ARINC 658

Internet Protocol Suite (IPS) for
Aeronautical Safety Services – Roadmap Document

Updates to:

APPENDIX D – STANDARDIZATION GAP ANALYSIS DATA

21 June 2018

21 June 2018 Updates to: APPENDIX D – STANDARDIZATION GAP ANALYSIS DATA [Overview]

INTRODUCTION

Industry stakeholders who participated in the development of the ARINC 658 roadmap document conducted a detailed analysis to understand and assess ATN/IPS-related standardization activities. In particular, the analysis identified gaps where the industry stakeholders believe that a standard is required but an associated standardization activity is not yet identified. The primary objective of the analysis was to identify the need for new ATN/IPS-related ARINC Standards and to identify existing ARINC Standards that may require modification to support ATN/IPS. However, having a comprehensive picture of ATN/IPS-related standardization efforts across standards organizations also helps to minimize duplication of effort and facilitates the identification of topics that might benefit from cross-organization

IPS GAP ANALYSIS COLUMNS

A **Work Area**
B **Sub-work Area**

Together, these columns organize the standardization activities with respect to the ATN/IPS work areas and sub-woek areas identified in Sections 3 and 4 of the ARINC 658 Roadmap Document.

C **Work Type**

Activity work type, which may take one of the following values (using a pull-down menu):

STD	Standard / Specification
GM	Guidance Material
ANA	Analysis
PRO	Prototype Implementation
VAL	Validation
VER	Verification
V&V	Verification and Validation
OPR	Operations

D **Work Status**

Status of the work activity, which may take on one of the following values (using a pull-down menu):

Complete	Work activity is complete
In-Progress	Work activity is started and in-progress
Planned	Work activity is planned, but not yet started
Proposed	Work activity is proposed, but not yet planned or started
GAP	Identified work activity gap
TBD	Status is to be determined

E **A658 Section where gap is addressed**

A reference to the section in the A658 Roadmap Document where potential actions to address an identified gap are described. The following color coding is used:

#	A658 section in which a gap is described; the gap still exists at the time of this update
#	A658 section in which a gap is described; work activity to address the gap has been initiated, per the status in Column D
	No gap; a work activity was already initiated prior to the publiction of A658

F **Standards Organization**
G **Working Group / Sub-group**

Taken together, these columns identify the Standards Development Organization and the associated working group and sub-working group (optional) associated with the specified standardization activity. The Standards Development Organization is selected using a pull down menu, and the working group / sub-group entry is free

H **Activity Description**

Description of the standardization activity (normal font, black text) OR a description of an identified gap (*italicized font, red text*)

I **Artifact**

A document number, if known, for the planned output of the work activity.

J **Dependencies**

Identification of other activities on which the standardization activity may be dependent.

K **Planned Completion Date**

Date, if known, when the output of the work activity is expexted to be completed.

L **Additional Comments**

Additional commentary, clarification, or observations offered by industry participants

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A	B	C	D	E	F	G	H	I	J	K	L
		IPS-related Standardization Activities									
Work Area	**Sub-work Area**	**Work Type**	**Work Status**	**A658 Section where Gap is Addressed**	**Standards Organization**	**Working Group / Sub-group**	**Activity Description / *Gap Description***	**Artifact**	**Dependencies**	**Planned Completion Date (MMM-YYYY)**	**Additional Comments**
Application Interfaces	DSI (legacy)		In-Progress		ICAO	PT-I	ATNPKT definition for backward compatibility with existing dialog service-based OSI applications	Doc. 9896	Doc. 9880	Nov-2020	Job Card: CP-DCIWG.006.01
		STD	*GAP*	5.4.4	ICAO	PT-I	*Mapping between OSI addresses and IPS address (see comment)* *Updates to DSI (?)*	Doc. 9896	Doc. 9896 (IPS addressing)		1. Consider multi-phased approach, where initial deployments use address mapping from OSI to IPS, but future deployments may be IPS addresses only. 2. May start in ICAO and move to RTCA/EUROCAE (SC-214/WG-78)
	ACARS (legacy)	STD	*GAP*	5.4.4	ICAO	PT-I	*Provisions for accommodation of FANS messages*	Doc. 9896			
		STD	*GAP*	5.4.1.1	ICAO	PT-I	*Encapsulation of FANS (e.g., A618) for IPS (e.g., mapping of FANS to IPS DS), including what parts of the ACARS message are included (e.g., SMI)*	Doc. 9896	Doc. 9896 (above)		
		STD	*GAP*	5.4.1.2.7	AEEC	DLK	*Standardization of air-ground messaging layer for AOC (A620 non-safety) applications over IP (MIAM over IPS)*	ARINC 841			
	Native IP (future)	STD	In-Progress	5.4.4	AEEC	IPS	Support for native IP applications	ARINC 858			
Mobility	Access Network	ANA	In-Progress		ICAO	PT-I / MSG	Mobility sub-group to analyze Mobility options for the Access Sub-Networks (Terrestrial (VDL-2 and LDACS), AeroMACS, and Satellite) and protocols (e.g. PMIPv6, other)	Working Papers	AeroMACS, L-DACS, SATCOM, and VDL Standards		Note that intra-subnetwork mobility is not part of PT-I responsibility. PT-I may review what is offered by each subnetwork. Otherwise, this is
	Inter-subnetwork	ANA	In-Progress		ICAO	PT-I / MSG	Mobility sub-group to analyze Multi-link mobility options (e.g.,MIPv6, AERO, LISP) and recommend a candidate	Working Papers	LISP - SESAR 15.2.4 AERO - IETF RFC		
		STD	Planned		ICAO	PT-I / MSG	Mobility technical provisions	Doc. 9896		Nov-2020	
	Inter-region	STD	Planned		ICAO	PT-I / MSG	Mobility technical provisions	Doc. 9896		Nov-2020	Job Card: CP-DCIWG.006.01
Upper Layers	Transport Options	ANA	In-Progress		ICAO	PT-I	Further refinement of transport options, whether UDP/TCP/etc. should both be supported, and including reliability extensions	Working Papers			
		STD	In-Progress		ICAO	PT-I	Document IPS transport provisions	Doc. 9896		Nov-2020	
	Supporting Services Identification	STD	In-Progress		ICAO	PT-I PT-I / MSG	Identify additional services necessary to support IPS, e.g. ICMP, local BGP, etc.	Doc. 9896		Nov-2020	
		GM	Planned		EUROCAE + RTCA	WG-108 / SC-223	MASPS	ED-TBD DO-TBD		Dec-2019	
	Profile	STD	In-Progress		EUROCAE + RTCA	WG-108 / SC-223	IPS profile	ED-TBD DO-TBD		Dec-2018	
	E2E Guidance	GM	Planned		EUROCAE + RTCA	WG-108 / SC-223	IPS End-to-End interop guidance (MASPS)	ED-TBD DO-TBD	ICAO WG-I AEEC IPS	Dec-2019	

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		IPS-related Standardization Activities									
Work Area	**Sub-work Area**	**Work Type**	**Work Status**	**A658 Section where Gap is Addressed**	**Standards Organization**	**Working Group / Sub-group**	**Activity Description / *Gap Description***	**Artifact**	**Dependencies**	**Planned Completion Date (MMM-YYYY)**	**Additional Comments**
Lower Layer Interfaces	AeroMACS	STD	Complete		ICAO	PT-S	AeroMACS SARPS	Annex 10		Complete	
		STD	Complete		ICAO	PT-S	AeroMACS Technical Manual and Guidance	Doc. 10044		Complete	
		STD	Complete		RTCA	SC-223	AeroMACS Profile	DO-345		Complete	
		STD	Complete		RTCA	SC-223	AeroMACS MOPS	DO-346		Complete	
		STD	Complete		AEEC	AeroMACS	AeroMACS Transceiver and Installation	ARINC 766		Complete	
		STD	*GAP*	5.4.1.2.4	AEEC	AeroMACS	*AeroMACS architecture concepts (for segregation) to support IPS may not be defined adequately for developers*	ARINC 766			If dual connectivity with ACD and AISD is required in the radio.
	LDACS	STD	In-Progress		ICAO	PT-T	LDACS SARPS	Annex 10, Vol III		Dec-2018	Job Card: CP-DCIWG.010.01
		STD	In-Progress		ICAO	PT-T	LDACS Technical Manual	Doc. TBD		Dec-2018	Job Card: CP-DCIWG.010.01
		GM	Planned		ICAO	PT-T	LDACS Guidance Material	Doc. TBD		Dec-2022	Job Card: CP-DCIWG.010.01
		STD	Planned		EUROCAE	WG-82	Development of MOPS/MASPS	Doc. TBD			
		STD	*GAP*	5.4.1.2.5	AEEC	TBD	*LDACS transceiver and interfaces*	ARINC TBD			
	SATCOM (current) - Performance Class B	STD	Planned		ICAO	PT-T	Update SARPs (generic) and Technical Manual, including technology-specific parts (e.g., INMARSAT and Iridium)	Doc. 9925 (new part) Annex 10 Vol3 Ch4		TBD	
		STD	Planned		EUROCAE	WG-82	MOPS / MASPS updates for IPS	ED-TBD		TBD	
		STD	Planned		RTCA	SC-222	MOPS / MASPS updates for IPS	DO-262x / DO-343x		TBD	
		STD	In-Progress		AEEC	AGCS	MK3 Aviation SATCOM Systems Form/Fit/Function - additional work currently in progress to focus on ACARS (which may support accommodation)	ARINC 771 ARINC 781		TBD	
		STD	*GAP*	5.4.1.2.6	AEEC	AGCS	*Updates (as necessary) and architecture concepts to support IPS*	ARINC 771 ARINC 781			Some initial placeholder text in planned next versions (2018), but future update expected to fully address IPS.
	SATCOM (future) - Performance Class A	STD	Proposed		ICAO	PT-T	SATCOM Class A Technical Manual and Guidance and SARPS	Doc. TBD		TBD	Proposal presented by Eurocontrol during ICAO CP/2 in October 2016. Draft Job Card presented during ICAO CP/2 in WP02.
		STD	In-Progress		EUROCAE	WG-82	MOPS / MASPS updates for IPS	ED-TBD		TBD	
		STD	*GAP*	5.4.2	RTCA	SC-222	*Extension of current MOPS/MASPS to accommodate future SATCOM and IPS*	DO-TBD			
		STD	*GAP*	5.4.1.2.6	AEEC	AGCS	*Updates (as necessary) and architecture concepts to support IPS*	ARINC TBD			

21 June 2018 Updates to: APPENDIX D – STANDARDIZATION GAP ANALYSIS DATA [3/6]

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		IPS-related Standardization Activities									
Work Area	**Sub-work Area**	**Work Type**	**Work Status**	**A658 Section where Gap is Addressed**	**Standards Organization**	**Working Group / Sub-group**	**Activity Description / *Gap Description***	**Artifact**	**Dependencies**	**Planned Completion Date (MMM-YYYY)**	**Additional Comments**
Lower Layer Interfaces (continued)	Non-safety SATCOM	**STD**	**Complete**		AEEC	KSAT	Track non-safety SATCOM activities to ascertain whether there are concepts/techniques that can be leveraged for IPS	ARINC 791 ARINC 792			
	VDLm2	**STD**	**In-Progress**	**5.4.1.2.3**	AEEC	Joint VDL Group	Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and	ARINC 631-8 Doc. 9776 input		Jun-2019	APIM 17-002
		STD	***GAP***	**5.4.4**	ICAO	PT-M (?)	*Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and address IP packets in VDLm2.*	Doc. 9776			
		STD	***GAP***	**5.4.2**	RTCA	SC-214 / VDLSG	*Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and address IP packets in VDLm2.*	DO-224E (MASPS) DO-218D (MOPS)			EUROCAE WG-92 (responsible for ED-92) meets jointly with RTCA SC-214 VDLSG.
		STD	***GAP***	**5.4.2**	EUROCAE	WG-92	*Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and address IP packets in VDLm2.*	ED-92D (MOPS)			
	Distributed Radio Architecture	**STD**	***GAP***	**New M07**	AEEC	SAI	*Focus is mainly hardware, but there may be impact on the overall architecture and interfaces with respect to IPS (e.g., radios on a network)*	ARINC TBD		Apr-2020	APIM 18-003
Naming and Addressing	Naming	**STD**	**In-Progress**		ICAO	PT-I	Define naming convention and DNS requirements	Doc. 9896	Coordination with RTCA SC-223	Nov-2020	Job Card: CP-DCIWG.006.01
	Addressing	**STD**	**In-Progress**		ICAO	PT-I	Define addressing	Doc. 9896	Coordination with RTCA SC-223	Nov-2020	Job Card: CP-DCIWG.006.01
	IPv6 Transition Ph1	**ANA**	**In-Progress**		AEEC	NIS	Roadmap for IPv6 transition in aviation	ARINC 686		Oct-2019	APIM 17-001
	IPv6 Transition Ph2	**STD**	**Proposed**		AEEC	NIS	Updates to standards for IPv6 transition as identified during the roadmap activity	ARINC 664pX(other parts and/or new part)			APIM 17-001 (proposed Phase 2)
	Administration	**OPR**	***GAP***	**5.4.4**	ICAO	PT-I (?)	*Processes for on-going administration of IP names and addresses* *IP database management/translations*				
		OPR	***GAP***	**5.4.5**	OTHER	IATA	*Same as above but for AOC*				

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Work Area	**Sub-work Area**	**Work Type**	**Work Status**	**A658 Section where Gap is Addressed**	**Standards Organization**	**Working Group / Sub-group**	**Activity Description / *Gap Description***	**Artifact**	**Dependencies**	**Planned Completion Date (MMM-YYYY)**	**Additional Comments**
Security	Risk Analysis	ANA	In-Progress		ICAO	PT-I	Notional end-to-end risk analysis for IPS	Working Papers		Dec-2018	
		GM	Planned		EUROCAE + RTCA	WG-108 / SC-223	Use the results of the ICAO risk analysis to identify other requirements (e.g., regional constraints) on IPS as part of MASPS	ED-TBD DO-TBD	ICAO PT-I Risk Analysis	Dec-2019	
		GM	Planned		ICAO	PT-I & Sec. Panel		Doc. 9896	Doc. 10044	Nov-2020	Job Card: CP-DCIWG.007.01
	End-to-End - Dialogue Service	STD	Complete		ICAO	PT-I / SSG	Secure Dialog Service (SDS), end-to-end Dialogue Service application-layer security applicable to both OSI and IPS	Doc. 10094, Part I		Complete	Complete without validation; complete with validation by Dec-2019
		GM	In-Progress		ICAO	PT-I / SSG	Secure Dialog Service (SDS) Concept of Operations	Doc. 10094, Part II		Dec-2018	
		GM	In-Progress		ICAO	PT-I / SSG	Secure Dialog Service (SDS) guidance material	Doc. 10094, Part III		Jun-2019	
		VAL	In-Progress		FAA	WJHTC	SDS validation	Validation Report		Dec-2019	
	Security Framework	GM	In-Progress		ICAO	PT-I / SSG	Overall security framework	Doc. 10090		Dec-2020	
	Ground-Ground	STD	In-Progress		ICAO	PT-I / SSG	Ground-ground IPS security	Doc. 9896		Dec-2020	
	PKI	STD	Complete		ICAO	PT-S	AeroMACS PKI Certificate Policy, which includes certificate/CRL profiles. Expected to be reusable for SDS.	Doc. 10044	ATA Spec 42 WMF Certificate Profile & Certificate Policy	Complete	
		VAL	Complete		WMF	AWG	AeroMACS test certificates			Complete	
		STD	Planned	5.4.4	ICAO	PT-I / SSG	PKI Policy for Aeronautical Communications	Doc. 10095		Dec-2019	
		VAL	Planned	5.4.4	ICAO	PT-I / SSG	Public Key Infrastructure Validation	Doc. 10095		Sep-2020	
		STD	In-Progress		ICAO	SecP / iNNOVA	Security requirements for air-ground	Doc. TBD		TBD	
		GM	*GAP*	5.4.1.2.8	AEEC	TBD	*Key loading and key management necessary for LRU installation and maintenance (e.g., key replacement) -- updates necessary for IPS (all systems)*	ARINC TBD			Requires future APIM
	Network Layer Security	STD	In-Progress		ICAO	PT-I	Definition of the security solution for the network level, including for AOC traffic (VPN)	Doc. 9896	RTCA SC-223 / EUROCAE 108 Profile Activity		
	Aircraft Security Reliance on Ground Security	GM	In-Progress		EUROCAE + RTCA	WG-72 / SC-216	Airworthiness Security Methods and Considerations - Trustworthiness considerations in the security environment	ED-203A DO-356A		Sep-2018	
		GM	Planned		EUROCAE + RTCA	WG-108 / SC-223	IPS End-to-End guidance supporting certification (MASPS)	ED-TBD DO-TBD	ICAO WG-I AEEC IPS	Dec-2019	
		GM	*GAP*	5.2 ?	OTHER	ARAC (?)	*Address this topic and provide recommendations to FAA/EASA*				
		GM	*GAP*	5.2	FAA		*FAA/EASA regulation update or new process?? Impact on certification if aircraft has reliance on the ground*				
		GM	*GAP*	5.2 ?	EASA		*FAA/EASA regulation update or new process?? Impact on certification if aircraft has reliance on the ground*				
	Security Management	STD	*GAP*	5.4.2	OTHER	TBC	*Overall security processes regarding incident management, logging/analysis, Aviation ISAC, etc.*				
	Security Policy	STD	Planned		ICAO	PT-I / SSG	ICAO Overall Security Policy Requirements	Doc. TBD		TBD	Job Card: CP-DCIWG.007.01

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A	B	C	D	E	F	G	H	I	J	K	L
		IPS-related Standardization Activities									
Work Area	**Sub-work Area**	**Work Type**	**Work Status**	**A658 Section where Gap is Addressed**	**Standards Organization**	**Working Group / Sub-group**	**Activity Description / *Gap Description***	**Artifact**	**Dependencies**	**Planned Completion Date (MMM-YYYY)**	**Additional Comments**
Performance	QoS	**STD**	**Planned**		ICAO	PT-I / MSG	Map ATN QoS to IPS DIFFSERV (should be defined as an end-to-end mechanism)	Doc. 9896	Doc. 9880 Doc. 10044	Nov-2020	
		STD	**In-Progress**	**5.4.1.1**	AEEC	IPS	*Detailed QoS mechanisms for segregating ATS and AOC traffic (part of ATN/IPS router form factor / architecture??)*	ARINC 858			
	Compression	**STD**	**In-Progress**		ICAO	PT-I	ATNPKT update to include compression provisions	Doc. 9896			
		STD	**In-Progress**	**5.4.1.1**	AEEC	IPS	Standardization of proposed compression techniques	ARINC 858			
	RCP (B2)	**STD**	**Complete**		EUROCAE + RTCA	WG-78 / SC-214	SPR	ED-228A / DO-350A ED-122 / DO-306		Mar-2016 Oct-2007	
	RCP (Beyond B2)	**STD**	***GAP***	**NEW M06**	ICAO	ODLWG	*RCP/RSP updates for beyond B2*	Doc. 9869			
		STD	***GAP***	**5.4.3**	EUROCAE	WG-78	*SPR update for beyond-B2 services*				
		STD	***GAP***	**5.4.3**	RTCA	SC-214	*SPR update for beyond-B2 services*				
	Multi-link	**STD**	**Planned**		ICAO	PT-I / MSG	Multi-link technical provisions	Doc. 9896	SESAR PJ14.2.4 RTCA SC-223 / EUROCAE 108 Profile Activity	Nov-2020	
		STD	**In-Progress**	**5.4.1.1**	AEEC	IPS	*Detailed definition of multi-link based on ICAO definition.*	ARINC 858	SESAR PJ14.2.4 Doc. 9896 RTCA SC-223 / EUROCAE 108 Profile Activity		The CMU standard would need to refer to the IPS router standard for the specification of the multilink functional specification, I.e., the CMU is one instance of an IPS router.
	MASPS	**GM**	**Planned**		EUROCAE + RTCA	WG-108 / SC-223	IPS End-to-End guidance supporting certification (MASPS)	ED-TBD DO-TBD	ICAO WG-I AEEC IPS	Dec-2019	

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		IPS-related Standardization Activities									
Work Area	**Sub-work Area**	**Work Type**	**Work Status**	**A658 Section where Gap is Addressed**	**Standards Organization**	**Working Group / Sub-group**	**Activity Description / *Gap Description***	**Artifact**	**Dependencies**	**Planned Completion Date (MMM-YYYY)**	**Additional Comments**
Form / Fit / Interfaces	CMU	**STD**	***GAP***	**5.4.1.2.2**	AEEC	DLK	*CMU specification updates to support IPS (e.g., including segregation, new interfaces, data logging, traffic shaping/filtering, etc.)*	ARINC 758			Although A758 is open, the current APIM 17-003 addresses Ethernet interface but does not include IPS; a future APIM will be necessary
	IPS Router	**STD**	**In-Progress**	**5.4.1.1**	AEEC	IPS	Specification for an IPS-specific router or router function (e.g., including segregation, new interfaces, etc.)	ARINC 858			AEEC IPS should review A758 document as a reference for structure and content for current CMF
Ground Systems	OSI/IPS and ACARS/IPS Gateway	**GM**	**In-Progress**	**5.4.4**	ICAO	PT-I	Technical definition of what needs to maintained between OSI and IPS in order to maintain application correlation. (Ground requirements RTCA/EUROCAE involvement?)	TBD			
		STD	**In-Progress**	**5.4.1.1**	AEEC	IPS	Definition of ACARS-IPS gateway function	ARINC 858			
		STD	**Planned**	**5.4.4**	EUROCAE + RTCA	WG-108 / SC-223	Ground system considerations for IPS end-to-end interoperability and performance as part of MASPS	ED-TBD DO-TBD		Dec-2019	
	IPS NW Topology	**ANA**	**Planned**		ICAO	PT-I	Discuss network topologies and proposals (e.g., DSP-centric solution)	Working papers			
		GM	***GAP***	**5.4.5**	OTHER	Regional CAAs	*Regional implementation of IPS based on the ICAO standard*				