

**AGENCE POUR LA SECURITE DE LA NAVIGATION
AERIENNE EN AFRIQUE ET A MADAGASCAR**

Telecommunication Infrastructure for ADS / CPDLC



Migration from Leases Lines to IP-VSAT on AFISNET

ASECNA Experience



Operational Data Link Workshop - Accra , 08 - 12 August 2016



PLAN OF THE PRESENTATION

- ❖ **ASECNA Surveillance Project**
- ❖ **Operational aspects**
- ❖ **Datar sharing & Interoperability**
- ❖ **Operational architecture**
- ❖ **Technical architecture**
- ❖ **ADS/CPDLC Application from ASECNA ATM systems**
- ❖ **Migration from leases lines to IP-VSAT**
- ❖ **Architectures**
- ❖ **Status of implementation**
- ❖ **Conclusion**





Project overview

- **ASECNA plays a key role in securing air traffic security over the African continent, ensuring air navigation services over an significant area. Therefore, ASECNA requires to rely on an ATM system that offer high standards of safety and operational availability.**

- **This project covers:**
 - **Monopulse Secondary Surveillance Radar (MSSR) Systems with mode S Functionality;**
 - **Air Traffic Management (ATM) Systems;**
 - **ACC upgrades (APP and TWR), to support Area, Approach and Tower Air Traffic Control Operations**

- **MSSR Sites (countries)**
 - **Nouakchott (Mauritania), Bamako (Mali),**
 - **Bissau (Guinea Bissau), Ouagadougou (Burkina Faso),**
 - **Niamtougou (Togo), Cotonou (Benin),**
 - **Douala (Cameroon), Libreville (Gabon),**
 - **Bangui (Central African Republic), Antananarivo (Madagascar),**
 - **Moroni (Comoros)**



ASECNA MSSR Radars Coverage








-  Radar ASECNA existant
Existing ASECNA radar
-  Centre ATC ASECNA existant
Existing ASECNA ATC centre
-  Centre ATC ASECNA mis à niveau
Upgraded ASECNA ATC centre
-  Nouveau radar ASECNA
New ASECNA radar
-  Nouveau centre ATC ASECNA
New ASECNA ATC centre





ASECNA MSSR Radar Sharing



-  Radar ASECNA existant
Existing ASECNA radar
-  Centre ATC ASECNA existant
Existing ASECNA ATC centre
-  Centre ATC ASECNA mis à niveau
Upgraded ASECNA ATC centre
-  Nouveau radar ASECNA
New ASECNA radar
-  Nouveau centre ATC ASECNA
New ASECNA ATC centre





Project overview

➤ **MSSR ATM (countries) : TopSky-ATC**

- **Nouakchott (Mauritania),**
- **Bamako (Mali),**
- **Bissau (Guinea Bissau),**
- **Ouagadougou (Burkina Faso),**
- **Lomé (Togo),**
- **Cotonou (Benin),**
- **Douala (Cameroon),**
- **Libreville (Gabon),**
- **Bangui (Central African Republic),**
- **Antananarivo (Madagascar),**
- **Moroni (Comoros)**

➤ **ACC Upgrade**

- **Antananarivo (Madagascar), Dakar (Senegal), Niamey (Niger), Ndjamena (Chad), Brazzaville (Congo)**





ASECNA ATM Systems (TopSky)

- **The ASECNA ATM system is distributed over several sites, each site being usually located on an airport (or in its vicinity), and includes some or all of the following functionalities :**
 - **Monopulse Secondary Surveillance Radar (MSSR);**
 - **En-route / approach control centre (ACC/APP) automation systems;**
 - **Voice Communication System and his Backup (VCS);**
 - **Voice Recording Systems (VRS);**
 - **Control and Monitoring System (CMS);**
 - **Time Distribution (TD);**
 - **Miscellaneous (Optical fibre links, consoles, etc.).**

- **Only the two first cases are covered by the next presentation.**





ASECNA ATM Systems (TOP SKY)

- **ASECNA MSSR & ATM system is based on :**
 - Gathers, collates, processes and displays sensor, flight plan and aeronautical information data in a form that enable air traffic controllers and other personnel to effectively perform their operational duties in both a radar and non-radar environment;
 - Communicates, distributes and receives data from the internal system processing functions, customer Civil Aviation Authority and external agencies;
 - Records radar and flight data transactions for historical purposes and then playback such recordings when needed for analysis;
 - Provides a system monitoring function;
 - Provides on line support functions for the extraction and analysis of operational data and for system parameter management.

- **The ATC means of ASECNA are covered by one operational system (OPS) configured as:**
 - Enroute (ACC)
 - Approach (APP)
 - Tower (TWR)



- **System segments : TopSky-ATC provides external interfaces for the following purposes**
 - Exchanges of operational messages with other ATS centres via the AFTN (ICAO, AIDC);
 - Reception of Aeronautical information messages via the AFTN;
 - Reception of Meteorological data (GRIB);
 - Reception of Radar data;
 - **Air to Ground communication between aircraft and the ATS centre through ACARS network**

➤ External interfaces:

- **The external interfaces to be connected to the ATC System are the followings:**
 - Capacity to connect up to 32 radar stations (local and remote MSSR radars);
 - **ACARS interface on IP through a service provider (SITA)**
 - AFTN line on IP (for AIDC, ICAO, AIS messages)
 - AIDC messages over AFTN line
 - GRIP on IP
 - Billing System (FREDA);
 - Master Clock System (NTP interface);
 - Voice Recording System (VRS)





Air to Ground communication ADS/CPDLC

- **Situation until December 2015 : Lease Lines**
 - Lease lines contract with local telecommunication operator from SITA POP to each TopSky-ATC system;

- **Weakness**
 - Quality and Availability of the lease line
 - No control of the times of delivery services after failures;
 - Higher cost of leases lines (OPEX)

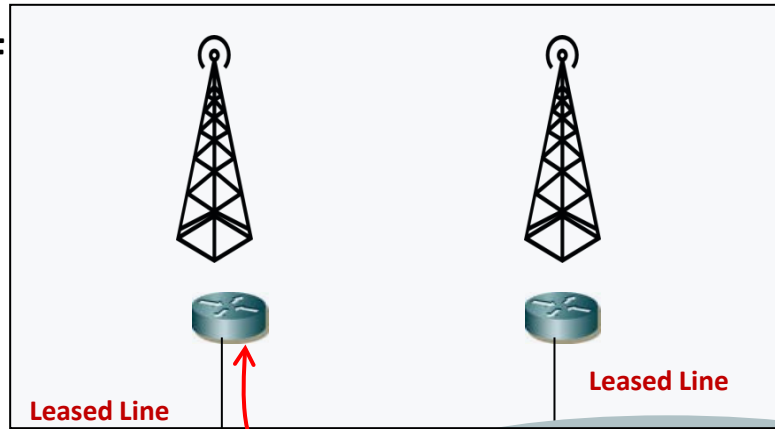




Air to Ground communication ADS/CPDLC – Situation before December 2015

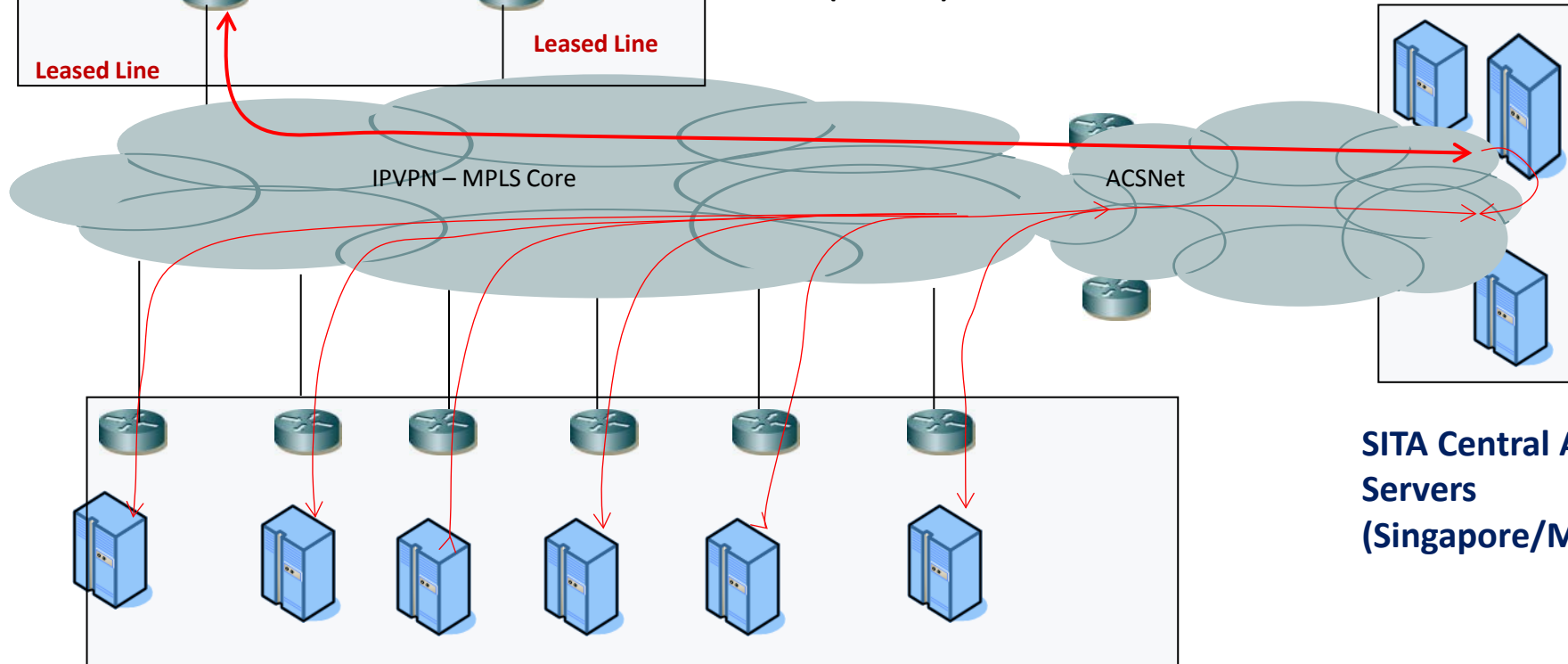


SITA RGS and VHF Infrastructure



FANS Traffic consists of 2 streams

1. ADS-C : traffic one way, from the aircraft to the ASECNA Locations
2. CPDLC : Traffic is two-way
3. SatCOM from Aircraft captured and separately terminates into AIRCOM cloud (ACSNet)

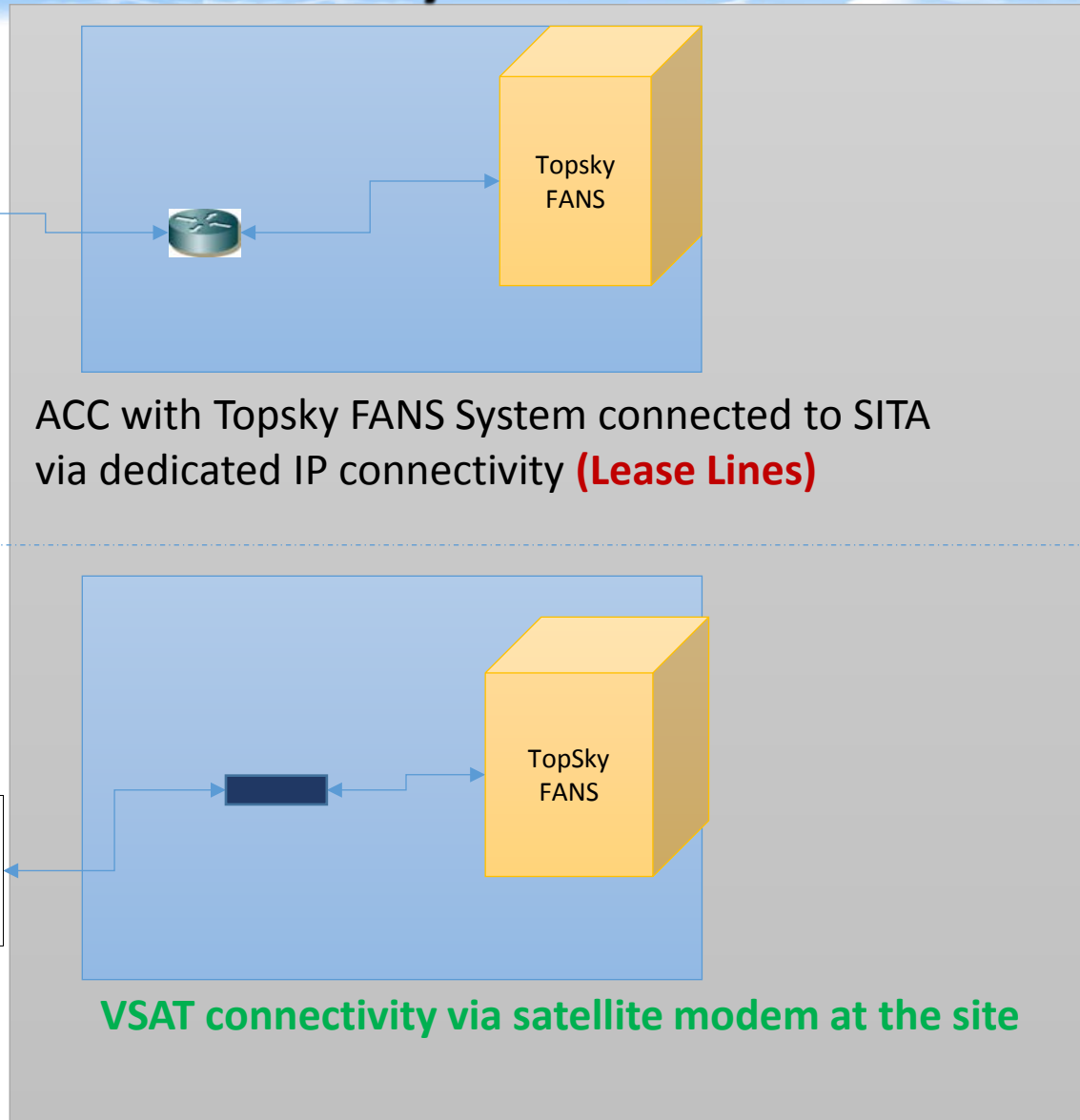
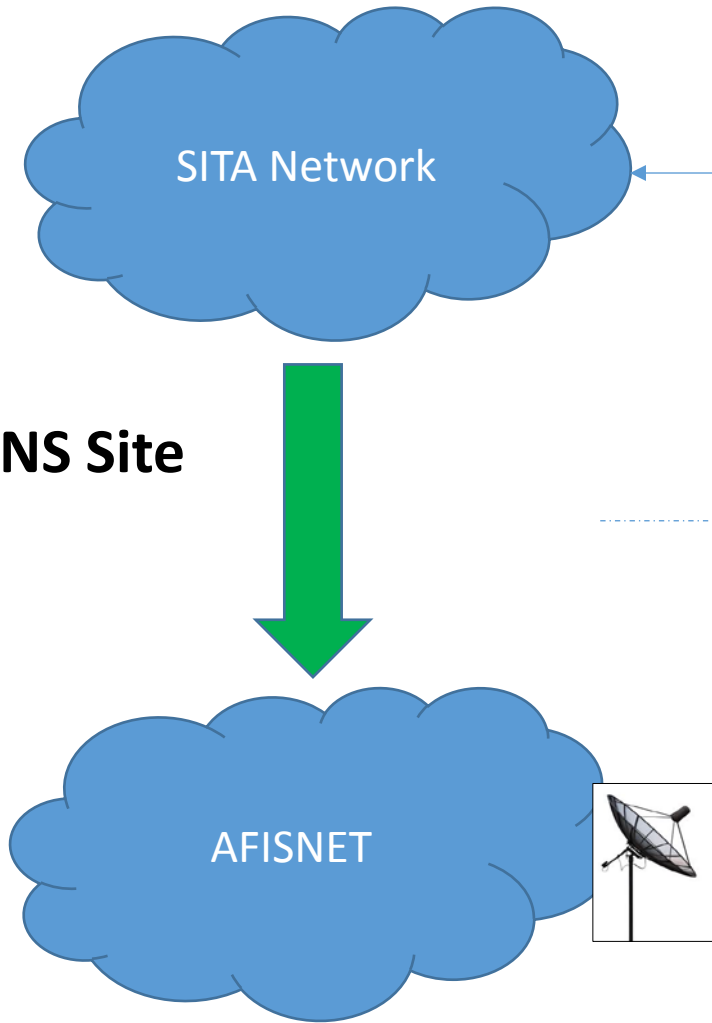


ASECNA TopSky-ATC System, Connected via Leased Lines and either X25 (XOT) or pure IP to SITA MPLS core



Air to Ground communication ADS/CPDLC – IP VSAT Project

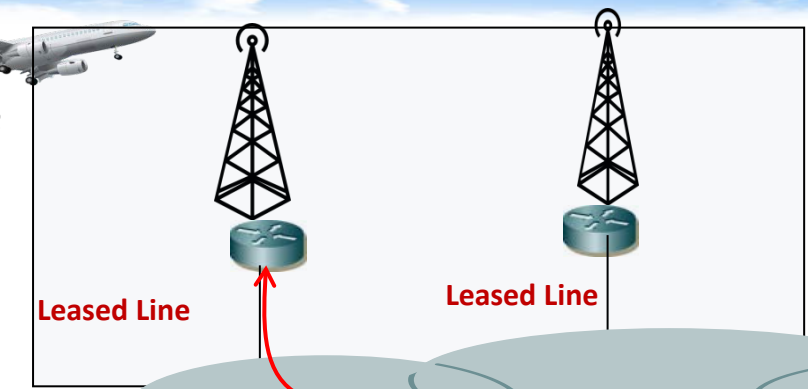
ASECNA FANS Site



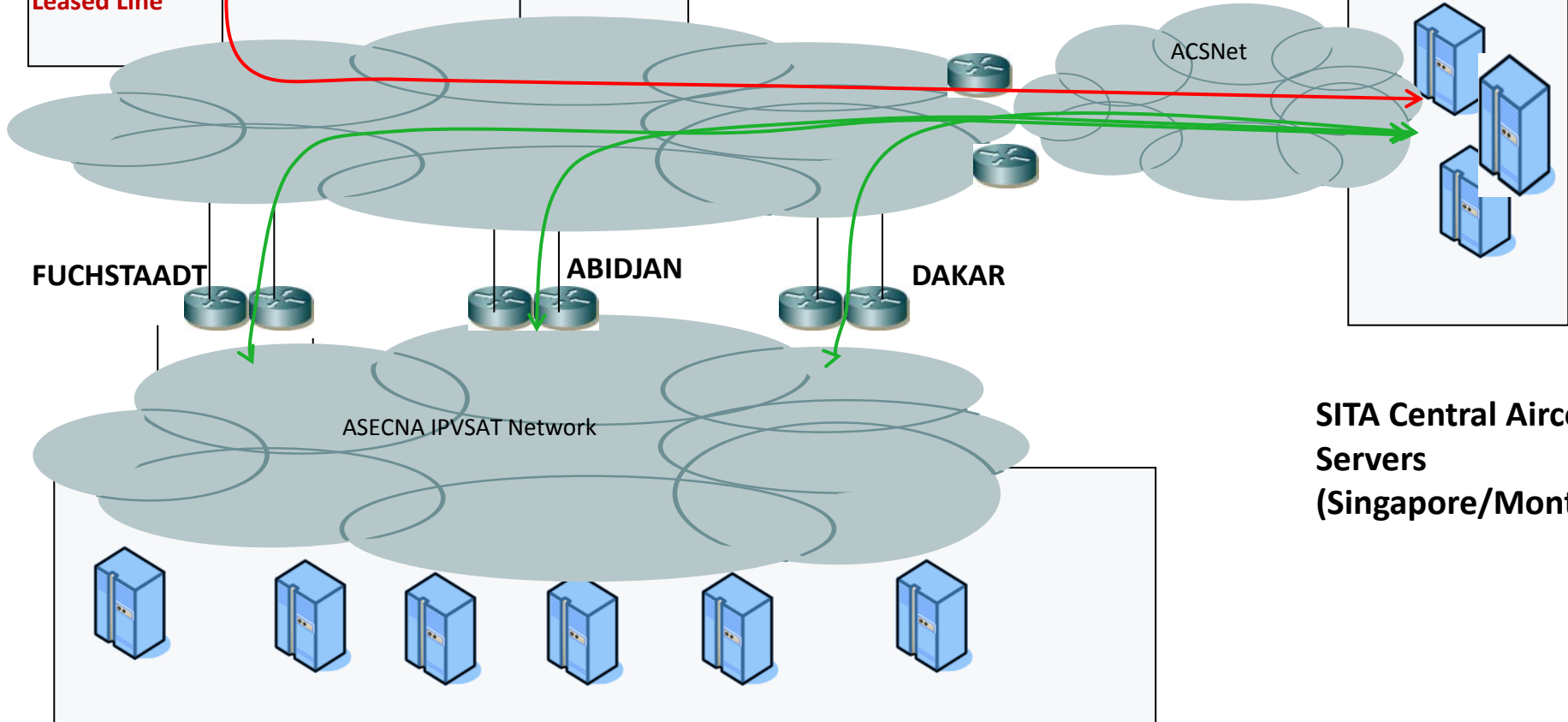


Air to Ground communication ADS/CPDLC – Current situation

SITA RGS and VHF Infrastructure



Gateway Traffic flows

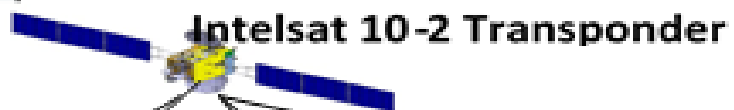
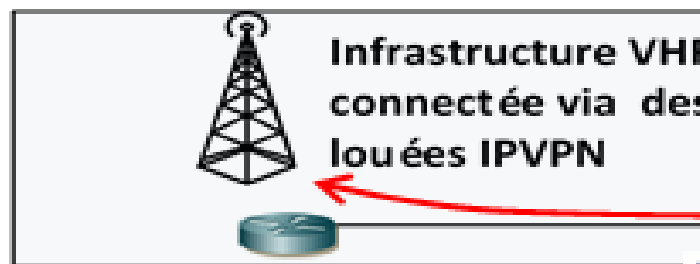


SITA Central Aircom Servers (Singapore/Montreal)

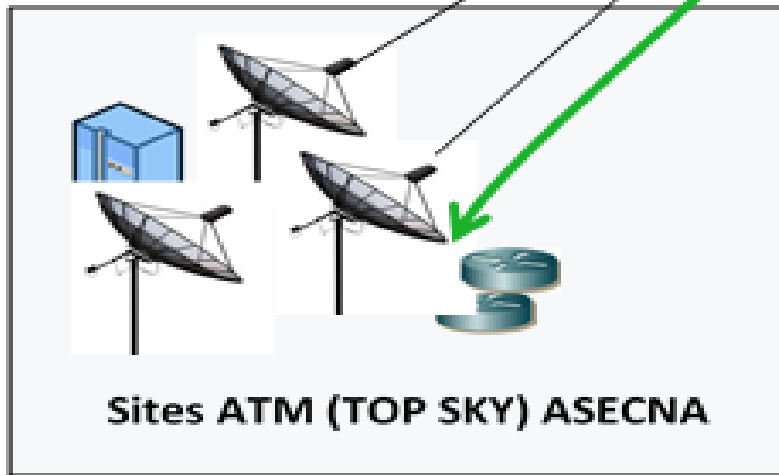
ASECNA Locations (TopSky-ATC), each with its FDPS interconnect to Gateway Sites – DKR, ABJ and Fuchstaadt



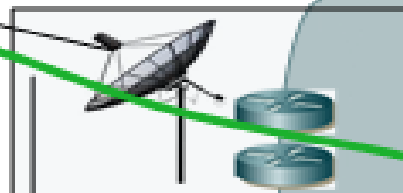
GateWay – IPVSAT on AFISNET Implementation



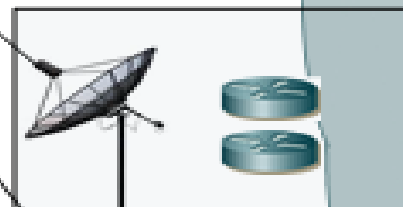
ASECNA IPVSAT SITA



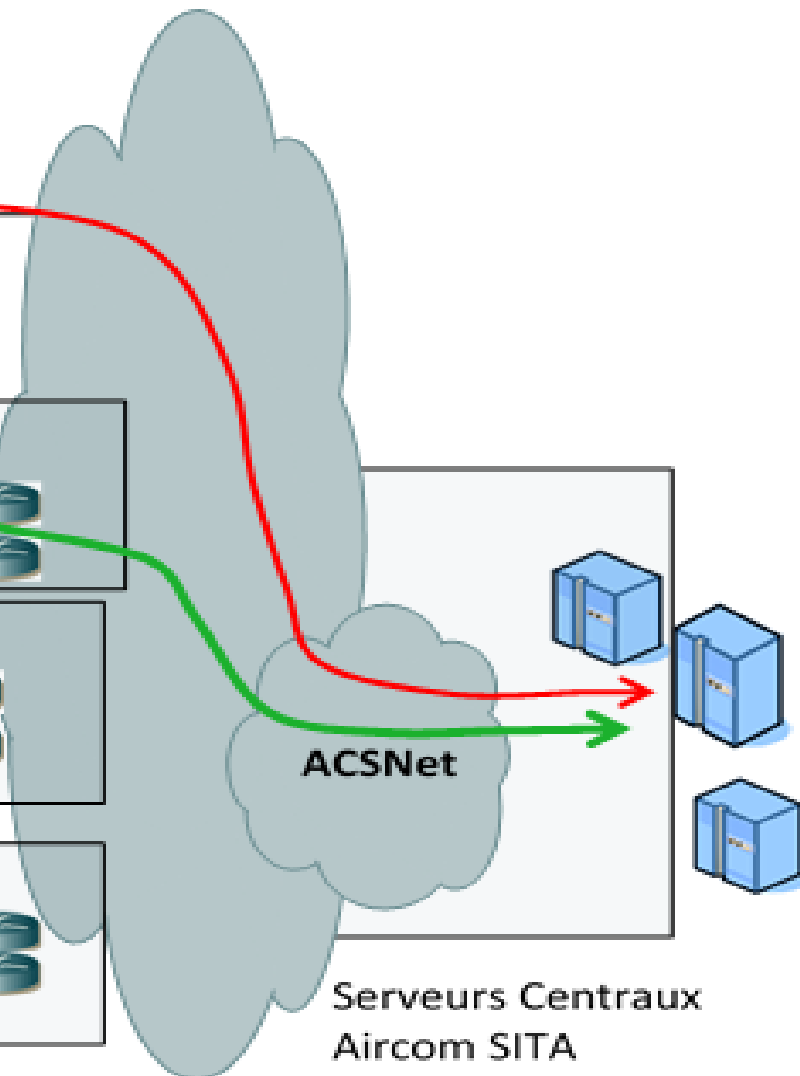
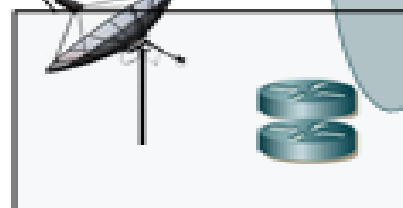
DAKAR



ABIDJAN



FUCHSSTADT



Serveurs Centraux
Aircom SITA
(Singapore/Montreal)



Systems interoperability

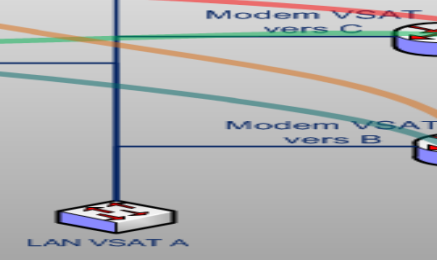
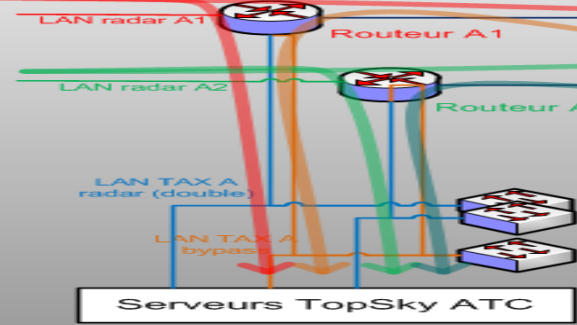
Site A
ATM avec radar local

Salle technique TopSky ATC et/ou bloc technique

Radar A
ligne 1

Radar A
ligne 2

Radar local



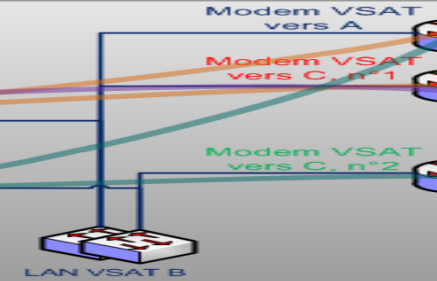
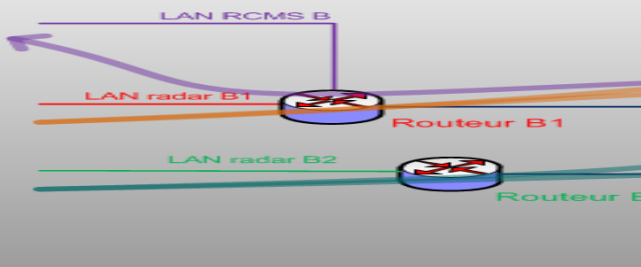
Site B
Niamtougou
radar isolé
associé au site C

Bloc technique
RCMS
radar B

Radar B
Ligne 1

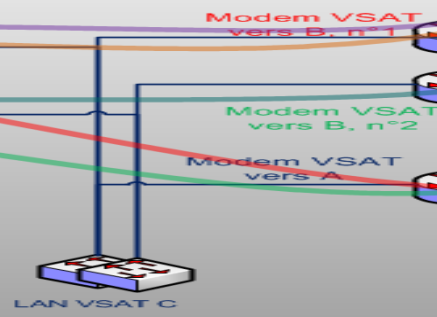
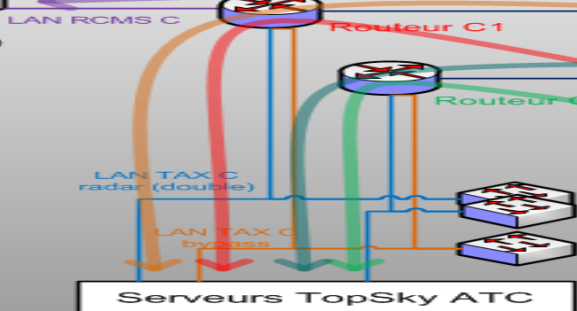
Radar B
Ligne 2

Radar local



Site C
Lomé
ATM sans radar local
associé au site B

Salle technique TopSky ATC et/ou bloc technique



Réseau VSAT

TRAITEMENT

TRANSPORT RESEAU

AGENCE POUR LA SECURITE DE LA NAVIGATION AERIENNE EN AFRIQUE ET A MADAGASCAR



Thank you for your attention

See You Soon !



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