

FAA NextGen Weather Systems

SWIM Success: Weather Access

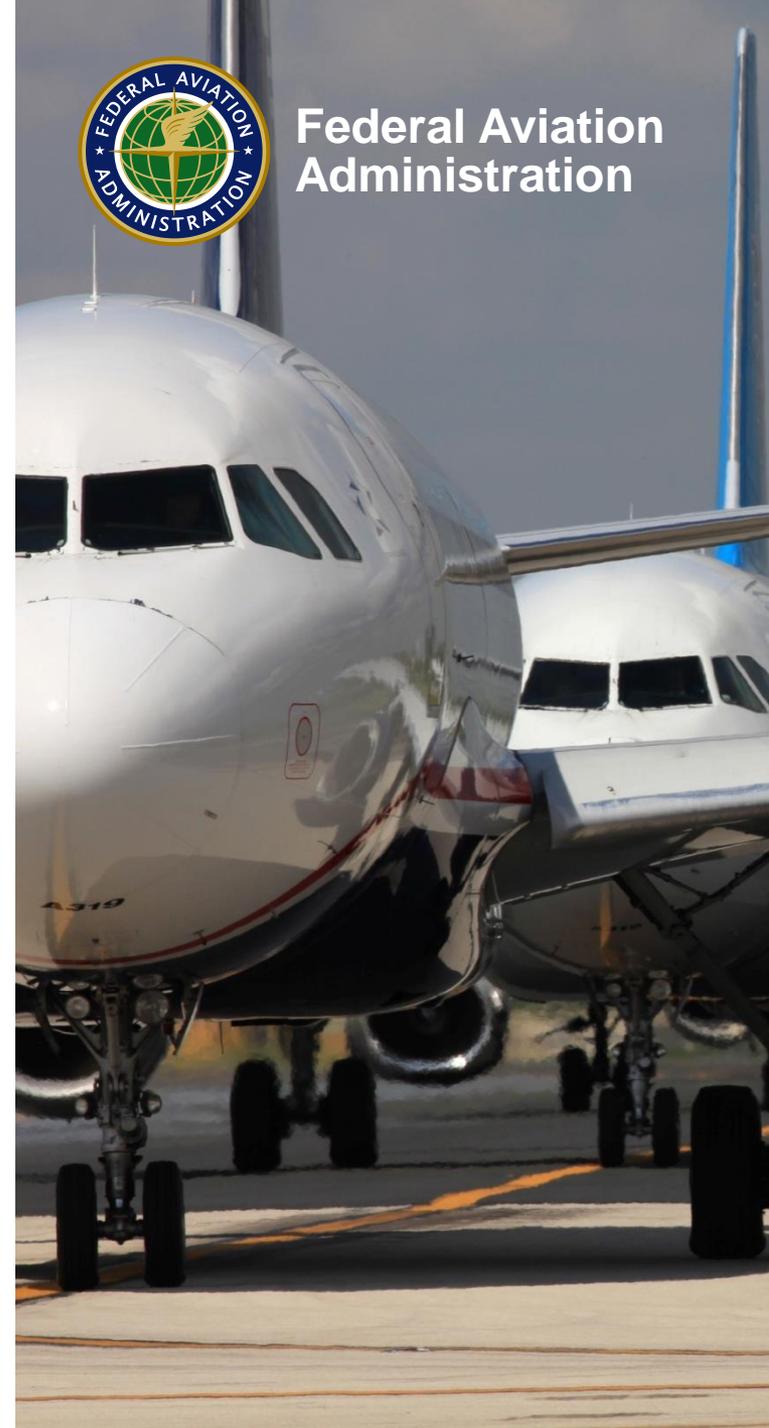
To: ATCA

By: Alfred Moosakhanian (FAA)

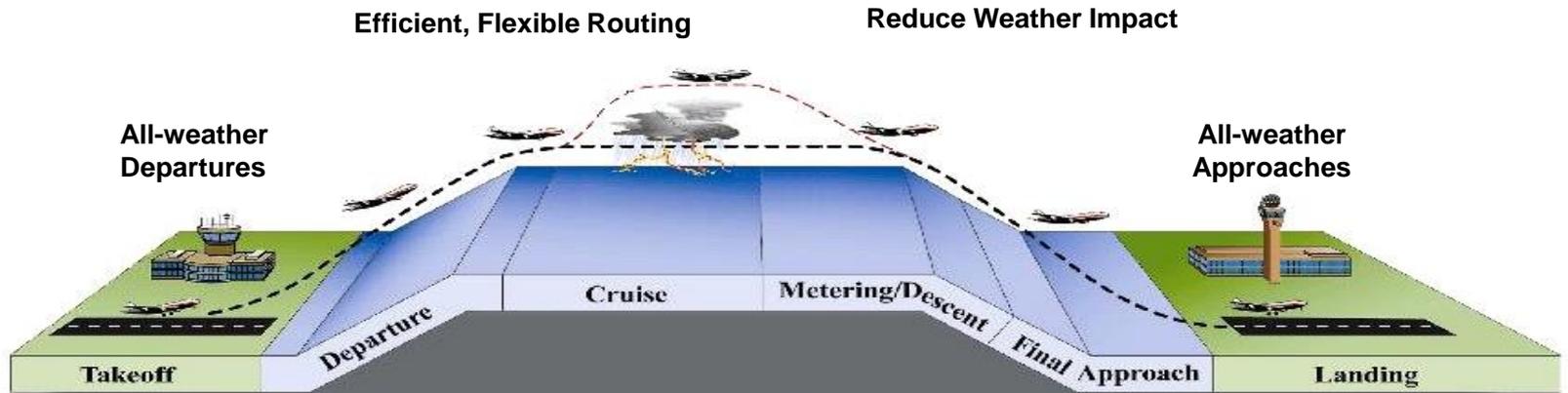
Date: September 29, 2014



Federal Aviation
Administration



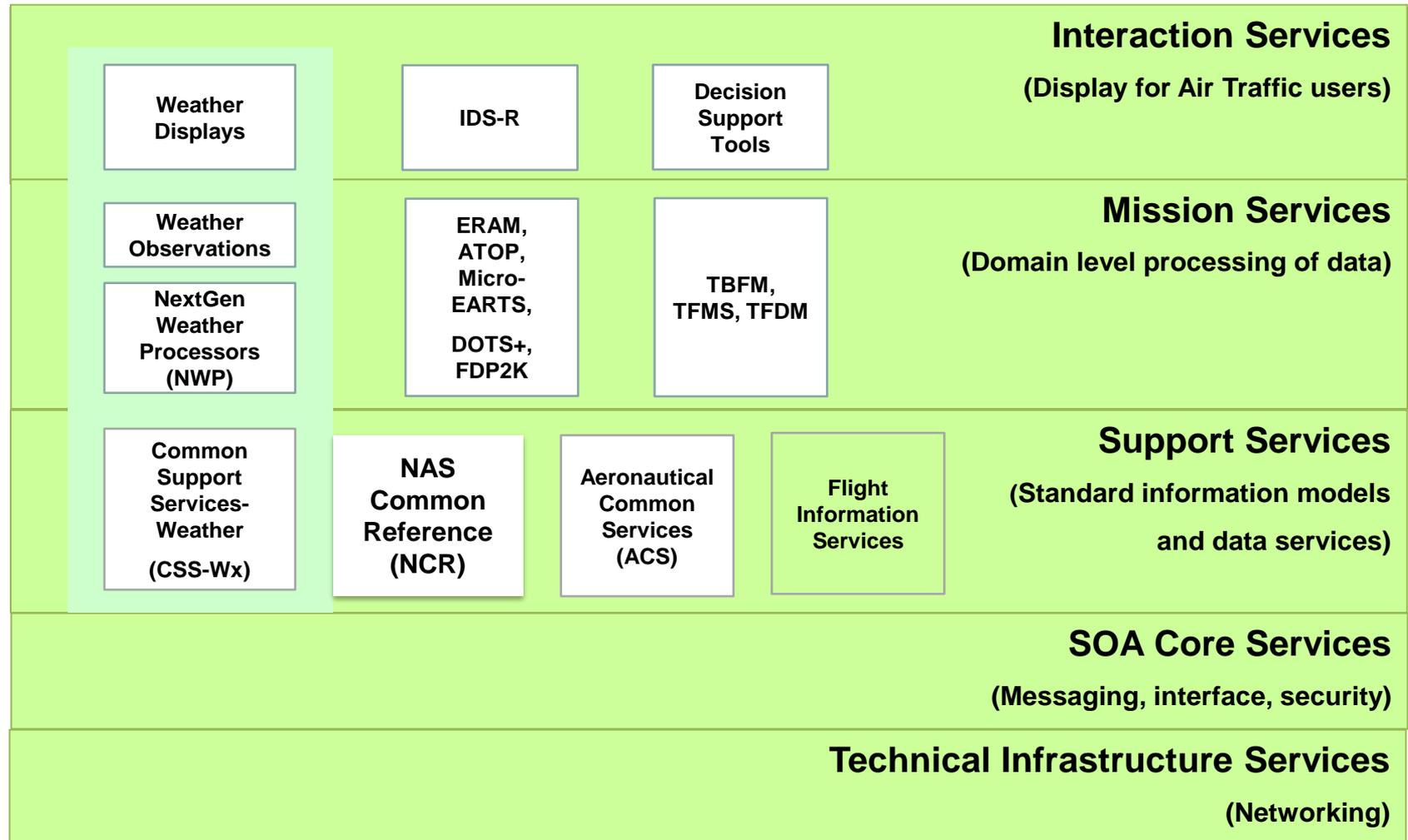
NextGen Weather Systems



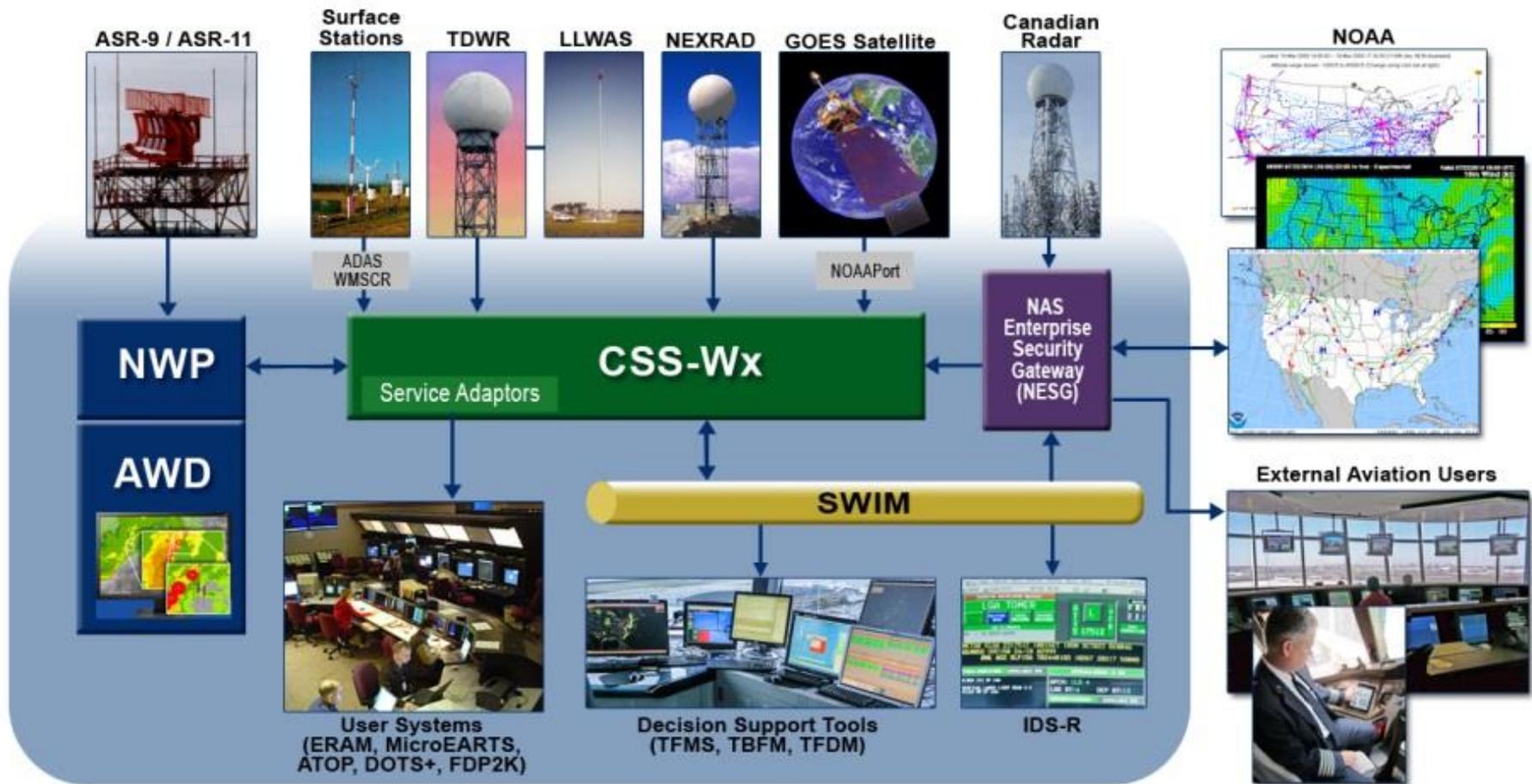
Current Wx Dissemination	<ul style="list-style-type: none"> ITWS NFU, ITWS VOLPE 	<ul style="list-style-type: none"> ITWS NFU, ITWS VOLPE WARP WINS, FBWTG 	<ul style="list-style-type: none"> CIWS CDDS WARP WINS, FBWTG 	<ul style="list-style-type: none"> ITWS NFU, ITWS VOLPE WARP WINS, FBWTG 	<ul style="list-style-type: none"> ITWS NFU, ITWS VOLPE
Future	CSS-Wx				

Current Wx Processing	<ul style="list-style-type: none"> ITWS 	<ul style="list-style-type: none"> ITWS WARP 	<ul style="list-style-type: none"> CIWS WARP 	<ul style="list-style-type: none"> ITWS WARP 	<ul style="list-style-type: none"> ITWS
Future	NWP				

Weather in NAS Enterprise Architecture



NextGen Weather Architecture



CSS-Wx Program Scope



- Provides a single source for FAA weather information and establishes enterprise level common support services using SWIM
- Provides users with the right information at the right time
- Consistent with global standards (e.g., WXXM)
- Enables decommissioning of legacy weather dissemination systems (e.g., WARP WINS, FBWTG, CDDS)
- \$2B total benefits over the lifecycle FY14-40

NWP Program Scope



- Produces advanced aviation specific weather products
- Translates weather information into weather avoidance areas for integration into decision support tools
- Enables decommissioning of legacy weather processor systems (e.g., WARP, ITWS, CIWS)
- \$4.2B total benefits over the lifecycle FY14-40

NextGen Weather Programs Support FAA Strategic Initiatives

Once implemented, CSS-Wx and NWP will:

- **Make aviation safer and smarter**
 - Improve standardization and data access
 - Enhance decision-making process
- **Deliver benefits through technology and infrastructure**
 - Achieve benefits of NextGen
 - Right-size the NAS
- **Enhance global leadership**
 - Transform our internal structure (e.g. stakeholder collaboration)
 - Ensure global Interoperability of NextGen

CSS-Wx Geospatial Data Access Services

- **Web Feature Service (WFS):**
 - Filtered access to non-gridded data formatted as XML (WXXM GML)
 - Provides Common Geospatial constructs for other NAS data (aeronautical, air traffic)
- **Web Coverage Service (WCS):**
 - Filtered access to gridded data formatted as NetCDF4
 - Uses OGC Reference Model
- **Web Map Service (WMS):**
 - Image of Weather data formatted as gif, png, jpeg, etc.
- **Web Map Tile Service (WMTS):**
 - Image of Weather data as set of tiles formatted as gif, png, jpeg, etc.



Integrated Web Services Benefits

- **OGC Web services provide standardized methods for filtered weather data transfer using modern standards**
- **Weather data transferred in standardized formats**
 - netCDF-4 for gridded data
 - Weather Information Exchange Model (WXXM) and North American Weather (NAWX) for alphanumerics
- **Publish/Subscribe message pattern for continuous data transfer for automated systems**
- **SWIM interface provides a unified interface for NAS consumers weather access**
- **Reduced BW utilizations by only transferring filtered coverage areas and one-to-many tiered design**



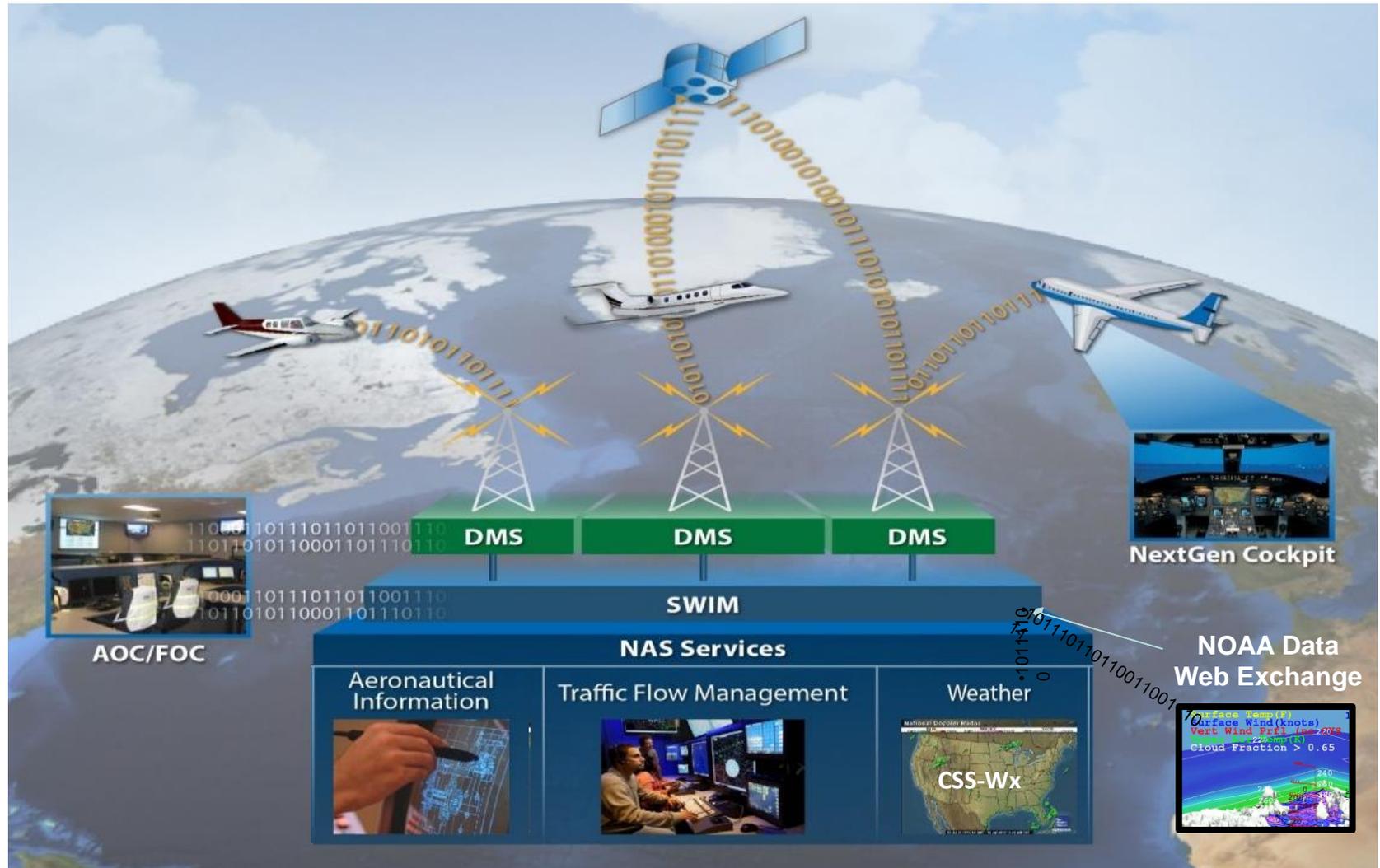
CSS-Wx and NWP Accomplishments

- **CSS-Wx early success demonstrating viability of new technology**
 - Joint Capability Evaluations between multiple agencies
 - SOA Interface for limited set of weather information
- **NWP planned extended convective weather capability demonstrated**
 - Utilized at operational facilities
 - Collected feedback from multiple agencies
- **Developed Government Furnished Information (GFI) Packages**

Joint Capability Evaluation (CE)

- **Demonstrated capability for data exchange:**
 - Ground-Ground between NOAA and FAA
 - Air-Ground between FAA and Aircraft
 - FAA CSS-Wx published weather data to Aircraft:
 - NOAA Web Services
 - WTIC turbulence research
 - Aircraft accessed via AAtS Data Management Service (DMS)
- **Demonstrated NextGen Weather Capabilities**
 - Providing common weather picture to aircraft as well as ground users
 - Enabling more proactive Pilot-ATC interaction

FAA/NOAA Joint Concept Demo



CSS-Wx for R&D Environment

- **Weather for users in Nextgen Prototype Network**
- **CSS-Wx Data Products**
 - METARs (Routine Aviation Meteorological Report)
 - TAFs (Terminal Aerodrome Forecast)
 - NEXRAD (Doppler Radar)
 - PIREP (Pilot Reports)
 - AIRMET/SIGMET
 - Terminal Wind Forecast
 - Terminal Icing Probability and Severity Forecast
 - GTG (Graphical Turbulence Guidance)

Web Services

- **NWS, WINS and SWIM provides integrated Web service data exchange using a set of services**
 - Web Coverage Service (WCS) provides access to gridded weather products
 - Web Feature Service (WFS) provides access to alphanumeric weather products
 - Web Mapping Service (WMS) provides access to weather image products
- **Web services provide Publish/Subscribe and One-time request message exchange patterns**
 - Supports real-time data notifications with background Heartbeat messages for system data feed monitoring
- **System is developed in a tiered hierarchy where products are acquired from the NWS and other data provider sources (NEXRAD, etc...) and transferred across the NAS via WINS Distribution Nodes and SWIM services**
- **Built-in 15 day archive data collection**

Supported Weather product sets

- **WCS (gridded data):**
 - RAP 13km/40km, CONUS coverage
 - GFS 1.0deg and 1.25deg, global coverage
 - UKMET, global coverage
 - NAM Alaska, CONUS and Puerto Rico
 - CIP
 - NCWD
- **WFS (alphanumeric data):**
 - NCWF
 - MDCRS
 - METAR
- **WMS:**
 - Weather radar mosaics (regional and national)
 - Weather Satellite layers (GOES East and West, POES)
 - Lightning data
 - Gridded data Isopleth plots

Backups



Key Acronyms

- ADAS: Automated Weather Observing System (AWOS) Data Acquisition System
- ARTCC: Air Route Traffic Control Center
- ASOS: Automated Surface Observing System
- ASR: Airport Surveillance Radar
- ATOP: Advanced Technologies and Oceanic Procedures
- AWD: Aviation Weather Display
- AWOS: Automated Weather Observing System
- AWSS: Automated Weather Sensor System
- CDDS: CIWS Data Distribution Service
- CIWS: Corridor Integrated Weather System
- CREWS: CTAS Remote Weather System
- CSS-Wx: Common Support Services for Weather
- DHS: Department of Homeland Security
- DoD: Department of Defense
- DOTS+: Dynamic Oceanic Tracking System Plus
- DST: Decision Support Tools
- ERAM: En Route Automation Modernization
- EWD: Enhanced WINS Dissemination (WARP)
- FBWTG: FAA Bulk Weather Telecommunications Gateway
- FDP2K: Flight Data Processing 2000 System
- FTI: FAA Telecommunications Infrastructure
- IDS-R: Information Display System Replacement
- ITWS: Integrated Terminal Weather System
- LLWAS: Low-Level Windshear Alert System
- MEARTS: Microprocessor En Route Automated Radar Tracking System
- NAS: National Airspace System
- NESG: NAS Enterprise Security Gateway
- NEXRAD: Next Generation Weather Radar (WSR-88D)
- NFU: NWS Filtering Unit
- NOAA: National Oceanic and Atmospheric Administration
- NEMC: National Enterprise Management Center
- NWP: NextGen Weather Processor
- OGC: Open Geospatial Consortium
- RAMP: Radar Acquisition and Mosaic Processor
- SWIM: System Wide Information Management
- TBFM: Time Based Flow Metering
- TDWR: Terminal Doppler Weather Radar
- TFDM: Terminal Flight Data Manager
- TFMS: Traffic Flow Management System
- TMU: Traffic Management Unit
- TRACON: Terminal Radar Approach Control
- VOLPE: National Transportation Systems Center (ITWS Web Services Provider)
- WARP: Weather and Radar Processor
- WINS: Weather Information Network Server
- WMSCR: Weather Message Switching Center Replacement



