IMPLEMENTATION OF ADS-C & CPDLC SERVICES

Automation System and Integrated Telecommunications for Air Navigation Services/System-Wide Information Management (SWIM) Workshop (AUTO/SWIM)

Mexico City, Mexico, 21 to 24 April 2014

SITA views by: Adriana Mattos

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Agenda
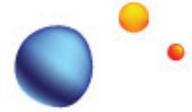
1. Addressing Safety by using Data link
   - FANS 1/A overview and applications
   - Why to use FANS ?
   - FANS Infrastructure
2. SITA AIRCOM Service
   - ATS use of Data Link as Air Ground communication
   - AIRCOM ATS Portfolio
   - AIRCOM coverage (VHF, Satellite)
   - Managed services (Support and Reports)
3. ATN/CPDLC implementation: European case
   - VHF partnerships to support European DKL mandate
4. FANS implementation in CAR/SAM region
5. SIRIUS programme: continental CPDLC in Brazil
6. Data link comms is a must!

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Data Link?

The Safety
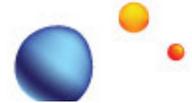
4.3.4 Air Traffic Control

The investigation showed that the use of HF as a means of communication between ground and aeroplane is limited. Link outages were frequent in this area, especially on the day of the accident. A simulation of the use of ADS-C and CPDLC functions showed that the loss of altitude would have generated an alert on the DAKAR controller's screen. There are numerous areas in the world where HF remains the only means of communication between ground and aeroplane, though more reliable means are available today.

Consequently, the BEA recommends that:

○ **the Brazilian and Senegalese authorities make mandatory the utilisation, by aeroplanes so equipped, of ADS-C and CPDLC functions in the zones in question; [Recommendation FRAN-2012-037]**

○ **ICAO request the involved States to accelerate the operational implementation of air traffic control and communication systems that allow a permanent and reliable link to be made between ground and aeroplane in all of the areas where HF remains the only means of communication between the ground and aeroplanes. [Recommendation FRAN-2012-038]**

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FANS I/A Overview

ICAO established special committee on the Future Air Navigation System (FANS) charged at developing the operational concepts for the future of Air Traffic Management (ATM)

1985

ICAO FANS Committee Report published. Transition from analog CNS to digital CNS ATM system. ICAO created ADS panel to standardise ADS/CPDLC applications, initially designed to be implemented within the ATN environment.

1988

As it was uncertain when the ATN network would happen, Boeing decided to develop a FANS-1 ADS/CPDLC package using ACARS network. The package was certified in 1995. Initial ANSP implementations

1995

Airbus "FANS-A" Package also certified. Collectively, Boeing and Airbus implementations are referred to as FANS-1/A.

2000

ATN-Based CPDLC Implemented in Maastricht UAC under the Link 2000+ program

2004

FANS-1/A implemented by ANSPs in many locations worldwide

Today - future

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FANS 1/A applications

ATS Unit

- **AFN** (ATS Facilities Notification)
  - Allows aircraft to logon to ATC facility & the transfer of control

- **CPDLC** (Controller Pilot Data Link Communications)
  - Replaces for verbal ATC instructions and pilots read-backs
  - Automates ATC processes

- **ADS** (Automatic Dependent Surveillance)
  - Gives accurate position reporting
  - Allows additional data reporting (wind, temperature etc)
  - Providers reporting in regions out of radar coverage
  - Significantly increases traffic that can be handled in remote areas
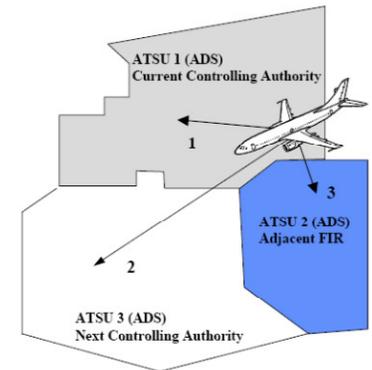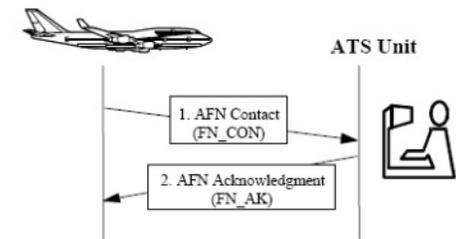
ANS Providers - Why use FANS?
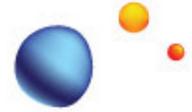
➤ To get familiar with datalink technology as a first step towards the ATN environment

➤ Increased safety - blocked or deteriorated VHF

➤ Reduced VHF overload

➤ Use of FANS supports separation reductions between aircraft

➤ CPDLC removes misunderstanding between ATC and pilots

➤ ATC is certain that the correct message has reached the aircraft through use of Message Assurance on uplinks

➤ CPDLC saves time by avoiding the usual problems with HF voice medium (solar flares etc)

➤ ATC surveillance of aircraft using ADS in remote & oceanic airspace is more certain than procedural control and will gradually allow separation reductions

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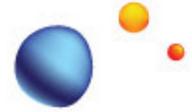
Airlines - Why use FANS?

➢ Obtain fuel and time savings when using more optimal routing = $

➢ Improved safety

➢ FANS supports separation reductions which means more frequent access to optimal level = $

➢ Reduction of emissions

➢ Releases pilots from the usual problems with HF voice (although HF voice is still the backup medium)

➢ Most modern aircraft come equipped with FANS avionics – why not use the automation?

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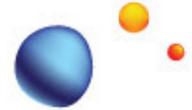
GOLD Document

➢ The Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG), have endorsed the initial release of the Global Operational Data Link Document (GOLD).

➢ To the greatest extent possible, the GOLD resolves regional and/or State differences impacting seamless data link operations. The NAT SPG/46 endorsed the GOLD to supersede the Guidance Material for ATS Data Link Services in North Atlantic Airspace. ICAO Regional Headquarters, Bangkok, has authorized the GOLD to supersede the existing FANS Operation Manual (FOM).

Global Operational Data Link Document (GOLD)

This document is available from the following web sites:
http://www.ispacg-cra.com
http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/data_link/

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FANS 1/A Infrastructure

FANS Aircraft

ATN Aircraft

RGS

VDL M2

ATN router

VGS

ADLT

ATN Subnet

DSP Partner internetworking

FANS Gateway

ANSP Ops System

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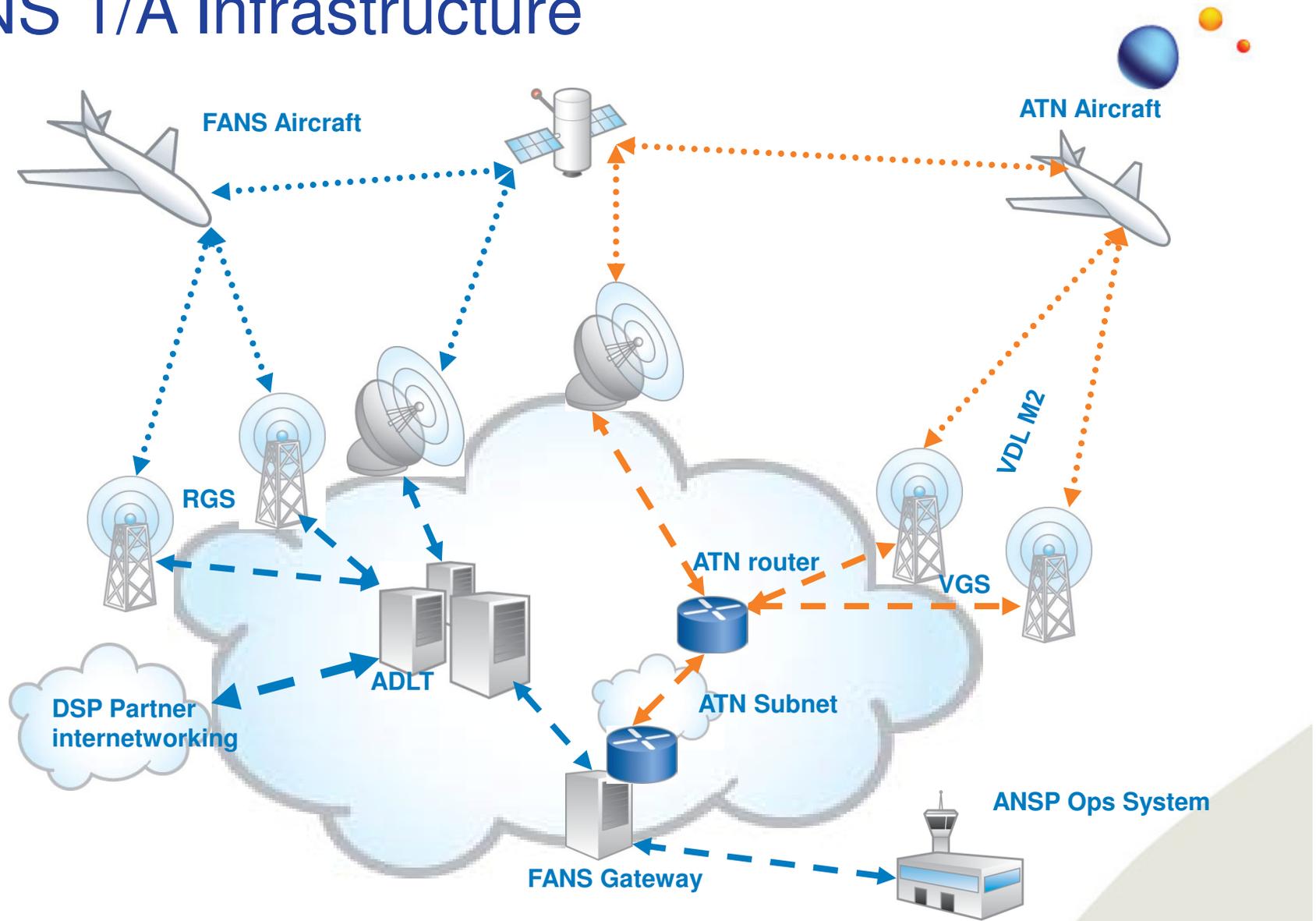
AIRCOM by SITA

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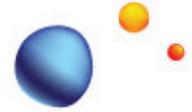
Air/Ground Data Link Services

SITA has almost 30 years experience in the delivery of air/ground data link services

- To support AOC since 1980
- To support ATS since 1990
  - Digital-ATIS
  - Departure Clearance
  - FANS 1/A (CPDLC, ADS-C)
- Services delivered through
  - VHF data link (**1500** VHF ACARS /VDL Mode 2 radios operating in 160+ countries)
  - Satellite data link (data and voice service via the Inmarsat satellites, the Japanese MTSAT satellite and, since 2008, via the Iridium constellation)
- Based on the ACARS and ATN protocols
- SITA Network Services uses the OBS network which extends to 225 countries.

SITA AIRCOM ATM portfolio
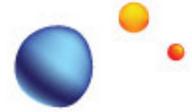
Data link Air Traffic Services

- PreFANS services : D-ATIS, D-VOLMET, DCL and OCL

- FANS service : ADS and CPDLC

- ATN VDL2 service : Full Operational service, ATN backbone, Test / Trial ATN service

- Hosted ATS services (CFRS / CADS)

- Regional ADS-B service trial

Data link Air Traffic Systems

- Airport Tower Systems : D-ATIS (EVATIS) , D-VOLMET (EVAMET), DCL (CLEVER) and Centralized ATS server (CATS)

- En Route Systems : ADS/CPDLC Gateway, ADS/CPDLC Workstation, Data-Link Front End Processor.

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High Level Functional Architecture

ANSPs hosts

GES

SITA Network Services

RGS/VGS

ACARS

PROCESSORS

24/7 Helpdesk

**Airlines Hosts**
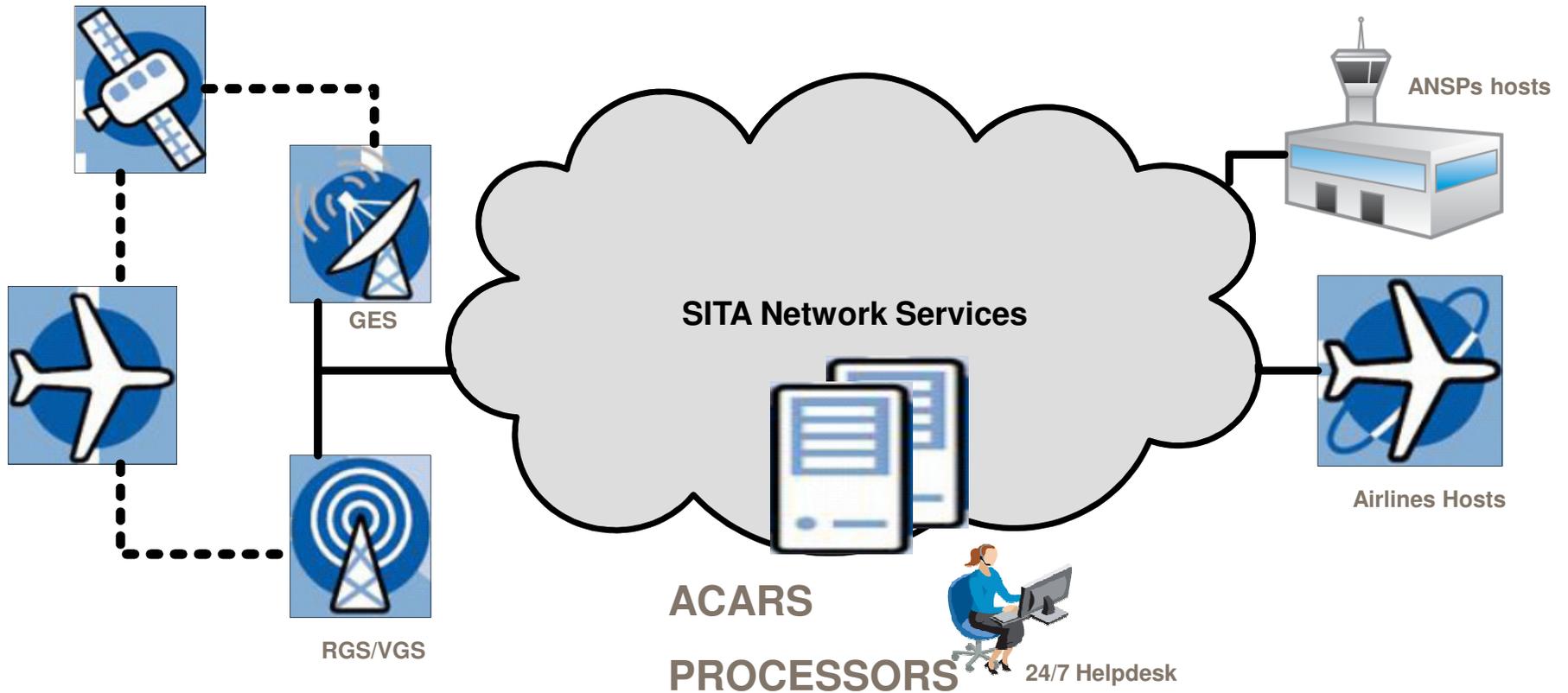
VHF AIRCOM Coverage - worldwide
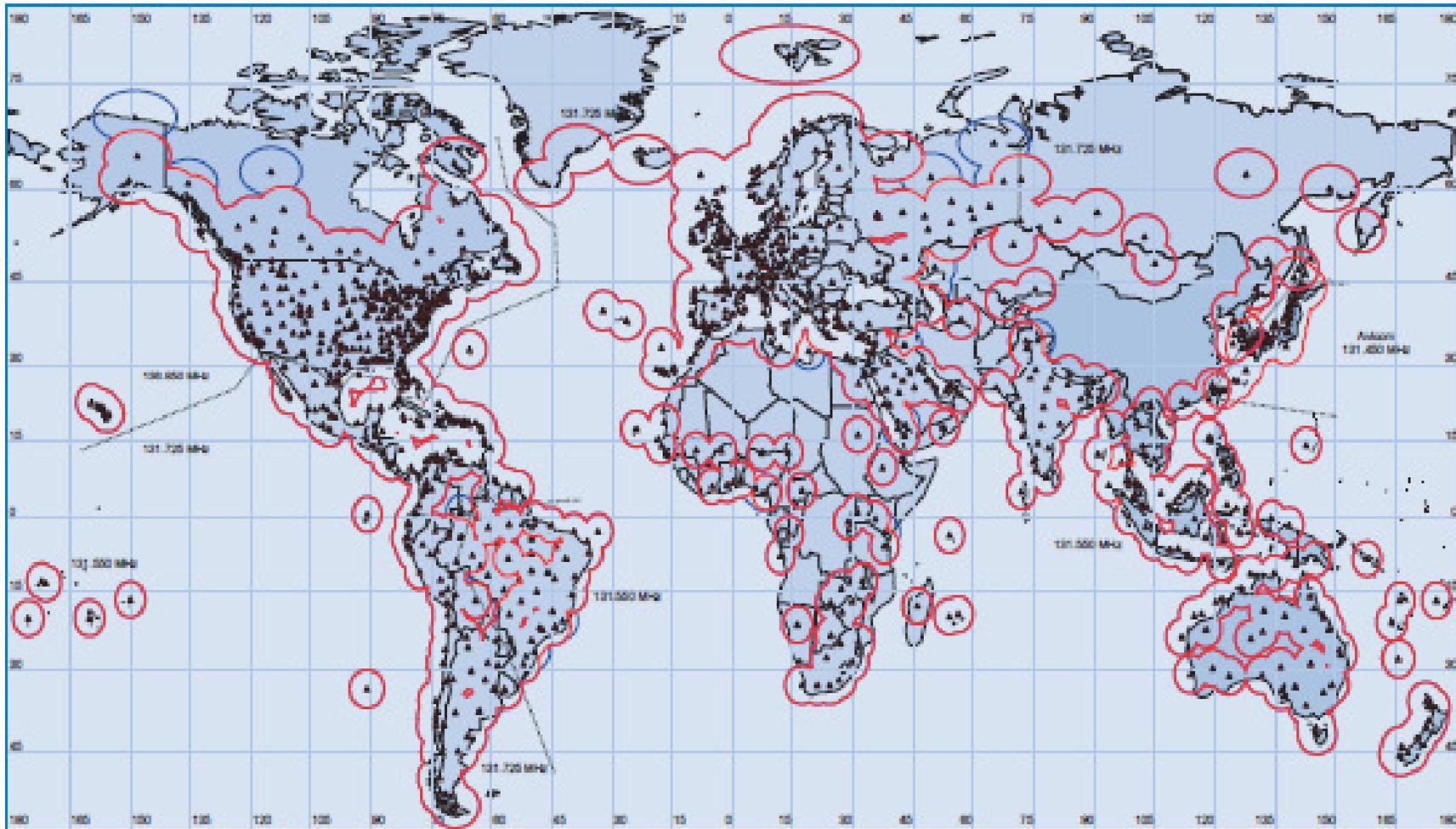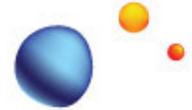
VHF AIRCOM Coverage – Americas

# VDL World-Wide Coverage
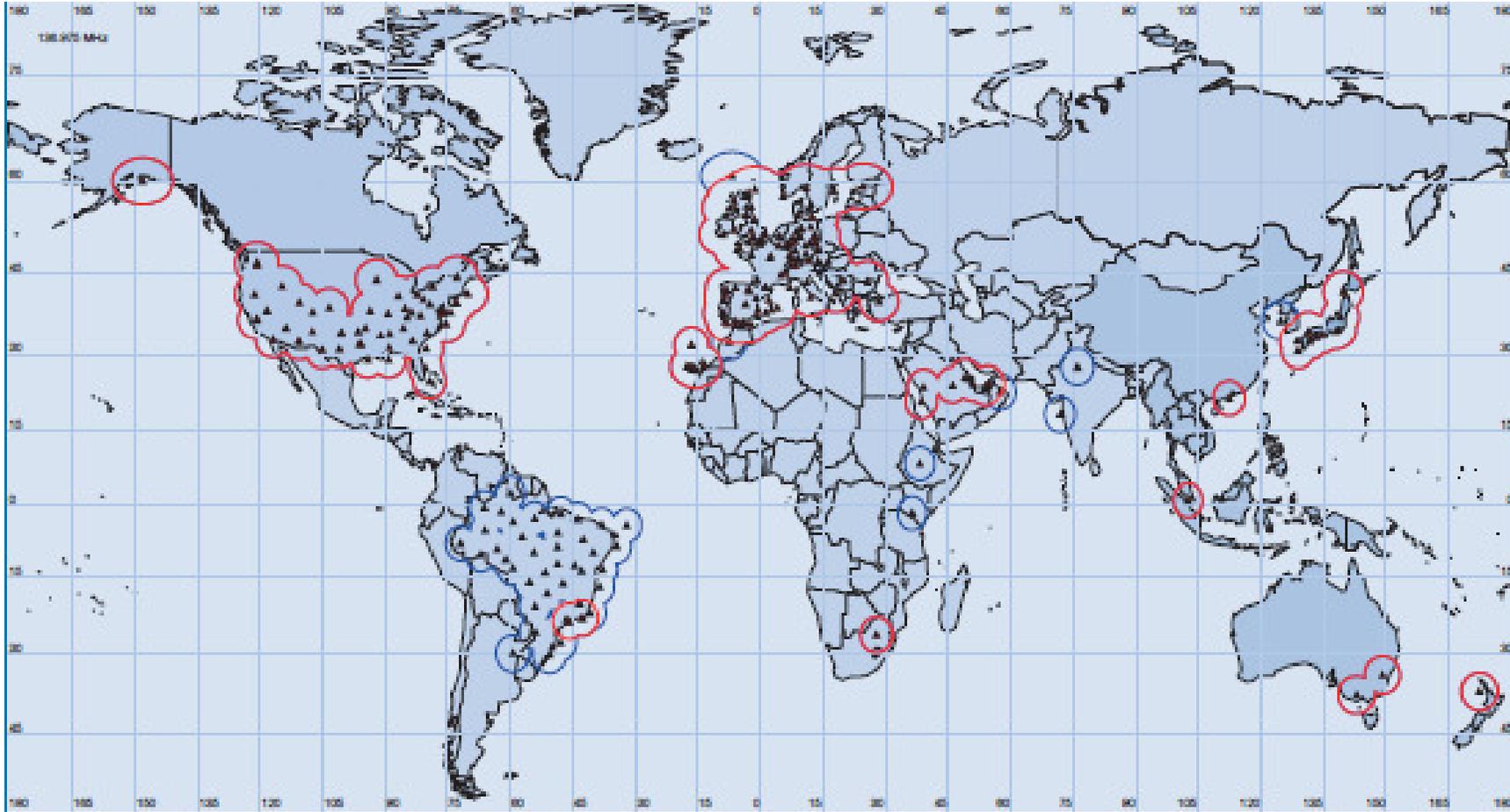
SITA's Satellite AIRCOM

- Inmarsat
  - Classic Aero services
  - Swift64
  - SwiftBroadBand

- Iridium
  - Voice
  - Data

- MTSAT
  - Standard Classic Aero Services via JCAB MTSAT constellation
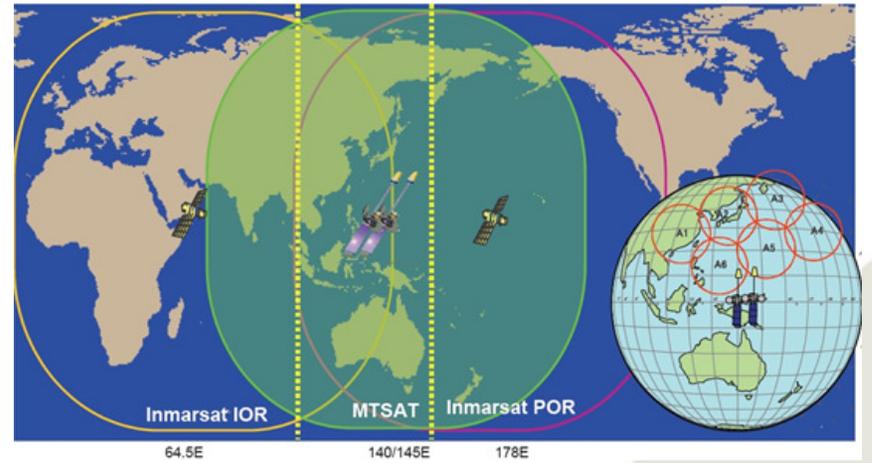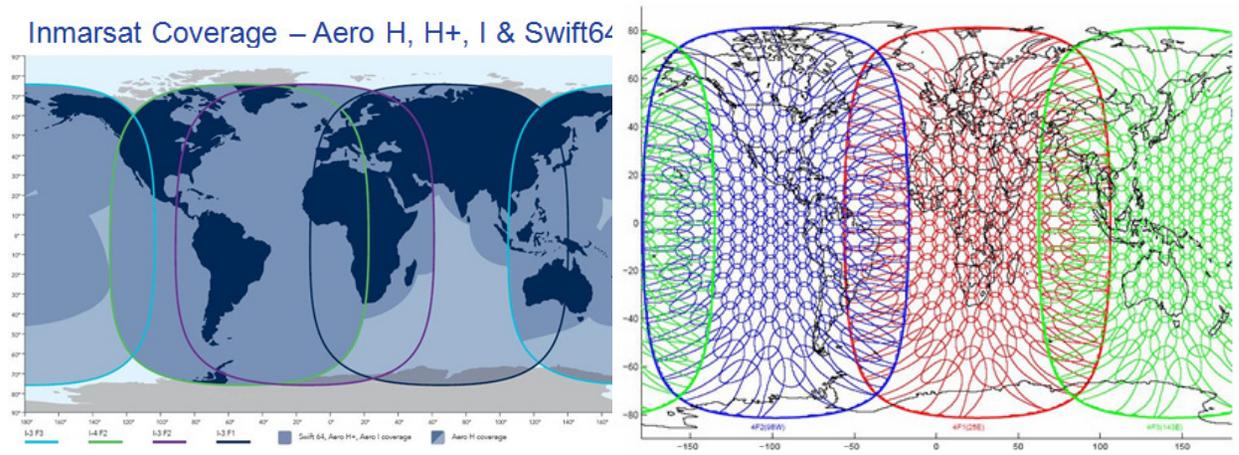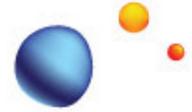
Iridium Service

- **Polar-type constellation of low earth-orbiting (LEO) satellites**
  - 6 orbital planes with 11 satellites (+1 spare) per plane

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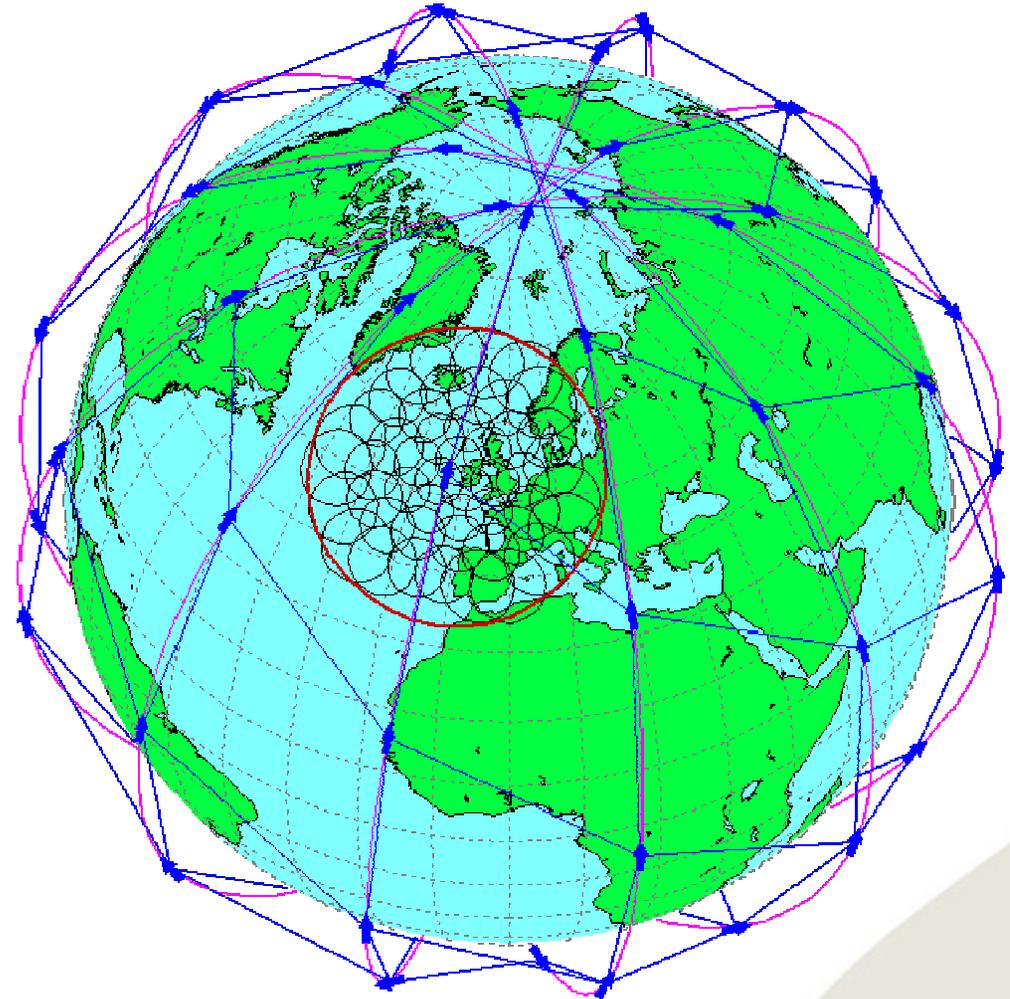
AIRCOM Helpdesk located in Montreal and Singapore, 12 hours Montreal, 12 hours Singapore. Seamless transition between centres. Single contact point.

MONTREAL

SINGAPORE

Timely Service Advisories to nominated addresses within your organization, advance notice of planned works, plus just prior, during and on completion, timely notification of unplanned outages, then updates and post- service restoration

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Customer Support Team is comprised of Regional Customer Support Specialists who are based around the world. Experts in AIRCOM applications, available during normal business hours and keep customers up to date on new products and services

MONTREAL

PARIS

HONG KONG

SINGAPORE

RIO DE JANERIO

SYDNEY

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ATS Internetworking

SITA

Internetworking

Partner DSPs
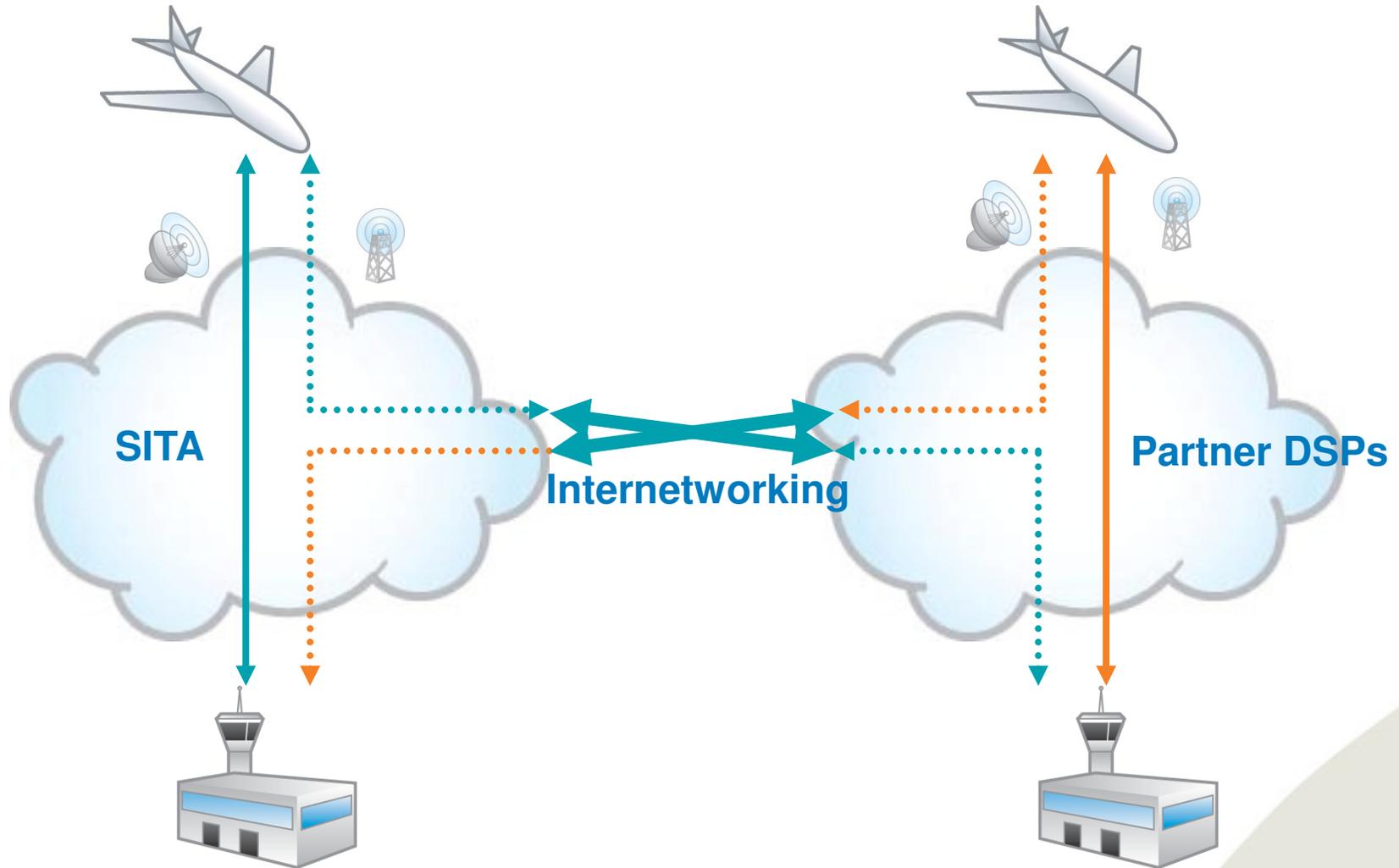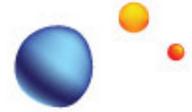
SITA FANS service performance report
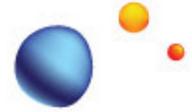
- SITA FANS services perfomance reports are provided to ANSP

- Main sections of the Performance report :

  - Traffic data: number of messages/by airlines

  - Availability of the service (processor, VHF network, Satellite network)

  - Reliability of the service (uplink success rate)

  - Performance data (uplink and downlink delivery times)

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The European Data link mandate

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CPDLC in European Airspace
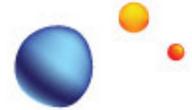
- Airlines today are progressively equipping itself with ACARs avionics and are datalink capable.

- Regionally, increasing number of ANSPs are planning to introduce datalink for ATS services

CPDLC in European airspace

Recent adoption of the Implementing Rule on Data Link Services by the European Commission's Single Sky Committee (regulation EC 29/2009) obliges European ANSPs and airlines operating in their airspace to implement CPDLC over ICAO compliant ATN/VDL Mode 2 technology (ATN/VDLm2) for all airspace above Flight Level 285.

From 1 January 2011	All new aircraft must be fitted with CPDLC/ATN/VDLm2.
From 7 February 2013	CPDLC and data link services to be provided by ANSPs in the core area (Western Europe).
By 5 February 2015	All existing aircraft to have been retrofitted with CPDLC/ATN/VDLm2.
From 5 February 2015	CPDLC and data link services must be provided by ANSPs in the extended area (entire European Union).

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EUROCONTROL Link 2000+ Program
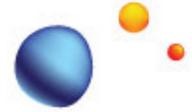
- The European Airspace is complex, fragmented, congested, traffic forecast expect to double or triple by 2020-2025.
- New technologies will have to be introduced into the ATC process to meet growing traffic. CPDLC is one of the first new technologies which can have direct impact in ATC capacity.
- Ground systems are reaching maximum capacity
- Data link equipage would result in a 14% increase of sector capacity.
  29% reduction of overall controller workload

ANSPs	
Today	(green)
2008-2009	(blue)
2013	(yellow)
2015	(red)

| Aircraft Operators | 2011 - forward fit |
| | 2015 - retro fit |

Source: Eurocontrol

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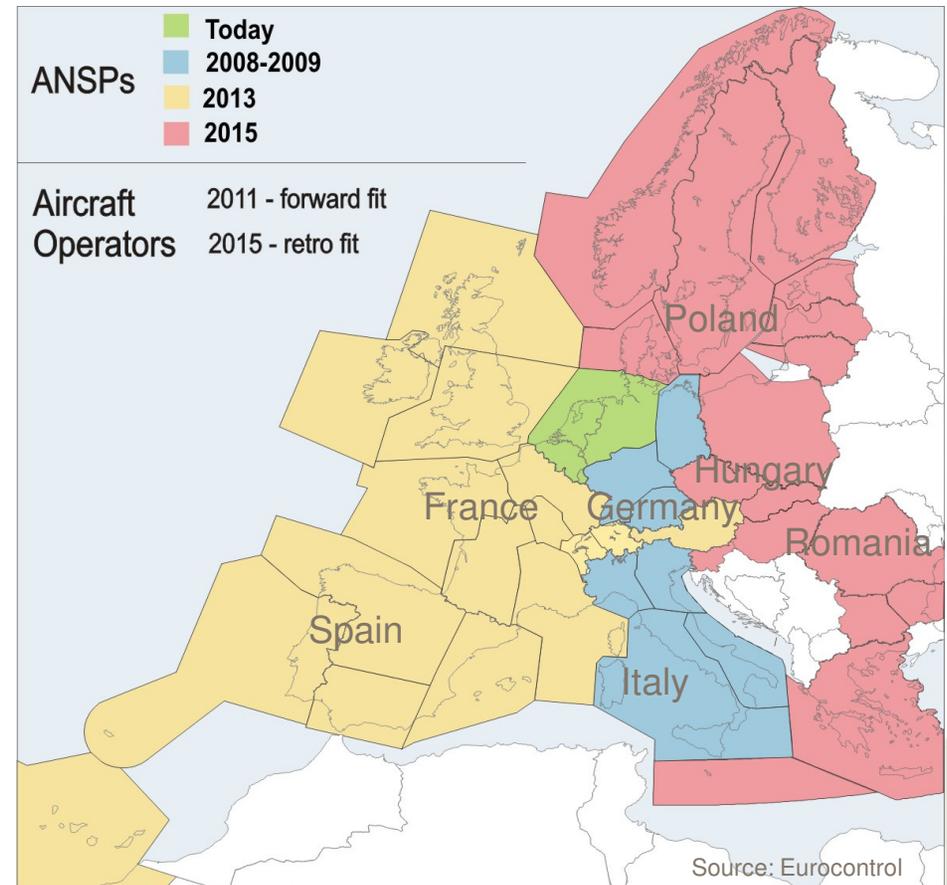
The European Implementing Rule on DLS: EC 29/2009
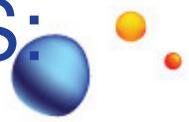
Why?
11% Capacity Gain
29% controller workload decrease
About 1000 aircraft

When?

ANSPs	Today
	2008-2009
	2013
	2015

Aircraft Operators	2011 - forward fit
	2015 - retro fit

What?
Mandating En-route CPDLC over ATN/VDL2
Over FL285

Exemptions?
FANS Equipped aircraft until Dec. 2014
State flights, test flights, etc.

eurocontrol
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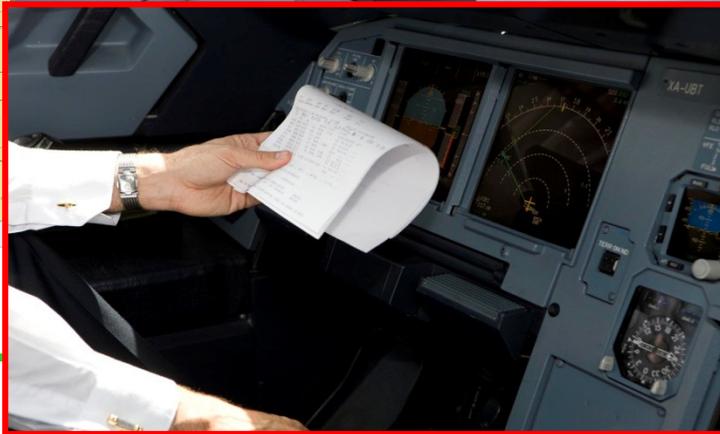
SITA's contribution and VHF partnerships

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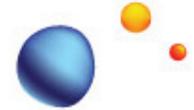
The ATN Service

- **The ATN Service enables ANSPs to benefit from SITA owned VDL and ATN infrastructure, including :**
  - **VDL coverage in desired airspace (single or redundant)**
  - **IP access to SITA ATN routers (redundant advised)**
  - **24/7 Helpdesk**
  - **Performance reporting**
  - **ATN backbone service (access to neighboring ATN community)**

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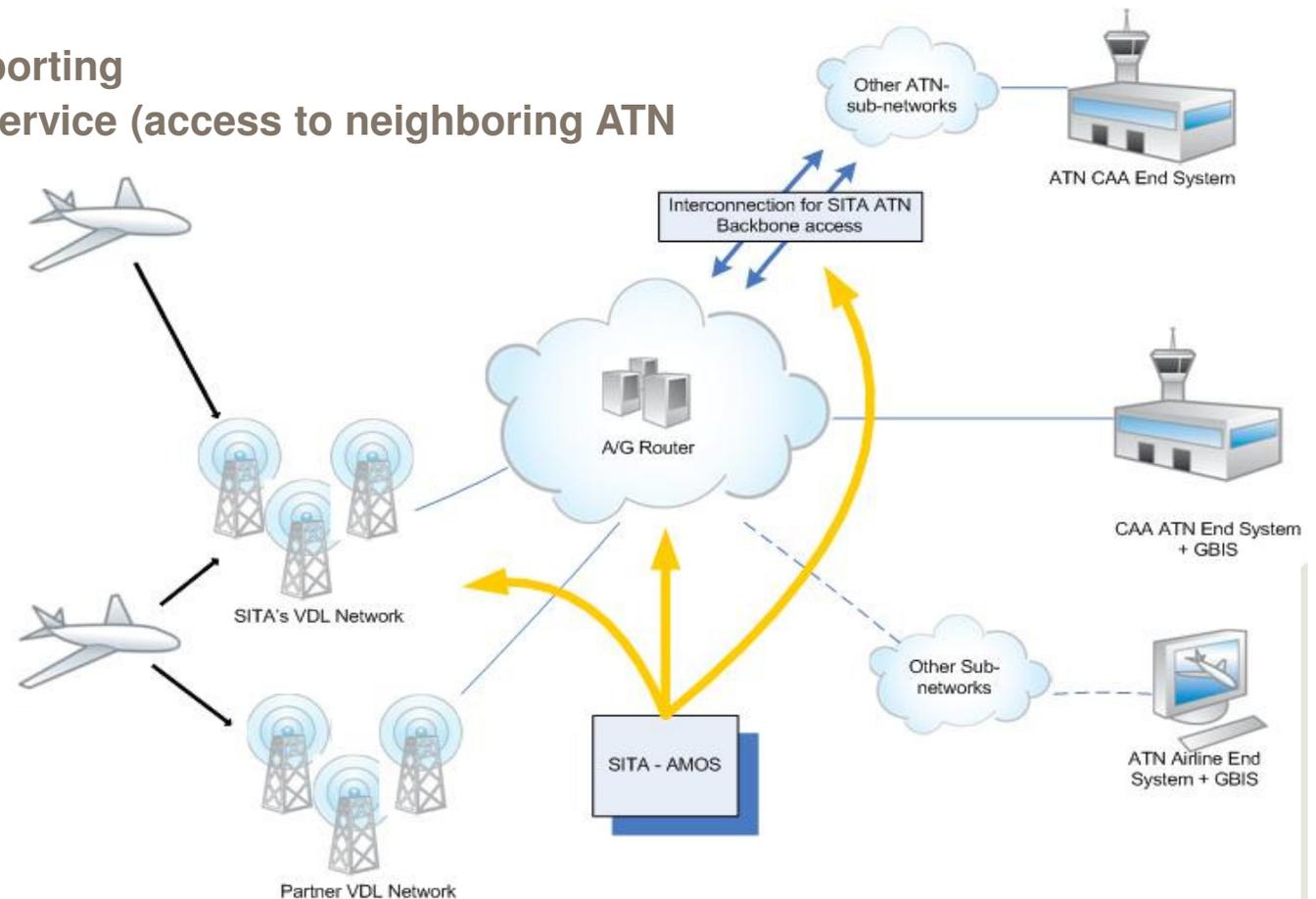
The VHF Partnership
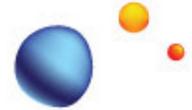
Win / Win Approach
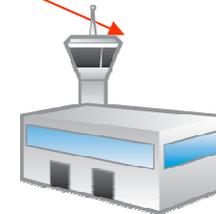
- SITA outsources the provision of its A/G communication service (AOC, ATC) to the ANSP
- SITA contributes to the ANSP costs for operating the A/G infrastructure

- The ANSP deploys a state-of-the art A/G datalink communication infrastructure at a fraction of the costs it would sustain if developed from scratch
- The ANSP owns and operates the infrastructure and develops its know-how
- The ANSP receives a cost contribution that is directly linked to the volume of AOC traffic

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The VHF Partnership

ATN/CPDLC

AOC

FANS/PreFANS

ANSP VHF Network Service Interface

VHF stations

AIRLINE Host Computer

Non ANSP ATS Host Computer

Link2000+ CPDLC

SITA ACARS Processor

ANSP G/G Network

SITA Network Service

ACARS Based ATS Applications

Network Gateway

ATN Router

ATN Router

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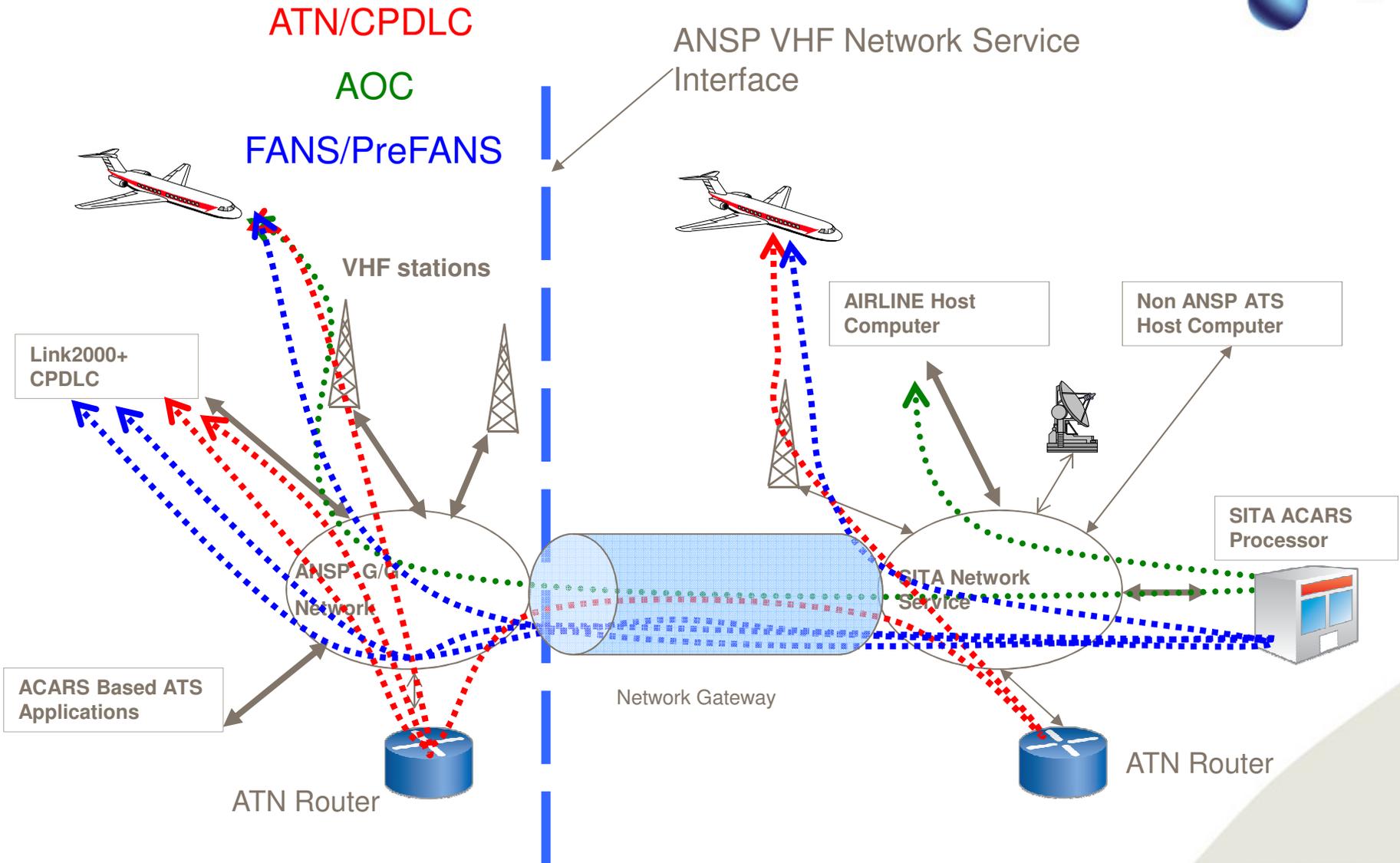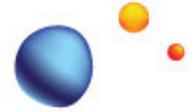
SITA's Current ATN/VDLm2 Provision in Europe

NATS/IAA FAB:
ATN/VDLm2 Service

Maastricht UAC:
ATN/VDLm2 Service

FABEC (France,
Benelux, Switzerland):
VHF Partnership

DFS (Germany):
VHF Partnership

NAV Portugal:
VHF Partnership

AENA (Spain):
VHF Partnership

FANS implementation in CAR/SAM region
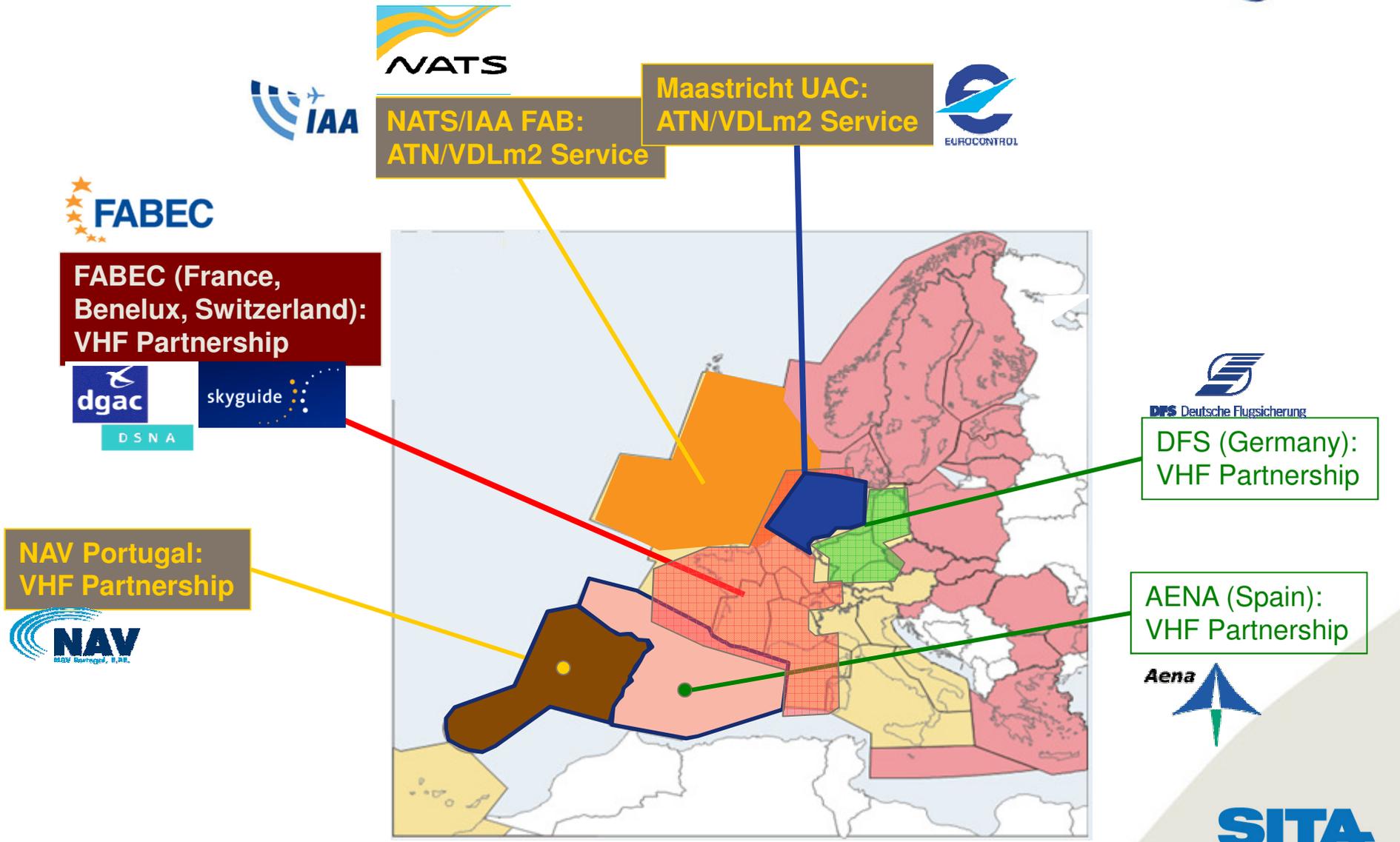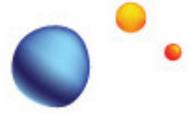
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Our credentials:
ANSP using SITA Data link services in Americas

NAVCANADA
CADS/CFRS
NORTH ATLANTIC

FAA
ACC ANCHORAGE
ACC OAKLAND
PACIFIC

FAA
ACC NEW YORK
NORTH ATLANTIC

DSNA FRANCE
FIR ROCHAMBEAU
ACC CAYENNE

COCESNA
FIR CENTROAMERICANA
ACC CENAMER
PACIFIC

DECEA BRASIL
ACC AO
SOUTH ATLANTIC

DINACIA URUGUAY
ACC MONTEVIDEO
SOUTH ATLANTIC

DGAC CHILE
OCEANIC SECTOR
SOUTH PACIFIC

DGCTA ARGENTINA
EZEIZA/CMD RIVADAVIA
SOUTH ATLANTIC

Continental CPDLC implementation in Brazil

SIRIUS BRAZILIAN ATM PROGRAMME

BRAZILIAN ATM PROGRAM*
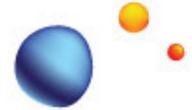
- The SIRIUS program is the Brazilian response to ICAO demand for the State Members to develop and implement a national ATM plan compliant with worldwide ATM concept as envisaged by that Organization.

- The related projects and initiatives are described in the Brazilian ATM Implementation Plan doc, where DECEA defined several objectives, activities and proposed schedule.

  * http://www.decea.gov.br/cnsatm/

Brazilian ATM Implementation Plan*
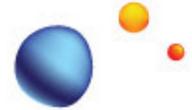
Activities for ATN	Planned schedule	Resp	Status
To supervise strategically, in an integrated manner, all the development, implementation, deployment and operation of National ATN.	**2018**	VICEA	Valid
To develop Guidelines for the Implementation of ATN Network.	2011	SDTE/CISCEA	Done
To implement the IPS based network infrastructure for data communications, that support the National ATN.	2012/2014	SDTE/CISCEA	Valid
To monitor the implementation of the new Regional Network II in coordination with ICAO Lima.	2012/2014	SDTE/CISCEA	Valid
To integrate with National ATN to Regional ATN	2012/2014	SDTE/CISCEA	Valid
To implement and commission CPDLC in the Brazilian continental areas of operational interest.	**2014/2018**	SDTE/CISCEA	Valid
To integrate D-ATIS services to ATN in the selected airports for the SISCEAB	**2012/2016**	SDTE/CISCEA	Valid
To integrate DCL services to ATN in the selected airports for the SISCEAB	**2012/2016**	SDTE/CISCEA	Valid
To implement D-VOLMET (data) services for the SISCEAB.	**2012**	SDTE/CISCEA	Valid

* http://www.decea.gov.br/cnsatm/documentacao/

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The VHF data link infrastructure
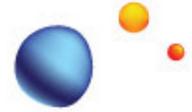
- In 2010, after a public RFP process, SITA has been selected by DECEA to deploy a new VHF data link network in Brazil
- The contract model is a 20 years public concession where SITA operates and mantain the VHF network on behalf of DECEA
- Exclusive service provider in Brazil for AOC
- ATS Intwk with other DSP

Rede Terrestre do Sistema Data Link Brasil

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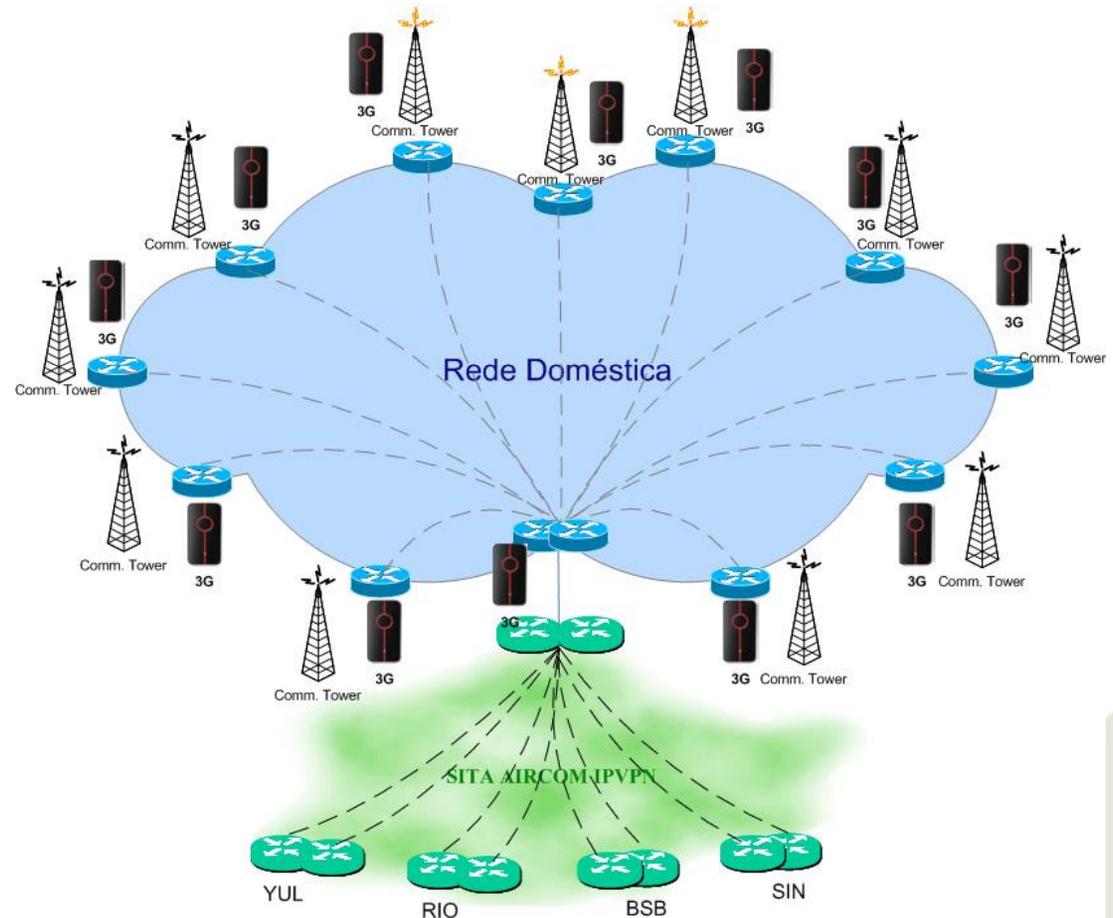
Roadmap for Brazil

Air ground data link project

Dec2010 | **Aug 2012** | **2014** | **2016**

Contract signature

PHASE 1 ➜

Concession operation initiated

PHASE 2 ➜

CPDLC/ ATN trial

PHASE 3 ➜

Lot 01
- the existing infrastructure is replaced (ACARS processor, VHF stations (24) and Network) + 5 key sites are duplicated (GRU,CGH, GIG, RIO and BSB) = 29 Stations by end of 2012

Lot 02
- complete POA (ACARS) Data Link coverage over Brazil;
- 22 additional SITA stations.

Lot 03
- complete VDL coverage over Brazil;
- Initiate ATN routing implementation

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Current status of implementation
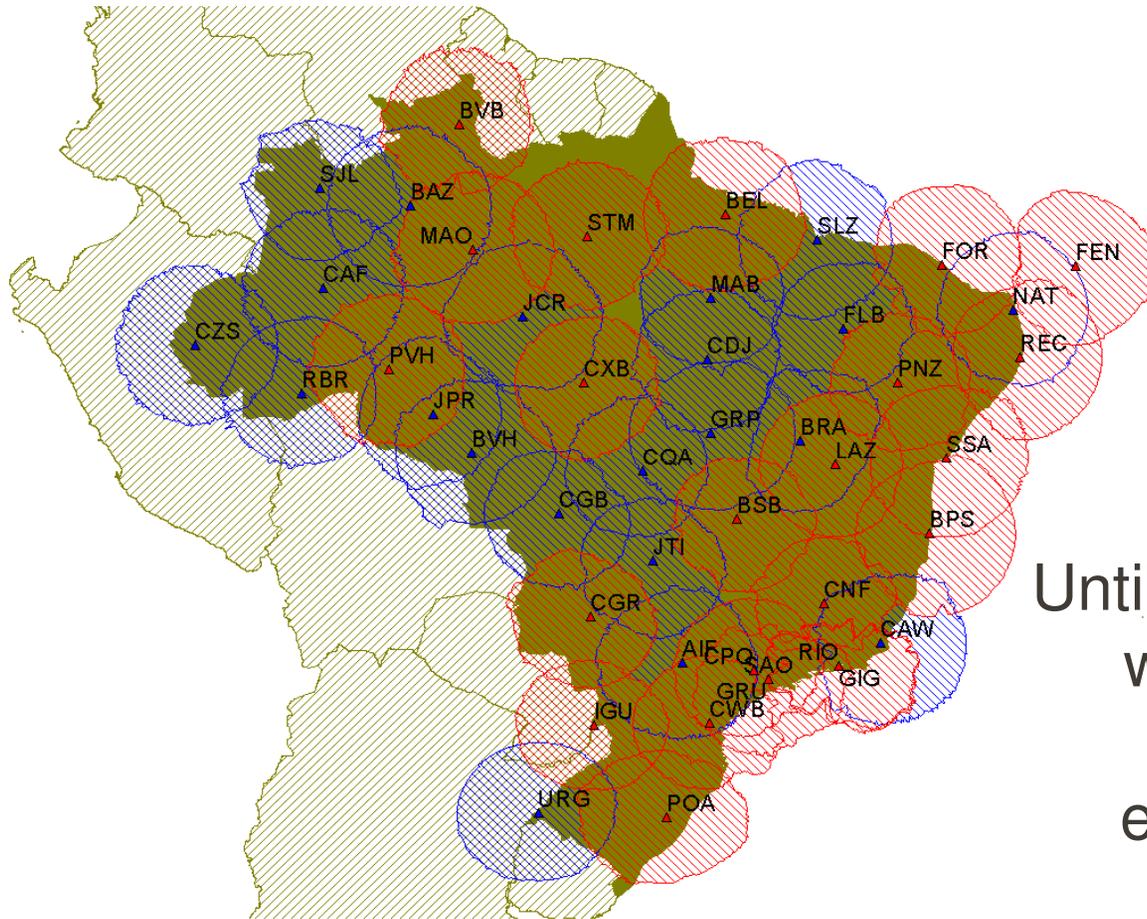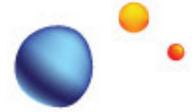
Currently there are 41 VHF ground stations active, capturing data link traffic over 39 sites.

Until the end of 2015, there will be a total of 47 sites (51 stations) covering entire Brazilian airspace above FL245.

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World Air Traffic
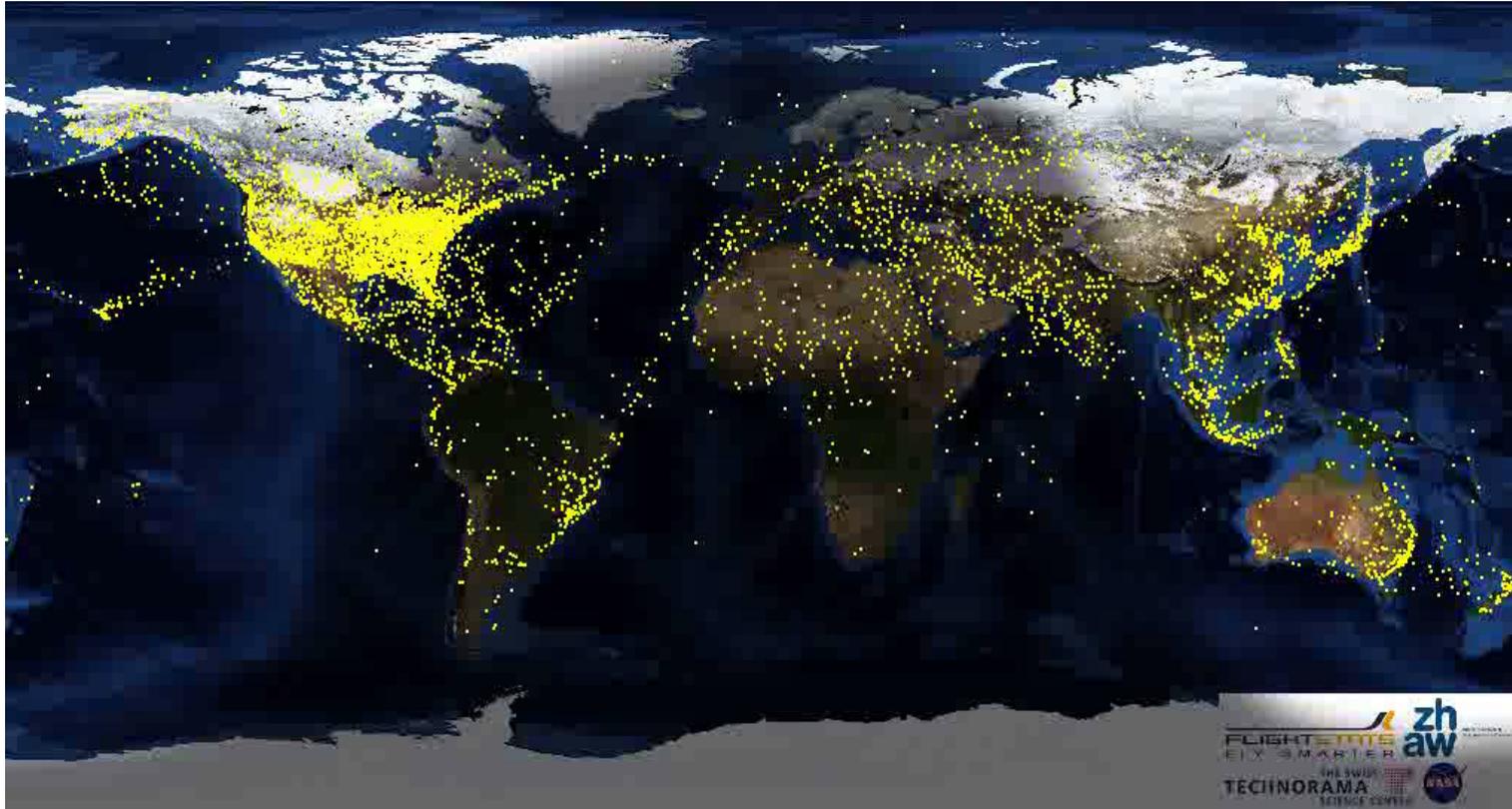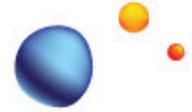
Data link communication on remote, non radar and oceanic areas is critical mission for ATM and flight operations.
Take action!

Thank you !

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