

PJ.14-W2-77

Contextual Services

Note FCI

TRL6

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PJ.14-W2 I-CNSS

INTEGRATED COMMUNICATION, NAVIGATION AND SURVEILLANCE SYSTEM

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Abstract

This TRL6 Contextual Note (CN) provides a description of SESAR PJ.14-W2-77 “FCI Services” technological solution, in terms of scope, main benefits, relevant system impacts and a summary of its main achievements.

Solution PJ.14-W2-77 addresses the technical specification, development and validation of the seamless, resilient and integrated FCI (Future Communication Infrastructure).

This contextual note complements the D5.1 - PJ14-W2-77 TRL6 FCI Services Data Pack, comprising the PJ.14-W2-77 deliverables.

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1 Purpose

This contextual note introduces the SESAR Solution PJ.14-W2-77 FCI Services, which is aiming to achieve a TRL6 maturity in November 2022, as foreseen in the H2020 Grant Agreement No 874478.

It provides to any interested reader (external and internal to the SESAR programme) an introduction to the SESAR Technological Solution PJ.14-W2-77 “FCI Services” in terms of scope, main operational and performance benefits, relevant system impacts as well as the validation of the SESAR technological solution (system enabler) with both laboratory tests and Live OTA tests, fulfilling all essential operational Use Cases defined in the FCI Concept of Operation (D5.1.610 deliverable).

It introduces a summary of its main achievements and the TRL6 technical data pack comprising the SESAR JU deliverables. These deliverables are proposed to support industrialization/deployment.

2 Improvements in Air Traffic Management (ATM)

Europe's future communications will need to support an increased number of aircraft, new types of manned and unmanned craft, as well as military air traffic. This demands higher datalink communication capacity and better performance than any kind of current communication system. SESAR is focused on developing an air-ground communication infrastructure capable of supporting future air traffic services in addition to flight operations centres (or military wing operations centres). A key part of resilient air-ground communications is the development of a future communications infrastructure (FCI) network infrastructure to support future service concepts and the migration towards internet protocol. The extension of a common, shared, integrated and resilient network infrastructure is necessary to enable SWIM applications and interfaces between all parties, including the military.

Timely access to airspace management data and information services is the first step towards enabling real-time sharing of trajectories in 4D. The SESAR research includes completion of specifications for the FCI network infrastructure, in order to support multilink capability and complete mobility between different datalink systems such as satellite communications (SatCom), LDACS, or AeroMACS. It also addresses civil-military interoperability requirements for ground/ground network interfaces, safety and security requirements.

The PJ.14-W2-77 FCI Services solution intended benefits are

- Improved capacity, efficiency, performance, safety and resilience of the current A/G datalink infrastructure
- It will enable the implementation and deployment of ATN-IPS in Europe and will support interoperability of the OSI and IPS networks
- It supports traffic prioritization via Class of Service (CoS), with protection at all times of safety critical traffic, performance-based communication routing via Quality of Service (QoS), and strengthened cyber-security
- Limited need for airborne changes to support multilink and mobility concepts, thanks to well-designed ground IP infrastructure
- Improved civil-military interoperability
- Positive economic impact on the deployment of the overall future communications system

through the enhancement of the flexibility of the overall datalink system through the provision of resilient multilink and mobile communications capabilities to the aircraft.

Moreover, the ATN/IPS Multilink validated in PJ.14-W2-77 is, based on the assessment of ICAO and SESAR experts conducted over multiple years, the only scenario able to comply to the challenging EUROCAE ED-228A Availability and Continuity Requirements.

The relevant top-level benefits associated with PJ.14-W2-77 FCI Services are: Cost efficiency, Safety, Security, Performance, Interoperability and Civil-Military Coordination (as defined in the SESAR Performance Framework).

Figure 1 presents a high-level representation of the topology implemented by communication networks within the FCI, as developed and validated in the PJ.14-W2-77 FCI Services solution.

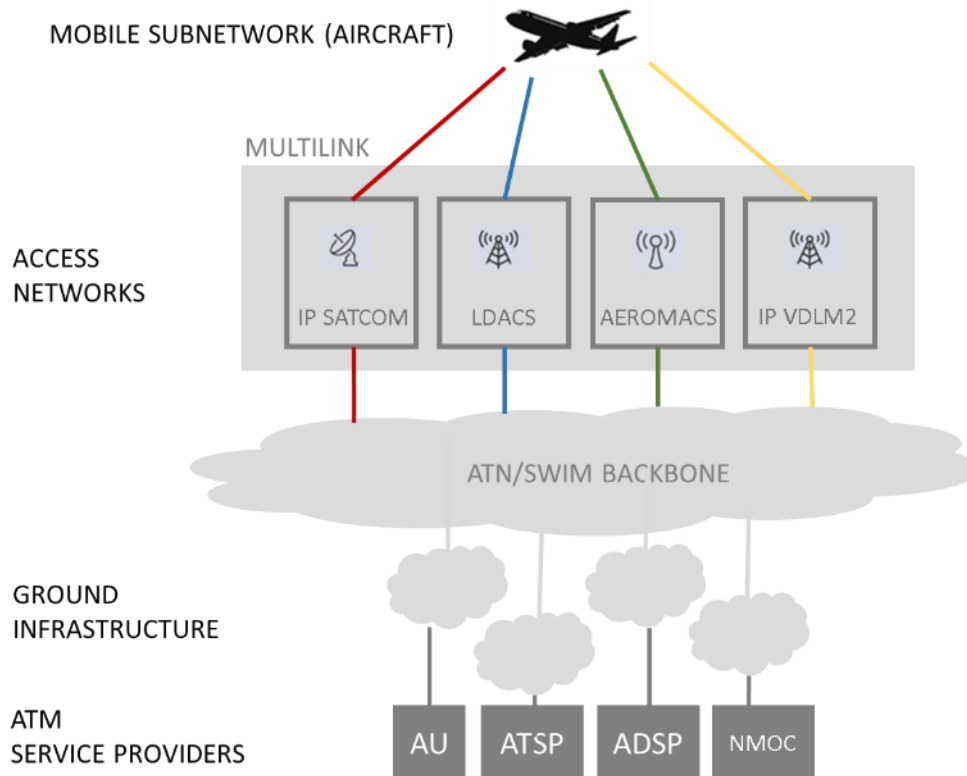


Figure 1 Network topology of the FCI

Please, note that the FCI solution has coordinated activities and used synergies with other solutions:

- Solution 107 (SATCOM),
- Solution 60 (LDACS),
- Solution 61 Hyper Connected ATM (HCATM).

3 Operational Improvement Steps (OIs) & Enablers

PJ.14-W2-77 covers the Operational Improvement Steps POI-0015-ATM Future Communication Infrastructure Network.

reports SESAR Solution PJ.14-W2-77 Scope and related Functional Blocks/roles & Enablers.

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler ID (from EATMA)	POI/OI	Enabler Title (from EATMA)	Enabler coverage/
Technological Solution PJ.14-W2-77 - Future Communication s Infrastructure	Communication Infrastructure - Routing Networking Equipment for Data Link	CTE-C04	POI-0015-ATM Future Communication Infrastructure Network	Future Communication Infrastructure - ATN/IPS and Multilink	Required and Developed
Technological Solution PJ.14-W2-77 - Future Communication s Infrastructure	Communication Infrastructure - Data radio station	CTE-C02d	POI-0029-COM-ATM High Performance Airport Datalink	New Airport Data Link Technology (AeroMACS)	Optional and Used
Technological Solution PJ.14-W2-77 - Future Communication s Infrastructure	Communication Infrastructure - Data radio station	CTE-C02e	POI-0022-COM — ATM High Performance Terrestrial Data Link	New A/G datalink using ATN/IPS over L-band (to augment the VDL2 datalink services)	Optional and Used
Technological Solution PJ.14-W2-77 - Future Communication s Infrastructure	Communication Infrastructure - Data radio station	CTE-C02f	POI-0018-COM — SATCOM Class B for ATM	SATCOM Data Link (Class B) in Multilink	Optional and Used
Technological Solution PJ.14-W2-77 - Future Communication s Infrastructure	Communication Infrastructure - Data radio station	CTE-C02h	POI-0019-COM — SATCOM Class A for ATM	Future Satcom for ATM - Long term Satcom/IRIS (class A Satcom)	Optional and Used

Technological Solution PJ.14-W2-77 - Future Communications Infrastructure	Communication Infrastructure - Routing Networking Equipment for Data Link	CTE-C06b	CNS-0001-B — Rationalisation of COM systems/infrastructure for SESAR2020 Wave 1	PENS - Phase 2	Required and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	ATN-OSI VDLm2, single and multi-frequency	CTE-C02b and CTE-C02c	POI-0015-COM-Future Communication Infrastructure Network	ATN-OSI VDLm2, single and multi-frequency	Optional and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Communication Infrastructure - Data radio station	CTE-C02j	POI-0015-COM-Future Communication Infrastructure Network	Ground part of A/G datalink terrestrial Infrastructure via ATN/IPS over VDLm2	Optional and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Communication Infrastructure - Data radio station	CTE-C02k	POI-0015-COM-Future Communication Infrastructure Network	A/G datalink exchange via ATN/IPS over VDLm2	Optional and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Civil Aircraft (CC)/ Aircraft – Airborne Router	A/C-95	POI-0015-COM-Future Communication Infrastructure Network	FCI - Airborne part of ATN/IPS and Multilink	Required and Developed
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Civil Aircraft (CC)/ Aircraft – Data radio	A/C-93	POI-0015-COM-Future Communication Infrastructure Network	Avionic Technology for the new Airport Data Link (AEROMACS) integrated with ATN/OSI and ATN/IPS	Optional and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Civil Aircraft (CC)/ Aircraft – Data radio	A/C-98	POI-0015-COM-Future Communication Infrastructure Network	Avionic Technology for New A/G datalink using ATN/IPS over L-band	Optional and Used

Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Civil Aircraft (CC)/ Aircraft – Data radio	A/C-31e	POI-0015-COM-Future Communication Infrastructure Network	Airborne part of A/G datalink exchange via ATN/IPS over VDLM2	Optional and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Civil Aircraft (CC)/ Aircraft – Data radio	A/C-33a	POI-0015-COM-Future Communication Infrastructure Network	Class B SATCOM	Optional and Used
Technological Solution PJ.14-W2-77 – Future Communications Infrastructure	Civil Aircraft (CC)/ Aircraft – Data radio	A/C-33b	POI-0015-COM-Future Communication Infrastructure Network	A/C SATCOM Long Term	Optional and Used

Table 1: SESAR Solution PJ14-W2-77 Functional Blocks/roles & Enablers

These Standards for FCI Architecture are referenced in MEGA:

- STD-039 — EUROCAE Standards for D-TAXI A/G datalink using Multilink
- STD-040 — ICAO Standards for A/G datalink using Multilink
- AGDLS-TECH-2 — New ICAO Standard for ATN / IPS (ICAO Doc 9896)
- LISP Protocol – Locator/Identifier Separation Protocol

4 Background and validation process

4.1 SESAR background projects

PJ.14-W2-77 has continued and completed, with TRL6 target maturity level, the work initiated and performed by PJ14.02.04 in SESAR 2020 Wave 1 on the Future Communication Infrastructure, which had developed and validated the FCI Solution up to the TRL4 maturity.

The Wave 1 PJ14.02.04 solution was itself the extension and the completion of the work produced within SESAR 1 by P15.02.04 (FCI and Multilink).

4.2 Validation Process

The main objective of PJ.14-W2-77 validation activities has been to assess the compliance of the FCI Mobility & Multilink solution to the technical requirements defined by the Solution 77 Technical Specifications/Interface Requirements Specifications (deliverable D5.1.120), which trace up to the operational requirements defined in the FCI Concept of Operation (deliverable D5.1.610).

The technology maturity aimed to be achieved in this solution is TRL6.

Five Validation Objectives have been defined in the Technological Validation Plan (deliverable D5.1.200)

- **ATN-IPS connectivity, mobility, multilink and performance:** Validate IPS connectivity, mobility and multilink (Including application layer security with DTLS) supporting ATN B1 and ATS B2 services through different representative air-ground access networks complying with the applicable performance requirements. Assess achievable performance margins in order to provide substantiated inputs to the future B3 services definition
- **ATN-IPS performance to support Air-Ground SWIM:** Validate IPS connectivity to support Air-Ground safety SWIM (purple profile) services through different Access Networks (SATCOM, LDACS, AeroMACS, IP VDLm2)
- **ATN-OSI backwards compatibility:** Validate backwards compatibility towards ATN-OSI infrastructure, supporting ATN-B1 and ATS-B2 services
- **FCI Security Infrastructure:** Verify that the foreseen FCI Security Infrastructure is robust towards different types of cyber-attacks (DDoS attack, MITM)
- **FCI scalability and performance:** Verify the ability of FCI to scale up and scale down the number of Aircraft and ground systems

and five Validation Exercises have been conducted and documented in the Technological Validation Report (TVLR, deliverable D5.1.400)

- **EXE1** FCI Multi-Link and IPS Mobility Management
- **EXE2** FCI IPS Data Connectivity and QoS Management

- **EXE3** Interoperability with OSI Domains
- **EXE4** Secure FCI connectivity
- **EXE5** FCI Scalability

All validation tests have been conducted using a WAN geographically distributed test setup, comprising several different laboratories, interconnected by ground-ground VPNs, as shown in Figure 2

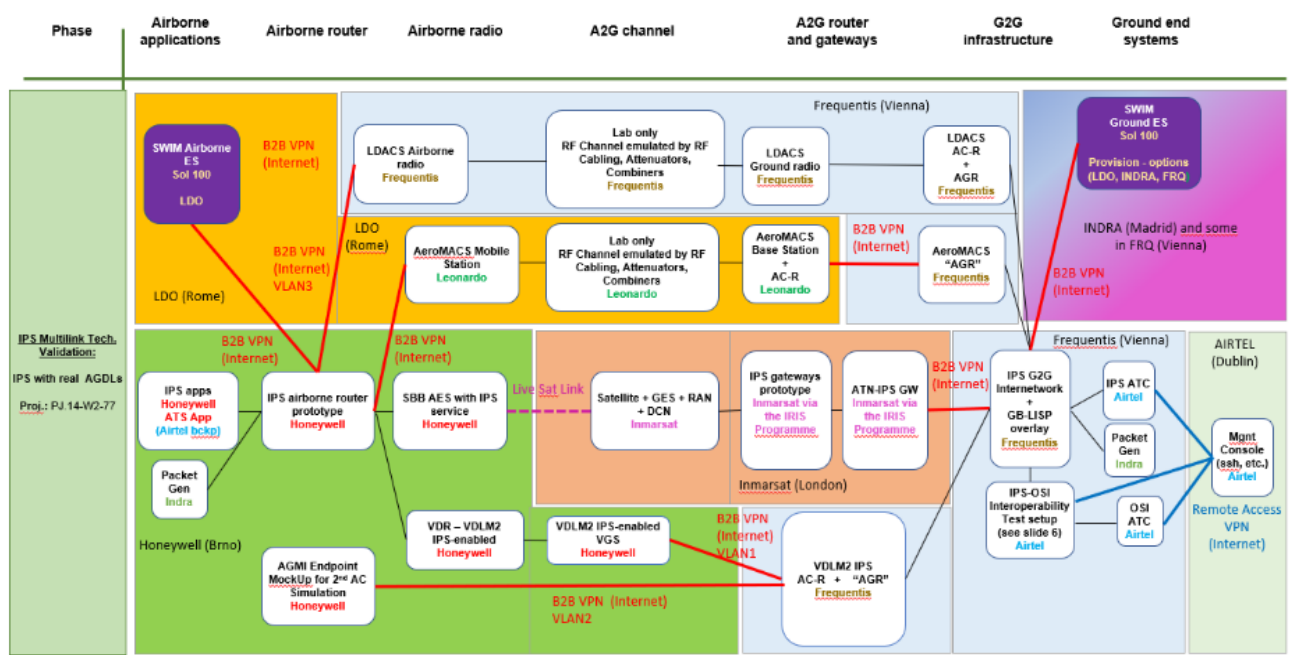


Figure 2 FCI validation platform for the technical validation exercises

The four Air-Ground Datalink Technologies defined in the FCI Operational Concept, namely LDACS, SATCOM Long Term, AeroMACS and IP VDLm2, have all been integrated in the validation test setup, including use of live OTA connections (Satcom service provided by the PJ14-W2-107 solution and the Iris Programme).

5 Results and performance achievements

All PJ.14-W2-77 “FCI Services” foreseen tasks have been successfully completed.

The main PJ.14-W2-77 results and achievements are summarized in the following sections, which cover the different Tasks/Deliverables produced in the project.

In particular, results on the validation of the network performances, with respect to the Safety and Performance requirements identified as reference for compliance in both the FCI Concept of Operation and the TS/IRS, are covered in section 5.3.

5.1 FCI Operational Concept

The original FCI Operational Concept was further developed in two rounds. The final version [D5.1.610] already takes into account the experiences gained through the time including the validation exercises.

Solution 77 was focused implementing the network infrastructure part. It is out of scope to develop the human interfaces for operators, controllers, or pilots. This is intentionally left for other projects.

5.2 FCI Deployment and Transition Strategy

The deployment and transition strategy is mainly documented in the Deployment and Transition Strategy [D5.1.800] and the CBAT [D5.1.500]. Please, note that the deployment plans are still under discussion and might change even in the near future.

There is a detailed proposal through continuation projects to reach TRL8 in the next few years.

5.3 FCI Technical Specifications

Future Communication Infrastructure (FCI) requirements have been inherited from the Wave 1 PJ14.02.04 work, revised and extended to cover all aspects required by a TRL6 maturity and to drive the validations (deliverable D5.1.110 Initial TS/IRS) and finally consolidated with all feedback coming from the validation results in the of the Final TS/IRS (deliverable [D5.1.120]).

The following categories of requirements have been consolidated:

- Functional
- Interface
- Interoperability
- Performance
- Safety
- Security

The FCI System Architectural Model in EATMA has been updated to account for validations feedback and the traceability with TS/IRS requirements has been completed, with use cases consolidation and traceability among requirements and architectural elements.

5.4 FCI Development, Integration and Validation at TRL6

The validation exercises were successfully completed. No blocking factors were found. The results are documented in the validation report [D5.1.400]. There are some identified improvements in the validation report that will be channeled into the standardization and continuation projects with higher target maturity.

5.5 Transversal Activities

Transversal activities were focusing on performing the Security assessment (Part III of the Initial TS/IRS [D5.1.110]) and the Safety assessment (Part II of the Final TS/IRS [D5.1.120]) and on creating a cost-benefit analysis for deploying this solution in the future. The results are documented in [D5.1.500].

The standardization and certification roadmaps are currently discussed in various organizations. Proposals exist, but there are still under continuous revisions.

5.6 Support to Standardization

The work in Solution 77 has a significant impact on ICAO and RTCA/EUROCAE proposals. These are not fully finished yet. The following future improvements in ATN/IPS standards are expected based on the Solution 77 results:

- ICAO Doc 9896 – AGMI protocol, multi-link mobility reference architecture, GB-LISP specification (high-level),
 - Solution 77 validation results to be reported back to ICAO WG-I
- EUROCAE ED-262A – Detailed GB-LISP profiling, also discussed in ICAO WG-I and its Mobility SG. It was maintained in an ICAO Work Paper, but it will be incorporated into ED-262A in the near future.
- EUROCAE ATN/IPS upcoming MASPS – contributions on security and performance verification, feasibility checks on generic requirements
- IETF LISP specifications moving to Standards Track – significant motivation and influence in cooperation with Cisco and Google to move it forwards. First round completed in October 2020 (see <https://datatracker.ietf.org/wg/lisp/documents/>).
 - Additional rounds are expected in the future to provide a full coverage of all GB-LISP features (for example Publish/Subscribe).
- IETF specification on GB-LISP – a draft document is maintained (see <https://datatracker.ietf.org/doc/draft-haindl-lisp-gb-atn/>), most likely to be converted into an Informational RFC once ED-262A is completed.

Additional standardizations and updates might become necessary as continuation projects further improve the FCI solution towards maturity levels beyond TRL6. However, the baseline set of standards are quite mature, some of them are already approved, or well prepared for a near future approval. Air-ground interoperability is already well covered. Ground-ground interoperability between access network providers and mobility backbone providers is specified. Ground users connection to mobility backbone providers is defined. Interworking between multiple mobility backbone providers is lacking the necessary details, this will be targeted by future continuation projects. However, this is not crucial to start using the FCI, it is more like a further optimization enabler of the business model.

6 Recommendations and Additional activities

Detailed technical recommendations for future improvements are described in two deliverables: Final TS/IRS [D5.1.120] and Technological Validation Report [D5.1.400]. Among them, the following are a few:

- Test further the performances of LDACS, AeroMACS and IP VDLm2 in On The Air environment (e.g., Digital Sky Demonstrators)
- Test further the performances under simulated large-scale congestion conditions that might not happen in the flight tests
- In the ICAO WG-I Mobility Subgroup to discuss further the topic of the Link DEGRADED status, its pros and cons and to evaluate the complexity of managing this additional information on both air and ground side
- Update the AGMI protocol specification to handle situations in which the AGMI Requests cannot be sent or delivered to the AGMI Ground Proxy
- Investigate further federation implementation guidance, for cases where the CSPs interfacing to each other are both using the LISP technology
- Radio link retransmission timing and signalling should be tuned with the multilink environment. For example, the retransmission timers at link layer could be more aggressive in presence of a multilink scenario, compared to the case where a single link only is available; a faster detection of a link loss would allow the Airborne IPS System to react more quickly than with a single link, re-routing the user traffic over an alternative radio link. The radio link should signal the Airborne IPS System the need to try another radio link early enough to avoid long delays that can violate the Continuity requirements (e.g. the Link DEGRADED state could serve this purpose)
- Observe the progress of proposed Next-Generation AeroMACS and find some ways to test this new technology in the FCI environment
- Identify and analyse the additional requirements collected by ICAO WG-I and EUROCAE WG-108 for the FCI solution in the last two years (i.e. after the Solution 77 TS/IRS was produced)
- Implement an automated local policy override example application for controlling the GGBR. Test and document the performance of such a prototype
- Concerning SWIM PP user plane, whatever system is used on the aircraft to host the SWIM PP applications, in order for the SWIM user plane data to be downlinked by the Airborne Router, the packet size shall have to be limited to the maximum MTU allowed by the IPS Standard of 1280 bytes

- Discuss with the IETF LISP Workgroup adding a mapping system capability in the protocol, for automatic removal of all Sub-MNPs associated to one MNP, when the MNP itself is removed, instead of requiring one dedicated removal request for each Sub-MNP as it is now
- A recommendation for the IPS standardization is also that Dialogue Service Retransmission Timer is set to a compliant to than the RCP60 requirement, in order to account for at least 1 ATNPKT retransmission and still be able to meet the RCP60 required performance, if Dialogue Service is maintained for ATS-B3 applications

Although the solution is reaching now TRL6, further improvements are needed to reach TRL7, TRL8, and finally TRL9. The major generic items are:

- Align with the latest modifications on AGMI and GB-LISP proposed in ICAO WG-I for Doc 9896.
- Move from prototype development to full ED-109A/ED-153 software assurance
- Add further performance improvements in implementations
- Extend support for high-availability configurations
- Complete the management support features for operations automation
- Tune the network configuration parameters based on flight trials

An application for a continuation project has been prepared for SESAR 3 for certain improvements, which are beneficial for reaching TRL7.

The next major step is organizing realistic flight trials with test aircraft. Proposals are under preparations. This could target reaching TRL8 through an intermediate TRL7 step.

It would be also recommended to do large scale testing using realistic data link traffic simulation on a full population of European flights and create a capacity design guidance document based on the results. That would give important input for provisioning production systems for TRL9.

7 Actors impacted by the SESAR Solution

The following actors may be impacted by the deployment of the FCI capability, addressed in PJ.14-W2-77:

- Airspace Users (AUs)
- Air Navigation Service Providers (ANSPs)
- Airport Operators (AOs)
- Communication Service Providers (CSPs)
- Network Managers (NMs)
- Airworthiness Authorities (EASA, FAA)
- Standardisation Bodies (ICAO, EUROCAE, RTCA, AEEC)
- Public Network Operators (PNOs)
- Airframers
- Avionics Suppliers

8 Impact on Aircraft System

FCI relies on new software functions in the aircraft avionics systems. The Airborne IPS System has to be deployed in the aircraft implementing e.g., IPv6 protocol stack, updates Dialogue Service functions, cyber security functions, multilink functions, AGMI protocol, CIRI protocol, etc. as defined by the updated ICAO Doc 9896 Ed.3, ARINC 858 or EUROCAE ED-262. This might require hardware changes or not, depending on the capabilities of the avionics components that are in charge of the Safety Services communication management (e.g., a CMU – Communication Management Unit).

Specific data link technologies might also need software updates, for example:

- Updated SATCOM service with ATN/IPS support
- Updated VDLm2 solution with ATN/IPS support

AeroMACS is not installed currently on any European aircraft. A next generation AeroMACS is under consideration, but it is still not clear when it would be available. This could be based on 4G/5G technologies, so it would have more chances to be accepted by the stakeholders.

The AEEC specified new CIRI¹ protocol should be implemented on the airborne IPS system and on all IPS-enabled Airborne Radios.

Interoperability testing and certification would be needed for example on (the list is not exhaustive):

- Dialogue Service implementations between aircraft and ground end system operators
- Cyber Security implementations between aircraft and ground end system operators
- AGMI protocol implementations between aircraft and access network operators
- CIRI protocol implementations between the Airborne IPS System and the IPS-enabled Airborne Radios

Please, note that the impact has certain limitations to enable an easier migration. For example, the OSI end systems can be integrated without any changes, since the solution will accommodate ground OSI/IPS gateways. For native IPS applications support for IPv6 is required, so some systems need to be enabled for the usage of IPv6.

For more details on the business impact, please see the CBA document [D5.1.500].

¹ Common IPS Radio Interface

9 Impact on Ground Systems

The ground systems solution was design to minimize the impact on existing installations and to support COTS equipment as much as possible. End systems do not need any software modifications, even if they use ATN/OSI. An OSI/IPS gateway can be provided as part of the FCI solution. For native IP applications support for IPv6 is required, so some systems need to be enabled for the usage of IPv6.

The access network provider has to implement the AGMI Ground Proxy functionality:

- Terminate and answer AGMI Requests originated by the aircraft
- Integrate with the GB-LISP Air/Ground Boundary Router (AGBR) logical node

The access network provider has to support one of the following internal routing protocols to reuse the developed FCI solution without major changes:

- OSPFv3 as an IF3² implementation
- PMIPv6 as an IF3 implementation
- Optional, IF10² implementation using gRPC³ transport

Other integrations might be possible on IF3, but those are not covered and validated by Solution 77.

The access network provider can implement the AGMI Ground Proxy and GB-LISP on a COTS router. The full GB-LISP stack is available commercially at TRL9 maturity. The AGMI Ground Proxy is currently a prototype at TRL6, but it would become a commercial offering at TRL7 in the near future. It will then further evolve into TRL8 and then TRL9 in a reasonable timeframe.

The GB-LISP AGBR might be owned and managed by the access network provider. The commercial GB-LISP stack for the AGBR role is at TRL9. Alternative open source implementations would need functional extensions to reach TRL6. The AGBR should provide an API for the AGMI Ground Proxy to control the LISP stack for the necessary GB-LISP functions. Alternatively, the AGMI Ground Proxy might implement an independent LISP stack and use the separate IF6+² concept described in the technical specifications [D5.1.120].

The global mobility service provider could install COTS routers to implement the GB-LISP functions including the Mapping System (MS/MR). These are available at TRL9. It would be also possible to implement such functions brand new or improving existing open source LISP implementations. However, the open source implementations are only at TRL5 and they would need functional extensions.

The ground user might manage its own GGBR as a COTS router or outsource this function to a CSP (global mobility backbone provider). The commercial GB-LISP stack for the GGBR role is at TRL9. Alternative open source implementations would need functional extensions to reach TRL6.

² See D5.1.120 for details on FCI Interfaces

³ gRPC is a Development Framework based on the Remote Procedure Calls protocol

Please note, that all AGMI and GB-LISP functions are documented in enough details publicly that an independent green-field implementation would be possible. New entrants as suppliers for FCI solutions could reuse other supplier components, improve open source implementations, or create their own implementations for scratch.

For more details on the business impact, please see the CBA document [D5.1.500].

10 Regulatory Framework Considerations

For the aircraft systems the standardization by ICAO, RTCA/EUROCAE, SAE/AEEC, IETF might provide enough input for proper interoperability. No specific need was identified in that sense for new regulations.

However, the transition from older data link solution to ATN/IPS might need some additional motivation from regulation. From Safety perspective, it would be beneficial to prescribe a multi-link data link solution by legislation.

11 Standardization Framework Considerations

The standardization framework is already established, and a significant progress was already achieved. The standardization is split into various areas:

- ICAO: high-level multi-link mobility architecture, minimum interoperability requirements between aircraft and ground, OSI interworking, mainly by Doc 9896, but some aspects, such as security, would be covered by other ICAO documents
- SAE/AEEC: interoperability between devices on the aircraft, for example the CIRI protocol
- RTCA/EUROCAE: detailed ATN/IPS profiles, GB-LISP profiles, MASPS, potentially other future requirements and guidance for ground systems, updates on generic performance requirements such as RTCP/RSTP, extensions to multi-link scenarios, introduction of new performance baselines as needed
- IETF: LISP protocol related standards, explanation of the usage of LISP for aviation purposes
- ITU-T: reuse existing recommendations for the access network and global mobility backbone providers when feasible, references by the other verticals specific standards

Please, note that the GB-LISP profile might be adapted or extended for other verticals where multi-link mobility would be beneficial. The common aspects of those verticals should be covered by IETF specifications.

12 Solution Data pack

The Data pack for this Solution includes the following documents:

Code	Deliverable	Issue	Edition Date
D5.1.120	D5.1.120 - PJ.14-W2-77 TRL6 Final TS/IRS – FCI services Part I (Reqs)	01.01.01	05/12/2022
D5.1.120	D5.1.120 - PJ.14-W2-77 TRL6 Final TS/IRS – FCI services Part II (SAR)	01.01.01	05/12/2022
D5.1.400	D5.1.400 - PJ.14-W2-77 TRL6 TVALR – FCI services	01.00.02	01/12/2022
D5.1.500	D5.1.500 - PJ.14-W2-77 TRL6 CBAT – FCI services	01.00.01	05/12/2022
D5.1.610	D5.1.610 - PJ14-W2-77 TRL6 Overall Concept of Operation FCI Services – Update	01.00.00	30/09/2022

The following additional PMP deliverables have been produced:

Code	Deliverable	Issue	Edition Date
D5.1.600	Overall Concept of Operation FCI Services	01.01.00	14/12/2020
D5.1.110	Initial TS-IRS FCI Services - Part I	01.00.03	30/07/2021
D5.1.110 - Attachment ICD	FCI IF6 - ATN IPS AG-R to GB-LISP Interface Control Document	01.00.01	19/07/2021
D5.1.120 - Attachment ICD	FCI IF6 - ATN IPS AG-R to GB-LISP Interface Control Document	01.01.00	02/11/2022
D5.1.110	Initial TS-IRS FCI Services - Part IIIA – SeAR / Low Risk Security Material	01.00.00	15/12/2021
D5.1.110	Initial TS-IRS FCI Services - Part IIIB – SeAR / Medium Risk Security Material	01.00.00	16/12/2021
D5.1.110	Initial TS-IRS FCI Services - Part IIIC – SeAR / High Risk Security Material	01.00.00	16/12/2021
D5.1.200	Technical Validation Plan (TVALP) - Part I	01.01.00	17/11/2021

D5.1.200	Technical Validation Plan (TVALP) - Part II - Safety Assessment Plan	01.00.01	27/01/2022
D5.1.200	Technical Validation Plan (TVALP) - Part III - Security Assessment Plan	01.00.00	24/09/2021
D5.1.310	AN FCI Services EXE1	01.00.00	04/07/2022
D5.1.320	AN FCI Services EXE2	01.00.00	04/07/2022
D5.1.330	AN FCI Services EXE3	01.00.00	12/04/2022
D5.1.340	AN FCI Services EXE4	01.00.00	04/07/2022
D5.1.350	AN FCI Services EXE5- FCI Scalability	01.00.00	12/04/2022
D5.1.800	Deployment and Transition Strategy FCI Services	01.00.00	30/08/2022
D5.1.910	Global Standardization, Dissemination and Harmonization Activities Report 2020	01.00.00	22/12/2020
D5.1.920	Global Standardization, Dissemination and Harmonization Activities Report 2021	01.00.00	23/12/2021
D5.1.930	Global Standardization, Dissemination and Harmonization Activities Report 2022	01.00.00	30/11/2022
D5.1.120	TS/IRS - Part II - Safety Assessment Report	01.00.00	15/10/2022

These additional PMP deliverables are not part of the Solution Data Pack available for the general public, as per SESAR 2020 process. These documents might include sensitive information that needs to be kept under control.

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