ICAO NAM/CAR/SAM ADS-B Implementation Workshop/Seminar

November 26-29, 2018, Mexico City Mexico

FREQUENTIS COMSOFT

Continuity with new perspectives

FREQUENTIS COMSOFT

#1
Market leader in AMHS

300+
ADS-B/MLAT receiver units sold worldwide

1989
A pioneering role in surveillance communication since 1989

Located in a high tech region of Germany

80
Installed base in over 80 countries

FREQUENTIS
A member of the Frequentis group since January 2016

200
employees from diverse cultures

70%
of our staff hold university degrees

A glance at our history

1989 — **Entering the ATC market** with a contract for European Surveillance Network **RADNET** on behalf of **EUROCONTROL**

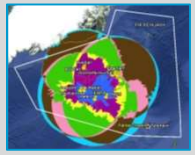
1997 — 

COMSOFT AMHS solution selected as candidate for European Communication Gateway

1998 — RAPS product is qualified as **ASTERIX Reference & Test Tool**

2001 — Industrial Partner of **EUROCONTROL** for Centralised ARTAS Maintenance and Support (CAMOS) **until today**

EUROCONTROL

2006 — 

Thanks to **Quadrant** ISAVIA is the first European ANSP to provide air traffic control **based on ADS-B**

2007 — New Generation of COMSOFT's **Surveillance Data Distribution System**

2012 — 

Undisputed AMHS market leader: our solutions are involved in virtually all AMHS connections worldwide

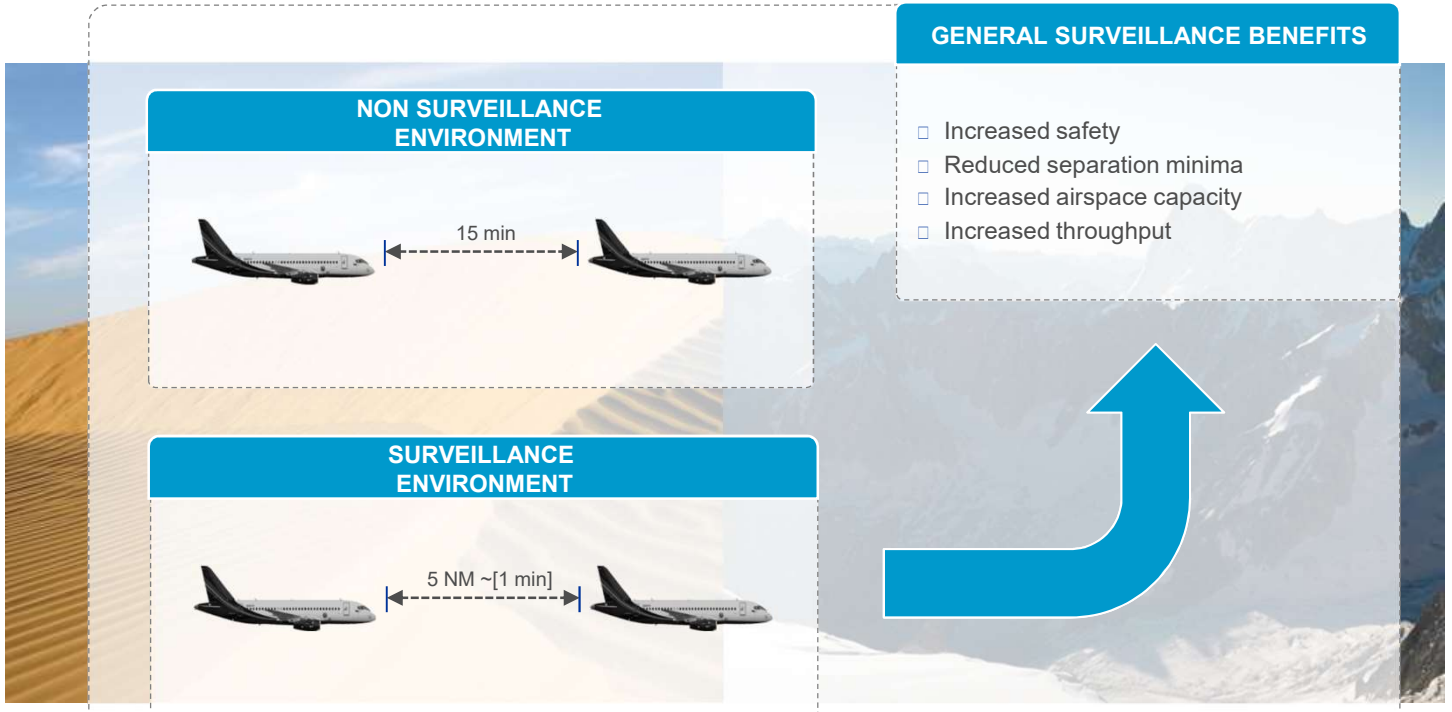
2016 — COMSOFT SOLUTIONS

FREQUENTIS

Comsoft Solutions becomes a member of the **Frequentis Group**

2016 — Comsoft Solutions & Frequentis: Together **market leader in AIM**

WHY DO WE NEED SURVEILLANCE



PRODUCT APPLICATION

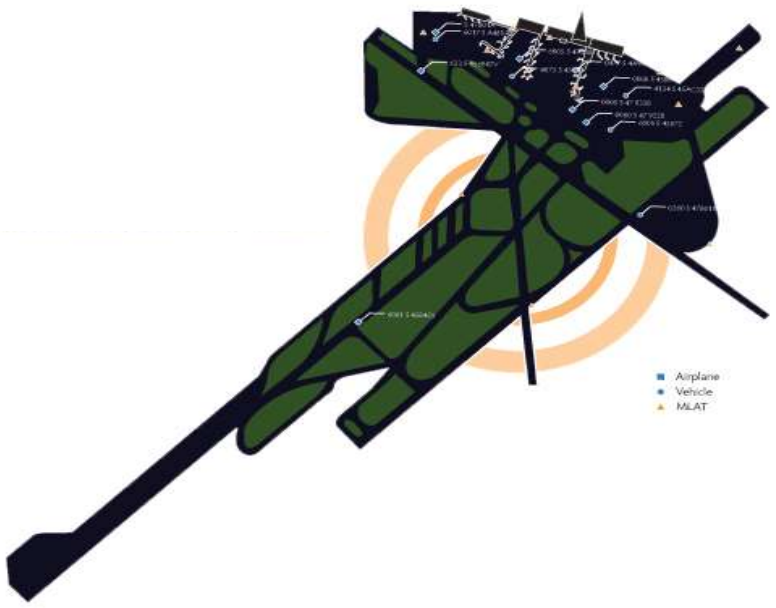
AIRPORT SURFACE	TERMINAL AREA	WIDE AREA	PRECISION RUNWAY MONITORING	SMALL / REGIONAL TOWER
				
A-SMGCS	LAM	WAM	PRM	TWR
Key Benefit: Multilateration provides unique identification of ***all aircraft*** — and not just a “blob” — and stops tags from jumping from one target to another as they would get near each other	**Key Benefit:** enables lower altitude operations in the terminal area (no ***radar*** coverage with high terrain). As a result, airports are prevented from high diversion rates in instrument weather conditions.	**Key Benefit:** Multilateration provides ***superior range*** over secondary radar, ***more accurate*** tracking, significantly ***lower costs*** (TOC), and ***significantly earlier*** operational readiness following contract award.	**Key Benefit:** Enable Airports with closely spaced parallel runways to maintain ***independent*** approaches, even during adverse weather conditions, which greatly improves capacity	**Key Benefit:** The ADS-B Kit enables the air traffic controller (ATCO) to be the eye of the pilot in severe weather conditions (VFR In IMC). Provides ***enhanced*** air situation awareness and enables ***early*** traffic planning

PRODUCT APPLICATION

FREQUENTIS COMSOFT

AIRPORT SURFACE

Advanced Surface Movement Guidance and Control Systems (A-SMGCS)



AIRPORT SURFA

A-SMGCS

Key Benefit:

Multilateration provides unique identification of ***all aircraft*** — and not j a "blob" — and stop tags from jumping fr one target to anothe as they would get n each other

RING

allel

ves

SMALL / REGIONAL TOWER

TWR

Key Benefit:

The ADS-B Kit enables the air traffic controller (ATCO) to be the eye of the pilot in severe weather conditions (VFR In IMC). Provides ***enhanced*** air situation awareness and enables ***early*** traffic planning

PRODUCT APPLICATION

FREQUENTIS COMSOFT

TERMINAL AREA OR WIDE-AREA

AIRPORT S

A-SMG

Key Benefit:

Multilateration
provides uniq
identification
aircraft — ar
a "blob" — ar
tags from jum
one target to
as they would
each other

MALL / REGIONAL
TOWER

TWR

y Benefit:

e ADS-B Kit
ables the air traffic
ntroller (ATCO) to
the eye of the pilot
severe weather
nditions
FR In IMC).
ovides ***enhanced*** air
uation awareness
d enables ***early***
ffic planning

PRODUCT APPLICATION

FREQUENTIS COMSOFT

AIRPORT SURFACE

A-SMGCS

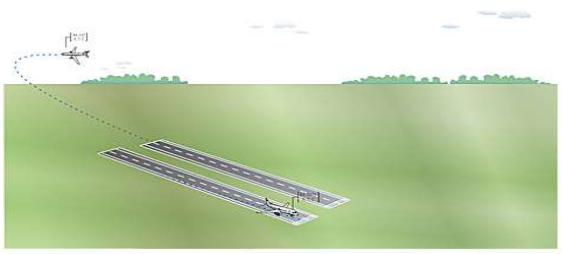
Key Benefit:

Multilateration provides unique identification of ***all aircraft*** — and not just a "blob" — and stops tags from jumping from one target to another as they would get near each other

PRECISION RUNWAY MONITORING

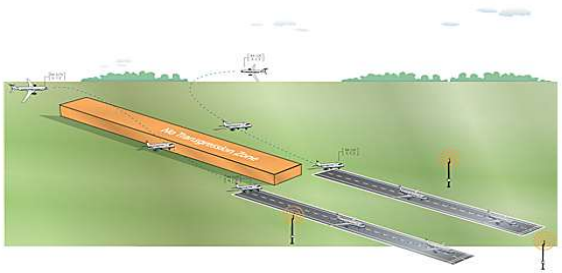
Without PRM System

Airports with closely spaced parallels must maintain staggered approaches, which decreases throughput, especially during peak periods and inclement weather.



With PRM System

Airports with closely spaced parallels can maintain independent approaches, even during adverse weather conditions, which greatly improves capacity.



SMALL / REGIONAL TOWER

TWR

Key Benefit:

The ADS-B Kit enables the air traffic controller (ATCO) to be the eye of the pilot in severe weather conditions (VFR In IMC). Provides ***enhanced*** air situation awareness and enables ***early*** traffic planning

PRODUCT APPLICATION

FREQUENTIS COMSOFT

SMALL / REGIONAL TOWER

VFR Pilot in IMC (bad visibility)

Question:

What help can ATC provide if pilots find themselves caught in bad weather?

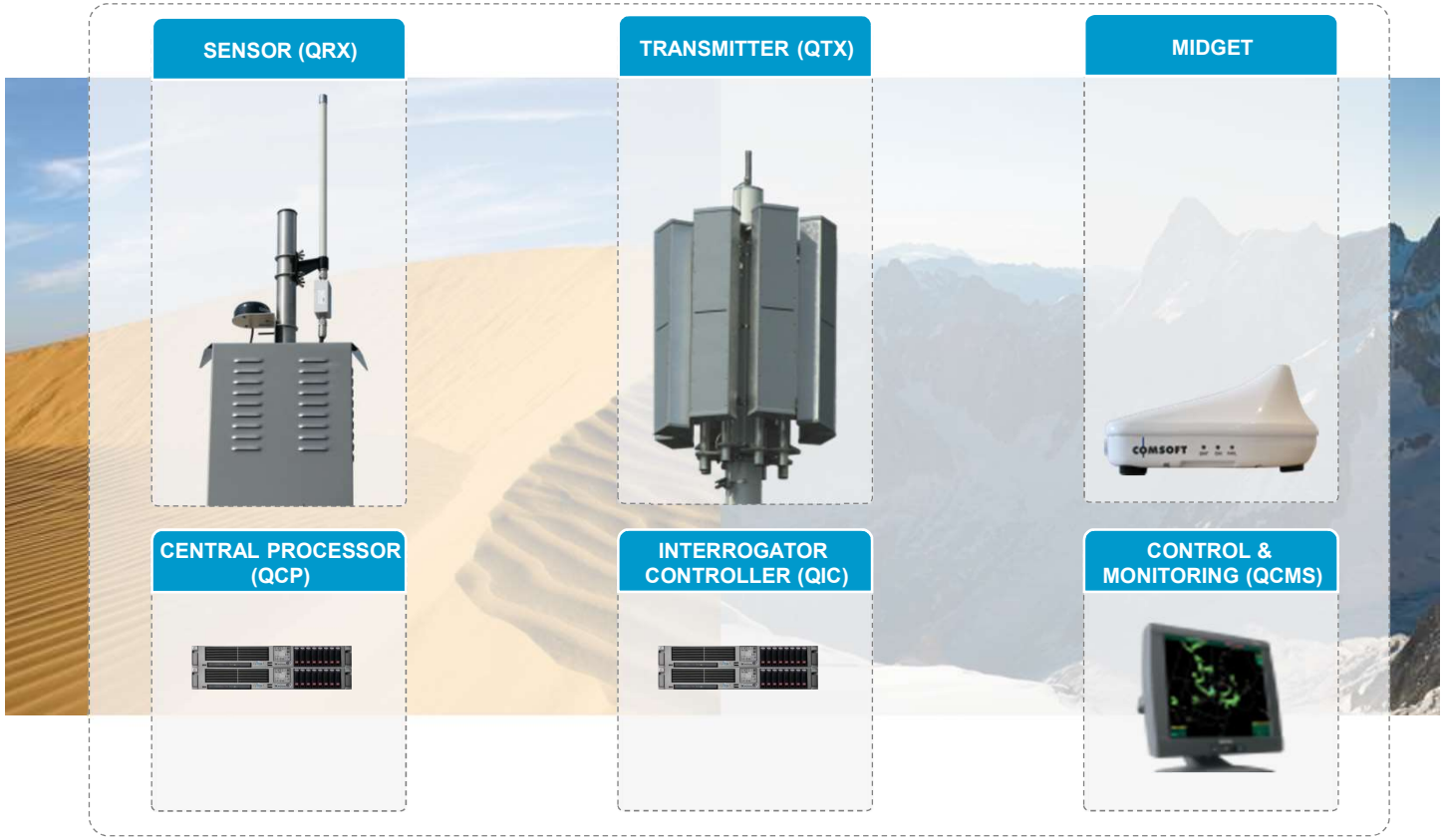
without surveillance data:
NOTHING

with surveillance data:
BE THE EYE OF THE PILOT

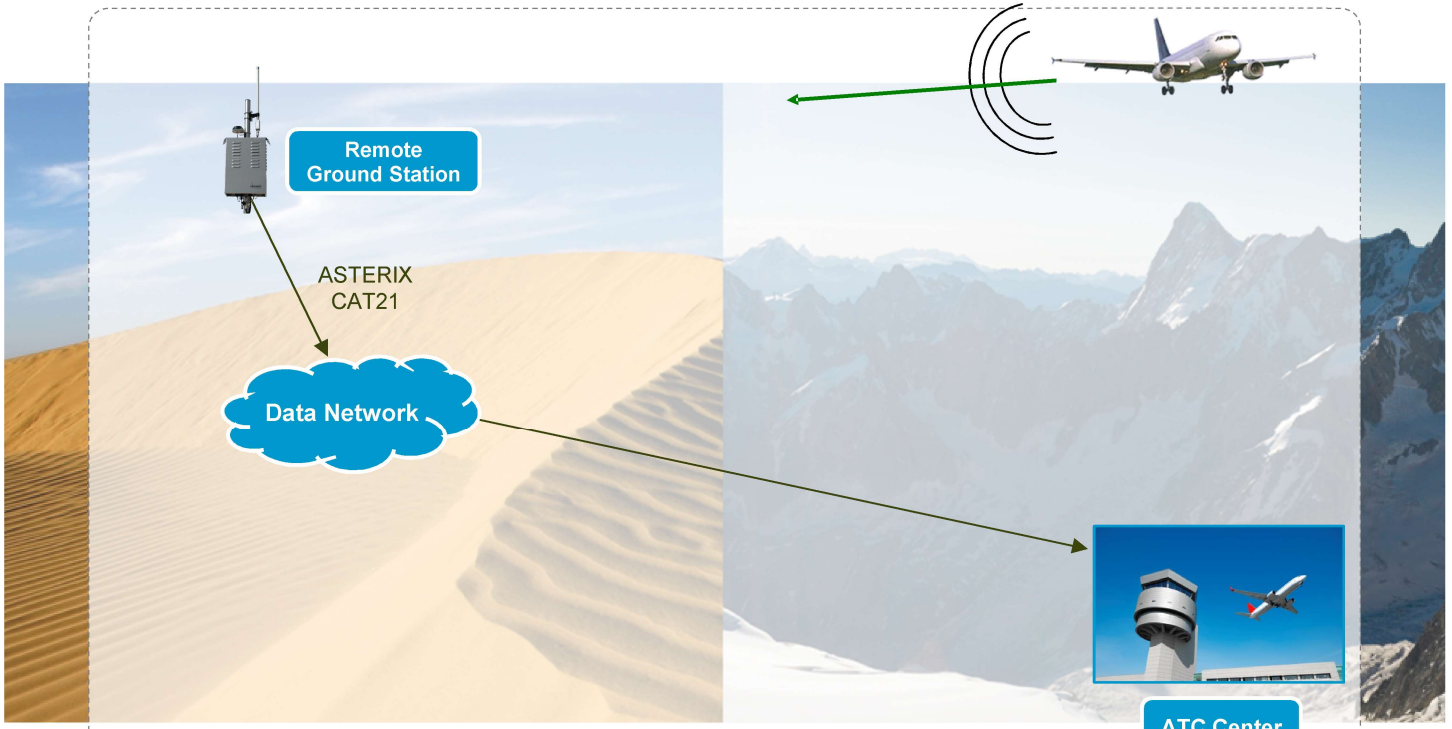
“We do our best to be the eye of the pilot”

M. Franklin – potomac tracon, NATCA

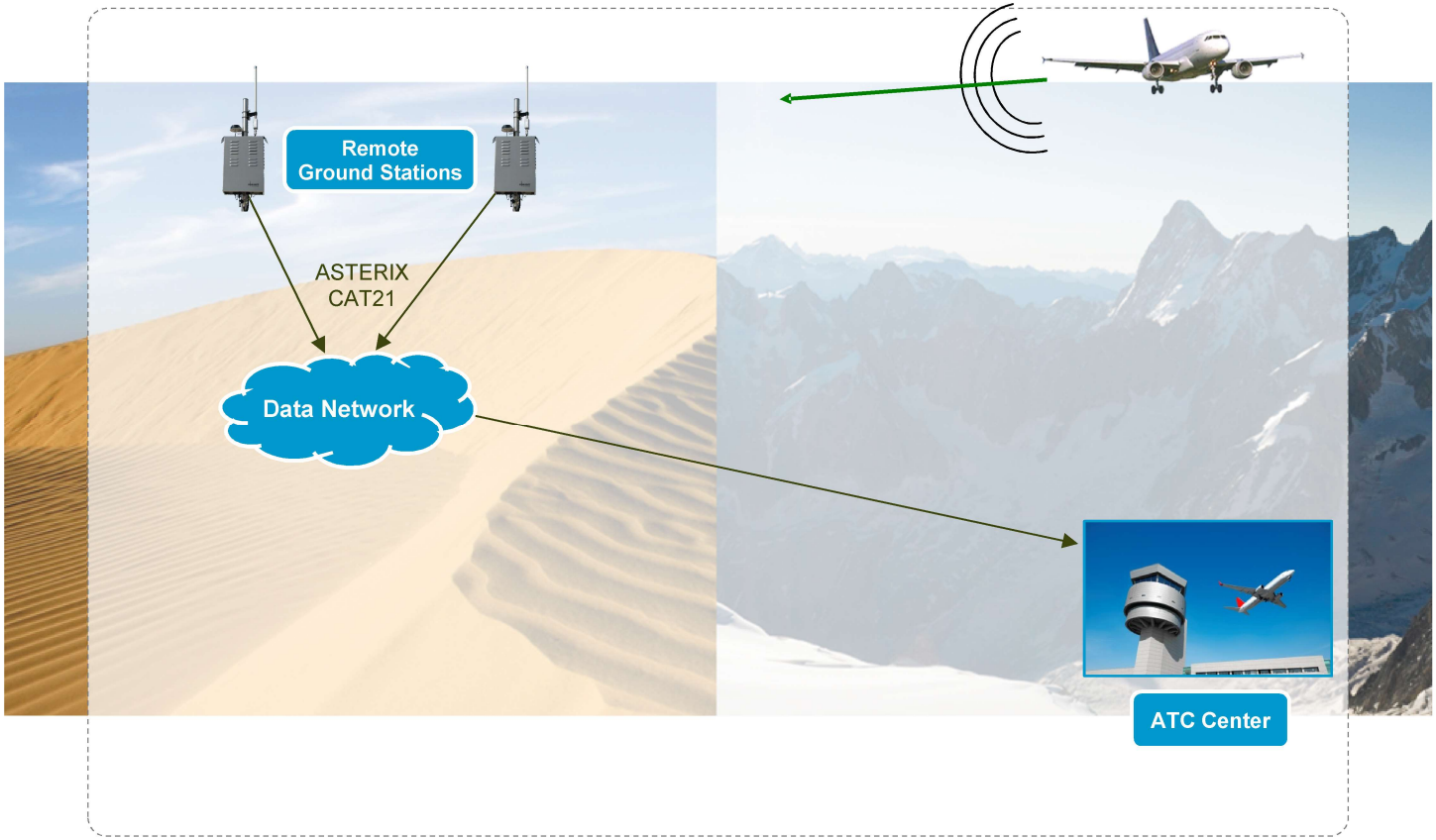
QUADRANT – PRODUCT PORTFOLIO



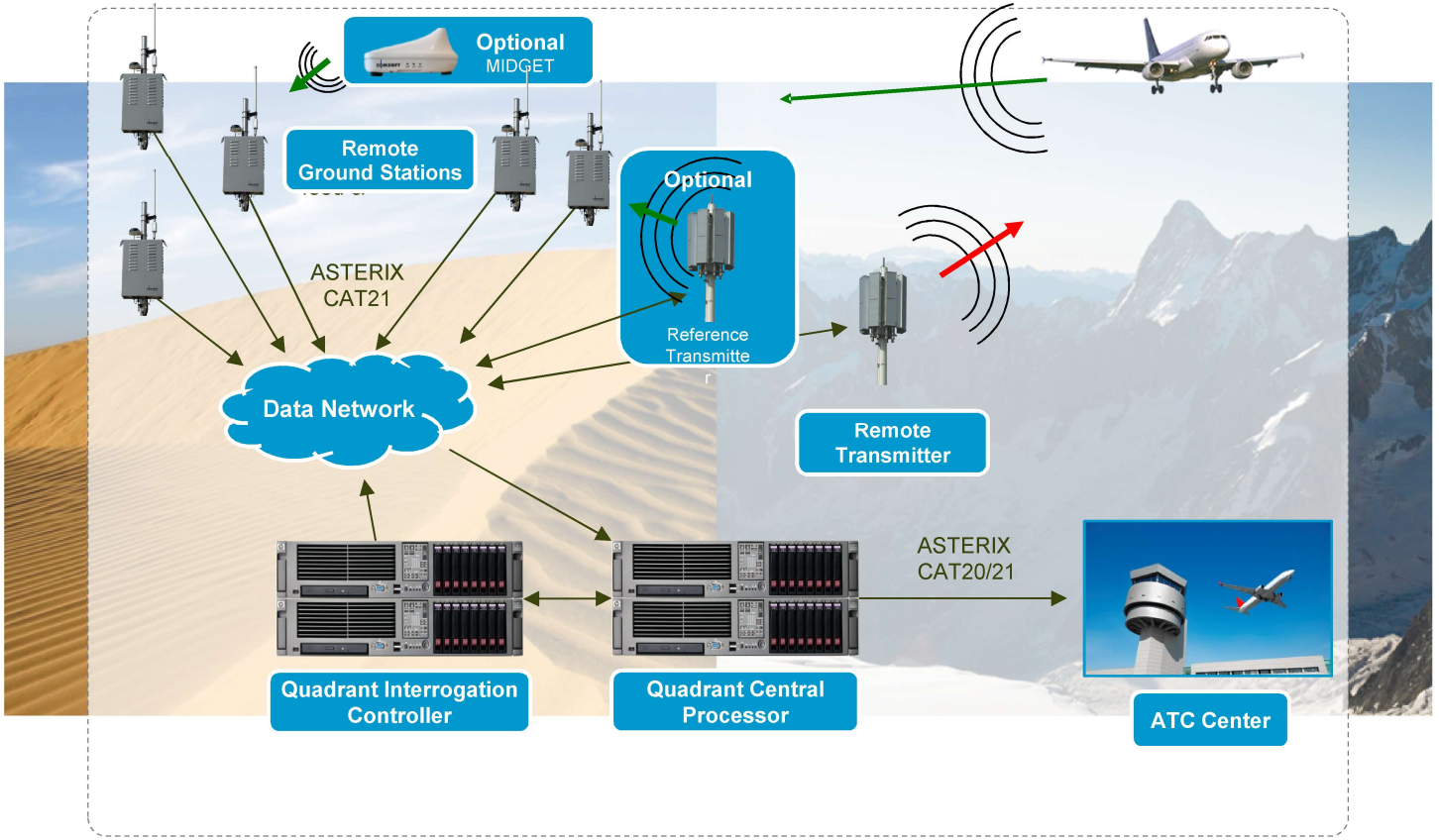
SINGLE ADS-B SYSTEM



EXTENDED ADS-B SYSTEM (n ADS-B SENSORS)

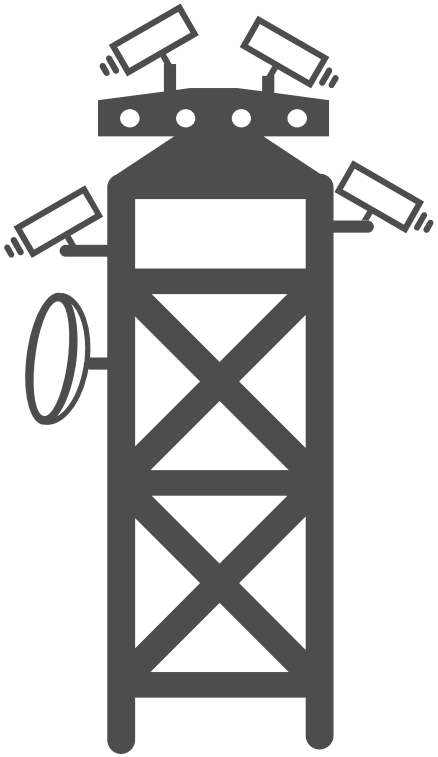


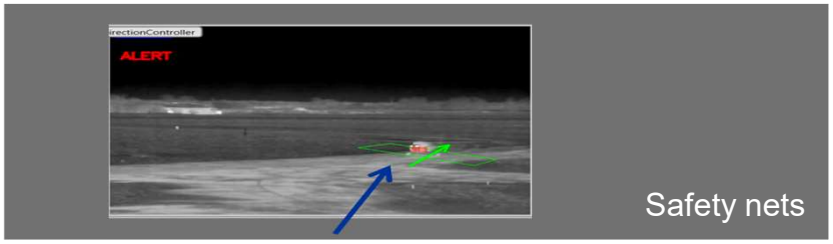
MLAT SYSTEM



smartVISION - for better Ground Surveillance

Take and give…





smartVISION – enhancing the tower view

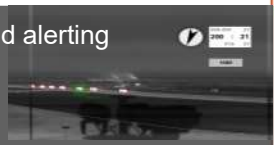
Use of IR technology, object tracking and augmentation

FREQUENTIS COMSOFT

Flexible presentation / compact working position			Automatic detection of multiple objects in panorama view
Enhanced high quality 360 degree visual and IR view			Video-based safety net to alert critical situations
PTZ camera line of sight tracking (follows objects automatically)			Label overlay in visual view (based on surveillance data)
Integrated control panel for improved situation awareness			Bandwidth-optimised network concept for remote transmission

Fully adaptable to individual customer needs

Solution profile – smart VISION

	Basic | Airfield ground monitoring		Advanced | Ground & control zone monitoring	
Capabilities of panorama view	• Panoramic view for selected sectors • Standard housing • Wiper-based cleaning		• 360° Visual + IR • Extended vertical view • Special protection housing • High pressure cleaning	
Capabilities of PTZ view	• Visual zoom • Optional light gun		• VIS zoom • Cooled IR zoom • Secondary PTZ and light gun • Mechanical stabilisation	
System functions	• Manual PTZ control • Predefined positions • PTZ assignment via Pano • Static video overlays		• Automatic object detection and alerting • PTZ tracking • Surveillance integration • Safety net functions • Information overlay	

Cost optimised

Performance optimised

ADS-B, WAM & MLAT Solutions

FREQUENTIS COMSOFT

Quadrant

Forward-thinking surveillance solution able to provide ADS-B and Multilateration on one single hardware platform

300+

ADS-B/MLAT receiver units sold worldwide

Highlights

- **Flexible solution:** Identical hardware can be shared to support applications from A-SMGCS to countrywide WAM
- **Improved coverage:** Advantage for surveillance over difficult terrain, particularly mountain ranges
- **Low maintenance:** No moving or degradable parts, so only occasional external inspection for damage is required
- **Expandable solution:** Through the addition of further sensors, without upgrade or modification
- **High precision:** By providing more precise data, enhanced runway incursion alerts can be supported
- **Low power consumption**, **small physical footprint**

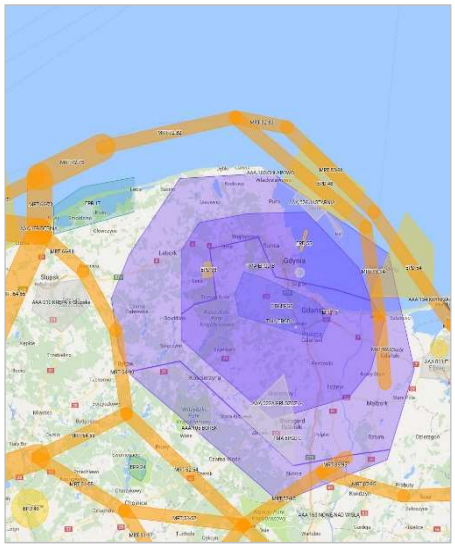
User Benefits

- **Flexible, modular and scalable with the ability to transition seamlessly** from ADS-B to MLAT using the same ground station equipment
- Allows surveillance coverage to be extended to **areas where surveillance was previously unavailable**
- Its ability to provide a **precise and high-quality air situation picture and high update rate** with minimal investment
- **Dynamic management of interrogation patterns** according to aircraft capabilities and current states
- Interrogation Power, Direction and Repetition Rate is **managed dynamically**
- **Long term synchronisation** after loss of GPS signal
- **Low operational cost** during life cycle

Modern Surveillance – Quadrant success stories

PANSA, Poland

- First surveillance system in Poland to detect and locate aircraft using **multilateration technology**
- Detection and localization of aircraft equipped with mode 3/A, C, S transponders
- Deployment of **ADS-B / WAM sensors** and **transmitter units** serving as interrogator, site-monitor and reference transponder
- Customer specific surveillance data conversion for smooth integration in PANSA infrastructure
- **Cost-efficient extension** of Gdansk TMA **surveillance coverage** for low altitudes



Modern Surveillance – Quadrant success stories

AAI, India

- Phase I: redundant **Quadrant sensors** at **14 sites** throughout the country
- Phase II: Quadrant ADS-B sensors at **further 7 sites**
- **Country-wide** coverage of **subcontinent of India**, Bay of Bengal and the Arabian Sea

GCAA, Abu Dhabi, UAE

- **Country-spanning** active **Wide Area Multilateration (WAM) system** for GCAA
- Extension of the existing network of **3 redundant Quadrant ground** stations with **additional ADS-B/WAM sensors plus active interrogation**
- Sensors and additional processing equipment cover **majority of airspace controlled by GCAA**

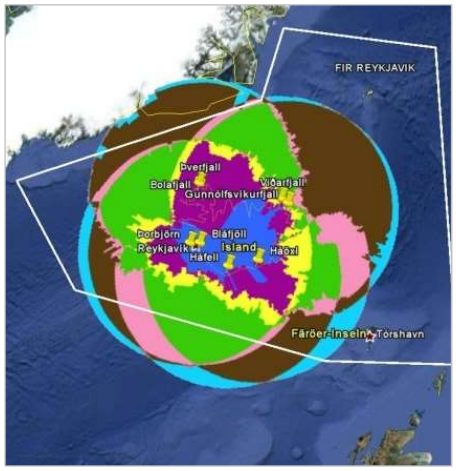
ADS-B Sensor deployment – Desert Climate

GCAA, Abu Dhabi, UAE

Modern Surveillance – Quadrant success stories

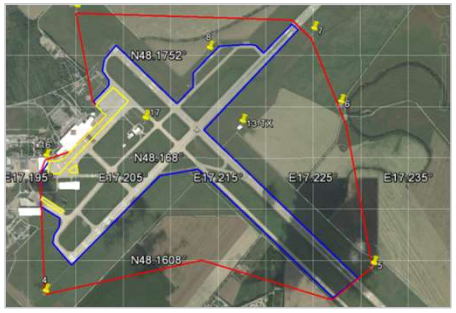
ISAVIA, Iceland

- Advanced surveillance for **one of the largest airspaces in the world**
- **5.4 Mil square kilometers** of Iceland's FIR **covered** by Quadrant **ADS-B units**
- Weather challenges due to **Iceland's sub-polar oceanic climate**
- ISAVIA is the **first European ANSP** to provide **air traffic control based on ADS-B**
- **ADS-B** system with **sensors** and **redundant centre**
- **MLAT** system with **sensors** and **transmitter**



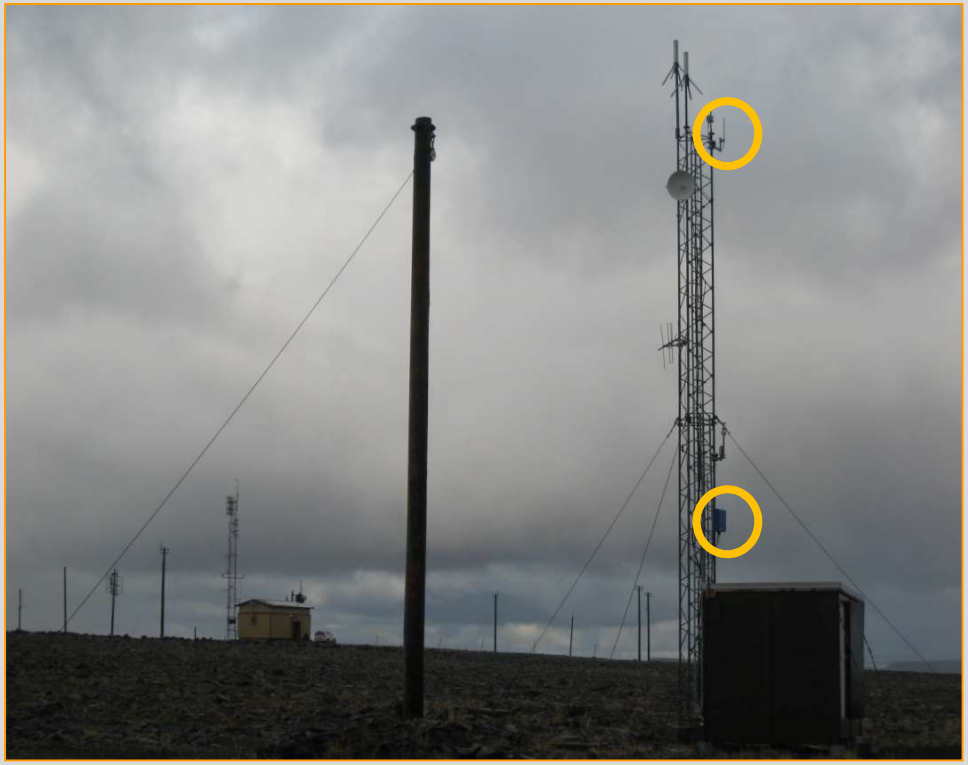
LPS, Slovakia

- Location: **Bratislava, M. R. Štefánik Airport**
- **Local Area Multilateration system** (LAM) solution with **ground stations** providing data of the airport surface
- **ADS-B system** with **sensors** for ARTAS implementation
- Solution is **certified by the Slovak Transport Authority**, authorising its use in civil aviation as an aeronautical ground facility



ADS-B Sensor deployment – Arctic Climate

Scandinavia



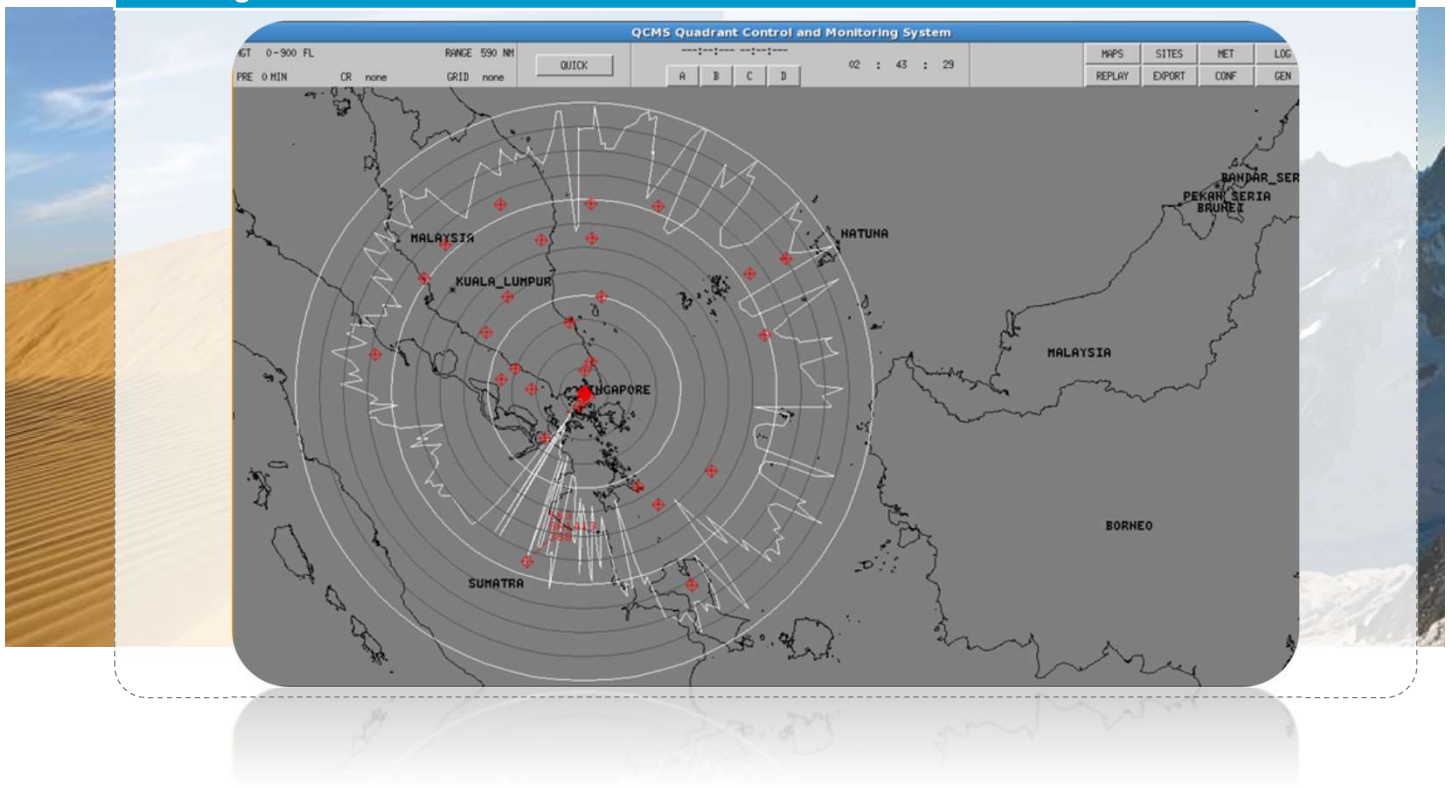
REFERENCE: ADS-B | CAAS SINGAPORE

Installation

Site with redundant sensors

REFERENCE: ADS-B | CAAS SINGAPORE

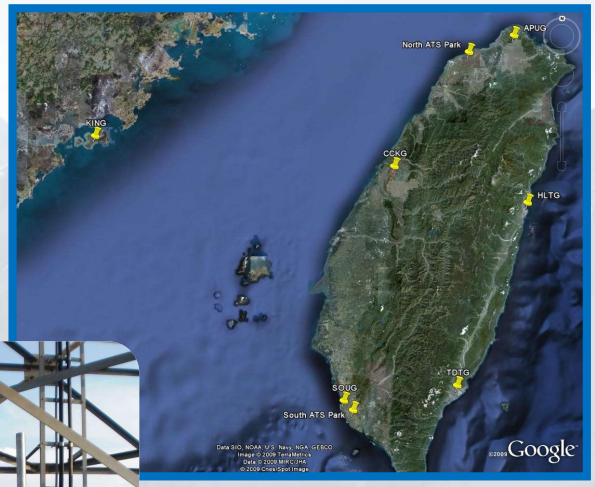
Coverage



REFERENCE: ADS-B / WAM | ANWS IN TAIWAN

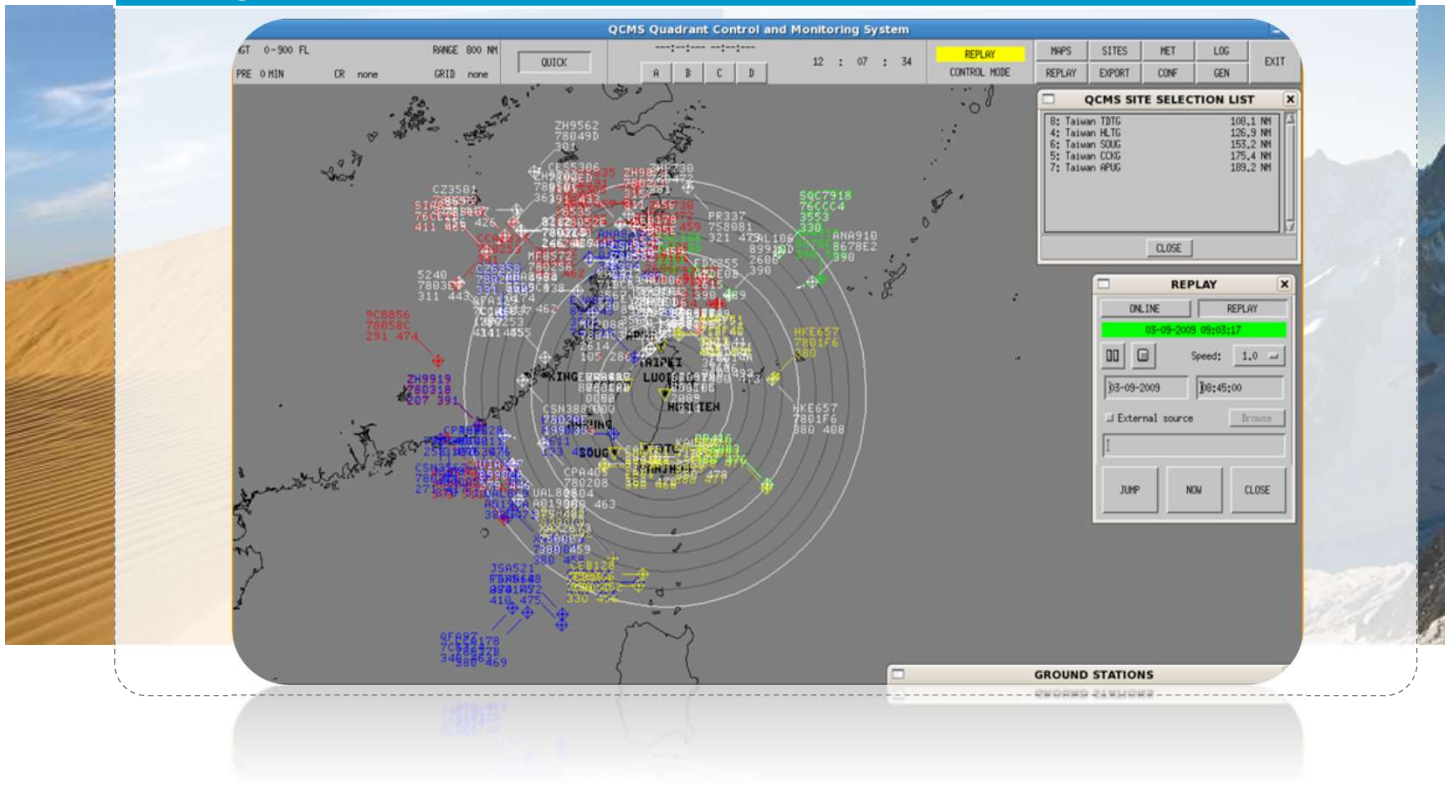
Installation

Site with redundant sensors



REFERENCE: ADS-B / WAM | ANWS IN TAIWAN

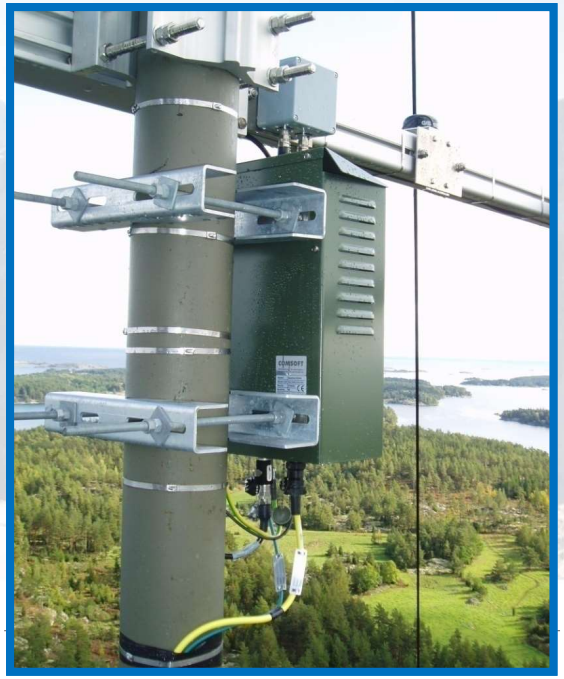
Coverage



REFERENCE: WAM | FMV IN SWEDEN

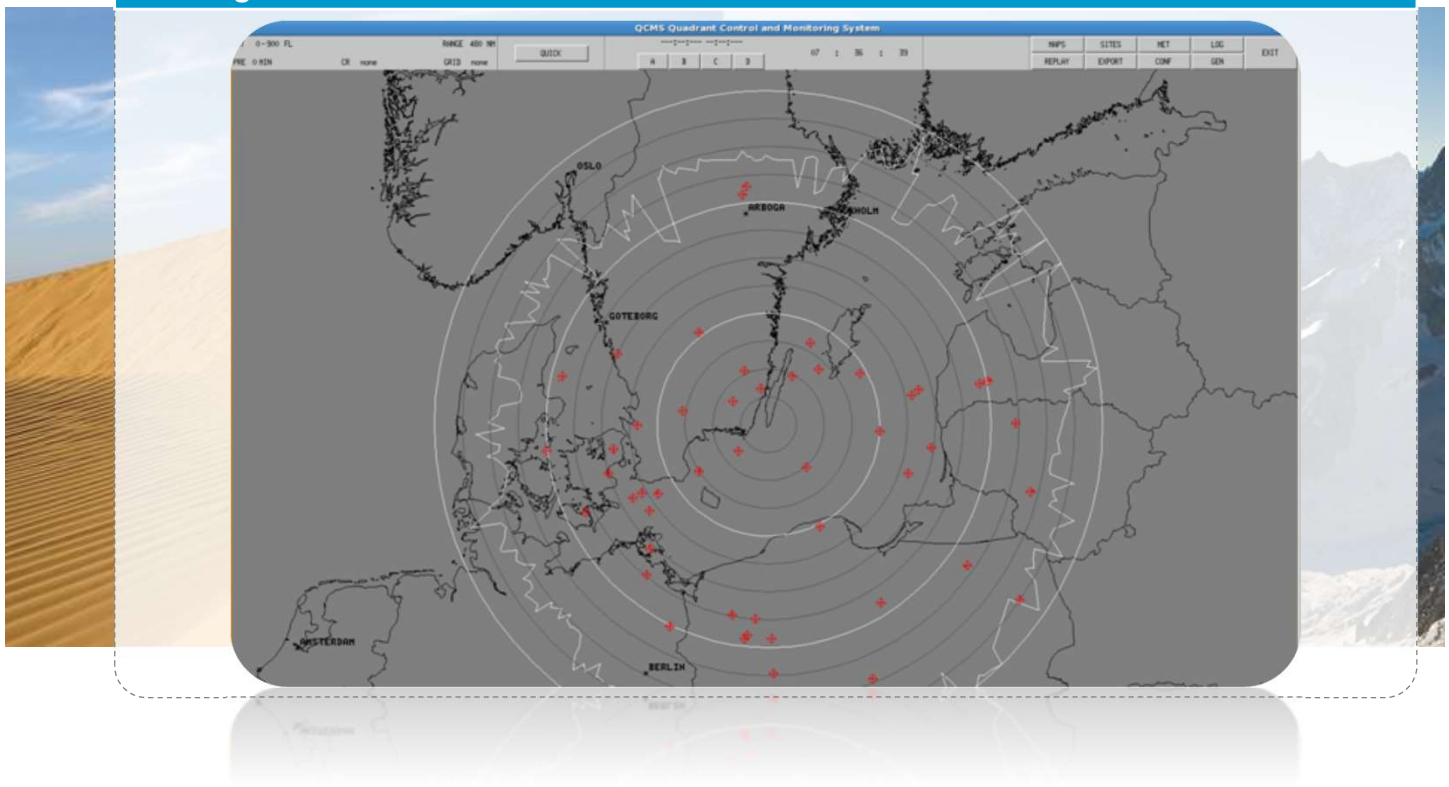
Installation

4 Sites in South Sweden



REFERENCE: WAM | FMV IN SWEDEN

Coverage



REFERENCE: WAM | GCAA - UAE

Installation

6 redundant sites

REFERENCE: WAM | GCAA - UAE

FREQUENTIS COMSOFT

Sites

REFERENCE: WAM | DENMARK NAVIAIR

Installation

Sensors to be installed on an oil platform

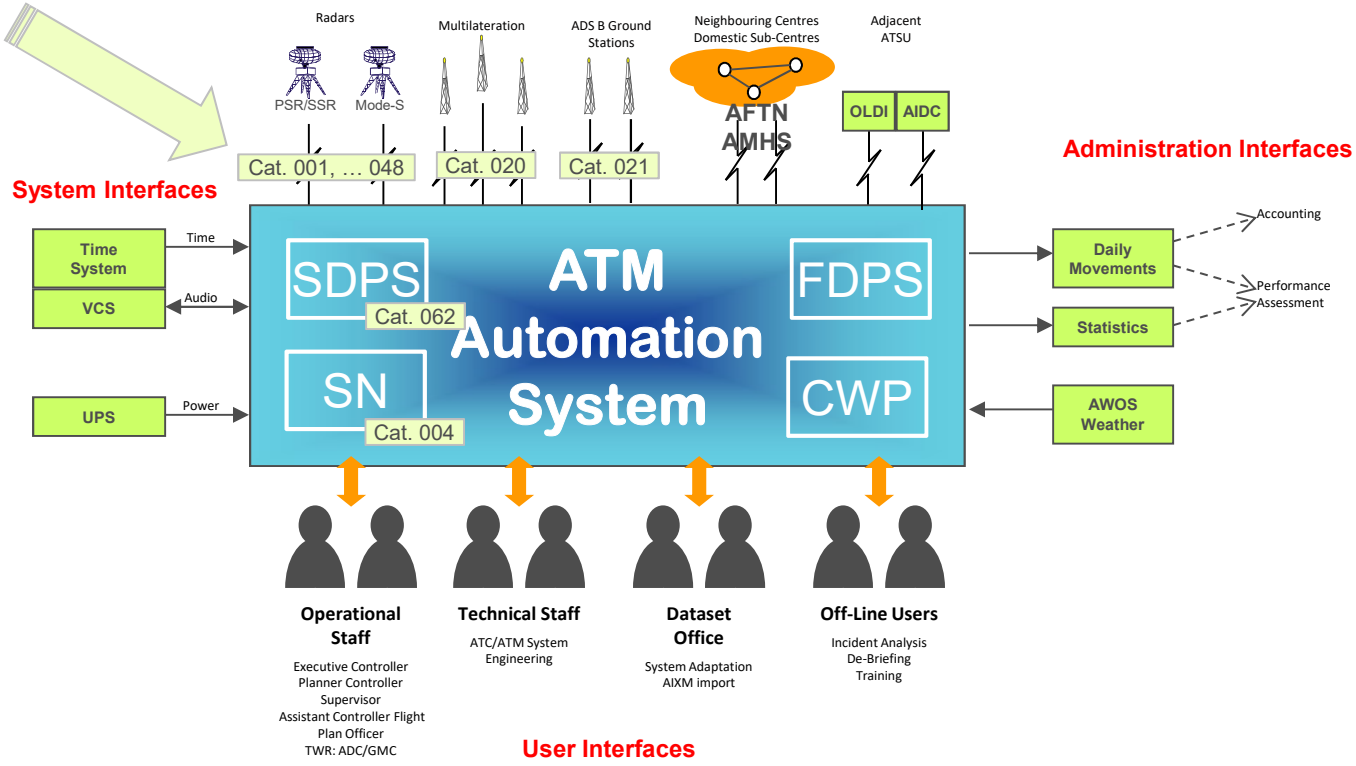
Summary

- From air to ground, there are several valid use cases for ADS-B and multilateration (MLAT)
- ADS-B and MLAT ground systems provide high quality surveillance data from ADS-B equipped aircraft
- Quadrant ADS-B solutions are flexible, modular and scalable with the ability to transition seamlessly from ADS-B to MLAT using the same ground station equipment
- The FREQUENTIS Group readily has available today solutions ranging from Quadrant ADS-B, via Multilateration to smartVision, a complete safe portfolio

Detour 1: Standard Interfaces, Please (!!!)

All-purpose STructured Eurocontrol suRveillance Information eXchange

http://www.eurocontrol.int/services/asterix



Surveillance Support Tools

FREQUENTIS COMSOFT

RAPS-3

Toolset for testing, analysis, validation & generation of surveillance data

150+

RAPS systems sold world-wide

Highlights

- **EUROCONTROL qualified reference product** for the ASTERIX standard
- Support of **military ASTERIX**
- User-definable **test** and **evaluation suites**
- Online surveillance **data real-time monitoring** and **analysis**
- Available on **various portable platforms**
- Experienced support team with **wide service portfolio**

User Benefits

- **Established & accepted tool:** Indispensable toolset for ATC environments and manufacturers
- **Standardised acceptance**: within the scope of integrating new communication and data processing systems, radars, sensor and other surveillance data sources into an existing operational environment
- **Diverse fields of application:** ATC centres as a measurement and analysis system, manufacturers as an independent reference system for acceptance testing of various systems and applications
- **Bespoke military requirements:** unique derivate MILRAPS for military customers is designed and developed for the specific requirements of the armed forces, as defined by NATO

RAPS-3 – success stories

Over 50 customers worldwide

Reference product for **ASTERIX**, the worldwide standard for surveillance data exchange

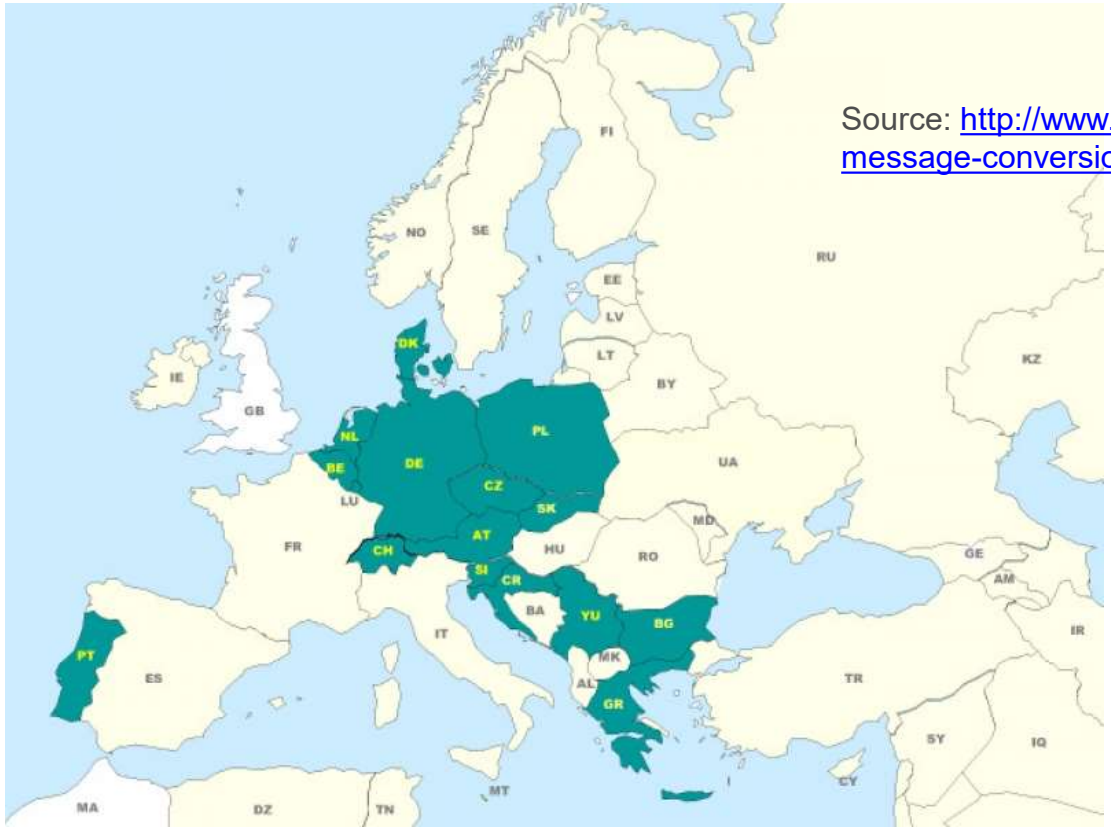
2003 RAPS-2 is **qualified by EUROCONTROL** as an ASTERIX test tool

2007 RAPS-3 is recommended by **EUROCONTROL**

2016 Number of **delivered RAPS-3 > 90 units**

Number of RAPS systems in **total > 150**

Detour 2: Benefit of Standardized Interface: Share!



Source: http://www.eurocontrol.int/services/surveillance-message-conversion-and-distribution-equipment-rmcde

Surveillance Communication

FREQUENTIS COMSOFT

SDDS-NG

For all surveillance distribution needs, providing the single access point for surveillance data

35 sites

equipped with turnkey solutions world-wide

Highlights

- **Scalable:** from one-box installations up to surveillance service networks
- **Central Management:** tasks can be centrally controlled, monitored and configured
- **Conversions:** between legacy formats and ASTERIX, and between ASTERIX Categories or versions thereof
- **Filtering:** flexible filter criteria including geography and aircraft ID, configurable per end user

User Benefits

- **Increased efficiency** through **centralised** monitoring, configuration and control
- SDDS-NG **minimises system complexity** of the surveillance chain
- **Improves the availability of data** through automatic switching mechanisms
- **Safe integration** of legacy and new technologies
- **Security functions** by acting as **an application level gateway** for surveillance data
- **Transition support** by integration of homogenous system landscapes

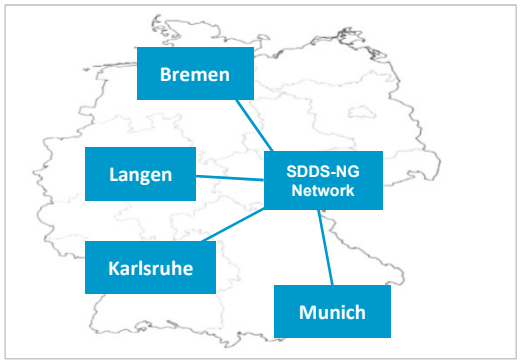
Surveillance Communication – SDDS-NG success stories

Brazilian Airforce

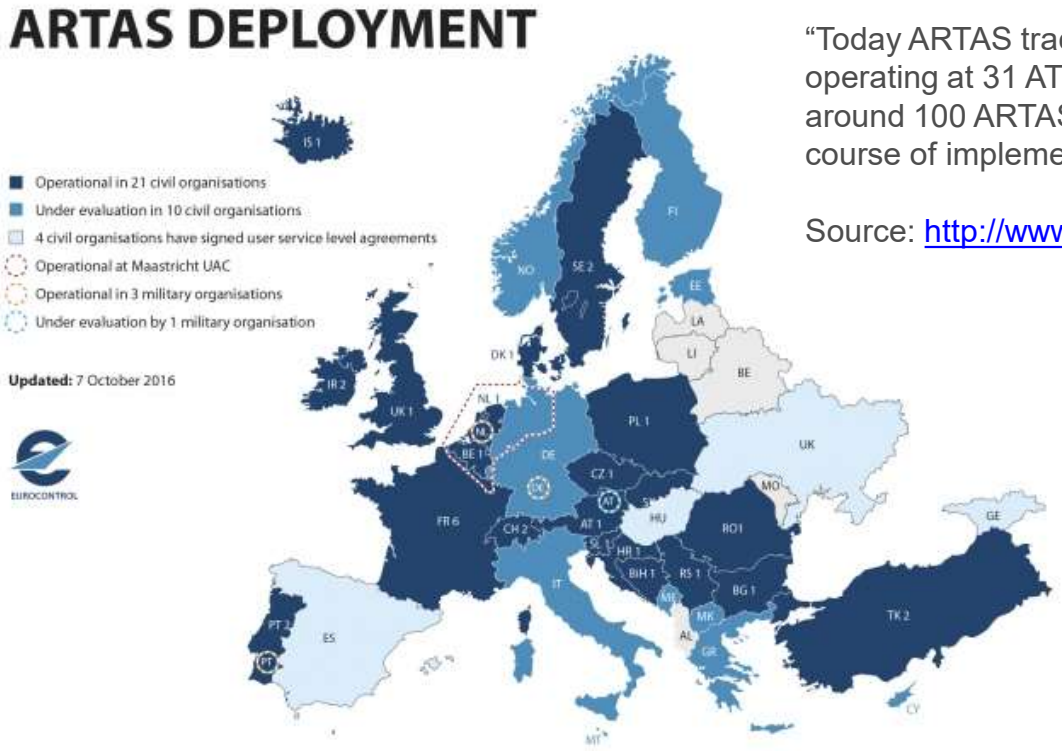
- Location: SDDS-NG systems at **22 radar sites**, in the northern part of Brazil
- **Four different types of radar** provide data to the ATC centres
- **Advanced surveillance** for the fifth largest country in the world

DFS, Germany

- Location: **Bremen, Karlsruhe, Langen, Munich**
- **16** network nodes
- **Centralised** administration
- Advanced data exchange of surveillance information over an **IP-based network**
- Integration into **RADNET**
- Being implemented



Detour 3: Benefit of Standardized Interface: Experience!



"Today ARTAS tracks close to 80 % of European daily flights operating at 31 ATC Centres in 40 European states. In total, around 100 ARTAS units are currently implemented or in the course of implementation."

Source: http://www.eurocontrol.int/artas

ARTAS Product & Services

FREQUENTIS COMSOFT

ARTAS

Multi-sensor data fusion with highly-configurable track services (PSR, SSR, Mode S, ADS-B, ADS-C, MLAT)

Since 2001

Centralised ARTAS Maintenance and Support (CAMOS) **for EUROCONTROL**

Highlights

- **Applications:** ARTAS is intended for En-Route, TMA and approach control.
- **Surveillance data sources:** PSR, SSR, CMB, Mode-S Elementary & Enhanced, 3D radar, ADS-B, ADS-C feeds and Multilateration data
- **Tracking technology:** Multiple Sensor Variable Update Tracker, EKF, JPDA, IMM, MHT, MSEA, DAP processing
- **Scalable:** Supports up to 255 surveillance data sources, 20+ simultaneous track services, up to 32000 concurrent tracks
- **System platforms:** ARTAS runs on LINUX platforms and standard servers, defined and validated by CAMOS

User Benefits

- Integrates **all kinds of surveillance data sources** and establishes a **coherent and accurate Air Situation Picture** for downstream systems
- Enables an **efficient integration of ADS-B and Multilateration** into existing surveillance infrastructures
- ARTAS tracking **will be ready for Surface Movement Surveillance**
- ARTAS **uses the latest tracking technologies** to deliver an outstanding level of **accuracy and reliability** in data output
- A key to the success of ARTAS is the **Centralised ARTAS Maintenance and Support Service (CAMOS)** for which Comsoft Solutions is EUROCONTROL's industrial Partner

ARTAS Tracker & Services – 15 years of partnership

FREQUENTIS COMSOFT

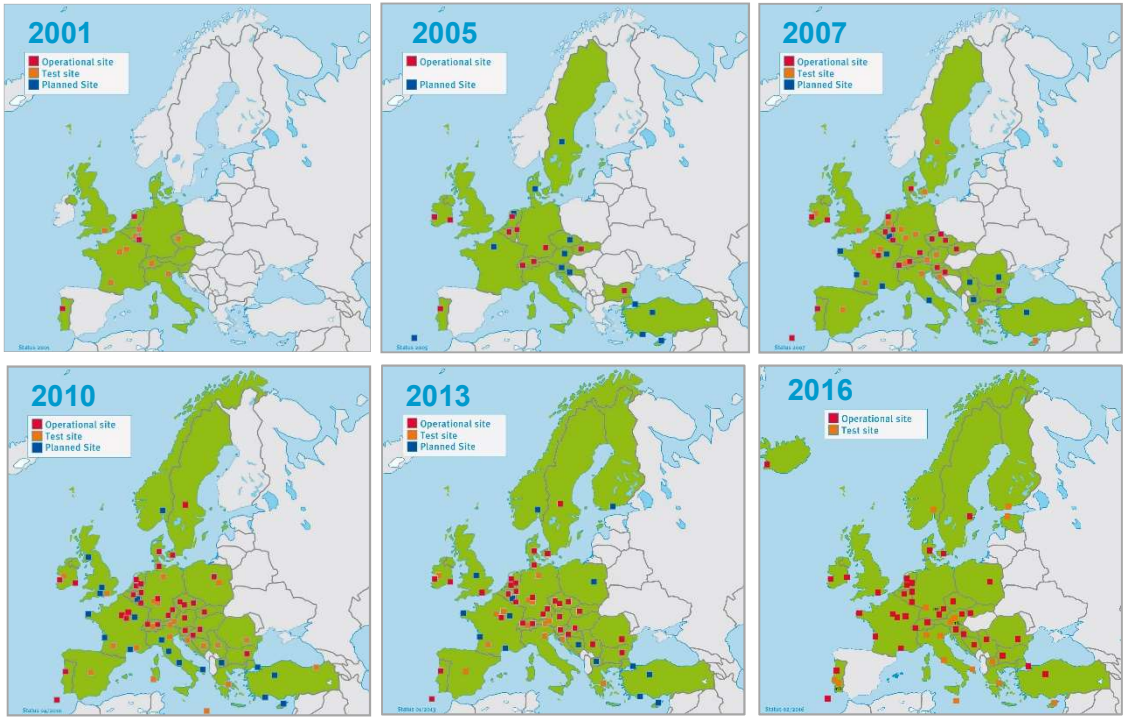
EUROCONTROL, Belgium

2001 Industrial Partner of EUROCONTROL for Centralised ARTAS Maintenance and Support (CAMOS)

2007 Renewal of CAMOS contract for 5 years

2011 Third continuation of CAMOS contract

2014 EUROCONTROL awards Comsoft Solutions a further five year contract for CAMOS as industrial partner



ARTAS population since 2001

FREQUENTIS COMSOFT

Please contact me:
Vaclav.Sourek@frequentis.com
Director Marketing & Sales