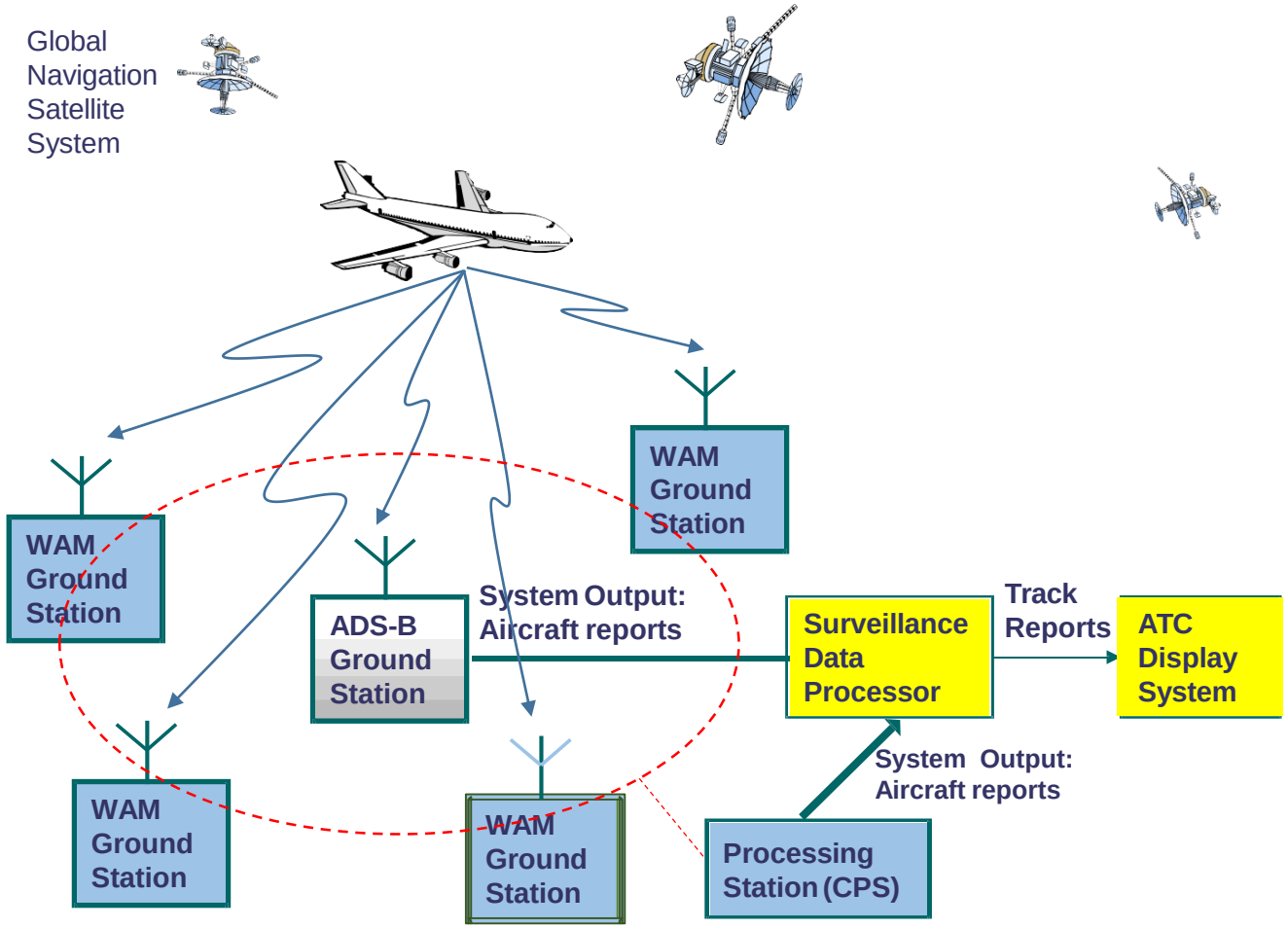
Sharing Data & Applications

THALES_ Massimiliano Ferla, Product Line Manager for Navaids and Non Radar Surveillance

THALES
Building a future we can all trust

ADS-B and WAM System Principles



ADS-B

ADS-B messages contain real time data, like: position, altitude, velocity vector, intent.

Aircraft use GNSS and/or inertial navigation sensors to determine their own position

Aircraft broadcast ADS-B messages periodically without being interrogated.

Messages are received on ground and decoded by the ground stations and the target is distributed for use

WAM

Aircraft broadcast ADS-B, Mode-S, Mode-A/C messages

Messages are received on ground and decoded by various ground stations that geometrically are suitable placed

The stations distribute to the central processor server the messages, Time Difference Of Arrival is calculated and, consequently, the position of the plane is detected and information are distributed for use

Key enablers for shared data

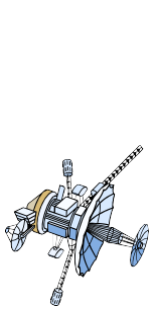
ADS-B	WAM
Data network: transfer latency might affect the capability to integrate data in ATC system	**Data network**: transfer latency over the ground network might affect the capability to use received data for the position calculation
Suitable locations to be identified in order to allow satisfactory coverage of the airspace to be monitored	**Suitable locations / constellation** to be identified in order to create a coverage network with multiple receivers able to detect the same target at the same time
Depending on the ATC, **redundant targets filtering** might be necessary before sending to ATC tracker	**Stations has to be synchronized** and data exchange in between them and the Data Processor has to be maintained all time
	Quality of synchronization is affecting the accuracy of the system
	The system must to allow **great flexibility in parameter configuration** to overcome and manage from the simple to the most demanding site complexity
	High system resilience is necessary to **support multiple failures and extended synchronization** needs in case of **large / very large systems**
Overall operating costs -> Total Cost of Ownership (TCO) reduction	

How to optimize Total Cost of Ownership (TCO)

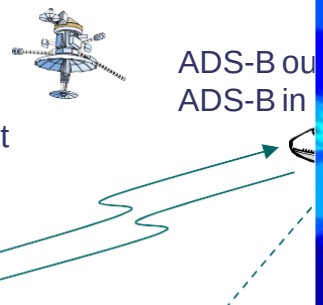
- **Shared ADS-B** infrastructure
  - Leveraging on long range coverage, multiple entities jointly forming an ADS-B constellation
  - Low investment by multiple customers (states, islands, airfields, …)
    installing small number of ground stations and providing network/power
  - Receiving a ADS-B surveillance picture with guaranteed performance in return
  - ADS-B central processor to manage data filtering, duplication removal, appropriate format and data flow dispatch
  - Allows great flexibility and scalability on the final solution, open for additional integrations

➢ **Shared WAM** infrastructure
  - Multiple entities jointly forming a WAM constellation
  - Low investment by multiple customers (states, islands, airfields, …)
    installing small number of ground stations and providing network/power
  - Receiving a WAM surveillance picture with guaranteed performance in return
  - Collecting data from customers, manage the system and provide WAM data according to the agreed coverage area among the parties
  - Allow flexible approach in defining both coverage level and area to be covered

Shared ADS-B



Global Navigation Satellite System



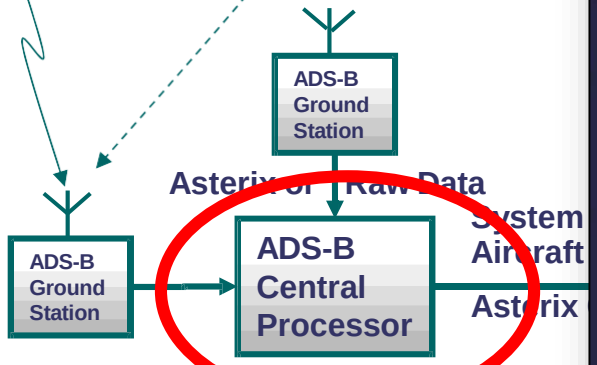
ADS-B out
ADS-B in

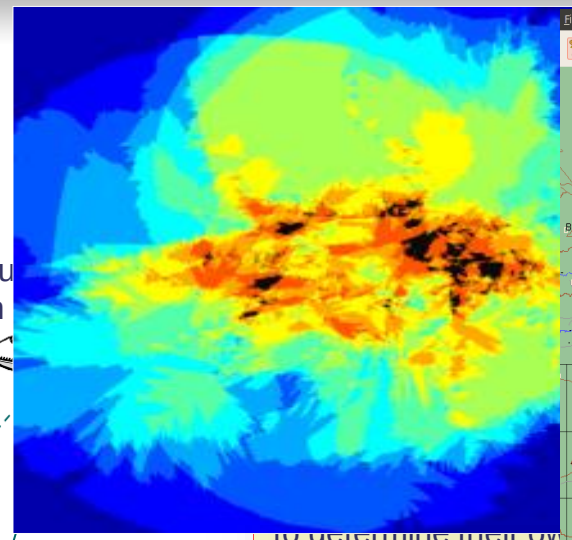
ADS-B out
ADS-B in

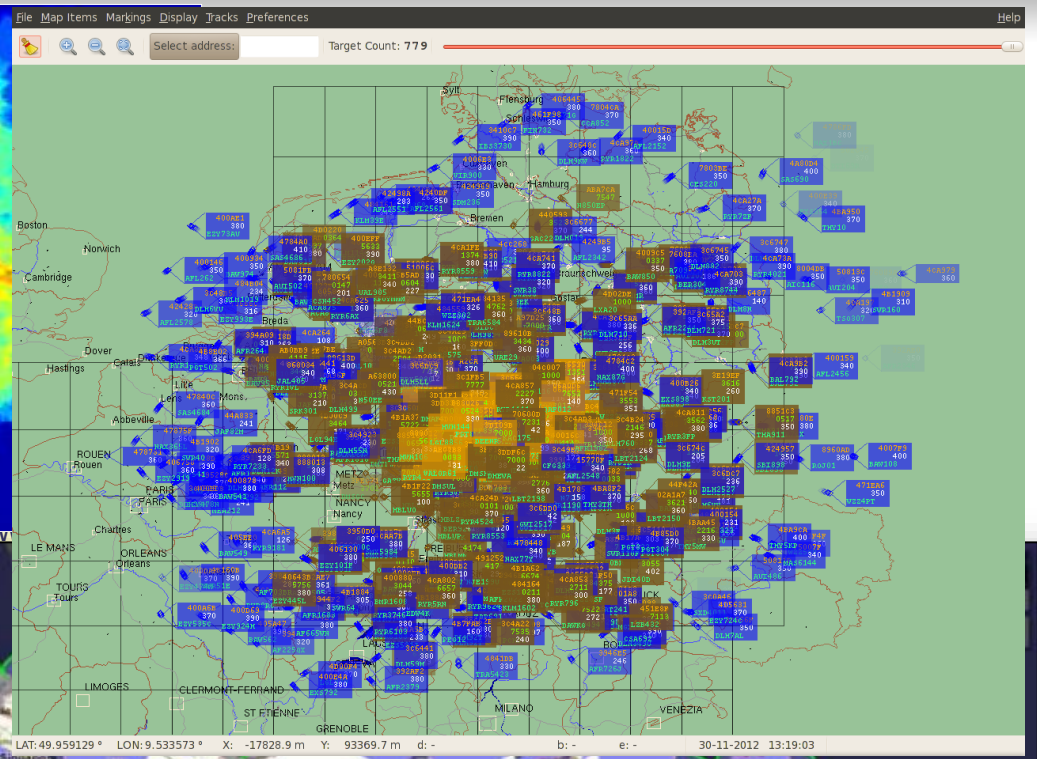
ADS-B Messages

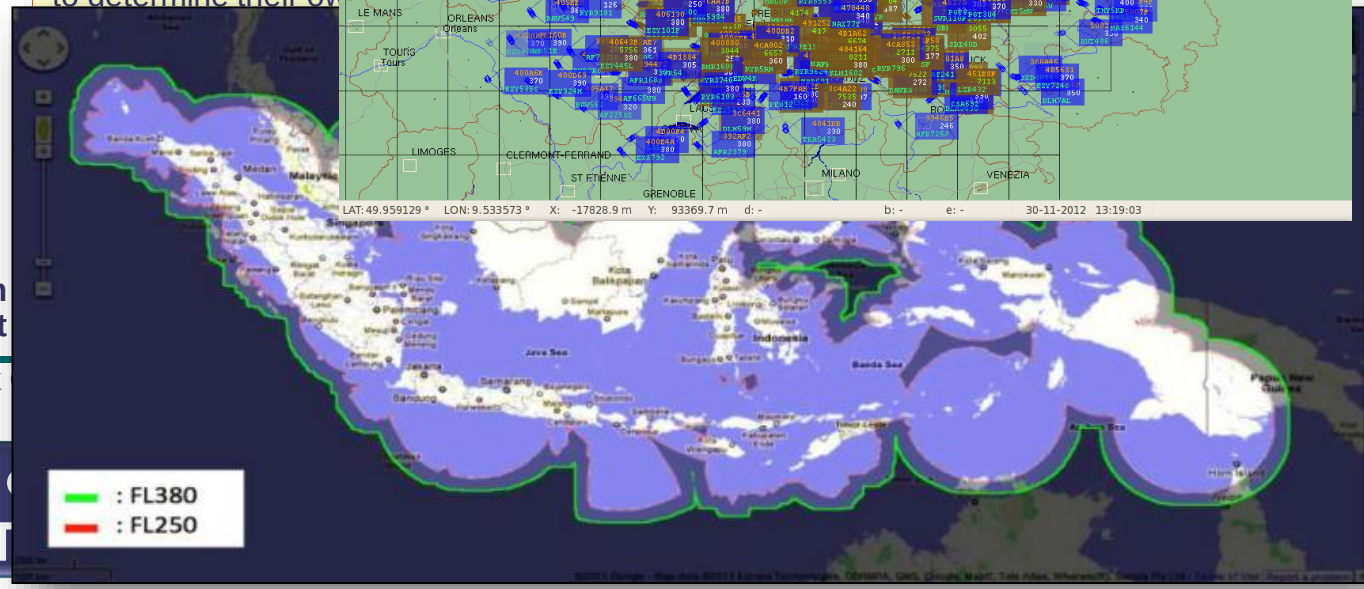
ADS-B messages contain realtime data, like:

- position,
- altitude,
- velocity vector,
- intent.





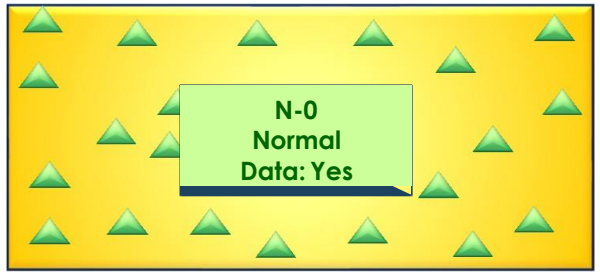




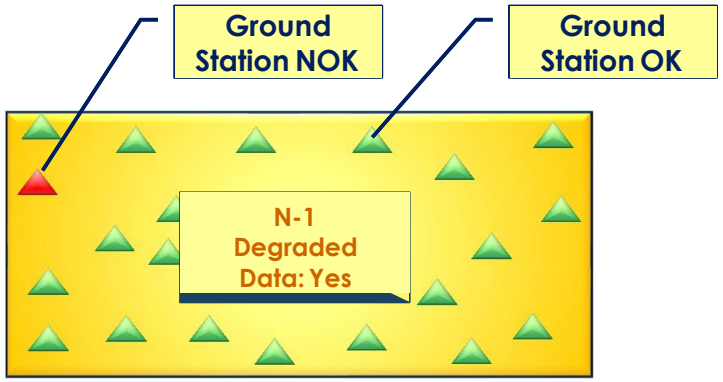
ADS-B Ground Station provides Raw Data (
ADS-B Central Processor provides Asterix T

Shared WAM – classical concept

Classical N-1 System Concept



System State: **Normal**



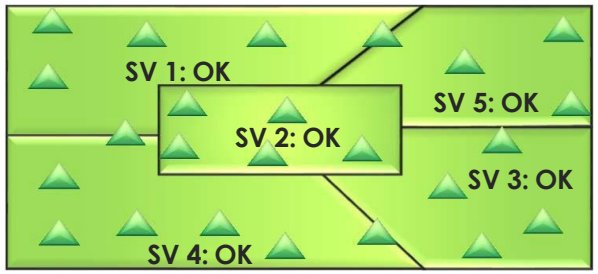
System State: **Degraded**

System State: **NOGO**

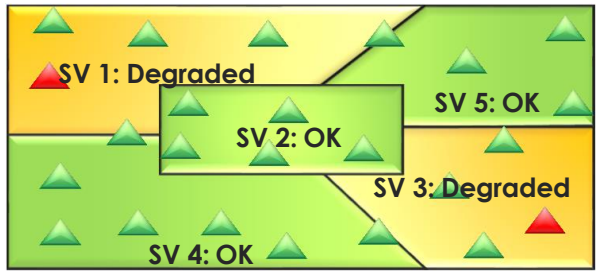
System State: **NOGO**

Shared WAM – Improved resilience

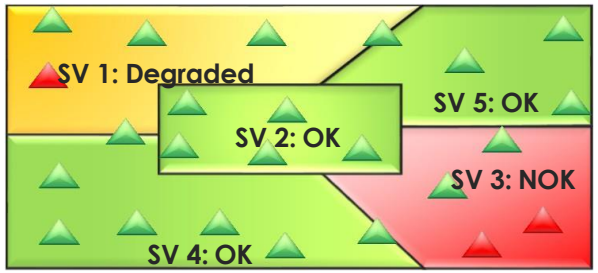
Solution for improved Availability – Virtual WAM



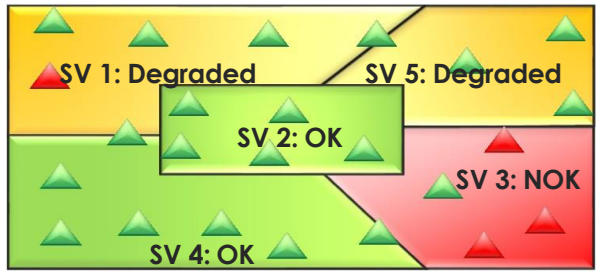
System State: **Normal**



System State: **Degraded**

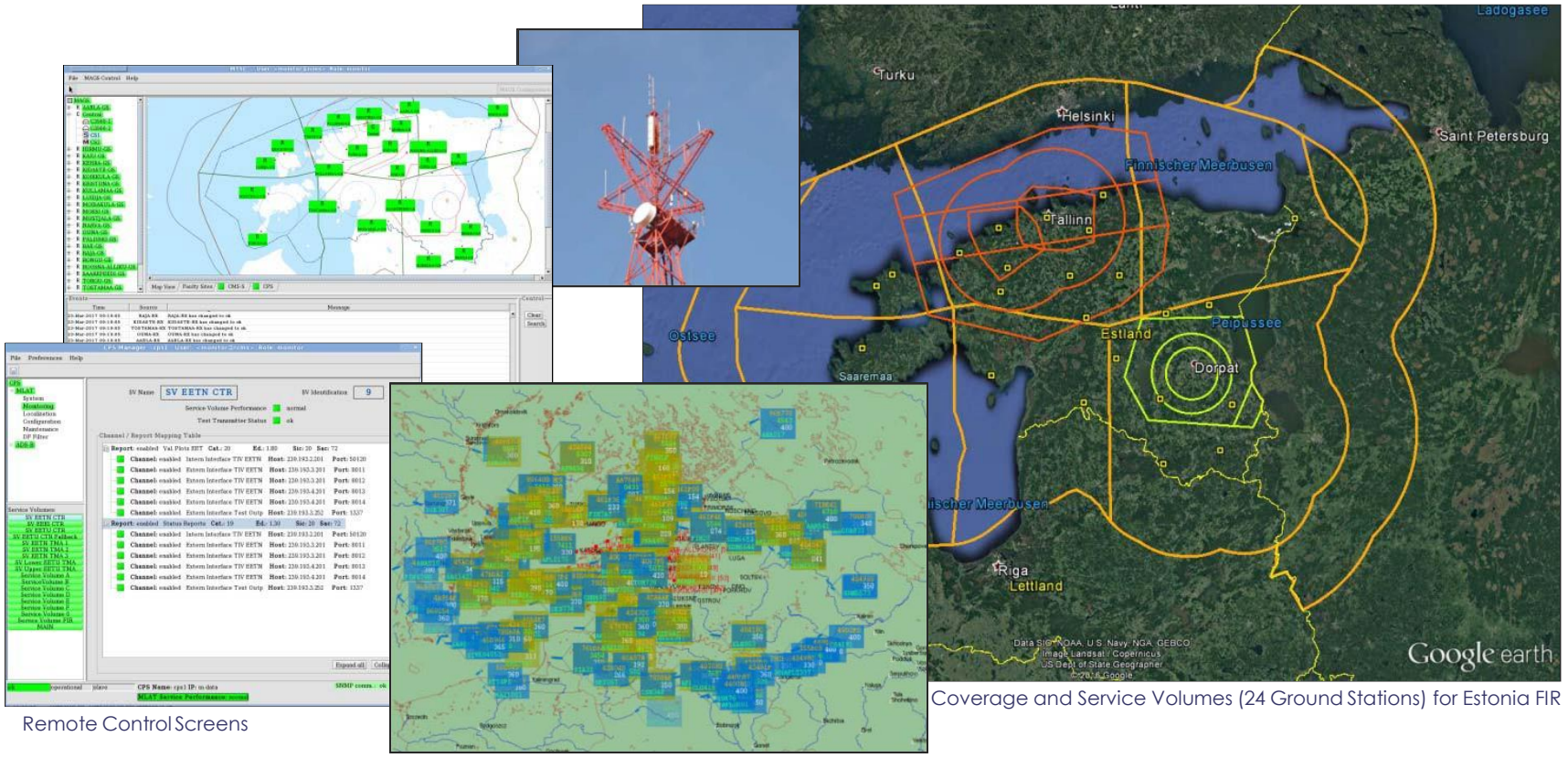


System State: **Degraded**



System State: **Degraded**

Example of Virtual WAM Service Volumes



Remote Control Screens

Coverage and Service Volumes (24 Ground Stations) for Estonia FIR

Key issues in data sharing

- **Main issues while sharing data**
  - Data sovereignity
  - Cross border data infrastructure availability
  - Agreement on business model, system service availability / maintenance SLA and related coordination
  - Agreement on system performances / system requirements
  - Cyber-security protetion against threaths
  - Appropriate data filtering before data re-distribution
  - …

THANK YOU