

SWIM Connect 2015



Federal Aviation
Administration

*SWIM Today and
Tomorrow: Transforming
Information Exchange in
the Aviation Community*

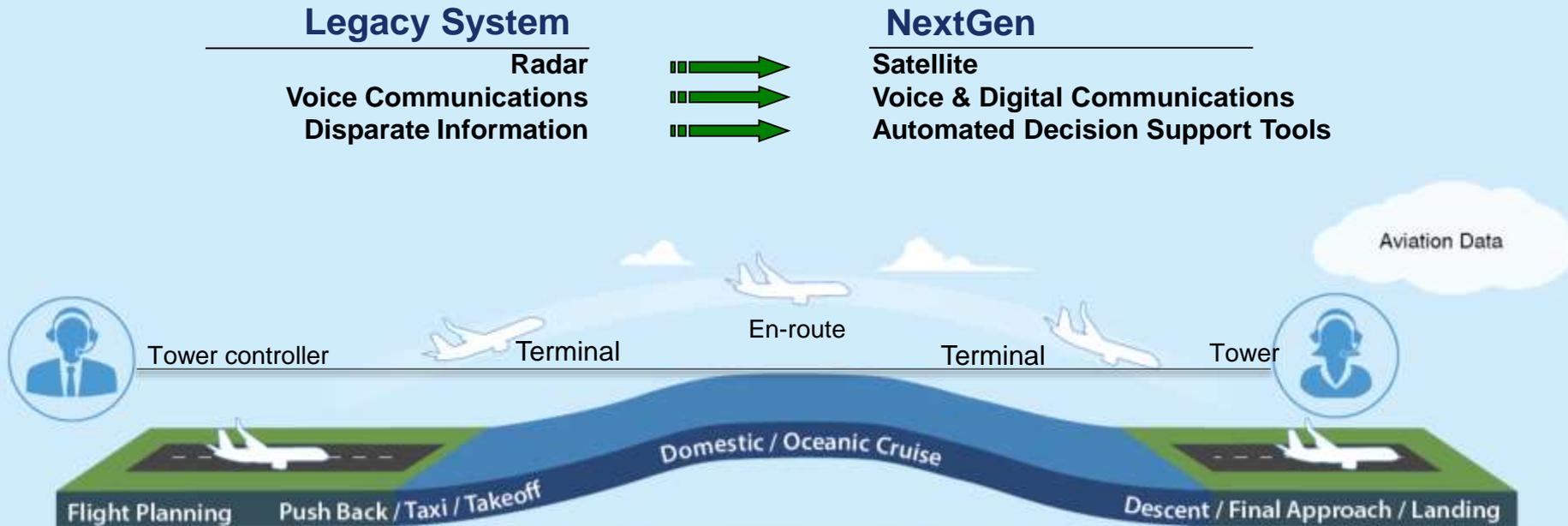
By: Chris Pressler
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Date: November 2, 2015

The logo for SWIM connect 2015, featuring the text "SWIM" in a large, bold, black font, followed by "connect 2015" in a smaller, black font. To the right of the text are three blue circles of varying sizes, arranged in a triangular pattern. The entire logo is set against a white circular background with a blue gradient at the bottom right.

SWIM
connect 2015

Delivering NextGen Major Investments



NextGen

Automatic Dependent Surveillance-Broadcast (ADS-B),
DataComm, National Airspace System (NAS) Voice System (NVS),
Terminal Flight Data Manager (TFDM), System-Wide Information Management (SWIM)

Foundational

En Route Automation Modernization (ERAM)
Terminal Automation Modernization/Replacement (TAMR)

A brief history of TCP/IP and how it changed the world

- **While the Internet today is recognized as a network that is fundamentally changing social, political, and economic structures, it didn't start out that way.**
 - Non-standard and unique protocols were generally not compatible with each other
 - Computer systems were isolated and unable to really share information
 - Greek City State model
- **Then came TCP/IP (thank you Robert Khan and Vinton Cerf)**
 - When TCP/IP was standardized (and adopted) computers finally had a cheap and easy to implement way to communicate with each other.
 - Once computers started to share data, the world changed!
- **SWIM is very similar to the standardization and adoption of TCP/IP and while it's impact will not be quite as large, it is a game changer.**

Challenge Statement

The FAA needs to evolve the interfaces that are used for information sharing within the NAS, for two reasons:

- Need to get rid of old technology (dedicated circuits) and transition to the FTI Ops IP network
- Existing interfaces do not easily allow sharing the full set of information needed to implement many of the operational improvements that make up NextGen
- Existing interfaces do not easily allow sharing of NAS data to the external aviation community in a scalable, secure way



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The logo for "SWIM connect 2015" is displayed within a white circular graphic. The word "SWIM" is in a large, bold, black sans-serif font. To its right are three blue circles of varying sizes. Below "SWIM" is the word "connect" in a smaller, black, lowercase sans-serif font, followed by "2015" in a larger, black, lowercase sans-serif font. The entire graphic is set against a dark blue background with abstract, overlapping light blue circles at the bottom.

WHAT IS SWIM?

System Wide Information Management (SWIM) is the infrastructure that allows members of the Aviation Community to access the information needed to facilitate an innovative and efficiently run National Airspace System (NAS).

What is SWIM doing for the Aviation community?

SWIM makes it possible to have access to real-time, relevant aeronautical, flight and weather information.



SWIM

Information Access to
Transform the Aviation
Community.



Enables new and cutting edge tools and applications.



Facilitates an innovative, efficiently run airspace.



Saves operating and implementation costs.

- Replaces unique interfaces with modern standards-based data exchange
- Leverages a single interface to receive multiple data products
- Provides SWIM users access to information without directly connecting to another system
- Provides enterprise security for incoming and outgoing data
- Establishes a single point of contact for FAA data
- Establishes Enterprise Help Desk for SWIM operational consumer calls
- <http://www.faa.gov/nextgen/swim>

SWIM has two “functional” areas

- **Internal Programmatic Communication**

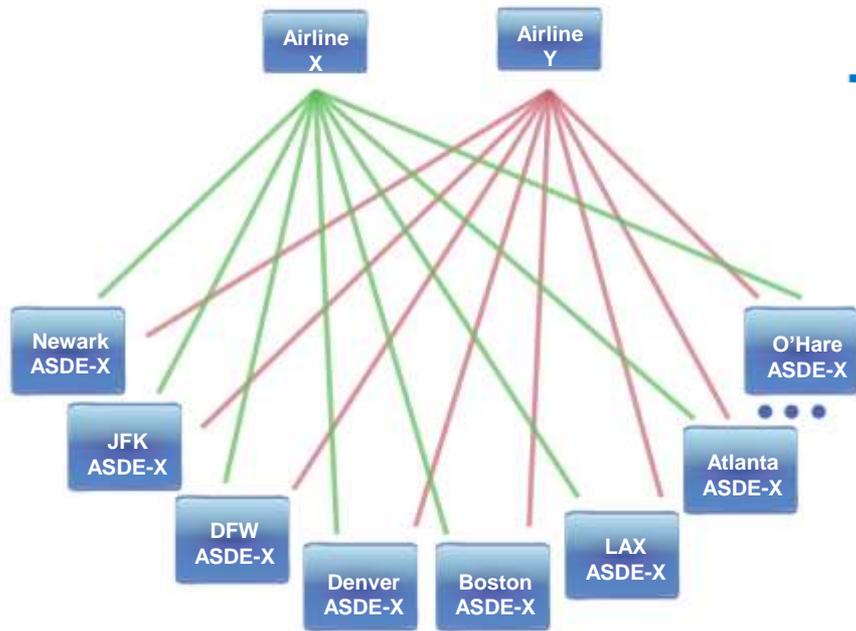
- Messaging and data transport infrastructure between/for FAA programs
 - Programs don't have to invest development resources to create a way to get data from site to site
 - Programs on both Mission Support and Opsnet work can easily access any data needed

• All

- **External User data sharing**

- Creates one secure connection into the FAA where external users can access any authorized data
 - Removes stove pipe and multiple dedicated connections
- Allows for secure and standard method for aviation partners to send data into the FAA

SWIM: External Access



Before SWIM:

Point-to-point connections

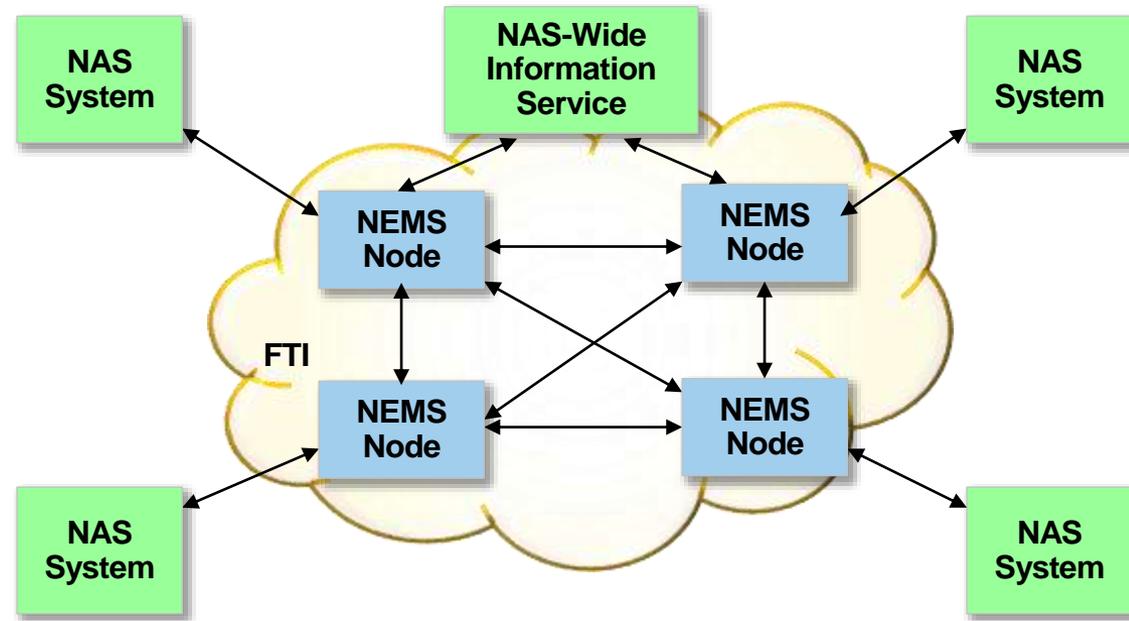


With SWIM:

Data Exchange (Published once, consumed by many)

SWIM-Internal NAS program data sharing

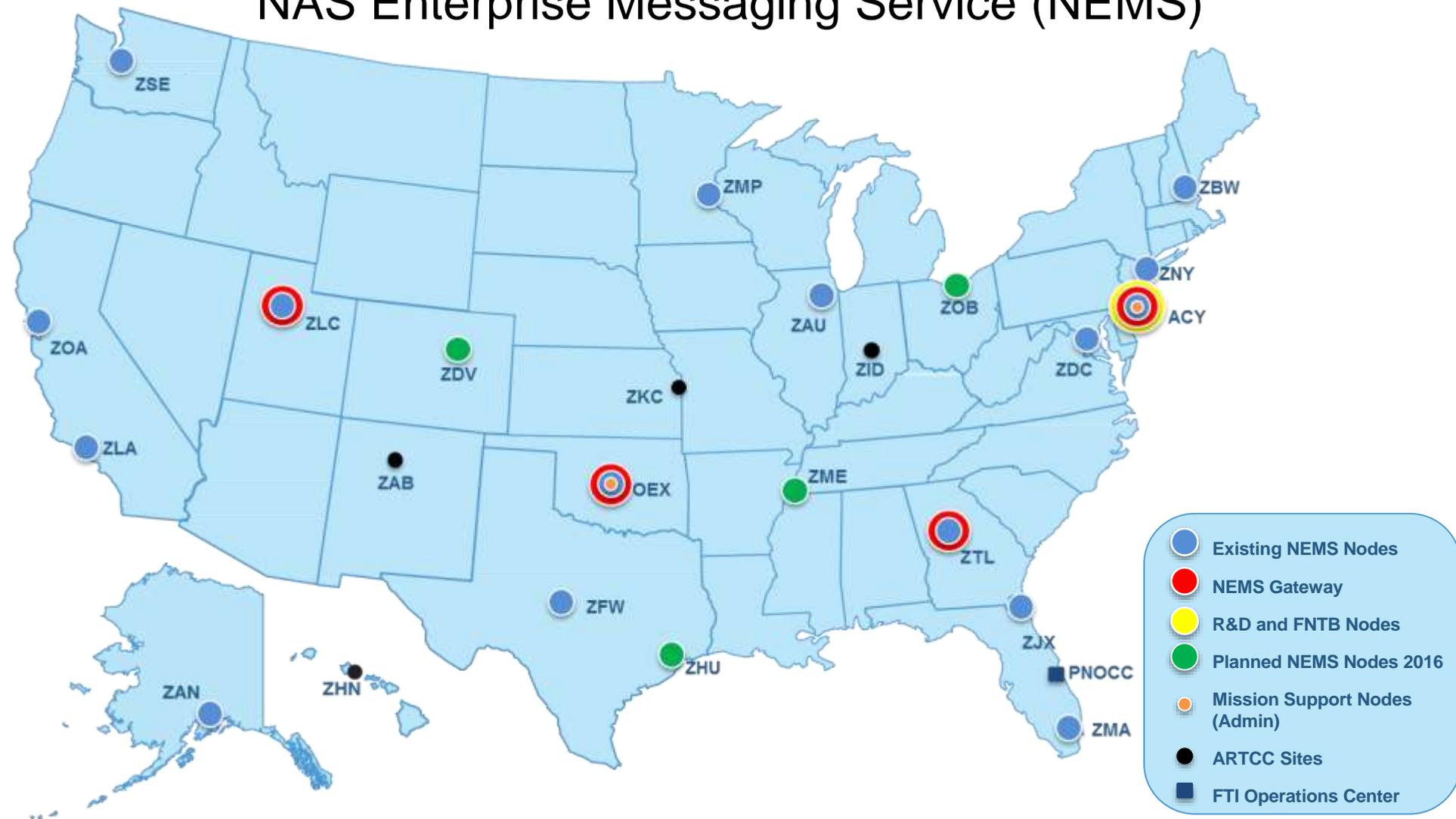
- NAS systems implement SWIM service interfaces using open standards
- These SWIM service interfaces allow publish/subscribe and request/response message exchange patterns to be implemented by the NAS systems
- COTS software is available to simplify building and using these SWIM service interfaces



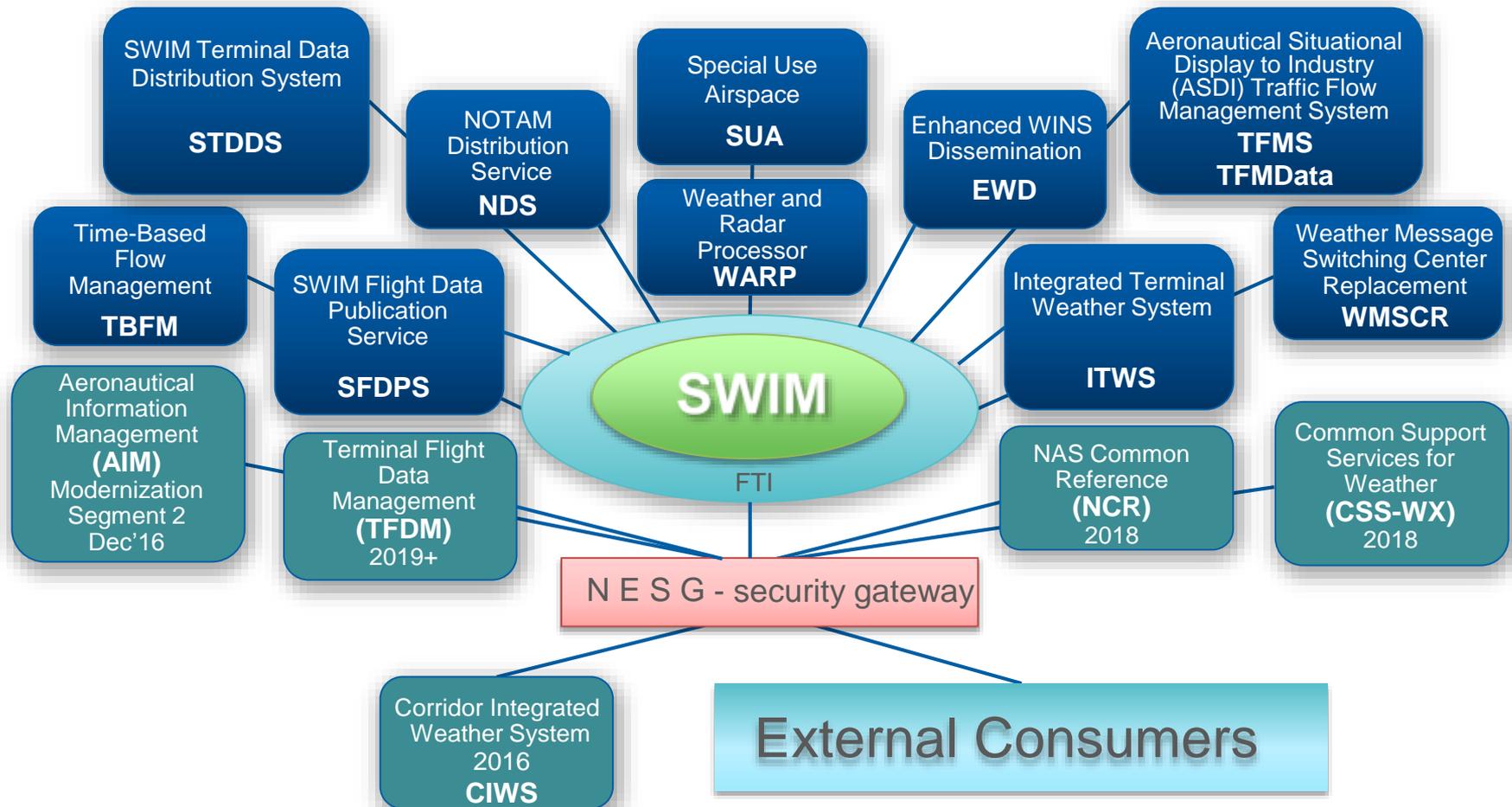
- A “NAS-Wide Information Service” can also be created if needed to ensure that only the authoritative source is allowed to make changes to flight data, and to ensure that all participating NAS systems are provided with a consistent view of the data
- XML allows for systems to easily “Speak the Same Language”
- NEMS nodes located at each center will allow for programs to share data without playing over haul FTI charges.

SWIM Infrastructure

NAS Enterprise Messaging Service (NEMS)



Status of SWIM Services



SWIM Terminal Data Distribution System (STDDS) Deployment



SWIM Terminal Data Distribution System (STDDS)

JMS Publish/Subscribe connection of XML data (Airport Surface Detection Equipment-Model X (ASDE-X), Airport Surface Surveillance Capability (ASSC), Electronic Flight Strip Transfer System (EFSTS), Tower Data Link Services (TDLS), and Runway Visual Range (RVR))

- **ASDE-X and ASSC**

- Event date/time for each flight:
 - Spot Out (departure aircraft crosses from ramp to surface movement area)
 - Spot In (arrival aircraft crosses from surface movement area to ramp)
 - Off (wheels up)
 - On (wheels down)
- Category 11 data and Generic Flight Plan data

- **Tower Departure Event Data**

- Aircraft parking gate and Departure runway
- Clearance delivery time (date/time at which clearance was issued)
- Taxi start time (date/time at which taxi start was issued)
- Takeoff time (date/time at which takeoff clearance was issued)

- **RVR Data**

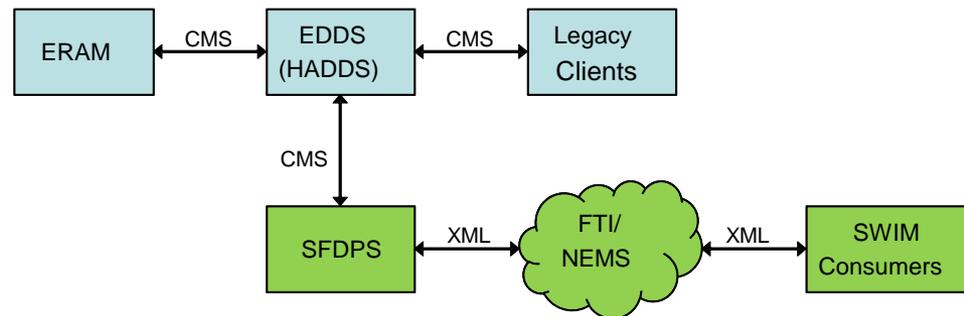
- Visual range in hundreds of feet at touchdown, midpoint, and rollout
- Visibility trend (steady, increasing, decreasing) at touchdown/midpoint/rollout
- Runway edge light and center light setting intensity from 0 (off) to 5 (maximum)

SWIM Flight Data Publication Service (SFDPS)

Now Operational – flight data, airspace data, operational data, and general information messages

SFDPS Services include the following:

- En Route Flight Data Publication
- En Route Airspace Data Publication
- En Route Operational Data Publication
- En Route General Information Message Publication
- Services using FIXM standard V3.0

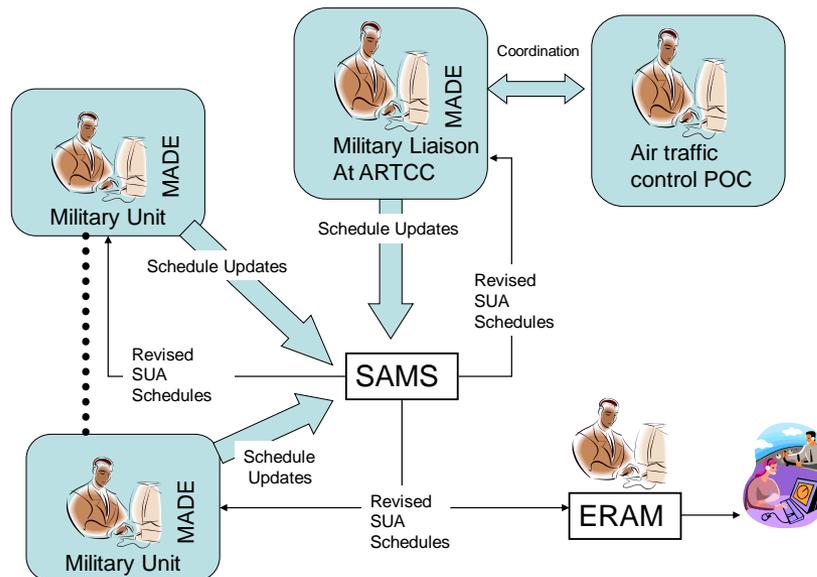


Aeronautical Information Management (AIM) Special Use Airspace (SUA) Automated Data Exchange

SUA is an area designated for operations such that limitations may be imposed on aircraft not participating in those operations.

AIM SUA Automated Data Exchange improves civilian access to current SUA schedules, and changes in SUA scheduling are captured and distributed in AIXM 5.0 compliant format as they are made.

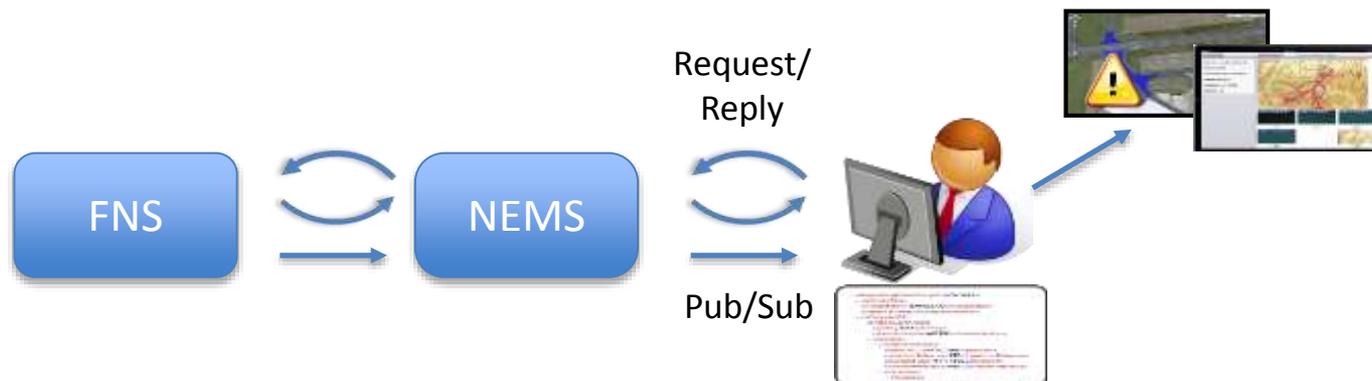
AIM Modernization improves SAA capabilities and includes Temporary Flight Restrictions, Altitude Reservations, and Military Training Routes and integrating SAA/SUA data with Notices to Airmen and airport data.



Federal NOTAM System – NOTAM Distribution Service Overview

Provides distribution of Notices to Airmen (NOTAMs)

- **Data feed that uses OGC WFS web-services**
 - Enables graphical NOTAM representation
- **Standards:** Aeronautical Information Exchange Model (AIXM) 5.1 format
- **ALL or Some:** Query and select types of data
- **External Market:** Enables 3rd party app development
- **Standards:** Include info needed for fusing data



Traffic Flow Management System (TFMS): TFMData Service

TFMS TFMData Service describes current and planned traffic flow initiatives in the NAS. This service will provide a means for information consumers to subscribe to traffic management data consisting of both Flight Data and Flow Information associated with the Traffic Flow Management domain.

Products include the following:

- Flow Constrained Area (FCA) / Flow Evaluation Area (FEA)
- Ground Delay Program (GDP) / Unified Delay Program (UDP)
- Airspace Flow Program (AFP)
- Collaborative Trajectory Options Program (CTOP)
- Route Availability Planning Tool (RAPT) time-line data
- ATCSCC Advisories
- Ground Stop (GS)
- Reroutes
- Airport runway config and rates
- Airport deicing
- Restrictions



FSM Ground Delay Tools components



Airspace Flow Program (AFP)



Denver Reroute

Time-Based Flow Management (TBFM) Information Sharing Service

TBFM optimizes the flow of aircraft into busy airspace. It was installed in all 20 En Route centers in July 2013 to meter aircraft through all phases of flight in order to deliver the correct number of aircraft to airspace sectors and down to the runway at the exact pace at which the aircraft can be accommodated.

JMS Publish/Subscribe connection of XML data to TBFM's Information Sharing provides this metering information.



Enhanced Weather Information Network Service (WINS) Dissemination (EWD)

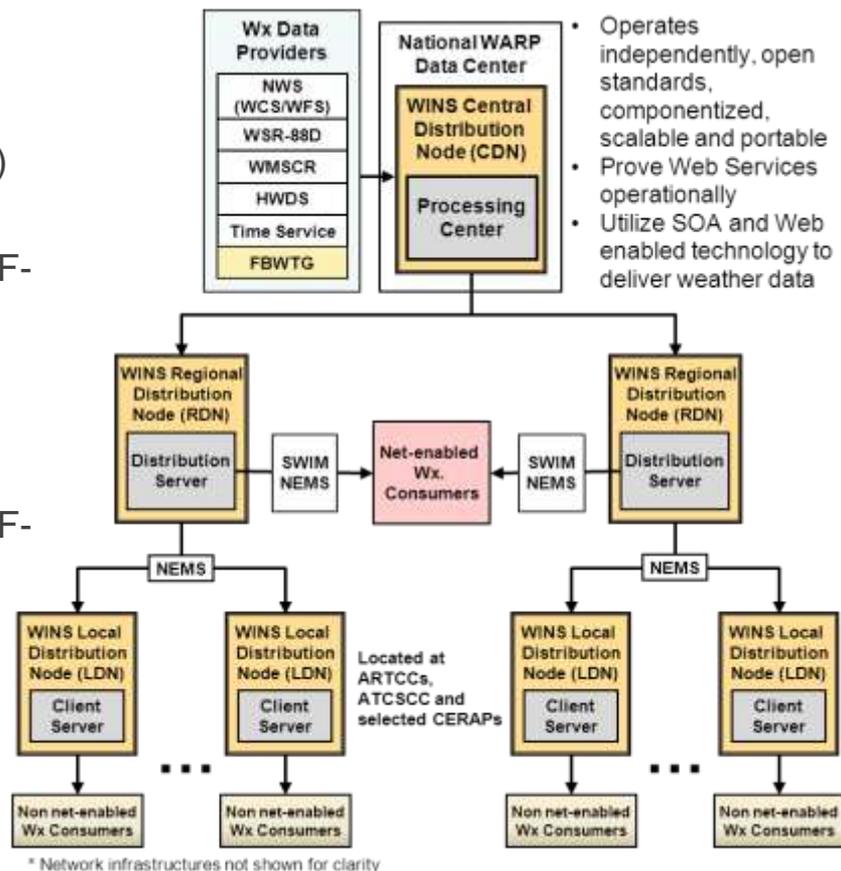
Web Service and JMS Publish/Subscribe connection to XML and binary data on adverse weather, forecasts and other meteorological advisories.

Current products:

- Harris Weather Data Service (HWDS)
- Weather Surveillance Radar – 1988 Doppler (WSR-88D)
- Aviation Routine Weather Report (METAR)
- Weather Research and Forecasting-Rapid Refresh (WRF-RR) 40km Resolution Model Data
- North American Mesoscale (NAM) Model Data
- Global Forecast System (GFS) Model Data

Planned products:

- Weather Research and Forecasting-Rapid Refresh (WRF-RR) 13km Resolution Model Data
- Current Icing Product (CIP)
- National Convective Weather Forecast (NCWF)
- National Convective Weather Diagnostic (NCWD)
- Significant Meteorological Information (SIGMET)
- Collaborative Convective Forecast Product (CCFP)
- Airmen's Meteorological Information (AIRMET)



Integrated Terminal Weather System (ITWS)

Publication of XML data (weather data products available to TRACONS and Tower Controllers) using SWIM compliant JMS Publish/Subscribe capabilities

ITWS provides data to consumers externally via SWIM in Industry Standard XML format

ITWS processing capability will be subsumed by NextGen Weather Processor (NWP) in 2017 timeframe

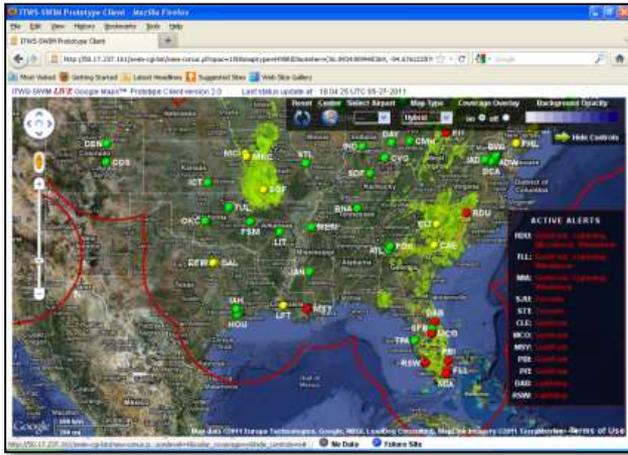
ITWS publishing capability will be subsumed by Common Support Services – Weather (CSS-Wx) in OGC formats in 2017 timeframe

Terminal Areas with ITWS:

Atlanta, ASO (ATL)	Indianapolis, AGL (IND)	Oklahoma City, ASW (OKC)
Boston, ANE (F90)	Kansas City, ACE (MCI)	Orlando, ASO (MCO)
Charlotte, ASO (CLT)	Las Vegas, AWP (LAS)	Philadelphia, AEA (PHL)
Chicago MCF, AGL (C90)	Louisville, ASO (SDF)	Phoenix, AWP (P50)
Cincinnati, ASO (CVG)	Memphis, ASO (MEM)	Pittsburgh, AEA (PIT)
Cleveland, AGL (CLE)	Miami, ASO (MIA)	Potomac, AEA (PCT)
Columbus, AGL (CMH)	Minneapolis/St. Paul, AGL (M98)	Raleigh-Durham, ASO (RDU)
Dallas/Fort Worth MCF ASW (D10)	Nashville, ASO (BNA)	Salt Lake City, ANM (S56)
Denver MCF, ANM (D01)	New Orleans, ASW (MSY)	San Juan, ASO (SJU)
Detroit/Wayne, AGL (DTW)	New York, AEA (N90)	St. Louis, ACE (T75)
Houston, ASW (I90)	Northern Cal, AWP (NCT)	Tulsa, ASW (TUL)
		Wichita, ACE (ICT)

ITWS Data Products:

Configured Alerts	Storm Motion (SM) Storm	Gust Front Estimated Time to Impact
Forecast Accuracy	Extrapolated Positions (SEP) 5nm	Hazard Text 5nm
Forecast Contour	SM SEP Long Range	Hazard Text Long Range
Forecast Image	SM SEP TRACON	Hazard Text TRACON
Gust Front TRACON Map	Terminal Weather Text Normal	ITWS Status Information
Microburst TRACON Map	Terminal Weather Text Special	Microburst Automatic Terminal Information Service (ATIS)
Precipitation 5nm	Terminal Weather Graphics	Runway Configuration
Precipitation Long Range	Tornado Alert	Storm Motion 5NM
Precipitation TRACON	Tornado Detections Wind Profile	Storm Motion TRACON
Anomalous Propagation (AP) Indicated	Precipitation	Wind Shear ATIS
	AP Status	



Current SWIM Product Portfolio (1 of 2)

Flight and Flow Data

Traffic Flow Management System (TFMS): Provides flight data and flow information

- ✓ Flow Constrained Area (FCA) / Flow Evaluation Area (FEA)
- ✓ Airspace Flow Program (AFP)
- ✓ Aircraft Situation Display to Industry (ASDI)
- ✓ Ground Delay Program (GDP) / Unified Delay Program (UDP)
- ✓ Ground Stops (GS)
- ✓ Reroutes
- ✓ Advisories
- ✓ Collaborative Trajectory Options Program (CTOP)

SWIM Terminal Data Distribution Systems (STDDS): Collects and publishes data from 150+ airports

Surface Movement Event Service

- ✓ Spot-In / Spot-Out Times
- ✓ Wheels-Up / Wheels-Down Times
- ✓ Aircraft ID / Type / Wake Class
- ✓ Position / Heading / Speed / Altitude
- ✓ Mode S / Mode 3A
- ✓ Departure or Arrival Runway
- ✓ Departure Fix for Departures
- ✓ Departure Airport for Arrivals
- ✓ Coasted / Suspended Track No.
- ✓ Fused Track Acceleration
- ✓ ADS-B Information
- ✓ Source Information

Airport Data Service

- ✓ Runway Visual Range (100s of feet)
- ✓ Visibility Trend (steady / incr. / decr.)
- ✓ Runway Edge / Center Lighting

Terminal Automation Info. Service

Flight Plan (FP)

- ✓ Aircraft ID / Type
- ✓ Flight Rules in FP Record
- ✓ FP Status (pending, active, etc.)
- ✓ Flight Type (arr. / dep. / enroute)
- ✓ RNAV Indicator
- ✓ Assigned Runway
- ✓ Entry / Exit Fix

Track

- ✓ Track Status (active / coast / drop)
- ✓ Position / Velocity
- ✓ Beacon Code / Mode C

Tower Departure Event Service

- ✓ Aircraft Parking Gate
- ✓ Pre-Departure Clearance Time
- ✓ Taxi-Start / Takeoff Times

Time Based Flow Management (TBFM): Provides metering information

- ✓ Scheduled Time of Arrival (STAs)
- ✓ Estimated Time of Arrival (ETAs)
- ✓ Meter Reference Elements (MREs) Assignments
- ✓ Airport Configuration Information
- ✓ Satellite Airport Configurations

SWIM Flight Data Publication Service (SFDPs): Provides flight data and updates to clients for filed and active flight plans

- ✓ Flight Plan & Update Information
- ✓ Flight Amendment Information
- ✓ Converted Route Information
- ✓ Cancellation Information
- ✓ Departure Information
- ✓ Aircraft ID Amendment
- ✓ Hold Information
- ✓ Progress Report Information
- ✓ Expected Departure Time Information
- ✓ Position Update Information
- ✓ Tentative Flight Plan Information
- ✓ Tentative Aircraft Identification Amendment Information
- ✓ Tentative Flight Plan Removal
- ✓ Tentative Flight Plan Amendment Information
- ✓ Track / Drop Track Information
- ✓ Interim Altitude Information
- ✓ ARTS Flow Control Track/Full Data Block Information
- ✓ Beacon Code Reassignment
- ✓ Beacon Code Restricted
- ✓ Flight Plan Data Bank (FDB) Fourth Line Information
- ✓ Point Out / Inbound Point Out Info
- ✓ Handoff Status

Airspace Data Publication Service: Published by SFDPs

- ✓ Sector Assignment Status
- ✓ Route Status
- ✓ Special Activities Airspace (SAA)
- ✓ Altimeter Setting

Operational Data Publication Service: Published by SFDPs

- ✓ Instrument Approach / Traffic Count Adjustment
- ✓ Sign In Sign Out
- ✓ Beacon Code Utilization
- ✓ Geographic Beacon Code Utilization

General Information Message Publication Service: Published by SFDPs

- ✓ General Information

Current SWIM Product Portfolio (2 of 2)

Weather Data

Integrated Terminal Weather System (ITWS) Data Publication:

Provides specialized weather products in the terminal area

- ✓ Configured Alerts
- ✓ Forecast Accuracy / Contour / Image
- ✓ ITWS Status Information
- ✓ Gust Front TRACON Map
- ✓ Microburst TRACON Map
- ✓ Tornado Alert
- ✓ Precipitation: 5nm, Long Range, TRACON
- ✓ Wind Shear ATIS
- ✓ Storm Motion: 5NM, TRACON
- ✓ Storm Motion - Storm Extrapolated Positions: 5nm, Long Range, TRACON
- ✓ Tornado Detections Wind Profile
- ✓ Anomalous Propagation (AP) Indicated Precipitation
- ✓ AP Status
- ✓ Gust Front Estimated Time to Impact
- ✓ Hazard Text: 5nm, Long Range, TRACON
- ✓ Runway Configuration
- ✓ Microburst Automatic Terminal Information Service (ATIS)
- ✓ Terminal Weather Text Normal
- ✓ Terminal Weather Text Special

Corridor Integrated Weather System (CIWS) Data Publication*:

Provides specialized 3D storm related weather information in the En Route area

- ✓ Vertically Integrated Liquid (VIL) Mosaic (1km resolution)
- ✓ VIL 2-hr. Forecast
- ✓ Echo Tops Mosaic (1 km resolution)
- ✓ Echo Tops 2-hr. Forecast
- ✓ Satellite Mosaic
- ✓ Storm Info: Echo Top Tags, Leading Edges, Motion Vectors
- ✓ VIL Forecast Contours (Std. Mode)
- ✓ VIL Forecast Contours (Winter Mode)
- ✓ Echo Tops Forecast Contours
- ✓ Growth & Decay Contours
- ✓ Forecast Accuracy: Echo Tops, Std. Precipitation, Winter Precipitation

Weather Message Switching Center Replacement (WMSCR)

Publications: Provides NWS textual aviation weather products

- ✓ Transmission of Voice Pilot Reports (PIREPs) to WMSCR
- ✓ Stored PIREPs
- ✓ Altimeter Settings

Enhanced Weather Information Network System

- ✓ Current Icing Product (CIP)
- ✓ Weather Research and Forecasting-Rapid Refresh (WRF-RR) Model Data
- ✓ North American Mesoscale (NAM) Model Data
- ✓ Global Forecast System (GFS) Model Data
- ✓ Airmen's Meteorological Information (AIRMET)
- ✓ National Convective Weather Forecast (NCWF)
- ✓ National Convective Weather Diagnostic (NCWD)
- ✓ Aviation Routine Weather Report (METAR)
- ✓ Significant Meteorological Information (SIGMET)
- ✓ Collaborative Convective Forecast Product (CCFP)

Weather and Radar Processor (WARP) Publications

- ✓ Next Generation Weather Radar (NEXRAD)

Aeronautical Data

Aeronautical Information Management (AIM) Special Use Airspace (SUA) Data Exchange:

Provides notification and status regarding airspace

- ✓ SUA Data, dynamically provided in the Aeronautical Information Exchange Model (AIXM) standard
- ✓ AIXM SUA Definitions

Notices to Airmen (NOTAM) Distribution Service

- ✓ Digital NOTAMs AIXM 5.1

*Service in development or on-ramping process

C90 ITWS Status: Operational | KMDW 0001 ITWS TERMINAL WX -NO STORM WITHIN 15NM |

SFDPS Flight Viewer v.2.0

00:06:36 UTC

ARTCC: ZFW

Overlays

- SFDPS Flights:
- ITWS Alerts:
- Airports:
- ARTCC Boundaries:
- NOAA Precipitation:
- Airport Delays:

Reload

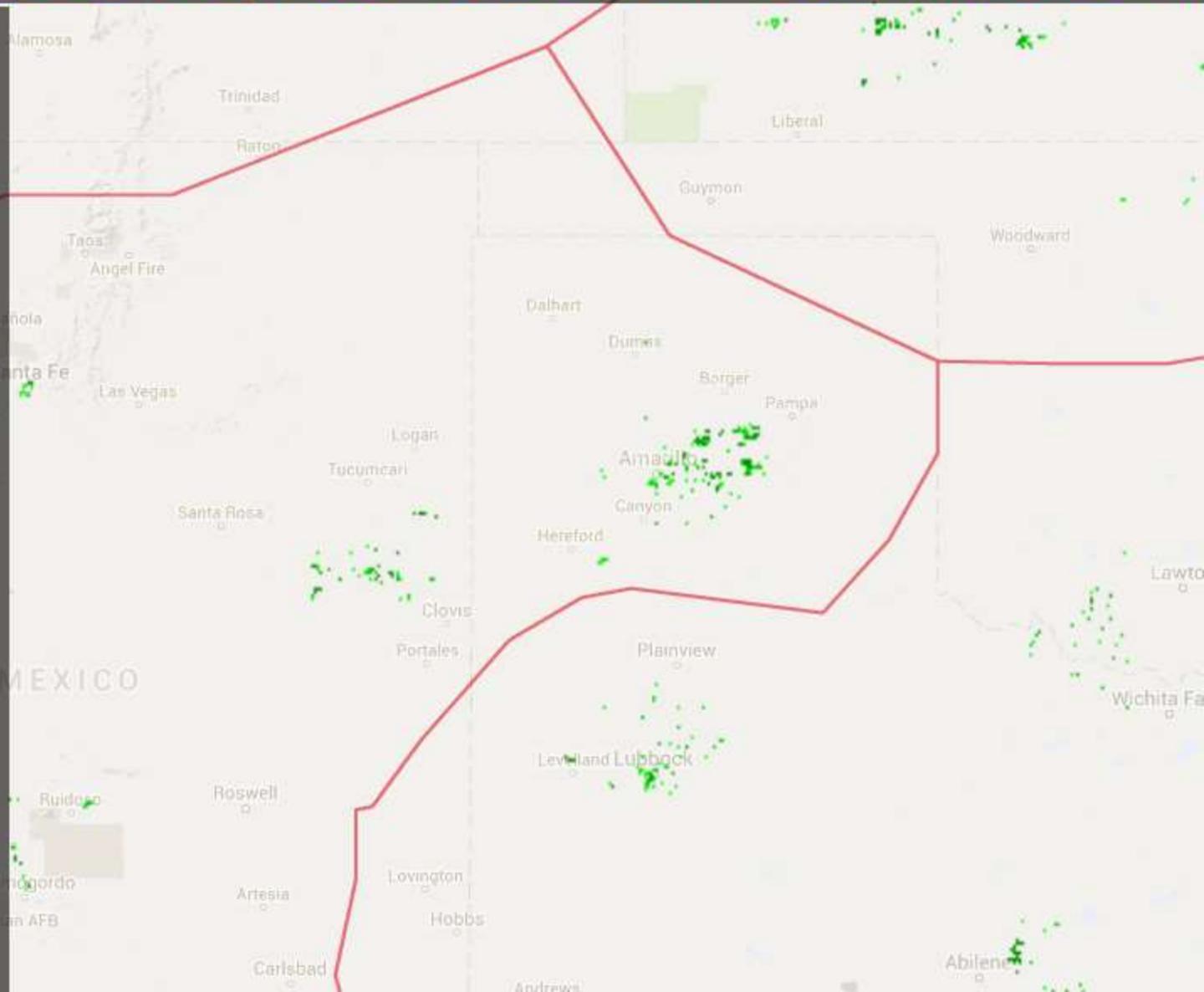
Recenter

Zoom Level

- +



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Go forth and conquer!!

- The data is there for the taking!
 - Get the data and go develop the next great Air Traffic Tool!!
- Extra Bonus points if someone.....

I want to fly with the planes!!

- Build me an Air Traffic Control tool that uses a VR head set!!



Questions



Contact Information

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