SWIFT:
FAA Industry Collaboration Workshop #15

SWIM Services & SWIFT
(SWIM Industry-FAA Team)

Presented to: User Community

By: FAA SWIM Program Communications,
Information and Network Programs

Date: August 19, 2021

FAA Collaborative Workshop #15

- **On-line Virtual Conference Starts Promptly 12:30pm**
- **Welcome and Introductions**
  - David Almeida (LS Technologies)
  - Opening Remarks
    - Amy Gusky (FAA)
    - Kimberly Pyle (FAA)
- **SWIFT Focus Group General Updates**
  - Operational Context – Ray Mitchell (LS Technologies)
  - Development & Analytics - Erin Cobbett (Delta Airlines) and Mike Jagmin (United Airlines)
    - Time Based Flow Management (TBFM) SPRINT 2 Update
  - Operational Issues (Ops Issues) Deep Dive Updates: Chris Gottlieb (JetBlue)
- **NAS Producer Programs: Common Support Service - Weather (CSS-Wx) & NextGen Weather Processor (NWP) Updates**
  - William Brown (FAA)
- **Special Topic: Insights into Trajectories & Supplemental SWIM Capabilities**
  - Weather Information Services Update – Integrated Terminal Weather Services (ITWS) – Tony Colon & Shane Kent (Volpe)
    - SWIFT WINDS: United Developed Widget leveraging ITWS – Mike Jagmin (United Airlines)
  - SWIM Flight Data Publication Service (SFDPS) Operational Context Document Review – Xavier Pratt (LS Technologies)

Intermission – followed by conclusion of Insights into Trajectories & Supplemental SWIM Capabilities
  - NAS Common Reference (NCR) – Stefanie Calabrese (FAA) & Patrick Sheridan (Volpe)
- **New York Area Case Study Update:**
  - Chris Gottlieb (JetBlue), Xavier Pratt (LS Technologies), and Mark Hopkins (LST Technologies)
- **SWIFT Topic: Information Services Roadmap Update**
  - Xavier Pratt (LS Technologies)
- **Close out**

Who is in the "Zoom Room" at SWIFT #15?

Attendee Organizations

58 — Airline Industry

5 — FFRDC

89 — Government

76 — Support Organization

108 — Vendor to Industry

14 — Other

•**Other defined as**: Consultant, Operator, Researcher, Safety, Academia, ATM Vendor, Association, ANSP, Airport, Airline and Flight Operator

Attended a SWIFT Meeting Before?

I'm a Veteran: 298

No, I'm New: 52

350 attendees

SWIFT

SWIFT Stakeholders

Airspace Users — American Airlines, Alaska Airlines, allegiant, ATLAS AIR, DELTA, FedEx, Jazz, jetBlue, UPS, spirit airlines, HORIZON AIR, Southwest, Republic Airways, UNITED, ADB SAFEGATE

Professional Associations — Airlines for America, ACI Airports Council International, AOPA Aircraft Owners and Pilots Association, NBAA, Embry-Riddle, IATA, NBCA

Airport / Airspace Authorities — THE PORT AUTHORITY OF NY & NJ, SFO San Francisco International Airport, DFW Dallas Fort Worth International Airport, NAV CANADA, Hartsfield-Jackson Atlanta International Airport

Standards Bodies — OGC Open Geospatial Consortium, Inc., RTCA, RED CLOUD

Government — U.S. Air Force, Department of Transportation United States of America, NASA, Federal Aviation Administration

Vendors to Industry/Government — ADB SAFEGATE, Agile Secure Data Exchange, amazon, ATAC Aviation Analysis Experts, AvMet, barich, BOEING, Booz Allen, CGH Technologies Inc., CIRIUM, Cisco, cobec, Concepts Beyond, CONFLUENT, D., Deep Water Point, DNI Director National Intelligence, DTIS, EDB POSTGRES, ettaviation, Evans Incorporated, FREQUENTIS, FlightAware, FLIGHTKEYS, GE Aviation, GENERAL DYNAMICS Information Technology, Google, Honeywell, IBM, IDS Air Nav, inmarsat, JEPPESEN, JMA Solutions, KARSUN SOLUTIONS, LINCOLN LABORATORY Massachusetts Institute of Technology, L3HARRIS, leidos, LST, M, MAPLARGE, METRON AVIATION, Microsoft, MITRE, MOSAIC ATM, MuleSoft, NAVBLUE, NetApp, noblis, NORTH STAR GROUP, NORTHROP GRUMMAN, objectstream, PASSUR AEROSPACE, Palantir, Raytheon, Red Hat, regulus group, Rockwell Collins, route 3 software, SAAB Sensis, Sabre, SAIC, SeaTec, SITA, SITAONAIR, skymantics, SLICK QR, solace, Space Metrics Inc., THALES, The Fans Group, verizon

SWIFT: At the Intersection of Operations, Technology & Data

- **SWIFT addresses industry recommendation to:**
  - A community forum that acts as a clearinghouse for collaborative engagement around NAS information and data sharing
  - **Educate**: Synchronize community on information services
  - **Collaborate**: Discuss issues most relevant to community
  - **Communicate**: Inform community about SWIM & NAS programs
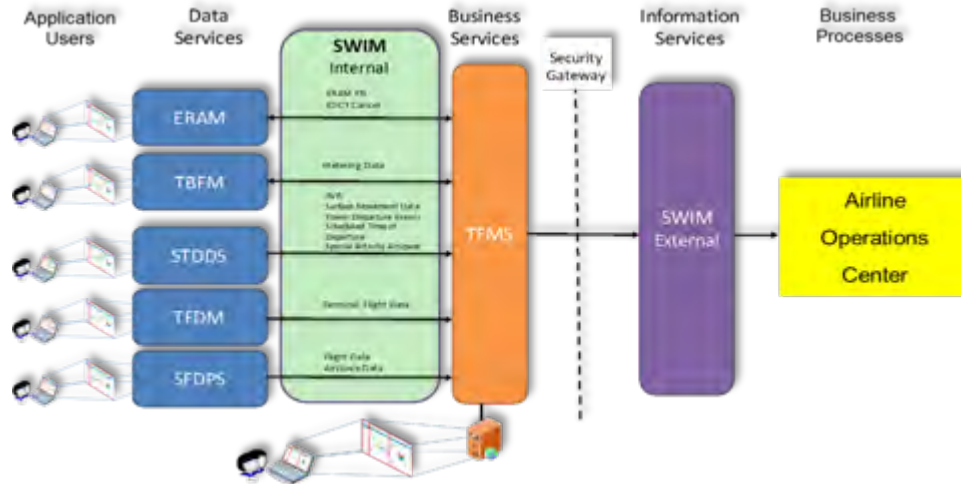
"Airwave Procedures"

- **Please note during the session all attendees are muted. Use the zoom controls depicted to interact with presenters.**

- **To ask questions or engage during a topic of interest please use the "QA" feature. The SWIFT Team will either announce your question/comment or unmute you <u>(time permitting).</u>**

SWIFT: Announcements

- **TFMS Technical Webinar: Every Second Thursday of the month @ 1PM EST**
    - Next Meeting scheduled for Sept 9th, 2021
    - Send questions or topics to Chris.Burdick@faa.gov

SWIFT Focus Group Status Updates

Operational Context Document Focus Group

SWIFT 15 Update

Presented to: SWIFT

By: Ray Mitchell – LS Technologies

Date: August 19, 2021

Focus Group Updates & Schedule

- **Important Notices**
  - **Please submit any comments/feedback by our August 26th Session**
- **Schedule Subject to Change**
- *Interested in Joining? Please contact Ray Mitchell @ ray.mitchell@lstechllc.com*

March 2021	April 2021	May 2021	June 2021	July 2021	August 2021
NCR WFS *Update Draft*	NCR *WFS Final Draft*	Canceled Due to SWIFT 14	NCR WFS (Close Out)	TTP Operational Metrics (Storyboard)	TTP Operational Metrics (First Draft)
TTP Flight Data Service (TBD)	TTP Flight Data Service (Updated Draft)		TTP Flight Data Service (Final Drat & Close Out)	TTP Flight Delay (Close Out)	TTP Surface Meter Program (Storyboard)
TTP Airport Information Service (TBD)	TTP Flight Delay (First Draft)		TTP Airport Information Service (Update)	TTP Airport Information (Service Final & Close Out)	TTP Traffic Management Restrictions (First Draft)
TTP Flight Delay (Storyboard)	TTP Airport Information Service (Frist Draft Update)		NCR Web Map Service (Storyboard)	TTP Traffic Management Restrictions (Storyboard)	NCR Web Map Service (Update)
				NCR Web Map Service (First Draft)	

Ops Context Spotlight - Weather Focused

- **Integrated Terminal Weather Services (ITWS)**
  - Provides service background and operational context for users
- **CSS-Wx Web Services**
  - Coming soon…
- **Repository information:**

  https://connect.lstechllc.com/index.cfm/main/opconfocusgroup

Development & Analytics Focus Group (DAFG)

SWIFT 15 Update

Presented to: SWIFT

By: Erin Cobbett – Delta Airlines &

Mike Jagmin – United Airlines

Date: August 19, 2021

Development & Analytics Focus Group

Leads: Erin Cobbett, and Mike Jagmin – Delta & United Airlines

Background & Purpose Recap:

Data Analytics

- Identify smaller scale data, operational, and analytical problems that already exist in the community
- Identify services, messages, data elements, logical transformations to solve problem

Development

- Create logical software design to solve problem
- Develop physical representations of data as designed by group

Current Status:

- DAFG has decided to slow the cadence from monthly to quarterly sessions

TBFM Delays Sub Team Sprint 2

Current Status:

- DAFG team is actively supporting the TBFM Sprint 2 resolution activities, continuing to meet Bi-Weekly with TBFM producer program team to fully flush out proposed solutions

  - FAA and Airlines have provided comments to the updated Java Message Description Document (JMSDD) and will be closing out the comment adjudication process in the next few weeks

Next Steps:

- Key members of the DAFG have been asked to support the Ops Issues Focus Group – New York Area Case Study and as progress continues with the study the DAFG may spark off more ad hoc sessions or even another small working group

Want to join us? Contact Us:

Erin Cobbett - erin.cobbett@delta.com

Mike Jagmin - michael.jagmin@united.com or Ray Mitchell – ray.mitchell@lstechllc.com

Operational Issues Focus Group

SWIFT 15 Update

Presented to: SWIFT
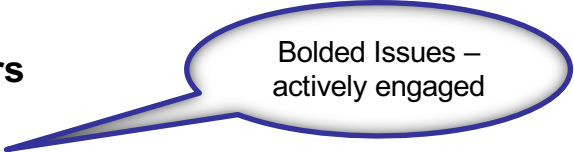
By: Chris Gottlieb – JetBlue Inc.

Date: August 19, 2021

Ops Issues Focus Group

- **Lead:** Chris Gottlieb, JetBlue

- **Goal:** Address NAS-wide operational issues that might benefit from information sharing between organizations

- **Current Prioritized Issues:**
  - **TBFM delays (United) who, what, why it matters**

  - **Flight Planning over IP (SWA)**

  - **Early Planning for Disruptions**
    - **Early Detection Deviation over Fix (JBU)**
    - **Early Detection for Airport Surface Delays (JBU)**
    - Taxi Out Return to Gate (Delta)
    - Long taxi issues (JBU) at JFK

  - TBFM/TFMS double delays

Bolded Issues – actively engaged

Analyzing potential linkages

Flight Planning over IP

Goal

- Align FAA Flight Plan Modernization efforts with Flight Operators' needs
  - *Understand operator systems' technical needs for Flight Planning, Filing and Data Sharing through CSS-FD*
  - *Better foresight into NAS constraints and impacts to Ops planning and decision-making*
  - *Improve service through increased reliability of operations*

Current Activities

- FAA CSS-FD Constraints Working Group (CWG) activities were concluded earlier this year. The CWG involves FAA stakeholders with various disciplinaries.
  - *Started list of constraints based on Radio Technical Commission for Aeronautics (RTCA) recommendations for CSS-FD (2017) and identified a total of 39 constraints relevant to pre-departure flight planning.*
  - *List was refined based on impact to pre-departure flight planning and availability in digital format*
  - *The constraints are categorized by types of constraints, e.g., traffic management, airspace constraints, etc.*
  - *In phase 1 of CSS-FD, 27 constraints, except for ATC constraints, will be provided as references, whereas ATC constraints will be provided in a form of flight plan amendment.*
  - *CWG is currently planning a formal kickoff to commence development.*

Early Planning for Disruptions (New York Area Case Study)

Goal

- Improve NAS stakeholder planning and execution for IROP events.
  - *Identify factors and variables that drive suboptimal throughput*
  - *Accurately prioritize list of operations impacted by disruptions*
  - *Identify anticipated level of impact on operations*

Current Activities

- The Ops Issue Group has supported refining the operational *Information Gaps* identified while dissecting the case study. Current actions include:
  - *Selecting candidates dates to serve as case study baseline for future predictive analytics/ML*
  - *Connected to SCDS to begin retrieving relevant SWIM data.*
  - *Collaborating with external stakeholders to leverage existing or prototype support capabilities. .*

Want your Ops Issues to be heard?? Join us!

For more information:

- Join the **SWIM Flight Planning Modernization** Teams Group page for updates and continued dialogue

OR...

Contact Us:

- Chris Gottlieb – Christopher.Gottlieb@jetblue.com
- Xavier Pratt- Xavier.Pratt@lstechllc.com

NextGen Weather Systems

CSS-Wx and NWP

Presented to: SWIM Industry-FAA Team (SWIFT)

By: NextGen Wx Systems, AJM-333

Date: August 19, 2021

Federal Aviation Administration

Purpose

- **Provide overview and status of NextGen Weather Systems**
    - Common Support Services – Weather (CSS-Wx)
    - NextGen Weather Processor (NWP) and Aviation Weather Display (AWD)
- **Describe NextGen Weather Data Services**
    - NextGen Weather Products
    - SWIM involvement

CSS-Wx Program Overview

Common Support Services – Weather (CSS-Wx): ACAT 1NI

Improves weather information management and user access; provide new interface standards and formats

Reduces FAA cost by enabling decommissioning of legacy weather dissemination systems (e.g., WARP WINS, FBWTG, CDDS)

Capabilities	Benefits	Timeline
➢ **Single provider of weather data products within the NAS, using standards-based weather dissemination**	➢ **Reduces FAA costs**	➢ **Awarded to L3Harris**
	➢ Reduces infrastructure/bandwidth costs by optimizing weather dissemination	➢ **Incremental Agile Software design/development/test in progress**
➢ **Makes weather products available from NOAA, NWP and other data sources for integration to air traffic systems**	➢ Reduces interface development costs by eliminating custom point-to-point interfaces	➢ **Key Site Initial Operational Capability in 2024**
➢ **Provides weather products via a set of common Web Services for weather, using international data access and data format standards**	➢ **Improves NAS information**	
	➢ Facilitates consistent weather information using standard formats	
	➢ Increases NAS access to common weather information	

NWP Program Overview

NextGen Weather Processor (NWP): ACAT 2

Increases NAS efficiency and safety by improving weather product generation, translation, and display for aviation weather users

Reduces FAA costs by enabling decommissioning of legacy weather processor systems (e.g., WARP, CIWS)

Capabilities	Benefits	Timeline
➢ **Produces advanced aviation specific weather products, e.g.,** • Real-time weather radar information (e.g., ERAM) • 0 to 8 hour aviation weather products • Convective Weather Avoidance Fields ➢ **Translates weather information into weather avoidance areas for integration into decision support tools (e.g., TFMS, TBFM)** ➢ **Provides Aviation Weather Display (AWD) of NextGen weather information for AT users**	➢ **Reduces operational costs** • Establishes weather processing platform • Consolidates legacy processors ➢ **Reduces air traffic delays** • Maximizes airspace usage • Improves accuracy, timeliness and look ahead (0-8 hour) of aviation-specific weather information to air traffic • Enhances weather algorithms	➢ **Awarded to Raytheon** ➢ **Incremental Agile Software design/development/test in progress** ➢ **Key Site Initial Operational Capability in 2024**

CSS-Wx and NWP Status

- **Currently in Solution Implementation phase**
  - CSS-Wx and NWP systems are being developed by L3Harris and Raytheon, respectively
  - Incrementally developing and testing the software system functionalities and data products, and conducting activities at the factories as well as FAA WJHTC and other facilities
- **Recently completed re-planning approved by JRC in May 2021**
  - Decommission Weather and Radar Processor (WARP) and Corridor Integrated Weather System (CIWS)
- **Key Site Initial Operational Capability (IOC) in 2024**
  - NOAA NextGen IT Web Services (NGITWS) targeting August 2021 release
  - Currently conducting CSS-Wx integration and system testing at WJHTC
  - Ongoing CSS-Wx interface testing with ERAM at WJHTC
  - End user systems and SWIM to support CSS-Wx and NWP testing by 2024
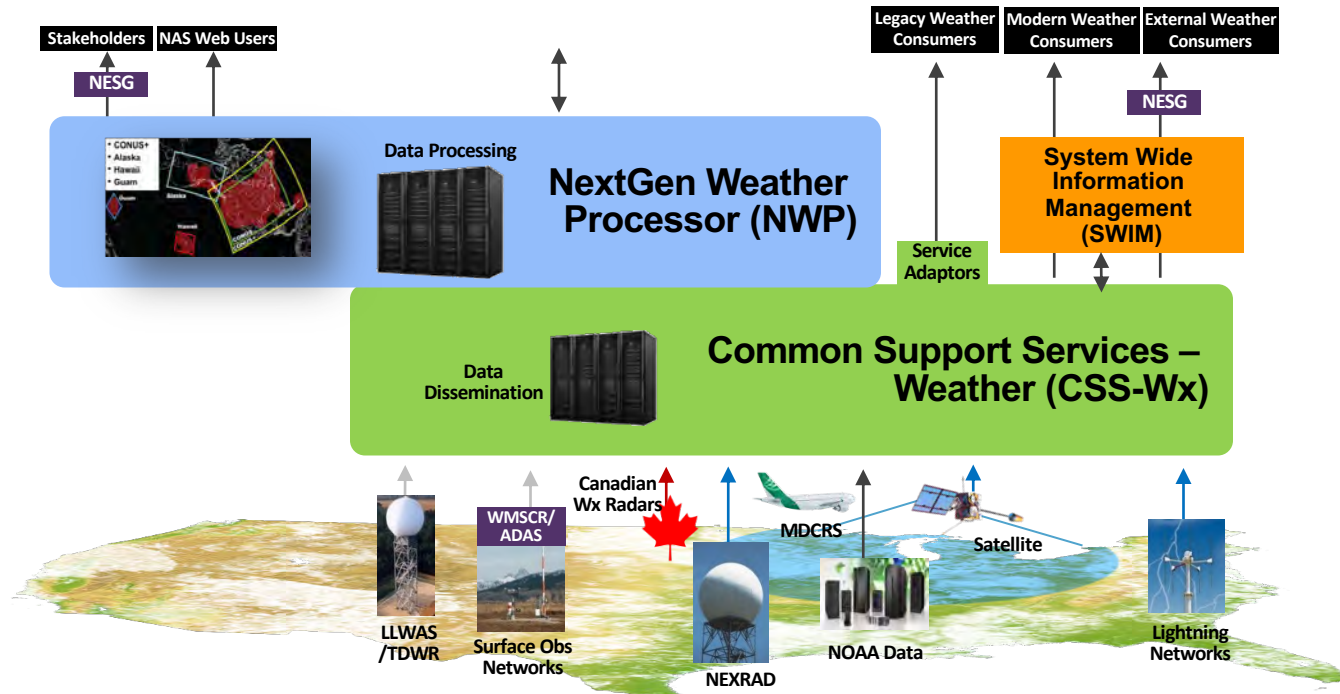
NextGen Weather Providers/Consumers
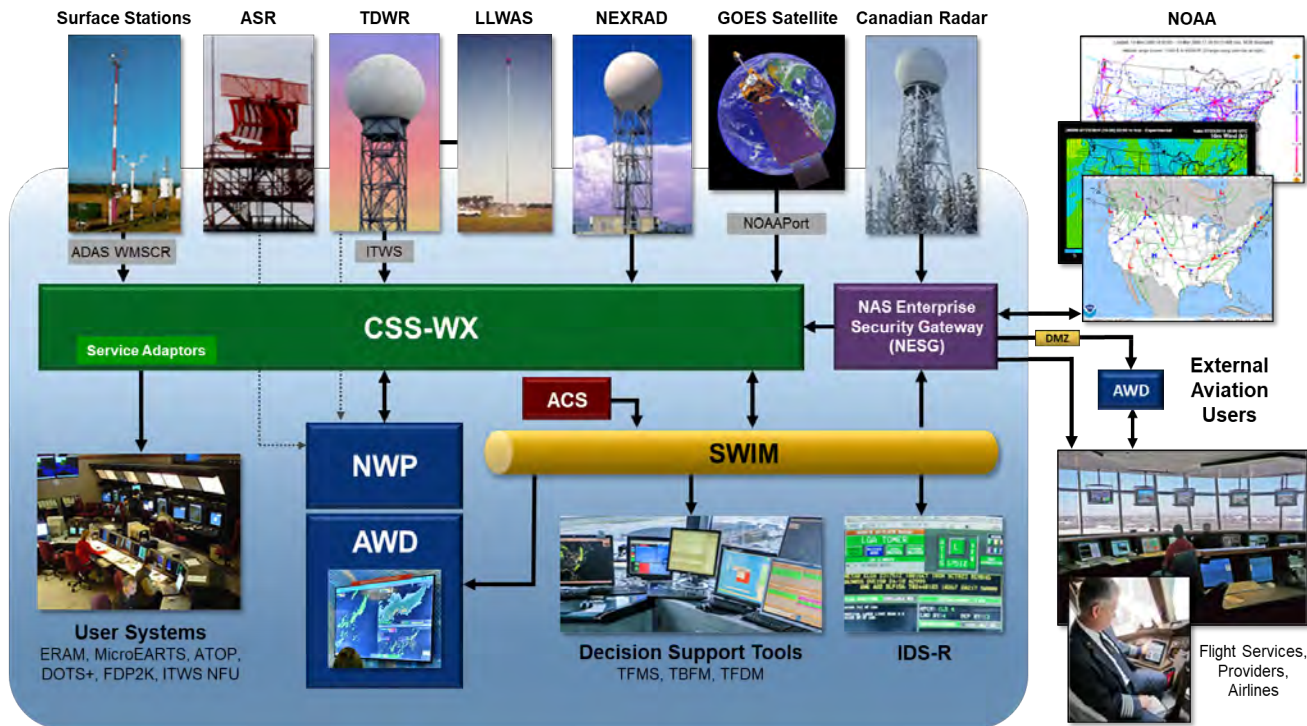
NextGen Wx to Replace Legacy Systems

Weather for Traffic Flow Management

Consolidated coverage domains

NWP Domains
- CONUS
- CONUS+
- Alaska
- Hawaii
- Guam

CIWS

Guam

Alaska

CoSPA

Hawaii

8-hr Predictions (prototype)

CONUS
CONUS +

Enroute Controllers' Mosaics

WARP
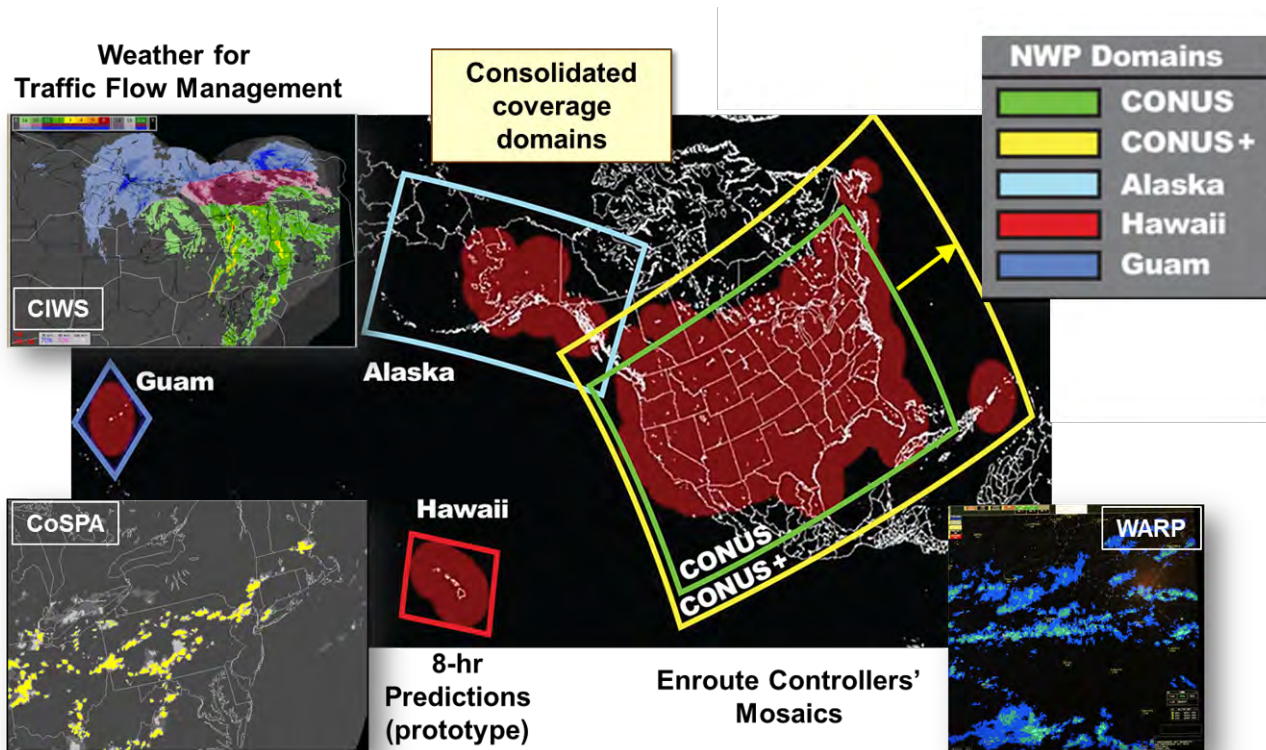
CSS-Wx and NWP Systems Using SWIM

CANRAD
NEXRAD
WMSCR

NGITWS
NOAAPort

FTI: NCMS, RMLS, ITWS NFU, ERAM, ATOP, DOTS+, FDP2K, Micro-EARTS

CSS-Wx
2 Central Nodes

NWP
2 Central Nodes

Airlines, Other Internal & External Users

SWIM: Internal (e.g., TFMS, TBFM), External (e.g. DoD, Airlines.)

NEMS

AWD
External
Web Server

NWP
6 NWP – AWD Nodes

Compressed TDWR

TDWR

AWDs (e.g. ARTCCs, ATCSCC, CERAPs, NEMCs, ATCTs/TRACONs)
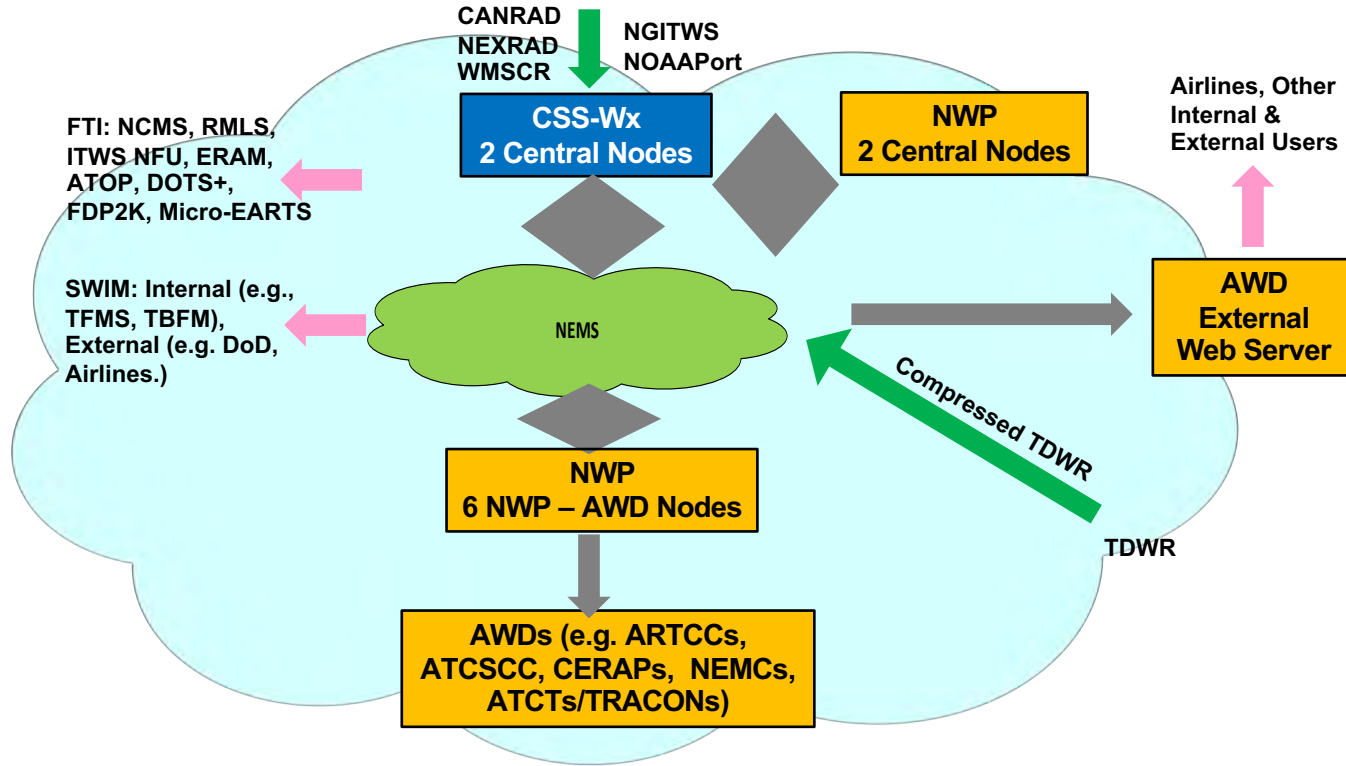
NextGen Weather Site Implementation
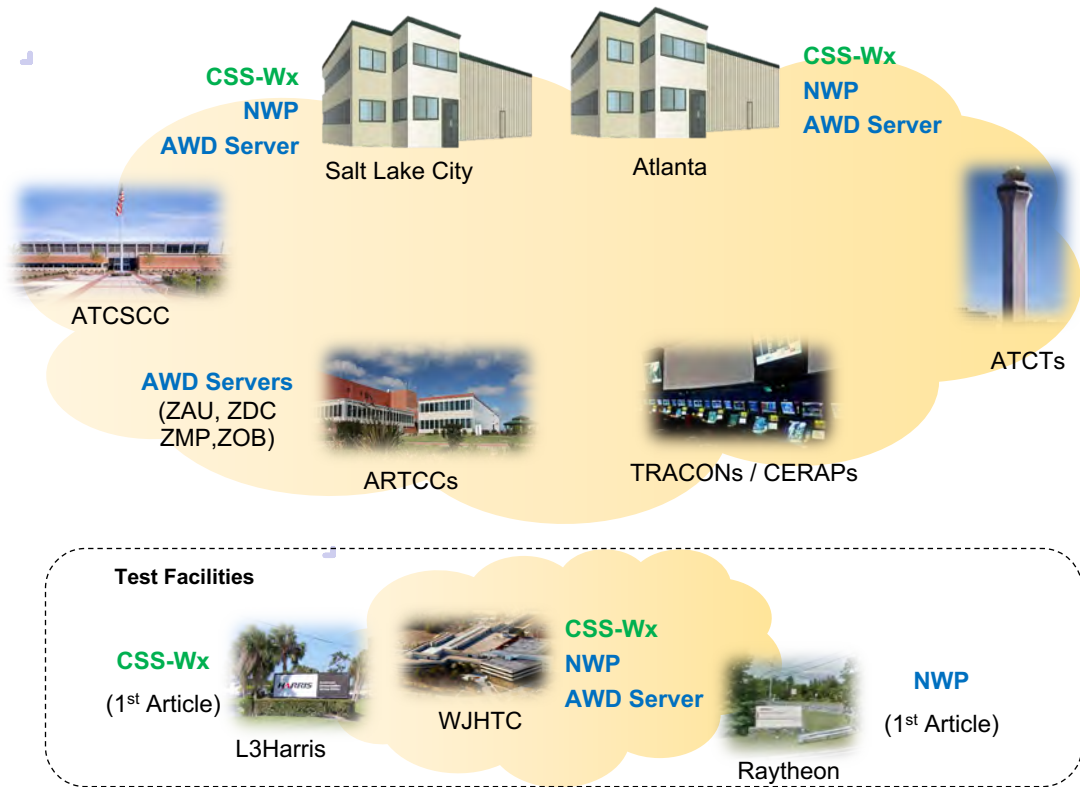
Aviation Weather Display (AWD)

- **AWD provides users with access to aviation specific weather information from CSS-Wx generated by NWP, NOAA, other sources**
  - AWD Servers obtain information from CSS-Wx published on SWIM
  - AWD will be used in designated Air Traffic (AT) facilities by users such as AT specialists, Center Weather Service Units (CWSU) meteorologists
  - Authorized users internal and external to the FAA will have access to the AWD via the internet through the AWD website
- **Replaces legacy weather displays, e.g., WARP Briefing Terminals, CIWS Situation Displays and Website**

Legacy Weather Displays

Aviation Weather Display
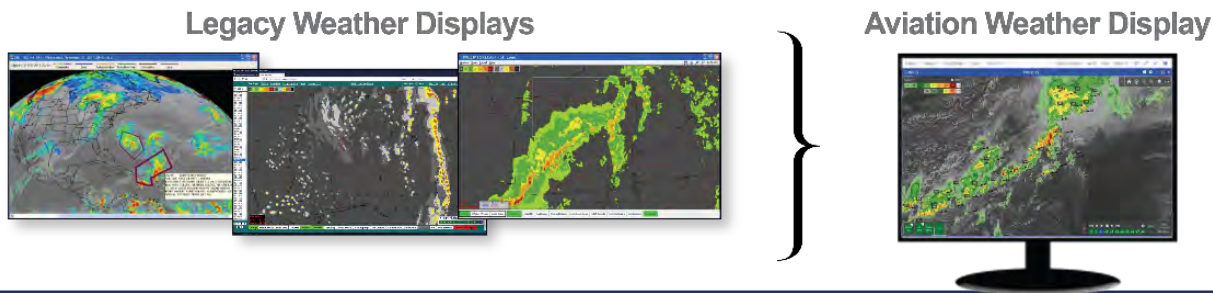
CSS-Wx Data Access Services

- Ingests weather sensor, NWP data and NOAA data (e.g., satellite, models, alphanumeric)
- Makes weather data available through Web Services/JMS
- Adheres to international standards for handling and representing geospatial data
- Consumers subscribe to CSS-Wx products through SWIM

OGC®
Open Geospatial Consortium

Java Message Service
- Queue(s) configured to consumer's specific data needs
- Notifies as new data is published

Web Coverage Service	Web Feature Service	Web Map Service
• Filters and transforms large gridded dataset • NetCDF format	• Filters and transforms non-gridded data sets • XML format	• Renders weather data as single large image or sets of tiled images for display • JPEG, PNG, GIF format

NextGen Weather Data Services

- **Available Products will be listed in NAS Service Registry Repository (NSRR)**
  https://nsrr.faa.gov
  - Documentation that provides product details and information on how to acquire
- **Sample products could be made available upon request (outside NSRR)**
- **Users outside the FAA obtain products through Subscription Service**
  - Data available to consumers via SWIM
  - JMS destination is configured specifically for subscriber
  - Products distributed to subscriber as received
- **Designated users will have access to products via website (requires registration)**

NextGen Weather Products – Gridded

Gridded Weather Data	
• Precipitation (VIL)	• Icing Layer
• Precipitation (VIL) with Mask	• Composite Icing
• Precipitation (VIL) Forecast	• Icing Layer Forecast
• Precipitation (VIL) Forecast with Mask	• Composite Icing Forecast
• Echo Tops	• Turbulence Layer
• Echo Tops Forecast	• Turbulence Layer Forecast
• Precipitation (Base Reflectivity)	• Composite Turbulence
• Precipitation (Composite Reflectivity)	• Composite Turbulence Forecast
• Precipitation (Composite Reflectivity) with Mask	• Convective Weather Avoidance Fields
• Surface Precipitation Phase	• Convective Weather Avoidance Field Forecast
• Surface Precipitation Phase Forecast	• Satellite
	• Terminal Winds
NOAA Produced*	• *NOAA Model Data (RAP, HRRR, GFS, NAM)**

Future Weather Enhancement will also include Offshore Precipitation Capability (OPC), Precipitation on Glass (PoG)

NextGen Weather Products – Non-Gridded

Non-Gridded Weather Data		
• Precipitation (VIL) Forecast Accuracy • Precipitation (VIL) Forecast Contours • Echo Tops Forecast Accuracy • Echo Tops Forecast Contours • Lightning • Storm Information Hazard Text • Storm Information Leading Edges • Storm Information Motion Vectors • Fronts Forecast • Growth Trends • Decay Trends	• Forecast Confidence • Convective Weather Avoidance Polygons / CWAP Forecast • Wind Profiles • Tornado Detections • Icing Layer Contours • Composite Icing Contours • Turbulence Layer Contours • Composite Turbulence Contours • Pilot Report (PIREP) • Urgent Pilot Report (PIREP) • *ICAO Aircraft Report (AIREP)** • *Significant Meteorological* Information (SIGMET)** • *Convective Significant Meteorological Information (Convective SIGMET)** • *TFM Convective Forecast (TCF)**	• *Airmen's Meteorological Information Advisories (AIRMET)** • *Graphical AIRMET (G-AIRMET)** • *Winds Aloft Forecast** • *Surface Weather Observations* • *Aviation Watch Notification** • *Tornado Warnings** • *Severe Thunderstorm Warnings** • *Public Severe Weather Watch Notification (SEL)** • *Volcanic Ash Advisory Statement (VAAS)** • *Terminal Area Forecast (TAF)** • *Center Weather Advisories** • *Meteorological Impact Statements** • *Severe Weather Statements (SVS)**

NOAA Produced*

Future Weather Enhancement will also include Traditional Alphanumeric Code (TAC) data, etc.

NextGen Weather SWIM Partner

- **NextGen Weather Programs have frequent meetings with the Enterprise Engineering Services (EES) organization to plan for SWIM service requirements**
- **Working with SWIM to finalize CSS-Wx Producer on-ramping form**
  - Publish information to SWIM, e.g., NWP, OMO
  - External AWD Web Server on-ramping form to subscribe to information from SWIM
- **SWIM (Solace) Phase 1 Qualification Testing scheduled for August 2021**
- **CSS-Wx/NWP weather products are scheduled to be available on SWIM in 2024**
- **ITWS terminal weather products will continue on SWIM**

Summary

- **CSS-Wx and NWP establish FAA enterprise weather platform**
  - Work with SWIM to provide weather information to OGC users
- **Provide NextGen weather capabilities/advanced weather products to end-user systems, e.g., TFMS, ERAM, ATOP**
  - CSS-Wx and NWP key site IOC in 2024
- **Enhance weather capabilities for future users**
  - e.g., Offshore Precipitation Capabilities (OPC) for ERAM, Precipitation on Glass (PoG) for STARS, and Traditional Alphanumeric Code (TAC) data for ATOP

Special Topic: Insights into Trajectories & Supplemental SWIM Capabilities

Integrated Terminal Weather System (ITWS)

Presented to: SWIFT User Group

By: Volpe Center

Date: August 19, 2021

Federal Aviation Administration

ITWS SWIFT Presentation Agenda

1. **ITWS Program Overview**
2. **Simplified Data Flow**
3. **ITWS Web**
4. **ITWS-SWIM**

Federal Aviation Administration

ITWS Overview

- **ITWS is an automated weather information system that integrates weather data from multiple National Weather Service sensors and systems, as well as aircraft in flight.**
- **ITWS products include microburst prediction, gust front prediction, storm location, storm cell information, terminal winds, and tornado data. (approx. 30 products)**
- **FAA Air Traffic Management facilities and commercial air carriers can use this data to make operational decisions.**
- **Volpe Center connects to all 34 Product Generators (coverage for 80 airports)**
- **Volpe Center provides ITWS data in 2 formats:**
  - Graphical Images via Legacy ITWS Web
  - XML via SWIM

Federal Aviation
Administration

ITWS Overview: History

- **ITWS Web declared operational (2006)**

- **ITWS-SWIM Prototype produced live data (2008)**

- **ITWS-SWIM declared operational (2011)**

  - Pre-NEMS

  - Remote Broker hosted at WJHTC

  - Limited Users

- **ITWS-SWIM NEMS transition completed (2014)**

  - Removal of Remote Broker at WJHTC

  - Available to all SWIM users

Federal Aviation
Administration

ITWS Overview: Data Sources and User Types

ASR

TDWR

NEXRAD

Pilots

Controllers

AWOS/ASOS

LLWAS

Lightning

Aircraft

(MDCRS)

RUC

ITWS Real-Time Processor

- **1 hr Forecast**
- **Microburst Prediction**
- **Gust Front Prediction**
- **Storm Location & Motion**
- **Storm Cell Information**
- **Terminal Winds**
- **Tornado**

Airlines
- Dispatch
- Ramp Tower

Supervisors
- TRACON
- ARTCC TMU
- CWSU
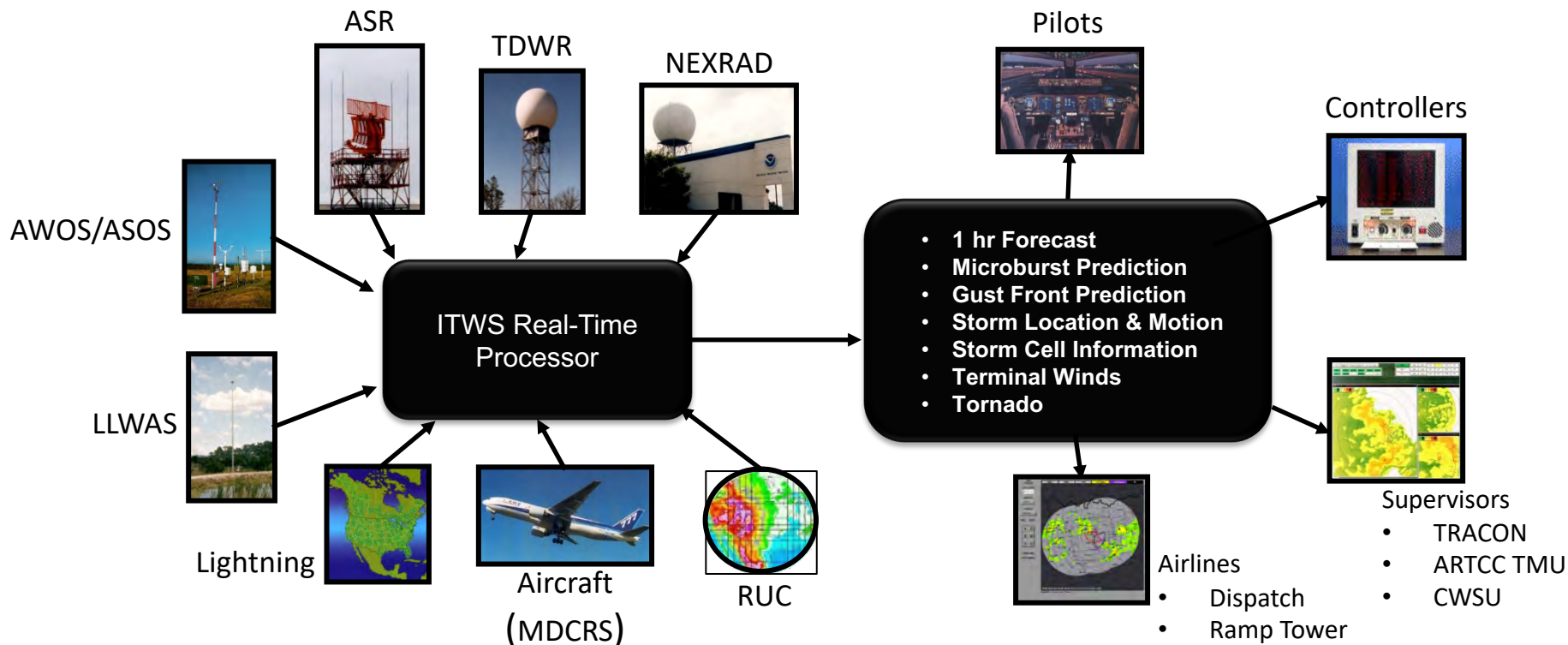
ITWS Overview: Coverage Area

- **34 ITWS Sites**
- **80 Airports**
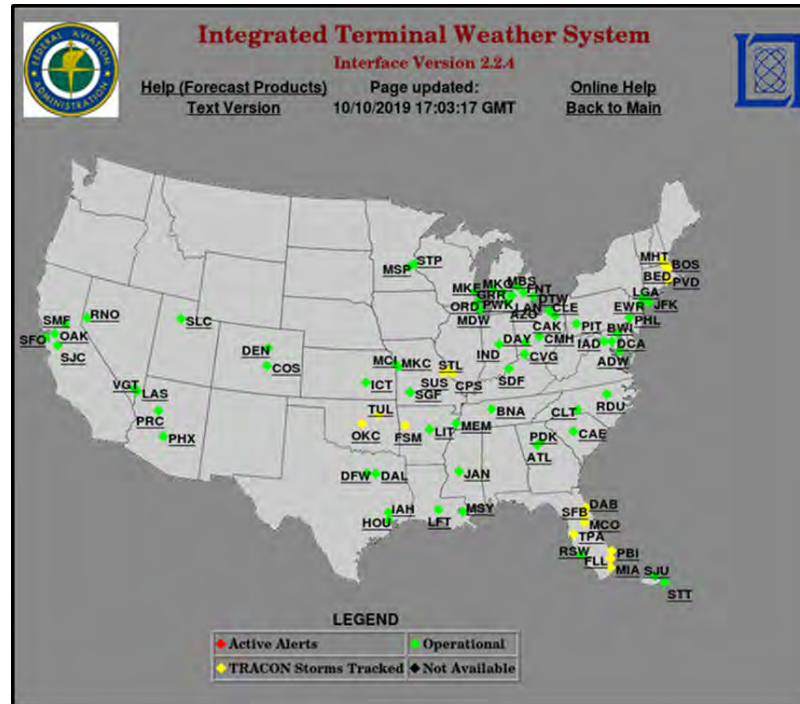
ITWS Simplified Data Flow
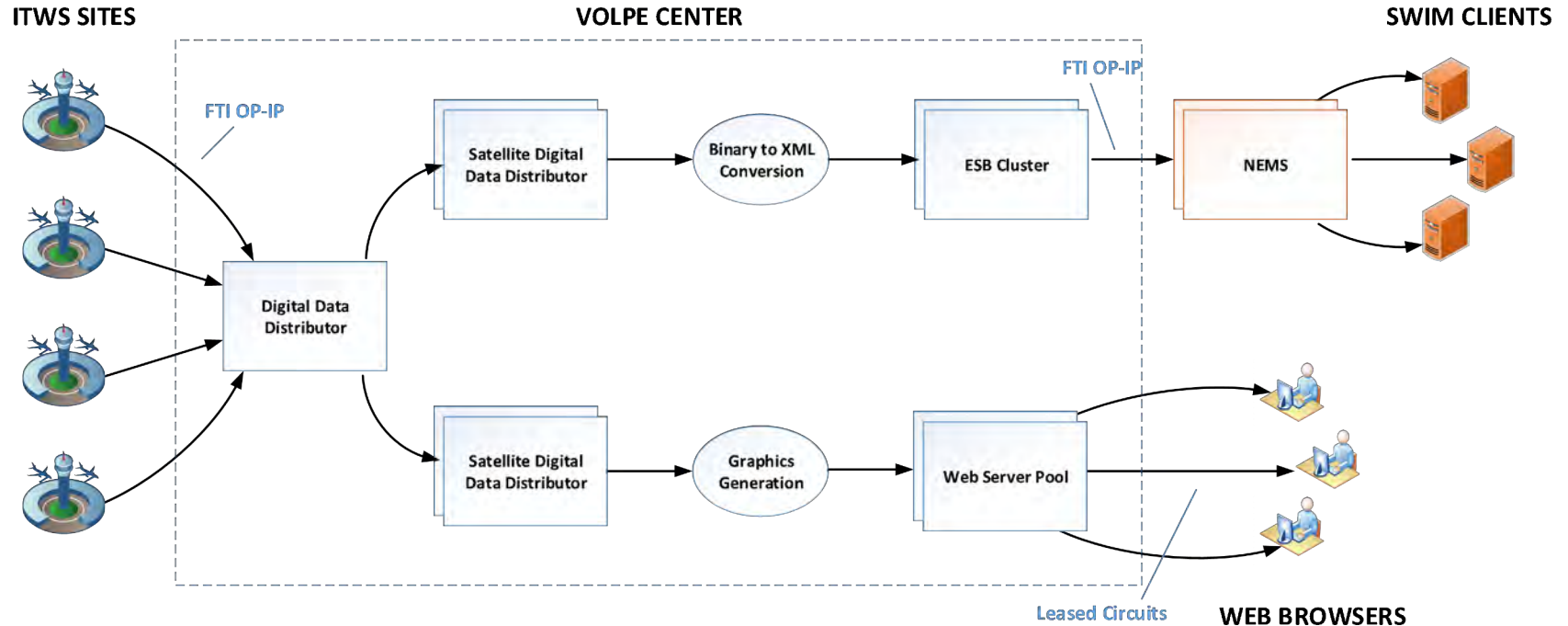
ITWS Web: Situation Display vs. ITWS Web

ITWS Situation Display
(New York)
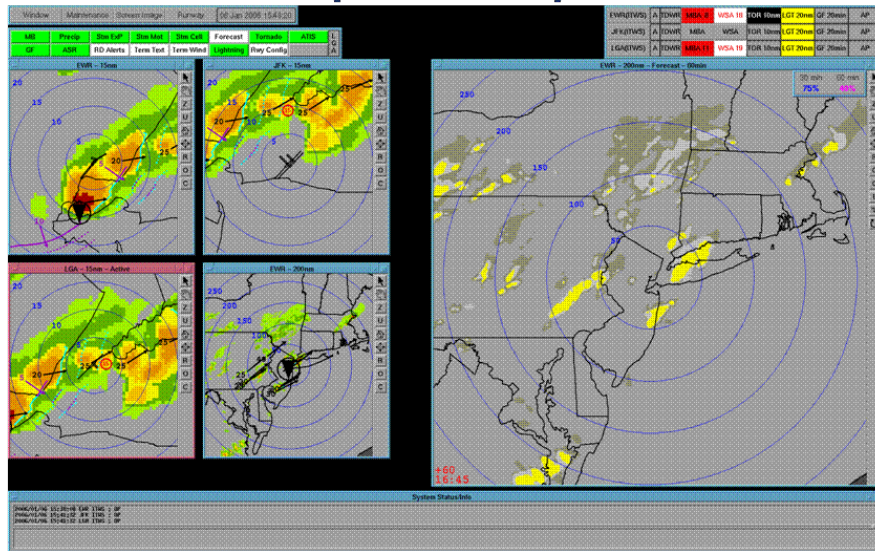
ITWS Web Display
(New York)

Federal Aviation
Administration
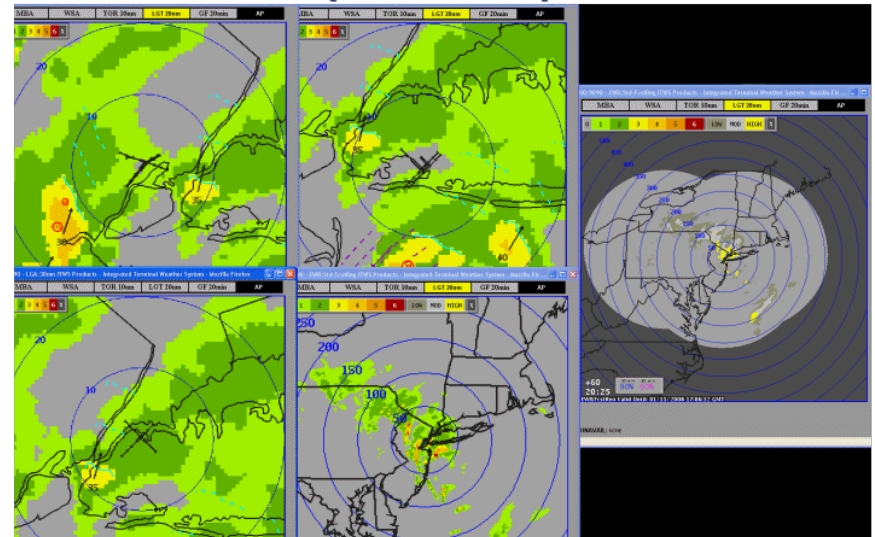
ITWS Web: Visualizations

ITWS Web: Current Users

Logo	Name
FAA LIT	Little Rock
FAA Technical Center	William J. Hughes Technical Center
FAA NWP	NextGen Weather Processor
PSF OKC	Program Support Facility Oklahoma City
NASEO	NAS Security and Enterprise Operations
C90	Chicago TRACON

Logo	Name
ATCSCC	Air Traffic Control System Command Center
ATL ROC	Atlanta Regional Operations Center
FAA DFW	Dallas/Fort Worth
FAA ESC	Eastern Service Center
FAAHQ	Headquarters
FAA JAN	Jackson, MS

Logo	Name
American Airlines	American Airlines
Continental Airlines	Continental Airlines
Delta Air Lines	Delta Airlines
FedEx Express	Federal Express
nwa Northwest Airlines	Northwest Airlines
Southwest Airlines	Southwest Airlines

Logo	Name
DFW Dallas/Fort Worth International Airport	Dallas/Fort Worth Airport Authority
MIT Lincoln Laboratory	Lincoln Laboratory
Metron Aviation	Metron
NOAA	National Oceanic and Atmospheric Administration

ITWS-SWIM: Messages

- **Timing information important to ITWS**
  - generation_time: When product was created at ITWS site
  - expiration_time: When product is no longer valid (from ITWS site)
  - received_time: When ITWS-SWIM received message from Digital Data Distributor
  - enqueue_time: When placed on NEMS input queue
- **Simplified for easy integration**
- **One-to-one message fields**
- **No alterations made**

```
- <itws_msg>
  - <packet_header>
        <packet_header_msgno>1929114</packet_header_msgno>
        <packet_header_product>12</packet_header_product>
        <packet_header_packet_index>1</packet_header_packet_index>
        <packet_header_packets_in_msg>1</packet_header_packets_in_msg>
        <packet_header_packetsize>316</packet_header_packetsize>
    </packet_header>
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```

ITWS-SWIM: Products Available

Product ID	Product Name	Implemented	Enabled
9832	Microburst TRACON Map Product	YES	ENABLED
9833	Gust Front TRACON Map Product	YES	ENABLED
9834	Gust Front ETI Product	YES	ENABLED
9837	Wind Profile Product	YES	ENABLED
9838	Tornado Detections Product	YES	ENABLED
9839	Tornado Alert Product	YES	ENABLED
9840	Configured Alerts Product	YES	ENABLED
9893	Microburst ATIS Product	YES	ENABLED
9894	Wind Shear ATIS Product	YES	ENABLED
9844	Terminal Weather Text Normal Product	YES	ENABLED
9895	Terminal Weather Text Special Product	YES	ENABLED

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ITWS-SWIM: Products Available, cont.

Product ID	Product Name	Implemented	Enabled
9843	Terminal Weather Graphics Product	YES	ENABLED
9845	Airport Lightning Warning	YES	ENABLED*
9847	AP Status	YES	ENABLED
9848	AP Indicated Precipitation Product	YES	ENABLED
9849	Precipitation 5nm Product	YES	ENABLED
9850	Precipitation TRACON Product	YES	ENABLED
9853	SM_SEP 5nm Product	YES	ENABLED
9854	SM_SEP TRACON Product	YES	ENABLED
9857	Hazard Text 5nm Product	YES	ENABLED
9858	Hazard Text TRACON Product	YES	ENABLED
9861	Runway Configuration Product	YES	ENABLED

* Airport Lightning Warning encrypted and not available to most users.

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ITWS-SWIM: Products Available, cont.

Product ID	Product Name	Implemented	Enabled
9835	Coarse Analysis Product	NA	NA
9836	Fine Analysis Product	NA	NA
9897	ITWS Status Information	YES	ENABLED
9901	Forecast Image Product	YES	ENABLED
9902	Forecast Accuracy Product	YES	ENABLED
9903	Forecast Contour Product	YES	ENABLED
9904	Hazard Text Long Range Product	YES	ENABLED
9905	Precipitation Long Range Product	YES	ENABLED
9906	SM SEP Long Range Product	YES	ENABLED
9911	SM SEP 5nm Product	YES	ENABLED

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ITWS-SWIM: Data Integration
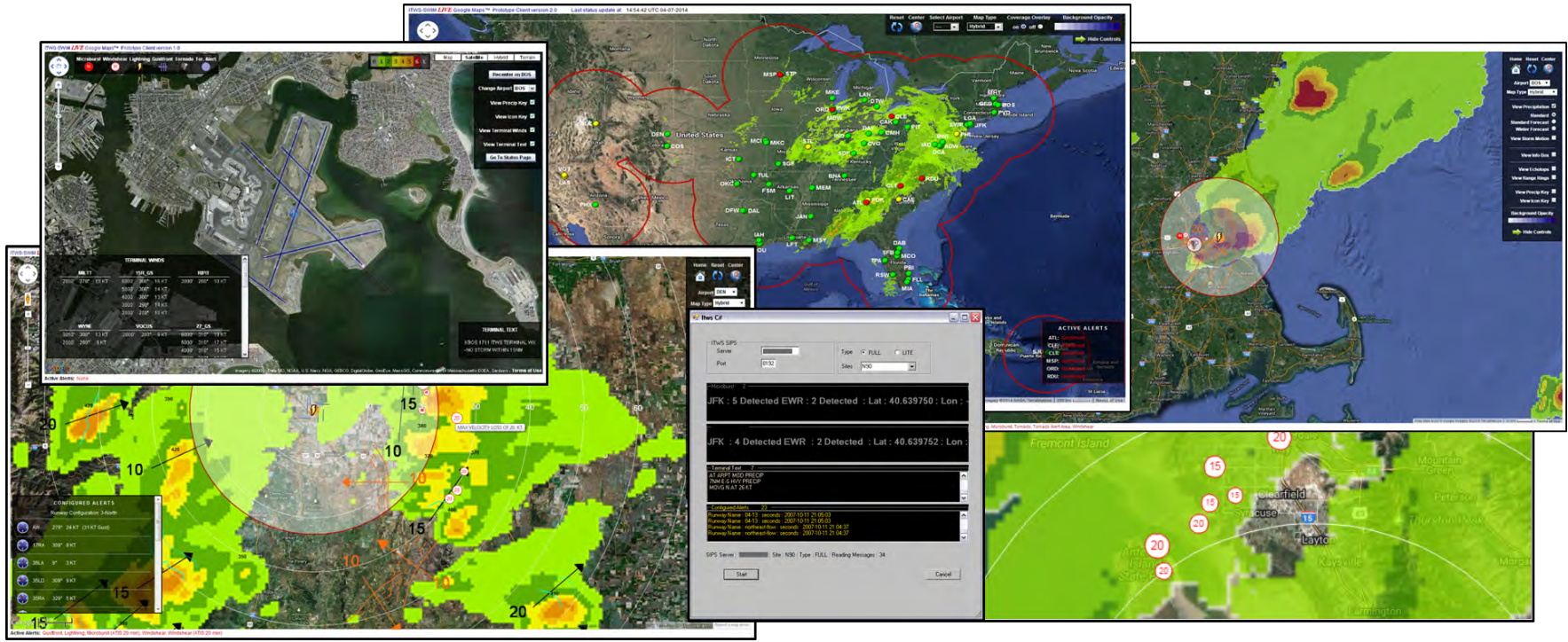
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ITWS SWIFT Presentation

Questions or Comments?

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SWIFT WINDS

United Widget – Leveraging ITWS

Presented to: SWIFT

By: Mike Jagmin – United Airlines

Date: August 19, 2021

SWIFT Winds

- **United ATC had expressed interest in ITWS Center field winds and associated alerts**
  - Opportunity to explore a new SWIM Feed
  - Learn more about ITWS
  - Use the data to provide better information
- **Expected Benefits**
  - Access to real-time wind data available to the FAA ATC controllers
    - **Higher Refresh Rate**
    - **More granular wind readings**
      - Center Field Winds
      - Runway Specific App/Dep Wind Readings

Today's Operation

- Approach and Tower facilities make decisions based on the information in ITWS

- Airlines do not have this information readily available and are relying on ASOS or METARs which have a much lower refresh rate and may not match the ITWS center field or runway readings

  - Leading to inconsistent wind data, potential rework, and increase AOC/ATC workload

ITWS Winds

- **What are Center Field Winds?**
  - Generally more centrally located than ASOS
  - More frequent refresh rate than other weather reports

- **Where to find them in ITWS?**
  - "Configured Alerts" Message
    - Ribbon Display Alerts
    - Airport Winds

ITWS Winds

- **2 Versions in Use**
  - The Wind Measuring Equipment (WME,LLWAS 2)
    - One pole located near the center field of the airport
    - 2 Min Average, 10 Second Update
  - LLWAS-NE++ (LLWAS 3)
    - Network of poles providing runway specific alerts (integrated with ITWS) at the threshold
      - 30 Second Average, 10 Second Update
    - Center Field pole 2 Min Average /10 second Update

Sample Configured Alert Message

Dashboard Display

- **Center Field (AW)**
  - Previous 60 readings
    - Direction, Speed, Max Gust included
- **Runway Alerts**
  - Most Recent Reading
    - Direction, Speed, Max Gust
    - Active Hazard
    - Active Hazard Wind Speed Gain or Loss

LGA A04-D31 Wind: 330@13 G19 2020-11-03T22:05:10Z

Runway	Dir	Speed	Hazard
31 A	330	14	
31 D	340	11	
04 A	330	17	
04 D	350	12	

SWIFT Winds

- **Big Thanks to those who helped me decipher and understand the data**

  - Shane Kent (Volpe)

  - Seth Troxel (MITLL)

  - Robert Ottesen (Solace)

LIVE DEMO

Operational Context Focus Group

Special Topic: SWIM Flight Data Publication Service (SFDPS)

Presented to: SWIFT

By: Xavier Pratt – LS Technologies

Date: August 19, 2021

Agenda

- **ERAM Background for SFDPS**
- **SFDPS Data Flow**
- **SFDPS Data Messages Overview**
- **SFDPS Publish/Subscribe & Query Services**
- **SFDPS Ops Context Document Layout**
- **SFDPS Updates**

SFDPS Background

- **SFDPS is the SWIM program developed to provide En Route Automation Modernization (ERAM) flight and airspace information services to a wide variety of consumers.**
    - SFDPS publishes ERAM data from the 20 Contiguous U.S. (CONUS) Air Route Traffic Control Centers (ARTCCs)
    - SFDPS uses Service-Oriented Architecture (SOA) message patterns for publishing data from the ERAM
    - These systems are located at each of the 20 ARTCCs

- **SFDPS provides the following services:**
    - En Route Flight Data Publication & Query (ERFDP/ERFDQ)
    - En Route Airspace Data Publication & Query (ERADP/ERADQ)
    - En Route General Message Publication (ERGMP)
    - En Route Operational Data Publication* (ERODP)

Note: ERODP is an internal FAA service and, as such, no Ops Context Document will be developed.

SFDPS Data Flow
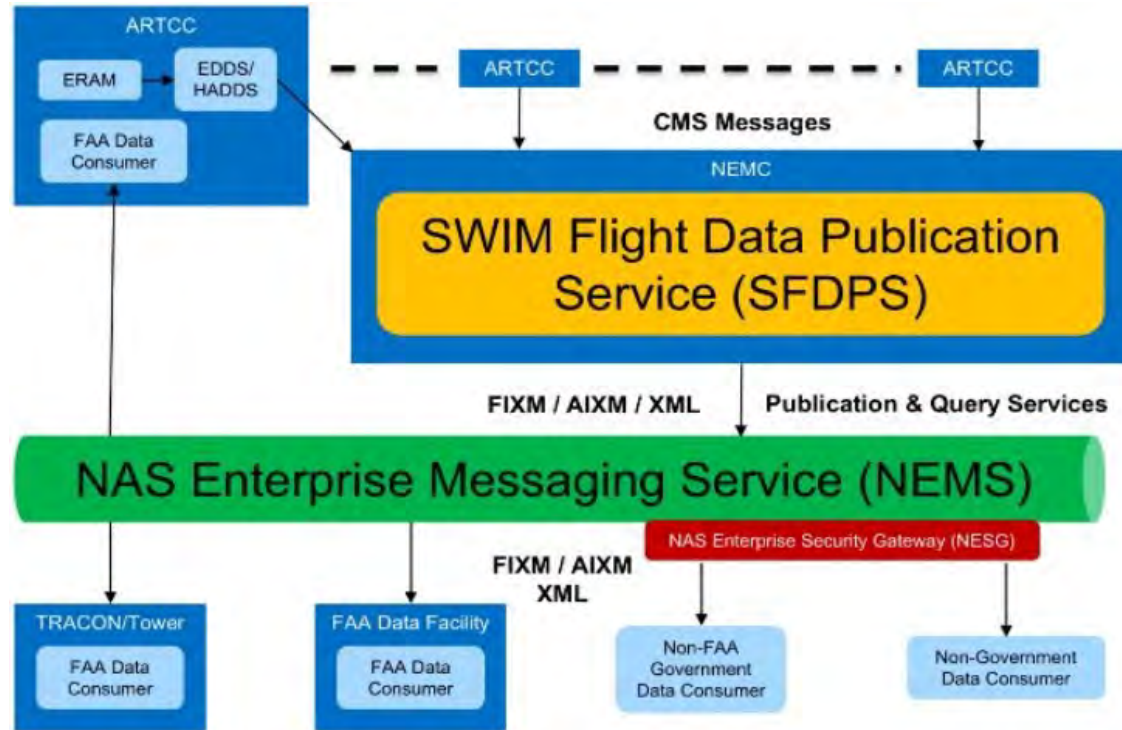
https://www.faa.gov/air_traffic/technology/swim/sfdps/

SFDPS Data Messages Overview

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

- Flight Plan information
- Flight Amendment Information
- Converted Route Information
- Cancellation Information
- Departure Information
- Aircraft Identification Amendment Information
- Hold Information
- Progress Report Information
- Flight Arrival Information
- Flight Plan Update 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 Information
- Drop Track Information
- Interim Altitude Information
- Automated Radar Terminal System (ARTS) Flow Control Track/Full Data Block Information
- Beacon Code Reassignment
- Beacon Code Restricted
- Flight Plan Data Bank (FDB) Fourth Line Information
- Point Out Information
- Inbound Point Out Information
- 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

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

General Information Message Publication Service*: Published by SFDPS

- General Information

SFDPS Publish/Subscribe Services

- **Consumers subscribe to the SFDPS publication via the NEMS and receive messages over a Java Message Service (JMS) topic assigned to them.**
  - A client subscribes (signs up) to a service to receive all messages (published).
  - Elect to receive all or a subset of the messages available in XML, Flight Information eXchange Model (FIXM), Aeronautical Information eXchange Model (AIXM) formats.
  - **Publish/Subscribe services include:**
    - ERFDP – En Route Flight Data
    - ERADP – En Route Airspace Data
    - ERGMP – En Route General Information
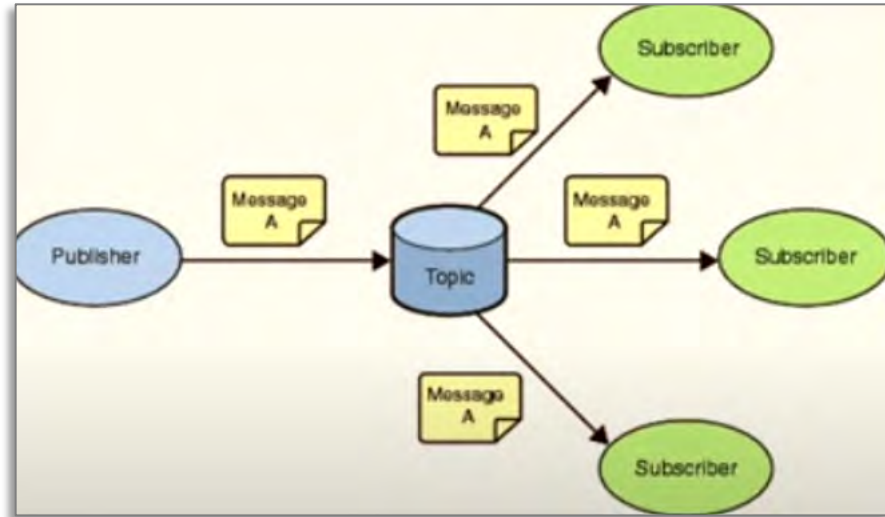
The publish/subscribe messaging model, is a form of asynchronous service-to-service communication where any message published to a topic is immediately received by all subscribers to the topic.

SFDPS Query (Request/Reply) Services

- **SFDPS Request/Reply enables consumers to request a range of SFDPS data through temporary subscriptions.**
  - Requests includes multiple criteria that consumers can use to specify the type of data they require.
  - Response data is streamed back to the consumers, through the NEMS JMS interface.
  - Consumers may receive the data on the same topic where they receive their pub-sub data.
- **Returned messages are available in XML, FIXM, and AIXM formats.**
- **Publish/Subscribe services include:**
  - ERFDQ – En Route Flight Query
  - ERADQ – En Route Airspace Query
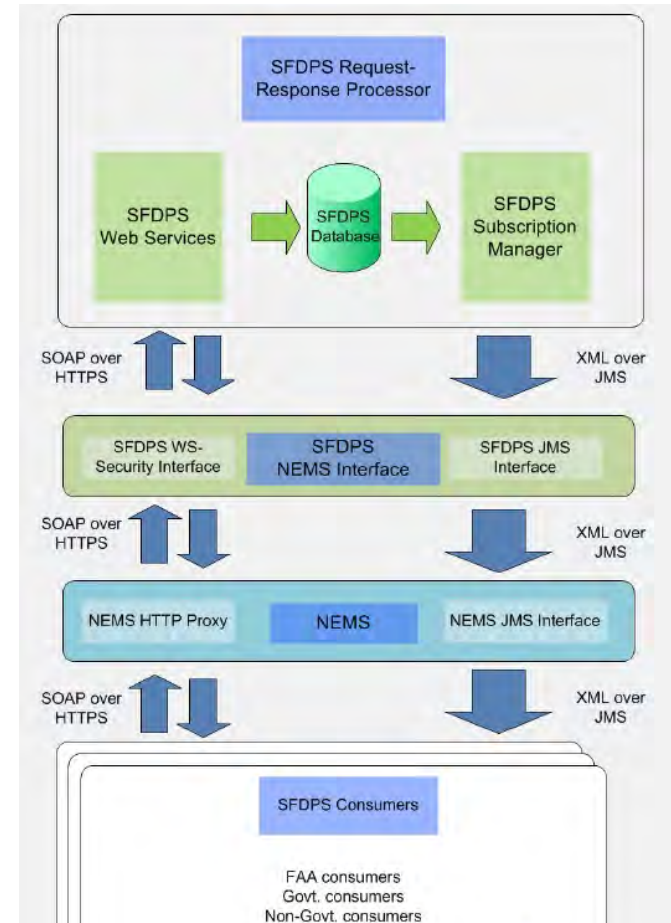
In a request/reply messaging model, a message is published to a Topic or Queue, in which, a client can consume the message without providing a reply message in response to the publisher.

SFDPS Ops Context Document(s) Layout

1. **Introduction**
2. **En Route Data/ERAM Overview**
   - Includes References
3. **SFDPS Service Overview**
4. **SFDPS Message Types**
5. **Appendix**
   - Acronyms
   - Sample SFDPS Message

SWIFT Information & References

- **SWIFT Focus Group Website**
  - http://connect.lstechllc.com/index.cfm/main/opconfocusgroup
- **Documents**
  - In addition to the NSRR, all SWIFT Documentation can also be found at: https://connect.lstechllc.com/index.cfm/main/swifthome
- **Contacts**
  - Xavier Pratt xavier.pratt@lstechllc.com
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  - Stefanie Calabrese stefanie.c.calabrese@faa.gov

INTERMISSION

NAS Common Reference (NCR)

Correlating NCR with Flight Data

Presented to: SWIFT 15

By: Kristin Cropf – FAA & Patrick Sheridan (Volpe)

Date: August 19, 2021

Federal Aviation Administration

Agenda

- **Introduction**
- **NCR Overview**
- **Three NCR data correlation Use Cases**
  - NCR scaling exercise (SFDPS / NCR)
  - Using SWIM data sources to correlate flight data with NCR
  - OPSNET-R historical analysis
- **Next Steps**

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Purpose of NAS Common Reference (NCR)

Consolidate NAS Data
- Acquire and integrate NAS status and constraint information from cross-domain sources

Provide Filtered Constraints
- Provide the ability for constraints to be retrieved for a specific 4D trajectory (4DT) and/or a defined airspace volume

Provide Auto Updates
- Provides defined sets of information via one-time request or via request with future updates

Correlate NAS Data
- Create a spatially and temporally correlated view of NAS data to improve common situational awareness

NCR Overview

- **NCR is a NAS Program that provides SWIM Services for parsing, storing, and correlating NAS data**
  - Consumers multiple SWIM producers across NAS domains
    - Aeronautical
    - Traffic flow management
    - Weather - future
  - Data standardization
    - Geo-referencing
    - Units of measure
    - Coordinate reference systems (CRS)
  - Dynamic user queries
    - Any combination of geospatial, temporal, and attribute filters
    - Think of a database query
    - Queries can be submitted as subscriptions
  - Applies constraints to trajectories (in 2D, 3D or 4D)
  - GML or GeoJSON response integrates with open source code

NCR 1.1 Available Constraints

TFMData Flow Information Service

Federal NOTAM System – NOTAM Distribution Service (FNS-NDS)

National Airspace System – Resources (ACS)

ACS + FNS-NDS

STDDS ISMC

Standard Terminal Data Distribution Service (STDDS) APDS

Minutes-in-Trail (MINIT)

Miles-in-Trail (MIT)

Airspace Flow Program (AFP)

Reroute

Airport Configuration (APTC)

Stop

Collaborative Trajectory Options Program (CTOP)

Advisory Text

Deicing (DICE)

Airport Data Services (APDS) Status

Departure Spacing Program (DSP)

Runway Visual Range (RVR)

Flow Evaluation Area / Flow Constrained Area (FXA)

PostgreSQL

Notice to Airmen (NOTAM)

Ground Delay Program (GDP)

Special Activity Airspace (SAA)

Ground Stop (GS)

Active SAA

Aviation Administration

Consistent Data

Temporal

- Issue time
- Start time
- End time
- Expiration time

Spatial
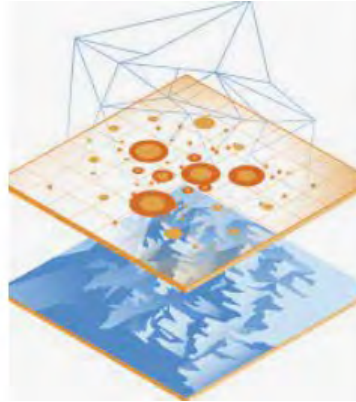
- Geo reference
- Min altitude
- Max altitude

Unit of Measure

- Altitude - Mean sea level
- Units - Feet
- CRS - 4326

Reference to original
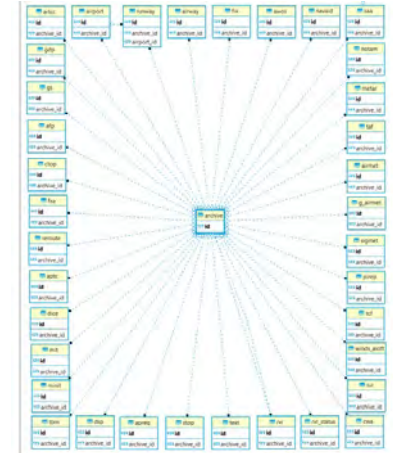
- Original messages in archive table
- Feature table rows link to an original message

NCR Request/Response

NESG

WFS

GeoServer

NEMS

GML/
GeoJSON

NESG
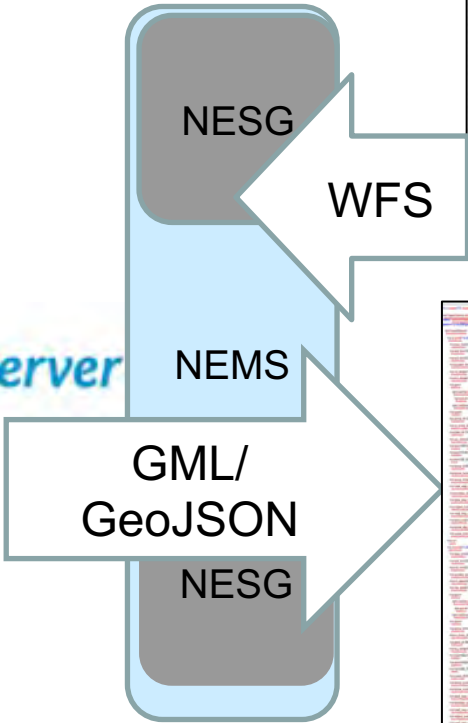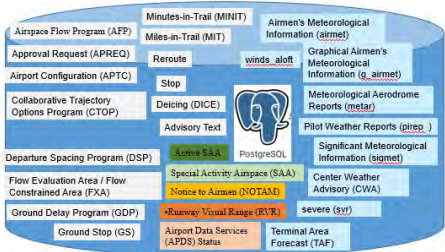
**Route
Query**

Web R/R

- **WFS**
- WMS
- XM
- Subscription

JMS

- Publication of changes
  based on subscription

**Query
Response**

Constraints

NCR Overview (cont'd)

- **SWIM compliant infrastructure and interface standards**
  - NAS Enterprise Messaging Service (NEMS) interface with producer systems and authorized NAS and Non-NAS consumers using.
- **NCR interfaces with the following NAS producers**
  - Traffic Flow Management System (TFMS)
  - SWIM Terminal Data Distribution System (STDDS)
  - Aeronautical Common Services (ACS)
  - FNS

NCR System Architecture
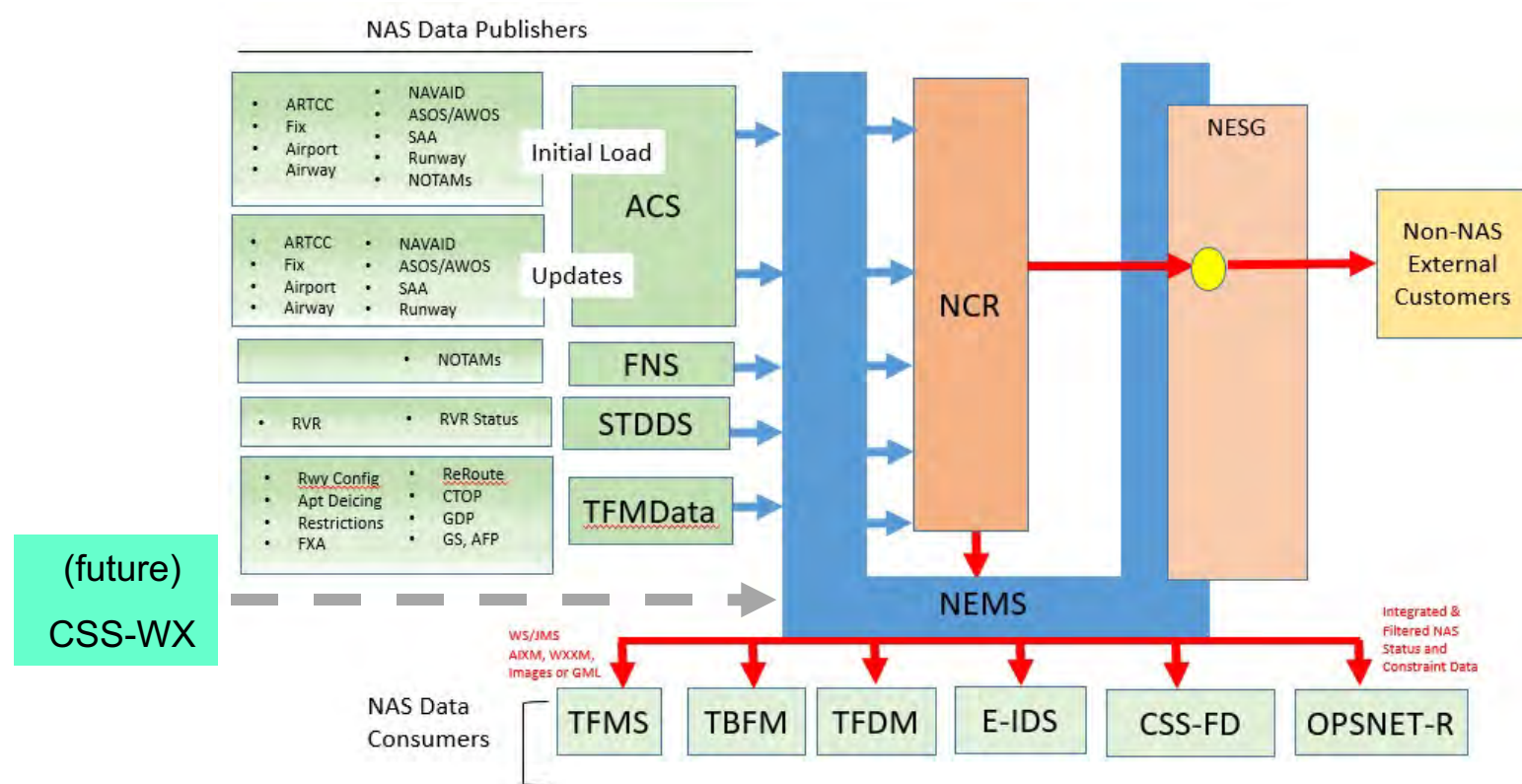
Three Use Cases Correlating SWIM Data

1. **NCR scaling exercise**
   - Data Sources: SFDPS + NCR
   - Purpose: Exercise the scaling capability of NCR docker containers to meet potential user needs
2. **Using SWIM data sources to correlate flight data with NCR**
   - Data Sources: SFDPS + NCR
   - Purpose: Demonstrate how to correlate SWIM Flight data with NCR constraint data
   - Live Demo
3. **OPSNET-R historical analysis**
   - Data Sources: FAA NAS Datawarehouse + NCR
   - Purpose: Correlate flight delays with past constrains in the NAS

NCR Scaling experiment Methodology

- **Use SWIM Data (SFDPS) as a Route Data Source**
  - SFDPS data via SCDS connection
  - Produce a tool to convert the SFDPS data into a database (sfdps-flights)
  - Used SFDPS flight data
    - FH - Flight Plan Information
    - AH - Flight Amendment Information

- **Metric Tool**
  - Read the sfdps-flights data base
  - Submit different route query types to NCR
    - Specific type - route_string, 2-D, 3-D, 4-D
    - Mixed (random)
  - Run multiple metric tools to increase the queries submitted to NCR

- **Collect metrics**
  - Response Time
  - Response size
  - Matching layers
  - Number of features
  - http status

Query Type	Inputs	Processing
Route Sting	Route String, Departure Time, Cruising Speed, Cruising Altitude	Converts route string to 2DT, then follows 2DT processing.
2DT	Series of X/Y Points, Departure Time, Cruising Speed, Cruising Altitude	Utilizes trajectory model to convert inputs to a series of X/Y/Z/T points.
3DT	Series of X/Y/Z Points, Departure Time, Cruising Speed	Utilizes trajectory model to convert inputs to a series of X/Y/Z/T points (altitude modeling not required).
4DT	Series of X/Y/Z/T Points	No use of trajectory model.

Flight data in SWIM

SWIM Data Consumers

Airlines

National Airspace Data Interchange Network (NADIN)

En Route Automation Modernization (ERAM)

SWIM Flight Data Publication Service (SFDPS)

Flight Information Exchange Model (FIXM)

EDDS: En Route Data Distribution Service (EDDS)/Host ATM Data Distribution System (HADDS)

SWIM Cloud Distribution Services (SCDS)

NCR Metric Tool

SCDS connection set up for all airports and all flight types

AH – Flight Amendment

FH – Flight Plan

Flight/Route Metric Tool Overview

SWIM Flight Data Publication Service (SFDPS)

APACHE nifi

SFDPS
flight_routes
flights

Get flight data

Scaled to increase demand on NCR

•Metric Tool

Create route Query
Get NCR results
Store in database - include metrics

1 2 3 4 5

NCR Request processing

Metrics
- ✓ route_type
- ✓ query_duration
- ✓ feature_count
- ✓ layers_received
- ✓ bytes
- ✓ http_status

Metric
metrics
results

Web Request/Response (Route Query)
(NCR Response)

Scalable to meet demand

of NCR Route Queries per Hour

Queries per hour**
7/19@0400 to 7/23 @0900

**Queries per hour is SFDPS data x 5 metric tools (proposed flights)

July 19   July 20   July 21   July 22   July 23

# of Queries

Month-Day-Hour
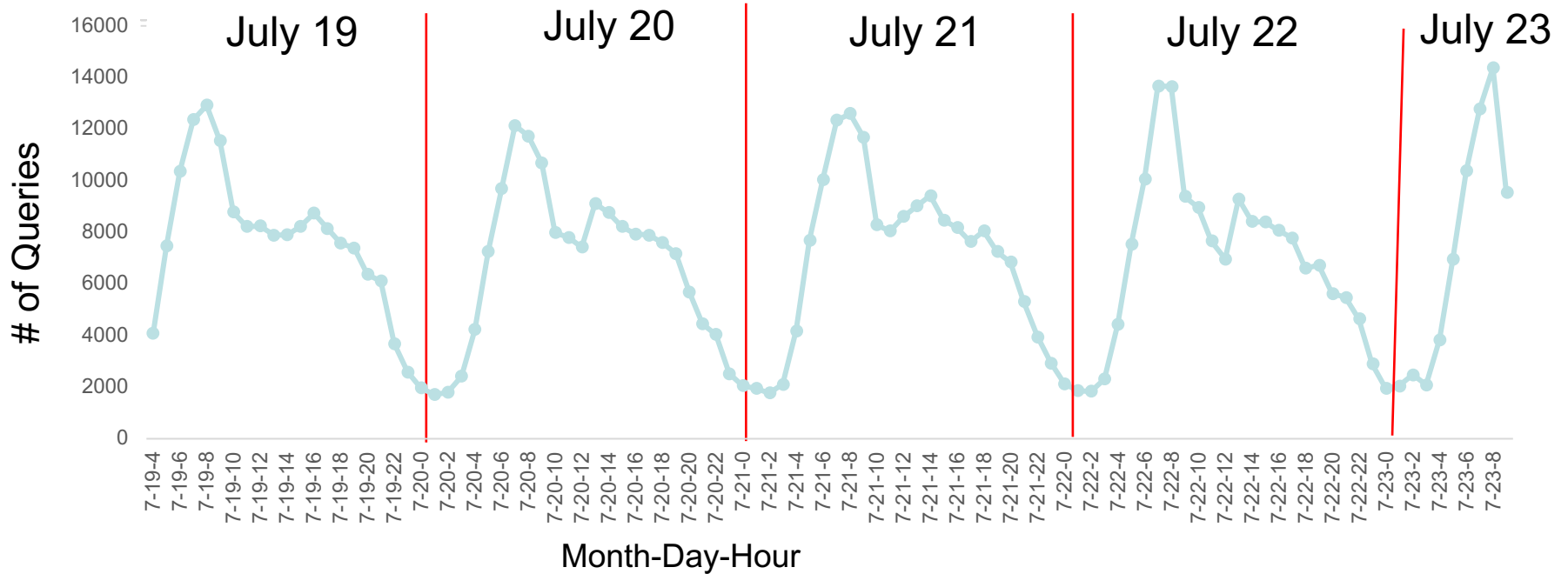
NIFI Development

History of Apache NiFi

2006	2014	2015	Till Now
Developed by NSA	Denoted to ASF	Official part of Apache Project suite	New Update releases

Year	Description
2006	Niagara Files (NiFi) was developed by the NSA (United State National Security Agency) in 2006 for over eight years.
2014	In November 2014, NSA released it as open-source software and donated to Apache Software Foundation (ASF).
2015	In July 2015, it reached to ASF top-level project status and became an official part of Apache Project Suite.
Till now	Every 6-8 months since then, Apache releases a new update of Apache NiFi

https://nifi.apache.org/docs.html

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NIFI Key Features

Partial NIFI SFDPSD

Processing Graph

Apache NiFi

Key Features

- Guaranteed delivery
  - Data buffering
  - Backpressure
- Pressure release
- Prioritized queuing
- Flow specific QoS
  - Latency vs. throughput
  - Loss tolerance

- Data provenance
- Supports push and pull models
- Recovery/recording a rolling log of fine-grained history
- Visual command and control
- Flow templates
- Pluggable, multi-tenant security
- Designed for extension
- Clustering

https://nifi.apache.org/docs.html

Correlate Flight data & NCR Route Query - Demo
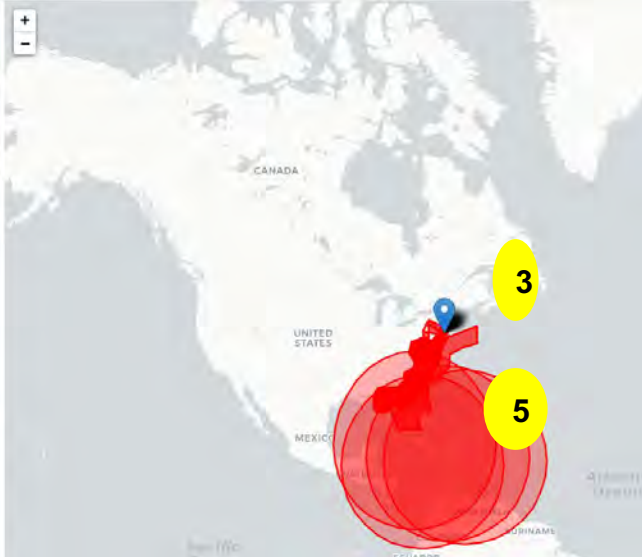
- **SWIM Data**
  - SFDPS
  - NCR
- **Allow users to correlate flights at an airport with constraints**
- **Demonstrate how to use NCR to better understand NOTAM data associated with a flight**

Flight <> Route correlation demo

1 – Enter Query Information for flight data

2 – Select a flight to get the route and NCR query options

3 – Map the route

4 – Get a count of constraints

5 – Map the constraints

6 – Review NOTAMs

KJFK./.TRV031157..APOLO.CWRLD4.KMCO

3 (Map icon)	Map Route	5 (Search icon) Map Constraints
4 (Bar chart icon)	Get Constraints	6 (Histogram icon) NOTAM Key Word Histogram
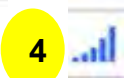
NOTAM Key Word Histogram

1. Known Keywords
2. User requested keywords

NOTAM Histogram

Operations Network (OPSNET)

- **FAA's official source for National Airspace System**
  - daily delay reporting
  - airport traffic counts
  - instrument operations
- **Provides essential metrics for accurate measurements of NAS performance - including**
  - Daily collaborative reports involving the FAA, air traffic facilities and airlines
  - Weekly NAS status reports
  - Congressional reports
  - Capability improvements

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Operations Network (OPSNET-R)

- **Expand collection and recording of delay causes**

- **Provide a system that:**
  - limits manual data entry
  - automates compilation of operational data received from FAA automation systems

- **Increase the accuracy of reporting**
- **Enable the FAA and the airlines to improve air traffic operational services and procedures**
- **Improve definitions for measuring NAS performance**
- **Standardize definitions of the reported metrics**

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NCR as a Source of Causal Information

- **NCR provides an alternate source of constraint data**
  - Without modifying the NCR interface, query data for core 30 airports at regular intervals
  - Constraint data includes point or polygon location data useful for visualization
- **Store NCR query results for historical**
  - Retain NCR query results in Postgres and Elasticsearch
  - OPSNET-R could query stored NCR data for delay causes
- **NCR data can be merged with NAS-DW data for additional insight**
  - NCR data is stored in the PoC PostgreSQL database

FAA NDW & NCR Data Flow

FAA NAS-DW

Transformed data (excluding tracks), SFDPS counts

Airport TMIs and constraining events core 30 airports

elasticsearch → kibana

Single flight, all available data

NCR Constraints

OPSNET-R

Single flight transformed data (including tracks)

Single airport transformed data

Web pages (demo)

Single airport, all available metrics

General Query (airport polygon)

TMIs, NOTAMs, IMC events

- Updating each metric every ~30 minutes

- Added SFDPS Point Out and Hold Message counts from NDW

- Added NCR constraints to Elasticsearch for aggregation, applied "correlation score" as a relevance indicator

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DFW Arrivals/Departures
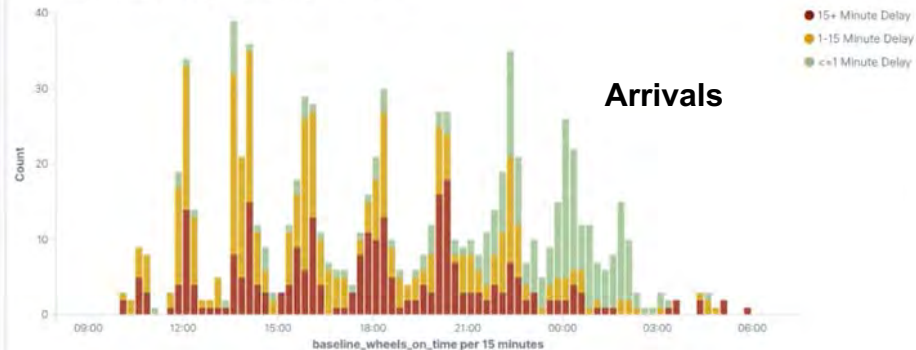
Federal Aviation Administration
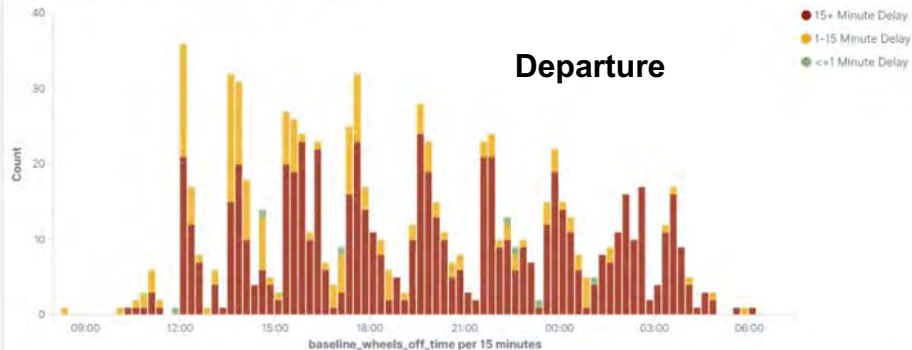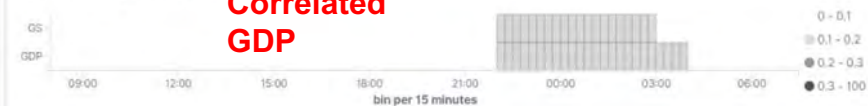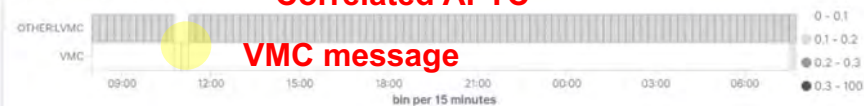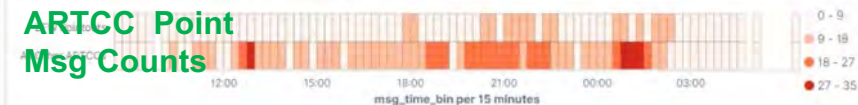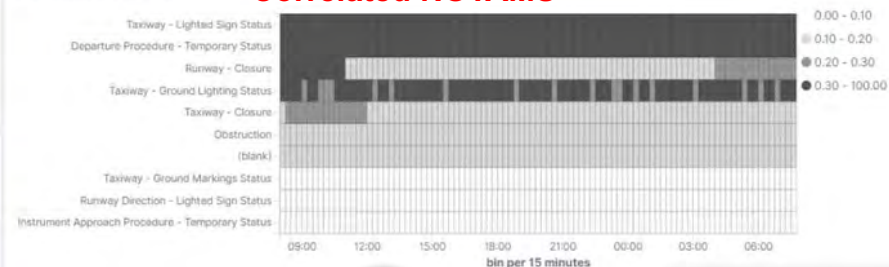
Next Steps

- **NCR to be in Ops for internal users by 8/31/2021**
- **Will monitor stability and performance**
  - Will be doing some performance tuning in the next few months
- **External NESG users will be on-ramped in the first half of CY2022 in batches**
- **Before on-ramping, NCR will help users in building their client software and testing in FNTB environment**

  - Based on FNTB availability

- **If you are interested in connecting to NCR, please send an email to: <u>swim@faa.gov</u>**

SWIFT Update: New York Area Study On *Early Planning For Disruptions*

SWIFT 15

Presented to: SWIFT

By: Chris Gottlieb – JetBlue Inc.

Date: August 19, 2021

SWIFT Recap & Context

- **Case Study Origins:**
  - Selected NY Metro Area for case study due to their daily vulnerability for SWAP
  - Sought alerting capabilities to support real-time tactical decisions by FAA and Carriers

- **Approach to Modeling Case Study:**
  - Visualize delays resulting from aircraft deviations over fix
  - Leverage open-source data to evaluate deviations along flight trajectories
  - Support back-end database and analytics for post Ops studies

- **Case Study Evolution:**
  - Seek to improve delay forecasting outlook for NAS stakeholders
  - Compare results with other current forecasting support tools
  - Apply case study model to other NAS Metroplexes to mitigate impacts

Case Study Trajectory

Identify	Investigate	Analyze

SWIFT 9 - 11
- *Define Problem Statement*
- *Define Operational Context*
- *Identify Ops Impacts through Tabletop Discussions*

SWIFT 12 - 14
- *Solicit Ops SME Input*
- *Investigate Data Gaps through SWIM Services*
- *Solicit DAFG Support*
- *Leverage Historical ZNY/N90 Studies*

SWIFT 15 and Beyond
- ***Engage DAFG/MIT-LL for Model Development & Support***
- ***Apply Context to Data***
- ***Compare Existing Forecast Tools with Model Results***

Case Study Model Baseline

- **Need to identify correlation between IROP events, SWIM messages/data elements, and impact delay metrics.**
    - Selected June 21, 2021 as a candidate disruptive date for model baseline
        - Severe Convective Wx activity with traffic demand impacted ZNY and ZOB operations
        - Convective Wx and lightning events occurring from 1300Z through 2100Z
        - Wx development over multiple N90 Arrival, Departure and Jet Routes
    - Through collaboration with MIT Lincoln Laboratory, we leveraged support tools to visualize Wx forecasts, traffic movement and resource metrics.
        - Consolidated Storm Prediction for Aviation (CoSPA) / Traffic Flow Impact (TFI)
        - Route Availability Planning Tool (RAPT)
        - RAPT Evaluation Post-Event Analysis Tool (REPEAT)

Leveraging Support Tools

Prototype Support Tool: Traffic Flow Impact (TFI)

- **TFI is a real-time prototype product that displays the permeability of FCAs based on precipitation intensity and echo tops, updated every 15 minutes.**

- **Based on the operational Convective Weather Avoidance Model (CWAM) used in the RAPT augmented by modern machine learning algorithms.**

- **TFI integrates the following:**
  - Corridor Integrated Weather System (CIWS)
  - Consolidated Storm Prediction for Aviation (CoSPA)
  - High Resolution Rapid Refresh (HRRR) ensembles
  - Localized Aviation Model Output Statistics Program (LAMP)
  - Short-Range Ensemble Forecast (SREF)

Prototype Tool: Traffic Flow Impact (TFI) Example
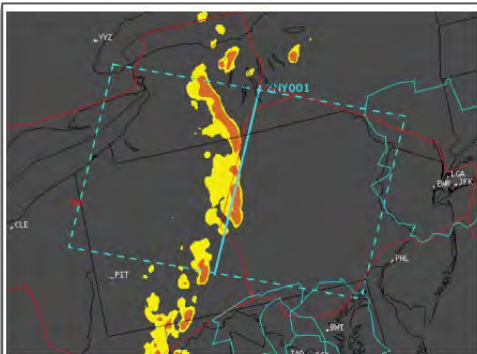
Figure 2: CoSPA convective weather forecast, generated at 1500Z and valid at 2200Z
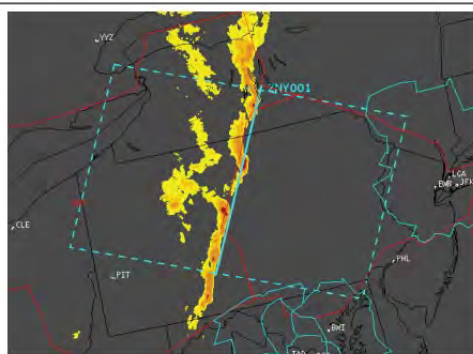
Figure 3: Actual weather at 2200Z
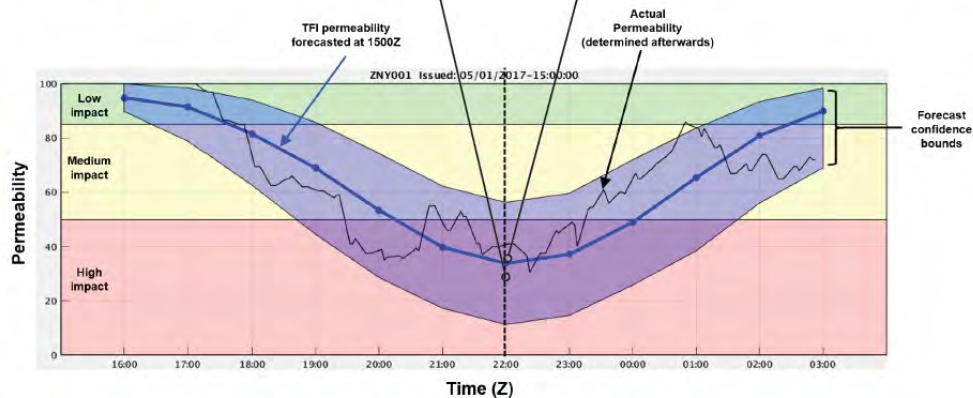
- A 12-hour TFI forecast generated at 1500Z (thick blue line) predicts high impact between 2015Z–0000Z
- The confidence bounds indicate that high impact could start as early as 1830Z and extend later than 0130Z, or alternately the weather might be less severe but still degrading sufficiently to have medium impact.
- The TFI forecast can be used to aid in selecting appropriate Airspace Flow Program (AFP) rates for the selected Flow Constrained Area (FCA).
- The width of the confidence bounds depends on the agreement and historical performance of the five weather products used to generate the forecast.
- The thin black line indicates the actual permeability, computed post-event, showing that permeability generally remained inside the confidence bounds as expected.

How can TFI supports study?

- TFI, all participants have a common picture of the statistical distribution of capacity reduction 0–12 hours in advance so that discussions can focus on risk assessment, FCA rate setting, and determining the start and end times of TMIs.

Prototype Support Tool: Route Availability Planning Tool (RAPT)

- **RAPT was developed by Lincoln Laboratory and prototyped for the FAA in the New York and Chicago regions between 2003 and 2013.**
  - RAPT status data available for the New York, Chicago, Philadelphia, and Potomac regions via Traffic Situation Displays.

- **RAPT uses deterministic precipitation intensity and storm height (echo tops) forecasts, together with airspace usage and flight trajectory models, to forecast storm impacts for specific departure routes.**
  - Uses a model based on a statistical analysis of prior weather/traffic events, to calculate the predicted overlap between convective weather and departure routes.
  - Assigns a level of impact based on precipitation intensity, storm height, and expected pilot behavior.
    - Timelines are generated for each route, showing the anticipated level of impact for 5-minute intervals out to 30 minutes into the future

Prototype Support Tool: Route Availability Planning Tool (RAPT)
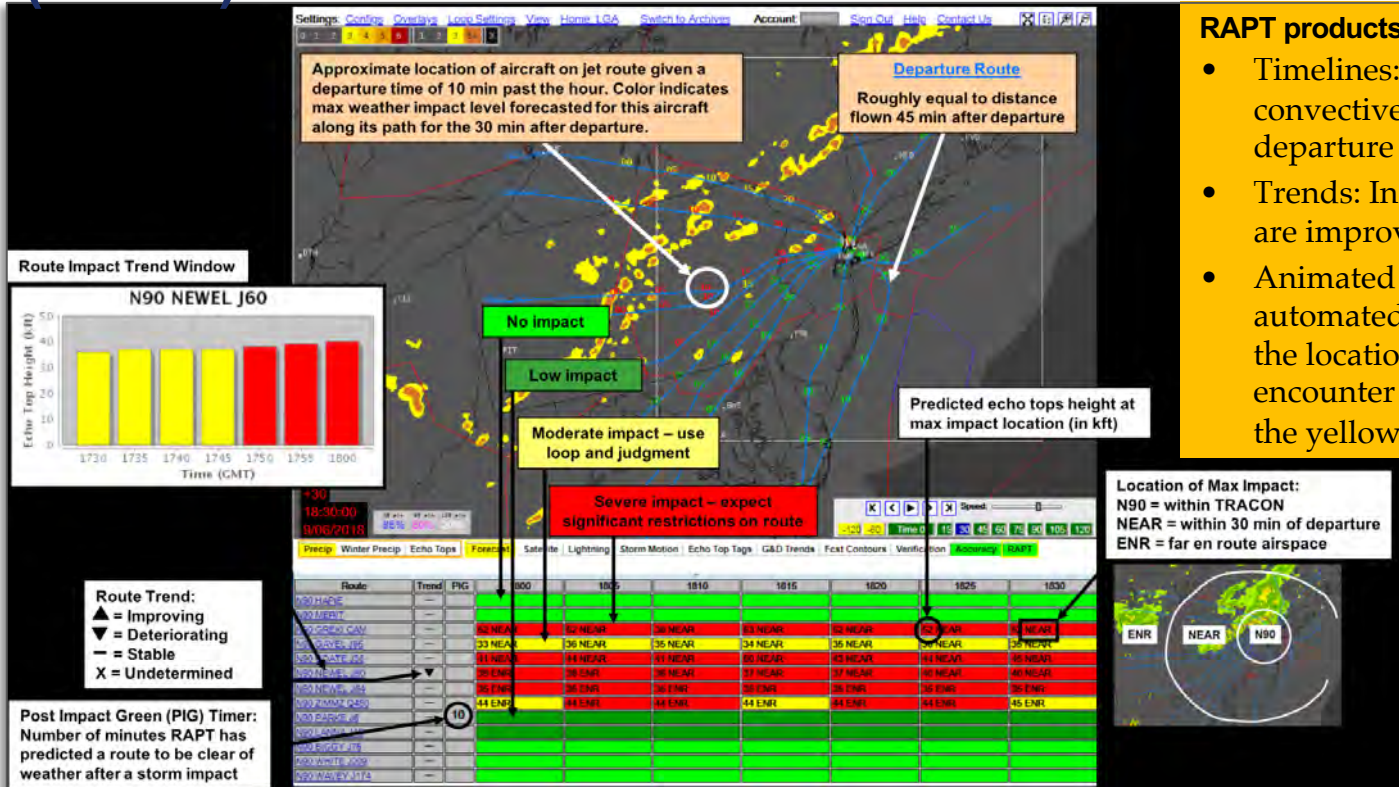
RAPT products include:

- Timelines: Forecasted severity of convective weather impact on key departure routes
- Trends: Indicates if conditions on the route are improving or deteriorating
- Animated Trajectories: Studying the automated trajectories provides a sense of the location and timing of a weather encounter and is particularly helpful for the yellow forecast

Prototype Post-Ops Capability: RAPT Evaluation Post-Event Analysis Tool (REPEAT)

- **REPEAT is a Post-Ops prototype that provides playbacks and delay metrics for historical dates, in select traffic regions.**

- **Views include**
  - NYC/PHL Wx/Traffic
  - N90 Cumulative Traffic
  - Route/RAPT Usage Analysis

- **Post-Ops data currently only active for New York and Chicago Metroplexes.**
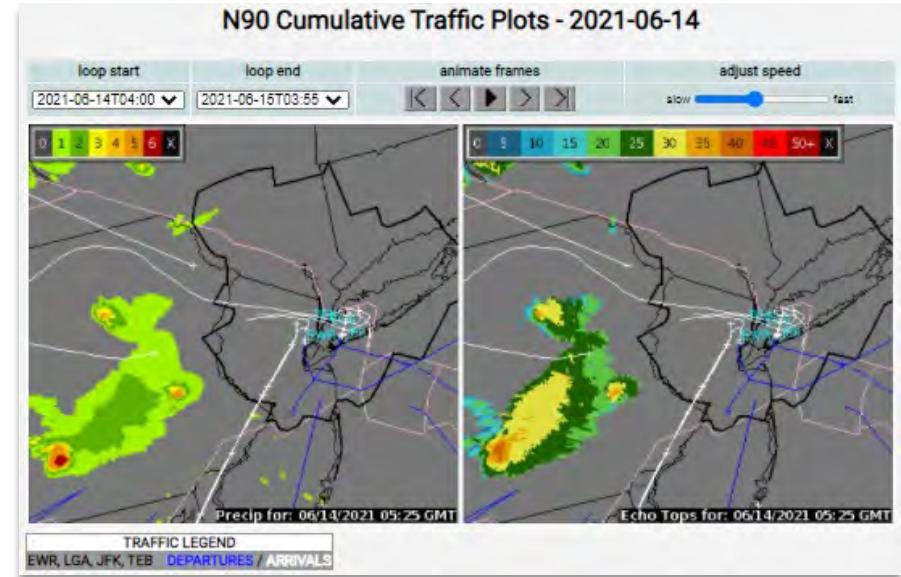
REPEAT Tool Metric Reporting

June 21, 2021 REPEAT Metrics
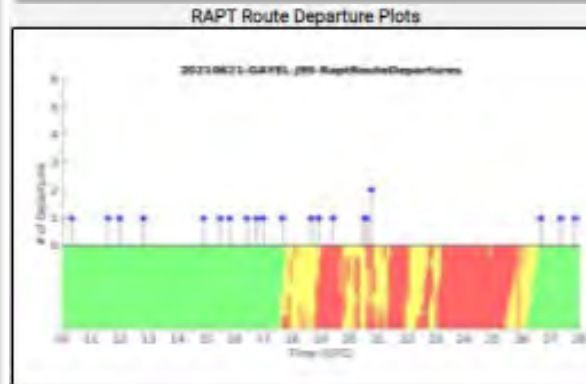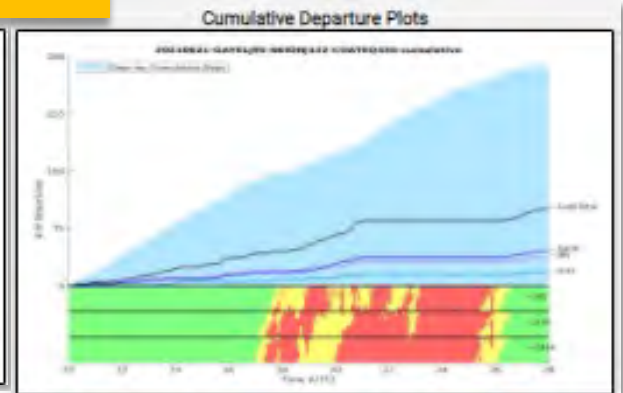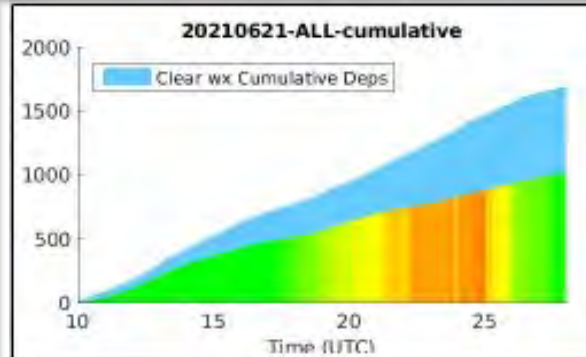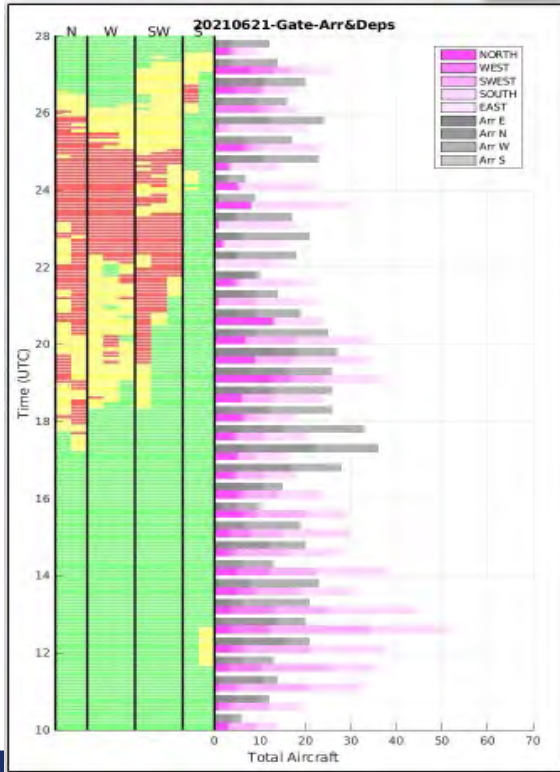
Leveraging SWIM Data

SWIM Data Support

- **RAPT raw data for New York and other regions is available to subscribers via the TFMS/SWIM data feed.**
    - TFMData: Flow service
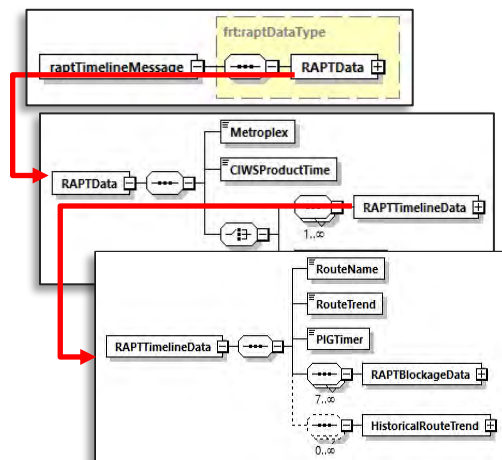
*Message structure is truncated

Data Element	Data Element Definition
raptTimelineMessage	Contains the current availability of departure routes due to convective weather. Only sent for airports that have the Route Availability Planning Tool (RAPT) function. Updated frequently to show current status.
RAPTData	RAPT timeline data for a particular RAPT metroplex
RAPTTimelineData	RAPT timeline data for TSD display.

Information Gaps (Summary)

Identified Information Gap during IROP Event	Relevant SWIM Service	Impacted NAS Stakeholder	Disrupted Operation
Need to aggregate data on DEP fix constraints to support alerting around crew issues.	SFDPS – En Route Airspace Data Publication	Flight Operator	Departure Deviations
Speed restrictions may be imposed at ARTCC when traffic begins to flow off-nominally. In certain cases, this may not be communicated to TRACON. In this case, speed restrictions could be deduced from the radar view (e.g. observing ground speeds).	SFDPS – En Route General Data	ATC, ARTCC & TRACON	Departure Deviations
Knowledge of where a pop-up storm could develop that could lead to deviations on a route. We could then coordinate ways around the weather, or ways outbound. Knowledge of when to reroute flights on the ground waiting; estimates on how long fixes would be impacted to make use of all available routes. This supports decision points for dispersing traffic over multiple available fixes.	TFMData: Flow, TFM:Data Flight, Integrated Terminal Weather System (ITWS)	ATC TRACON	Departure Deviations
Need to understand when and why ATC issues flight reroutes or events that involve changing a flight trajectory (e.g. DEP fix, ARR fix, waypoints)	SFDPS – En Route Flight Data Query, TFMData: Flow	Flight Operator	Arrival Deviations
During severe weather, we would want to move traffic out of ZNY, away from departures. Given ZNY tight route structure and coordination, we must know when and where to cut off the line and reroute flights..	SFDPS – En Route Flight Data, TBFM Metering Information Service, ITWS	ATC ARTCC & TRACON	Arrival Deviations
During weather events, we would typically restrict the entire flow into ZNY airports (e.g. AFPs, GDPS, etc.), but sometimes only the southern routes require restrictions. Combining routes (which is difficult to do in TRACON space) is something that wasn't done enough. ZDC does this routinely, which also helped manage flows into EWR and LGA without needing a GDP (ZNY-bound flights).	TFMData: Flow, SFDPS – En Route Data Airspace Query	ATC TRACON	Arrival Deviations

SCDS SWIM Data Access

- **Status: We are in the process of accessing the select SWIM messages available in SCDS.**
  - Currently, we can consume SFDPS, RAPT, and TFM messages and save data to a *postgreSQL* database.
  - SCDS publishes present-day information; historical data must be requested.
  - Contingent upon what information is available for June 21 (or other candidate dates), we are seeking XML messages for:
    - *SFDPS - En Route Airspace Data: Sector Assignment Status, Route Status, General Information Messages*
    - *SFDPS – En Route Flight Data: Flight Amendment Messages*
    - *TFMData: Flow: Reroute Messages, Restrictions Messages, Constraints Messages, Advisory and Compression Messages*

Next Steps

Investigating NASPlay Prototype

- **NASPlay is prototype architecture developed by MIT Lincoln Laboratory, used to train Air Traffic managers to gain broad experience with TFM decision-making and its repercussions.**
  - NASPlay gives operators the opportunity to tackle, in a day or two, the decisions that they would normally encounter throughout a whole year or more.
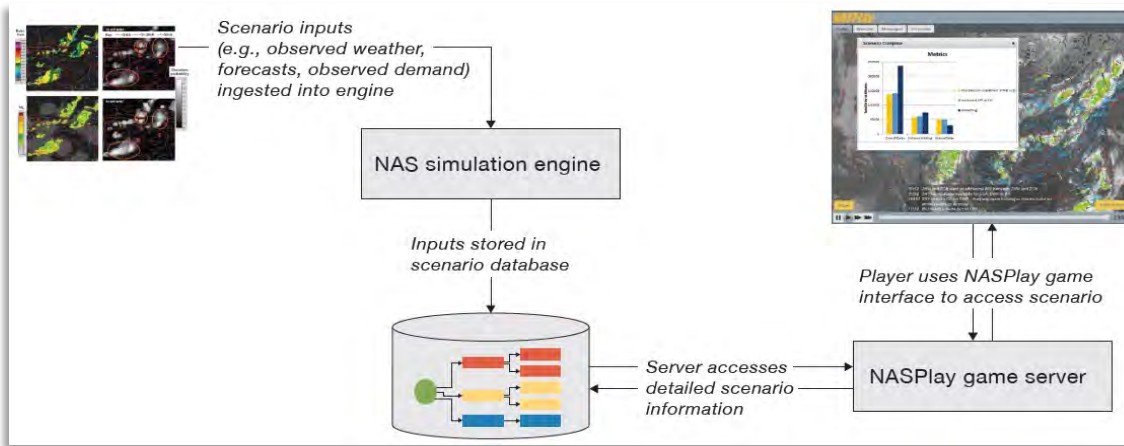
Investigating NASPlay Prototype

NASPlay may provide insight into predictive analytics/ML for IROP events.

Decision tree for a constrained choice, illustrates the choices available to the player at different times during the scenario.

The NASPlay user interface includes display modes, time sliders, filtering options, game time, and other data critical to the decisions required, such as the Flight Schedule Monitor.
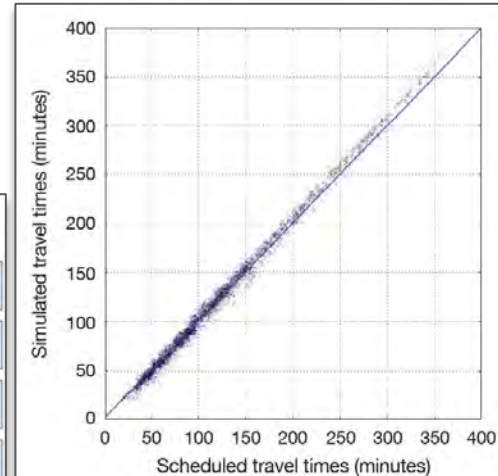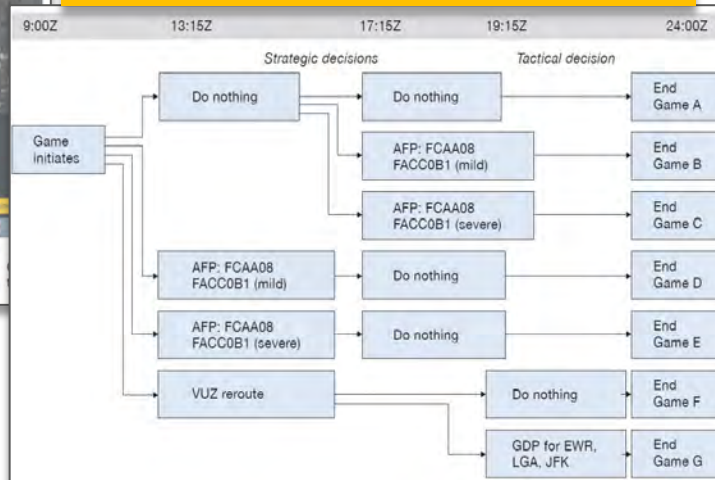
A comparison of simulated and observed flight times for major airport origin-destination pairs are shown.

Notional "Near Term" Timeline

Activity	2020					2021				2022
	SWIFT 9	SWIFT 10	SWIFT 10.5	SWIFT 11	SWIFT 12	SWIFT 13	SWIFT 14	SWIFT 15	SWIFT 16	SWIFT 17
Problem Identification		▓								
Initial Demonstration of FAA Data & Open Source Capabilities	▓	▓								
Refine Problem Statement & Operational Environment			▓	▓	▓					
Tabletop Exercise						▓				
Stakeholder & SME Identification & Engagement					▓	▓	▓	▓		
Root Cause Analysis of Deviations on Operations						▓	▓	▓	▓	
Discovery & Data Collection						▓	▓	▓	▓	
MIT Lincoln Lab Engagement & Data Share							▓	▓	▓	
Analysis SWIM Data						▓	▓	▓		
Apply Operational Context to SWIM Data								▓		
Development Analytics Focus Group Engagement (DAFG)						▓	▓	▓		
Identify Key Data Parameters							▓			
Explore Real-world IROP conditions to identify operational environmental drivers							▓			
Analyze Applicable Algorithms (AI/ML)							▓			
DAFG Comparative Analysis Legacy Forecasting Vs New Operational Metrics							▓			
Predictive Model Development							▓			
Stakeholder Case Study Validation									▓	▓

Legend:
:Light Blue - In Progress
:Yellow - At Risk
:Red - Behind Schedule
:Green - Complete
:Gray - Planned Not Committed

Note: *Milestones captured as major SWIFT Events starting with early inception SWIFT 10 projecting out to SWIFT 17, in which there will be ad hoc out brief sessions for the General Ops Issue Focus Group*

Next Steps for SWIFT 16

- **SWIM Connection (SCDS)**
  - Accessing to SFDPS Flight/Airspace and TFMData: Flow
    - Receiving relevant SWIM message/data elements for candidate dates
    - Correlate key SWIM data to IROP disruptions
  - Access to NCR (pending)
    - Collaborate with NCR Team to leverage:
    - 4D constraints based on given flight trajectory
    - Positioning of convective activities against flight trajectories

- **RAPT and TFI Support**
  - Evaluate areas where supplemental external data can best serve case study, e.g.:
    - Sector Throughput
    - Traffic Count against Sector Map Values
    - Fix Utilization

- **NASPlay Exploration**
  - Collaborate further to determine how to leverage NASPlay functionality
    - Machine Learning Applications and TFM
    - Predictive Analytics Applications and TFM

Want to get involved with case study? Join us!

Contact Us:

Chris Gottlieb – Christopher.Gottlieb@jetblue.com

Mark Hopkins - mark.hopkins_nlst@lstechllc.com

Xavier Pratt- Xavier.Pratt@lstechllc.com

Information Services Roadmap

SWIFT 15 Update

Presented to: SWIFT

By: Xavier Pratt – LS Technologies

Date: August 19, 2021

SWIM Services By Phase of Flight
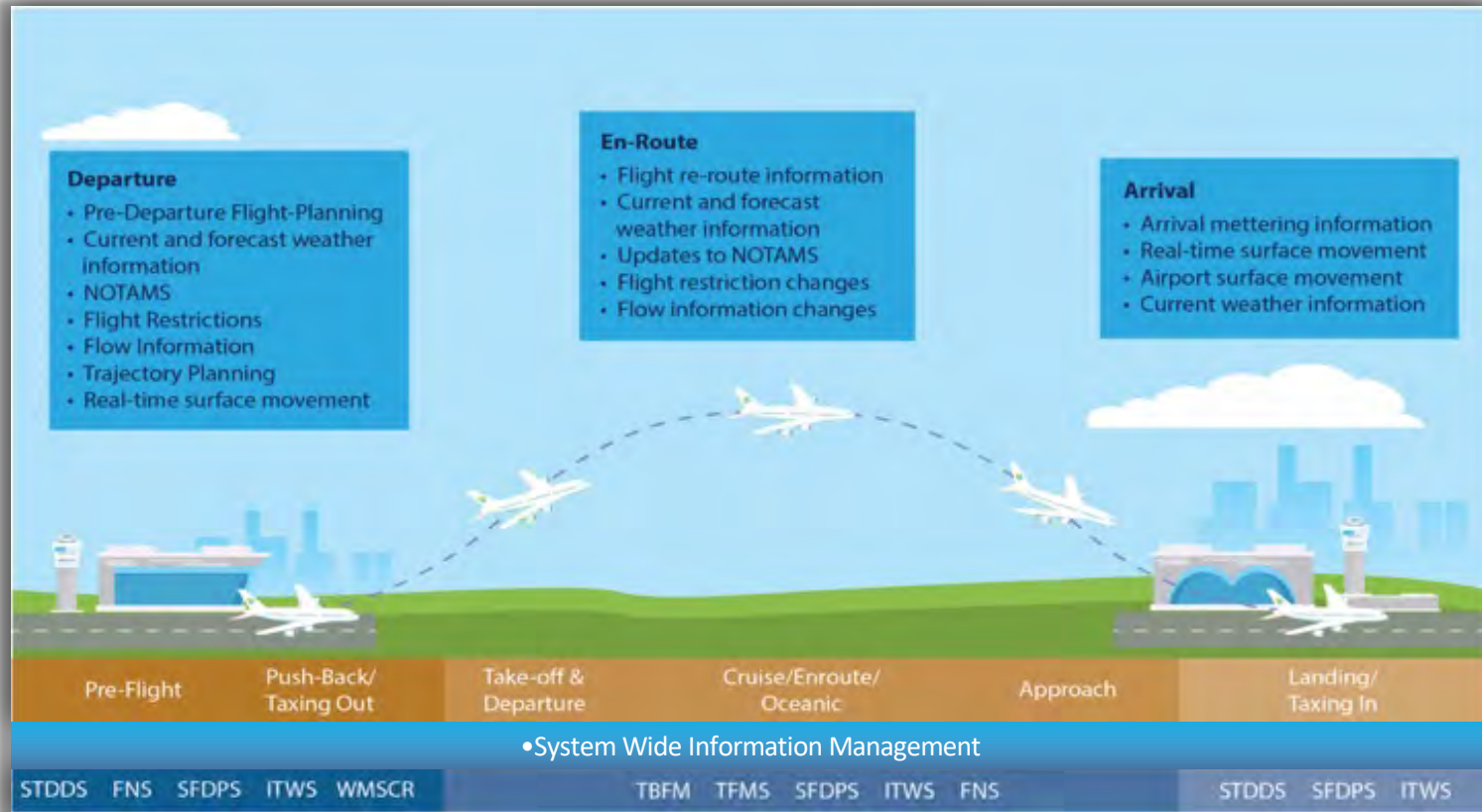
SWIM Services Deployment *(Near-Term)*

2020	2021	2022

2020
- NCR
- AIMM ACS
- TFDM Deployment Begins
- STDDS R5
- CSS-Wx Deployment Begins
- TFMS R14 (v3.0)

2021
- Identity and Access Management Ph2B IOC
- NCR R1.1
- AIMM Ph2 ACS
- TFDM Deployment Continues
- STDDS R6
- CSS-Wx Deployment Continues
- TFMS R14 (v3.2)
- Operational & Support Implementation System
- Lost Message Retrieval

2022
- TBFM RTS
- TBFM MIS R1.1.0
- TFDM B1 IOC
- TFDM B2 Deployment Continues
- CSS-Wx Deployment Continues

Legend:
Weather | SWIM Capability | Flight/Flow | Surveillance | Aeronautical

*Calendar year dates, subject to change

IAM: **Ph2B IOC Mar 2021.** Digital authentication certificate service between NAS systems and external users.

NCR: **R1.1 Jul 2021.** Integrates current and predicted NAS status information with aeronautical and TMI constraint data.

STDDS: **Ph2R6 targeting Sep 2021.** Includes TAIS message enhancements, publish additional TDLS messages, and SMES runway event and CAT10 enhancements

AIMM ACS: **Ph2 targeting Sep 2021.** Feature requests via WFS and Data Query Service. Aeronautical information and mapping features via WMTS and WMS.

SFDPS: **R1.5.0 targeting Oct 2021.** Flight Plan, Route Status and SAA revised schema.

OASIS: **Targeting Nov 2021.** Supports FAA Flight Service Specialists in providing weather briefing and FP services to GA pilots.

TFMS: **TFMData R14 targeting Nov 2021.** New TFMData Schema version for R14 is v3.2.

LMR: **Targeting Fall 2021.** Request lost messages due to interrupted SWIM connection

TBFM MIS: **R1.1.0 targeting Spring 2022.** New JMS properties for message routing based on additional A/C data attributes, new heartbeat message and connecting to Solace vs WebLogic.

TFDM Build 1: **IOC May 2022.** Includes TTP which provides airport and flight information, surface scheduling and metering.

TFDM Build 2: **Targeting May 2023.**

CSS-Wx: **Targeting IOC 2024.**

SWIM Information Services Roadmap

*Calendar year dates, subject to change

SWIM Information Services Roadmap

SWIFT 15 August 19th, 2021

122
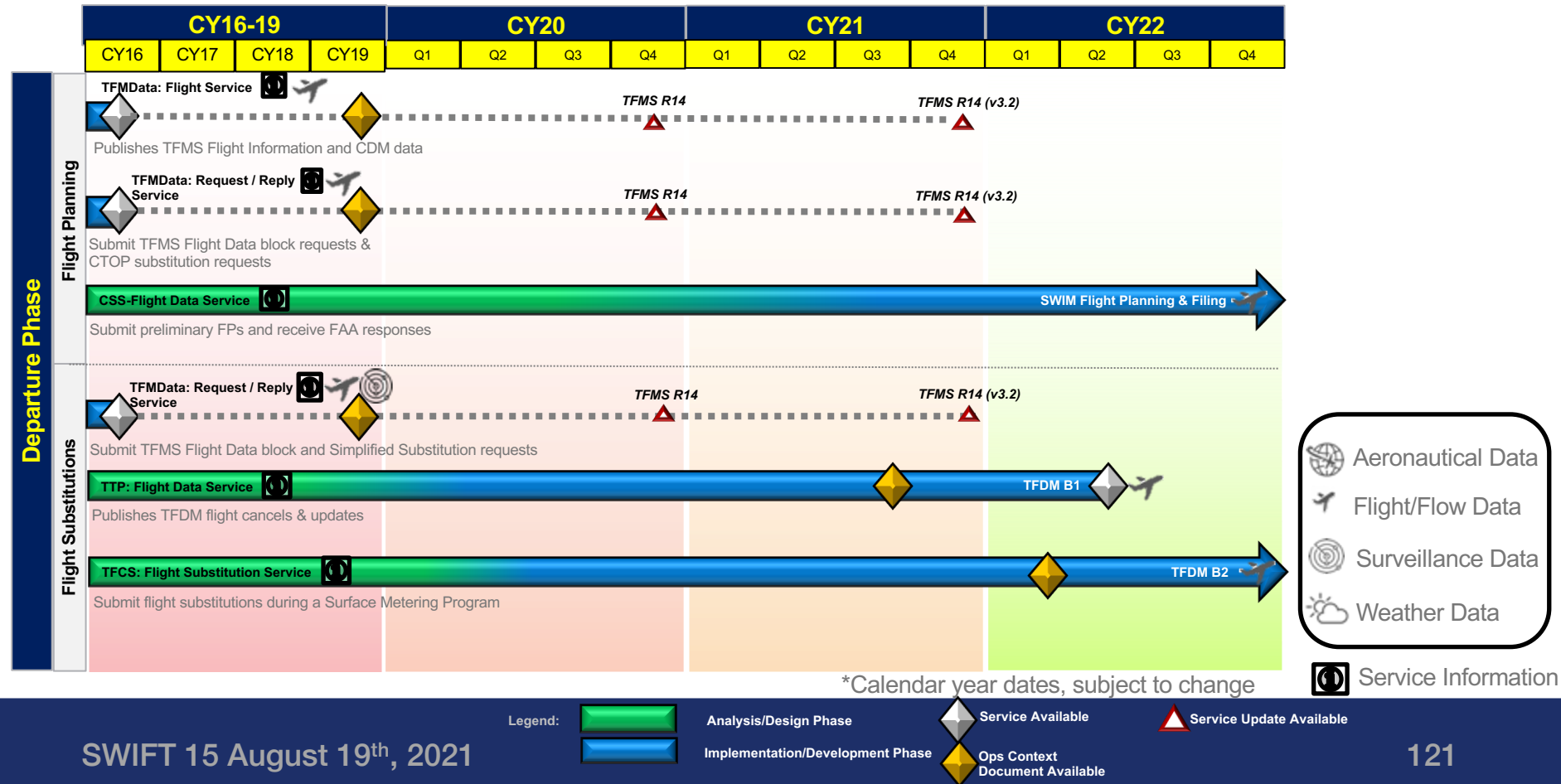
SWIM Information Services Roadmap

SWIM Information Services Roadmap

CY16-19				CY20				CY21				CY22			
CY16	CY17	CY18	CY19	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

En Route Phase — **Weather Data**

Integrated Terminal Weather System
Publishes weather information in graphic and textual formats

CSS-Wx Web Coverage Service — CSS-Wx / NWP
Publishes gridded WXXM weather data products to users that request the information

CSS-Wx Web Map Service — CSS-Wx / NWP
Allows users to request multiple images from a WMS server and overlay them into a single view

CSS-Wx Web Mapping Tile Service — CSS-Wx / NWP
Allows users to use predetermined maps to cache map tiles as a scalable solution and pre-render images with a default set of map characteristics

CSS-Wx Web Mapping Tile Service — CSS-Wx / NWP
Publishes non-gridded WXXM weather data products that have XML based encodings

*Calendar year dates, subject to change

Legend

Aeronautical Data
Flight/Flow Data
Surveillance Data
Weather Data
Service Information

Analysis/Design Phase	Service Available
Implementation/Development Phase	Ops Context Document Available
	Service Update Available

SWIM Information Services Roadmap

SWIFT 15 August 19th, 2021

125

SWIM Information Services Roadmap

Final Announcements

SWIFT *#16 Virtual Workshop*

- **Date**
  - **November 10th, 2021**
  - **12:30- 4pm EST**
- **Location**
  - **Online Session**

SWIFT Site Information

SWIFT@faa.gov

– Any SWIFT-related questions
– Sign up for SWIFT mailing list

https://www.faa.gov/air_traffic/technology/swim/swift

– Register for future SWIFT meetings
– Stay up to date with SWIFT
– Past meeting slides

SWIFT Contact Information

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David Almeida, SWIFT Community Moderator
- Phone: (321) 735-2774
- Email: **David.Almeida@LSTechLLC.com**

Back Up Slides

CSS-Wx & NWP Back Up

Users of NextGen Weather Products

NAS Systems/Investments and Internal/External Users Depend on CSS-Wx and NWP, e.g.:

- En Route Automation Modernization (ERAM), Time Based Flow Management (TBFM), Advanced Technologies and Oceanic Procedures (ATOP) – NWP and NOAA products; Future Enhancement including NWP Offshore Precipitation Capability (OPC) and CSS-Wx Traditional Alphanumeric Code (TAC) NWS data

- Traffic Flow Management System (TFMS), Microprocessor En Route Automated Radar Tracking System (Micro-EARTS) – NWP products

- Enterprise Information Display System (E-IDS), Future Flight Service Program (FFSP) – NWP and NOAA products

- Dynamic Ocean Tracking System Plus (DOTS+), Flight Data Processor 2000 (FDP2K) – NOAA products

- Standard Terminal Automation Replacement System (STARS) – NWP products (Future Weather Enhancement)

- NAS users, e.g. Collaborative Decision Makers, Traffic Management Unit (TMU) – NWP and NOAA data on AWDs

- Additional FAA users, e.g., Commercial Space

- Government agencies, e.g., NOAA, DoD, and DHS – NWP products

- Global harmonization with EUROCONTROL and International Civil Aviation Organization (ICAO) through the use of standards

- Other external users, e.g., Airlines – NWP products

Users Involvement in NextGen Weather Implementation, e.g.:

- NAS users, including NATCA, have been actively involved in the development of the NextGen Weather Systems, and are anticipating the implementation of the systems

- SWIM and End User Systems are engaged in technical exchanges and testing activities during NextGen Weather System implementation

- Other users, including Airlines, are also being informed throughout the NextGen Weather Systems development and await for using the advanced weather information to be provided

NextGen Weather and Enhancement

Achieve FAA Goals and Performance:

- FAA Strategic Goal 2 – Infrastructure

- FAA Performance Metric 3 – Maintain an average daily capacity for core airports of 59,303 or higher, arrivals and departures

- FAA Performance Metric 4 – Achieve a NAS on-time arrival rate of 88 percent at core airports and maintain through FY 2020

Deliver NextGen Weather Benefits:

- Improved NAS-wide routing/resource convective Wx impact mgmt
- Improved Airspace Flow Program (AFP) execution/management
- Enhanced Playbook reroute planning/execution
- Improved DST performance from the integration of NWP data
- Improved operational ATM decision-making from enhanced access to Wx products
- Enhanced weather products leading to reduced weather accidents
- Reduced future infrastructure costs to support forecast data bandwidth needs
- Reduced costs to develop future custom weather interfaces
- Increased weather access leading to reduced weather accidents
- Legacy system cost avoidance

Fulfill NextGen Operational Improvements:

[103119-13] Enhanced In-Flight Icing Diagnosis and Forecast

[103119-17] 4-D Tailored Volumetric Retrievals of Aviation Wx Information

[103119-18] Enhanced Turbulence Forecast and Graphical Guidance

[103119-19] Enhanced Ceiling and Visibility Analysis

[103306-04] Common Support Services – Weather

[103119-11] Enhanced NAS-Wide Access of 0-2 Hours Convective Weather on Traffic Forecast for NextGen Decision-Making

[103119-14] Enhanced Weather Radar Information for ATC Decision-Making

[103119-15] Extended Convective Weather on Traffic Forecast for NextGen Decision-Making

[103119-16] Convective Weather Avoidance Model (CWAM) for Arrival/Departure Operations

Enable Future NextGen Operational Improvements:

[103123-01] Aircraft-to-Severe Weather Notification

[103123-02] Net-Enabled Access to NextGen Common Weather Information Source - Enhanced

[103123-03] Enhanced Icing Information

[103123-04] Expanded Turbulence Information

[103123-05] Generation of Enhanced NextGen Weather Information - Extended

[103123-06] Expanded Ceiling and Visibility Information

[103123-09] Space Weather Information

[103123-10] Weather Precipitation on the (Terminal) Glass

NCR Back Up

SFDPS Data Captured

Table – flight_routes

¹²³ flight_record_id	ᴬᴮᶜ update_type	🕐 update_time	ᴬᴮᶜ route_text	☑ tailored	¹²³ requested_altitude
1	2,051,822 ⊡ AH	2021-08-11 10:12:17	KIND./.DNV040029..JVL..KCID	[X]	[NULL]
2	2,052,811 ⊡ AH	2021-08-11 09:11:26	KJLN./.OSW087044..SGF..WELTS.TRTLL6.KOR	[X]	[NULL]
3	2,057,556 ⊡ FH	2021-08-11 11:13:21	KORD./.OMRAK.Q935.HANKK.Q140.KODEY..	[X]	[NULL]
4	2,050,595 ⊡ AH	2021-08-11 09:11:26	KAUG./.BGR238140..ZIZZI..ATR..LAFLN.MIIDY	[X]	[NULL]
5	2,058,860 ⊡ AH	2021-08-11 11:13:22	KMRY.MRY5.MRY..SERFR..BOILE..BLH..BXK..K(	[ ]	[NULL]

Table – flights

¹²³ id	ᴬᴮᶜ fdps_gufi	ᴬᴮᶜ fdps_flightid	ᴬᴮᶜ departure_point	ᴬᴮᶜ arrival_point	🕐 departure_time	🕐 arrival_time	¹²³ air_speed	¹²³ requested_altitude
1	2,084,854	us.fdps.2021-08-12T02:28:28Z.000/0	CNS737	KACK	KPWM	2021-08-12 15:10:00	2021-08-12 15:49:00	271	17,000
2	2,062,095	us.fdps.2021-08-11T15:12:13Z.000/2	N404DP	KMRB	KIAD	2021-08-11 11:30:00	2021-08-11 11:44:00	250	4,000
3	2,087,026	us.fdps.2021-08-12T07:30:45Z.000/1	OAE7987	KONT	PGUA	2021-08-12 08:00:00	2021-08-12 19:13:00	489	38,000
4	2,046,394	us.fdps.2021-08-11T06:03:48Z.000/1	JBU1574	KLAX	KEWR	2021-08-11 04:00:00	2021-08-11 08:57:00	471	31,000
5	2,071,610	us.fdps.2021-08-11T19:18:21Z.000/0	LXJ576	KCAK	KTEB	2021-08-12 11:22:00	2021-08-12 12:14:00	440	45,000
6	2,048,745	us.fdps.2021-08-11T09:30:11Z.000/1	SKW5212	KDSM	KDEN	2021-08-11 07:00:00	2021-08-11 08:20:00	449	36,000

	ᴬᴮᶜ uuid_gufi	ᴬᴮᶜ org_name	ᴬᴮᶜ fdps_flight_status	ᴬᴮᶜ flight_plan_identifier	ᴬᴮᶜ latest	ᴬᴮᶜ center	🕐 first_message_time
1	0 8b161d95-42f3-4429-b055-3bf60cb	PLANESENSE INC	PROPOSED	KB08908500	[NULL]	ZBW	2021-08-11 22:28:28
2	0 65cb2a89-f27f-40fe-bddc-1527af43c	[NULL]	COMPLETED	KW54733401	[NULL]	ZDC	2021-08-11 11:13:30
3	0 068f5ecb-9226-4378-9f60-6575eac8	OAE	PROPOSED	KL27045500	[NULL]	ZLA	2021-08-12 03:30:46
4	0 d29f5e90-3b96-4aab-a474-64e1cd5:	JBU	COMPLETED	KL21828400	[NULL]	ZNY	2021-08-11 02:03:55
5	0 18409cc9-2988-4a38-843e-1153ff45	FLEXJET	PROPOSED	KC69501400	[NULL]	ZOB	2021-08-11 15:18:23
6	0 15999d7e-4809-43af-9e9e-f018621€	SKW	ACTIVE	KP34211400	[NULL]	ZDV	2021-08-11 05:30:11

NCR Metric Data

Table – metrics

123 id	123 flight_record_id	flight_update_time	123 query_duration	123 feature_count	ABC layers_requested	ABC layers_received
1	18,689	39,000	2021-06-10 13:03:37	17,177	480	[notam, rvr, saa]	[saa, notam, rvr]
2	18,690	5,000	2021-06-10 13:04:07	818	208	[notam, rvr, saa]	[notam, rvr]
3	18,691	11,000	2021-06-10 13:04:11	2,233	80	[notam, rvr, saa]	[notam, rvr]
4	18,692	37,000	2021-06-10 13:04:11	1,471	277	[notam, rvr, saa]	[saa, notam, rvr]
5	18,693	40,000	2021-06-10 13:03:19	5,604	667	[notam, rvr, saa]	[saa, notam, rvr]

geom	ABC wfs_query_filter	query_time	ABC route_type	123 bytes
LINESTRING (-80.29011583 25.79536	<wfs:GetFeature xmlns:wfs="http://w	2021-06-10 13:09:28	TRAJECTORY_2D	1,130,391
LINESTRING (-81.86325 26.58661111	<wfs:GetFeature xmlns:wfs="http://w	2021-06-10 13:09:45	TRAJECTORY_4D	426,333
LINESTRING (-80.14969444 26.07166	<wfs:GetFeature xmlns:wfs="http://w	2021-06-10 13:09:47	ROUTE_STRING	161,213
LINESTRING (-82.53325 27.97547222	<wfs:GetFeature xmlns:wfs="http://w	2021-06-10 13:09:49	TRAJECTORY_4D	585,211
LINESTRING (-74.06083333 40.85011	<wfs:GetFeature xmlns:wfs="http://w	2021-06-10 13:09:51	TRAJECTORY_3D	1,486,496

Table – metrics

123 id	record_time	123 flight_id	success	ABC notes	123 http_status	ABC message_id
1	1,259	2021-06-11 13:40:03	36,000	[X]	[NULL]	[NULL]	[NULL]
2	1,267	2021-06-11 13:40:07	37,000	[X]	[NULL]	[NULL]	[NULL]
3	1,269	2021-06-11 13:40:08	39,000	[X]	[NULL]	[NULL]	[NULL]
4	1,288	2021-06-11 13:40:19	36,000	[X]	[NULL]	[NULL]	[NULL]
5	1,295	2021-06-11 13:40:29	39,000	[X]	[NULL]	[NULL]	[NULL]

OPSNET-R NOTAM Details

Information Services Roadmap

ITWS

Service Description

- – ITWS receives data from a variety of weather and surveillance radars and sensors and converts this data to a format understandable by various software components able to present current weather information in graphic and text formats.

Service Interface

- – Publish/Subscribe via JMS

Message Sets

Weather Data

Integrated Terminal Weather System (ITWS) Data Publication: Provides specialized weather products in the terminal area

- ✓ Configured Alerts
- ✓ Forecast Accuracy
- ✓ Forecast Contour
- ✓ Forecast Image
- ✓ Gust Front TRACON Map
- ✓ Microburst TRACON Map
- ✓ Precipitation 5nm
- ✓ Precipitation Long Range
- ✓ Precipitation TRACON
- ✓ Storm Motion (SM) Storm Extrapolated Positions (SEP) 5nm
- ✓ SM SEP Long Range
- ✓ SM SEP TRACON
- ✓ Terminal Weather Text Normal
- ✓ Tornado Alert

- ✓ Tornado Detections Wind Profile
- ✓ Anomalous Propagation (AP) Indicated Precipitation
- ✓ AP Status
- ✓ Gust Front Estimated Time to Impact
- ✓ Hazard Text 5nm
- ✓ Hazard Text Long Range
- ✓ Hazard Text TRACON
- ✓ ITWS Status Information
- ✓ Microburst Automatic Terminal Information Service (ATIS)
- ✓ Runway Configuration
- ✓ Storm Motion 5NM
- ✓ Storm Motion TRACON
- ✓ Terminal Weather Text Special
- ✓ Wind Shear ATIS

SFDPS - *En Route Flight Data Publication (ERFDP)*

Service Description

– The En Route Flight Data Publication Service publishes flight plan, track, and other flight-related messages. Data published are derived completely from Common Message Set (CMS) messages received by SWIM Flight Data Publication Service (SFDPS) from the Host Air Traffic Management (ATM) Data Distribution System (HADDS) at each of the Contiguous United States (CONUS) Air Route Traffic Control Centers (ARTCCs). The source of the data received by HADDS is the En Route Automation Modernization (ERAM) at the ARTCC.

Service Interface

– Publish/Subscribe via JMS
– Request via SOAP WS with Replay via Subscribe JMS

Message Sets

SWIM Flight Data Publication Service (SFDPS)*: Provides flight data and updates to clients for filed and active flight plans		
✓ Flight Plan information	✓	Tentative Aircraft identification Amendment Information
✓ Flight Amendment Information	✓	Tentative Flight Plan Removal
✓ Converted Route Information	✓	Tentative Flight Plan Amendment Information
✓ Cancellation Information	✓	Track Information
✓ Departure Information	✓	Drop Track Information
✓ Aircraft Identification Amendment Information	✓	Interim Altitude Information
✓ Hold Information	✓	Automated Radar Terminal System (ARTS) Flow Control Track/Full Data Block Information
✓ Progress Report Information	✓	Beacon Code Reassignment
✓ Flight Arrival Information	✓	Beacon Code Restricted
✓ Flight Plan Update Information	✓	Flight Plan Data Bank (FDB) Fourth Line Information
✓ Expected Departure Time Information	✓	Point Out Information
✓ Position Update Information	✓	Inbound Point Out Information
✓ Tentative Flight Plan Information	✓	Handoff Status

Latest News

- **SFDPS R1.5.0 coming soon**

- **Preliminary deployment scheduled late October 2021**

  - Flight Plan Messages: Flight Plan, Flight Plan Amendment and Flight Plan Update

  - Data Base Reconstitution: Flight Plan and Track

  - Software Fixes

SFDPS - *En Route Airspace Data Publication (ERADP)*

Service Description

- The En Route Airspace Data Publication service publishes route, sector, altimeter setting, and special activities airspace information. Data published are derived completely from Common Message Set (CMS) messages received by SWIM Flight Data Publication Service (SFDPS) from the Host Air Traffic Management (ATM) Data Distribution System (HADDS) at each of the 20 Contiguous United States (CONUS) Air Route Traffic Control Centers (ARTCCs). The source of the data received by HADDS is the EnRoute Automation Modernization (ERAM) at the ARTCC.

Service Interface

- Publish/Subscribe via JMS
- Request via SOAP WS with Replay via Subscribe JMS

Message Sets

Airspace Data Publication Service*: Published by SFDPS		
✓ Sector Assignment Status	✓	Special Activities Airspace (SAA)
✓ Route Status	✓	Altimeter Setting
Operational Data Publication Service*: Published by SFDPS		
✓ Traffic Count Adjustment	✓	Beacon Code Utilization
✓ Instrument Approach Count Adjustment	✓	Geographic Beacon Code Utilization
✓ Sign In Sign Out		
General Information Message Publication Service*: Published by SFDPS		
✓ General Information		

Latest News

- **SFDPS R1.5.0 targeted October 2021**

- **Preliminary deployment scheduled late October 2021**

  - Route Status messages: Provides an increase in a data field

  - Data Base Reconstitution: Route Status

  - Special Activity Airspace (SAA): Updated with additional data to reflect expanded controller changes to SAA schedules

  - Software Fixes

SFDPS - *En Route General Message Publication (ERGMP)*

Service Description

– The En-Route General Message Publication Service publishes general information and status messages. Data published are derived completely from Common Message Set (CMS) messages received by SWIM Flight Data Publication Service (SFDPS) from the Host Air Traffic Management (ATM) Data Distribution System (HADDS) at each of the Contiguous United States (CONUS) Air Route Traffic Control Centers (ARTCCs). The source of the data received by HADDS is the En Route Automation Modernization (ERAM) at the ARTCC.

Service Interface

– Publish/Subscribe via JMS
– Request via SOAP WS with Replay via Subscribe JMS

Message Sets

Message Name	Description	Supported Properties
ERAM Status Information	The ERAM Status Information message is sent when an ERAM status change occurs.	SourceFacility
General Information	A general information message is used to communicate a free-form text message from one facility to one or more other facilities. The content of the message is free-form text, contained in an inter-facility remarks field.	
Hold Status Information	The Hold Status Information message provides hold information (holding fix, and estimated fix departure time for definite-duration holds) on all active aircraft to a client during the initialization process.	
Interim Altitude Status Information	The Interim Altitude Status Information message provides interim altitude status information on all active aircraft to a client during the initialization process.	
Unsuccessful Transmission Information	The Unsuccessful Information Transmission (UI) message is sent by ERAM when transmission of flight data to a remote facility is unsuccessful either due to a transmission error or because transmission of the flight data to the remote facility is inhibited.	

STTDS - *Airport Data Service (APDS)*

Service Description

– STDDS Airport Data (APD). The SWIM Terminal Data Distribution System (STDDS) Airport Data (APD) service publishes Runway Visual Range (RVR) data to SWIM consumers. Data includes runway visibility and trend for touchdown, midpoint and rollout, depending on the instrumentation for the runway. Data also includes edge and centerline light intensity settings.

Service Interface

– Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
RVR Data Update Message	Sent periodically (nominally every 60 seconds) and upon change of any published fields received from RVR.	airport

WMSCR – *Submit PIREP Service*

Service Description

–   The Weather Message Switching Center Replacement System (WMSCR) collects, processes, stores, and disseminates textual aviation weather products such as PIREPs and Altimeter data.

Service Interface

–   Publish/Subscribe via JMS

Message Sets
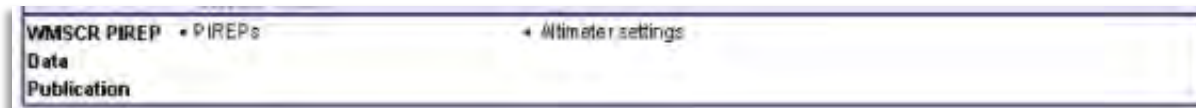
STTDS – *Tower Departure Event Service (TDES)*

right

Service Description

– STDDS Airport Data (APD). The SWIM Terminal Data Distribution System (STDDS) Airport Data (APD) service publishes Runway Visual Range (RVR) data to SWIM consumers. Data includes runway visibility and trend for touchdown, midpoint and rollout, depending on the instrumentation for the runway. Data also includes edge and centerline light intensity settings.

Service Interface

– Publish/Subscribe via JMS

Message Sets

Sample Message Data Elements:

STDDS ARCHITECTURE
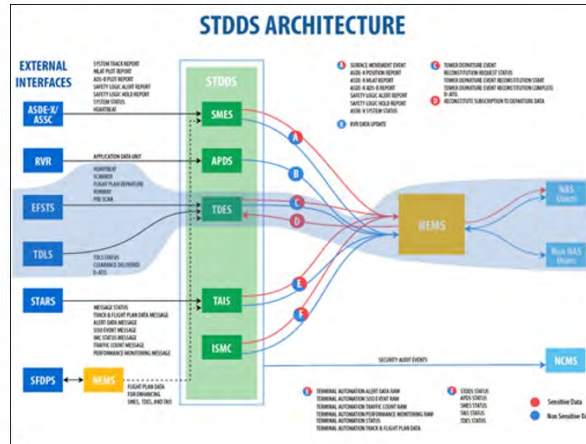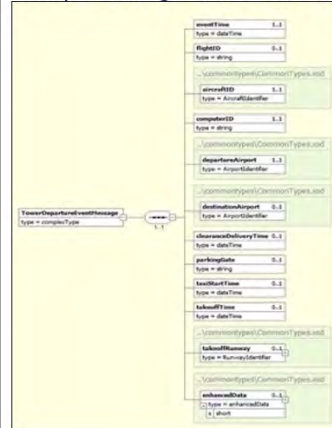
Latest News

STDDS Ph2R6 targeted September 2021

- Publish additional TDLS data in TDES messages

  - Adds beacon code, ECID and aircraft type from TDLS to all TDES messages except the D-ATIS message.

- Parse and publish entire dataHeader in DATISMessage

  - Includes the Data Type, ATIS code, and Data Generation Timestamp found in the DATIS message header –

  - R6 will continue publishing the dataHeader field containing raw D-ATIS data, for backwards compatibility.

STTDS – *Surface Movement Event Service (SMES)*

Service Description

– The Surface Movement Event Service sends derived surface movement events for all aircraft monitored at select towers associated with a TRACON. In addition, the service sends ASDE-X/ASSC track positions for all aircraft and vehicles collected from towers associated with a TRACON.

Service Interface

– Publish/Subscribe via JMS

Message Sets

| Message Name	Description	Supported Properties
ASDEX Message	Sent upon the receipt of a System Track message, a Status message, an ADS-B Plot Report, or a MLAT Plot Report from ASDE-X or ASSC. The MsgType indicates the type of message as follows: AT – PositionReport AY – SystemStatus AD - adsbReport ML - mlatReport	
Safety Logic Alert Report	Sent upon the receipt of a Safety Logic Alert Report from ASDEX or ASSC.	airport
Safety Logic Hold Bar Message	Sent periodically (nominally every 60 seconds) and upon change of any published fields received from ASDE-X or ASSC.	
Surface Movement Event Message	Provides surface movement events derived from ASDE-X or ASSC position data.	

Latest News

- **STDDS Ph2R6 targeted September 2021**
- Enhance SMES with 2 additional airport movement events:
  - Runway in—target has entered the geographical boundaries (lat/lon) of a runway
  - Runway out—target has exited the geographical boundaries (lat/lon) of a runway
- Add *_COVAR and DF type fields to the MLAT and ADSB CAT10 messages to improve track precision measure
- Extend SFDPS data enhancement to the ASDE-X/ASSC CAT10 data (MLAT and ADSB messages)

STTDS – *Terminal Automation Information Services (TAIS)*

Service Description

– The Terminal Automation Information Service (TAIS) publishes operational live flight plan data, track data, alert data, Instrument Meteorological Conditions (IMC) data, traffic count data, and performance monitoring data from the Standard Terminal Automation Replacement System (STARS) to authorized SWIM service consumers.

Service Interface

– Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
TA Status	STARS status sent periodically (nominally every 60 seconds) and upon change of any published fields received from STARS.	
TA Track and Flight Plan	A package of track and flight plan data. Only track data with altitude below an adaptable threshold (nominally 18000ft) is published.	Source Tracon
TA Raw	Full base64 encoded contents of a STARS AIG message. The MsgType indicates the type of AIG message as follows; AR – Alert Data SI – SISO Event IR – IMC Status CR – Traffic Count Data PR – Performance Monitoring Data	

Latest News

- **STDDS Ph2R6 targeted September 2021**

  - Reduce flight plan repetition –

  - Add rawFlightRules field to TerminalAutomationFlightPlan message

    - rawFlightRules can contain more than 'V' for VFR, 'P' for VFR on Top, and 'E' for Enroute IFR (site adapted)

AIMM – *Aeronautical Common Services (ACS)*

Service Description

- – AIMM Phase 2 is leveraging the prior aeronautical information modernization efforts to provide a common platform via the ACS to provide services that integrate static and dynamic aeronautical information, making integrated Aeronautical Information available for information consumers over SWIM.
- – The ACS provides a set of web services for information consumers that provide integrated static definitions for aeronautical information such as airports, NAVAID, airspace, and obstacles with dynamic status updates such as schedules and NOTAMs.

Service Interface

- – Request/Reply via OGC

Message Sets

Latest News

- **ACS capabilities will be operational and available to internal FAA consumers and external consumers September 2021.**

  - Feature requests via a WFS and a Data Query Service.

  - Feature change notification service.

  - Aeronautical information image services

  - ACS mapping services to support viewing aeronautical information and NOTAM data

  - Airspace confliction detection service

  - Geodetic calculation service

  - Post –Ops metrics service

AIMM – *Federal NOTAMs System (FNS)*

Service Description
- The Federal Notice to Airmen (NOTAM) System (FNS) Publication is a subscription-based service for publishing NOTAMS. It supports all NOTAMS, legacy and digital, published in the United States NOTAM System (USNS).
- The Federal Notice to Airmen (NOTAM) System (FNS) NOTAM Distribution Service (FNS-NDS) is a web service that provides digital NOTAM messages in Aeronautical Information Exchange Model (AIXM) format in response to requests by end users. The FNS-NDS is a system-to-system interface that enables end systems to receive digital NOTAMs from FNS. The FNS-NDS uses the event schema developed by the international Digital NOTAM Focus Group jointly led by EUROCONTROL and the FAA. Digital NOTAM messages exchanged through the FNS-NDS include static baseline features as well as the temporary changes due the NOTAM event and enable the graphical display of NOTAMs. The FNS NDS supports the distribution of all NOTAMs, to include the digital NOTAMs originated through the FNS as well as legacy NOTAMs originated through the legacy system.

Service Interface
- Publish/Subscribe via JMS
- Request/Reply via SOAP Web Service

Message Sets

Message Name	Description
Get Capabilities	GetCapabilities is a discovery request, which provides information related to the options provided by the FNS-NDS Web Feature Service.

	Property Name	Description	Permissible Values		
Get Feature	Source Type	Specifies the NOTAM classification	• Domestic (D) • FDC (F)	• Military (M) • Local Military (L)	• International (I) • Others (O)
	Location Designator	NOTAM location designator of the affected airport/heliport or facility	Any active NOTAM location identifier		
	NOTAM Function	New, Replacement, Cancelled	• NOTAMN	• NOTAMR	• NOTAMC
	NOTAM Keyword	Keyword associated with the NOTAM	• AD • APRON • AIRSPACE • CHART • COM • IAP • NAV	• OBST • ODP • ROUTE • RWY • SECURITY • SID • SPECIAL	• STAR • SVC • TWY • VFP • CONSTRUCTION • LTA
	Airspace Usage	Additional message property to filter airspace related NOTAMs	• TFR	• SUA	• CARF
	NOTAM Status	Status of the NOTAM	• ACTIVE	• CANCELLED	

Latest News

- **NOTAMs API target launch Fall 2021**

  - Quick on boarding and access

  - Multiple formats for user needs

  - Enables direct NOTAM query

  - All NOTAM and available geometry from single source

    - *Integrates TFR and SAA*

    - *Enables graphical visuals*

TFDM Build 1 – *TTP Airport, Flight Data, Flight Delay, Ops Metrics, TMR Services*

Service Description

– TFDM is the surface management solution for NextGen. TFDM is planned to provide Airport and Flight Information Service (AFIS), which is expected to be deployed in the timeframe. AFIS data includes airport configurations, airport specific demand and delay information, and airport-initiated departure stop restrictions. AFIS will provide more timely and specific information on individual flights from the operators, including gate and estimated off block times as well as schedule and surface metering information from TFDM to operators. TFDM services will interface with other information services to provide airport-specific arrival predictions and schedules, call for release data exchanges, flight data, and surface situational awareness

Service Interface

– Publish/Subscribe via JMS

Message Sets

Business Function	Steady State Flow Message Types
Airport Information	Airport Information Heartbeat
Flight Data	Flight Add Flight Update Flight Notification Flight Delete Heartbeat
Flight Delay	Flight Delay Heartbeat
Surface Metering Programs	SMP Data Message SMP Flight List Update Heartbeat
Traffic Management Restrictions	Traffic Management Restrictions Heartbeat

Latest News

- **Developed remote TFDM lab access for developmental testing of the TFDM software**

  - Completed Build 1 software updates and completed most of testing

- **TFDM Build 1**

  - Key Site: Phoenix Sky Harbor International Airport (PHX)

  - New Projected* IOC Date: May 2022

Back to Roadmap

TFDM Build 2 – *TTP Surface Meter Program, TFCS Flight Sub Services*

Service Description

– TFDM is the surface management solution for NextGen. TFDM is planned to provide Airport and Flight Information Service (AFIS), which is expected to be deployed in the timeframe. AFIS data includes airport configurations, airport specific demand and delay information, and airport-initiated departure stop restrictions. AFIS will provide more timely and specific information on individual flights from the operators, including gate and estimated off block times as well as schedule and surface metering information from TFDM to operators. TFDM services will interface with other information services to provide airport-specific arrival predictions and schedules, call for release data exchanges, flight data, and surface situational awareness.

Service Interface

– Request/Reply via JMS

Message Sets

– TBD

Latest News

- **Completed Build 2 preliminary software development**

  - Completed TFDM testbed for early industry connection to TFDM

- **TFDM Build 2**

  - Key Site: Charlotte-Douglas International Airport (CLT)

  - New Projected* IOC Date: May 2023

Back to Roadmap

TBFM – *Metering Information Service (MIS)*

Service Description

– The TBFM Metering Information Service publishes metering information to allow the TBFM system, FAA systems (e.g., TFMS), and industry to collaborate, share TBFM data and be informed of TBFM STAs that are in effect during metering events.

Service Interface

– Publish/Subscribe via JMS

Message Sets

Message Name	Description	Supported Properties
Aircraft Information	Provides metering information about an aircraft; specifically: flight plan (relevant subset), STAs, ETAs, Meter Reference Elements (MREs) Assignments, and scheduling group information	Data Group, ARTCC
Configuration Information	Provides metering information about the configuration of the system; specifically: airport configurations, airport acceptance rates, TRACON acceptance rates, gate acceptance rates, Meter Point acceptance rates, runway acceptances rates, super stream class configurations, and satellite airport configurations	
Other Information	Provides metering information about the status of metering and the status of system interfaces	
Adaptation Information	Provides information about applicable system adaptation to include TRACON names, gate names, configuration names, Meter Reference Point names, and stream class names	
Sync	Sent only to indicate an impending refresh of all TBFM data, either as a result of system startup or a periodic synchronization event.	

Latest News

- **New JMS Properties for more efficient message routing based on:**
  - Departure Airport, Destination Airport
- **Additional Aircraft Data Attributes**:
  - Computer Identifier (CID) , Global Unified Flight Identifier (GUFI)
- **New Heartbeat Message**
  - Heartbeat Message indicating TBFM MIS service is operational. Requires 3rd (new) .xsd file
- **TBFM connecting to Solace vs WebLogic broker**
  - New service version v1.1.0 to provide SWIM based

NCR – *NAS Common Reference*

Service Description

– NCR is a NAS Program that provides SWIM Services for parsing, storing, and correlating NAS data. Consumers multiple SWIM producer across NAS domains such as Aeronautical, Traffic Flow Management and Weather. Provides data standardization such as geo-referencing, units of measure and Coordinate Reference Systems (CRS). NCR enables dynamic queries for any combination of geospatial, temporal and attribute filters, which are submitted as subscriptions. NCR can apply constraints to trajectories 2D, 3D or 4D. NCR GML or GeoJSON responses integrate with open-source code.

Service Interface

– Request/Reply via GeoServer and NEMS

Message Sets
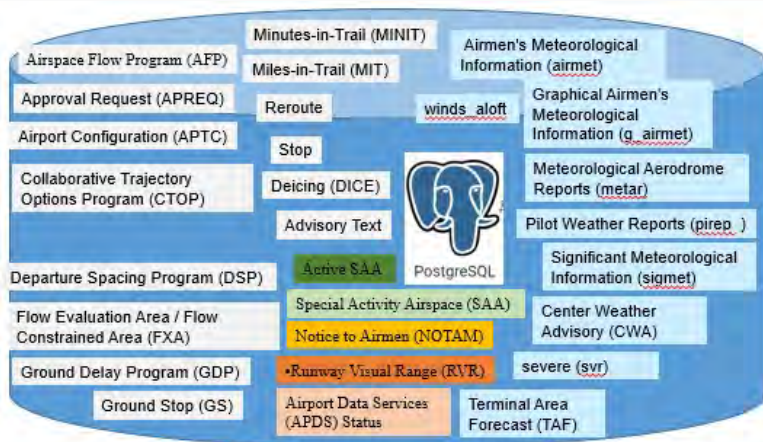
Latest News

- **NCR R1.1 to be in Ops by August 31, 2021, for internal users**

  - Will monitor stability and performance

  - Will be doing some performance tuning in the next few months

- **External NESG users will be on-ramped in the first half of CY2022 in batches**

- **Before on-ramping, NCR will help users in building their client software and testing in FNTB environment**

  - Based on FNTB availability

TFMS – *TFMData: Flight Data Service*

Back to Roadmap

Service Description
– Flight Data is comprised of data from a variety of systems but the main contributor of input data is the Enroute Computer System and International Data Providers. TFMS has a consolidated view of the entire system and adds value to that information such that the resulting output is an accurate reflection of the state of the NAS in terms of traffic flow management. Flight Data is sent as it is updated, when there is a commanded change, or when there is a computed change.

Service Interface
– Publish/Subscribe via JMS

Message Sets

Message Name	Description
Track Information	Track Information messages are used to provide a position update for the identified flight. In cases where the track position causes a route re-conformance (trajectory modeling) additional route data is provided. The messages are transmitted as received by TFMS on a cyclic basis.
Flight Plan Amendment Information	The flightPlanAmendment message provides revised flight plan data as the result of a flight plan being successfully amended.
Arrival Information	Arrival Information Message is used to provide arrival date and time information for all eligible arriving flights.
Beacon Code Information	The Beacon Code Information Message provides beacon code data on eligible flight plans.
Departure Information	The Departure Information messages is transmitted for all eligible initially activated flight plans.
Flight Plan Information	The Flight Plan Information Message is used to provide flight plan data for all eligible flight plans.
Flight Plan Cancellation	Flight Plan Cancellation messages are used to provide cancellation data for all eligible flight plans when a cancel message is received from the Host/ERAM or IADE interface or an operator action associated with the schedule database that causes previously Schedule Activated flights inserted into the NCSM to be canceled.
Boundary Crossing Update	Boundary Crossing Update is used to provide TFMM with current flight plan information on active eligible flights that are inbound from one ARTCC to another ARTCC facility.
Oceanic Report	Oceanic Report Type provides flight information for transoceanic flights and is generated when an Oceanic Position Report is received via NADIN.
NCSM Flight Create	NCSM Flight Create message is used to provide create data when CDM a flight create message is received.
NCSM Flight Modify	NCSM Flight Modify message is used to provide modify data when CDM a flight modify message is received
NCSM Flight Route	NCSM Flight Route message is used to provide route data for events that cause the flight route to be updated. The events are associated with CTOP or Reroute TMIs. They are also used to update the route information when the weekly adaptation data update is performed.
NCSM Flight Times	NCSM Flight Times message is used to provide updates of flight time data when departure or arrival times change due lateness in departure, a TBFM issued Scheduled Time of Departure, or STDDS surface movement events. *
NCSM Flight Schedule Activate	NCSM FlightScheduleActivate message is used to provide data flight data whenever an operator command or automatic timer causes a flight in the schedule database to be inserted into the NCSM. The timer is a five minute timer that causes flight's to be entered into the NCSM for demand prediction purpose 24 hours prior to their departure time.
NCSM Flight Control	NCSM Flight Control message is used to provide control data for messages/events that cause EDCT to be issued.
NCSM Flight Sectors	NCSM Flight Sectors message is used to provide updated sector crossing data an Airspace Assignment message is received.

Latest News

- **TFMS R14 deployment is targeted for October 23, 2021**
    - The new TFMData Schema version for R14 will be v3.2
    - TFMDatav3.2 to v2.0.5 mediation will be deployed with R14
    - Request/Reply re-certification will also shift with R14 deployment
- **Due to COVID-19 impacts, TFMS R14 will be deployed without Surface Viewer capability enabled.**
    - Surface Viewer capability (real-time display of airport surface and flight data) may be enabled sometime after R14 deployment.(exact date TBD)
- **All TFMData Request/Reply clients will be need to re-certified for R14 v3.2**
    - Users will not be expected to re-test for SWIM connectivity
    - Users who license their clients from a third party will not need to individually re-certify if the third-party product client is re certified

TFMS – *TFMData: Flow Data Service*

Service Description

– Flow Information is data that describes the TFM initiatives that are created, updated, or deleted from the system. Flow Information is created by TFM users; the information is used by TFMS to monitor capacity, to assist in controlling capacity of the system, or to describe characteristics of the system. Flow information provides a shared state of TFMS with authorized users in support of situational awareness and potentially to be used by CDM users in their own automation and research activities. Users consuming Flow Information can construct a dataset (or database) consistent with TFMS.

Service Interface

– Publish/Subscribe via JMS

Message Sets

Message Name	Description
AFP Advisory	Initial/Update Airspace Flow Program Message.
AFP Cancel	Cancel Airspace Flow Program Message.
AFP Compression	Initial/Update GDP/UDP Compression Message.
Airport Config Message	The airport configuration report.
CDM Update Data	TMI related data messages.
CTOP Cancel	Cancel Message.
CTOP Definition	Initial/Update CTOP Message.
Deicing Message	Deicing report.
ERAM Amendment Status Update	Details of the flights last ERAM amendment request.
FADT Broadcast	FADT Broadcast - R13 preferred way of communicating updates, cancellations of AFP,GDP, and GS programs.
FEA/FCA	Initial/Update/Cancel FEA/FCA Message.
FOS Data	FOS Flow Information output.
FEA/FCA Secondary Filters Delete	Initial/Update FEA/FCA secondary filters delete.
FEA/FCA Secondary Filters Update	Initial/Update FEA/FCA secondary filters update.
GDP Advisory	Initial/Update GDP/UDP Message.
GDP Blanket	Initial/Update GDP/UDP Blanket Message.

Message Name	Description
GDP Cancel	Cancel GDP/UDP Message.
GDP Compression	Initial/Update GDP/UDP Compression Message.
General Advisory	General Advisory Message.
GS Advisory	Initial/Update GS Message.
GS Cancel	Cancel GS Message.
AFP/GDP Update	Air Flow Program (AFP) or Ground Delay Program (GDP) TMI parameter create/update.
Blanket Update	AFP/GDP Blanket parameters create or update for TMI.
Compression Update	AFP/GDP Compression parameter update or create TMI.
Delete	Parameter delete for Fuel Advisory Delay TMI.
GS Update	Ground Stop (GS) TMI parameter create/update.
RAPT Timeline Message	The RAPT Timeline data.
Reroute	Initial/Update/Cancel Reroute Message.
Restriction Message	The restriction report.
TMI Flight Data List	General flight data for flights associated with any TMI or monitored airports.

Latest News

- **TFMS R14 deployment is targeted for October 23, 2021**
  - •The new TFMData Schema version for R14 will be v3.2
  - •TFMDatav3.2 to v2.0.5 mediation will be deployed with R14
  - •Request/Reply re-certification will also shift with R14 deployment
- **Due to COVID-19 impacts, TFMS R14 will be deployed without Surface Viewer capability enabled.**
  - •Surface Viewer capability (real-time display of airport surface and flight data) may be enabled sometime after R14 deployment.(exact date TBD)
- **All TFMData Request/Reply clients will be need to re-certified for R14 v3.2**
  - •Users will not be expected to re-test for SWIM connectivity
  - •Users who license their clients from a third party will not need to individually re-certify if the third-party product client is re certified

TFMS – *TFMData: Request/Reply Service*

Service Description

– The TFM Request/Reply Business Function exposes all of the TFMS services and makes them available to the SWIM community. TFMS Request/Reply is managed by TFMS by authorizing user request to ensure only FAA approved users are requesting services of the TFMS. These include requests that can impact the TFM system and/or the behavior of Air Traffic Flow.

Service Interface

– Request/Reply via JMS

Message Sets

Message Name	Description
Airport Fix Reply Data	Airport arrival and departure fixes.
Slot List	Slot assignment list.
CTOP Reply Data	
EDCT Check Report	
EDCT List Report	
EDCT Show Report	
EDCT Slot List Report	
EDCT Sub Show Report	
EDCT Unassigned Slots Report	
Flight Recon Data	
Forwarded Slot List	
FOS Reply Data	
Hist Popup Data	
Reroute Reply Data	
RRIA Reply Data	
Substitution Response Data	
TMI Reply Data	

Message Name	Description
Oceanic Position Report	There are three types of Oceanic Position Reports, described in this se... (1... (F... R...
Flight Recon Request	In... all...
Flight Schedule Request	In... fli...
FOS Request	In...
FEA/FCA Request	F...
Reroute Request	In...
Hist Popup Request	Hi...
Reroute Model Request	In...
Sub Block Request	T... re... ca... fli...
TMI Resync Request	In...

Message Name	Description
Advisory Request	Advisory Related Requests.
TMI ID Request	Request for a unique TMI ID to be used in a subsequent request for the creation of a TMI.
Airport Request	Request for candidate flights by airports.
AFP/GDP Update Request	Request to create or update an Air Flow Program (AFP) or Ground Delay Program (GDP) TMI.
GS Update Request	Request to create or update an Ground Stop (GS) TMI.
Blanket Update Request	Request to create or update an AFP/GDP Blanket parameters for TMI.
Compression Update Request	Request to create or update an AFP/GDP Compression TMI.
Delete Request	Request to delete parameters for any Fuel Advisory Delay TMI.
Fuel Advisory Delay Request	Request to create or update any Fuel Advisory Delay TMI.
Airport FIX Request	Identifies the airports for which arrival and departure fixes are to be supplied.
CTOP Request	Includes all of the CTOP requests.
EDCT Request	Includes all of the EDCT possible requests.

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SWIM Flight Planning – *Common Support Services: Flight Data (CSS-FD)*

Service Description

- **Flight Planning & Filing: A standards-based flight planning & filing environment.** To be used by flight operators and the FAA to negotiate preliminary and filed flight plans. Constraint sharing/feedback will enable the flight operator to receive and address constraints early in the planning phase
- **Flight Data Sharing: Provide a single common reference** for legacy and FF-ICE capable users facilitating operational flight data sharing across the NAS ecosystem in accordance with centralized and managed business rules.
- CSS-FD will support Additional flight data for **Trajectory Based Operations (TBO), International data exchange standards** *(i.e. Flight Information Exchange Model (FIXM)),* **Enhanced Collaborative decision-making and** International Civil Aviation Organization (ICAO) provisions for **Flight and Flow – Information for a Collaborative Environment (FF-ICE) and mixed-mode**

Service Interface

- TBD

Message Sets

- TBD

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Back to Roadmap

Latest News

- **CSS-FD Phase 1 Outlook lays a foundation to achieve FF-ICE/R1 compliance for flight planning and flight plan filing and supports future capabilities**

  - Finalized Risk Reduction Activity (RRA) Sprint 1 scope and activities

  - Initiated onboarding process for Volpe Center (US DOT R&D organization) for Sprint 1

  - Initiated internal Constraint Evaluation Working Group in preparation for industry engagement

- **CSS-FD Phase 2 plans to include preliminary flight plan and integration with TFM**

  - Supports potential future capabilities such as AAP feedback for Flight Planning

  - Accuracy of the feedback will continue to improve over time

NextGen Weather – *Common Support Services: Weather (CSS-Wx)*

Service Description

– **CSS-Wx will function as a single provider of weather data products within the NAS, using standards-based weather dissemination. The service makes weather products available from NOAA, NWP and other data sources for integration to air traffic systems, and provides weather products via a set of common Web Services for weather, using international data access and data format standards.**

Service Interface

– TBD

Message Sets

Gridded Weather Data

Precipitation (VIL)	Icing Layer
Precipitation (VIL) with Mask	Composite Icing
Precipitation (VIL) Forecast	Icing Layer Forecast
Precipitation (VIL) Forecast with Mask	Composite Icing Forecast
Echo Tops	Turbulence Layer
Echo Tops Forecast	Turbulence Layer Forecast
Precipitation (Base Reflectivity)	Composite Turbulence
Precipitation (Composite Reflectivity)	Composite Turbulence Forecast
Precipitation (Composite Reflectivity) with Mask	Convective Weather Avoidance Fields
Surface Precipitation Phase	Convective Weather Avoidance Field Forecast
Surface Precipitation Phase Forecast	Satellite
	Terminal Winds
	*NOAA Model Data (RAP, HRRR, GFS, NAM)**

Non-Gridded Weather Data

Precipitation (VIL) Forecast Accuracy	Forecast Confidence	Airmen's Meteorological Information Advisories (AIRMET)*
Precipitation (VIL) Forecast Contours	Convective Weather Avoidance Polygons / CWAP Forecast	Graphical AIRMET (G-AIRMET)*
Echo Tops Forecast Accuracy	Wind Profiles	Winds Aloft Forecast*
Echo Tops Forecast Contours	Tornado Detections	Surface Weather Observations
Lightning	Icing Layer Contours	Aviation Watch Notification*
Storm Information Hazard Text	Composite Icing Contours	Tornado Warnings*
Storm Information Leading Edges	Turbulence Layer Contours	Severe Thunderstorm Warnings*
Storm Information Motion Vectors	Composite Turbulence Contours	Public Severe Weather Watch Notification (SEL)*
Fronts Forecast	Pilot Report (PIREP)	Volcanic Ash Advisory Statement (VAAS)*
Growth Trends	Urgent Pilot Report (PIREP)	Terminal Area Forecast (TAF)*
Decay Trends	ICAO Aircraft Report (AIREP)*	Center Weather Advisories*
	Significant Meteorological Information (SIGMET)*	Meteorological Impact Statements*
	Convective Significant Meteorological Information (Convective SIGMET)*	Severe Weather Statements (SVS)*
	TFM Convective Forecast (TCF)*	

Back to Roadmap

> **Latest News**
>
> **Recently completed re-planning approved by JRC in May 2021**
>
> • Decommission Weather and Radar Processor (WARP) and Corridor Integrated Weather System (CIWS)
>
> **Key Site Initial Operational Capability (IOC) in 2024**
>
> • NOAA NextGen IT Web Services (NGITWS) targeting August 2021 release
>
> • Currently conducting CSS-Wx integration and system testing at WJHTC
>
> • Ongoing CSS-Wx interface testing with ERAM at WJHTC
>
> • End user systems and SWIM to support CSS-Wx and NWP testing by 2024