



ITT

ADS-B and Multilateration Integration in the U.S.

The Role of the Integrator



John Kefaliotis
Vice President
Next Generation Air Transportation Systems

ICAO/FAA Workshop on
ADS-B and Multilateration
Implementation

Engineered for life

This is ITT

- High-tech engineering and manufacturing company
- \$11 billion in revenues
- 40,000 employees
- Delivering extraordinary solutions to life's most essential needs:
 - More livable environments
 - Better protection and safety
 - Breakthrough connections

Engineered for life



ITT is the System Integrator for U.S. National ADS-B Program Ground Infrastructure Deployment



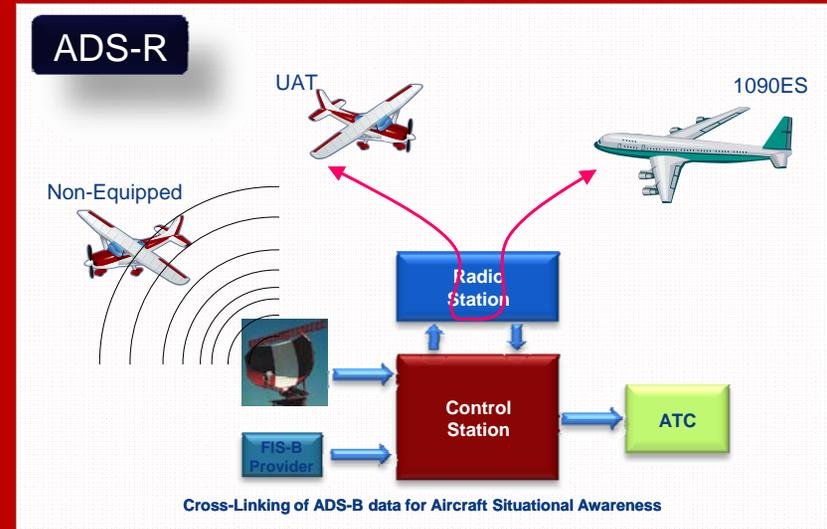
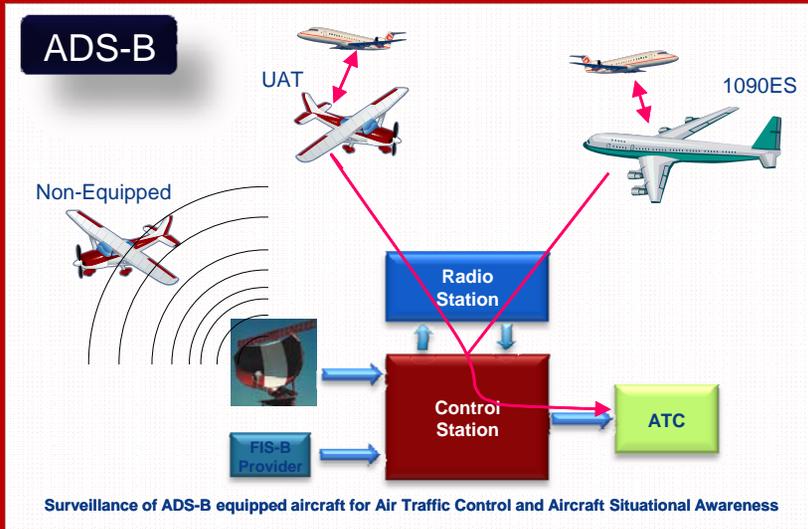
- **ADS-B Surveillance As A Service Components**
 - Collection of ADS-B reports and distribution to ATC facilities
 - Collection, processing and broadcast of TIS-B and FIS-B data
- **ITT was awarded the contract in 2007 on the basis of a cost effective exceptional technical solution**
- **Base Contract**
 - System Design, Development, Testing at Key Sites, Significant Broadcast Services Deployment
- **Optional Contract Line Items for nation wide deployment and operations and maintenance of the system through 2025**
 - Deployment capital expense funded by ITT
 - Nationwide deployment has begun



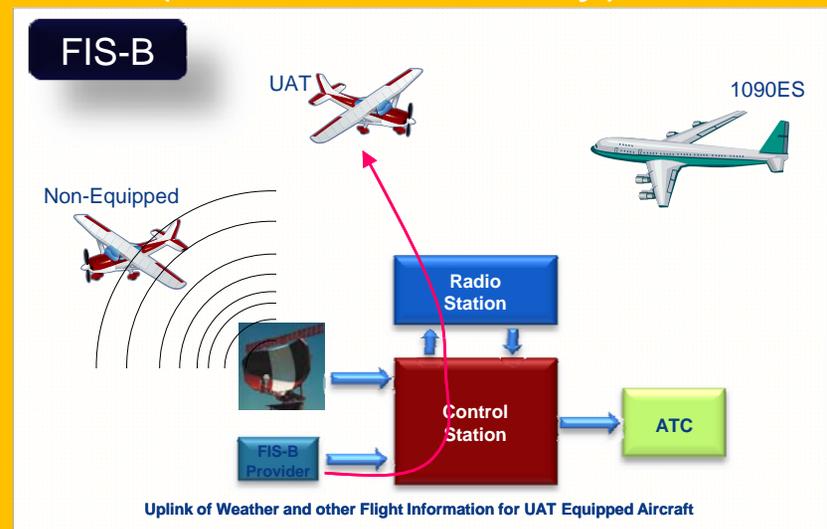
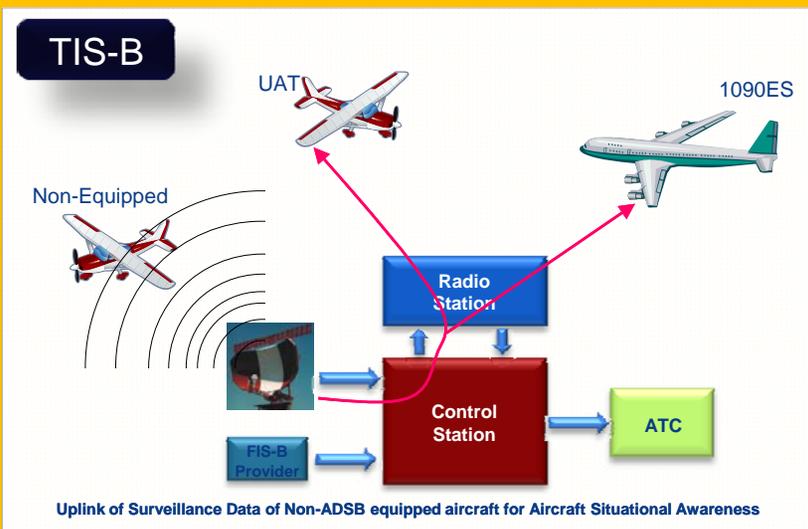
ITT is Delivering Four Services to the FAA



Surveillance Services = Critical (0.99999 Availability)



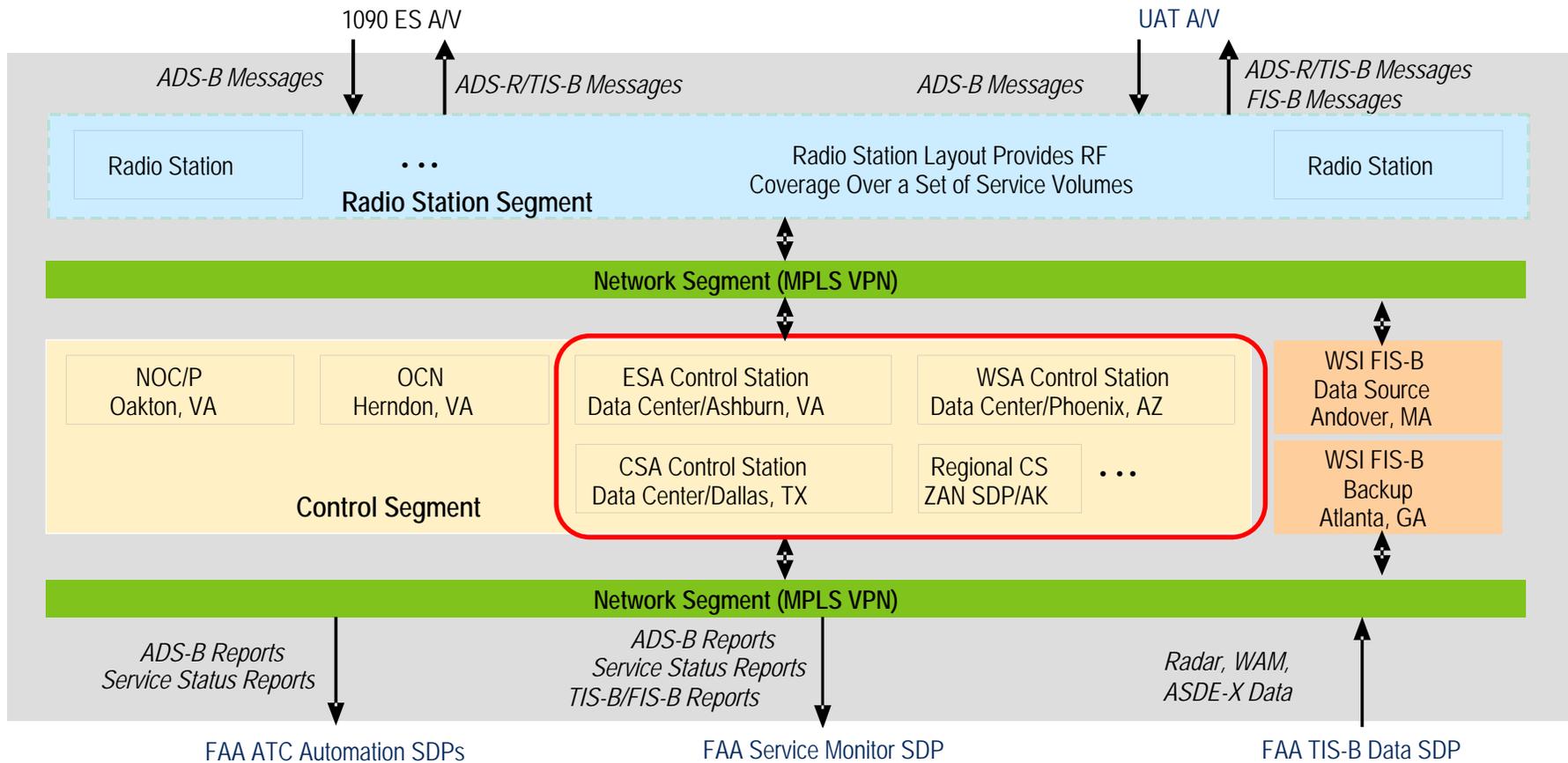
Broadcast Services = Essential (0.999 Availability)



Principal U.S. FAA Requirements Documents ITT

- Functional and performance requirements provided in two documents
 - The Essential Services Specification – TIS-B and FIS-B requirements
 - The Critical Services Specification – ADS-B and ADS-R requirements
- Coverage requirements contained in a Service Volume Description Document
 - Defines three service volume types
 - En route service volume – Air Route Traffic Control Center Coverage up to FL600 (ARTCC geographical area) – 26 (12 in Segment 1)
 - Terminal service volume – TRACON Coverage up to FL250 (60 mile radius around a center point) – 235 (2 in Segment 1)
 - Surface service volume – Airport surface and 7 NM radius of airport reference point to 2,000 feet – 35 (2 in Segment 1)
 - Identifies radar systems serving each area – where radar exists coverage required to be at least as good as radar coverage

The Ground System Architecture – Robust, Safe, and Secure



ADS-B System Components



ADS-B Stations

Collect



- Approx. 800 Locations
- Dual Link (1090 MHz/UAT)
- Installed at 60 GA Airports
- Installed on Commercial Telecommunication Towers

Communication Network

Transmit



- Commercial Network (AT&T)
- Redundant Connectivity
- Guarantees Low Latency

Control Stations

Process



- 3 Commercial Data Centers
- Geographically diverse
- Redundant Power Supplies
- Security: Network/Physical

Service Delivery Points

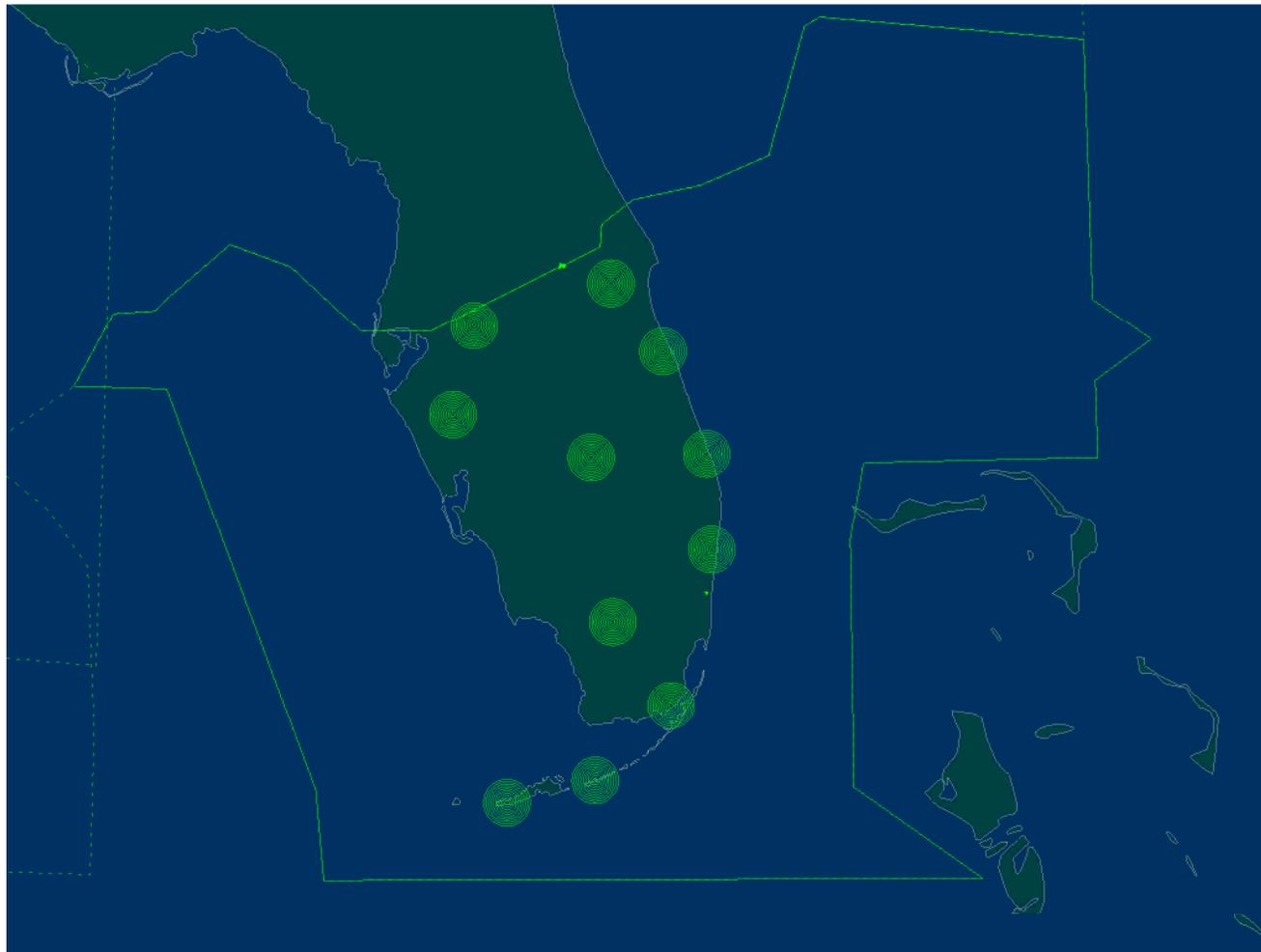
Deliver



- Approx. 270 FAA Facilities
- Ensures Minimum ITT footprint at FAA facilities

Centrally Monitored System from a Network Operations Center

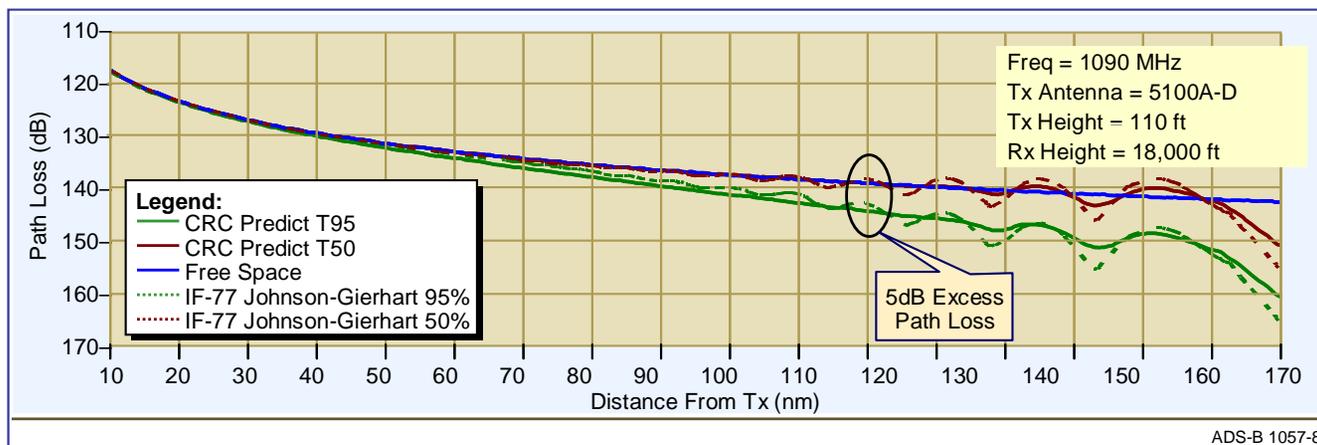
A Networked Architecture



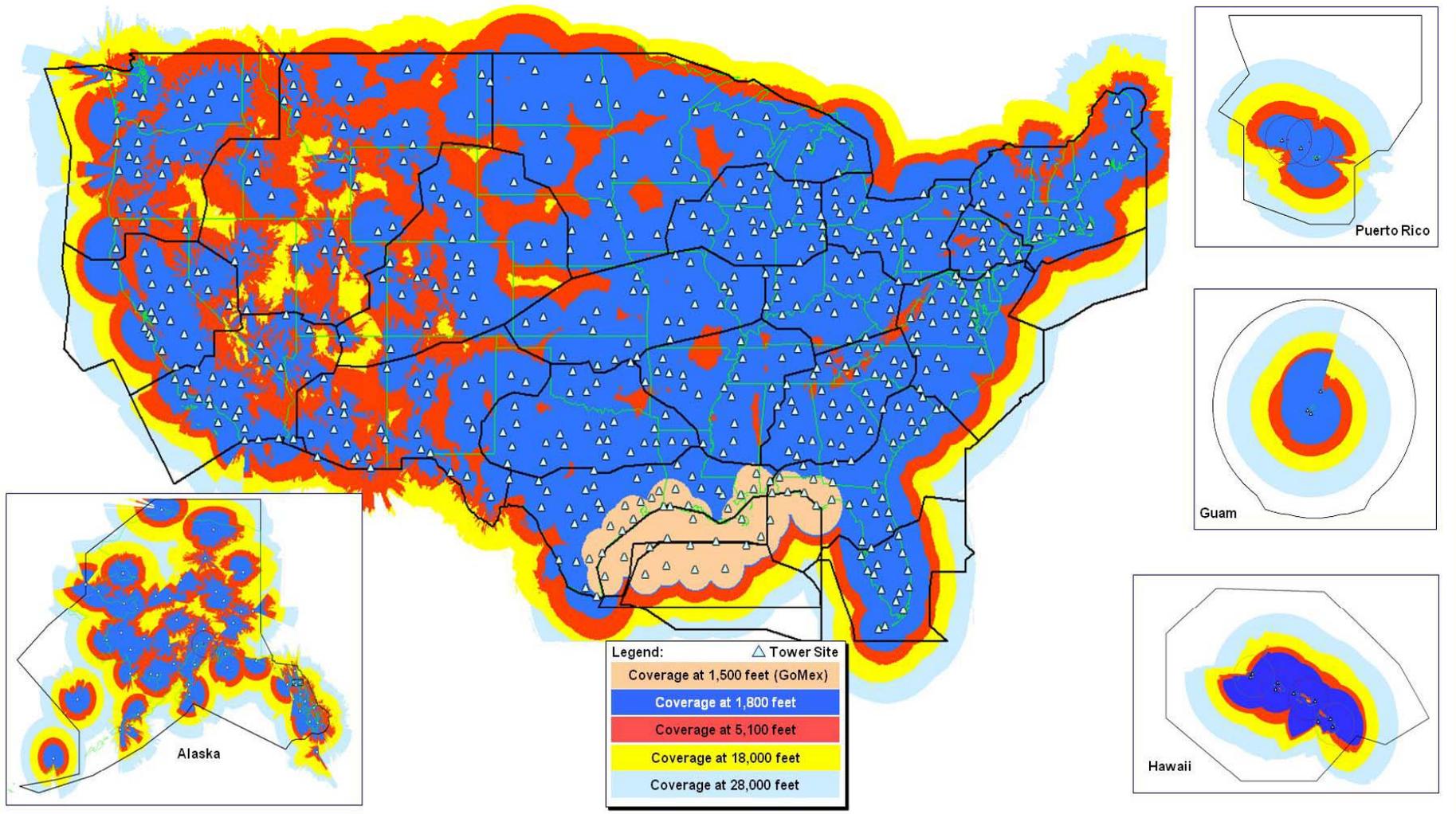
Surveillance Coverage Modeling



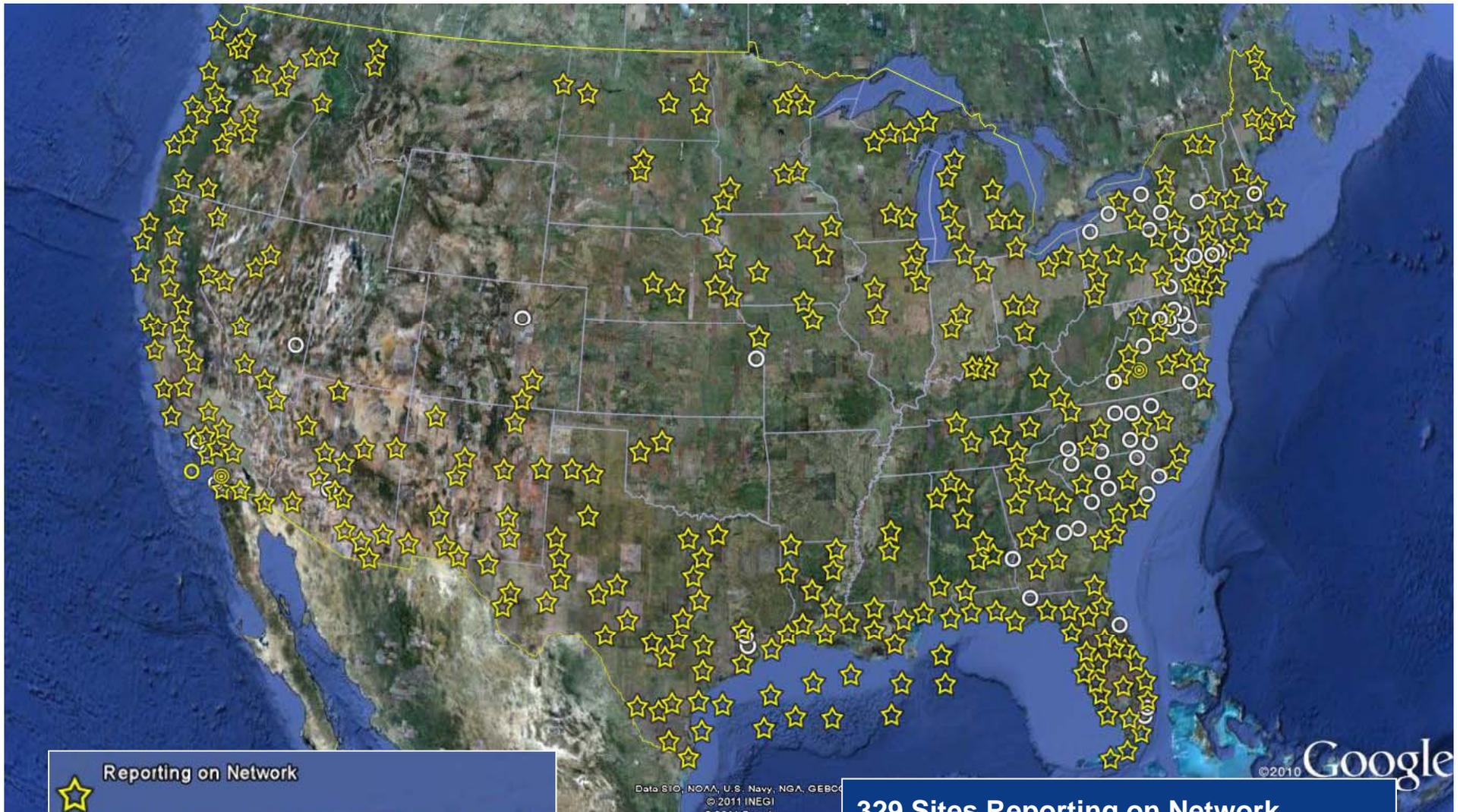
- FAA Order 6050.32B, “Spectrum Management Regulations and Procedures Manual” states
 - “the ITU is the fundamental authority for spectrum allocations and management.”
- ITU-R Recommendation P.528-2, recommends using IF-77 to determine transmission loss.
 - IF-77 curves do not consider terrain
- Our selected model, CRC Predict, considers terrain and closely matches the IF-77 predictions for time variability



U.S. National Coverage Solution – 794 ADS-B Ground Stations



Current U.S. ADS-B Program Deployment



-  Reporting on Network
-  Construction Complete. Telco & Utilities Installed
-  Construction Complete. Utilities or Telco Pending
-  Construction in Process or Pending

329 Sites Reporting on Network.

331 Sites Constructed

68 Sites in Planning or Construction.

Monitoring of ADS-B System is Centralized



- Monitors Provision of Services (ADS-B, ADS-R, TIS-B, FIS-B)
- Monitors Status of Communication Network
- Monitors Status of All ADS-B Ground Stations & Processors
- 24 / 7 / 365 Operation
- Staffed by 2 Members of the Team



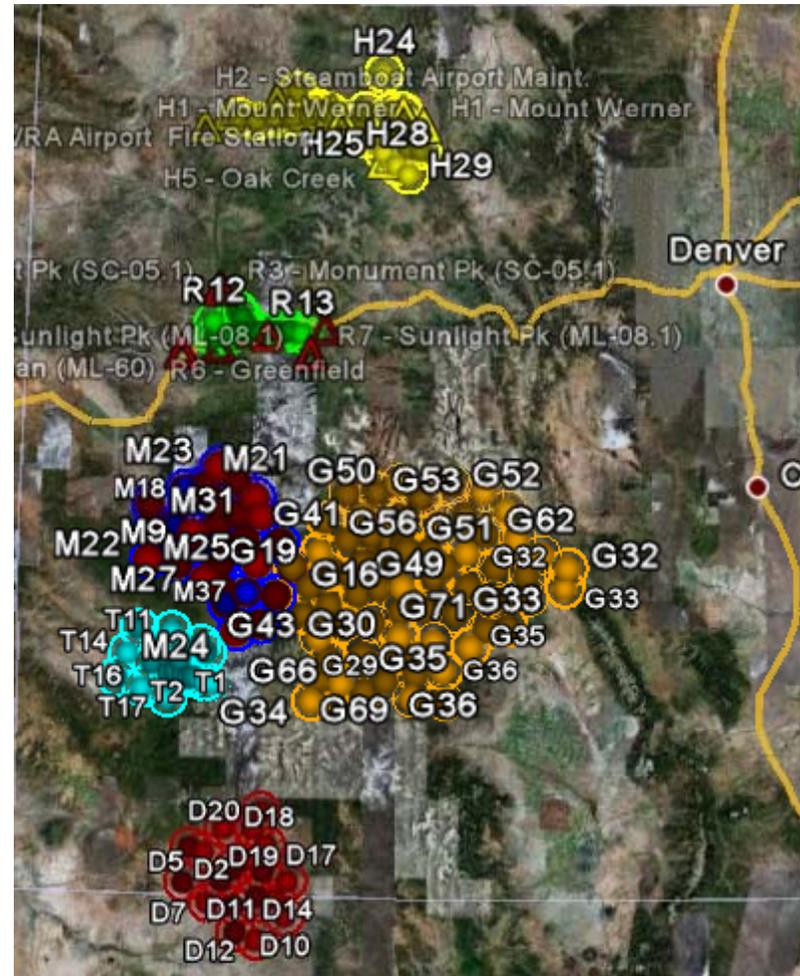
GOMEX Coverage from the US ADS-B System



We Are Adding Wide Area Multilateration (WAM) to the U.S. ADS-B Network



- FAA is working with the State of Colorado and ITT to develop and test a fifth service, MLAT to be initially deployed in Colorado
 - Montrose is Key Site
 - Telluride, Gunnison, and Durango would complete the CO MLAT installations
- Long term, it is expected that the FAA can replace aging terminal area radars with MLAT systems

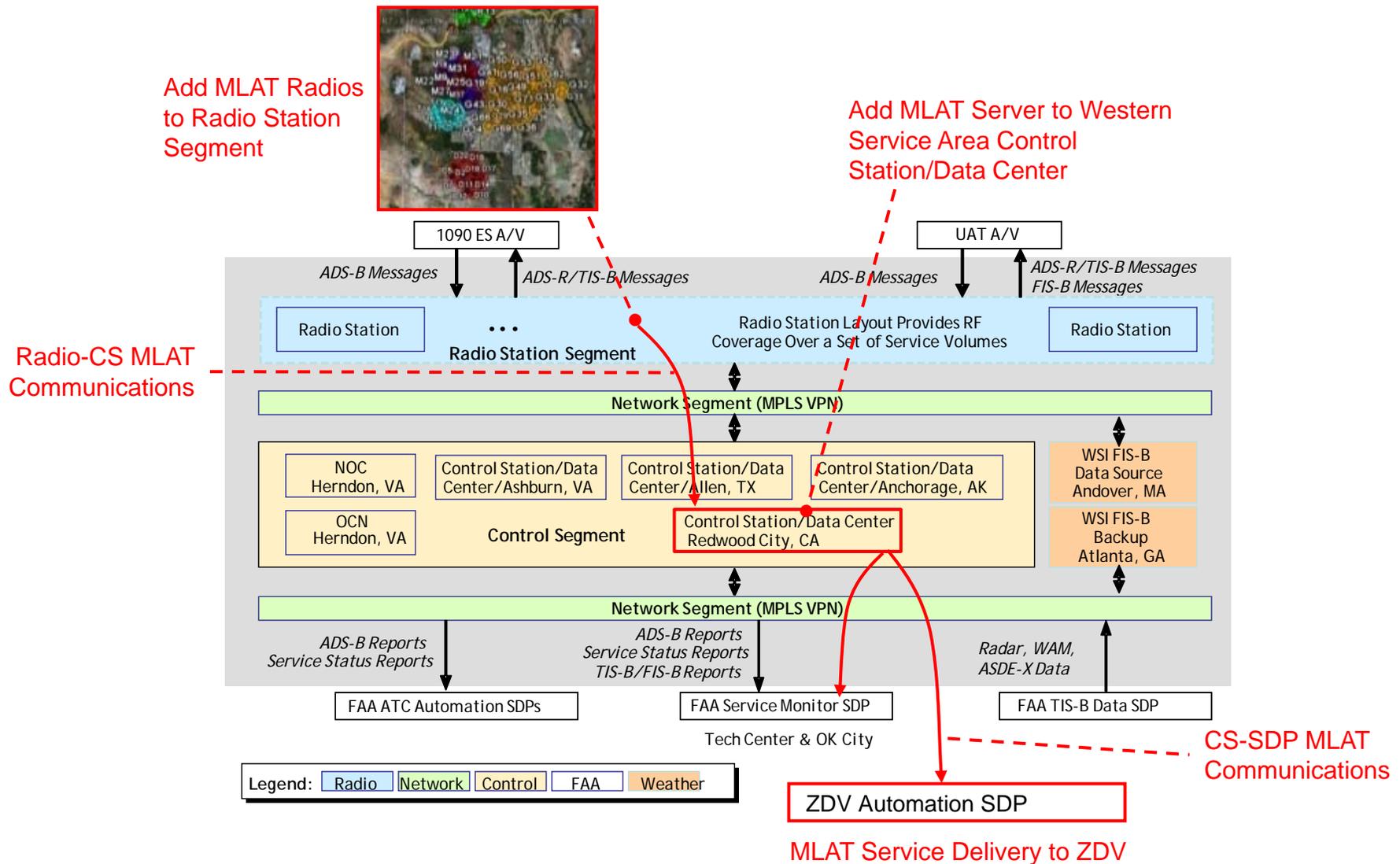


Program Guidance for the Addition of WAM



- The WAM Service will be developed and verified under the same set of Engineering, Development and Verification Processes as the current SBS Services
- The WAM Service will reuse applicable design solutions developed for the current SBS Services
- The solution for WAM Service will be scalable to NAS-wide deployment of WAM Service without further development
- The WAM Service will be robust to failures of the ADS-B Service Application and the other current Applications of SBS Services...and vice versa
 - While Applications are separate, ADS-B and WAM Services are served by a common set of Radios
- The introduction of WAM Service into an SV supporting SBS services will have no impact on existing services

ADS-B Architecture Augmentation for Colorado WAM Service Provision



A Data Utility Has Been Created as a Core for Commercial Services



- Fully isolated from the operational network
- Provides:
 - Streaming of data - geographically or otherwise filtered/ real-time or delayed
 - Archiving and retrieval of data for historical analysis
 - Web based tool for data visualization
 - Fleet tracking
 - Facilities for hosting value added applications, e.g. over-flight/airport billing

ITT Commercial Aircraft Movement Data



A Single Source of Real-Time Aircraft Surveillance Data for All Aviation Stakeholders

High Update Rate

Highly Reliable

Accurate

Secure

Cost Effective

One Aircraft Target...One Track...One Point of Contact....Nationwide

Surveillance Data Fused from Multiple FAA ATC Systems

ASDE-X

- Airport surface data
- 1 second update



Terminal Radars

- Terminal area data
- 5 second update



En-Route Radars

- En-route radar data
- 12 second update



ADS-B Network

- ADS-B network data
- 1 second update



Multilateration Systems

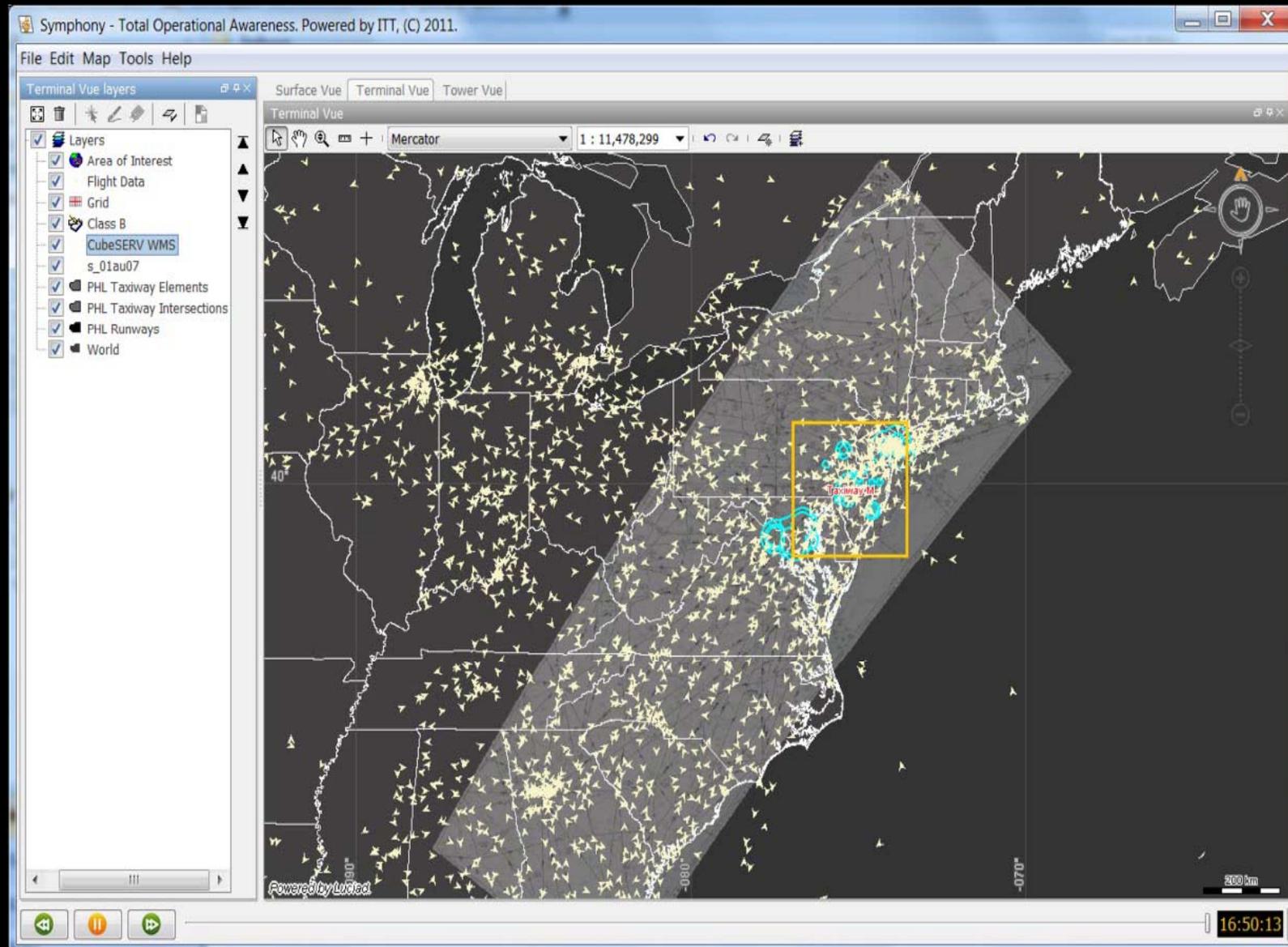
- MLAT network data
- 1 second update



Flight Plan Data

- Flight plan data from FAA Host Computer System

Surface Management Offering - Symphony



Conclusion



- The FAA is aggressively pursuing ADS-B implementation in the U.S. National Airspace System
- ITT has successfully designed, developed, and integrated an exceptional ADS-B ground infrastructure solution
 - Flexible, scalable, safe and secure
 - Excellent coverage
 - Capable of operating in the most benign to most stringent 1090 MHz spectrum environment
- We are adding multilateration to this networked infrastructure
- We are pleased to have had the opportunity to present at this forum

Contact Information



- **John Kefaliotis**

ITT Corporation
Vice President
Next Generation Air
Transportation Systems
john.kefaliotis@itt.com

- **Michael McNeely**

ITT Corporation
Marketing Director
Air Transportation Programs
michael.mcneely@itt.com