



# Iris

The Satellite Communications System  
for Safe and Secure Air Traffic Management Data Links and Voice

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## 1. Executive Summary

The satellite-based Iris system is one key to a successful European implementation of Data Link Services for Air Traffic Management; and could underpin a global solution.

Iris is a Data Link Service (DLS) satellite system funded and promoted by the European Space Agency. Based on Inmarsat SwiftBroadband-Safety technology that is already certified for oceanic use, it will be extended for use in continental airspace for the provision of advanced DLS (referred to as ATN B1 and B2), as well as advanced Airline Operational Communications (AOC).

Developed for ESA by a world-class industrial consortium led by Inmarsat, Iris is already contributing to the EC's Aviation Strategy and the aeronautical community: but additional steps are needed for the adoption of satellite into the ATM network and the provision of current and future DLS with the required performance.

In part this is because deployment of the terrestrial ATN system known as VDL2, (which was mandated by the EC in 2009), has shown its limitations even to the extent of affecting the correct operations of DLS.

Despite corrective actions and a recovery plan put in motion by the EC, the deployed terrestrial network still does not meet the performance required to fulfill the needs of air traffic controllers and airlines: Europe already has one of the world's most congested airspaces and air traffic is expected to double by 2035. It thus jeopardizes the ambitious goals set by the EC through the European Aviation Strategy published in December 2005.

Only an integration of all available technologies into a DLS system-of-systems, can meet current and future performance, safety, and capacity requirements that will become more stringent in line with increases in air traffic and data-hungry services.

Today Iris is a ready-technology that (integrated with terrestrial systems as part of the overall ATM network), can immediately deliver the required performance, while providing enough capacity to support the forecast medium-term data traffic in the busiest continental areas.

In agreement with the SESAR Joint Undertaking (SJU), Iris was designed to comply not only with the technical performance and requirements but also with the capability to support services for both air-ground ATM communications and AOC. It already provides enough capacity to support near-term, data-hungry services, whilst guaranteeing the required quality of service for safety of life services and with an easy scalability for possible future needs.

Although the use of different technologies will improve the required robustness and availability for safety of life services, the Iris solution in itself represents a bridge

towards longer-term SESAR objectives. Its high performance guarantees continuity in ATM service provision, even as the terrestrial component undergoes the required re-design to mitigate its current, well-known limitations.

In summary, Iris is a readily available solution enabling the EC's Aviation strategy based on:

- Compliance with ATM safety and performance requirements for both short and medium term (ATN B1 and B2 respectively);
- Immediate coverage for Europe and scalability to become a global system;
- High capacity, guaranteeing the required quality for safety services whilst also supporting the data-hungry services needed for airlines operations;
- Resilience to malicious attacks, due to an end-to-end secure and redundant system;
- Continuity, as satellite can not only fill the gaps of existing terrestrial-based ATM DLS but is also an asset on which to build reliable solutions for future ATM needs;
- Scalability and a cost viable solution because satellite usage is shared with many non-aeronautical users, resulting in a large customer base that will constantly demand new, high performance features;
- Future proofing, as upgrades to the existing system can be easily implemented to fulfill future requirements for improved performance or compatibility with IPS-based technology.

The results achieved so far draw on the involvement of leading European Institutional stakeholders (EC, SESAR, EASA and EUROCONTROL). ESA is committed to further this cooperation with European bodies to help fulfil the Single European Skies policy set by the EC. To this end, ESA has signed Memorandum of Cooperation with the SESAR Joint-Undertaking (SJU), the SESAR Deployment Manager (SDM) and EASA, to guarantee the compliance of Iris to the required standards and legislations. Exchanges between the involved parties aim to provide full visibility on all Iris related activities carried out or planned by ESA.

The Iris technology is a present reality, with the important milestone of technical validation already achieved within the SESAR1 programme, where Iris is solution #109 of the SESAR catalogue. Additional validation activities have been carried out in ESA's Iris Programme through several flight trial campaigns (the latest in July 2018), demonstrating that Iris meets the target performance requirements<sup>1</sup>.

The Iris system is currently being prepared for the execution of a large-scale validation using certified avionics flying on revenue flights from at least two different airlines (the so-called "Iris Early-implementation" in 2020-21). The achieved performances will be analysed with the support of pre-eminent ANSPs, while the airlines will analyse the commercial and operational benefits of Iris.

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<sup>1</sup> RCP 130 RSP 160

This “Iris Early-implementation” will pave the way to full implementation of the Iris System, which will rely on a common validation and deployment roadmap that EASA will define with the SJU and SDM.

Anticipating these planned steps, major ATM Stakeholders already recognise that Iris is the only candidate available for complementing VDL2 in the short term, while having strong potential for supporting global ATM automation in the long term.

Nevertheless, further actions are required to enable and boost a shared implementation plan for the Iris system at a European level.

Implementing the new ATM system will require amendment of current DLS legislation by the EC. This should formalize the use of a performance-based rather than technology-based approach for DLS provision (further details of which are provided in this paper). Explicit recognition by EASA of the Iris technology as an acceptable means of compliance to such new legislation, will be the key to unlocking funding for airlines and other stakeholders and thereby enabling a critical mass of airplanes to be equipped with Iris.

The coming period will be vital for defining and implementing new DLS worldwide. A united European front will give European industry a competitive advantage compared to other world players, whilst also contributing greatly to common global goals. This requires an amended ATM policy in Europe to be consolidated and approved as soon as possible.

## 2. Air Traffic Management European and Global Context

In December 2015, The European Commission (EC) shaped a comprehensive European Aviation Strategy<sup>2</sup> for implementing a new Air Traffic Management administrative, operational and technical concept.

The expected benefits to Air-Traffic-Management (ATM) stakeholders are to enable a three-fold increase in capacity which will reduce both ground and air delays; improve safety by a factor of 10; enable a 10% reduction in the effects flights have on the environment; and, provide ATM services to airspace users at a cost that is at least 50% lower.<sup>[1]</sup>

To achieve such an ambitious goal, the Single European Sky ATM Research (SESAR) has issued the ATM Master Plan<sup>3</sup> outlining the essential operational and technological changes required to achieve improvements in terms of operational efficiency, capacity, safety and security.

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<sup>2</sup> Brussels, 7.12.2015 COM(2015) 598 final

<sup>3</sup> <https://www.atmmasterplan.eu/>

SESAR has recognized the technological modernization of the Air-Ground Air Traffic Service (ATS) Datalink as a key enabler of such a transformation towards Trajectory Based Operations (TBO). Through TBO, flight plans will be continually updated during flight to maintain an optimal trajectory to destination, allowing air traffic control to offer better routings, sequence aircraft far in advance and maximize airport and airspace capacity. The combined effect will be less fuel burn, reduced delays and lower CO<sub>2</sub> emissions.

Furthermore, the continuous increase of traffic for both general aviation and new domains (e.g. UAVs) represents a major challenge for ATM systems, which are being required to handle a larger amount of data whilst also ensuring an improved level of Safety<sup>4</sup> and Security<sup>5</sup>. Aviation Safety will require robustness and hence a solid redundancy approach, while the integration of security in the end-to-end chain of the data link is already needed and will be vital for the ATM of the future.

Finally, the same novel technology will also be exploited from a more commercial perspective by AOC services<sup>6</sup>. These are capacity hungry and are in continuous evolution: they are also fundamental for the cost/benefit balance of DLS.

### 3. Data-Link Services

The availability of high quality data communications capabilities with adequate Quality of Service is essential to reach the ATM objectives of the EC/SESAR programme. In particular, the core concept of Initial 4D Trajectory (i4D) services entirely relies on an efficient means of exchanging data between the aircraft and the Air-Traffic-Control (ATC) system on the ground.

In the medium-term, the target is to create a “converged”<sup>7</sup> data link system that will operate globally according to the current and next generation of datalink services. Safety, Performance and Interoperability requirements are maturing and initial standards have now been published (ED-228 and ED-229). The new requirements package is ATN Baseline 2 and includes Initial 4D Trajectory Management (i4D) using ADS-C services. ICAO has endorsed it in the Global Air Navigation Plan (GANP). Both the strategy and the standards were developed in close co-ordination with the FAA NEXTGEN Programme<sup>8</sup> as well as with Airbus and Boeing.

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<sup>4</sup> Aviation safety means the state of an aviation system or organization in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.

<sup>5</sup> Aviation security is the set of measures and resources implemented to prevent malicious acts (terrorism) targeting aircraft, their passengers and crew members. Whilst air transport is the safest means of transportation in the world, its security has always been at the heart of the aviation industry's concerns.

<sup>6</sup> The AOC communications depend on the strategies defined by the airline companies for the operational procedures. Hence, messages are specific to the airline needs and can be different from one company to the other. Generally speaking, the AOC services are dedicated to flight plan management, air traffic operations and maintenance activities

<sup>7</sup> Converged: capable of aggregating all ATM data links needs through a common solution supporting both Air Traffic Controller and Airline needs.

<sup>8</sup> The Next Generation Air Transportation System, or NextGen, is the FAA-led modernization of America's air transportation system to make flying even safer, more efficient, and more predictable.

In the longer term (from 2040 on), after further R&D and taking the lessons learned from ATN B2 and i4D, another evolution step is expected towards “Full 4D Business Trajectories”; the associated requirements and operational concept are not mature at this time but are under study in SESAR. In this perspective, the on-going collaboration of ESA with SESAR is key, especially on the requirement specifications (performance, safety, and security) of the future ATM infrastructure, in order to make sure that Satcom can continue to play a significant role in the future ATM scenario.

Furthermore, in addition to ATM Datalink services, the datalink will support the increased use of AOC by crews, dispatchers, crew schedulers, ATM coordinators and strategic planners. Airline operations require services that offer the airlines great flexibility and control over their daily operations. AOC communications (although of less priority than ATS) are of a strategic nature for flight operations and as such need to be included (securely) in the main data link service stream.

Data Link Services Evolution is summarized in the Fig. 1 below.

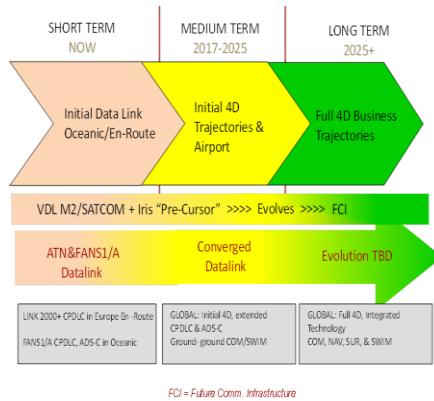


Figure 1: Datalink Service Evolution

#### 4. Satellite Data-Link Services in the context of SESAR

Satellite communications have an important role to play in the ATM infrastructure both in Europe and in the rest of the world, providing advantages to the Data Link Service in terms of global coverage <sup>(9)</sup>, improved reliability and increased capacity.

Satellite DLS are already used for oceanic and remote regions where they are the only available solution. Converged DLS relying on both a terrestrial DLS and a satellite DLS component will have improved robustness against breakdowns and resilience to interruption of either of them, thus improving reliability. Lastly, a Satellite DLS will provide additional bandwidth (and thus increased DLS capacity) for European continental

<sup>9</sup> An older datalink system (FANS1/A) has been in operation in Oceanic and Remote areas for over 20 years, based on ACARS messaging. FANS1/A is installed on many long haul aircraft and is supported by the long-established Inmarsat Classic Aero Service. In the short term Iris would support existing ACARS operation through the enhancements already made to SwiftBroadband for oceanic safety services.

operations. This may be of significant value given that there is still uncertainty about the exact capacity of the ground based VHF DLS and considering that DLS capacity is much needed to boost the development of new applications and services, especially close to airports where data congestion is anticipated first.

Indeed, terrestrial DLS introduction has been impeded and delayed by unexpected limitations of the terrestrial-based VHF (VDL Mode 2) system. The original intention of the EC was to have the new ground based data link system (VDL M2) deployed over Europe by 2015 but due to system performance issues, this deployment has now been delayed to 2018 or even 2020. This negatively affects other ATM functionalities that rely on efficient and performant data links; and it also holds back airlines from improving AOC, resulting in high costs and decreased efficiency for the overall European ATM network. In this context the capability of Satcom to augment the ground system (VDL M2), by adding a considerable capacity provided through alternative means, represent a key asset for Europe in order to meet the ATM Master Plan with no further delays.

## 5. Iris: ESA's contribution to the ATM DLS Modernization

In 2008, The European Space Agency kicked-off the IRIS Programme as a contribution to the ATM DLS Modernization and to the Single European Sky objective set by the European Commission. Close working relations have been set up with the SESAR JU and now with the SESAR Deployment Manager to ensure coordination and consistency of all the European efforts in that domain.

After a four-year Research phase involving major European space companies, in 2012 ESA started the development and validation/demonstration phase of a 1<sup>st</sup> generation (“precursor”) based on the SwiftBroadband-Safety (SB-S) service of Inmarsat and relying on the L-band satellite infrastructure of this satellite operator.

### What is Iris

Iris is a service running on the enhanced Inmarsat SwiftBroadband Safety (SB-S) infrastructure, for delivering operational DLS to airlines and Air Navigation Service Providers (ANSPs). Iris extends SB-S oceanic/remote service to busy continental areas, starting with Europe and scalable to global coverage. Iris supports safety services for the current and future Aeronautical Telecommunication Network (ATN-B1 and ATN-B2) and any other ATM applications requiring an efficient data link. This includes also data-hungry services in the AOC domain.

Iris key features include:

- Compatibility with Safety requirements for ATM (ED-120, ED-228A);
- ATN/OSI functionalities integrated into the existing ATM datalink infrastructure;

- Security procedures for providing secured link connections between aircraft and ground network:
  - Delivering secure end-to-end (from cockpit to ground CSP/ANSP's interface) links for the voice and data path, thus greatly reducing existing common threats and risks;
  - Providing stronger controls for mutual authentication and data integrity that do not exist in today ATM links; and
- Plans for an EASA certified Iris service provider

### Iris Added Value to ATM Data Link Services

Iris is well positioned to work in a “dual-link or multi-link” configuration, together with the terrestrial based VDL2 service, in order to provide far greater data link capacity and enable the real digital transformation of aviation. The resulting available bandwidth and throughput constitutes a game changer for the growth of ATC and of new demanding AOC services. From the cost/benefit stand point it should be underlined that Iris benefits from the existing SB-S infrastructure, which is shared with multiple mobile Satcom users in other application fields (e.g. maritime and land mobile).

Immediate main benefits deriving from Iris adoption for Europe:

- Extend the lifetime of VDL2 and the data link infrastructure already deployed for CPDLC and accelerate the delivery of CPDLC benefits;
- Support the continuous growth of AOC communications;
- Support the validation of i4D services in partnership with SESAR, ANSPs, Airlines and EU Institutions; and
- Accelerate and enable i4D operational deployment for the benefit of European business.

Initial assessment of Iris specific benefits identifies the following elements:

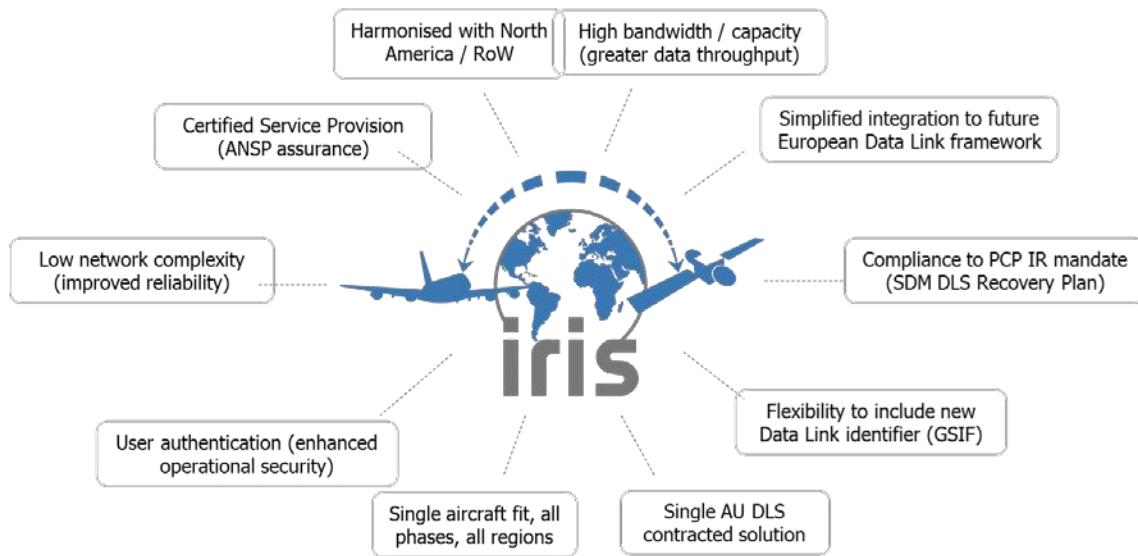


Figure 2: Iris Specific Benefits

## Iris Services

Iris has been designed (in agreement between ESA and the SESAR Joint Undertaking) to support air-ground communications services for ATM and AOC. Major ATM stakeholders recognise that Iris is a candidate available for complementing VDL2 in the short term, while having strong potential for supporting global ATM automation in the long term (ICAO Global Air Navigation Plan).

Iris communications service will deliver the following:

**ATN/OSI Data Safety Services** supporting CPDLC and ADS-C applications for:

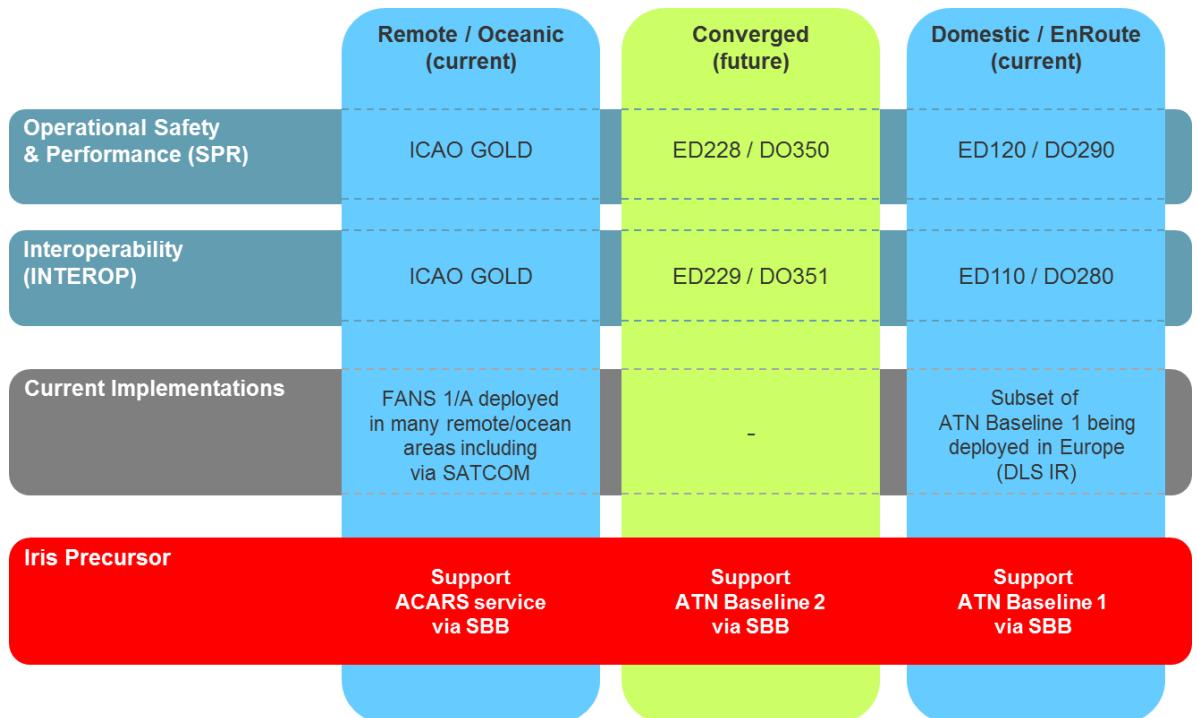
- **ATN Baseline 1**- the current set of ATS datalink services, a subset of which is in force through the DLS Implementing Rule; and
- **ATN Baseline 2** - The proposed future set of ATS Datalink services envisaged for the introduction of I4D in converged airspace, but not yet subject to an European Implementing Rule;

**ACARS Data Safety Services** - Existing FANS1/A datalink communications for remote and oceanic regions, as implemented for the current SBB Oceanic Safety;

**Cockpit Voice Service** - Prioritised circuit-switched (CS) and packet-switched (PS) channels will be provided for cockpit voice communications, again using the extensions provided under the SwiftBroadband Oceanic Safety;

**AIS/AOC Data Service:** Airline information and operational control services.

The delivered ATM services fulfil the set of operational safety, performance and interoperability requirements applicable, as shown below:



## Iris Architecture

### Iris System Architecture

A high level architecture of the Iris concept for ATN and ACARS, omitting redundancy, is shown in Figure 3.

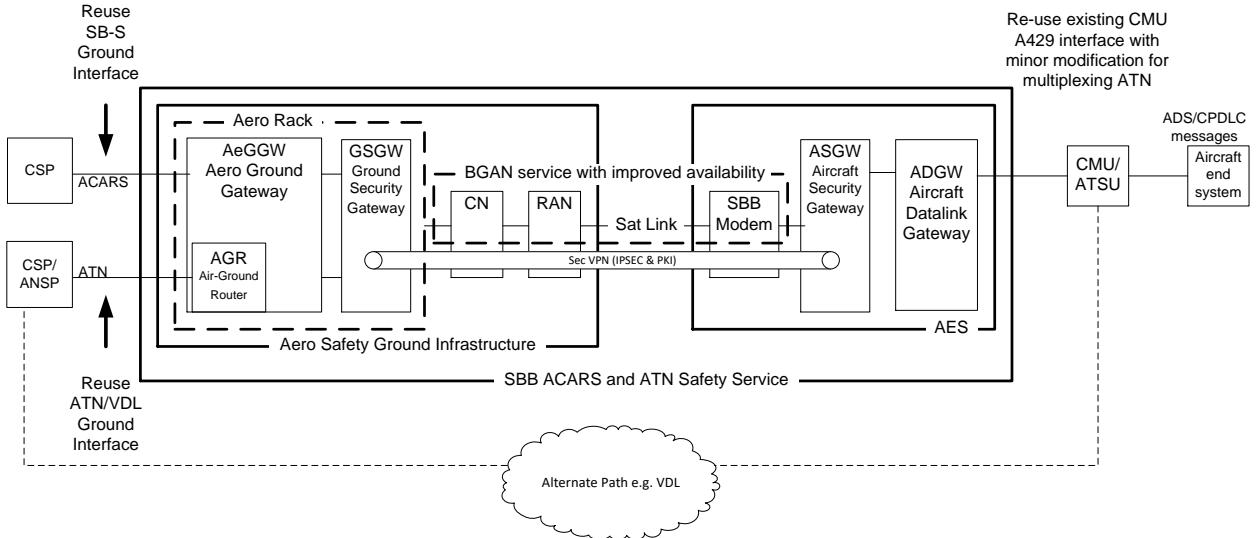


Figure 3: Iris High Level Architecture

The high level Iris architecture consists of three main component: Ground Segment, Space Segment (Satellite) and Aero Segment (Spacecraft).

The main **Iris ground segment components** are integrated in the Aero Rack, which includes the following elements.

**AeGGW** Aero Ground Gateway – a new component for this system. The AeGGW is the physical entity handling ATN/ACARS traffic to/from an AES. It contains the GDGW and the Air-Ground Router (AGR). The AGR is an ATN/OSI router software function within the AeGGW that peers with the ATSU/CMU on the aircraft. The AeGGW routes/receives ATN/OSI packets on the terrestrial interface through the AGR and delivers these over the satellite link through the GDGW.

**GSGW** Ground Security Gateway is the peer of the ASGW and terminates the IPSec secure VPN tunnel established by the AES.

**GDGW** Ground Datalink Gateway supports combined delivery of ATN and ACARS traffic over the satellite link, expanding on similar functions developed and operational for the SB Oceanic Safety ACARS service. Its peer is the ADGW on the aircraft.

The main **Iris Aero Segment components** that constitute the peer entities of the ground segment are implemented within the Satellite Data Unit (SDU) on the Aircraft Earth Station (AES) SATCOM terminal and include the following elements.

**ASGW** Aircraft Security Gateway, responsible for establishing the Secure VPN tunnel between the aircraft and its peer GSGW, for the provision of an IPSec VPN for secure air-ground datalink communication.

**ADGW** Aircraft Datalink Gateway, expands on similar functions developed and operational for the SBB Oceanic Safety ACARS service. It is a functional block within the AES that is responsible for encapsulating ATN/ACARS messages in an IP wrapper to allow them to be sent to the ground via SBB; and to de-encapsulate received ATN/ACARS IP messages for transmission to the aircraft CMU.

Also on the aircraft is the CMU (Communication Management Unit). The CMU manages aircraft communication across multiple sub-networks such as Terrestrial HF, VHF radio and satellite based communications, selecting which subnetwork to use based on availability and local routing policy.

The main **Satcom related components** for delivering Iris Swift Broadband (SBB) based services include the following key components.

**CN** Core Network provides the services, switching and routing of traffic to and from the AES, via the RAN towards external terrestrial networks. The CN consists of a suite of UMTS network nodes having separate Packet and Circuit Switched domains.

**RAN** Radio Access Network is responsible for all radio related aspects of the Inmarsat BGAN ground system. It controls AES communications over the satellite to the ground network. Each Inmarsat satellite is served by at least one RAN.

**INMARSAT I4 satellite fleet** is deployed worldwide and covers around 98% of the Earth's surface (with the exclusion of some polar regions above 70/80 degrees).

## Iris Redundancy Architecture

The Iris system needs to meet stringent targets in terms of network availability and service outages. In order to meet these demanding operational requirements, a comprehensive redundant system solution has been conceived, with no single points of failure and the ability to detect and switch over quickly to standby equipment in the event of failures.

Figure 4 below shows the Iris approach for redundancy implementation:

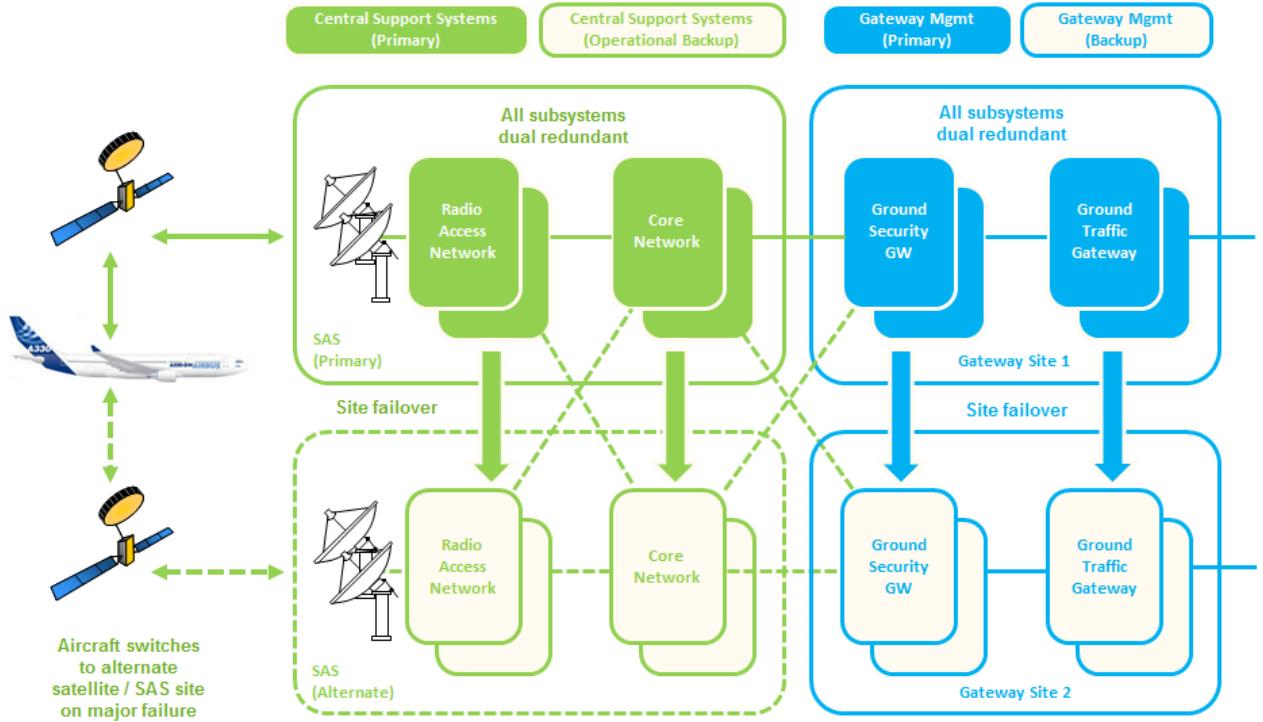


Fig. 4: Iris Redundancy Architecture

### Iris Security Architecture

The Iris solution also includes security mechanisms to ensure the end-to-end authenticity and integrity of ATS datalink exchange. This approach aims at establishing secure domains for Iris services in the ground and air segments for delivery of ATS datalink traffic; it also foresees the implementation of the necessary controls to ensure that the equipment within these domains is managed securely.

Figure 5 shows Iris Security Architecture approach:

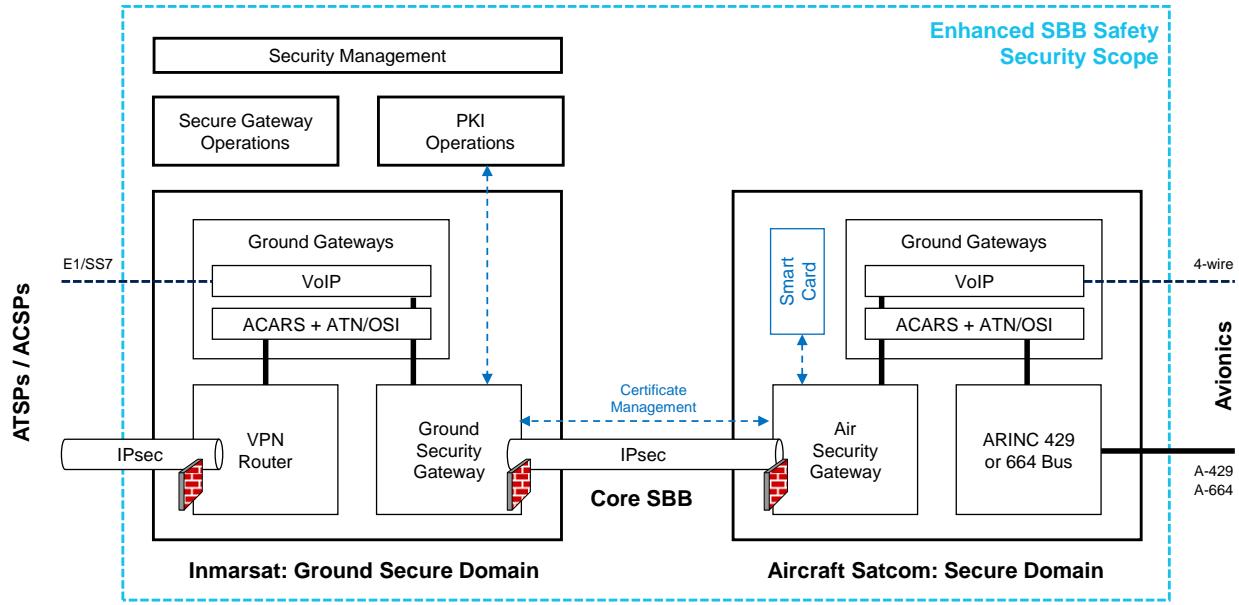


Fig. 5: Iris Security architecture

## 6. Iris Validation

The activities for the validation of Iris are performed in collaboration with SESAR-JU, through the SESAR1 and SESAR2020 Programmes. Thanks to the achieved results, Iris has been included as solution #109 of the SESAR catalogue (SESAR1).

Coordinated and complementary pre-operational validation activities have been carried out within ESA and SJU framework through several flight trial campaigns (the last one in July 2018), demonstrating that Iris meets the target performance requirements<sup>10</sup>.

The next phase of Iris is intended as a large-scale validation. The Initial Operational Capability (IOC) includes a key milestone in the implementation roadmap of the system, the so-called Iris “Early Implementation” or Iris Pilot. It will equip certified avionics flying on revenues flights (to be selected Airlines) for a 12-18 month period in 2020-2021. The achieved performances will be analysed with the support of (currently) five ANSPs<sup>11</sup>, while involved airlines will analyse the benefits of Iris for AOC services. EASA will be given full visibility of this phase and will actively monitor Iris Early Implementation by providing feedback and advice. This phase should be complemented by Very Large Scale Demonstrations, to be executed under the SESAR2020 programme. These will include

<sup>10</sup> **Short term:** ED-120, SPR Standard for Initial Air Traffic Data Link Services in Continental Airspace. Referred to as ATN baseline 1, in force through the DLS implementing rule EU 29/2009.

**Medium term:** ED-228A, SPR standard for the proposed future set of ATS data link services in converged airspace but not yet subject of an EU implementing rule. This standard is referred to as ATN Baseline 2.

<sup>11</sup> NATS, ENAIRE, MUAC, DFS, ENAV

multi-link environment (to be planned) and i-4D interoperability in oceanic-continental airspace (known as EAGLE).

Upgrades to Iris for the longer term are under study to assess how future performance requirements will be met from 2030 onwards.

## **7. Iris Deployment**

ESA and Inmarsat are implementing and co-funding all activities that will deliver the IOC from 2021. This requires close integration between the ground and the airborne elements. Iris works with two avionics suppliers to finalise Iris functional development and integration into the SB-S avionics (available by end 2018). Avionics are planned to be certified between Q4 2019 – Q2 2020 and will be used for the Iris Early-Implementation phase (also known as Iris Pilot).

The activities related to the implementation of Iris will be performed in cooperation with SESAR DM, with the final goal of creating a global ATN network where the implementation of the Satcom component is the result of a combined ESA and Industry effort.

In this context, Iris Early-Implementation can be considered as the first milestone of a common validation/implementation process, where all the major institutional partners of ESA (SJU, SDM, EASA) will provide their expertise and contribution.

## **8. Iris Service Distribution**

Inmarsat does not intend to be the Iris Service Provider (ISP) but positions itself through Inmarsat Operations as the operator of a satellite service based on Inmarsat satellite infrastructure and delivered to ISP. The latter will be responsible for the delivery of the Iris services with the ANSPs, in compliance with regulatory and safety requirements.

ESSP, a company closely linked to major European ANSPs and already provider of the EGNOS service, is working closely with Inmarsat in order to prepare certification and contribute to the instalment of the future Iris Service Provider.

The organisation of service distribution will be finalised by 2020 and will be compatible with the datalink services re-organisation defined by the SESAR Deployment Manager under EC mandate.

The preparation of the certification of the Iris Service Provider set up has already started, with the aim to get the certificate in 2021. The Verification and Validation activities for the ground infrastructure will run in parallel to the certification activities.

## **9. Iris current implementation: Next steps**

From the standpoint of a legal framework, the opportunity for Iris IOC to be introduced alongside VDL M2 already exists<sup>12</sup>. Although ATN/VDL M2 is currently the only validated solution for supporting European ATS datalink services, the 29/2009 Implementing Rule leaves the door open to air-ground communications technologies other than VDL Mode 2, provided that required safety and performance requirements are met (even though Iris is not explicitly mentioned as a potential alternative technology).

The complete success for Iris System deployment in Europe, however, entails other activities and challenges. ATM technologies and functionalities deployment are channelled through and organised within the SESAR Deployment Manager (SDM) as per the Common Project (CP) Regulation. It is thus critical that Iris activities are integrated by SDM into the overall datalink services strategy for the ATM community, to fully exploit the investment realised by ESA and Inmarsat.

One of the essential elements is for Iris to be included in the revision of the Pilot Common Project, setting a realistic framework for the service to be provided by ANSPs and also for the equipment of aircraft by airspace users. This framework should also include realistic dates and incentives for early equipment installation (e.g. INEA Grants and route charge modulation). These subjects need to be discussed and agreed with SDM.

Nonetheless, the ultimate target is to have Iris officially recognized in the relevant legislation (Common Project Regulation PCP<sup>13</sup> or CP2). The overall legal framework is not frozen but is currently under revision by the EC and is due in 2020. Such a revision to existing regulation is expected to propose amendments to existing rules that could formally include Satcom as a solution for ATM data communications. For this reason, it is important for ESA to liaise with DG-MOVE at the highest possible level, in order to make sure that Satcom will indeed have a role to play, dictated by amendments to existing regulation on Data Link Technology.

## 10. Iris in the future

In line with the expectation of the aeronautical community, EC is preparing for a full digital transformation in ATM, towards a higher level of automation and virtualization. The goal is to meet the increasing level of performance and capacity required by European aviation, which is moving from conventional aircraft to potentially hundreds of thousands of highly connected and automated air vehicles/devices offering advanced data-driven services.

In this context, Iris aims to become key enabler for the modernization and rationalisation of ATM operations, as a primary component enabling the European Communication-Navigation-Surveillance (CNS) infrastructure to deliver improved services.

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<sup>12</sup> European Datalink Services Implementing Rule - No 29/2009 and No 310/2015

<sup>13</sup> Pilot Common Project, Common Project2

By consolidating and capitalizing upon the results of Iris with Initial Operational Capability (Iris IOC), the Iris Programme will support:

- **Iris Service Provider ground segment upgrades.** Iris will develop the SATCOM interface to the European ATM infrastructure for an operational use of Iris in a multi-link environment. In close collaboration with SESAR Deployment Manager the Iris Service Provider will transition Iris towards operational deployment.
- **System and Technology Development for Iris global evolution.** Iris will explore the migration to Internet protocols of the SESAR's Future Communication Infrastructure (FCI), in compliance to standards that will be adopted at global level. Iris will also continue supporting the Hyper Connected ATM – i.e. future ATS and AOC (Airline Operation Communication) services - that will demand higher capacity and higher performance. All the segments will be addressed.
- **Enhancement of Iris to become the primary component of the European Communication-Navigation-Surveillance (CNS) infrastructure.** Technology development will be performed to integrate communications with navigation and surveillance services, in a rationalised CNS infrastructure for optimized air traffic management. The evolution of satellite constellations will support current and future ATM operations for all phases of flight.

## 11. Conclusions

ESA's satellite based Iris DLS system, developed by a world-class industrial consortium led by Inmarsat, is significantly contributing to the EC's Aviation Strategy and the aeronautical community.

Yet additional steps are needed for the adoption of satellite into the ATM network and the provision of current and future DLS with the required performance.

The results achieved so far, draw on the involvement of leading European Institutional stakeholders (EC, SESAR, EASA and EUROCONTROL). ESA is committed to further this cooperation with European bodies in order to help fulfil the Single European Skies policy set by the EC. In this respect, joint bilateral MoCs are in place between ESA and EASA, SESAR JU and SESAR DM; and exchanges between the involved parties aim to provide full visibility on all Iris related activities carried out or planned by ESA.

A further step towards integrated and coordinated action with all the above institutions is now required to develop a shared implementation plan of the Iris system.

The coming period will also be vital for defining and implementing new DLS worldwide. A united European front will give European industry a competitive advantage compared to other world players, whilst also contributing greatly to common global goals. This requires an amended ATM policy in Europe to be consolidated and approved as soon as possible.