ESSP
EUROPEAN SATELLITE SERVICES PROVIDER

Iris

Service Definition Document

Issue 2.0

DOCUMENT CHANGE RECORD

Revision	Date	Summary of changes
1.0	14/07/2023	First release of the document
2.0	04/04/2025	Iris network upgrade for traffic segregation Iris Service Area clarification Clarification related to the support of ATN B1 and ATS B2 Context Management Clarifications related to the States where Single European Sky (SES) regulation applies Reference updates to applicable Regulation Clarifications related to the service outage / degradation notifications and NOTAM proposal Clarifications of the boundaries of the Iris system Update of Viasat Geostationary segment Replacement of references to Inmarsat by Viasat

Table of Content

Table of Figures

Table of Tables

1 EXECUTIVE SUMMARY

The Iris Service is a satellite-based air–ground data communication service for Air Traffic Services (ATS). It is tailored for Aviation domain. The Iris Service is compliant with ICAO (International Civil Aviation Organization) Standards and Recommended Practices [RD-4] aviation requirements for operational Context Management (CM), Controller Pilot Data Link Communications (CPDLC) and aircraft-to-Air Navigation Service Providers surveillance-related information (ADS-C) as specified in the ATN Baseline 1 and ATS Baseline 2 Safety and Performance requirements standards [RD-6] and [RD-7] and then with the Commission Implementing Regulation (EU) 2017/373 [RD-2] , under the conditions of use and with the Service limitations described in this document.

The Iris Service is provided by the European Satellite Services Provider (ESSP) SAS (hereinafter referred to as ESSP) as the Iris Service Provider (ISP). The ESSP is granted an ATM/ATS Service Provider Organizational Approval (AOA) by European Union Aviation Safety Agency (EASA) for the provision of Iris Service, considered as an Aeronautical Mobile Satellite (Route) Service (AMS(R)S). The Iris Service utilizes Viasat[1] (former Inmarsat) geostationary satellite constellation and supporting ground stations and networks, providing global coverage and high data rate L-band communication to aircraft.

The Iris Service is accessible through a contractual agreement between the corresponding Organization (i.e. ANSP) and the Iris Service Provider (i.e. ESSP).

The "Iris Service Definition Document" (hereinafter referred to as "**Iris SDD**") provides information on the Iris Service.

[1] Inmarsat was acquired by Viasat, therefore, any reference in the legacy and related documentation in the context of the ISP's Iris Service needs to be understood as Viasat+Inmarsat, as Viasat has completed the acquisition of Inmarsat.

2 INTRODUCTION

2.1 Purpose and Scope of the Document

The purpose of this document is to present the scope of the Iris Service provided by ESSP as the Iris Service Provider (ISP) and to publish the conditions of access to the Service in an open and transparent manner.

This document provides the characteristics of the Service offered to users highlighting the Service performance and limitations as well as a description of the Iris System architecture and information on the established technical and organizational framework for the provision of the Service.

The Iris SDD is intended to be of use to Air Navigation Service Providers (ANSPs), airlines, operators and the end users of the Iris Service.

This document will be updated in the future as required in order to reflect changes and improvements to the Iris Service.

The Iris SDD comprises 7 main sections and 5 appendixes:

- Section 1 is an Executive Summary of the document.
- Section 2 (“Introduction”) defines the scope of the document and the relevant reference documentation. In addition, this Section clarifies the terms and conditions of Iris Service use, including liability, scope of the Iris Service and its intended lifetime.
- Section 3 (“Description of The Iris Service Provision framework”) gives a brief overview of the Iris Service, as well as its technical and organizational framework for Iris Service provision.
- Section 4 (“Iris System”) gives a brief overview of the Iris System, as well as connectivity information for end user.
- Section 5 (“Iris Airspace Users”) briefly presents the requirements for Airspace Users to get access to Iris as well as certification context.
- Section 6 (“Iris Service Performance”) describes the Service offered to users, the minimum performance and security specifications.
- Section 7 (“Iris Service Limitations”) describes the limitations of the Service and the corresponding side-effects.
- Appendix A presents the relevant definitions.
- Appendix B provides the list of acronyms used in the document.
- Appendix C presents the different RCP & RSP specifications and associated airspaces supported by the Iris Service.
- Appendix D provides the applicable requirements as defined in the standards.
- Appendix E provides a comparison analysis between the Iris commitments defined in this document and the observed performance for VDLm2.

2.2 Terms and conditions of use of the Iris Service, including liability

2.2.1 Scope of the Iris Service commitment

The Iris Service comprises the provision of satellite-based air-ground data communications to ANSPs with the specific commitments and subject to the Service limitations described here in the Iris SDD.

Only minimum performance characteristics are included in the commitment even though the users can usually experience a better performance. It is the objective that future versions of the Iris SDD will deliver, as a minimum, an equivalent or better level of performance. The Iris SDD will be updated whenever necessary, in such a way that the up-to-date performance offered is presented in the in-force Iris SDD.

Roadmaps anticipating future Service evolutions will be published regularly in the ESSP Iris User Support Website. Besides, the Iris Service evolutions will be consulted to users in advance in order to ensure a wide acceptance of its future evolutions.

2.2.2 Who Can Use the Iris Service?

The Iris Service is tailored for the Aviation domain, providing support of ATS data link services through SatCom technology. The relevant authority may determine specific requirements for the data link communication service based on the needs, regulations and standards of the domain, as well as certification procedures where/if necessary. It also requires signature of an Iris Working Agreement as specifically explained in Section 3.4 of the document, .

At the date of the Iris SDD publication, only the aviation domain has specific service requirements, as well as certification and individual authorization procedures developed and implemented.

In the EU[2] and EFTA (European Free Trade Association) States, the requirements that apply for implementing Data Link services based on the Iris Service are those set forth in the Single European Sky (SES) Regulation and the Commission Implementing Regulation (EU) 2017/373 [RD-2], and all related EU regulatory provisions applicable to the implementation of Data Link services. It is compulsory to comply with them in order to use the Iris Service as defined in this document.

The Iris signal additionally covers territories outside the EU. However, the authorization and safety oversight of the use of the Iris Service in civil aviation outside the EU falls within the sole responsibility of the respective third country. ESSP will support the operational use of Iris based Data Link services via the formalization of an Iris Working Agreement (IWA) provided that a level of safety at least equivalent to the Single European Sky requirements can be demonstrated by the interested parties on a case-by-case basis. The Iris Service Desk (see Section 3.3.2 for contact details) is available to clarify the steps to follow in this case.

The Iris Service is today provided within the Iris Service Area as defined in Appendix A (hereinafter referred to as the "Iris Service Area") to aviation users (hereinafter referred to as "Aviation Users") with the Service limitations described in Section 7, namely:

- Airspace users ("Airspace Users"), as defined in the Single European Sky (SES) framework Regulation[3], equipped with certified avionics as described in Section 5 and operating as general air traffic in accordance with instrument flight rules within the Iris Service Area under the management of an ANSP having with a valid Iris Working Agreement in force with ESSP;
- Organizations implementing Iris based Data Link services responsible for the operational use of the respective Data Link service:
    - Air Navigation Service Providers ("ANSPs") which have with a valid Iris Working Agreement in force as described in Section 3.4.

2.2.3 Obligations of the Users to Exercise Due Care

Iris is a complex technical system, and the Aviation Users also have certain obligations to exercise due care in using the Iris Service. Before any use of the Iris Service, all users should study this document in order to understand whether and how they can use the Service, as well as to familiarise themselves with the performance level and other aspects of the Service they can rely on.

In case of doubt, the Aviation Users and other parties should contact the Iris Service Desk (see Section 3.3.2 for contact details). Aviation Users may also contact their competent authority.

[2] i.e., territory in which the Treaty on the Functioning of the European Union applies, as well as airspace where the EU member states apply Regulation (EC) No 551/2004.

[3] Regulation (EC) No 1070/2009 (amending Regulation No 549/2004) of the European Parliament and of the Council of October 21, 2009, aiming at increasing the overall performance of the air traffic management system in Europe (SES II Package).

-DISCLAIMER OF LIABILITY-

ESSP's liability and its Subcontractors' liability towards each ANSP which with a valid Iris Working Agreement in force are defined in the corresponding Iris Working Agreement. Hence, this disclaimer of liability is not applicable to IWA Signatories.

ESSP, as Iris Services provider and its subcontractors (hereinafter the"Subcontractors"), as owners of Iris components of the Iris System or contributors to its functioning, expressly disclaim all warranties of any kind (whether expressed or implied) to any party, other than Aviation Users specified under 2.2.2 above, for any use of the Iris Service including, but not limited to the warranties regarding availability, continuity, latency, Service outage notification delay, reliability and fitness for a particular purpose or meeting the users´ requirements. No advice or information, whether oral or written, obtained by a user from ESSP and its Subcontractors shall create any such warranty.

By using the Iris Service, the Airspace Users agree that ESSP and its Subcontractors shall not be held responsible and/or liable for any type of damage, loss, claims, costs and expenses, resulting from the misuse (as defined herein) of, or the inability to use the Iris Service.

In any event, ESSP and its Subcontractors shall not be held liable for any indirect, special or consequential damages, including but not limited to, any loss of revenue or profit, any loss of use of property or right, any loss of clientele, any downtime cost, flight delays or cancellations, loss of goodwill or loss of reputation, loss resulting from business disruption or other intangible losses.

The liability of ESSP and its Subcontractors shall in any event not exceed the following cumulative liability caps:

- 100 000 euro in aggregate per year, per Airspace User;
- 1 million euro in aggregate per year for all Airspace Users within the Iris Service Area. ESSP will pay valid claims in a chronological order as they are made in writing by Airspace Users up to the 1 million euro liability cap.

Furthermore, no party shall be entitled to any claim against ESSP and its Subcontractors if the damage is the result, or the consequence, of any of the following events:

- Use of Iris Service beyond the conditions and limitations of use set forth in the Iris SDD, it being understood that the use of Iris Service by users other than Aviation Users constitutes a use beyond such conditions and limitations, or
- Use of equipment or receivers which are
  - not fully compliant as described in Section 5 or
  - not certified or approved by the relevant competent authority or
  - malfunctioning, or
- Use of the Iris Service without required airworthiness authorisation, or
- Use of the Iris Service in an area not managed by an ANSP with a valid Iris Working Agreement in force or use within this area beyond the ANSP conditions and/or limitations, or
- In case of a Force Majeure event.

2.3 Iris Service Scope

The Iris Service is an Aeronautical Mobile Satellite (Route) Service (AMS(R)S) supporting data communication services for operational ATN B1 / ATS B2 Context Management (CM) and Controller Pilot Data Link Communications (CPDLC) and ATS

B2 aircraft-to-Air Navigation Service Providers surveillance-related information (ADS-C). Further details are provided in Section 3.

The Iris Service has the boundary on the ground side between the Communications Network Provider (CNP) and the Air Navigation Service Provider (ANSP), and the boundary on the air side between the Satellite Service Provider (SSP) and the Aircraft Earth Station (AES). Further details are provided in Section 4.

The ESSP is the current Iris Service Provider, certified according to the Single European Sky (SES) Regulation as Air Navigation Service Provider.

2.4 Iris Lifetime

The Iris Service is intended to be provided for a minimum period of three years, as from its first declaration date, with at least a two-month advance notice of termination unless Force Majeure event otherwise.

2.5 Reference Documents

RD	Document Title
[RD-1]	Commission Implementing Regulation (EU) 2023/1770 of 12 September 2023 laying down provisions on aircraft equipment required for the use of the Single European Sky airspace and operating rules related to the use of the Single European Sky airspace and repealing Regulation (EC) No 29/2009 and Implementing Regulations (EU) No 1206/2011, (EU) No 1207/2011 and (EU) No 1079/2012 (as amended)
[RD-2]	Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight (as amended)
[RD-3]	Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the Service Provision Regulation) (as amended)[4]
[RD-4]	ICAO Standards and Recommended Practices (SARPs) Annex 10 Volume III, Communication Systems Part I – Digital Data Communication Systems - Second edition July 2007 including up to and including Amendment no. 92 (22/7/24) & Corrigendum no. 1 dated 9/10/24
[RD-5]	ICAO Standards and Recommended Practices (SARPs) Annex 10 Volume II, Communication Procedures including those with PANS status (Seventh edition July 2016 including up to and including Amendment no. 93 (20/7/24)
[RD-6]	EUROCAE ED-120/RTCA DO-290 Safety and Performance Requirements Standard for Air Traffic Data Link Services in Continental Airspace, April 2004
[RD-7]	EUROCAE ED-228A/RTCA DO-350A Safety and Performance Standard for Baseline 2 ATS Data Communications, March 2016
[RD-8]	EUROCAE ED-242C/RTCA DO-343D Minimum Aviation System Performance Standard for AMS(R)S data and voice communications supporting Required Communications Performance (RCP) and Required Surveillance Performance (RSP)
[RD-9]	EUROCAE ED-243C / RTCA DO-262F Minimum Operational Performance Standard for Avionics supporting Next Generation Satellite Systems (NGSS)
[RD-10]	EUR NSAP Address Registry, in force EUR Doc 028

[4] This regulation is repealed by the Reg (EU) 2024/2803 [RD-24], but the corresponding implementing rules are not yet available to comply with the binding regulation

RD	Document Title
[RD-11]	EUROCAE ED-228B / RTCA DO-350B Safety and Performance Standard for Baseline 2 ATS Data Communications
[RD-12]	ICAO Draft Updated AMS(R)S SARPS, in preparation by the ICAO CP DCIWG 2021.
[RD-13]	Eurocontrol Link 2000+ document "Interpretation of EUROCAE ED-120/RTCA DO-290 Performance Requirements" (LINK 2000+/LIT/ED120/PERF), Version 1.3, 2007
[RD-14]	ICAO Doc 9880, Manual on detailed specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Edition 2
[RD-15]	ICAO Doc 9705 Manual of technical provisions for Aeronautical Telecommunication Network (ATN), Edition 2
[RD-16]	EUROCAE ED-229A/RTCA DO-351A Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard)
[RD-17]	Certification Specifications and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance (CS-ACNS), Issue 5
[RD-18]	EUROCAE ED-231A/RTCA 353A - Interoperability Requirements Standard for Baseline 2 ATS Data Communications, ATN Baseline 1 Accommodation (ATN Baseline 1 - Baseline 2 Interop Standard)
[RD-19]	EUROCAE ED-230A/RTCA 352A Interoperability Requirements Standard for Baseline 2 ATS Data Communications and FANS 1/A Accommodation (FANS 1/A – Baseline 2 Interop Standard)
[RD-20]	Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (as amended)[5]
[RD-21]	Regulation (EC) no 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and (EC) No 552/2004 in order to improve the performance and sustainability of the European aviation system (as amended)
[RD-22]	Regulation (EC) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91: article 139 & Annex VIII (as amended)
[RD-23]	Commission Delegated Regulation (EU) 2023/1768 of 14 July 2023 laying down detailed rules for the certification and declaration of air traffic management/air navigation services systems and air traffic management/air navigation services constituents (as amended)
[RD-24]	Regulation (EU) 2024/2803 of the European Parliament and of the Council of 23 October 2024 on the implementation of the Single European Sky (recast)

[5] This regulation is repealed by the Reg (EU) 2024/2803 [RD-24], but the corresponding implementing rules are not yet available to comply with the binding regulation

3 DESCRIPTION OF THE IRIS SERVICE PROVISION FRAMEWORK

3.1 Objective of the Iris Service

The main objective of the Iris Service is to provide data communication services to support operational ATN B1 / ATS B2 CM and CPDLC and ATS B2 ADS-C.

In accordance with the Commission Implementing Regulation (EU) 2017/373 [RD-2], the Iris Service is provided within the Iris Service Area (as defined in Appendix A). The Iris Service enables supporting:

- The RCP standard of Required Communications Performance (RCP) for two-way, bidirectional, Context Management (CM) and Controller Pilot Data Link Communications (CPDLC) as specified in the ED-120 / DO-290 [RD-6],
- The RCP130 standard of Required Communications Performance (RCP) for two-way, bidirectional, Context Management (CM) and Controller Pilot Data Link Communications (CPDLC) as specified in the ED-228A / DO-350A [RD-7] and referred in the ED-242C / DO-343D [RD-8], and
- The RSP160 standard of Required Surveillance Performance (RSP)[6] for one-way aircraft-to-Air Navigation Service Provider surveillance-related information as specified in the ED-228A / DO-350A [RD-7] and referred in the ED-242C / DO-343D [RD-8].

The reader is invited to read Appendix C for more details about the ATS Data Link services and associated ATM operations along with the corresponding airspaces supported by the Iris Service.

3.2 Iris Service specification baseline

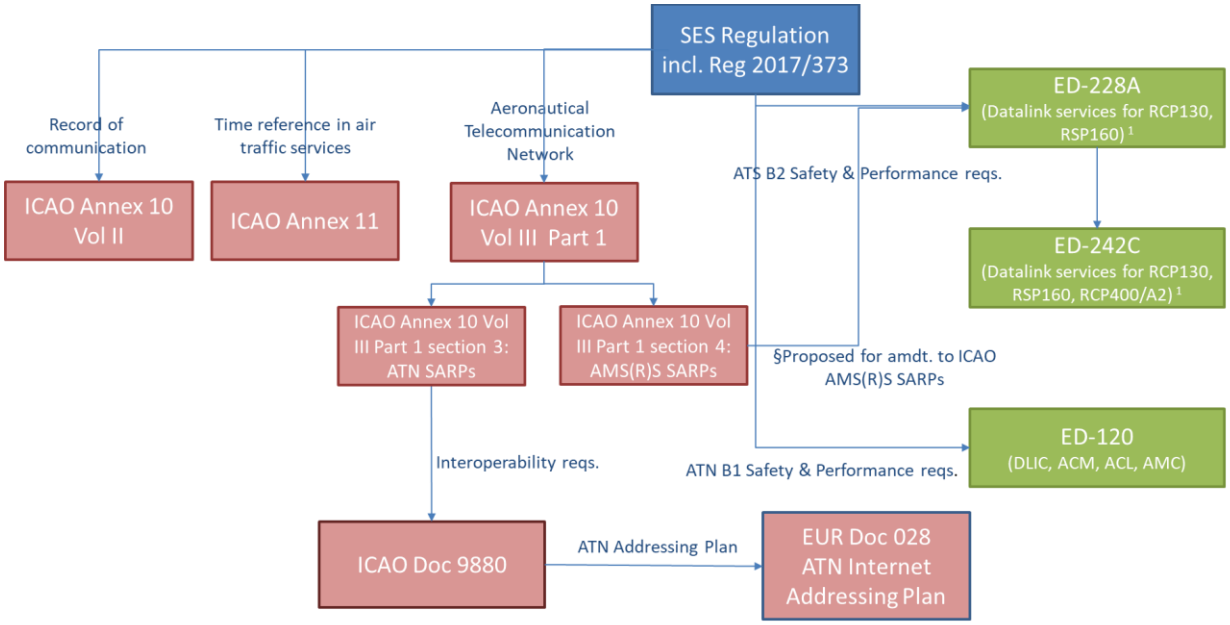
The Iris Service is in compliance with the Interoperability requirements laid down in[RD-2], [RD-21] and [RD-22] that apply to ESSP as an ANSP for the provision of AMS(R)S data COM services, with the limitations described in this document, and, by extension, with the applicable requirements defined in:

- ICAO Annex 10 Volume III Part 1 [RD-4] and in particular:
    - In ICAO AMS(R)S SARPs (chapter 4) requirements on data communications amended by the proposal for amendment (PfA) to ICAO AMS(R)S SARPs [RD-12] with the new requirements applicable to SatCom systems which enable support of operational ATN B1 / ATS B2 Context Management (CM) and Controller Pilot Data Link Communications (CPDLC) and ATS B2 aircraft-to-Air Navigation Service Providers surveillance-related information (ADS-C) (hereinafter referred to as ATN/OSI SatCom systems).
    - In ICAO ATN SARPs (chapter 3) requirements on ATN/OSI-based intermediate systems. The ICAO Doc 9880 (ICAO ATN Manual[RD-14] which supersedes the ICAO Doc 9705 [RD-15]) is used as means of compliance to these applicable SARPs and the EUR Doc 028 [RD-10] as the reference for the common ATN Internet addressing plan established in Europe. The ICAO Doc 9880 includes the interoperability requirements on the Internet Communication Service (ICS).
- ED-120 / DO-290 [RD-6] which specifies the performance and safety requirements applicable for ATN B1 Data Link services.
- ED-228A / DO-350A [RD-7] which specifies the performance and safety requirements applicable for RCP130 which enables support of ATS B2 Data Link services. In addition, the performance and safety requirements applicable for RSP160 are also considered.
- ED-242C / DO-343D [RD-8] which contains the Minimum Aviation System Performance Standards (MASPS) for AMS(R)S Data and Voice Communications Supporting Required Communications Performance (RCP) and

[6] In accordance with the ED-242C [RD-8] and the ICAO AMS(R)S SARPS which are in preparation by the ICAO CP DCIWG 2021 [RD-12], it is recognised that data link communications meeting the RSP standard are traditionally associated with the surveillance community. However, at the CSP level, there is no fundamental distinction between traditional two-way communications and the one-way surveillance applications. In addition, the ICAO AMS(R)S SARPS which are in preparation by the ICAO CP DCIWG 2021 gather requirements that the AMS(R)S service shall meet in order to support RCP130 and RSP160 based on the ED-228.

Required Surveillance Performance (RSP). Requirements for data communications which are the ones applicable to the Iris Service are referenced to and refined from the ED-228A / DO-350A [RD-7].

A schematic of the different applicable regulations and the applicable standards is provided in Figure 3-1.



Note 1: RSP160 is out of scope of Reg 2017/373 but supported by Iris service in order to enable 4D Trajectory Based Operation (4DTBO)

Figure 3-1: Schematic of the applicable regulatory provisions and applicable standards

The ICAO Annex 10 Volume III [RD-4] Part 1 chapter 4, the so-called ICAO AMS(R)S SARPs, currently does not include the provisions which apply to ATN/OSI SatCom.

In particular, the following ICAO Annex 10 Volume III [RD-4] provisions are applicable only to SatCom systems which enable support of ACARS services rather than ATN B1 and/or ATS B2 data link services and therefore they are not supported by the Iris Service:

- §4.6.2 Failure notification
- §4.6.4 Packet data service performance

Instead, Section 6.2 provides the applicable Iris Service outage notification and performance requirements.

Deviations with respect to the aforementioned requirement baseline are described in Section 7.

3.3 Iris Organizational Framework

3.3.1 Operational stakeholders and roles & responsibilities

Overall Stakeholder Organizations involved are provided in the table below.

Stakeholder Organization	Stakeholder Organization Name	Stakeholder Organization Description
ISP	ESSP acting as Iris Service Provider (ISP)	The ISP organization is responsible for delivering the certified end-to-end Iris Service to ANSP organizations. The European Satellite Service Provider (ESSP) is the current Iris Service Provider, certified according to the Single European Sky (SES) Regulation as Air

Stakeholder Organization	Stakeholder Organization Name	Stakeholder Organization Description
		Navigation Service Provider (ANSP). Hence, the ESSP is granted by EASA with the AOA certificate as a pan-European AMS(R)S Service Provider. EASA is responsible for the oversight of ESSP and all the involved Subcontractors in order to maintain the AOA certificate valid over time.
VST	Viasat	Viasat is the core operator of the overall Iris infrastructure. The Viasat service is part of the ISP's contracted services subject to EASA oversight.
CNP	Communication Network Provider(s)	The CNP is the operator of the ground-ground segment for the Iris Service. The CNP service is part of the ISP's contracted services subject to EASA oversight.
ANSP	Air Navigation Service Provider	ANSPs are the ISP Customers contracted with the ISP for the use of the Iris Service. The Iris Service Definition document is referenced in the IWA as the applicable document which provides the service commitments, terms, conditions, and characteristics of the Service.
AIRLINE	Airline End User	Airlines are "Aviation Users" of the ISP services. The airlines are responsible for obtaining all certificates requested for their operations involving the Iris Service.
EASA	EASA – Iris Competent Authority	EASA acts as the Competent Authority for the certification and continuous oversight of the ISP as pan-European AMS(R)S Service Provider. EASA ensures the required interactions and coordination with the National Competent Authorities (NCAs) once the ISP is certified guaranteeing the NCAs acknowledgement of the ISP certificate for use by the corresponding ANSPs.
NCA	National Competent Authority	NCAs act as the ANSP's Competent Authority for their ATS data link services which rely on the ISP certificate for the use of the Iris-based communication service.

Table 3-1: Iris-FOC (Final Operating Capability) Service Operational Stakeholders

3.3.2 How to Get Information on Iris and Iris Applications or Contact the Service Provider

Several websites and e-mail addresses are made available by ESSP and other organizations to provide detailed information on the Iris programme, the Service status and performance, as well as a set of user support tools. Table 3-2 below lists the main sources of information about Iris. ESSP does not manage some of these sources of information and, therefore cannot be held liable for their contents.

Topic	Organization	Web/contact details
Iris Programme ESA institutional information about the Iris Programme	ESA	https://www.esa.int/Applications/Telecommunications_Integrated_Applications/Iris_system_to_digitalise_airspace_goes_global
Iris Service Definition Document This document provides the Service specifications and the terms and the conditions of use of the Iris Service. It is a public document available in the ESSP Iris User Support website.	ESSP	https://satcom-dls-support.essp-sas.eu/documents/iris-service-sdd
Iris User Support Website Iris website with general information and applications. It is the ESSP dedicated service to users on Iris status and performance, system description, historical and real time services performances, forecasts, Iris applicable documentation, FAQs, etc.	ESSP	https://satcom-dls-support.essp-sas.eu/
Iris Service Desk Direct point of contact for any question, request or incident related with the Iris Service, its performance, and applications. The Iris Service Desk provides user support during Working Hours of Working Days[7].	ESSP	https://satcom-dls-support.essp-sas.eu/servicedesk
Iris Working Agreement (IWA) Formalization between ESSP and a specific organization for Data Link service implementation based on Iris Service.	ESSP	SatCom-DLS-WA@essp-sas.eu

Table 3-2: Where to find information about Iris

3.4 Iris Working Agreement

As foreseen in the Single European Sky (SES) regulatory requirements (see [RD-2] and [RD-3]), a working agreement, the Iris Working Agreement (IWA), is required to formalized between ESSP and the ANSP (referred to as Organization in this Section) using the Iris Service.

The overall objective of the Iris Working Agreement is to formalize the operational and technical baseline between ESSP and the specific Organization, as well as the required operational interfaces, in order to support the Iris Service.

The IWA includes:

- IWA contractual document: The agreement itself containing liability plus three annexes:
- IWA Annex 1: Including:

[7] Working Days mean calendar days excluding weekends and Spanish public holidays.

  - ESSP Iris Service Commitment as stated in this Iris SDD. It also includes reference to contingency coordination between ESSP and the Organization.
  - Service Level Agreement: Describing the key performance indicators (KPIs) and metrics based upon the commitments described in Section 6 as quantifiable measurements providing the means to control and assess the performance. It also describes, for each KPI and metric, the performance monitoring reporting scheme.

- IWA Annex 2: Including the "Service Arrangements" defined between the ESSP and the Organization with the purpose to enable the Organization to use the Iris Service, covering all identified applicable requirements, namely:
  - Service outage / degradation notifications and Iris NOTAM proposals: Outlining the terms and conditions under which the ESSP provides Iris outage / degradation notifications and Iris NOTAM proposals to the Organization based on the commitments described in Section 3.4.1.
  - Collaborative Decision Making (CDM): Defining clear working relationships between ESSP and the Organization describing the Organization involvement in the ESSP decision making process whenever any decision could lead to an impact on the Service provided.
  - Iris Data Recording: Describing the proposed means by which ESSP provides Iris data to the Organization. To this purpose, the detailed data, format, storing time, time to provide these data and procedures are described.
- IWA Annex 3: Service Charges.

The Iris users of other than aviation domains should refer to their sectorial laws and regulations.

All IWA related information or discussions are managed by ESSP through the dedicated focal points (see Section 3.3.2 for contact information).

The updated information concerning the Iris implementation status can be found in the Iris User Support Website.

3.4.1 Service outage and degradation notifications and NOTAM proposals

As mentioned in Section 3.2, the requirements on failure notifications stated in ICAO Annex 10 Volume III [RD-4] Part 1 §4.6.2 are applicable only to SatCom systems which enable support of ACARS services rather than ATN B1 and/or ATS B2 data link services and therefore, they are not supported by the Iris Service. Instead, the specifications of service outage notifications in Iris are referred to in the ED-228A / DO-350A [RD-7] and the ED-242C / DO-343D [RD-8] as well as the proposal for amendment (PfA) to ICAO AMS(R)S SARPs [RD-12] (see Section 6.2).

An outage is defined as a total loss of Service. Whereas a degradation is defined as any reduction in Service below nominal operation (i.e. worse than the commitments defined in Section 6.3). The outage and degradation are defined for a described period which corresponds with the start and finish time of such outage or degradation.

An unplanned Service outage /degradation is a Service outage for which no advance notification was provided to the appropriate parties.

An unplanned Service outage / degradation notification and a NOTAM proposal are sent not later than 5 minutes from when the outage / degradation is confirmed.

If an unplanned Service outage / degradation lasts longer than 2 hours, a Service outage / degradation notification and a NOTAM proposal update are sent, at two-hourly intervals.

A planned Service outage / degradation (excluding emergency maintenance activities) notification and a NOTAM proposal are also provided at least 24 hours[8] before the planned Service outage / degradation occurs.

For emergency maintenance activities with less than 24 hours advance notice, Service outage / degradation notifications and NOTAM proposals are provided as soon as reasonably possible.

[8] In accordance with the ICAO Draft updated AMS(R)S SARSPs [RD-12], the planned outage notification shall be provided with at least 24 hours of advance notice. Nevertheless, the notification of the associated planned activity will be provided well in advance in accordance with the CDM Service Arrangement.

When the Service outage / degradation is resolved, a Service outage / degradation notification and an Iris NOTAM proposal update on the resolution are provided.

The Service outage / degradation notifications and NOTAM proposals are only provided for Service outages / degradations that last more than 6 minutes.

The Service outage / degradation notifications are provided by email to the Organization's person of contact designated for that purpose. At least at the declaration of the Iris Service, and until specified differently in this document, the Iris NOTAM proposals are provided by email to the proper NOF's point of contact designated for that purpose by the Organization, and the content of the Iris NOTAM proposals[9] are the same as of the corresponding Service outage notifications (NOTAM Proposals are not provided upon a Service degradation).

The Service outage / degradation notifications and NOTAM proposals are provided on a 24H/7D basis.

3.4.2 Collaborative Decision Making

ESSP coordinates with the Organization its involvement in ESSP decision making whenever any decision (e.g. planned maintenance activities) could lead to an impact on the Service provided.

3.4.3 Iris Data Recording

ESSP provides the recorded and stored Iris data for purpose of accident/incident investigation or occurrence reporting related to the provision by the Organization of ATS Data Link services based on the Service under the conditions defined in the Iris Data Recording Service Arrangement.

[9] As long as the planned evolution is not specified in this document, the NOTAM proposal does not have a NOTAM format.

4 IRIS SYSTEM

4.1 Iris System architecture

The Iris System architecture is shown in Figure 4-1.

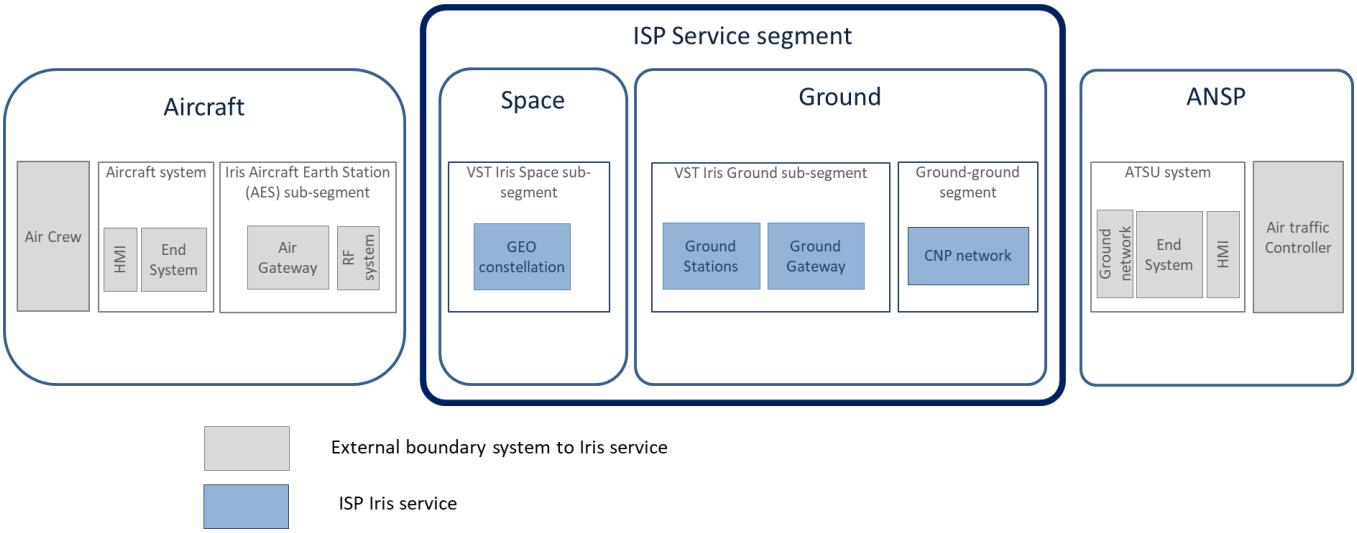


Figure 4-1: Iris System Architecture

In accordance with Figure 4-1, the ISP is not responsible of the contents of the CM, CPDLC or ADS-C messages or routing or transport protocol messages or any type of processing of thereof performed outside the ISP Service segment. Nevertheless, as part of the ISP's obligations as ANSP, the ISP may and/or will need to share the logs of these messages or any message conveyed through the Iris system to the Competent Authority (EASA/NCA) and/or any institution which has a need to know in compliance with the applicable legislation.

The Iris System comprises three main segments:

- **Air-Ground segment**: From the Aircraft boundary (i.e. the Aircraft Earth Station (AES) which is out of the scope of the ISP Service) down to the Viasat air-ground network which interfaces with the G/G segment through Meet Me Points (MMPs), and vice versa. This segment is described in Section 4.1.1.
- **Ground-Ground segment**: with the following options:
    - Option 1 – connection via SITA ATN G/G routers operated by SITA which route the CLNP (Connection-Less Network Protocol which supports ATN/OSI service) traffic all the way through to the ANSP ground network. This option is described in Section 4.1.2.
    - Option 2 – direct connection to Viasat ATN A/G router using NewPENS as the underlying IP connection to convey the traffic all the way through to ANSP ground network. This option is described in Section 4.1.3.

  NOTE 1: Option 1 is available from the Iris Service first declaration date. And option 2 will be activated upon IWA signatory request and after the required end-to-end validation is successfully completed.
  NOTE 2: The Service specifications provided in this document are the same regardless the connectivity option, either 1 or 2, unless otherwise explicitly mentioned in this document.

- **ISP Service segment**: providing the supporting Service to ensure compliance with the Service specifications provided in this document.

ESSP possesses valid statements of compliance (applicable during the transition period) with respect to Iris system components, duly submitted to EASA as required by Article 7 of [RD-23] and Article 45 of [RD-22].

4.1.1 Viasat Air-Ground Segment

A detailed description of the Viasat system is provided in the Attachment 1 to the ED-242C / DO-343D [RD-8] MASPS which contains system specific material for support of AMS(R)S using the Viasat SwiftBroadband.

The Viasat Air-ground segment comprises the following key sub-segments:

Space sub-Segment

The Space sub-Segment comprises a constellation of satellites that provides the required coverage in the Iris Service Area.

The Viasat satellites which provide the Signal in Space used for Iris Service are namely:

- Viasat I4 series satellite to provide EMEA (Europe, Middle East and Africa) coverage (currently I4-F4 (known as Alphasat) at 24.9 degrees East)
- Viasat I6 series satellite to provide IOE (Indian Oceanic East) coverage (currently I6-F1 at 83.8 degrees East)

Ground sub-Segment

The Ground sub-Segment is divided into the following major subsystems:

- The Ground Stations (GS) anchoring the RF communication with the aircraft via the satellite and supporting the air interface protocols required for data transmission over the satellite link.
- The Ground Gateways supporting the necessary functions to enable secure satellite data services connecting the aircraft to the air-ground network and routing the CLNP (Connection-Less Network Protocol) traffic all the way through to the corresponding ground network.
- DCN (Data Communications Network) providing connectivity between the elements of the Ground sub-Segment as well as connectivity out towards a number of meet-me-points (MMPs) which provide the means to physically connect to CNP networks.
- Central Support Systems for the operation and maintenance of the infrastructure.

Aircraft Earth Station (AES) sub-Segment (external to Iris)

The Aircraft Earth Station (AES) sub-Segment is divided into two major subsystems:

- The RF Systems (antennas, RF front-end and modems) supporting the RF communication with the ground and air interface protocols.
- The Aircraft Gateways supporting the corresponding functions in the aircraft to enable the satellite data service to interconnect with the respective aircraft systems.

These two sub-systems in conjunction are referred to as AES.

4.1.2 Ground-Ground Segment – Option 1

When the ground connectivity is via SITA acting as CNP, the ground-ground segment comprises the SITA Iris ATN/OSI Ground-Ground (G/G) routers (hereinafter referred to as SITA Iris G/G routers or SITA Iris GGR) which provide the ATN connectivity to route the traffic between the Viasat ATN/OSI Air-Ground router (hereinafter referred to as Viasat A/G router or Viasat AGR) and the ATN/OSI Ground-Ground router within the ANSP ground network.

It is worth noting that the SITA Iris ATN G/G routers are located at two different sites, i.e. Amsterdam and Montreal, in redundant architecture.

The ANSP ground network which connects to the SITA network including IP access (which can be referred to as, for example, meet-me-points, service delivery point or point of presence) is within ANSP domain and therefore external to Iris. In particular, the boundary of the ground-ground segment with the ANSP ground network is as follows:

- If the ANSP is directly connected to SITA using leased lines provided by SITA: at the ANSP terminating point of the ground ATN adjacency with SITA, excluding the ANSP ground network.
- If the ANSP is connected to SITA through the NewPENS: at the SITA side of the gateway between SITA and NewPENS.

4.1.3 Ground-Ground Segment – Option 2

When the ground connectivity is directly to Viasat A/G router, the use of NewPENS is required as the underlying IP network. Hence the ATN functionality remains at Viasat A/G router, in the same way as a CNP, which peers directly with the ANSP G/G router. The NewPENS connectivity comprises:

- the VPN (Virtual Private Network) dedicated to data link traffic which provides the secure IP transport between the Viasat segment and the ANSPs.
- the Service Delivery Points at which traffic conveyed by the NewPENS VPN (Virtual Private Network) is delivered. The Service Delivery Point (SDP) is a NewPENS term which corresponds with a dual IP 'router(s)' to provide redundancy.

The ANSP ground network including the Service Delivery Point attached to the ANSP ATN Ground-Ground router is within the ANSP domain and therefore external to Iris.

4.1.4 ISP (ESSP) Service Segment

The Iris end-to-end communication system which is composed of the A/G segment and G/G segment is overseen by ESSP with the support of the ISP Service Center (ISC) located in Torrejón de Ardoz (Madrid, Spain) in order to continuously monitor the Service and ensure compliance with the Service specifications provided in this document.

ESSP has the ISP Service Center to manage the end-to-end Service delivery and the external business-to-business relationships, including the relationships with the ANSPs having formalized an Iris Working Agreement or interested to formalize an Iris Working Agreement and with the Subcontractors operating the A/G and G/G segments.

The facilities are manned in such a way as to guarantee the provision of the Service Arrangements in the terms and conditions as per defined in the Iris Working Agreement.

In addition, ESSP through the Iris Service Center provides additional support to users via the Iris Service Desk and Iris User Support Website where relevant information is published (e.g. in-force Iris SDD, detailed information on Service status and performance, forecasts, Service evolution roadmaps, list of Iris equipped aircraft, Service Notices informing, for instance, of degraded situations expected to be maintained over time and other relevant information for users).

Figure 4-2 presents the scope of the ISP operations performed by the ISP Service Center.

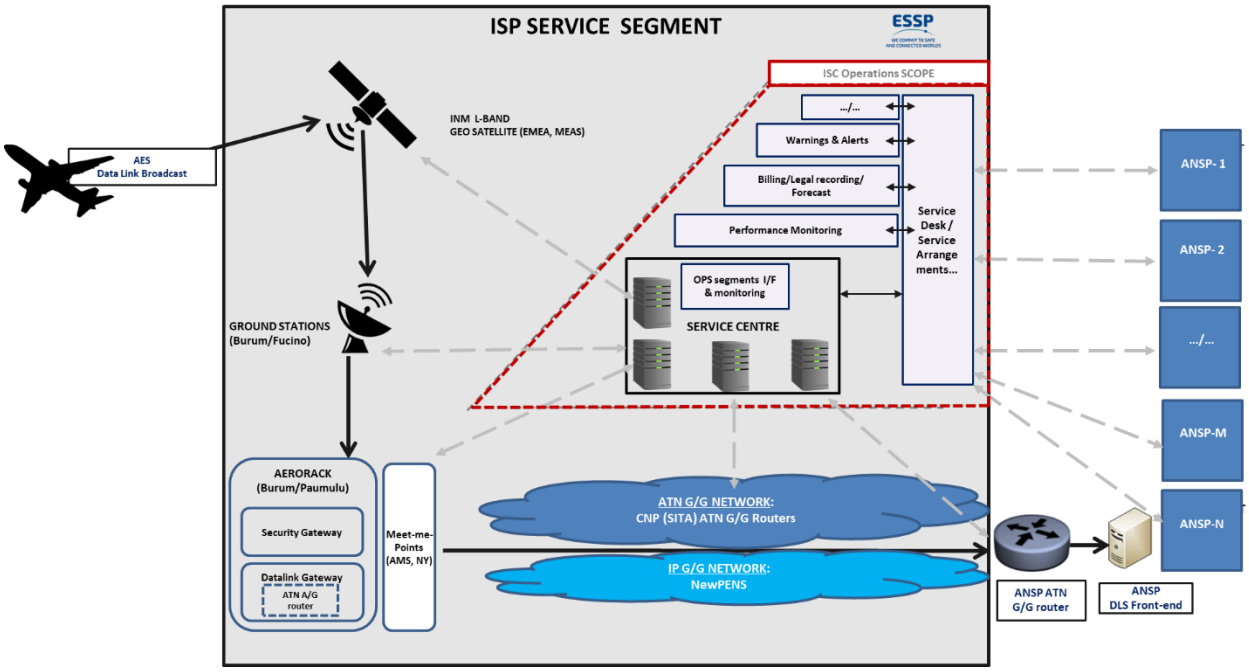


Figure 4-2: ISP Service Center (ISC)

4.2 Connectivity to the Iris System

The key elements in the Aircraft – ANSP end-to-end chain including the external ones to Iris are as follows:

- On the air side at application layer, Aircraft End System (external to Iris) is the End System onboard the aircraft responsible for supporting ATN applications (CM, CPDLC and ADS-C) over the ATN/OSI network, communicating with the corresponding end systems within the ANSP domain. The Aircraft End System interfaces with the flight management system and data link control and display unit to support air traffic control.
- On the ground side at application layer, the ANSP End System (external to Iris) is the End system within the ANSP domain which is the peer to the Aircraft End System at transport layer and above, supporting ATN applications (CM, CPDLC and ADS-C) over the ATN/OSI network. The ANSP End System provides the data service for supporting systems within the Air Traffic Service Units (ATSU).
- On the air-ground side at network layer, the Viasat Air/Ground Router peers at ATN/OSI network layer with the Aircraft End System on the aircraft for exchanging ATN/OSI routing updates and data packets. The Viasat A/G Router uses the service supported by the underlying Iris A/G SatCom subnetwork described in Section 4.1.1 to communicate with the aircraft.
- On the ground-ground side at network layer, the CNP Ground Networks connect ANSP sites to the Viasat Air/Ground Router that anchors the communication to aircraft across the Iris A/G SatCom subnetwork. The ground configuration depends on the connectivity option, namely:
    - When the ground connectivity is via the SITA G/G segment as described in 4.1.2., at ATN/OSI network layer, the Viasat A/G router peers with the SITA Iris G/G router and the SITA Iris G/G router also peers with the G/G Router within the ANSP ground network;
    - When the ground connectivity is direct to the Viasat A/G router as described in 4.1.3, the Viasat A/G router peers directly at the ATN/OSI network layer (Layer 3) with the G/G Router within the ANSP ground network.

To enable routing of traffic between the ANSP and the aircraft, the Iris A/G SatCom subnetwork first goes through a process of establishing a connection and advertises its availability to the Aircraft. The Aircraft airborne router and the Viasat A/G Router establish the ATN/OSI network address (Network Entity Title – NET) of each peer using ES-IS and subsequently exchange routing using IDRP (Inter-domain routing protocol) to update the routing tables.

The Viasat A/G Router then advertises the reachability of the Aircraft NET (prefix) through the CNP Ground Network. Aircraft routes are advertised to the ANSP G/G Routers in the case of direct connectivity between the Viasat A/G Router and the ANSP G/G Router as described in 4.1.3.

When the ground connectivity is via the SITA G/G segment, a level of route aggregation (e.g. a generic route is advertised to the ANSP G/G Routers) is typically performed by the SITA G/G Routers to reduce the size of routing tables and enable quicker convergence. Nonetheless, no convergence issue is expected in the case of direct connectivity to the Viasat A/G router as described in 4.1.3.

Besides, the Viasat A/G Router advertises to the aircraft the reachability of the ANSPs (i.e. advertisement of specific routes) that are connected to the SITA Iris GGR or directly to the Viasat A/G Router through the SatCom data link.

Once routing has been established, ATN/OSI data packets can be sent between the ANSPs and the Aircraft in the uplink and downlink directions. Routing policies dictate which air-ground subnetwork is preferentially used (either Iris or VDL) to support traffic out of those currently available. Each subnetwork needs to provide a timely indication if connection is lost in order to permit the Aircraft End System and anchoring ATN G/G Router to switch to another subnetwork whilst connection is being regained.

For ATN/OSI multilink operation, the Viasat AGR signals the relative link preference of each Iris Aircraft (either VDL preferred over SatCom or SatCom preferred over VDL) by changing the timestamp IDRP attribute of satcom routes in combination with an 11 octet route prefix[10]: a future timestamp indicates SatCom preferred, and a historic timestamp indicates VDLm2 preferred.[11]

[10] Aircraft specific route prefixes are 11 octets in length.

[11] This multilink implementation is in line with agreement at SESAR Project J 14.2.2 Task 6.

The routing policy results in the following routing decisions (see also Figure 4-3):

1. In case of connectivity option 1 (see Section 4.1.2):
    a. SITA Iris GGR selects Iris, if available, in preference to VDLm2, based on the future timestamp in the routes advertised by the Viasat A/G router for that aircraft.
    b. If Iris is not available, SITA Iris GGR has no routes to the aircraft through SatCom but only through VDL if available. Hence, SITA Iris GGR selects VDL path. As soon as Iris is available again, the SITA Iris GGR selects Iris.
2. In case of connectivity option 2 (see Section 4.1.3):
    a. the ANSP GGR selects Iris in preference to VDLm2, based on the future timestamp and / or the 11 octet prefix advertised by the VST AGR.
    b. If Iris is not available, the ANSP GGR has no routes to the aircraft through SatCom but only through VDL if available. Hence, the ANSP GGR selects VDL path. As soon as Iris is available again, the ANSP GGR selects Iris.

It is worth noting that if an Iris equipped aircraft overflies an airspace under an ANSP's remit who has not formalized a valid Iris Working Agreement (hereinafter referred to as non-IWA Signatory) as described in Section 3.4, the data link exchanges will be restricted to VDL path.

For example, when an Iris equipped aircraft is transferred from a Transferring Air Traffic Service Unit of an IWA Signatory (hereinafter referred to as IWA Signatory T-ATSU) to a Receiving Air Traffic Service Unit of a non-IWA Signatory (hereinafter referred to as non-IWA Signatory R-ATSU) where CPDLC is available, the transfer of voice communications and CPDLC will commence concurrently, in accordance with the ICAO Annex 10 Vol II §8.2.9.6.1.

Once the Iris equipped aircraft is transferred, the aircraft will contact the non-IWA Signatory R-ATSU following procedures. The non-IWA Signatory R-ATSU can send a CPDLC start request to the Iris equipped aircraft through VDL if available.

On the other hand, the Iris equipped aircraft can perform the CM Logon to establish data link communications in an airspace under a non-IWA Signatory's remit[12] through VDL if available.

Figure 4-3 shows the route signalling between ATN/OSI routers for the end-to-end communication between different IWA Signatory cases (depending on the way they are connected for Iris Service and ATN/VDL service(s)) and an Iris equipped aircraft configured as SatCom preferred as the currently certified avionics (see section 5.2).

[12] The CM Logon process is performed between the aircraft and the ATS unit, normally in the airspace where the aircraft takes off or when the log on forward and next authority notification processes are not performed or completed successfully (e.g. if the log on forward is not acknowledged).

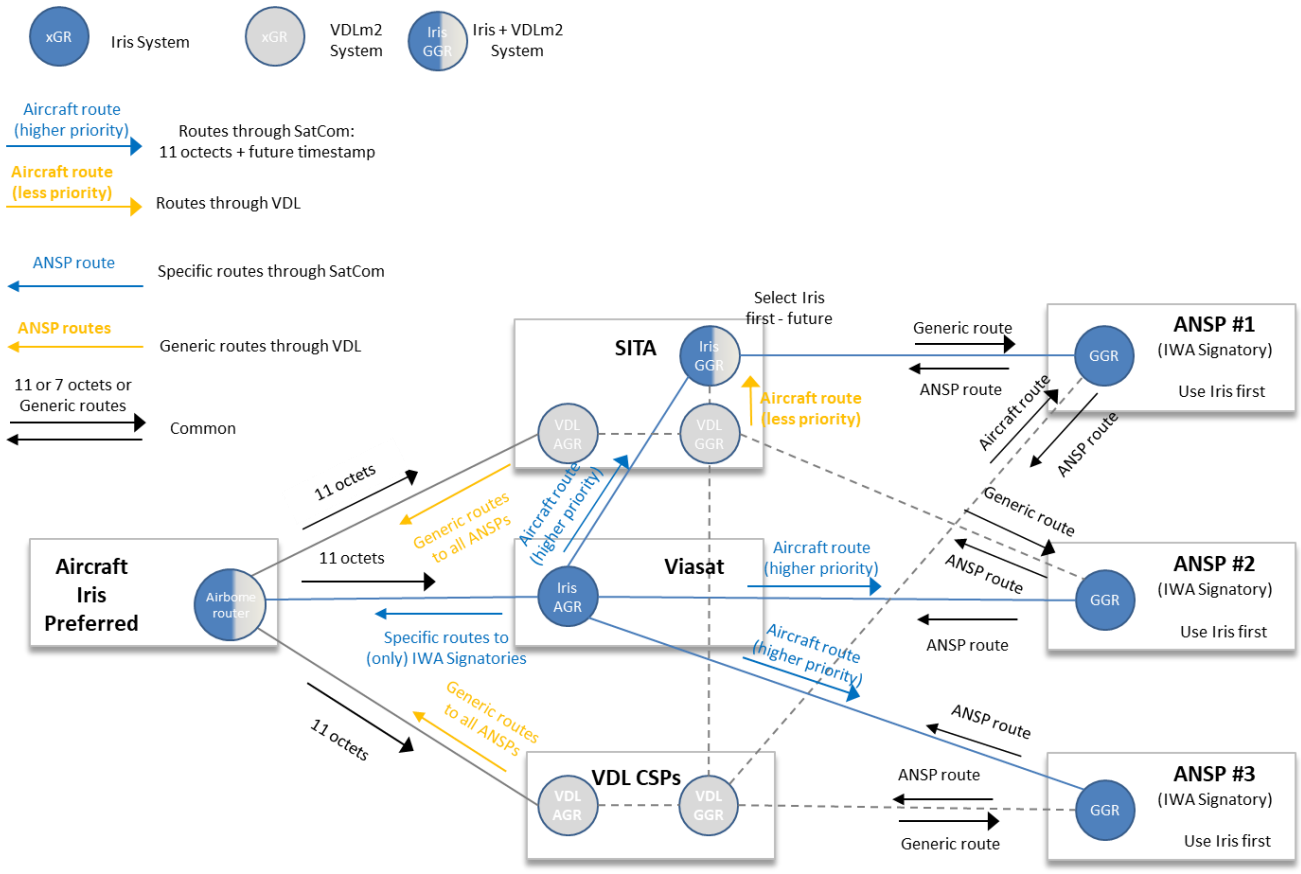


Figure 4-3 ATN/OSI Multilink signalling

Note: ANSP #1 is an IWA Signatory ANSP which is connected via the SITA network.

Note: ANSP #2 is an IWA Signatory ANSP which is connected directly to the Viasat network via NewPENS.

Note: ANSP #3 is an IWA Signatory ANSP which is connected via ENAV ATN backbone.

The data link exchanges between an Iris equipped aircraft and an ANSP will be performed through the air-ground data link based on the avionics preference and the availability of the air-ground link.

It is worth mentioning that most ANSPs are only connected to SITA and not to other VDL CSP(s) receiving only generic routes from the SITA Iris GGR.

Figure 4-3 shows the case of IWA Signatory ANSP(s) (ANSP#1) who are connected to SITA and to other VDL CSP (i.e. Collins) based on the assumption that these ANSPs' networks can process the time-stamp IDRP attribute advertised by SITA Iris GGR for the Iris equipped aircraft if Collins GGR advertises 11 octets prefix for that aircraft. Hence, these ANSP network would send the uplinks through the SITA Iris GGR when the data link exchanges are to be performed through Iris.

Figure 4-3 also shows the case of IWA Signatory ANSP(s) (ANSP#3) who are only connected to ENAV ATN backbone[13]. These ANSPs can either connect directly to Viasat network via NewPENS (as per Section 4.1.3), that is the case shown in Figure 4-3, or through ENAV ATN Backbone that would be also connected to the Iris GGR as long as the ENAV ATN Backbone implements the segregation, if needed, between IWA Signatory ANSP(s) and non- IWA Signatory ANSP(s) who use ENAV ATN/VDL subnetwork to communicate with aircraft.

The Iris Service uses the ATN Internet addressing plan defined in the EUR Doc 028 [RD-10] as the ATN common addressing scheme in order to unambiguously identify and address all ATN end-systems (hosts) and intermediate systems (routers) to deliver the Service over the Iris Service Area.

[13] The contractual relationship between ENAV and ANSP#3 is out of the ISP scope.

It is worth mentioning that the Iris Service is compliant with ICAO ATN SARPs provisions as well as with the ICAO AMS(R)S SARPs provisions for system interfaces [RD-4] as explained in Section 3.2.

4.3 Iris Signal in Space

This Section provides relevant information on the Signal in Space (SIS) supporting Iris, showing compliance with the applicable provisions of the ICAO AMS(R)S SARPs [RD-4], as explained in Section 3.2.

The Viasat satellites use L band for high date rate communications with the user terminals and C band for the feeder link. The system operates according to the ITU Radio Regulations in the frequency range 1525-1559 MHz (forward or to aircraft direction), and 1626.5-1660.5 (return or from aircraft direction).

The system is also capable to support the extended L band MSS (Mobile Satellite Service) allocation (1518-1525 MHz / 1668-1675 MHz) in line with the proposal for amendment (PfA) to ICAO AMS(R)S SARPs [RD-12]. The operational use of this frequency band depends on ICAO approval.

The main constellation provides global coverage for Iris Services from geostationary orbit, each satellite providing more than 200 spot beams (1 global beam, 19 regional beams and, typically, 192 narrow spot beams).

The global beam is only used in the forward direction for distributing a bulletin board, while regional and narrow beams are used in forward and return directions. Their hierarchy and use are shown in Figure 4-4.

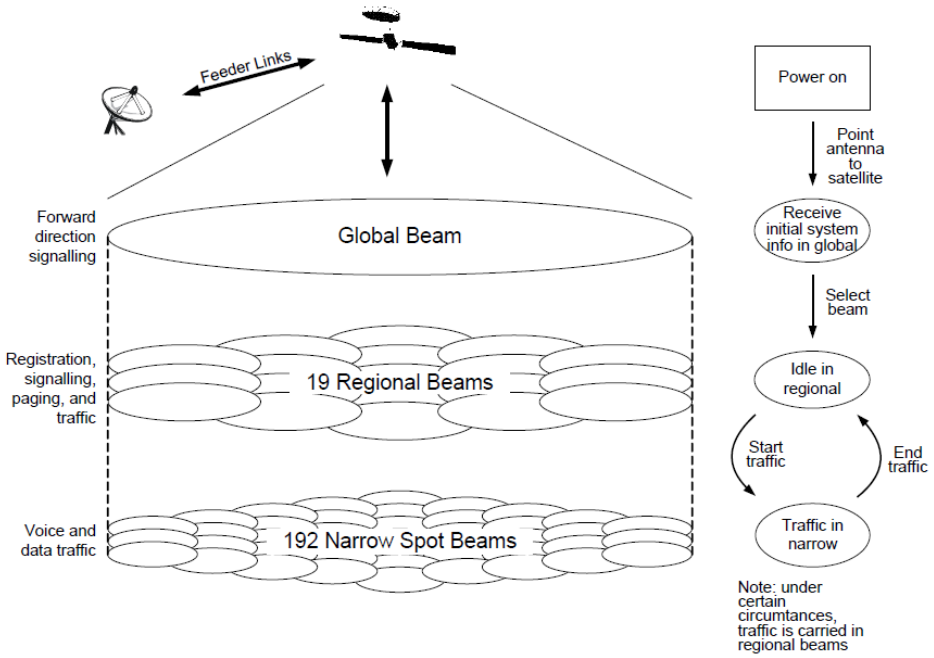


Figure 4-4: SBB beam hierarchy and AES behaviour [RD-8]

Only for general information purposes, the following figures show the narrow beam coverage for Iris at the time of writing this document:

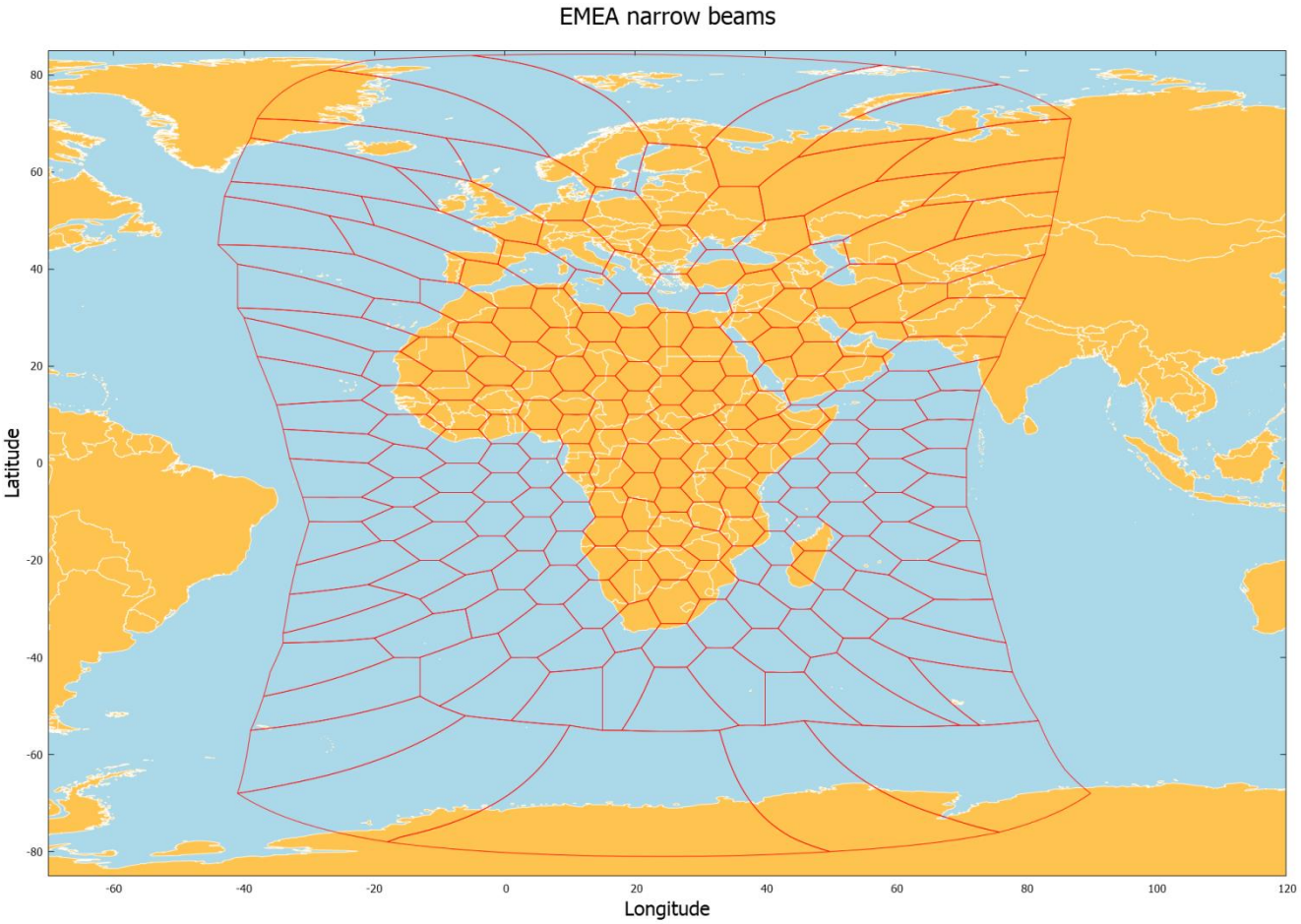


Figure 4-5: EMEA narrow spot beams[14]

[14] These maps are for general information purposes only and no guarantee is given of accuracy or fitness for a particular use. Coverage is subject to change at any time.

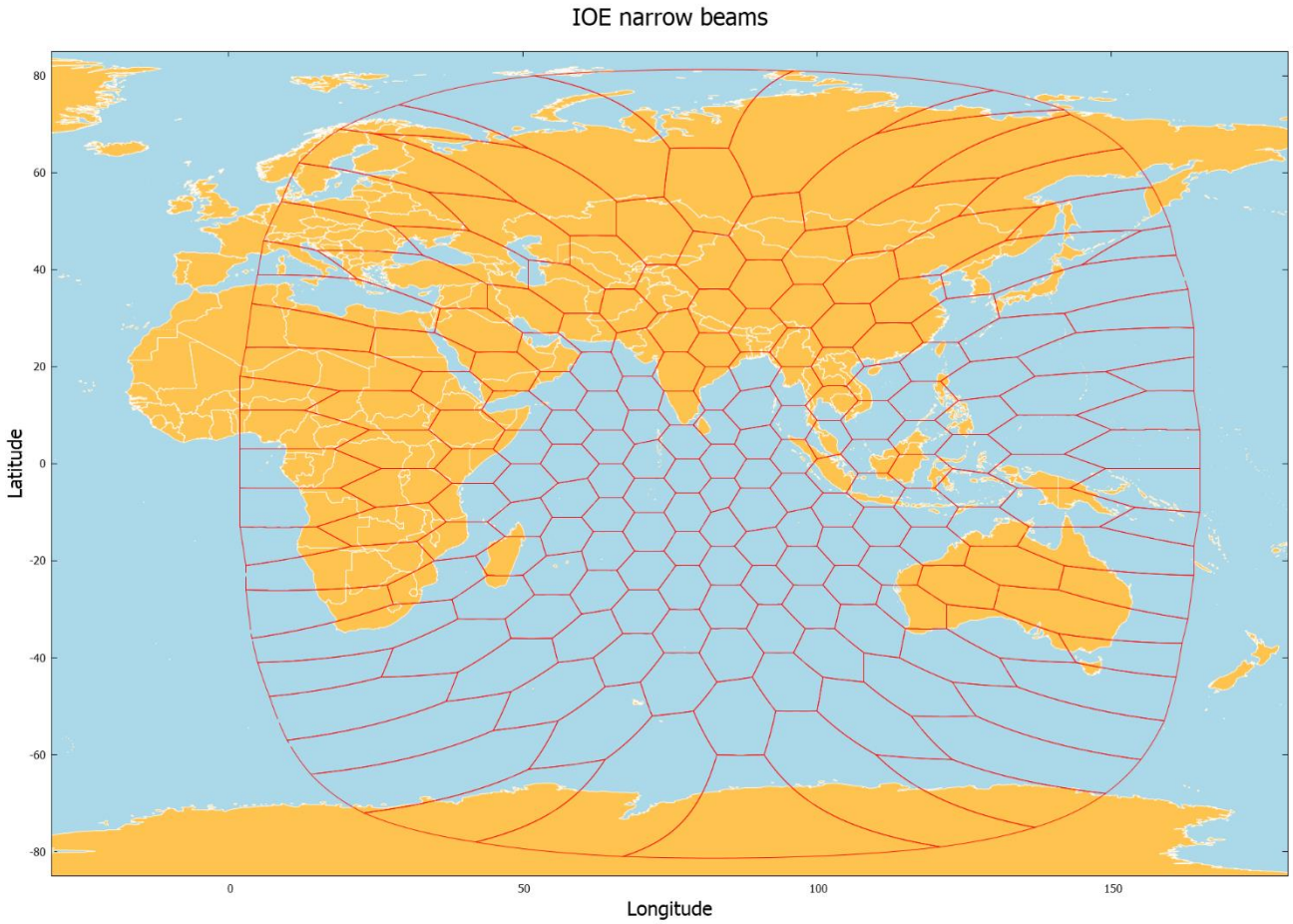


Figure 4-6: IOE narrow spot beams[14]

The Iris Service is provided throughout the Iris Service Area in a seamless manner supporting handovers of the terminals between satellites, beams, bearers[15] and ground stations without loss of user's data.

In case of loss of connectivity, the system automatically signals a link-down status[16] to the airborne and ground anchor systems so that the aircraft can switch to the alternative link (e.g. VDLm2) if available in a seamless manner for the users. The reversion to the alternative link will happen with a loss of connectivity that may either degrade the Service or may be substantial enough to cause a Service outage.

The system also provides priority and pre-emption capability to achieve the appropriate performance seen by the users even in congestion situations. This capability ensures handling the categories of messages and the order of priority in the establishment of communications and the transmission of messages in accordance with ICAO Annex 10, Volume II §5.1.8 [RD-5].

The system is capable of providing 15 different levels of priority and therefore scope of introducing future priority cockpit IP services can be accommodated without affecting ACARS or ATN traffic. The same priority is given to ACARS and ATN/OSI services being handled separately from other Priority IP services.

It is also important to highlight that the system provides safety voice communications priority over data communications.

The system is also compliant with the ICAO AMS(R)S SARPs provisions related to Signal in Space (SIS) acquisition and tracking except the recommendation establishing that the AMS(R)S systems should properly acquire and track service link signals when the aircraft is moving at a ground speed of up to 2 800 km/h (1 500 knots) along any heading (i.e. §4.5.1.1

[15] Bearers collectively refer to the carriers and burst of different modulation type, symbol rate and code rate. The selection of the bearers and code rates to be used are dynamically determined by the system, which allows AES to operate over a wide range of link conditions.

[16] This link-down status is sent not later than 90 seconds to the airborne anchor system and to the ground anchor system, in accordance with the recommendations laid down in the Draft Updated ICAO AMS(R)S SARPs [RD-12].

of ICAO Annex 10 Volume III Part 1 [RD-4]). Instead, the system supports aircraft moving at a ground speed of up to 1 500 km/h (800 knots) along any heading (i.e. §4.5.1 of ICAO Annex 10 Volume III Part 1 [RD-4]). This implies that the Iris System cannot support supersonic flights.

Further details can be found in the Attachment 1 to the ED-242C / DO-343D [RD-8] MASPS which contains system specific material for support of AMS(R)S using the Viasat SwiftBroadband.

5 IRIS AIRSPACE USERS

5.1 Avionics Certification

The Airspace users of data link communications based on Iris should comply with the relevant provisions laid down in the Commission Implementing Regulation (EU) 2023/1770 [RD-1].

EASA relevant Certification Specifications and Acceptable Means of Compliance for Airborne Communications; Navigation and Surveillance (CS-ACNS) are available in [RD-17]. These CS_ACNS provide the airworthiness standard for ATN B1 and ATS B2 limited to the provision of ADS-C EPP. As per GM2 ACNS.B.DLS. 001 within [RD-17], EASA recognises that ATS B2 in accordance with ED-228A and ED-229A (or later acceptable revisions) is the reference application for data link services in the future and will accept and support applications for the approval of systems that offer ATS B2 data link services in lieu of ATN B1 systems.

Therefore, the Airspace Users should follow the guidance provided in the applicable EASA material in order to ensure that the approval for the avionics installation by the aircraft manufacturer includes all the proper elements.

In particular, ATN B1 and /or ATS B2 data link installations intended to use the Iris Service should be compliant with the airworthiness standards stated in the EASA material to the extent of the scope of the Iris Service.

Besides, ATS B2 data link installations intended to use the Iris Service should be compliant with the following standards to the extent of the scope of Iris Service and the intended operations:

- ED-231A / DO-353A [RD-18], which defines the backward compatibility requirements for ATS B2 airborne and ground systems in order to support the required services when communicating with ATN B1 ground and airborne implementations.
- ED-230A / DO-352A [RD-19], which defines the Interoperability Requirements for Baseline 2 ATS Data Communications and FANS 1/A Accommodation to ensure seamless transition between two adjacent ATSUs, one using FANS 1/A+ and the other using ATS B2.
- ED-243C / DO-262F [RD-9], which provides the Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS).

5.2 Currently Certified Avionics

Today, the Iris Service is only supported by the latest evolution of the Airbus Light Cockpit SatCom (LCS). Together with the Air Traffic Service Unit (ATSU)[17] v 10, the LCS L4 provides the FANS-C over SatCom function which was certified by Airbus in December 2022 on the Airbus Single Aisle family (A318-319-320-321).

Figure 5-1: FANS-C over SatCom Avionics

[17] ATSU in this Section refers to the Airborne End-System. This terminology is used by Airbus and is equivalent to Communication Management Unit (CMU) used by other manufacturers.

FANS C product on A320 programs consists in a single product, offering ATC data link capabilities to fly worldwide:

- State of the art FANS+ capability
- FANS C (Baseline 2 revA) capability
- Backward compatibility with ATN B1 ATC centers (FANS B+)
- Optional A623 DCL, OCL, D-ATIS package

The FANS C Function fulfils the applicable requirements as defined in ED-228A [RD-7] except Interval Management and Dynamic RNP services that are not implemented.

The ATSU v10 manages multilink between SatCom and VDL for ATN traffic. It can be set up as SatCom preferred or VDLm2 preferred. The preferred linked will always be used by default if available and the ATSU will automatically switch to the secondary link if the preferred link is not available.

Any aircraft already equipped with the LCS for ACARS, Voice and IP services can be upgraded to full FANS-C over SatCom capability through a Software update of the ATSU and LCS.

The Iris Service is available on top of the legacy SatCom services provided by Viasat through LCS (ACARS, Voice, IP). Therefore, the Airspace Users need to have a contract with the CSP(s) Collins Aerospace and/or SITA, to provision the SatCom on the Viasat network.

6 IRIS SERVICE PERFORMANCE

6.1 Iris Service Description and Characteristics

The Iris Service provided by ESSP is a certified AMS(R)S data COM service which is intended to support the performance-based specifications identified in Section 3.1 in order to enable supporting the ATS Data Link services detailed in Appendix C. The boundaries of the ESSP ATM/ANS Service Provider Organizational Approval (AOA) certificate for this Service are detailed in Section 4.1.

Terms and conditions of use under which the Iris Service is offered are described in Section 2.2.

The commitments are defined in Section 6.3 and are the ones that can be obtained with the in-force version of the Iris SDD. These commitments present the minimum performance that can be observed over the Iris Service Area.

It is the objective that future versions will deliver an equivalent level of commitments as a minimum or better targeting the performance requirements gathered in Section 6.2. The Iris SDD will be updated whenever necessary.

6.2 Service Performance Requirements

The Iris System has been designed to support different performance-based specifications. Requirements for each specification have been issued by [RD-6] and [RD-7] and are summarised in Appendix D.

6.3 Iris Service minimum Performance Characteristics

The Iris Service minimum performance characteristics are described below for latency, continuity and availability,.

According to the standard [RD-8], the performance apportionment for the ISP Service corresponds to the CSP segment which encompasses both Satellite Service Provider (SSP) and Communication Network Provider (CNP) segments as shown below:

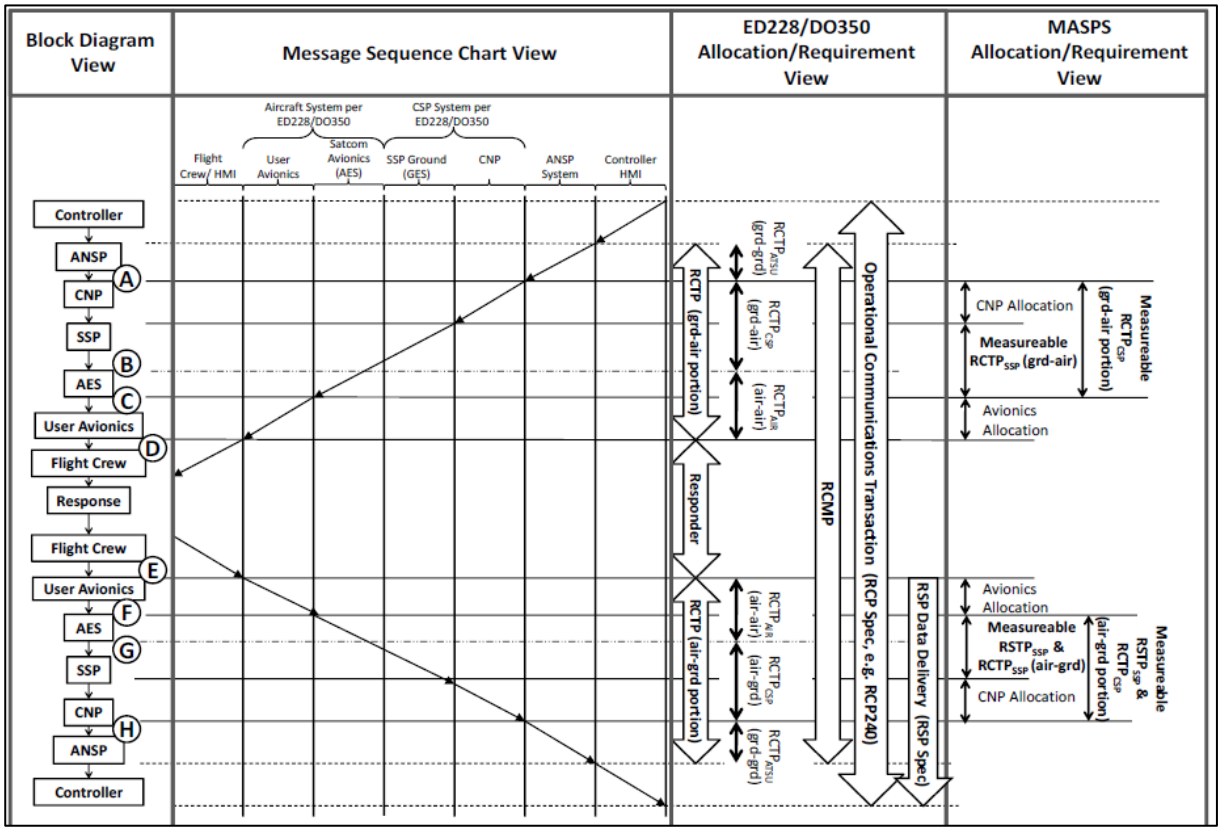


Figure 6-1: Required communication performance and required surveillance performance requirements and allocations for data services

The Iris Service is intended to enable support of three types of ATS data link applications, namely, CM, CPDLC and ADS-C. In order to take the different characteristics demanded by these applications (e.g. required communication bandwidth) into account in the definition of the commitments and continuous assessment of compliance, specific Service levels addressing each data link application are defined, namely:

- Iris ATN/OSI Service Level 1[18] which enables the following RCP specifications supporting CM and CPDLC applications for ATN B1 and ATS B2 data link services:
    - RCP specified in the ED-120 [RD-6] as interpreted in the Eurocontrol guidelines [RD-13];
    - RCP130/A1 specified in the ED-228A / DO-350A [RD-7] and referred in the ED-242C / DO-343D [RD-8].
- Iris ATN/OSI Service Level 2 which enables the following RSP specification supporting ADS-C application for ATS B2 data link services:
    - RSP160/A1 specified in the ED-228A / DO-350A [RD-7] and referred in the ED-242C / DO-343D [RD-8].

The Iris Service performance commitments are summarized in Table 6-1:

<table>
<tr><th rowspan="2">Iris Service Level</th><th colspan="5">ISP Performance Commitments</th></tr>
<tr><th>Latency (seconds)</th><th>Continuity</th><th>Availability (Service)</th><th>Unplanned Service outage / degradation notification delay</th><th>Planned Service outage / degradation notification delay</th></tr>
<tr><td rowspan="3">Iris ATN/OSI Service Level 1
(CM, CPDLC)</td><td>10</td><td>0.95</td><td rowspan="5">0.994</td><td rowspan="5">5 minutes after unplanned outage is confirmed
Every 2 hours up to the resolution (status update)
Upon resolution (status update on resolution)</td><td rowspan="5">24 hours before the planned outage occurs (excluding emergency maintenance activities)
As soon as reasonable for emergency maintenance activities
Upon resolution (status report on resolution)</td></tr>
<tr><td>18</td><td>0.99</td></tr>
<tr><td>24</td><td>0.995</td></tr>
<tr><td rowspan="2">Iris ATN/OSI Service Level 2
(ADS-C)</td><td>9</td><td>0.95</td></tr>
<tr><td>17</td><td>0.995</td></tr>
</table>

Table 6-1: Iris Service performance commitments

Note 1: The latency values for Iris ATN/OSI Service Level 1 are specified for two-way transaction. The latency values for Iris ATN/OSI Service Level 2 are specified for one-way transaction.

Note 2: Each latency value is for the indicated continuity value of all transactions that are initiated and delivered. For example, for Service Level 1 the requirements are 10 second for a continuity of 0.95, 18 seconds for a continuity of 0.99 and 24 seconds for a continuity of 0.995.

Note 3: The Continuity values are specified per transaction and availability value is specified per planned hours of operation over the entire Iris Service Area.

Note 4: The unplanned Service outages are referred to the Service unplanned outages impacting multiple aircraft.

Note 5: Service outages / degradations shorter than 6 minutes are not counted against the Service availability.

Note 6: For further details on unplanned and planned Service outage / degradation notifications, see Section 3.4.1.

[18] References to only CPDLC in the context of the Iris Service Level 1 made in any legacy and related documentation should be understood as ATN B1 / ATS B2 Context Management (CM) and Controller Pilot Data Link Communications (CPDLC) as defined in this document.

According to the standards, there is no allocation of Integrity to the communications as the requirement is wholly satisfied by the end-to-end mechanism (Protected Mode) in the aircraft and ATSU.

The allocated Integrity requirements are only evaluated over the data communication applications, implemented in the end-systems, i.e. the ATSU and Aircraft.

However, the Iris Service implements mechanism to detect and reject corrupted/misdirected/delayed messages.

The system software components developed specifically for Iris Service are assured to DO-278/ED-109A AL5 for Viasat ground systems.

It is important to note that the commitments provided in this Section are less stringent than the requirements described in Section 6.2. The details of these limitations are provided in Section 7.

6.4 Iris Service Security Characteristics

The Iris Service ensures segregation between safety data, cockpit safety voice and non-safety traffic with multiple lines of defence (layered protection).

On the ground, the Iris Service supports a ground-ground interface that is only accessible from equivalently secured and trusted parts of the Iris ground infrastructure.

In the air, the Iris Service also supports mutual authentication between the Ground and Aircraft Systems and a ground authentication endpoint with a level of security equivalent to the Aircraft Control Domain (ACD) on the aircraft, segregated from non-safety data.

The Iris Service also ensures protection against attacks coming from the public network with multiple lines of defence (layered protection).

The Iris Service provides security measures to ensure that Aircraft Systems are protected against attacks from other terminals connected to the network (such as another Aircraft or other mobile terminals), other non-safety communication service providers connected to the network and against attacks from inside the ground network premises.

It is also important to highlight that the Iris Service is compliant to the security recommendations contained in ED-242C / DO-343D [RD-8] MASPS Appendix B Security Recommendations When Using IP Based Systems To Deliver AMS(R)S and in turn with the ICAO AMS(R)S SARPs [RD-4] provisions for security.

The Iris Service is operated within an ISO 27001 Information Security Management System (ISMS) to ensure that security objectives and requirements are maintained over the life of the Service.

7 IRIS SERVICE LIMITATIONS

The Service specifications provided in this document have some limitations due to the deviations with respect to the requirement baseline presented in Section 3.2 and detailed in Section 6.2. These limitations are described below in Table 7-1.

Limitation	Most Likely Symptoms
Commitments for latency less stringent than standards The commitments for latency provided in Section 6.3 are less stringent than standards with the exception of the ATS B2 latency associated to the continuity of 0.95. These commitments are more conservative than the performance expected to be observed. Further data collection is required to ensure a confidence interval in accordance with the standards and build more accurate commitments with respect to the minimum performance observed.	**No side-cause effects expected** No side-cause effects are expected as the observed performance is likely to be better than the required latency requirements.
Commitments for continuity less stringent than standards The commitments for continuity declared in Section 6.3 are less stringent than standards. Further data collection is required to ensure a confidence interval in accordance with the standards and build more accurate commitments with respect to the minimum performance observed.	**Micro-interruptions of Service and potential Provider Aborts** In theory, the interruptions due to breaching of continuity may lead to provider aborts. Even though the actual symptoms of this limitation are still to be confirmed with further observations, latest experience in VDLm2 with worse continuity values show a provider abort rate less that the target of 1 provider abort per 100 flight hours. Further details are provided in Appendix D.
Commitment for availability less stringent than standards The commitment for availability declared in Section 6.3 is less stringent than standards. Further data collection is required to ensure a confidence interval in accordance with the standards and build a more accurate commitment with respect to the minimum performance observed.	**Revert to VDLm2 or voice** The observed performances are likely to be better than the required availability commitment. In case of outage, a Service notification will be sent to the corresponding ANSP as defined in Section 3.4.1. In addition, the Iris System will also automatically report a link-down status no later than 90 seconds to the ground anchor point and to the airborne anchor point when the relevant air-ground connectivity service for a given aircraft was lost. Therefore, when the SatCom connection is lost, the mechanism(s) to revert to VDLm2 or voice (if no data link is available) is undertaken.

Limitation	Most Likely Symptoms
Commitment for Service outage notification delay less stringent than standards As per Section 6.3 the Iris Service outage notification is provided within 5 minutes since the Service outage is confirmed. However, the standard establishes 5 minutes of Service outage notification delay from the commencement of the outage. In a trade-off between in-time notification without the possibility of outage confirmation versus a later confirmed outage notification, the latter is considered the best trade-off between added-value for users and feasibility for Iris.	**No side-cause effects expected** The Service outage notification delay is a requirement established for ATS B2 and not for ATN B1. According to ED-228A / DO-350A [RD-7] for ATS B2: "the safety requirement SR-GD-CPDLC-2A specifies an indication of loss of CPDLC service to the controller. The unplanned outage notification delay is an additional time value associated with the requirement to indicate the loss to the ATS provider per the RCP related safety requirement SR-GD-CPDLC-4A for the ATSP." The SR-GD-CPDLC-2A states that the ATSU system shall indicate to the controller a detected loss of the CPDLC service. The SR-GD-CPDLC-4A states that the ATSU shall be notified of planned outage of the CPDLC service sufficiently ahead of time. It is relevant to note that the Iris planned Service outage notification is provided at least 24 hours in advance of the outage as per 3.4.1.
Non-compliance with ICAO provisions related to support supersonic flights The Ground Station and Satellites cannot acquire and track service link signals when the aircraft is moving at a ground speed of up to 2 800 km/h (1 500 knots) along any heading. Instead, the Iris system supports aircraft moving at a ground speed of up to 1 500 km/h (800 knots) along any heading.	**No support of supersonic flights** Iris Service cannot support airspace users operating supersonic flights.

Table 7-1: Iris limitations

It is important to highlight that the Iris Service is expected to provide performance in line with or better than the commitments described in the previous Section 6.3 of this document. However, more samples are required in order to build a confidence data collection campaign that assures more accurate commitments. ESSP is continuously collecting data to evaluate the evolution of these commitments and the corresponding publication of new versions of this document accordingly.

APPENDIX A DEFINITIONS

4-Dimensional Trajectory Data Link (4DTRAD) [RD-7]**:** The 4DTRAD service supports delivery of an aircraft along an agreed 4D route. The 4DTRAD service supports dynamic demand and capacity balancing and traffic sequencing during the flight for non-time-critical communication.

The 4DTRAD service enables the negotiation and synchronization of trajectory data between ground and air systems. This includes the exchange of 4-dimensional clearances and intent information such as lateral, longitudinal, vertical and time or speed (including uplinked constraints specified as cleared speed / time constraints which can be issued as a part of a route clearance).

Airspace users [RD-20]: Operators of aircraft operated as general air traffic.

ATC Communications Management (ACM) [RD-7]**:** The ACM service uses the CPDLC application. DLIC is a prerequisite for ACM.

ACM provides automated assistance to the flight crew and current and next controllers to manage ATC communications. The ACM service encompasses the transfer of voice communication and the transfer of CPDLC data authority.

ATC Microphone Check (AMC) [RD-7]**:** The AMC service uses the CPDLC application. ACM is a prerequisite for AMC.

The AMC service provides controllers with the capability to uplink an instruction to an aircraft in order for the flight crew to check that the aircraft is not blocking a given voice frequency.

Automatic Dependent Surveillance – Contract (ADS-C) [RD-7]**:** A means by which the terms of an ADS-C agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions ADS-C reports would be initiated, and what data would be contained in the reports.

Availability (PROVISION) or Availability (SERVICE): The probability that communication with all aircraft in the area is in service. The Availability is computed as follows ([RD-8], which provides clarifications of [RD-7]):

$$1 - \frac{\sum Operationally\ significant\ unplanned\ outage\ durations}{Elapsed\ time}$$

The Service Availability is measured in a 12 month-period.

Availability (USE) [RD-6]**:** The probability that the communication system between the two parties is in service when it is needed.

Clearance Request and Delivery (CRD) [RD-7]**:** The CRD service uses the CPDLC application. ACM is a prerequisite for CRD.

The CRD service supports operational ATC data communication between the flight crew and the ground system/controller of the Current Air Traffic Service Unit (C-ATSU).

Continuity: The probability that the transaction will be completed before the transaction expiration time for CPDLC or overdue delivery time for ADS-C, assuming that the communication system is available when the transaction is initiated ([RD-6] and [RD-7]). The continuity is computed in a monthly basis as follows:

Number of CPDLC uplink messages requiring a LACK (ACK = 1) for which a DM100 LACK or a DM62 ERROR response is received within the Expiration Time or less / total number of uplinks requiring a LACK (ACK = 1).

Number of ADS-C downlink messages which are forwarded to the ANSP within the Overdue Delivery Time or less / total number of ADS-C downlink messages.

Controller Pilot Data Link Communications (CPDLC) [RD-7]**:** Application that allows ATC data communications between controllers and pilots.

Data Link Initiation (DLIC) [RD-7]**:** The DLIC service exchanges information between an aircraft and a DLIC ground system to identify the data link applications that they both support. The DLIC service is also used to establish a unique identify address for each aircraft initiating the connection process. The DLIC service provides version and address information for all data link applications. The DLIC service is executed prior to any other addressed data link service.

The DLIC service provides the capability to determine the compatibility of aircraft and ATSU systems, and may be used to correlate information between the aircraft and ATSU flight plan.

Data Link service [RD-2]: A set of related air traffic management transactions, supported by air-ground data link communications, which have a clearly defined operational goal and begin and end on an operational event.

ECAC: Consists of the envelope of all FIRs (Flight Information Regions) of the ECAC member States.

En-route 1 (ENR-1) [RD-7]**:** The ENR-1 airspace is a volume of controlled airspace that encloses the flight paths above and between airports where air traffic service in TMA is provided. Jet routes and airways are typically used to traverse the en-route airspace structure. The typical separation minima in this airspace are 3NM, 5NM, appropriate vertical and/or visual separation as required.

End/Final user: The airspace user in possession of a certified avionics using the Iris Signal-In-Space for operational ATN B1 / ATS B2 Context Management (CM) and Controller Pilot Data Link Communications (CPDLC) and ATS B2 aircraft-to-Air Navigation Service Providers surveillance-related information (ADS-C). On the contrary, the term “User” is typically used alone to refer to organizations in the context of Section 2.2.2.

Information Exchange and Reporting (IER) [RD-7]**:** The IER service uses the CPDLC and ADS-C applications. ACM is a prerequisite for IER using CPDLC. DLIC is a prerequisite for IER using ADS-C.

IER provides the capability for the ATSU and aircraft to exchange information.

Interval Management (IM) [RD-7]**:** The IM service uses the CPDLC application and may use the ADS-C application. ACM is a prerequisite for IM.

The IM service enables improved means for managing traffic flows and aircraft spacing. This includes both the use of ground and airborne tools, where ground tools assist the controller in evaluating the traffic picture and determining appropriate IM clearances to merge and space aircraft efficiently and safely, and airborne tools that allow the flight crew to conform to the IM clearance.

Iris Service or Service: The service provided by the Iris Service Provider, i.e. ESSP, as described in the in-force Iris Service Definition Document.

Iris Service Area: Geographic region which corresponds with the airspaces that are under the responsibility of the ECAC Member States and where the RCP and RSP specifications supported by the Iris Service are applicable as defined in Appendix C, with the limitations described in Section 7,.

Operationally significant unplanned outage [RD-8]**:** An unplanned outage whose duration exceeds the outage duration limit.

Performance-based communication (PBC) [RD-7]**:** Communication based on performance specifications applied to the provision of Air Traffic Services.

Performance-based surveillance (PBS) [RD-7]**:** Surveillance based on performance specifications applied to the provision of Air Traffic Services.

RCP (or RSP) Availability [RD-7]**:** An RCP (or RSP) parameter that specifies the required probability that an operational communication transaction can be initiated (or surveillance data can be provided).

RCP (or RSP) Continuity [RD-7]**:** An RCP (or RSP) parameter that specifies the minimum proportion of relevant communications transactions to be completed (or relevant surveillance data to be delivered) within the specified time, given that the service was available at the start of the transaction (or delivery).

RCP (or RSP) Integrity [RD-7]**:** An RCP (or RSP) parameter that specifies the required probability that an operational communication transaction (or surveillance data) is completed (or delivered) with no undetected errors.

Required Communications Performance (RCP) [RD-7]**:** A set of requirements for Air Traffic Service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

Required Communication Technical Performance (RCTP) [RD-7]**:** A RCP allocation that specifies the maximum technical time for relevant parts of the ATS unit’s system, aeronautical station’s system, the network systems and the aircraft system, for which there is no human contribution to the communication.

Required Surveillance Performance (RSP) [RD-7]**:** A set of requirements for Air Traffic Service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

Required Surveillance Technical Performance (RSTP) [RD-7]**:** A RSP allocation that specifies the maximum technical time for relevant part of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the surveillance data delivery performance.

Terminal Manoeuvring Area (TMA) [RD-7]**:** The TMA airspace is a volume of controlled airspace set up at the confluence of airways in the vicinity of one or more major airports to protect traffic climbing out from and descending into the airports. It is shaped like an upside-down wedding cake, in that the layers gradually get larger with increasing altitude. The typical separation minima in this airspace are 3NM, appropriate vertical and/or visual separation as required.

Transaction [RD-7]**:** The basic unit of a CPDLC interaction between peer parties used for operational, safety and performance assessments. An interaction includes one or more operational messages that are transmitted using the same communication medium from one party to the other.

It also includes related message activities, i.e. message identification, message composition, and message recognition.

Transaction time: The expiration time (ET) is defined as the maximum time within which 99.9% (ED-228A [RD-7]) (or 99% in ED-120 [RD-6]) of operational communication transactions is required to be completed after which the initiator is required to revert to an alternative procedure.

The nominal or transaction time (TT) is defined as the maximum nominal time within which 95% of operational communication transactions is required to be completed [RD-7].

The surveillance overdue delivery time (OT) is defined as the maximum time for the successful delivery of surveillance data at 99.9% Continuity, after which the controller is required to revert to an alternative procedure [RD-7].

The surveillance nominal delivery time (DT) is defined as the maximum nominal time within which 95% of surveillance data deliveries are required to be successfully delivered [RD-7].

Unplanned outage [RD-7]: An outage for which no advance notice was provided to the appropriate parties.

Unplanned Outage duration limit [RD-8]**:** The maximum acceptable duration of an unplanned outage before there is operational impact. In the ED-228A [RD-7], the value is 6 minutes for RCP130/A1 and RSP160/A1 data services.

APPENDIX B LIST OF ACRONYMS

The following table provides the definition of the acronyms used in this document.

Acronym	Definition
AACD	Arrival, Approach, Cruise, and Departure
ACARS	Aircraft Communication Addressing and Reporting System
ACK	Acknowledgment
ACL	ATC Clearance
ACM	ATC Communications Management
ADS	Automatic dependent surveillance
ADS-C	Automatic Dependent Surveillance (Contract)
AES	Aircraft Earth Station
AGR	Air Ground Router
AMC	ATC Microphone Check
AMS(R)S	Aeronautical Mobile Satellite (Route) Services
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AOA	ATM/ANS Service Provider Organization Approval
ARINC	Aeronautical Radio, Incorporated
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
ATSU	Air Traffic Service Unit
AVLC	Aviation VHF Link Control
CM	Context Management
CNP	Communication Network Provider
COM	Communications
CP	Communications Panel
CPDLC	Controller-to-Pilot Data Link Communication
CRD	Clearance Request and Delivery
CS	Certification Specification
CSP	Communications Service Provider
DCIWG	Data Communications Infrastructure Working Group
DLIC	Data Link Initiation Capability
DLS	Data Link Service
EASA	European Union Aviation Safety Agency
EC	European Commission
ECAC	European Civil Aviation Conference
ED	EUROCAE Document
EMEA	Europe Middle East and Africa
ENR	En route
ER	En Route
ES	End System
ESA	European Space Agency
ESSP	European Satellite Services Provider
EUROCAE	European Organization for Civil Aviation Equipment
EU	European Union
FANS	Future Air Navigation System
GGR	Ground-Ground Router
ICAO	International Civil Aviation Organization
IER	Information Exchange and Reporting
IM	Interval Management
IOE	Indian Oceanic East
IP	Internet Protocol
IR	Implementing Rule
ISO	International Organization for Standardization
ISP	Iris Service Provider
ITU	International Telecommunication Union
IWA	Iris Working Agreement
LACK	Logical Acknowledgment
LCS	Light Cockpit SatCom
MASPS	Minimum Aviation System Performance Standards
MEAS	Middle East and Asia
MSS	Mobile Satellite Service
NCA	National Competent Authority
NSAP	Network service access point
OSI	Open systems interconnection
R-ATSU	Receiving Air Traffic Service Unit
RCP	Required Communications Performance
RCTP	Required Communication Technical Performance
RF	Radio-Frequency
RSP	Response
RSTP	Required Surveillance Technical Performance
RTCA	Radio Technical Commission for Aeronautics
SARPS	Standards and Recommended Practices
SatCom	Satellite Communications
SBB	SwiftBroadband
SDD	Service Definition Document
SES	Single European Sky
SITA	Société Internationale de Télécommunications Aéronautiques
SSP	Satellite Service Provider
T-ATSU	Transferring Air Traffic Service Unit
TBO	Trajectory Based Operation
TMA	Terminal Manoeuvring Area
TRTD	Technical Round Trip Delay
TT	Transaction Time
VDL	VHF Data Link
VDLm2	VHF Data Link Mode 2
VST	Viasat

APPENDIX C IRIS SERVICE / RCP & RSP SPECIFICATIONS

The following table presents the different RCP & RSP specifications and associated airspaces supported by the Iris Service, to have a clear view of in which ATM Operations Iris Service is considered as an enabler.

ATM operations and ATS services (data link applications) with the associated RCP & RSP specifications enabled by Iris Service				
Airspaces	**ATS Services (data link applications) / Performance Specifications**	**Iris ATN/OSI Service Level 1**		**Iris ATN/OSI Service Level 2**
		RCP130 (ED228A)	RCP120 (ED120)	RSP160 (ED228A)
ER as specified in ED120	*DLIC (CM)*	N/A	N/A	N/A
	ACM (CPDLC), AMC (CPDLC), ACL (CPDLC)		ATC Comm	
ENR-1 as specified in ED228A	*DLIC (CM)*	N/A	N/A	N/A
	ACM (CPDLC), AMC (CPDLC), CRD (CPDLC)	ATC Comm		N/A
	4DTRAD (CPDLC, ADS-C)	4D TBO		4D TBO
	IER (CPDLC, ADS-C)	ATC Comm		ATC Comm
	IM (CPDLC, ADS-C)	IM-AACD		IM-AACD

Table C-1 Iris Service Levels versus RCP / RSP specifications

Source: ED228A [RD-7] (table 2-1, table 2-2 and table 2-3)

Source: ED120 [RD-6] (table 3-1)

Note: Based on a consultation to the Aviation Users conducted at the time of writing this document, the identified ATS services are operationally used in en route airspaces typically above the Flight Level (FL) 100. Hence, the FL100 is considered as the minimum flight level from which the Iris Service is provided in the en route airspaces defined in Table C-1.

APPENDIX D PERFORMANCE REQUIREMENTS SUMMARY

Based on the Service specification baseline identified in Section 3.2, the applicable requirements derived from this baseline are gathered in this Section.

The applicable requirements specified in the standards [RD-6] and [RD-7] are summarised in Table 7-2:

Data Link Application enabled by Iris Service	RCP /RSP type	RCTP / RSTP allocated requirements to ISP			
		Latency (seconds)	Continuity	Availability (service)	Service unplanned outage notification delay (minutes)
CM, CPDLC	RCP defined in ED-120	8	0.95	0.9995 / 0.9999	N/A
		16	0.99		
CPDLC	RCP130/A1 defined in the ED-228A	10	0.95	0.9995	5
		18	0.999		
ADS-C	RSP160/A1 defined in the ED-228A	5	0.95	0.9995	5
		12	0.999		

Table 7-2: Iris Service performance requirements

Note 1: The requirements for the RCP specification defined in ED-120 [RD-6] stem from the Eurocontrol Interpretation of ED-120 Performance Requirements [RD-13], including the availability of 0.9999. Whereas the availability of 0.9995 is derived from ED-120 Annex A, considering that the availability is equally allocated to ATSU and CSP.

Note 2: RCP130/A1 and RSP160/A1 stem from the ED-228A [RD-7] and referred in the ED-242C [RD-8].

Note 3: The latency values for RCP120 and RCP130 are specified for two-way transaction. The latency values for RSP160 are specified for one-way transaction.

Note 4: The Continuity values are specified per transaction and availability values are specified per ATSU hours over the entire area where service is provided.

Note 5: The service unplanned outage notification delay is the time from when the outage begins to when the ATS unit receives the notification.

Note 6: Each latency value is for the indicated continuity value of all transactions that are initiated and delivered. For example, for ATN B1 CPDLC the requirements are 8 second for a continuity of 0.95 and 16 seconds for a continuity of 0.99.

It is worth noting that the revision B of the ED-228B / DO-350B [RD-11] is issued, however this revision is not yet considered in the Iris Service specification baseline.

Furthermore, the proposal for amendment (PfA) to ICAO AMS(R)S SARPs [RD-12] provides the following proposed requirements and recommendations summarised in Table 7-3 and Table 7-4 respectively at the time of writing this document:

Data Link Application enabled by Iris Service	RCTP / RSTP allocated requirements to ISP				
	Latency (seconds)	Continuity	Availability (service)	Service unplanned outage notification delay	Service planned outage notification delay
CPDLC	12	0.95	0.999	Upon resolution (status update on resolution)	24 hours before the planned outage occurs (excluding emergency maintenance activities) As soon as reasonable for emergency maintenance activities
ADS-C	6	0.95			

Table 7-3: Proposed performance requirements in the Draft Updated ICAO AMS(R)S SARPs [RD-12]

Data Link Application enabled by Iris Service	RCTP / RSTP allocated recommendations to ISP				
	Latency (seconds)	Continuity	Availability (service)	Service unplanned outage notification delay	Service planned outage notification delay
CPDLC	*10*	*0.95*	*0.9995*	*30 minutes after the start of the outage* *Every 2 hours up to the resolution*	*Upon resolution (status report on resolution)*
	18	*0.999*			
ADS-C	*5*	*0.95*			
	12	*0.999*			

Table 7-4: Proposed performance *recommendations* in the Draft Updated ICAO AMS(R)S SARPs [RD-12]

Note 1: According to the draft Updated ICAO AMS(R)S SARPs [RD-12], the recommendation concerning the report to relevant ANSPs of the unplanned outages impacting multiple aircrafts not later than 30 minutes after the start of the unplanned outage is for at least the 95% of all these outages lasting more than 6 minutes. The recommendation concerning the report to relevant ANSPs of unplanned outages impacting multiple aircrafts is for all these outages lasting more than 2 minutes.

Note 2: According to the draft Updated ICAO AMS(R)S SARPs [RD-12], a status update to relevant ANSPs on resolution of unplanned outage impacting multiple aircraft (lasting either more than 2 or 6 minutes) shall be provided.

It is important to note that these requirements are not the commitments but the target values for the service. The commitments are provided in the Section 6.3.

APPENDIX E COMPARISON OF IRIS COMMITMENTS WITH OBSERVED VDLM2 PERFORMANCE

In order to evaluate the Iris commitments offered to users, the observed VDLm2 performance are presented below and compared with these commitments.

The data gathered in this Section is extracted from the reports presented at the Data Link Performance Monitoring Group meeting held in October 2022 (DPMG#13).

The figures below show the RCTP latency at 95th and 99th percentiles. Figure 7-1 shows that the RCTP latency at 95th percentile is around 10 seconds whereas at 99th is higher than 20 seconds and even exceeding 35 seconds. Table 7-5 also shows the RCTP latency over the same period per ATSU. This table shows that a small number of ATSUs do not achieve the target value of 16 seconds at 95th percentile whereas most of the ATSUs do not achieve the target value of 20 seconds at 99th percentile.

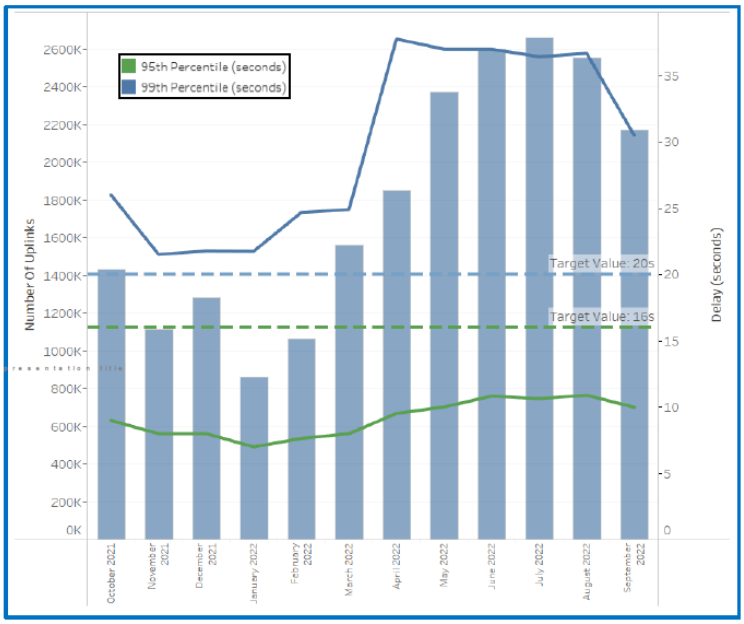


Figure 7-1: Technical Round Trip Delay (TRTD) for ATN/VDLm2 based services

Atsu Code	October 2021	November 2021	December 2021	January 2022	February 2022	March 2022	April 2022	May 2022	June 2022	July 2022	August 2022	September 2022
EDUU	8.4	7.0	7.0	6.4	6.7	7.5	8.9	9.9	10.5	10.7	10.5	10.3
EDYY	8.3	7.3	7.6	6.2	6.8	7.1	8.6	9.4	9.7	9.7	9.5	9.6
EGPX	7.3	6.8	6.9	6.5	6.7	7.4	8.3	9.1	9.4	9.4	9.2	9.4
EGTT	7.1	7.1	7.1	6.4	6.7	7.4	8.7	9.2	9.2	9.2	9.1	9.4
EKDK	9.0	8.0	8.0	8.0	8.0							
EPWW	5.7	5.5	5.4	5.1	5.0	5.1	5.6	5.9	6.2	6.3	6.3	6.7
ESMM	7.0	7.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
ESOS				6.0	6.0	6.0	6.0	6.0	7.0	6.0	6.0	6.0
EVRR	10.0	9.0	9.0	8.0	8.0	8.0	9.0	10.0	9.0	9.0	9.0	8.0
EYVC										5.0		5.0
GCCC	19.4	14.9	24.3	37.6	23.0	24.2	9.7	38.1	37.2	22.3	29.8	21.6
LDZO	12.0	9.0	9.0	9.0	10.0	10.0	11.0	13.0	13.0	13.0	14.0	14.0
LECB	9.7	7.8	8.3	7.4	7.9	8.1	8.0	7.8	8.5	8.8	8.9	8.5
LECM	7.3	7.7	7.1	7.1	7.1	7.2	7.4	7.2	7.8	7.7	7.7	7.6
LFBB	8.0	7.0	7.0	6.0	7.0	7.0	8.0	9.0	8.0	8.0	8.0	8.0
LFEE	10.0	10.0	9.0	9.0	9.0	10.0						
LFFF	11.0	11.0	10.0	9.0	10.0	10.0	12.0	13.0	14.0	14.0	14.0	14.0
LFMM	10.0	9.0	9.0	8.0	9.0	9.0	10.0	11.0	10.0	11.0	11.0	10.0
LFRR	9.0	8.0	8.0	7.0	7.0	8.0		9.0	9.0	9.0	8.0	8.0
LHCC						8.0	9.0	9.0	10.0	10.0	11.0	10.0
LIBB	8.8			6.3	6.9	7.8	10.1	12.4	15.0	12.8	15.9	15.9
LIMM				18.8	15.0	14.0	20.3	25.0	25.3	38.3	27.4	23.6
LIPP				11.0	12.8	12.9	18.3	25.4	28.4	34.6	28.0	23.9
LIRR				7.6	8.6	8.7	12.7	14.6	17.1	20.3	24.3	16.6
LJLA	13.0	10.8	11.0	11.5	11.4	11.8	13.4	15.0	17.2	17.8	17.8	17.0
LKAA	9.0	8.0	8.0	7.0	7.0	6.0	7.0	8.0	9.0	9.0	9.0	9.0
LOVV	11.0	10.0	9.0	9.0	10.0	10.0	11.0	13.0	13.0	13.0	13.0	13.0
LRBB	6.5	5.9	5.6	5.9	5.6	6.1	6.1	6.7	7.3	7.6	7.7	7.8
LSAG	10.0	9.0	10.0	9.0	9.0	10.0	11.0	13.0	13.0	13.1	14.3	13.6
LSAZ	11.0	10.0	10.0	9.0	9.0	10.0	13.0	14.0	15.1	15.3	15.9	15.2

Atsu Code	October 2021	November 2021	December 2021	January 2022	February 2022	March 2022	April 2022	May 2022	June 2022	July 2022	August 2022	September 2022
EDUU	34.6	22.4	21.7	21.1	23.4	33.7	37.6	40.3	42.7	41.1	39.6	38.6
EDYY	28.1	22.5	26.1	18.5	21.1	21.5	26.9	29.4	28.8	26.4	26.4	26.4
EGPX	24.2	20.8	26.7	25.1	21.4	21.6	30.8	37.5	37.3	27.8	36.8	32.5
EGTT	21.6	21.2	21.2	18.6	18.2	21.3	23.7	23.9	23.3	22.5	22.7	24.1
EKDK	19.0	16.0	18.0	18.0	19.0							
EPWW	20.7	20.2	13.8	13.1	12.0	12.9	14.3	13.4	21.1	21.3	21.0	21.3
ESMM	17.0	14.0		13.0	13.0	12.0	13.0	13.0	14.0	13.0	14.0	14.0
ESOS				14.0	13.0	13.0	14.0	14.0	14.0	13.0	15.0	14.0
EVRR	38.0	29.0	38.0	37.0	37.0	37.0	37.0	39.0	38.0	31.0	37.0	36.1
EYVC										13.0		12.0
GCCC	82.1	69.6	123.7	98.5	88.6	139.7	83.3	106.2	85.9	63.7	91.0	88.8
LDZO	37.0	23.0	26.0	29.0	26.0	32.0	28.0	33.0	34.0	33.0	36.0	36.0
LECB	37.0	24.8	24.8	23.3	37.6	25.7	22.2	21.4	22.4	22.0	23.9	22.3
LECM	37.2	40.2	37.3	38.4	37.9	37.6	37.4	23.2	38.0	28.4	27.6	26.8
LFBB	15.0	14.0	14.0	13.0	13.0	14.0	14.0	16.0	16.0	18.0	17.0	16.0
LFEE	20.0	18.0	18.0	17.0	16.0	19.0						
LFFF	21.0	19.0	20.0	18.0	18.0	21.0	24.0	26.0	33.0	35.0	33.0	31.0
LFMM	20.0	20.0	24.0	21.5	20.0	22.0	24.0	24.0	27.0	35.0	32.0	27.0
LFRR	17.0	16.0	15.0	16.0	14.0	15.0		17.0	18.8	22.0	19.0	19.0
LHCC						17.0	18.0	20.0	23.0	25.0	26.0	26.0
LIBB	36.5			18.8	24.1	28.2	36.4	41.7	74.2	47.2	86.3	100.0
LIMM				145.0	100.6	97.5	145.2	146.2	157.8	180.0	169.0	148.1
LIPP				85.0	88.1	86.1	105.4	145.1	153.8	151.9	160.4	125.2
LIRR				53.0	51.4	72.7	85.5	99.5	101.9	124.2	146.5	101.6
LJLA	39.8	37.4	37.3	44.8	38.0	37.7	41.2	44.7	54.0	53.6	65.3	53.5
LKAA	24.0	20.0	20.0	17.0	16.0	16.0	19.0	22.0	27.0	37.0	22.0	22.0
LOVV	37.0	37.0	37.0	36.0	37.0	37.0	37.0	38.0	37.0	37.0	36.0	37.0
LRBB	20.9	21.2	20.9	22.0	21.4	28.8	21.1	22.7	22.2	24.1	28.7	34.1
LSAG	25.0	25.0	30.0	25.0	21.0	26.0	37.0	38.2	40.8	38.5	44.9	42.9
LSAZ	36.0	28.0	26.0	22.0	24.0	31.0	40.0	46.0	56.7	55.1	54.5	47.0

Table 7-5: Monthly TRTD per ATSU for ATN/VDLm2 based services

The next figure shows the Provider Abort (PA) rate for the same period as the one used for the previous figures. It can be seen that there is a correlation between a higher latency and an increase of the PA rate. In most cases, the 1 PA per 100 FH CPDLC session is overcome when the latency at 95th percentile is higher than the target value and exceeding at the same time the latency target at 99th percentile.

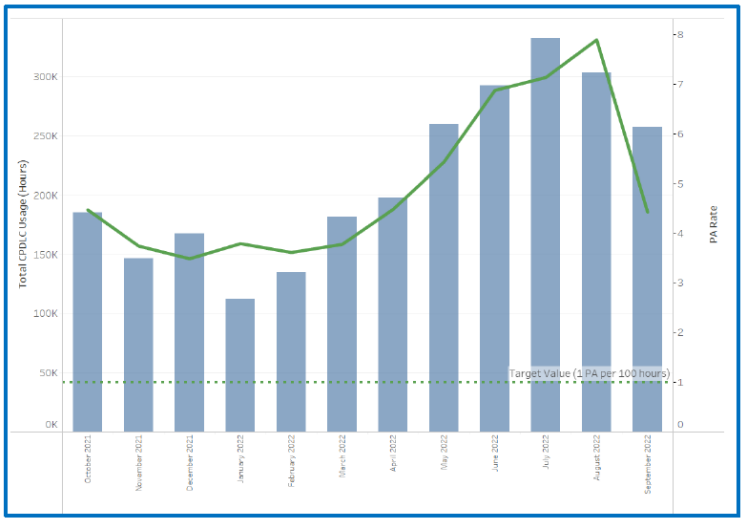


Figure 7-2: Provider Abort (PA) rate per 100 FH CPDLC session for ATN/VDLm2 services

Atsu Code	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
EDUU	2.1	1.6	1.3	1.2	2.2	2.3	2.2	2.6	2.7	2.5	2.0	2.4
EDYY	2.9	2.6	2.8	1.9	2.1	2.5	3.0	3.7	3.8	3.0	2.7	3.2
EGPX	5.6	5.8	5.3	5.7	4.5	6.1	6.8	6.3	6.6	5.7	7.0	6.4
EGTT	5.5	5.0	4.1	4.8	3.2	3.2	4.0	4.0	3.9	4.0	4.1	4.6
EKDK	7.2	8.4	9.3	7.3	9.7							
EPWW	3.4	3.5	1.8	1.8	1.4	2.1	2.3	2.7	5.0	3.6	2.6	3.1
ESMM	5.5	5.0		2.6	2.5	1.9	2.2	3.0	3.5	2.8	2.5	2.2
ESOS				14.6	9.2	3.9	4.5	6.8	4.7	3.8	4.1	5.9
EVRR	6.7	6.3	5.4	5.1	4.4	3.2	4.1	3.0	3.7	2.8	4.5	3.3
GCCC	39.9	50.8	42.5	44.5	53.9	41.2	42.3	41.1	49.2	45.1	47.6	44.2
LDZO	16.0	12.5	11.5	8.0	8.3	8.3	8.5	9.3	12.1	19.3	12.2	11.4
LECB	2.3	1.9	2.2	2.3	4.4	4.4	4.2	4.9	4.6	4.9	7.9	10.9
LECM	3.2	4.5	3.9	5.8	3.7	4.6	4.9	4.6	5.1	4.9	5.3	5.7
LFBB	0.9	0.8	1.5	0.9	1.0	1.5	1.4	1.4	1.5	1.6	2.8	4.0
LFEE	3.9	1.1	1.5	2.0	1.7	2.5						
LFFF	1.4	0.7	1.5	1.0	1.2	3.7	3.1	5.2	3.7	3.1	4.2	4.5
LFMM	4.5	3.5	6.2	5.3	5.6	7.4	4.0	7.7	8.9	13.1	10.3	8.1
LFRR	5.1	5.7	1.7	2.0	1.5	1.5		1.7	1.6	1.4	1.7	1.3
LIBB	14.5			27.4	22.8	21.4	23.8	44.6	84.4	143.1	167.4	
LIMM				15.5	10.9	11.2	16.5	45.0	90.0	158.4	216.9	
LIPP				10.1	10.0	15.8	18.1	62.9	162.7	95.3	425.5	
LIRR				11.1	13.3	10.5	15.0	25.3	54.7	151.9	61.2	
LJLA	19.0	7.7	5.4	3.4	13.6	5.4	5.9	6.7	7.8	7.6	8.5	7.9
LKAA	4.7	3.7	3.8	3.6	4.6	6.4	6.1	5.8	6.0	5.1	4.2	3.6
LOVV	8.5	8.2	7.1	5.3	5.9	4.8	5.5	6.2	6.5	7.0	6.2	5.2
LRBB	2.7	2.4	2.7	2.7	2.5	3.9	2.8	3.2	3.9	4.1	4.0	4.5
LSAG	1.5	1.4	2.5	2.4	2.7	2.8	2.9	4.8	6.4	16.2	5.0	4.6
LSAZ	1.7	1.4	2.1	1.9	1.7	2.4	2.6	3.2	5.9	15.5	4.2	4.1

Table 7-6: Monthly PA rate per 100 FH CPDLC session per ATSU for ATN/VDLm2 services

It is also important to look at one of the performance parameters specifically defined for VDLm2 which is the AVLC Reliability and is defined as the probability that an AVLC frame is acknowledged before a specific time. An “infinite” duration is taken for AVLC frames not acknowledged. This parameter is measured in a similar way as continuity in Iris. The difference between reliability (or continuity) and the TRTD is mainly that the former takes into account all transactions (including the ones which are not successfully delivered) whereas the latter takes into account only the transactions that are successfully delivered. Therefore, the AVLC reliability provides this additional information which is important for the overall performance analysis.

Figure 7-3 shows the cumulative distributions per frequency (and per CSP) for the AVLC Reliability of AVLC INFO frames conveying ATN packet considering all VGS logs. The 0.95 and the 0.999 percentile of the CSP allocation from ED-120 and ED-228A are also provided for information (red and blue dashed lines). Please note the logarithmic scale of the delays.

The Figure 7-3 shows that the value of 0.95 for a latency of 10 seconds (i.e. the Iris commitment as per Section 6.3) is not met by some CSPs' frequencies (i.e. CSC ARINC and CSC SITA). And the value of 0.99 for a latency of 18 seconds (i.e. the Iris commitment as per Section 6.3) is not met by any CSPs' frequency. The figure also shows that the value of 0.99 or higher (e.g. 0.995 defined as Iris continuity commitment as per Section 6.3) is never reached for any latency.

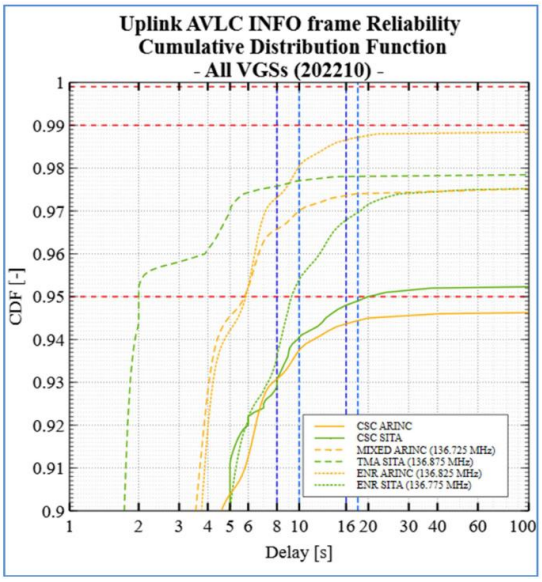


Figure 7-3: AVLC reliability

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