

AFI Region AIXM-e AIP Implementation Workshop

Dakar, Senegal, 3-5 October 2016

**Communication Requirements for a
Digital AIM Implementation &
Operation in the AFI Region**

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Outline



- **AIM Concept and principles**
- **AIS/AIM Transition Roadmap**
- **Concept Basis of AFS**
- **AFI AFTN Topology**
 - AFTN Chart
 - AFTN Directory
- **Supporting infrastructure**
 - Local Area Networks (LANs)
 - Wide Area Networks (WANs)
- **Evolution**
 - Transition from AFTN to ATN
 - Systems Integration : SWIM Concept
- **Follow up Actions**
 - Dashboards
 - Best Practices



The Dilemma



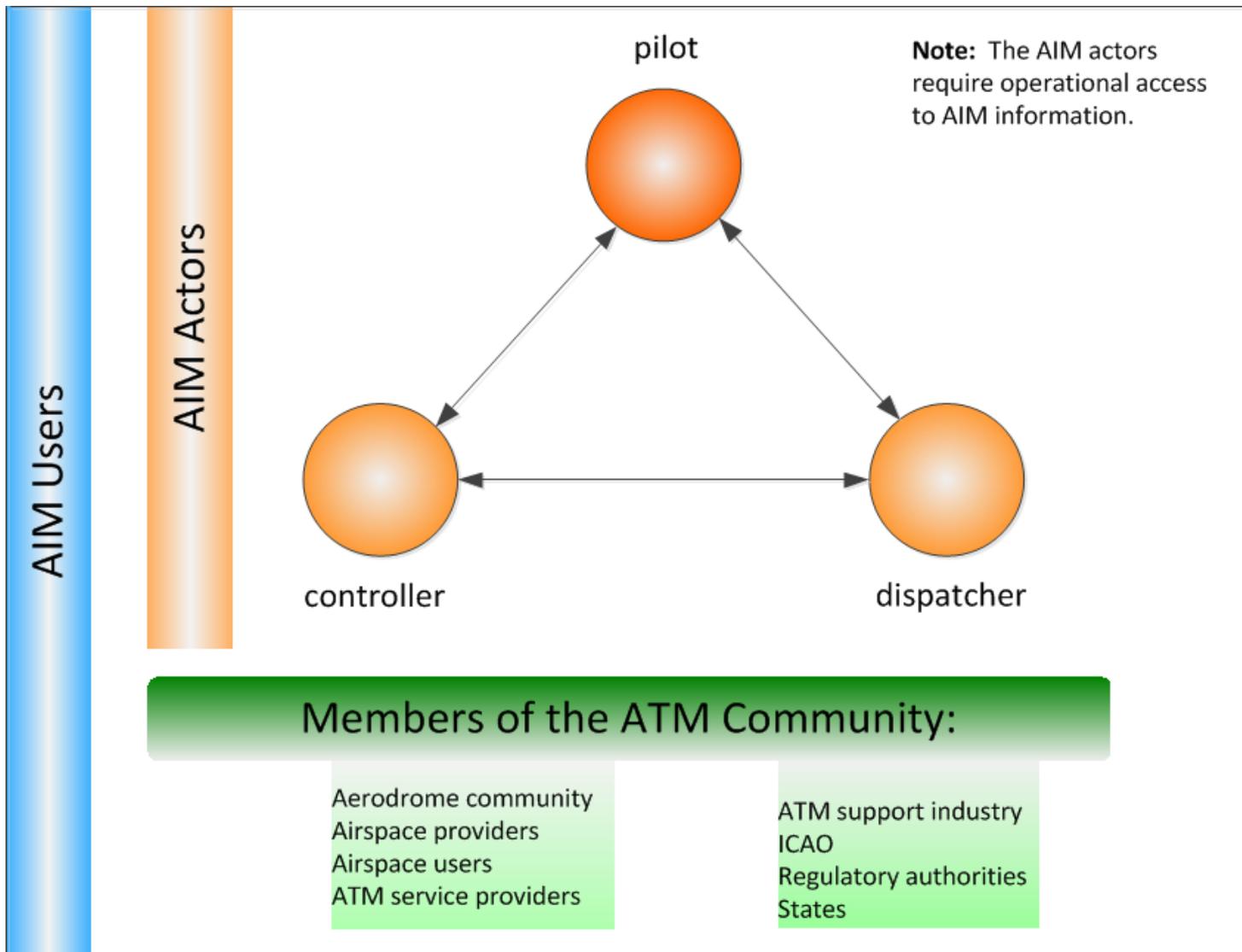
“Do we know where to go?”



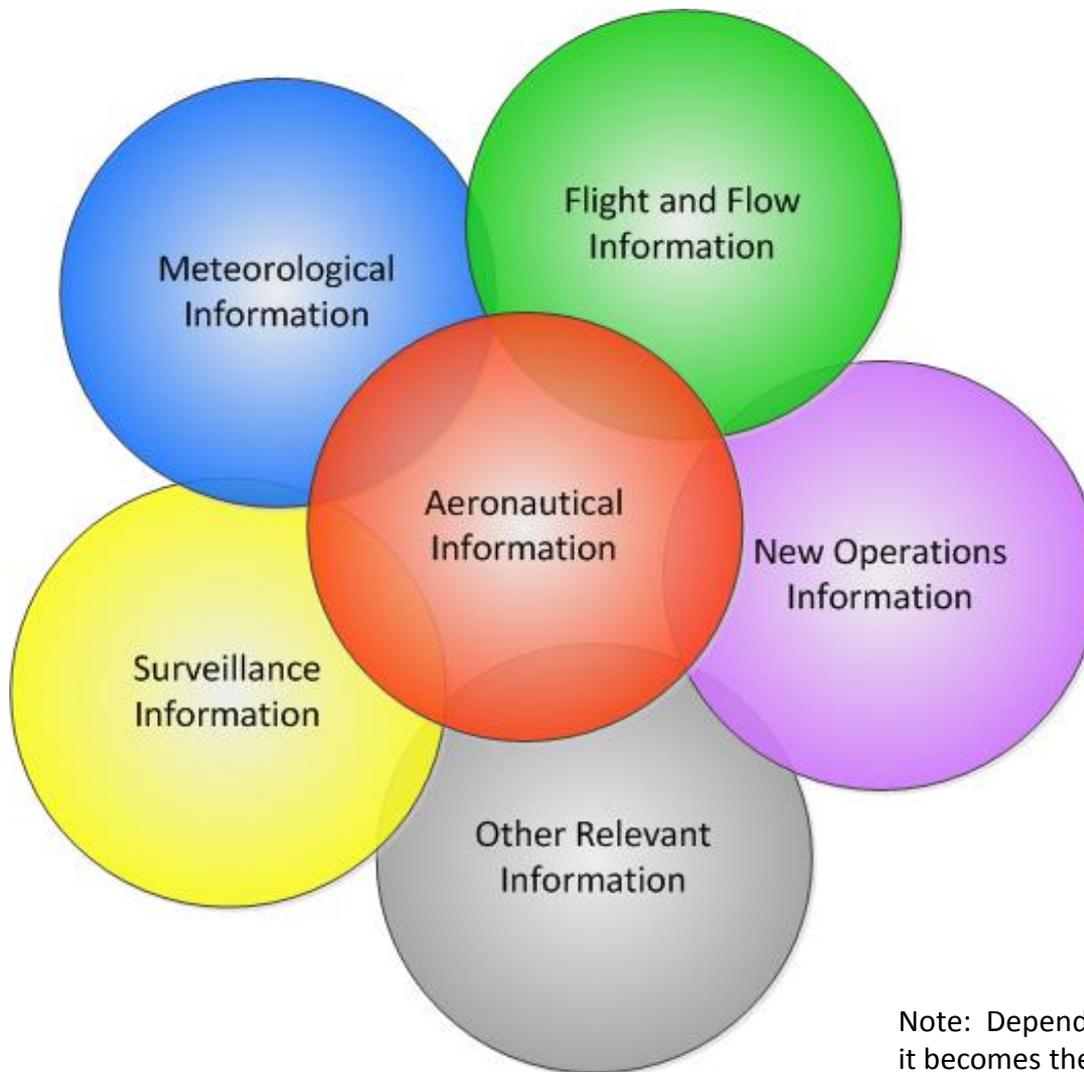
Scope of AIM

- The scope of AIM encompasses the information necessary to completely describe the physical and virtual Air Navigation Services (ANS) infrastructure, along with its status and condition, within its geospatial context, and including the temporality of Planning and Reference, pre-flight, in-flight as well as post-flight.

ATM Community and AIM Actors

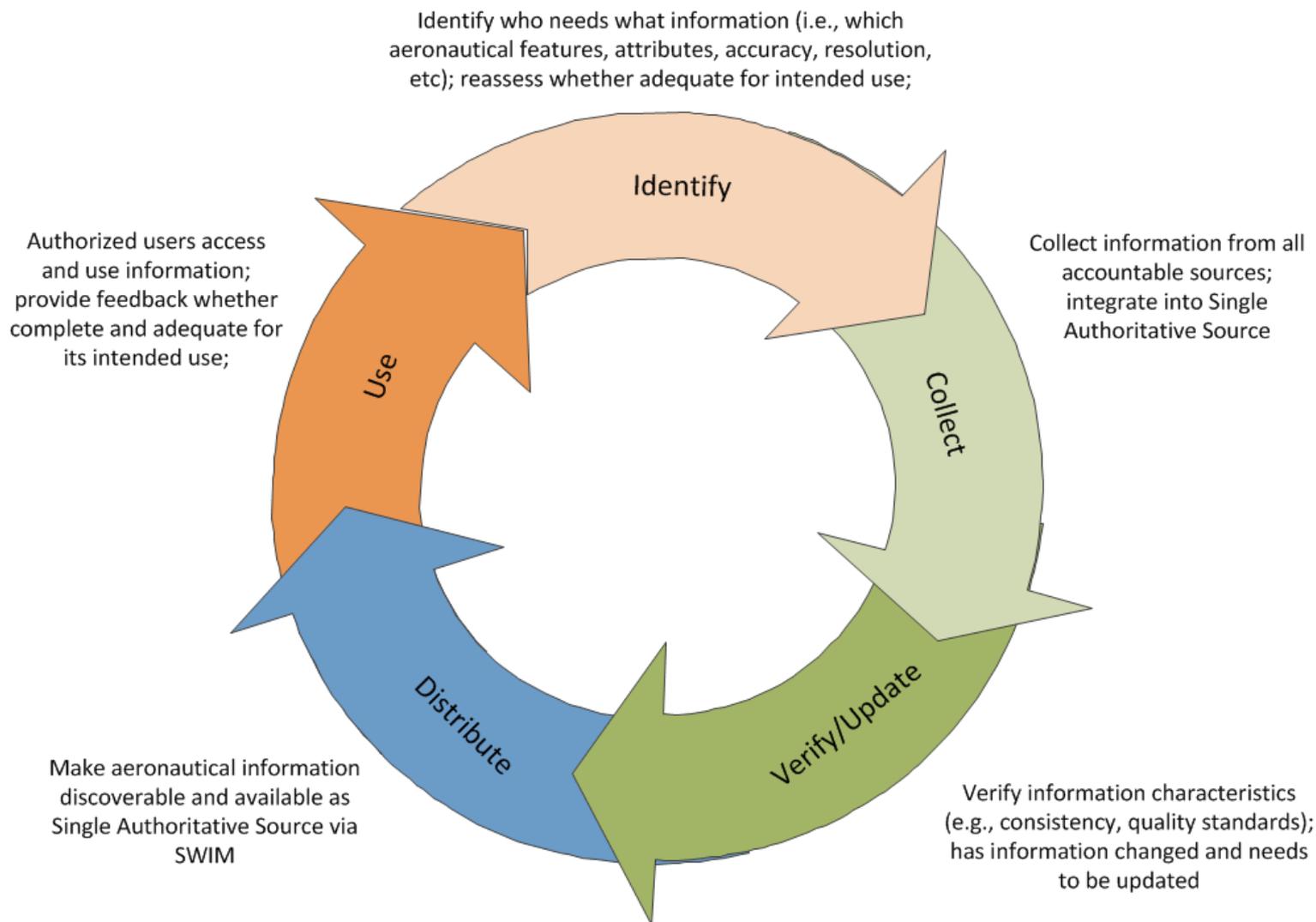


Information Domains



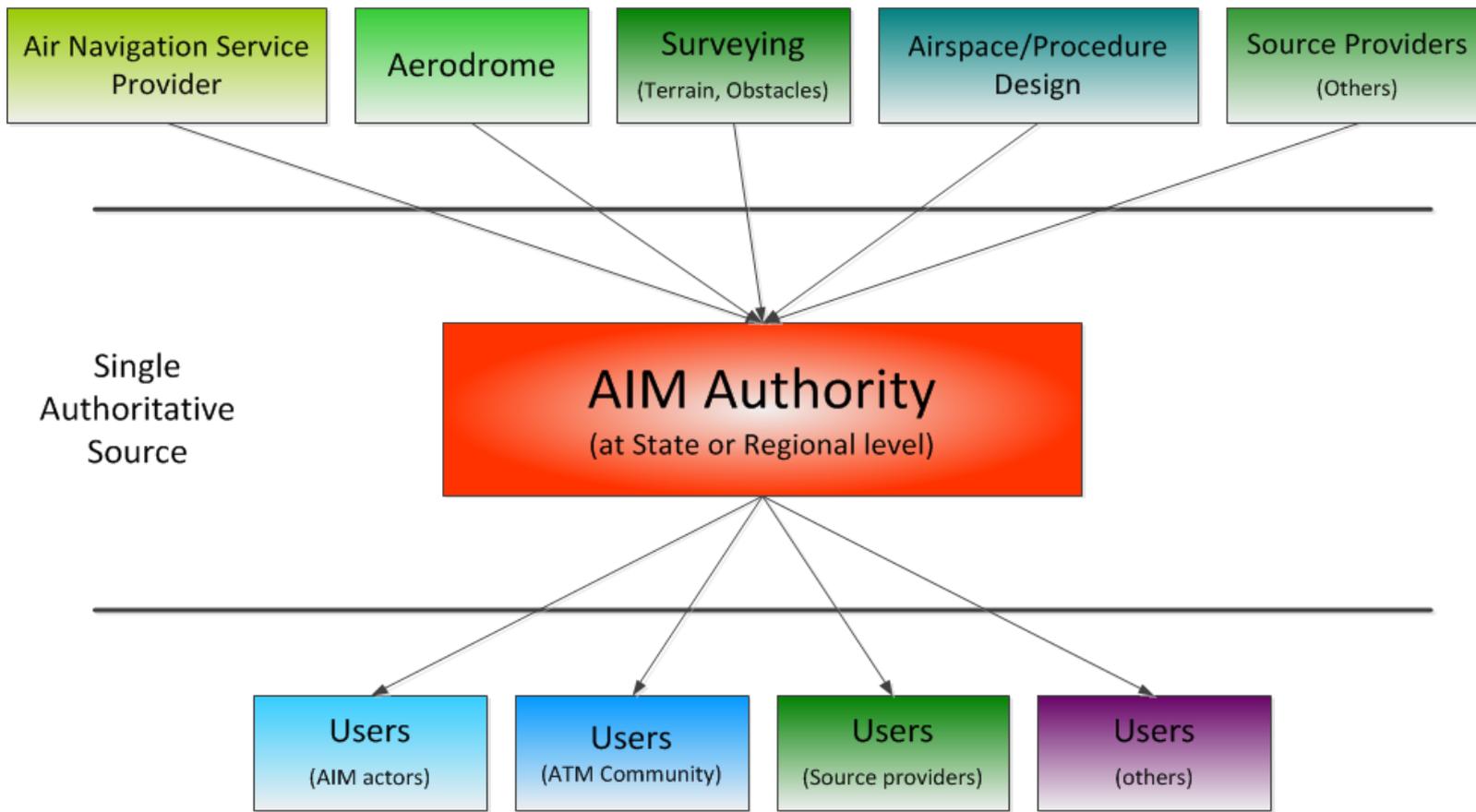
Note: Depending on one's individual perspective, it becomes the "central" information domain.

AIM Information Lifecycle



Distribution of Information

Accountable Source(s) of information



Consumers of AIM Information

Evolution to AIM

Temporality	<i>Planning and Reference</i>	<i>Pre-flight</i>	<i>In-flight</i>	<i>Post-flight</i>
Current description	Static	Dynamic		
Current AIS products	AIP AIP Supplement AIC Charts (some of which are used in-flight)	NOTAM SNOWTAM ASHTAM PIB	No definitive AIS products; Updates are disseminated by voice (and data link)	No specific AIS products; Opportunity for pilots to provide ad-hoc feedback
Future AIM applications	Single Authoritative Source (aggregating information from accredited sources)	Fully integrated and up-to-date Pre-flight Information Briefing	Critical information disseminated via data link	Analysis of single and aggregate trajectories for systemic improvements, as per Performance Based Methodology

Key AIM Principles



Aeronautical information

- **is digital**
- **is safe, secure and quality-assured**
- **is part of the network-centric environment** (e.g., SWIM)
- can be **digitally stored, managed, and displayed** (in textual and/or graphical format)
- can be **digitally disseminated** (via ground network and various data links)
- is integrated and readily integrate-able with other information domains
- is **increasingly harmonized** (including data definitions, data models, data formats, etc) the closer we get to the aircraft
- **has temporality** (Planning and Reference, Pre-flight, In-flight and Post-flight)
- **supports the needs of the ATM community, and the AIM actors in particular**
- **is adequate for its intended multiple uses, including operational decision making**
- is usable by automated Decision Support Tools and Expert Systems

Key AIM Concepts

- **AIM actors are controller, pilot, dispatcher**
- **Objective is to achieve shared situational awareness for collaborative decision making**
- **AIM is user-centric and focused on (trajectory-based) operations**
- **AIM temporalities include Planning and Reference, Pre-flight, In-flight, and Post-flight**
- **In-flight use requires near-real time updates for operational decision making**
- **AIM for post-flight phase to extend current AIS paradigm (improving data integrity) to Performance Based Methodology (closing the loop)**
- **AIM extends AIS and builds foundation for Knowledge Management**
- **Notion of Single Authoritative Source (SAS) to help avoid potential data duplication and fragmentation**
- **AIM as part of a network-centric environment**

ICAO AIS to AIM Transition Roadmap



Phase 1 — Consolidation

- **P-03 — AIRAC adherence monitoring**
- **P-04 — Monitoring of States' differences to Annex 4 and Annex 15**
- **P-05 — WGS-84 implementation**
- **P-17 — Quality**

ICAO AIS to AIM Transition Roadmap



Phase 2 — Going digital (1/2)

- **P-01** — Data quality monitoring
- **P-02** — Data integrity monitoring
- **P-06** — Integrated aeronautical information database
- **P-07** — Unique identifiers
- **P-08** — Aeronautical information conceptual model

ICAO AIS to AIM Transition Roadmap



- Phase 2 — Going digital (2/2)
- P-11 — Electronic AIP
- P-13 — Terrain
- P-14 — Obstacles
- P-15 — Aerodrome mapping

ICAO AIS to AIM Transition Roadmap



Phase 3 — Information management (1/2)

- P-09 — Aeronautical data exchange
- P-21 — Digital NOTAM
- P-10 — Communication networks
- P-12 — Aeronautical information briefing

ICAO AIS to AIM Transition Roadmap



Phase 3 — Information management (2/2)

- P-16 — **Training**
- P-18 — **Agreements with data originators**
- P-19 — **Interoperability with meteorological products**
- P-20 — **Electronic aeronautical charts**

BASIS OF AFS

- Based on ICAO Global ATM Operational Concept (Doc 9854);
- Ground/Ground Point to point or point to multipoint Communications (AIS/AIM Transition);
- ATS/DS (Voice);
- AFTN(AMHS)/CIDIN (FPLs, NOTAMs, Charts, e-AIP..);
- Inter-Centres Communications (ICC);
- Aeronautical Meteorology Data Disseminations



International Civil Aviation Organization

A satellite is shown in space, oriented diagonally. It has two large, rectangular solar panel arrays extending from its central body. A prominent parabolic dish antenna is visible on the lower part of the satellite. The background is a dark, starry space.

Communication systems for a digital AIM Implementation & Operation in the AFI Region

AFI AFTN Topology AFI (2/2)

Directory

- **Direct circuit;**
- **Switched circuit**
- **Fifteenth Revised Edition May 2013**



Annuaire
'Acheminement A

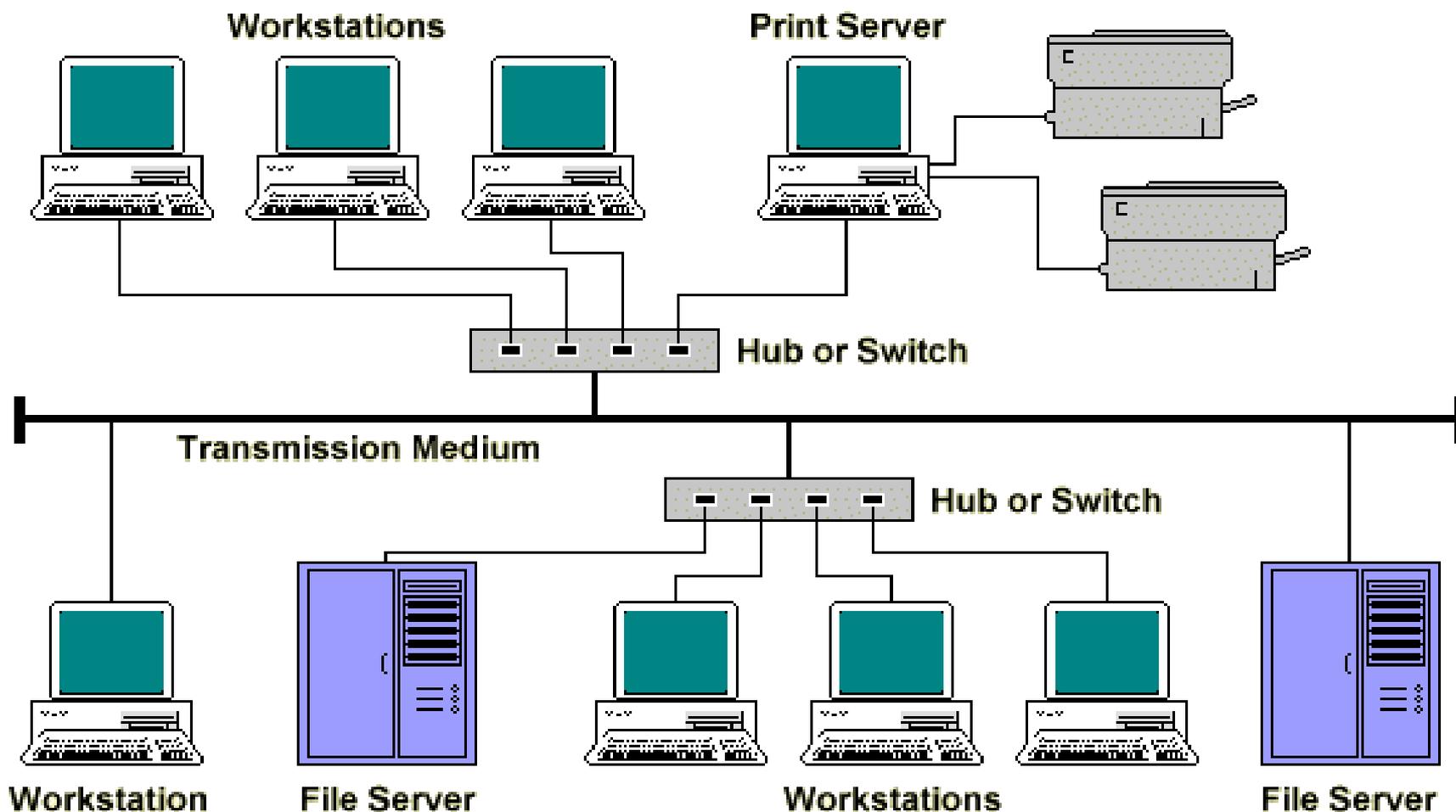
Supporting Infrastructure (1/6)

Local Area Networks

- ✈ Messages Switchers and Terminal Equipment;
- ✈ Interfaces and Multiplexing equipment;
- ✈ Local addresses management;
- ✈ Evolution to IP Based LANs;

Supporting Infrastructure (2/6)

LAN Principle

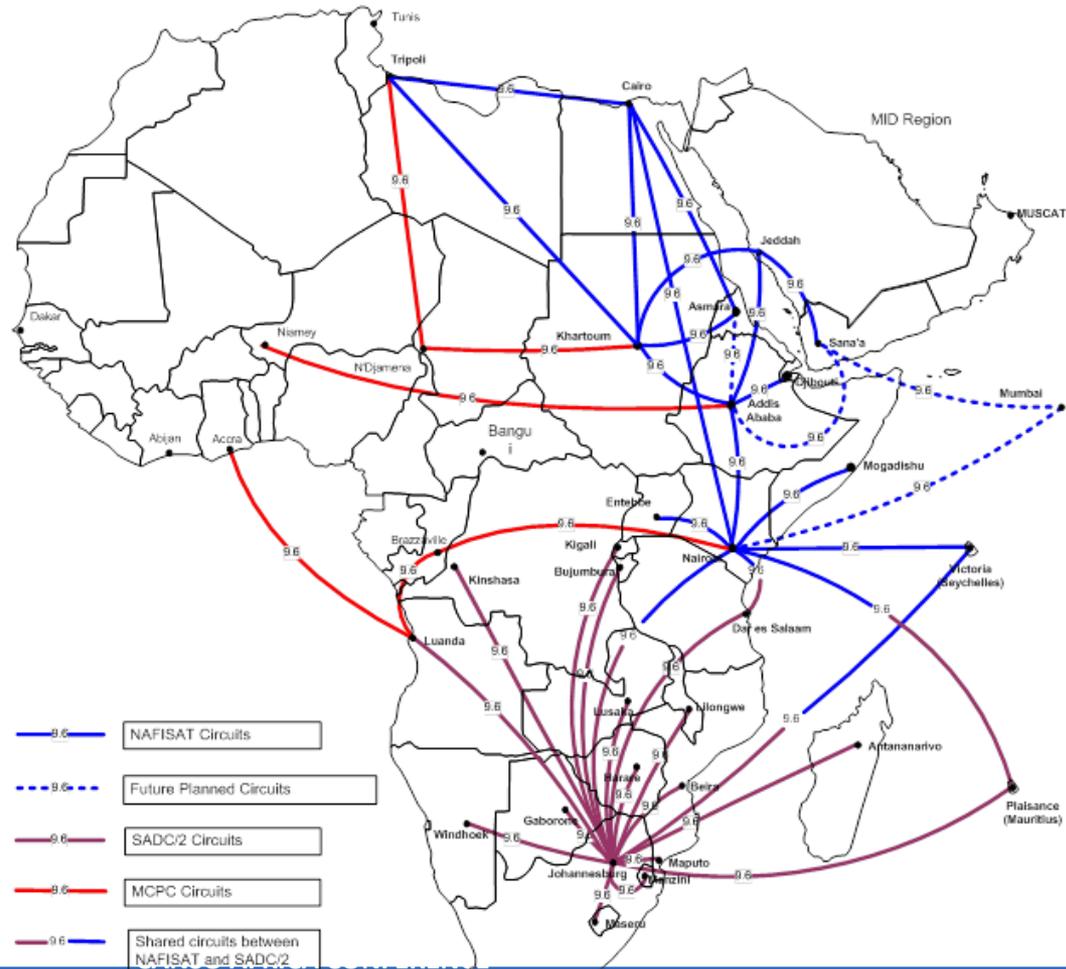


Supporting Infrastructure (3/6)



Wide Area Networks

ATNS VSAT NETWORK
NAFISAT and SADC/2 - AFTN Connectivity

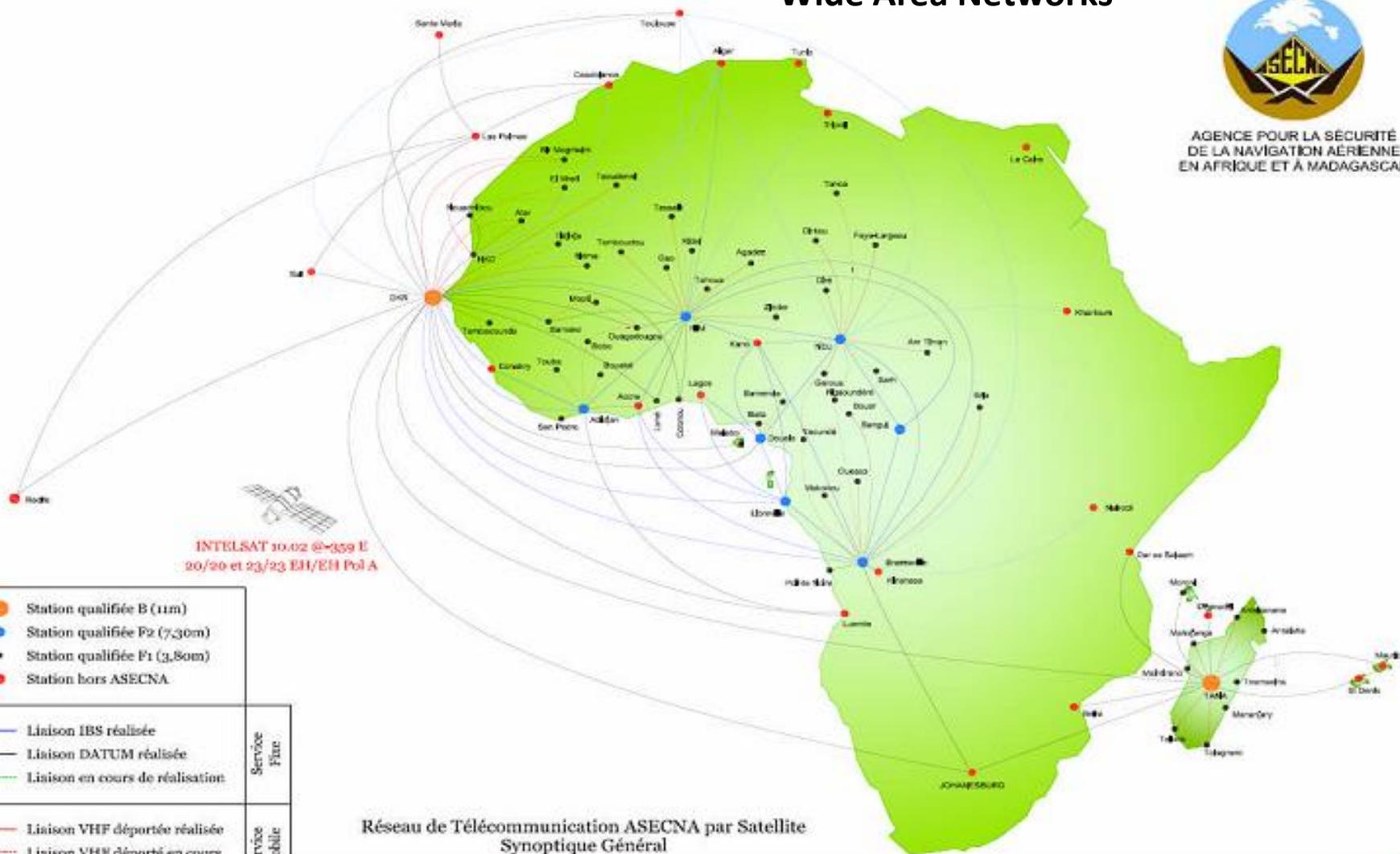


Supporting Infrastructure (4/6)

Wide Area Networks

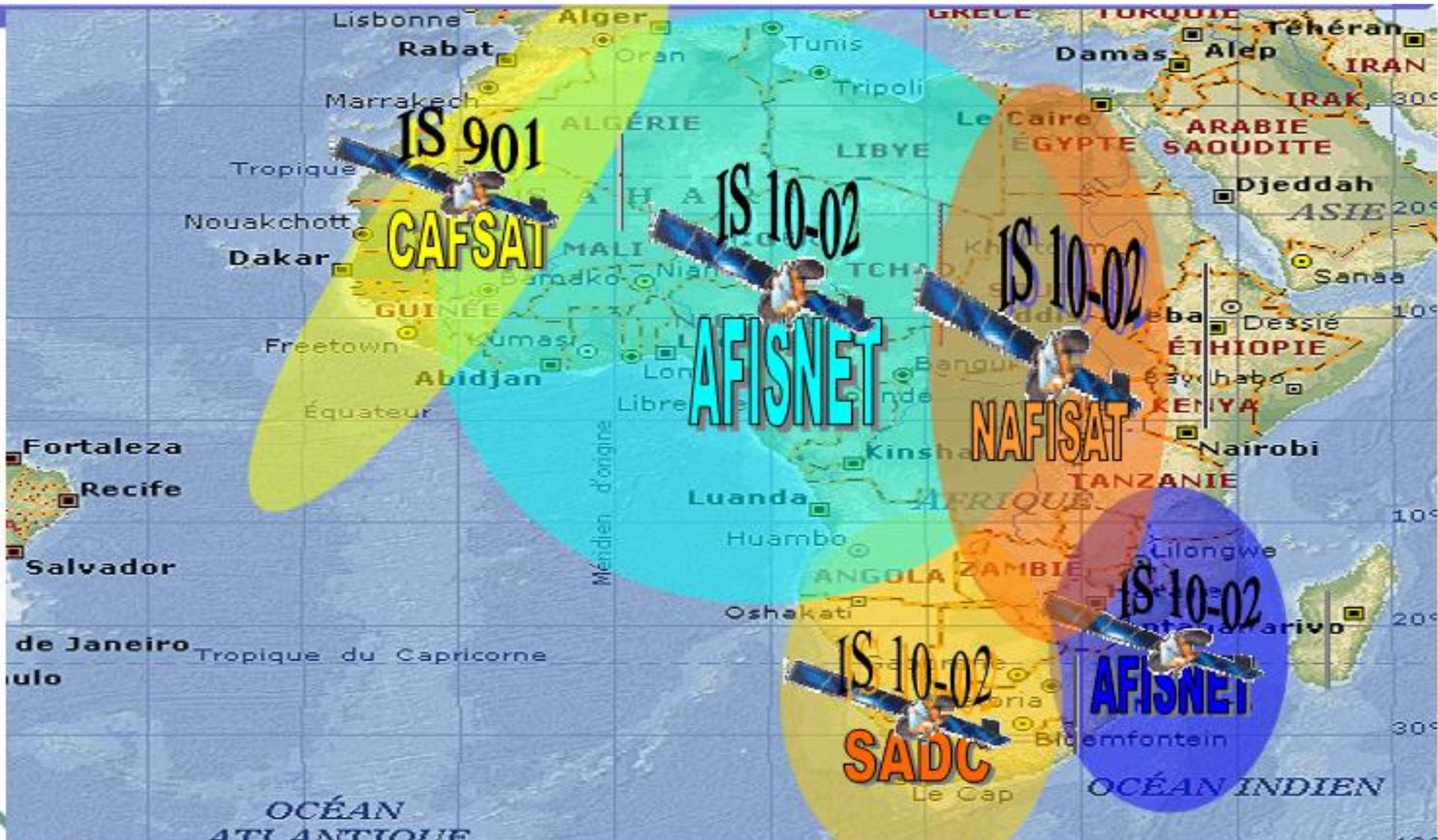


AGENCE POUR LA SÉCURITÉ
 DE LA NAVIGATION AÉRIENNE
 EN AFRIQUE ET À MADAGASCAR

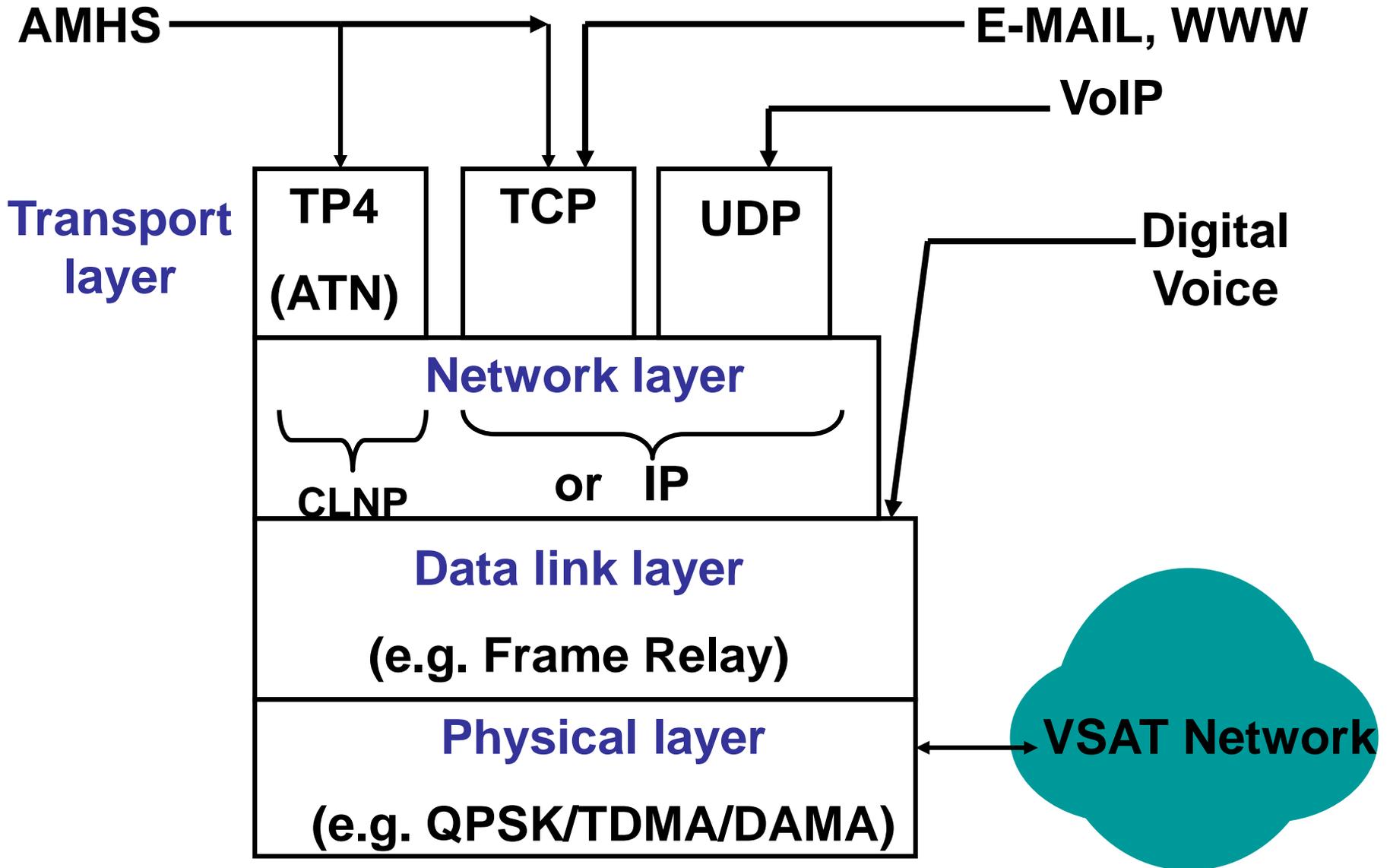


Supporting Infrastructure (6/6)

Réseaux Etendus



OVERVIEW OF COMMUNICATION LAYERS



Evolutions (1/2)

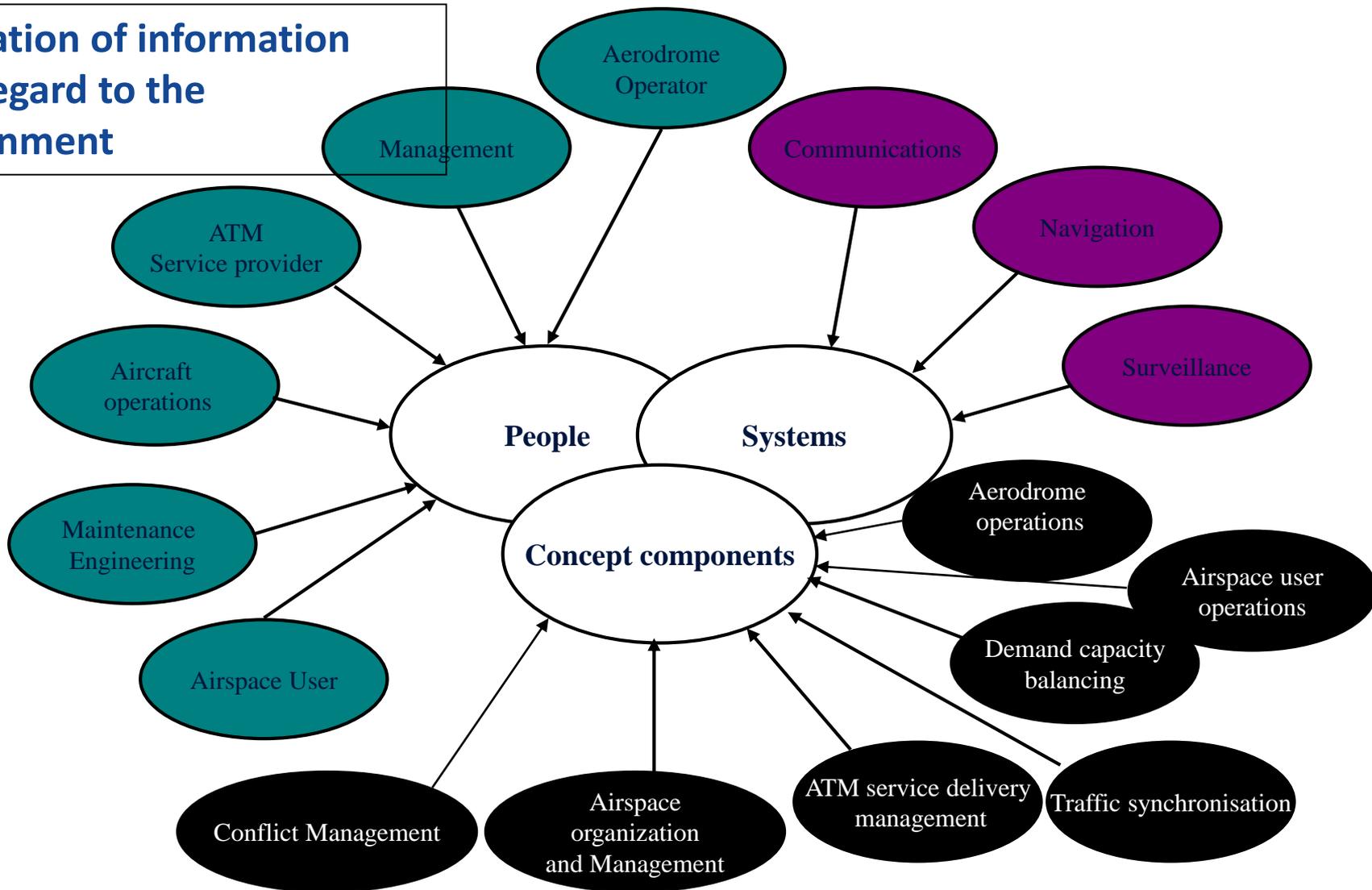
Transition AFTN/ATN

AFTN Inadequacies

- Transmission of messages under Alphanumeric format
- Limited MSGs size ≠ Requirement of transmission capacity
- Loss of Messages
- Slow Speed ≠ Requirement of time sensitive applications
- AMHS (ATN) = Digital Networks integration

Evolutions (2/2)

Integration of information with regard to the environment



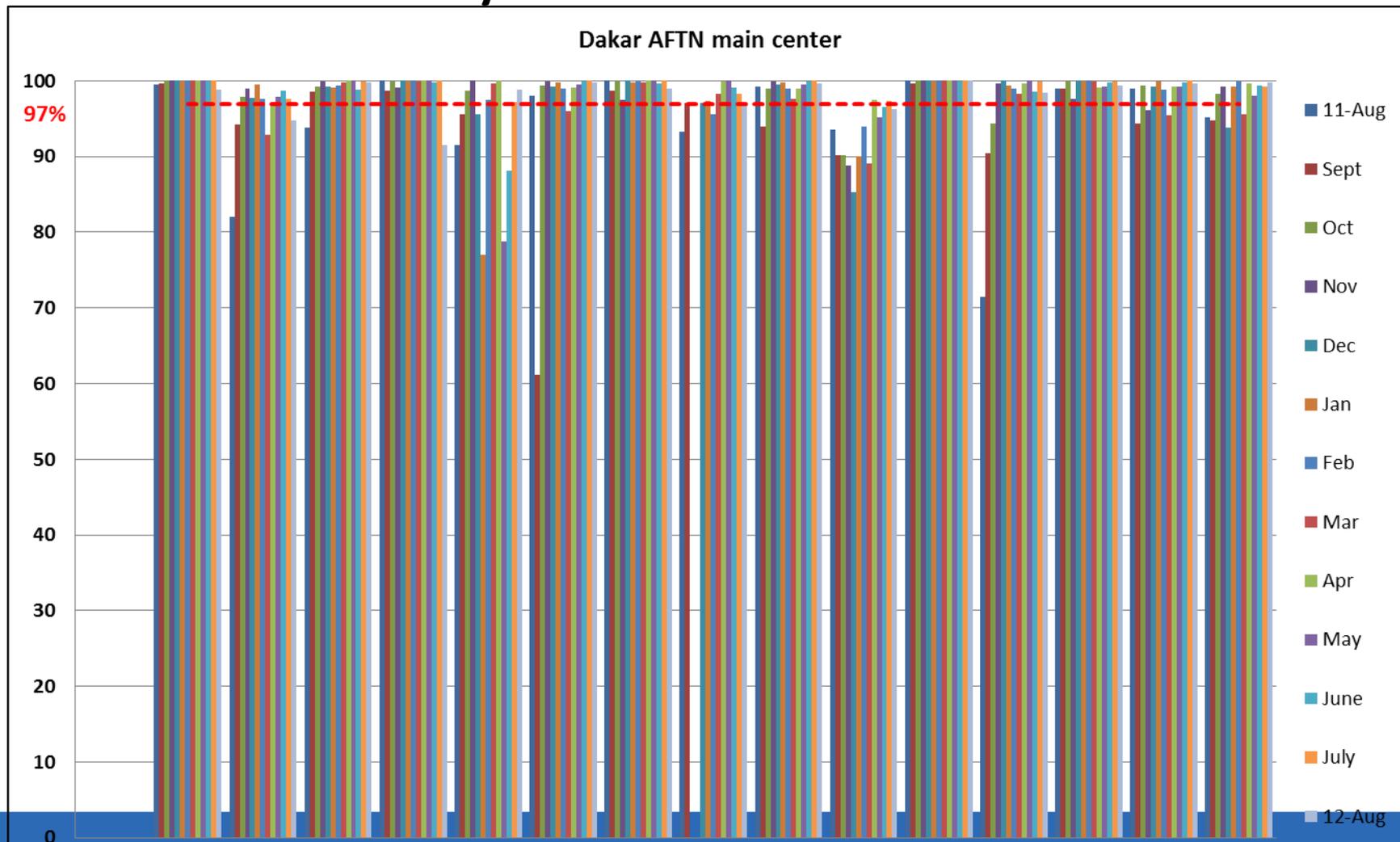
Follow up Action (1/3)

- Dashboard
- Rate of Availability

Country	Terminal I	Terminal II	Support	Com Prot.	Speed	Transit time	Routing	Monthly Availability 2013												% Annual Average Availability	
CAFSAT Collection of the Performance Statistic Data Performance of AFTN Centre: Lisbon (Coordinates: 38°46'29.14" N / 09°07'28.77" W, under WGS 84 format)																					
Date: 13/03/2014								07	08		09		10		11		12		2		
Portugal	Lisbon	Santa Maria	CAFSAT	Assy. V.24	2.4 Kbps		Direct	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
								100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
								07	08		09		10		11		12				
								Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx

Follow up Action (2/3)

- Dashboard
- Rate of Availability



Follow up Action (3/3)

- **Implementation of the AFI ANP**
 - **APIRG Conclusion 16/28 : AFI strategies for the implementation of CNS Systems**
 - **APIRG Conclusion 16/31 : Collective Approach for the management of CNS/ATM systems (CDM-ASBU)**
 - **APIRG Decision 20/21: Adoption of the AFI AMHS Manual and the AFI IP infrastructure test guidelines**
 - **APIRG Conclusion 20/22: Implementation of AMHS**
- **Focus on ICAO SARPs and guidelines through ASBU concept;**
- **Partnership with the industry**

Infrastructure Integration

- **To Implement ATN components:**
 - AMHS supporting AIM,
 - AIDC auto coordination,
 - VoIP,
 - ADS-C (GOLD Document) & SSR Data Exchange;
- **To follow the CNS Technologies Roadmap declined by ASBU(12thAN Conf;, GANP; AFI ANP);**
- **To take the opportunity of the existing CNS infrastructure**

Summary



- **We needed a vision: ICAO operational concept;**
- **We needed an implementation framework: GANP, AFI ANP;**
- **Implementation of LAN are ongoing and tends to tis operational maturity;**
- **CNS infrastructure is available even though it must be improved, we are working on it;**
- **Regional Initiatives to be undertaken through AFCAC, CANSO, ANSPs;**

We know where to go, but...



***“Vision without Action is a day-dream,
Action without Vision is a nightmare.”***



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