

FAA NextGEN Program & NEAR Laboratory

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NextGEN



FAA

EMBRY-RIDDLE
Aeronautical University



U.S. Air Traffic System – World's Most Demanding

**5,000 Planes in the air at
any time**

689M Passengers/Year

36B Pounds of Cargo/Year

**Linchpin of the U.S. Economy
5.6% of GDP, 11.5M Jobs**

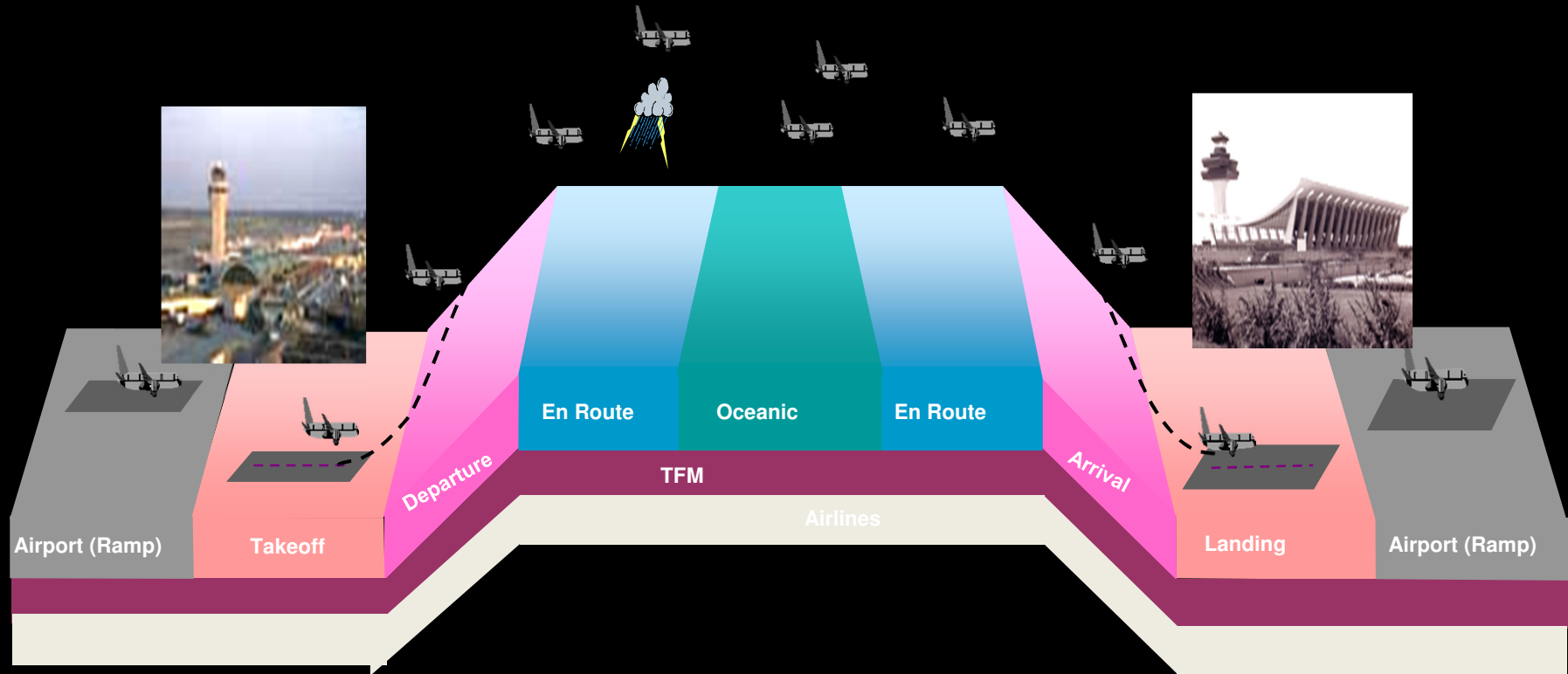
NextGen is more than just a...

- ***Single project...*** It is the integration of many projects, concepts, and technologies.
- ***Program plan...*** It is the integration of many program plans, some new and some ongoing, to deliver new service capabilities to meet increasing needs.
- ***New system...*** It is the integration of
 - new systems,
 - new procedures,
 - new aircraft performance capabilities,
 - renewable fuels,
 - new supporting infrastructure, and
 - *a new way to do business*as the *Air Transportation System*.

<http://www.youtube.com/watch?v=ZX15tBHeC1E&feature=relmfu>

Current NAS Problems

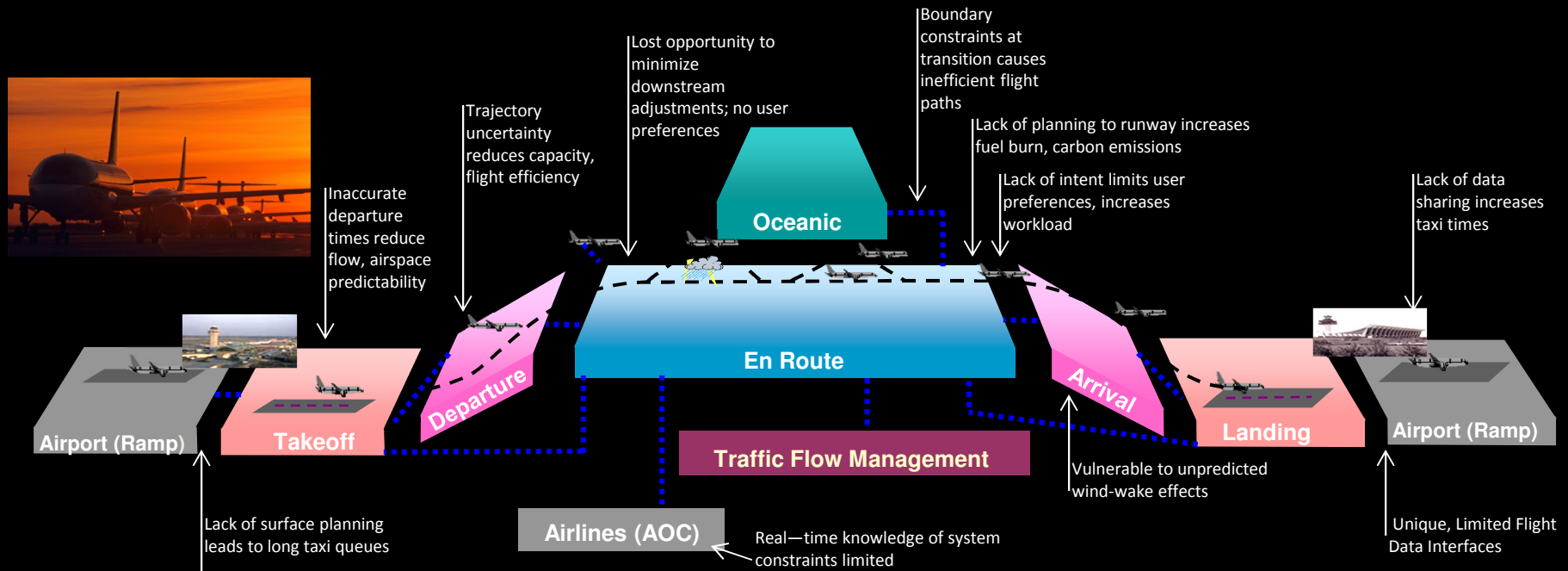
We Often Picture the Airspace as Looking Like This ...



But In Reality, Today It Looks More Like ...

Current NAS Problems ...

Today's System Lacks Common Situational Awareness



- **Different System Information, Trajectory and Problem View Causes Uncertainty & Inefficiency**
- **Limited Interoperability (Between ATC System Domains; Aircraft and Ground Systems)**
- **Unpredictable Results Lead to System Delays and Operational Costs**

System Limitations Result in Increased Passenger Delays and Airline Costs



NextGen Con Ops Provides the Vision

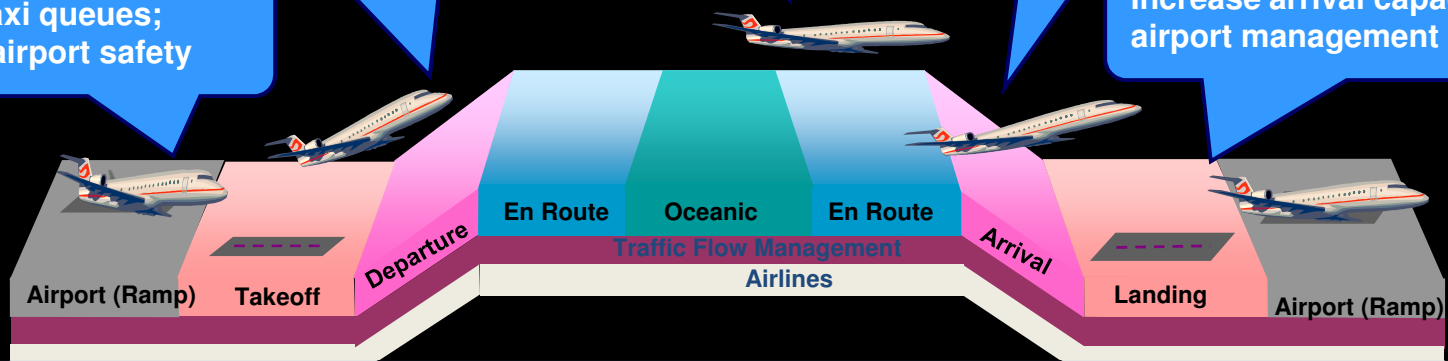
Collaborative, trajectory-based planning;
Seamless airspace operations

Fuel efficient, low noise flight profiles;
Full airport capacity utilization!

Predictable, fuel efficient departures!

Reduce taxi queues;
Increase airport safety

Increase arrival capacity; Efficient
airport management



NextGen Operational Improvements Provide Increases in Capacity & Shared Situation Awareness while Enhancing Safety



FAA's OEP Provides Implementation Planning

High Density Airports

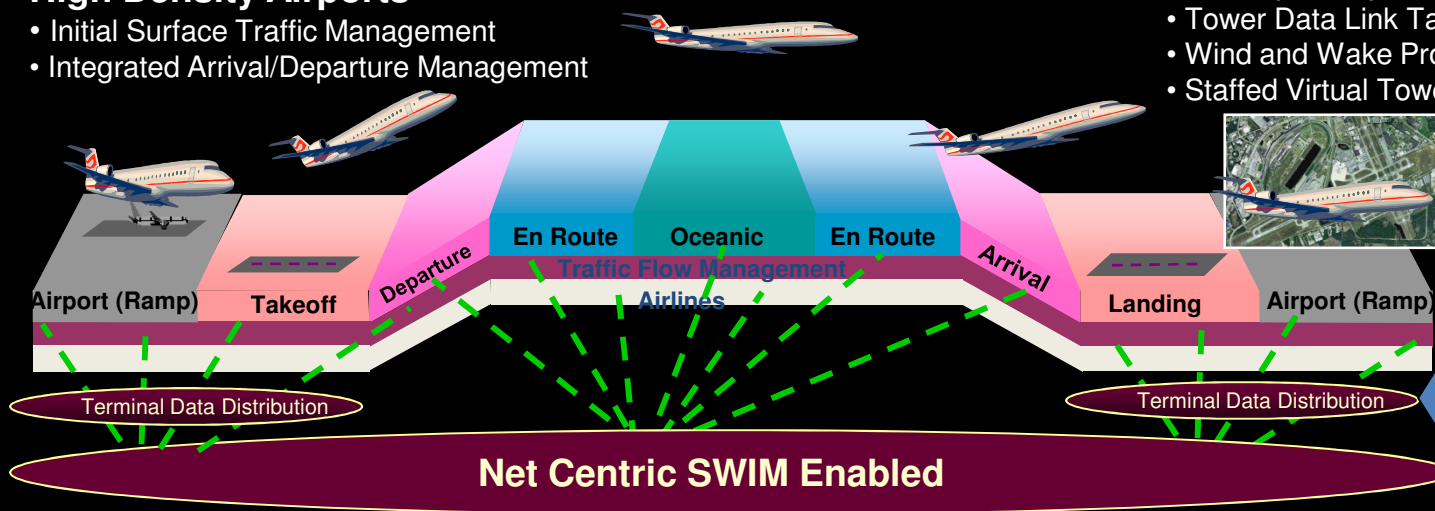
- Initial Surface Traffic Management
- Integrated Arrival/Departure Management

Trajectory-Based Ops

- 4D Trajectory Management
- Capacity and Efficiency Using RNP/RNAV

Flexible Terminals & Facilities

- Shared Surface Situation
- Runway Safety Alerting
- Tower Data Link Taxi Clearance
- Wind and Wake Procedures
- Staffed Virtual Tower



Reduce Weather Impact

- Integrate Weather into DSTs

Collaborative ATM

- Flight Plan Constraint Evaluation
- On-Demand NAS Information
- Trajectory Flight Data Management

Integrated Airport Builds on the FAA's Operational Evolution Partnership

FAA's NextGEN Testbed





NEAR

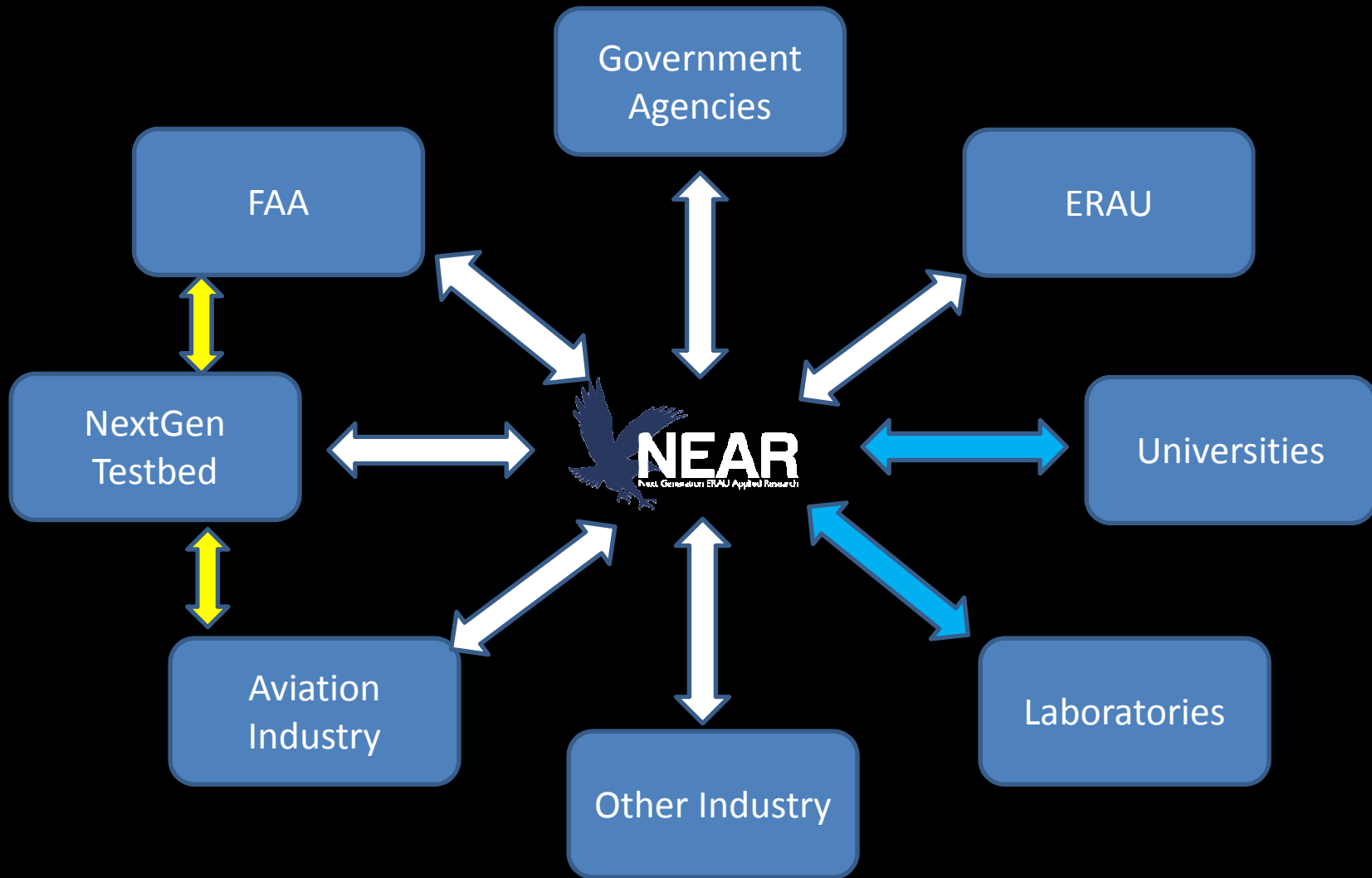
Next Generation ERAU Applied Research

NEAR Overview

- ERAU technical arm in NextGen testbed
- Resources and Capabilities
 - 11 full time staffs (7 Software Eng., 2 Analyst, 2 PhD Research faculty) + Affiliated faculty & students (grad, under grad)
 - Live data feed from FAA (ASDI, ABS-B, WX)
 - Part of Aviation SimNet
 - Flight & WX Historical Data (since 1997)
 - In house and 3rd party simulation and modeling tools

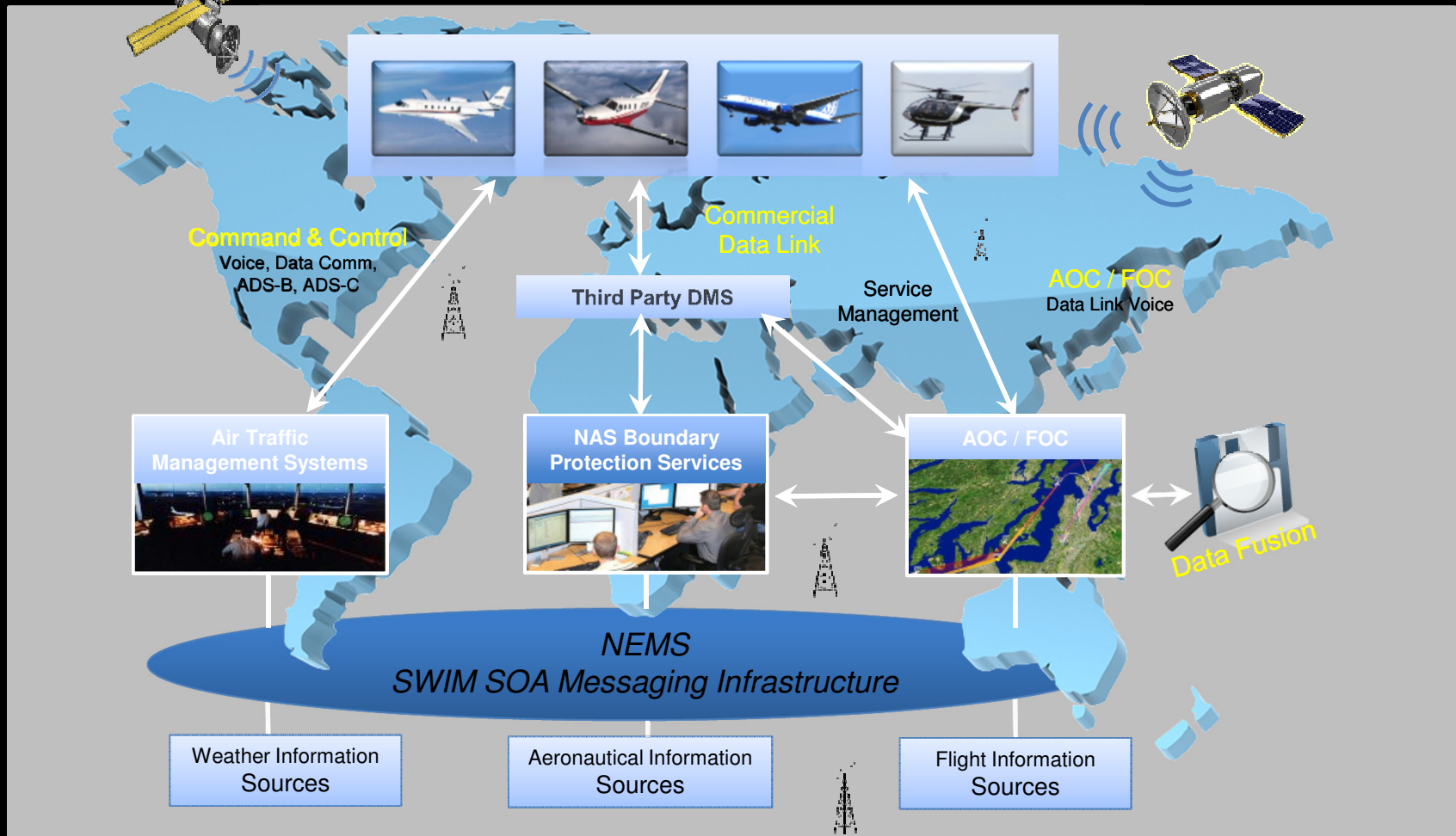
NEAR Lab Research Areas

- Fast and real-time Simulation and Modeling
- Mobile Aviation Application Development (IPAD, iPhone, Smart Phone)
- Data Mining
- Data Acquisition
- UAS (Unmanned Autonomous System)
- Small Avionics

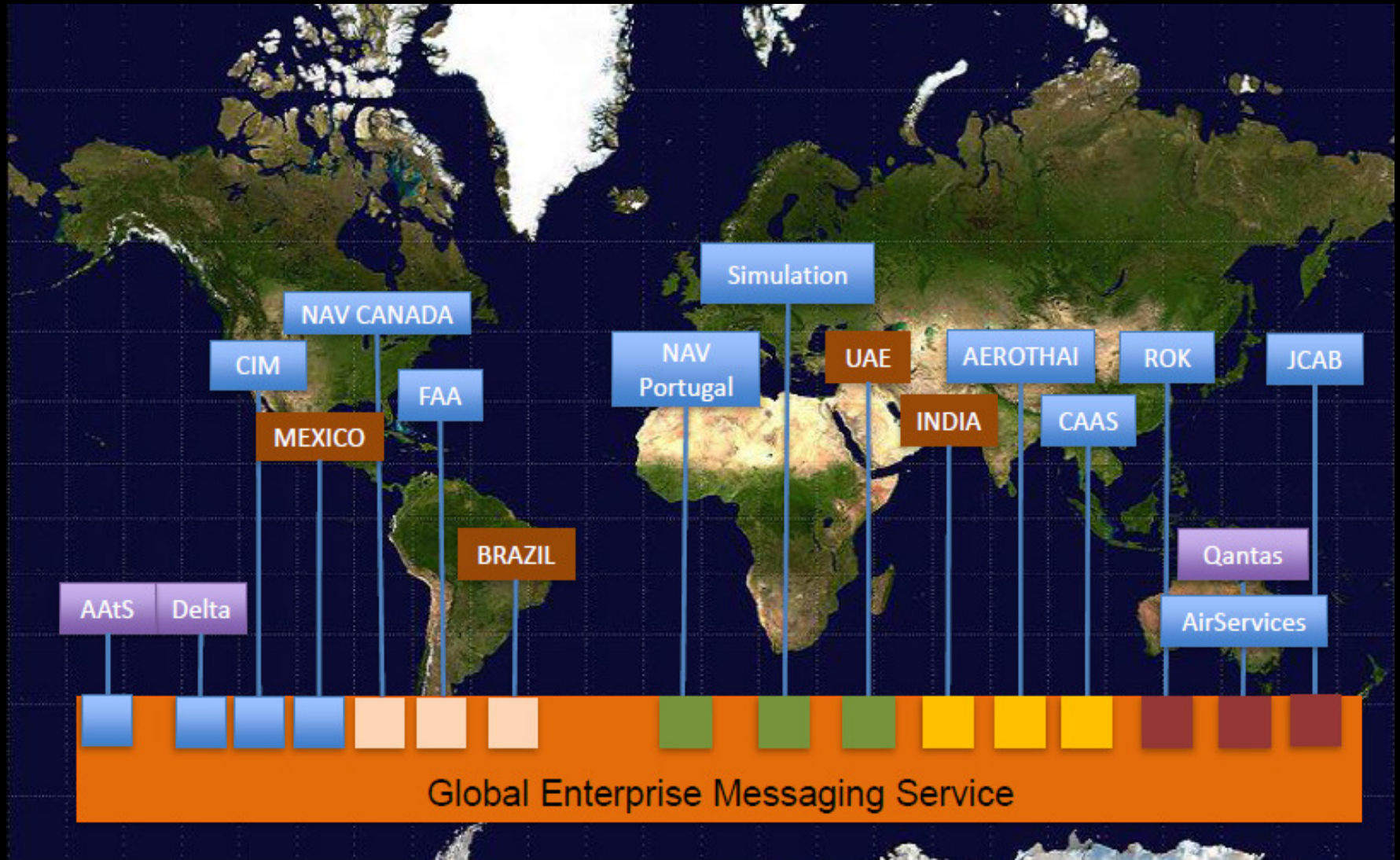


NEAR NextGEN Projects

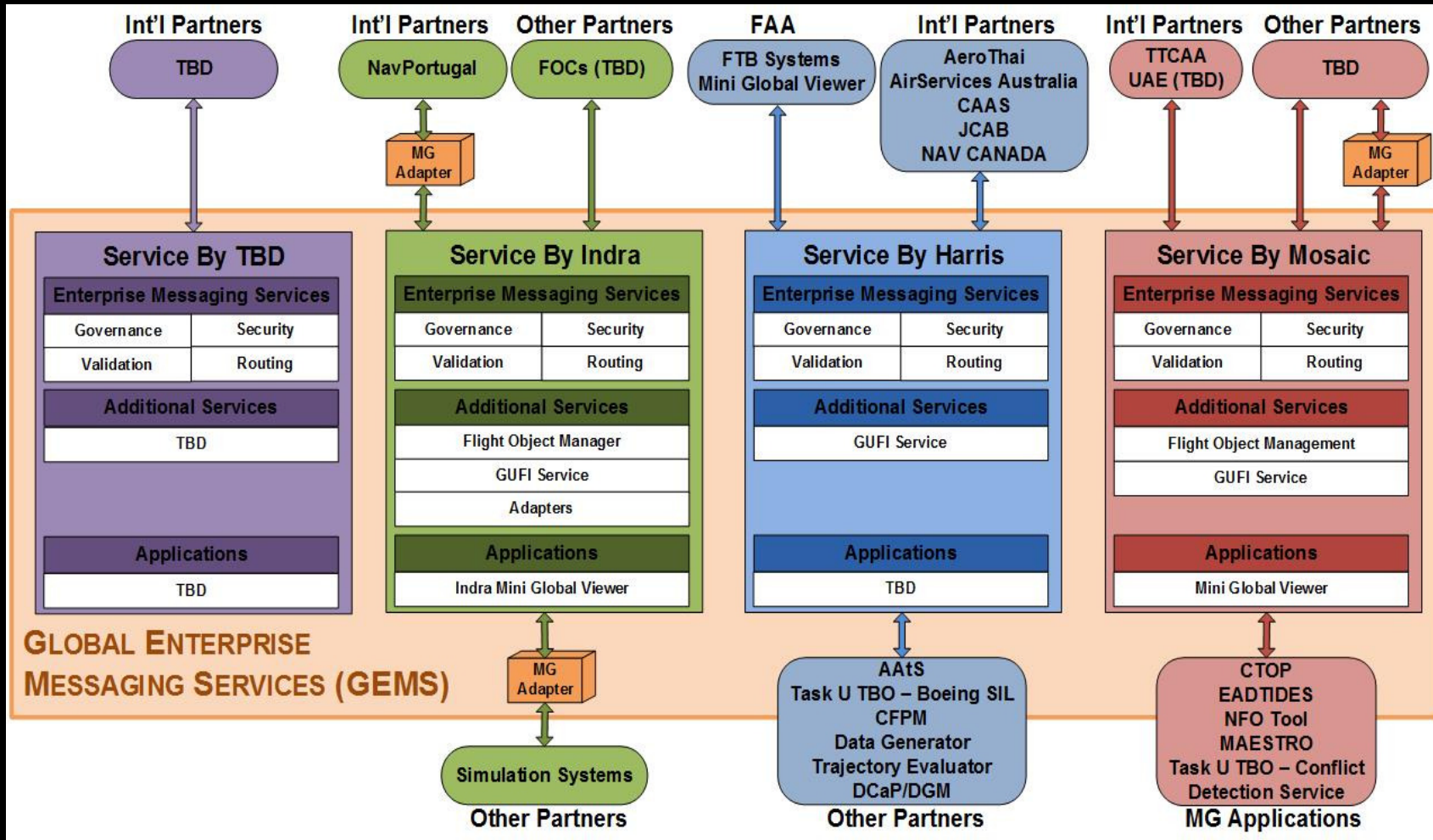
2015/2016 AAtS Objective



Mini Global II GEMS

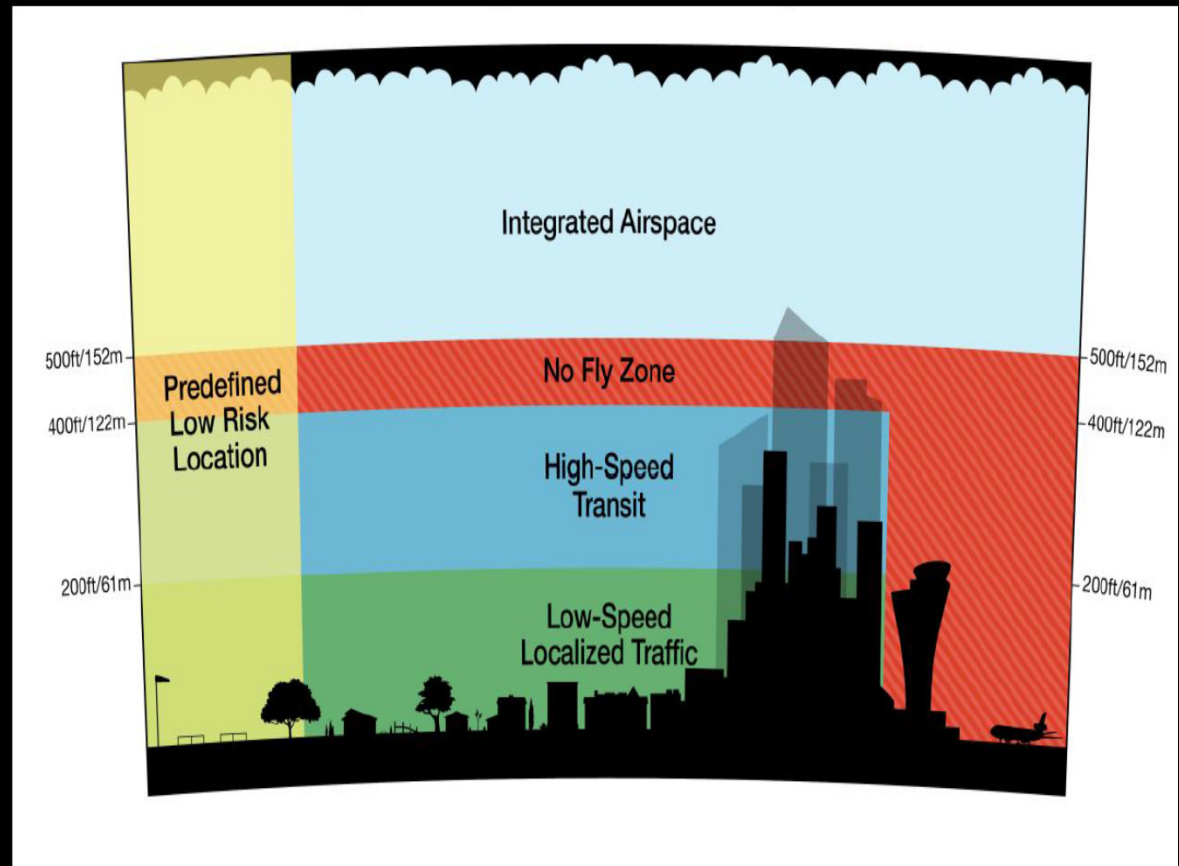


Proposed Mini Global II Architecture



UAS Integration to NAS

- Multiple Classes of UAV
- Different Capabilities
- Safe Integration



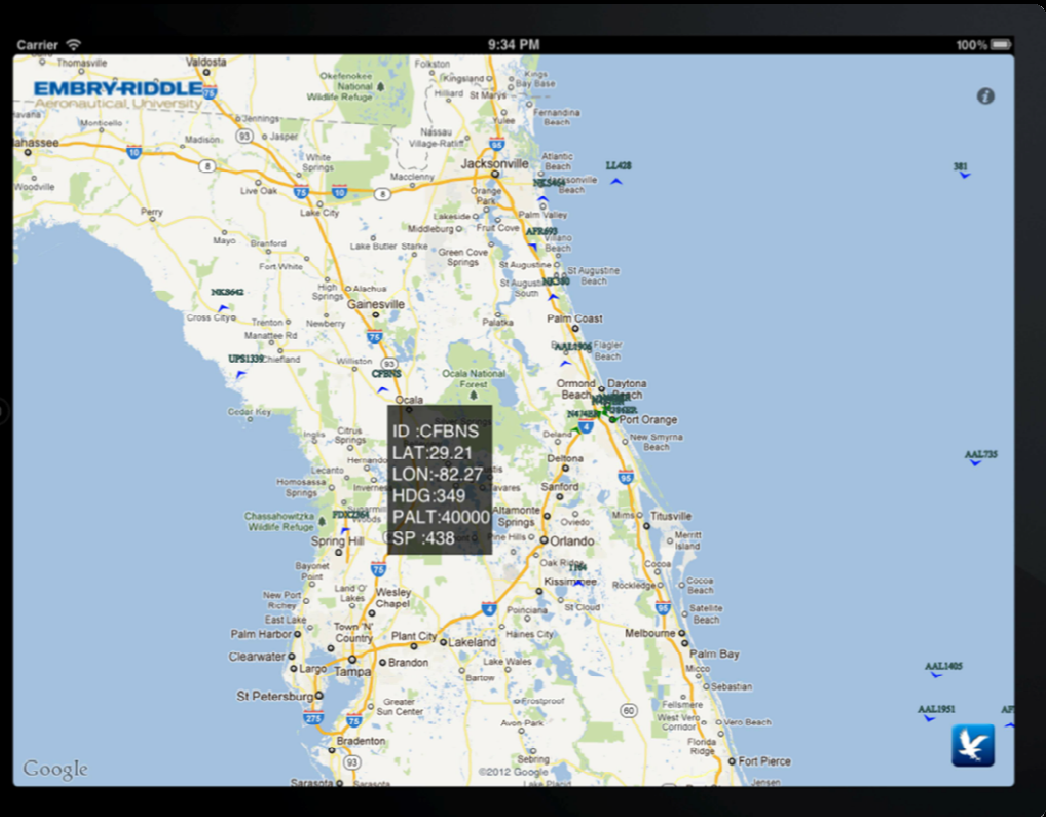
Picture Courtesy of Amazon

NEAR Products

EMID

ERAU Multi-Information Display

- Real Time aircraft
- Geospatial data
- Aircraft tracking
- Ready for App Store



EFB

Electronic Flight Bag

- Weather direct from FAA
- Push updates
- Background maps
- Multiple platforms

The screenshot displays the EFB application interface. At the top, there are window control buttons: 'Exit', 'Minimize', 'Logs', and a 'Ready' status indicator with a dropdown arrow. Below this is a map of Florida with several airport markers: KPIE, KTPA, KSPG, and KSRQ. A green play button icon is overlaid on the map near KTPA. To the right of the map is a weather data panel with an 'Edit' button at the top. The panel is divided into sections for KGNV and KTPA. The KGNV section shows METAR and TAF data. The KTPA section shows METAR and TAF data. At the bottom of the map area, there is an 'ICAO:' search field with a 'Search' button and a set of navigation arrows (+, -, v, ^, <, >). Below the map area is a row of tabs: 'METAR/TAF', 'PIREP', 'Airmets/Sigmets', 'NEXRAD', and 'NOTAM'.

ICAO:	Search
+	
-	
v	
^	
<	
>	

METAR/TAF	PIREP	Airmets/Sigmets	NEXRAD	NOTAM
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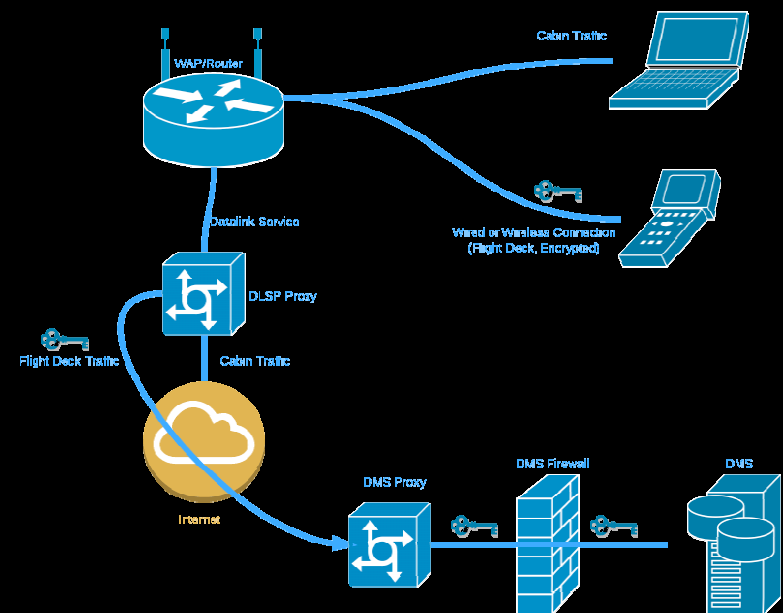
KGNV
METAR KGNV 251553Z 28006KT 10SM OVC046
24/22 A2985 RMIK AO2 SLP106 T02440222
TAF KGNV 251416Z 2514/2612 25006KT 6SM -
SHRA SCT010 SCT025 BKN040 FM252100
24006KT P6SM VCSH BKN040 FM260400
24005KT 5SM BR SCT007

KTPA
METAR KTPA 251553Z 20019G26KT 7SM -RA
SCT065 OVC110 23/21 A2986
TAF KTPA 251509Z 2515/2612 21012KT 6SM -RA
SCT070 BKN100 OVC150 TEMPO 2515/2517 3SM
SHRA BKN025 FM251800 24013KT P6SM SCT025
BKN150 FM252300 23008KT P6SM SCT025
SCT130 BKN250 FM260300 24008KT P6SM
SCT020 SCT250

EFB Security

EFB Security Research Task

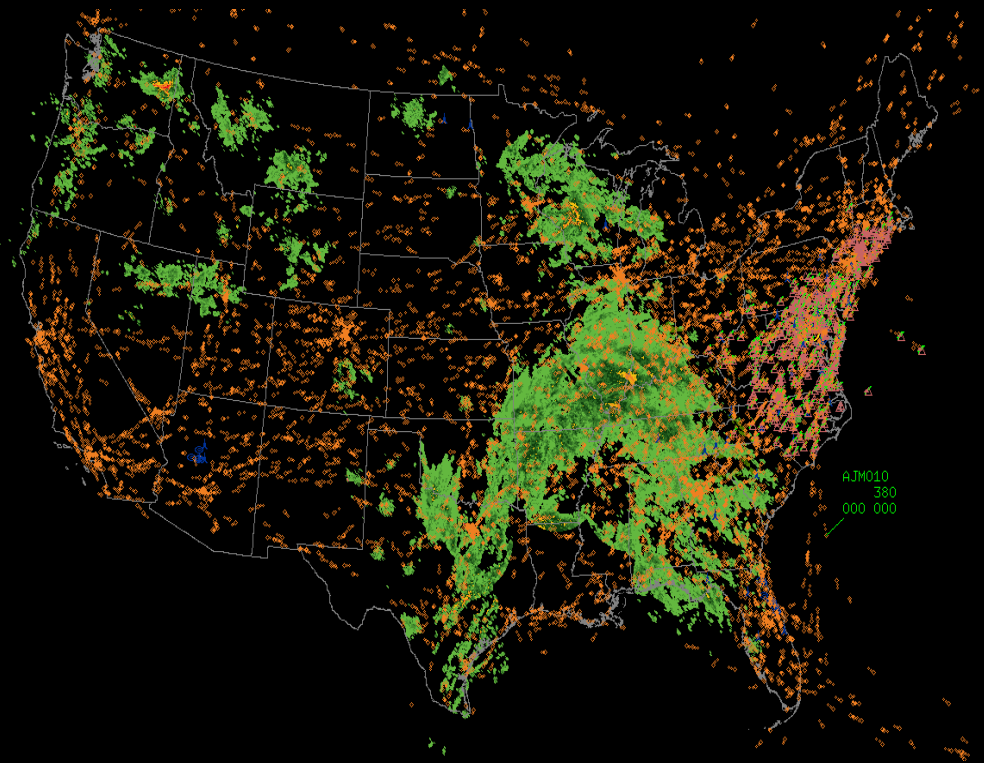
- Management
- Threat Identification & Mitigation
- Prioritizing data
- Quality of service measures
- Test case development



CASP

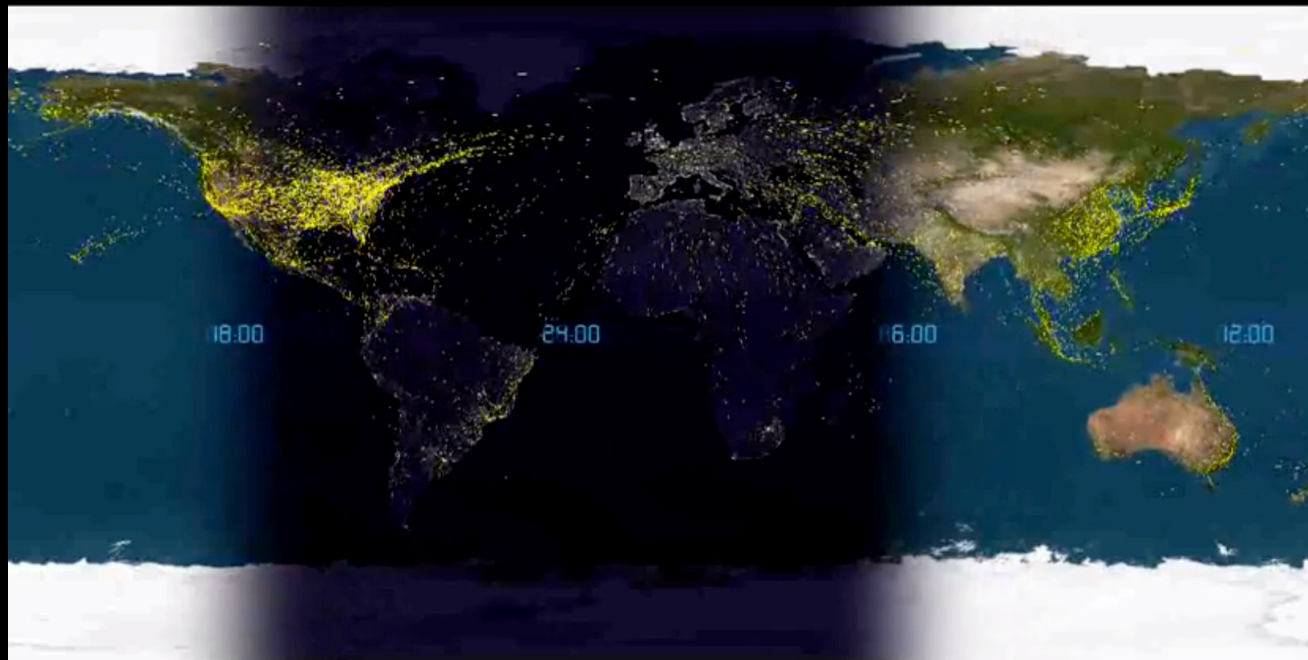
Common Air Surveillance Picture

- Composite image of NAS
- Real-Time aircraft information
- Real-time weather
- Flight plans



Data Archive

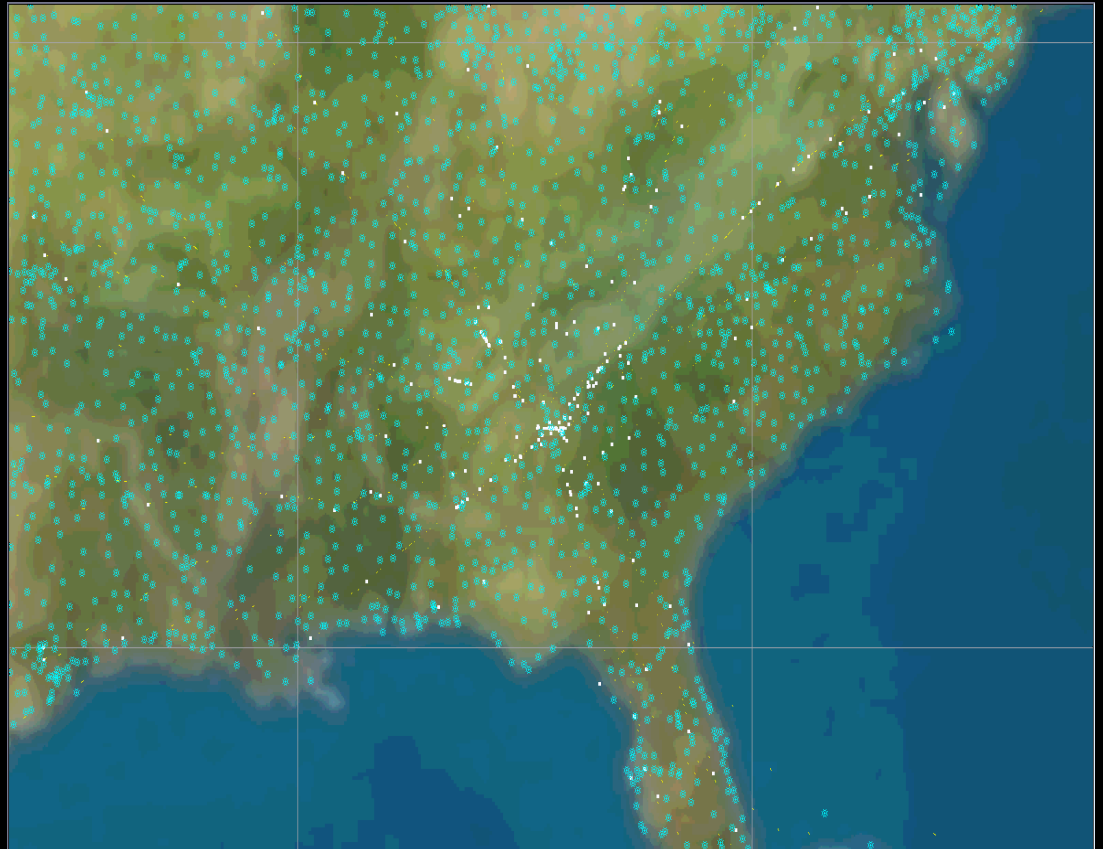
- Airspace Situation Display to Industry (ASDI) Class 1 real-time feed
 - ASDI Data Archive Starting 1999
- ADS-B, TIS-B real-time Development Chain Feed
 - ADS-B, TIS-B Data Archive Starting 2007



TAAM

Total Airspace and Airport Modeler

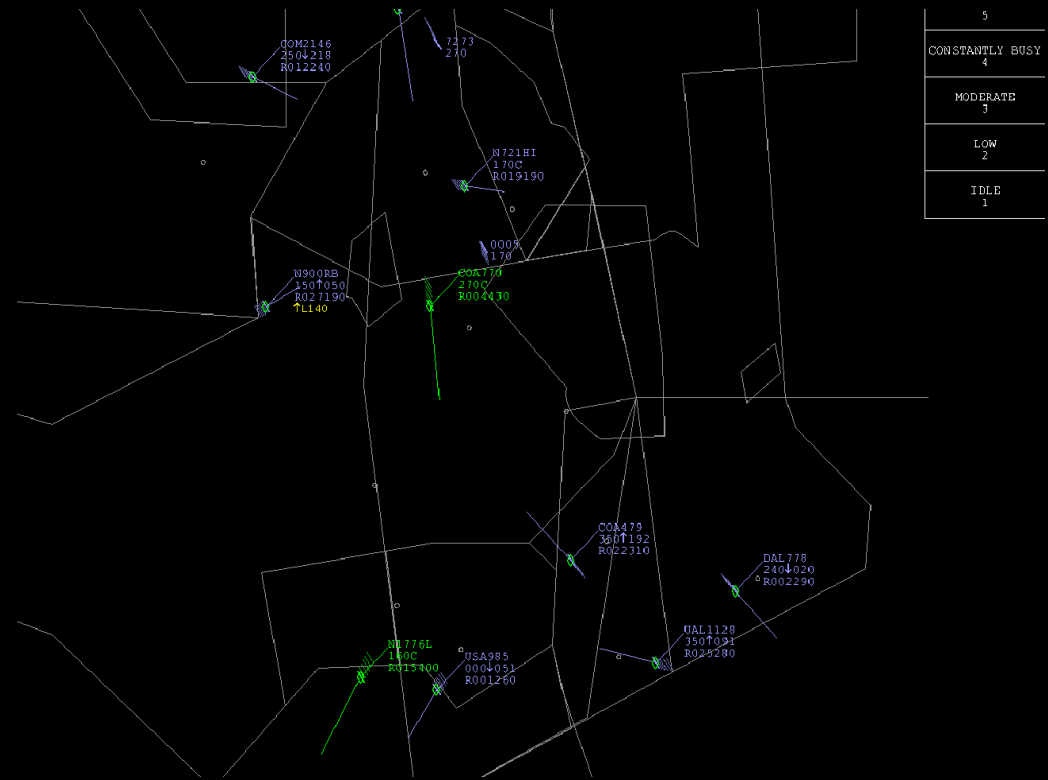
- Fast-time simulation
- Gate-to-gate
- Ground and air
- “*What if?*” scenarios



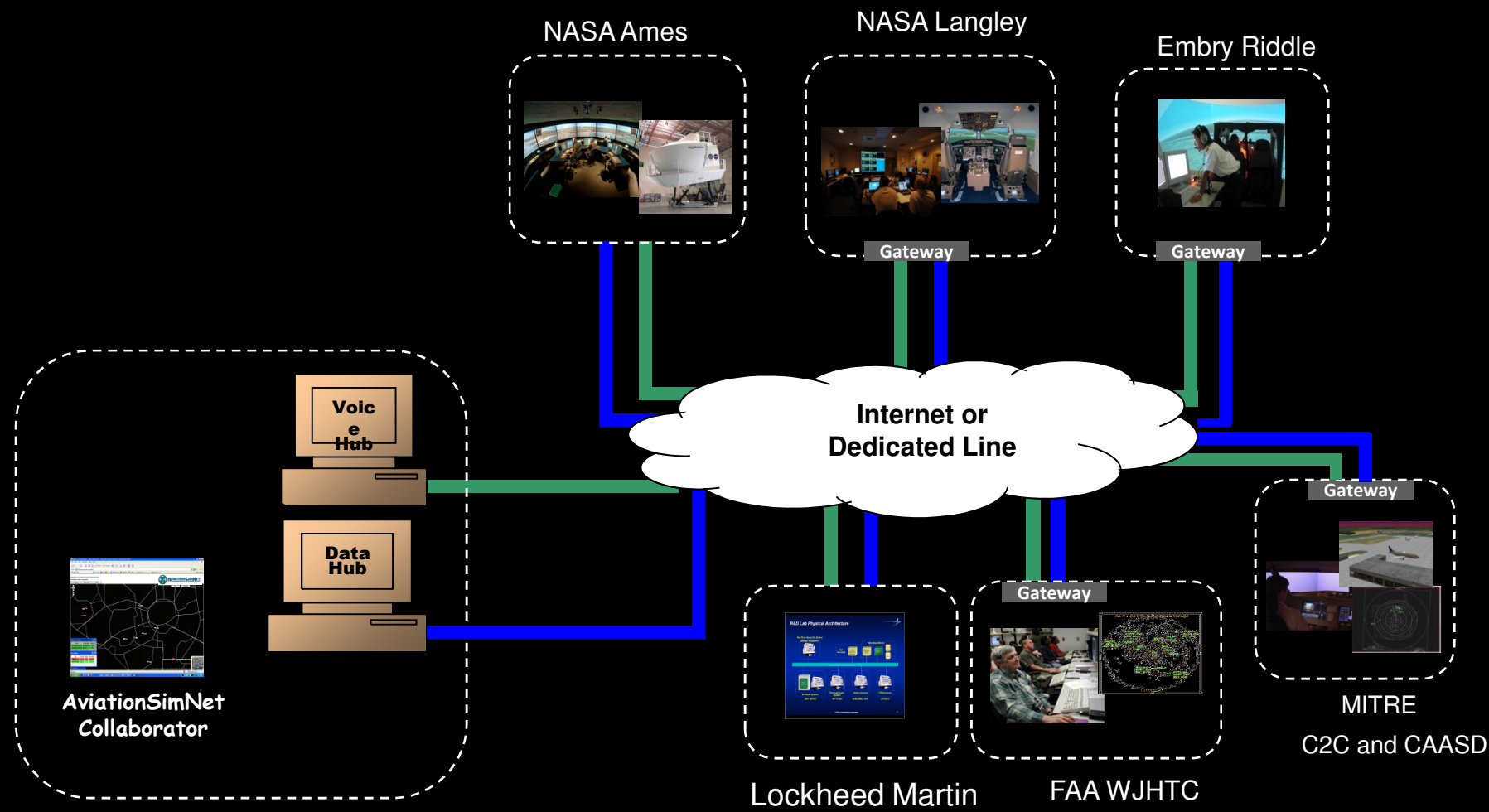
RTDS

Real Time Distributed Simulation System

- Flight-plan filer
- Pilot and ATC displays
- Target generator
- Voice-communication
- Distributed

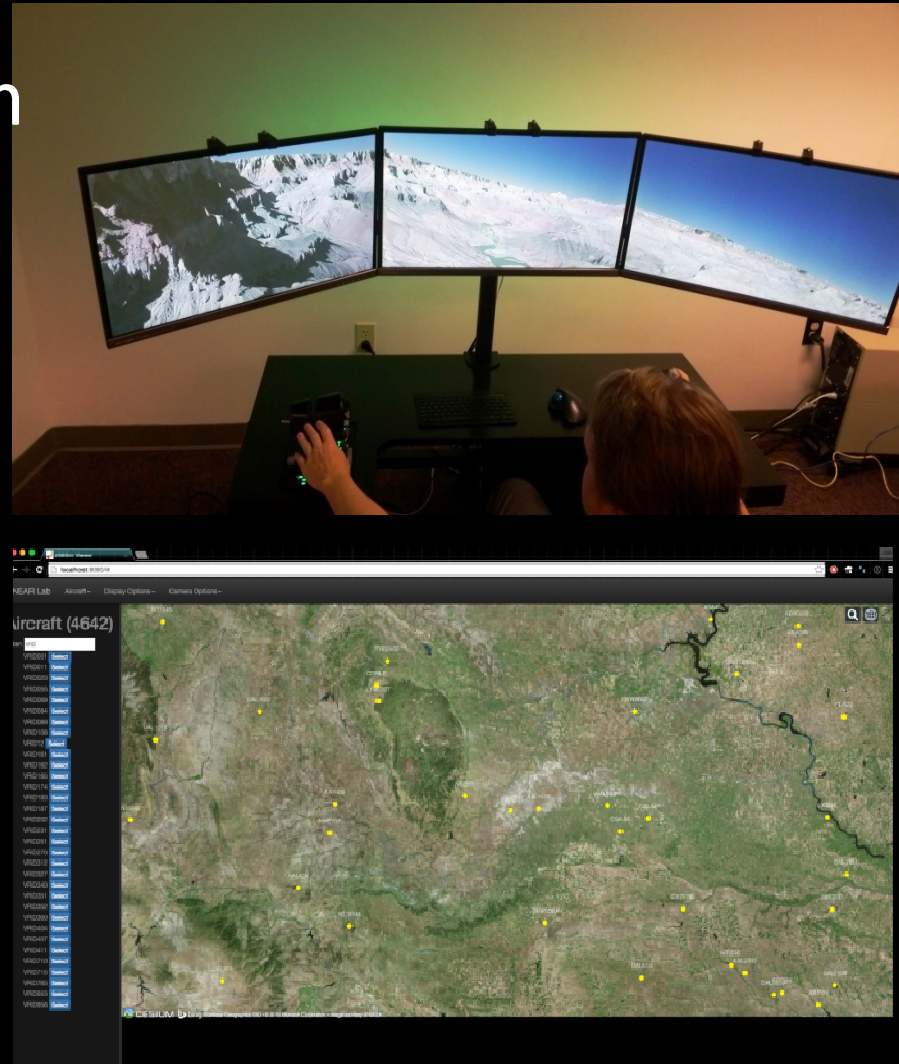


Aviation SimNet



Flight Simulator & Flight Management System (FMS)

- High Fidelity Flight Sim
 - Boeing 737
 - Bombardier 5000
 - JSBSim
 - Supports Autopilot
 - UAS
- FMS
 - Supports 4-DT



Virtual 3D NAS

- Virtual tower
- Real-time weather
- Real-time aircraft
- Simulated aircraft
- Playback



Sub-orbital ADS-B

ADS-B Prototype for Suborbital Reusable Launch Vehicles

- Track sub-orbital
- Prototype transponder
- Balloon high-altitude flight
- Rocket demonstration



GALE

UAS for Hurricane Research

- Tube launch
- Survey boundary layer
- PTH and winds
- Disposable





NEAR

Next Generation ERAU Applied Research



Questions?