ETSI Conference on
Non-Terrestrial Networks,
A Native Component of 6G

Future NTN Connectivity for Aviation Use Cases

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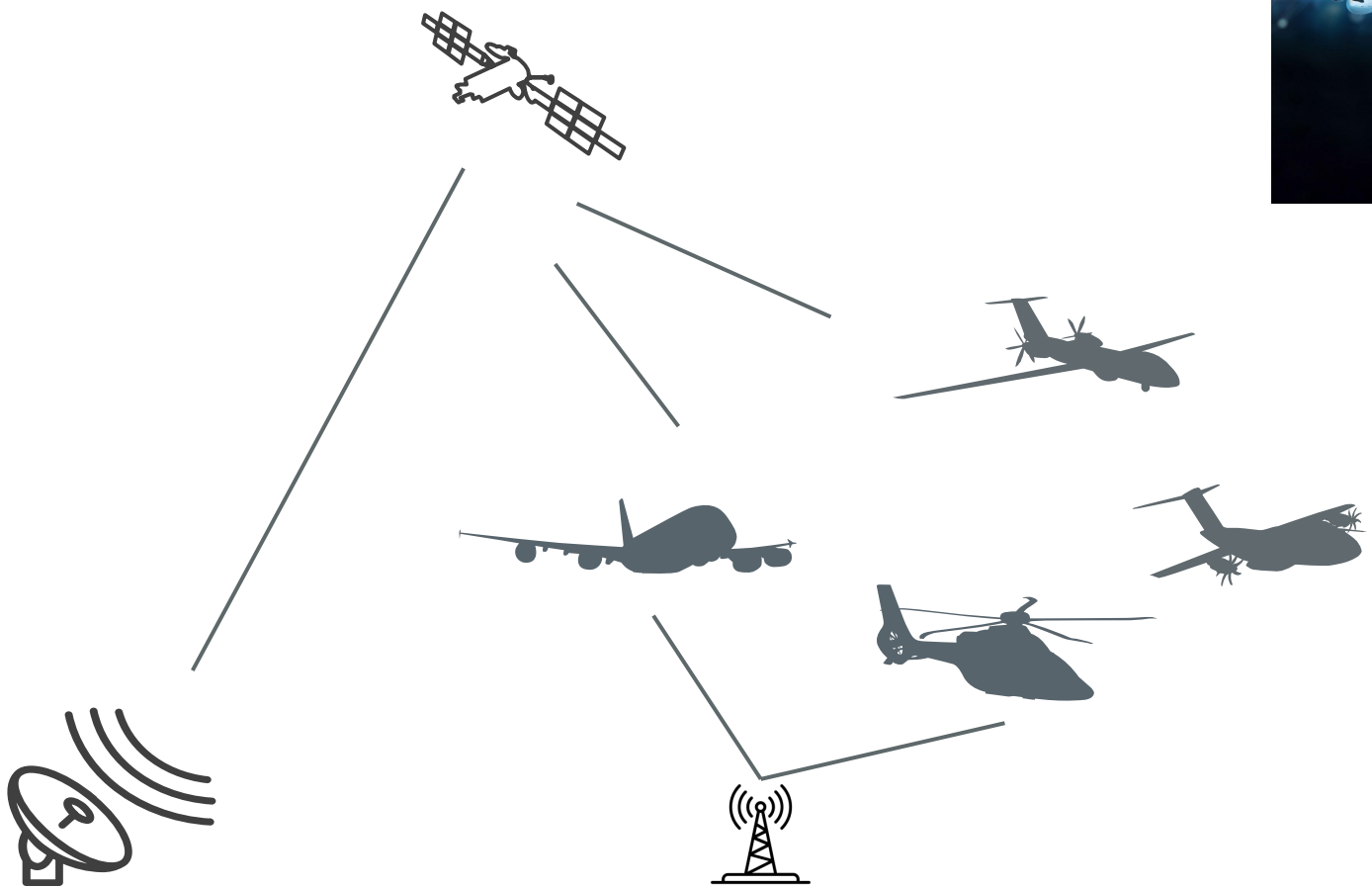
Connectivity for the Aviation Industry



Aeroconnectivity provides digital data communication between the aircrafts and the ground.

This can be done through several means, e.g. telecom satellites, mobile network connection (4G/5G),...

... but truly global and ubiquitous connectivity can be provided by satellites only

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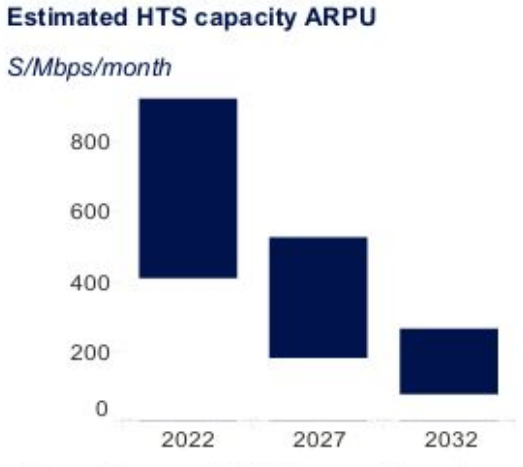
Satcom Ecosystem Evolution and Market Trend

Extract from the 20th Edition of the NSR report "Satellite Capacity Supply & Demand" (June 2023)

NGSO is the trigger for large adoption…

… Multi orbit is the optimal solution



Extract from the 11th Edition of the Euroconsult report "Prospects for Inflight Entertainment and Connectivity" (Sept. 2023)

In the future, Aviation platforms will be fully connected entities

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Aviation Connectivity Context

Purpose

Air Transport operations and passenger services rely heavily on Connectivity

Support both Cabin & Cockpit needs

Market

Airborne Satcom market size is projected to grow to $10B by 2032

Enhancement of passenger experience and modernization of ATM are key drivers

Functions

Passenger Communication

Airlines and Airport Operations

Air Traffic Management (ATM)

Standards

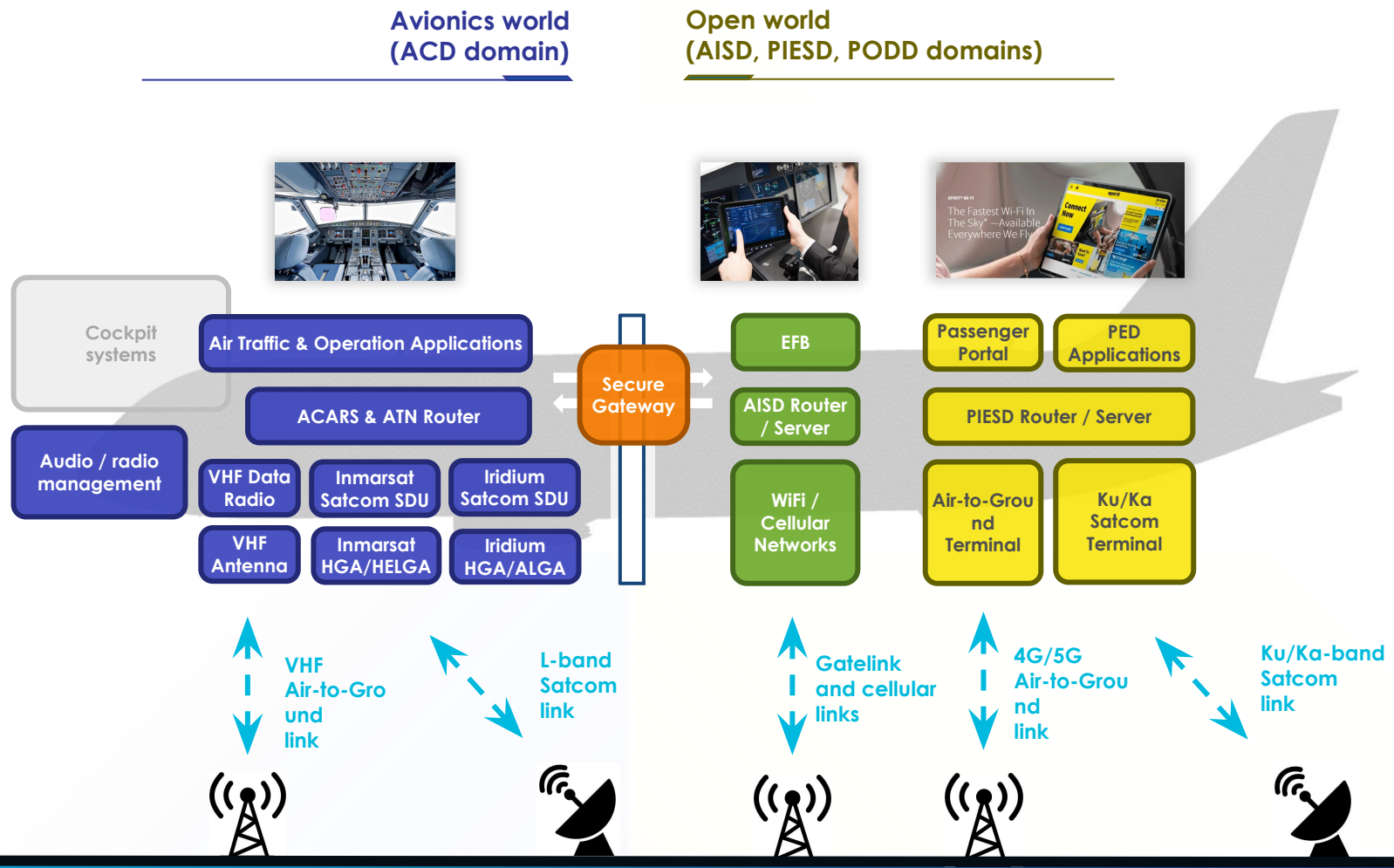
Industry is regulated by rulemaking and standard organizations

Support specifications and interoperability

ICAO, Eurocae, RTCA, FAA PARC, ARINC, SAA

Aviation Connectivity Domains & Stakes

- Digitalization of communication architectures
- IP networking in the cockpit (ATN/IPS)
- Overall expansion of Satcom capabilities
- Increased blurred boundaries between domains
- Domain segregation managed using Cyber Gateways



- HyperConnected Air Traffic Management
- Deployment of LEO / MEO constellations
- New linefit and retrofit Multi-network Terminals
- Anticipation of 6G Non Terrestrial Networks (NTN)

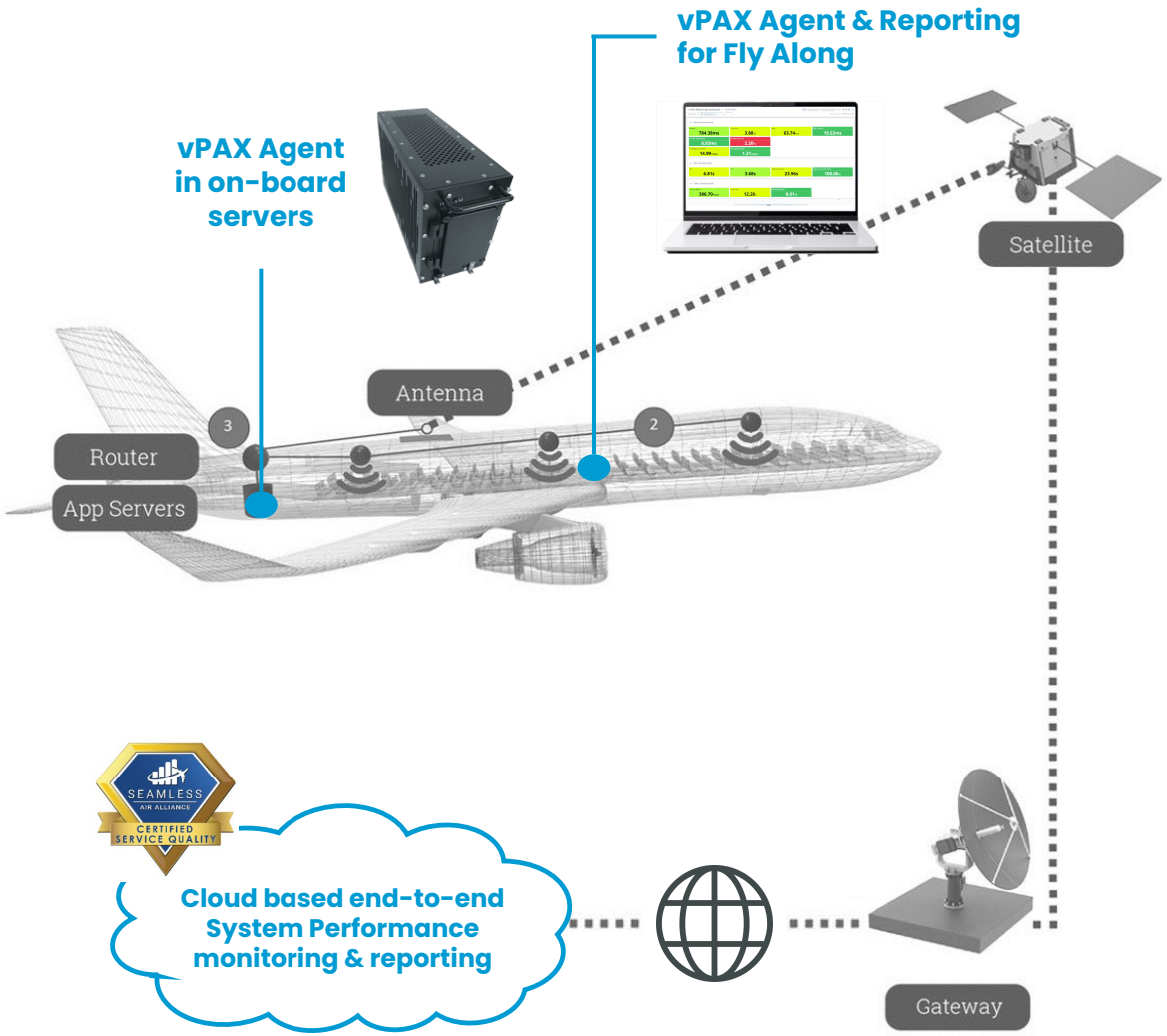
Aviation Connectivity Performance Targets

In-Flight Connectivity

- **Performance assessments using Quality of Experience** (QoE) metrics
- End-to-end system performances based on **measures of passenger satisfaction**
- Seamless certified IFC Suppliers offer **standard-based QoE measurements** (e.g. Thales vPAX)

Air Traffic Management

- **Future use of non-safety communication links to transport Air Traffic Data Services** (e.g. CPDLC, ADS-C)
- **HyperConnected ATM concept** relies on performance monitoring of the broadband Connectivity systems
- **Measures focused on availability and latency, using the PBCS criteria** (Performance Based Communication & Surveillance)



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Aviation Connectivity Challenges & Objectives

Fragmented Connectivity market with heterogeneous and proprietary solutions

Lack of interoperability and standardized solutions leading to expensive systems and scalability issues

Duplication of airborne communication systems to address multiple divergent performance and security requirements

Aviation Industry objective is to rationalize the Connectivity offering by standardizing Aircraft Terminal and leveraging 6G Non-Terrestrial Network (NTN) technology

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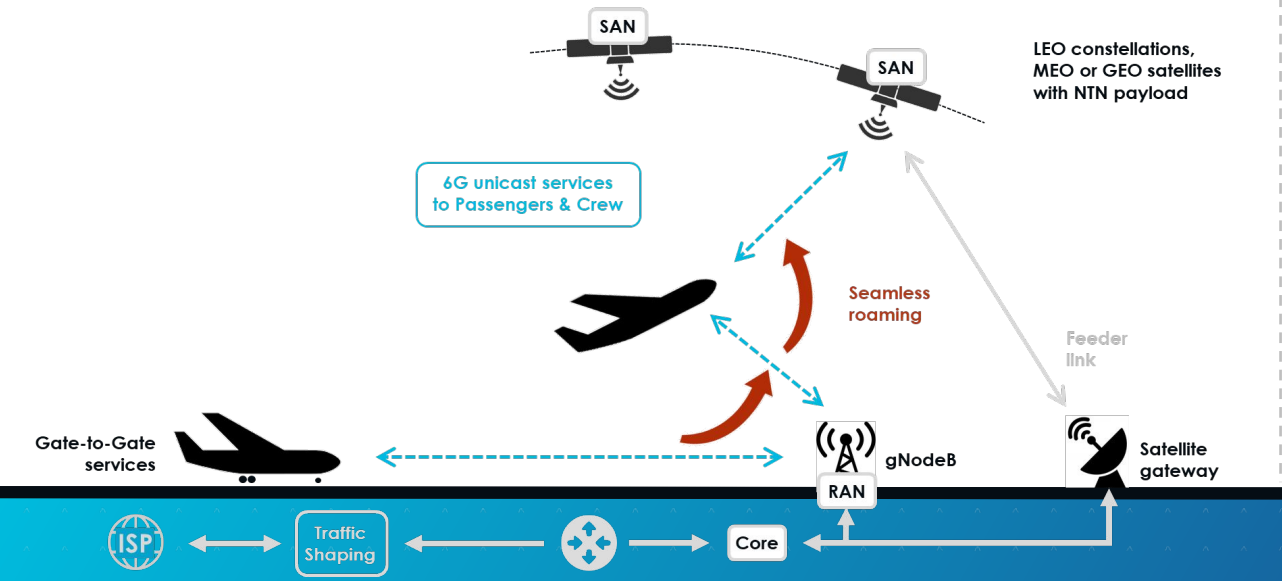
Aviation Use Cases

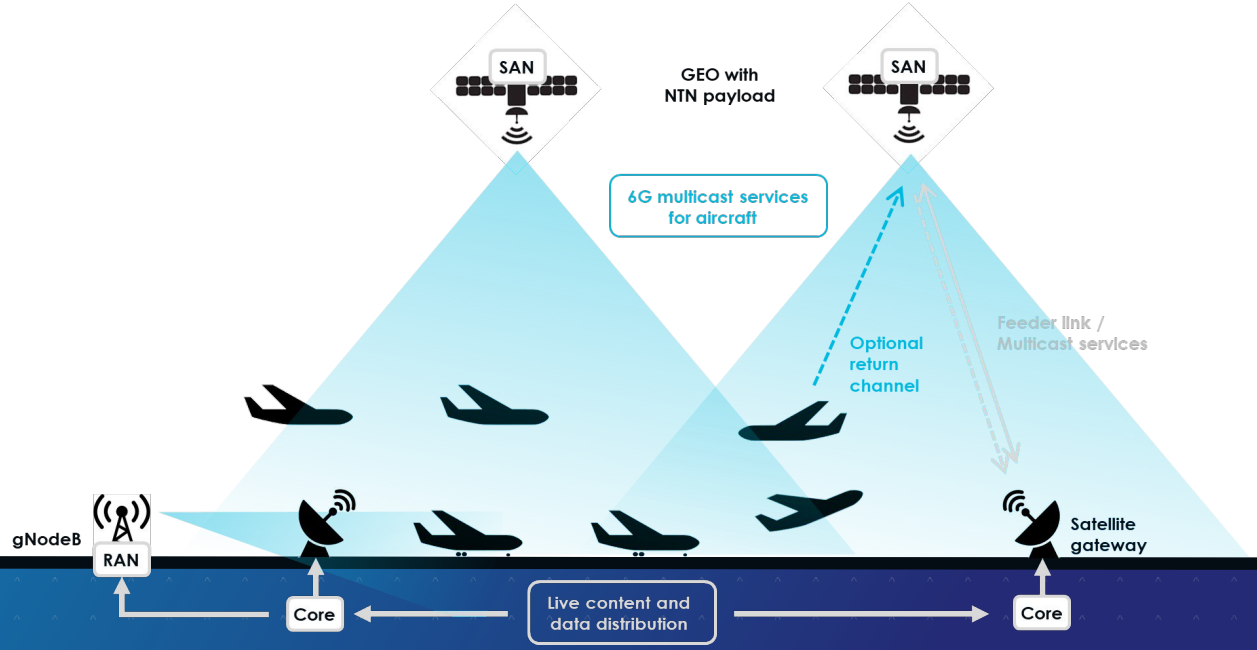
#1: Internet Access

- **Users:** Passengers, crew
- **Services:** Gate-to-Gate Internet services
- **KPIs:** Quality of Service (QoE)
- **Performances:** Service continuity, high capacity, seamless roaming
- **Capabilities:** Traffic shaping, fair sharing



#2: Multicast / Live Television

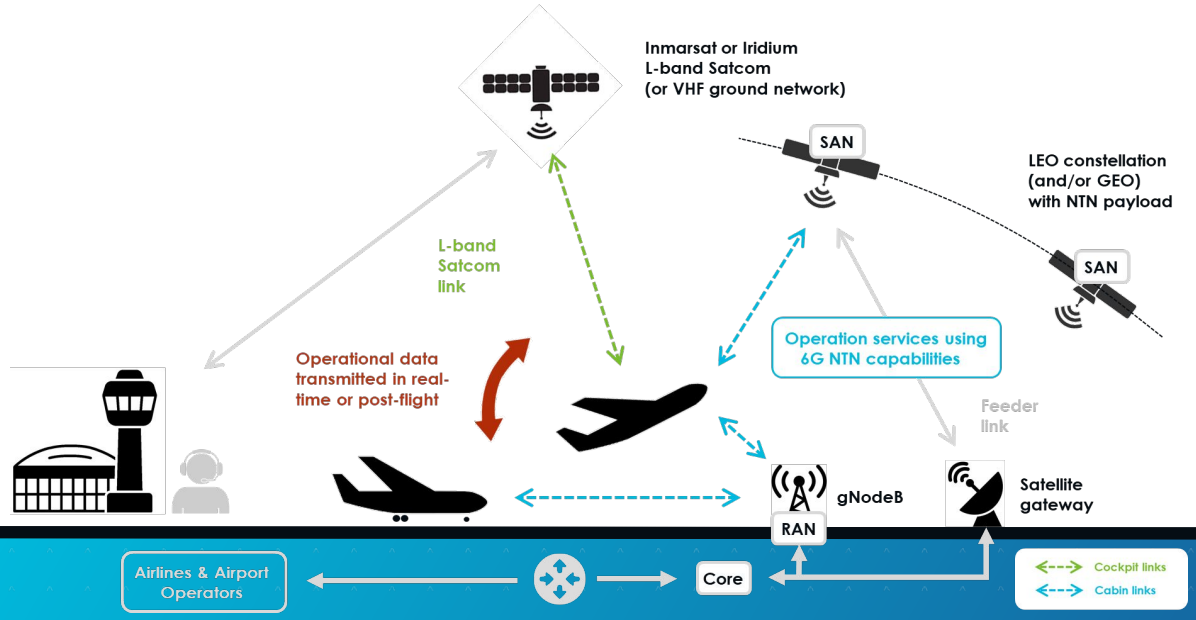
- **Users:** Passengers, crew
- **Services:** Live TV, caching, …
- **KPIs:** QoE, availability, packet loss
- **Performances:** Constant bandwidth for multicast services
- **Capabilities:** Network synchronization, FEC and/or return channel



Aviation Use Cases

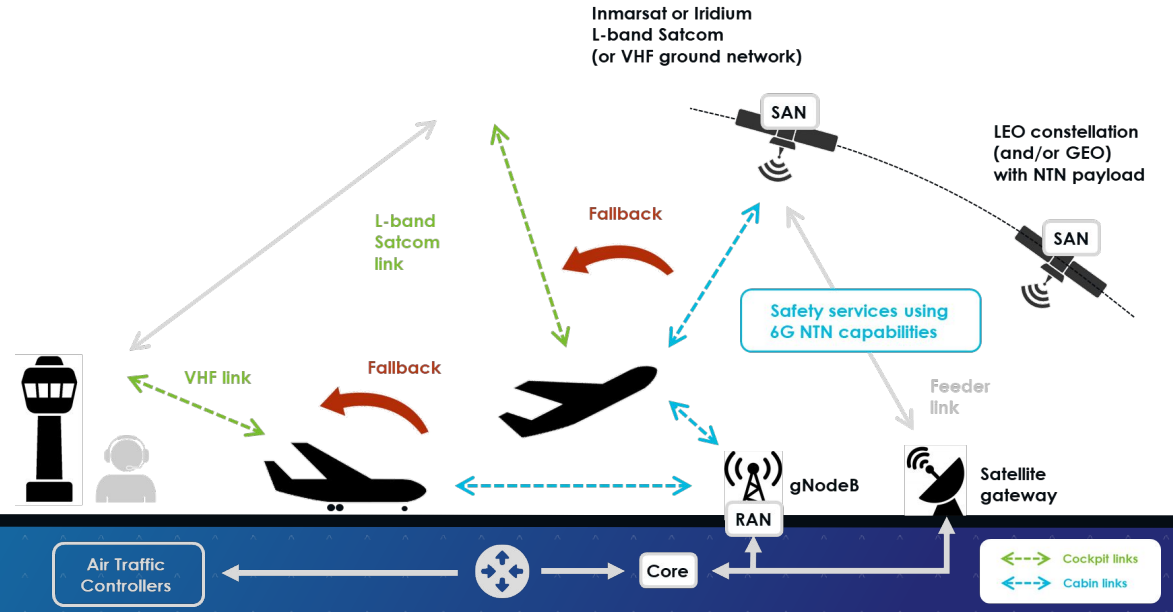
#3: Airlines & Airport Operations

- **Users:** Pilots, crew, operators
- **Services:** Flight management
- **KPIs:** Availability, bandwidth
- **Performances:** Post-flight and real-time data transfers
- **Capabilities:** Multi-link management with priority schemes



#4: HyperConnected ATM

- **Users:** Pilots, Air Traffic Controllers
- **Services:** Safety data services such as CPDLC and ADS-C
- **KPIs:** Availability and latency
- **Performances:** PBCS criteria
- **Capabilities:** Performance monitoring & HyperConnected ATM management



Conclusion

Aviation Connectivity is a growing market with lots of opportunities and different use cases

Aviation industry is facing challenges, e.g. interoperability, use cases specificities

Aviation industry expects 6G NTN to be a game changer in connectivity

- Move away from proprietary solutions with **standard-based and interoperable technologies**
- Take advantage of virtualized and independent logical networks using **network slicing**
- Drive 3D convergence and **natively integrate TN and NTN** with improved capacity, resilience and security
- Enable Wideband & Broadband connectivity **Direct to Mobile VSAT** (connected platforms) in Ku and Ka bands enabled by LEO constellations and GEO VHTS satellites
- Pave the way towards **universal modem based on standard chipset**
- Favor the **Electronically Steerable Antenna (ESA) technology maturation** and satcom terminal commoditization
- Enable seamless end to end **integration of connectivity service on board our aircrafts**

SEAMLESS AIR ALLIANCE

The Seamless Air Alliance intends to promote Aviation requirements for future Connectivity solutions including 6G business & technical needs for cabin and cockpit domains

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Thank you

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