M
FCTL	Does this BIS provide flow control?	7.7.5	M	M	M
SEQNO	Does this BIS provide sequence number support?	7.7.4	M	M	M
INTG1	Does this BIS provide Data integrity using authentication type 1?	7.7.1	O.1	M	M
INTG2	Does this BIS provide Data integrity using authentication type 2?	7.7.2	O.1	O	O
INTG3	Does this BIS provide Data integrity using authentication type 3?	7.7.3	O.1	O	O
ERROR	Does this BIS handle error handling for IDRP?	7.20	M	M	M
RIBCHK	Does this BIS operate in a "fail-stop" manner with respect to corrupted routing information?	7.10.2	M	M	M

1.3.1.2 **IDRP Update Send Process**

	Item	Ref.	ISO Status	Ground Router	Airborne Router
INT	Does the BIS provide the internal update procedures?	7.17.1	M	M	O
RTSEL	Does this BIS support the **MinRouteAdvertisementInterval** Timer?	7.17.3.1	M	M	O
RTORG	Does this BIS support the **MinRDOriginationInterval** Timer?	7.17.3.2	M	M	M

[1] The interpretation of this Item is that mandatory compliance requires that access to the MO is provided via a Systems Management Agent. Remote Systems Management is not required for CNS/ATM-1 Package and hence it is not reasonable to require mandatory support for this requirement.

JITTER	Does this BIS provide jitter on its timers?	7.17.3.3	M	M	M

1.3.1.3 IDRP Update Receive Process

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
INPDU	Does the BIS handle inbound BISPDUs correctly?	7.14	M	M	M
INCONS	Does this BIS detect inconsistent routing information?	7.15.1	M	M	M

1.3.1.4 IDRP Decision Process

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
TIES	Does this BIS break ties between candidate routes correctly?	7.16.2.1	M	M	M
RIBUPD	Does this BIS update the Loc-RIBs correctly?	7.16.2	M	M	M
AGGRT	Does this BIS support route aggregations?	7.18.2.1, 7.18.2.2, 7.18.2.3	O	M	O
LOCK	Does this BIS provide interlocks between its Decision Process and the updating of the information in its Adj-RIBs-In?	7.16.4	M	M	M
FIBUPD	Does this BIS create FIB entries reflecting subnetwork access restrictions correctly ?	7.16.2	-	M	M

1.3.1.5 IDRP Receive Process

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
RCV	Does the BIS process incoming BISPDUs and respond correctly to error conditions?	7.14, 7.20	M	M	M
OSIZE	Does this BIS accept incoming OPEN PDUs whose size in octets is between **MinBISPDULength** and 3000?	6.2,7.20	M	M	M
MXPDU	Does the BIS accept incoming UPDATE, IDRP ERROR and RIB REFRESH PDUs whose size in octets is between **minBISPDULength** and **maxBISPDULength**?	6.2,7.20	M	M	M

1.3.1.6 IDRP Optional Transitive Attributes

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
MEXIT	Does this BIS support use of the MULTI-EXIT DISC attribute?	7.12.7	O	O	O

1.3.1.7 Peer Entity Authentication

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
AUTH	Does this BIS correctly authenticate the source of a BISPDU?	7.7.2	O	M	M

1.3.1.8 Generating Well-Known Discretionary Attributes

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
EXTG	Does the BIS support generation of the EXT_INFO attribute?	7.12.2	O	O	O
NHRS	Does the BIS support generation of the NEXT_HOP attribute in support of route servers?	7.12.4	O	OX	O
NHSN	Does the BIS support generation of the NEXT_HOP attribute to advertise SNPAs?	7.12.4	O	OX	O
DLI	Does the BIS support generation of the DIST_LIST_INCL attribute?	7.12.5	O	OX	O
DLE	Does the BIS support generation of the DIST_LIST_EXCL attribute?	7.12.6	O	OX	O
TDLY	Does the BIS support generation of the TRANSIT DELAY attribute?	7.12.8	O	M	M
RERR	Does the BIS support generation of the RESIDUAL ERROR attribute?	7.12.9	O	O	O
EXP	Does the BIS support generation of the EXPENSE attribute?	7.12.10	O	M	M
LQOSG	Does the BIS support generation of the LOCALLY DEFINED QOS attribute?	7.12.11	O	OX	OX
HREC	Does the BIS support generation of the HIERARCHICAL RECORDING attribute?	7.12.12	O	OX	OX
SECG	Does the BIS support generation of the SECURITY attribute?	7.12.14	O	M	M
PRTY	Does the BIS support generation of the PRIORITY attribute?	7.12.16	O	O	O

1.3.1.9 **Propagating Well-Known Discretionary Attributes**

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
EXTGP	Does the BIS support propagation of the EXT_INFO attribute?	7.12.2	M	M	-
NHRSP	Does the BIS support propagation of the NEXT_HOP attribute in support of route servers?	7.12.4	O	OX	-
NHSNP	Does the BIS support propagation of the NEXT_HOP attribute to advertise SNPAs?	7.12.4	O	OX	-
DLIP	Does the BIS support propagation of the DIST_LIST_INCL attribute?	7.12.5	O	M	-
DLEP	Does the BIS support propagation of the DIST_LIST_EXCL attribute?	7.12.6	O	M	-
TDLYP	Does the BIS support propagation of the TRANSIT DELAY attribute?	7.12.8	O	M	-
RERRP	Does the BIS support propagation of the RESIDUAL ERROR attribute?	7.12.9	O	O	-
EXPP	Does the BIS support propagation of the EXPENSE attribute?	7.12.10	O	M	-
LQOSP	Does the BIS support propagation of the LOCALLY DEFINED QOS attribute?	7.12.11	O	O	O
HRECP	Does the BIS support propagation of the HIERARCHICAL RECORDING attribute?	7.12.12	O	OX	-
SECP	Does the BIS support propagation of the SECURITY attribute?	7.12.14	O	M	-
PRTYP	Does the BIS support propagation of the PRIORITY attribute?	7.12.16	O	O	-

1.3.1.10 Receiving Well-Known Discretionary Attributes

Item	Description	Ref.	ISO Status	Ground Router	Airborne Router
EXTR	Does the BIS recognise upon receipt the EXT_INFO attribute?	7.12.2	M	M	M
NHRSR	Does the BIS recognise upon receipt the NEXT_HOP attribute ?	7.12.4	M	M	O
DLIR	Does the BIS recognise upon receipt the DIST_LIST_INCL attribute?	7.12.5	M	M	M
DLER	Does the BIS recognise upon receipt the DIST_LIST_EXCL attribute?	7.12.6	M	M	M
TDLYR	Does the BIS recognise upon receipt the TRANSIT DELAY attribute?	7.12.8	M	M	M
RERRR	Does the BIS recognise upon receipt the RESIDUAL ERROR attribute?	7.12.9	M	M	O
EXPR	Does the BIS recognise upon receipt the EXPENSE attribute?	7.12.10	M	M	M
LQOSR	Does the BIS recognise upon receipt the LOCALLY DEFINED QOS attribute?	7.12.11	O	O	O
HRECR	Does the BIS recognise upon receipt the HIERARCHICAL RECORDING attribute?	7.12.12	M	M	O
SECR	Does the BIS recognise upon receipt the SECURITY attribute?	7.12.14	M	M	M
PRTYR	Does the BIS recognise upon receipt the PRIORITY attribute?	7.12.16	M	M	O