

SWIFT:

SWIM Industry Collaboration Workshop #12

SWIM, Services & SWIFT
(SWIM Industry-FAA Team)

Presented to: SWIFT Community

By: FAA SWIM Program Communications, Information and
Network Programs

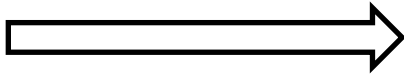
Date: November 19, 2020



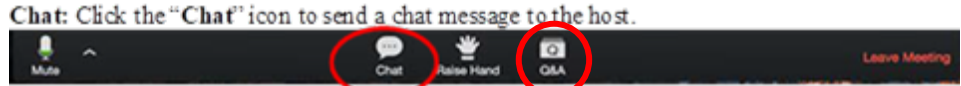
**Federal Aviation
Administration**

“Airwave Procedures”

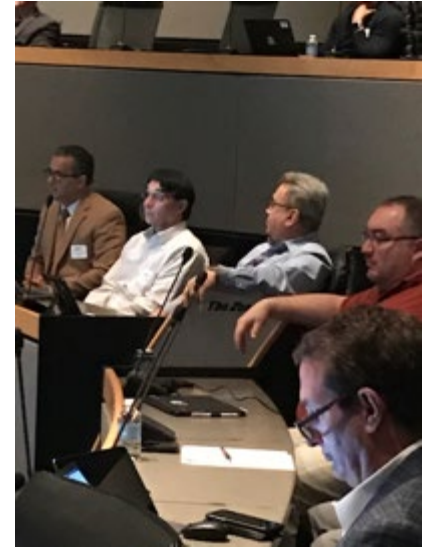
- Please note during the session all attendees will be muted, and will need to use the zoom controls to the right to interact with presenters



- If you would like to ask questions, or engage during a topic of interest please use the “Chat/QA” features and the Zoom Moderator will either announce your question/comment or unmute you time permitted



SWIFT: The Skies the limit!

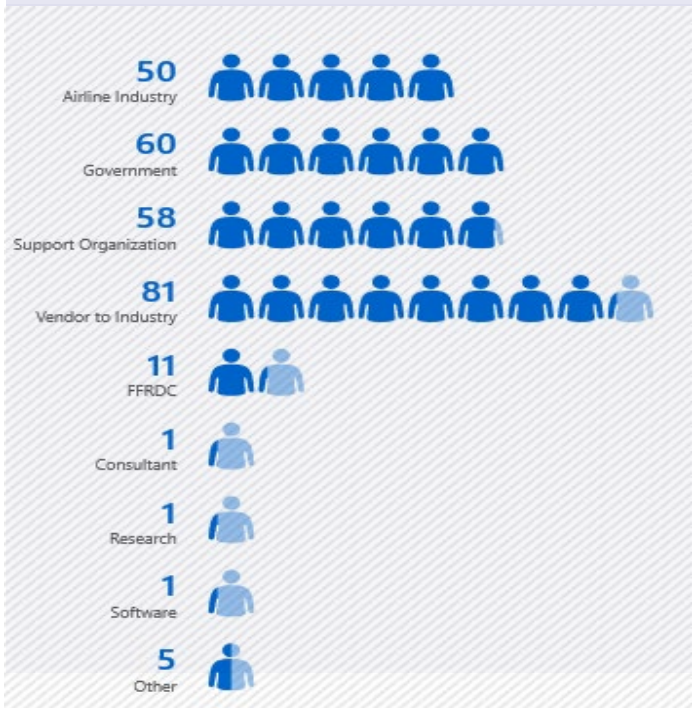


SWIFT Collaborative Workshop #12

- **On-line Virtual Conference Starts Promptly 12:30pm**
- **Welcome and Introductions**
 - David Almeida (LS Technologies)
- **Opening Remarks**
 - Mark Denicuolo (FAA)
- **SWIFT Focus Group Updates**
 - Chris Gottlieb (JetBlue), Mike Jagmin (United)
- **Widget Case Study: Honeycomb with NAS Common Reference (NCR)**
 - Chris Gottlieb (JetBlue)
- **NAS Program: Terminal Flight Data Manager (TFDM) Update**
 - Doug Swol (FAA), Steve Lent (Mosaic)
- **Widget Demo: SWIFT Winds**
 - Mike Jagmin (United)
- **Information Services Roadmap**
 - Xavier Pratt (LS Technologies)

Who is in the “Zoom Room” at SWIFT #12?

Attendee Organizations



•Other defined as: MIT Lincoln Laboratory, Deloitte, Aircraft-Noise, and Inmarsat

Attended a SWIFT Meeting Before?



268 attendees



Airspace Users



Professional Associations



Vendors to Industry/Government



Airport/Airspace Authorities



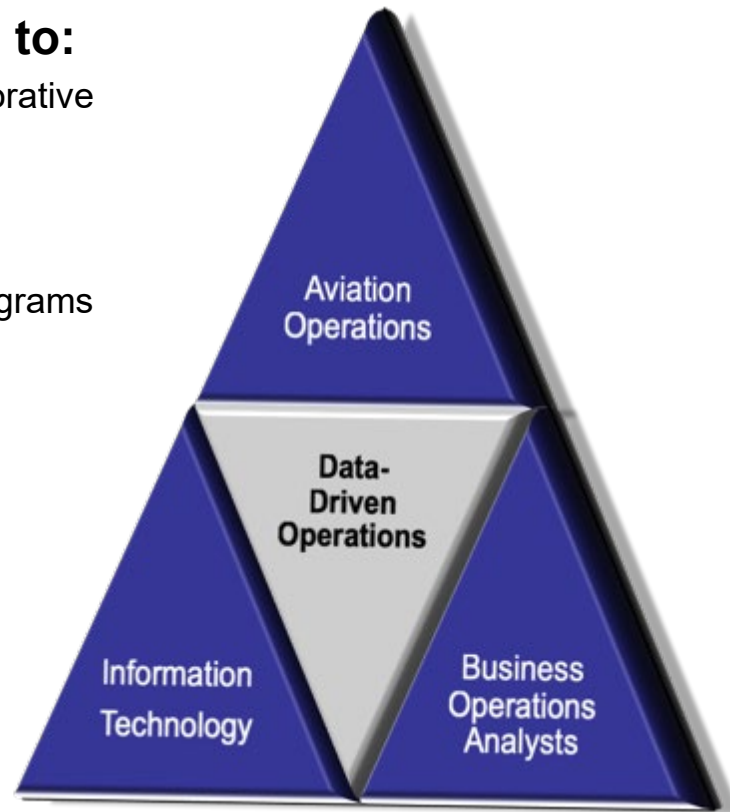
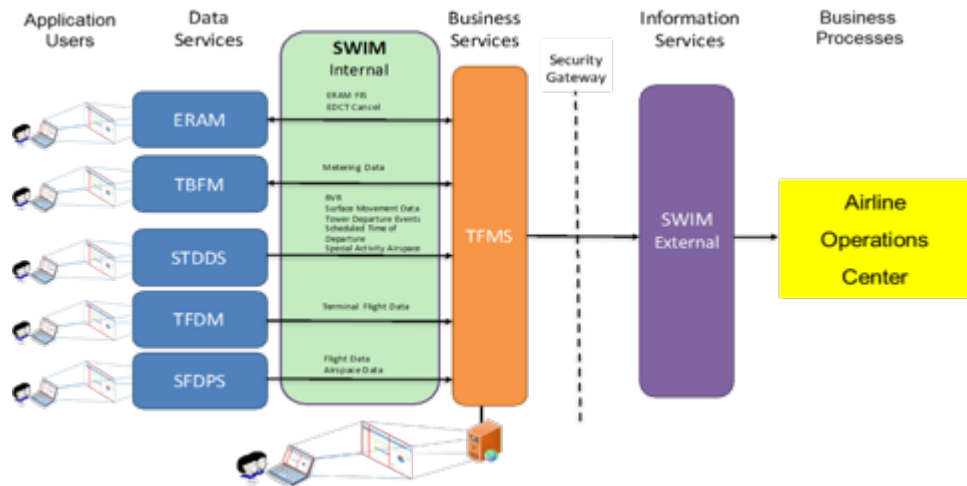
Standards Bodies



Government

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

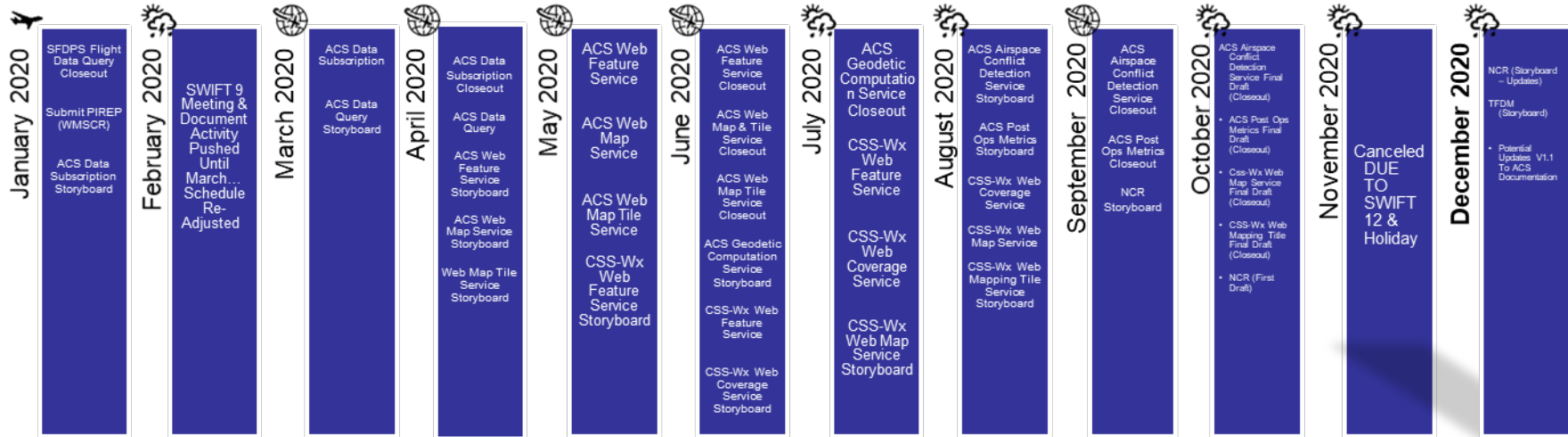


SWIFT: Announcements

- **SWIFT 13 Virtual Workshop: February 18, 2021 @12:30PM EST**
- **TFMS Technical Webinar: Every Second Thursday of the month @ 1PM EST**
 - Next Meeting scheduled for December 10, 2020
 - Send questions or topics to Chris.Burdick@faa.gov, or Thomas.ctr.Paccione@faa.gov

Focus Group Status Updates

Operational Context Focus Group: Document Updates



- **No Meeting this month – Next Session will be December 10th @10am – See you there!**
- **TFDM Use Case and TTP Ops Context**
 - Comments received on Use Case, team currently incorporating updates and working TTP Context Docs
- **Schedule subject to change if service updates are released and existing Operational Context documents need to be updated**

Operational Issues Focus Group Update

SWIFT 12 Update

Presented to: SWIFT

By: Chris Gottlieb – JetBlue

Date: November 19, 2020

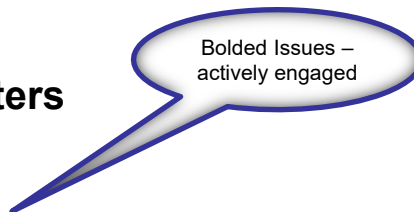


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Operational Issues Focus Group

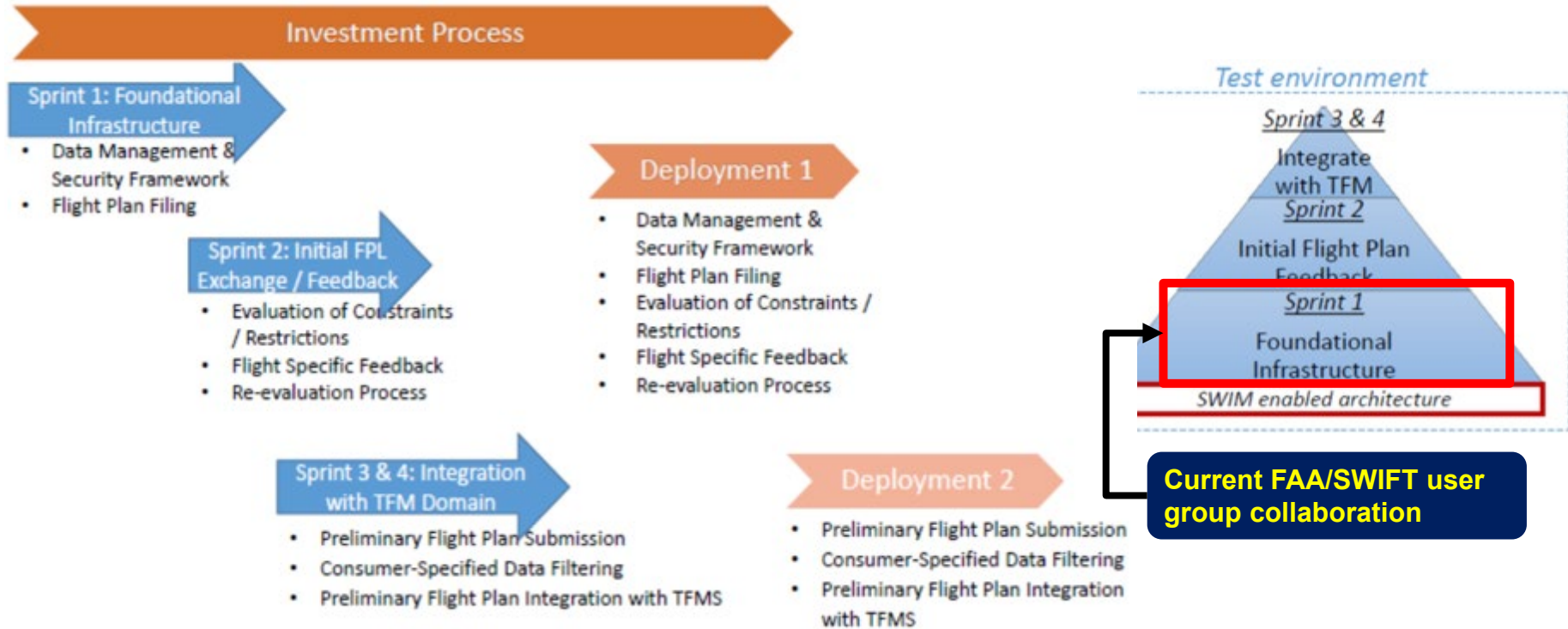
- **Lead:** Chris Gottlieb, JetBlue
- **Goal:** Address NAS-wide operational issues that might benefit from information sharing between organizations
- **Current Prioritized Issues:**
 - **TBFM delays (United) who, what, why it matters**
 - **Flight planning over IP (SWA)**
 - **Early planning for disruptions**
 - **Early Detection Deviation over Fix (JBU)**
 - **Early Detection for Airport Surface Delays (JBU)**
 - Taxi Out Return to Gate (Delta)
 - TBFM/TFMS double delays
 - Long taxi issues (JBU) at JFK



Industry seeking functionality that will help:

- **Focus limited resources on “things that matter”**
 - Establish business processes that maximize flexibility for internal planning and operations
 - Utilize resources more effectively for development activities and short-term “wins”
 - Optimize data feeds between FAA and airspace users
- **Improve service through increased reliability of operations**
 - Leverage flight planning to improve and deliver results to the operation
 - Identify the value of flight planning inputs as enablers to TBO
 - Define TBO benefits as component or enabler of broader airspace system efficiency & reliability
- **Understand flight planning data elements and their impact on each stage of operational planning and decision-making**
 - Translating data services into improved airspace user operations management
 - Ensuring internal capabilities are focused on improving passenger service experience

Notional Functionalities for SWIM Flight Planning



Flight Planning Modernization: Next Steps

- **Continue participant engagement:**
 - Adjudicate Flight Planning experience/comments from October SWIFT airspace user engagement
 - Solicit additional feedback on CSS-FD capabilities from user group
- **Scope sprint activities:**
 - Request actual user Flight Plans for test and trail period (Sprint 1) to derive benefits or assess system performance
- **Project planning:**
 - Prepare for next user group engagement in early December
 - Develop a common schedule and identify relevant interdependencies
 - Align resources to project milestone dates and work action plans, accordingly

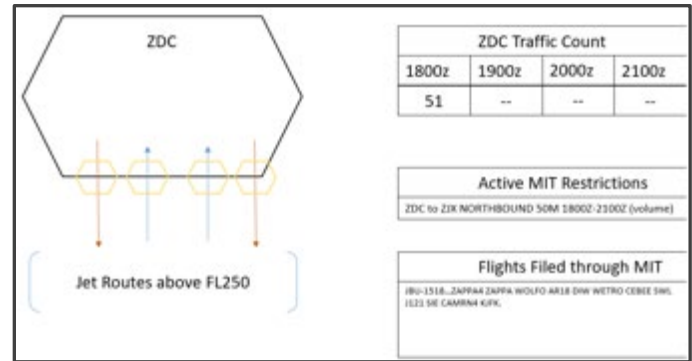
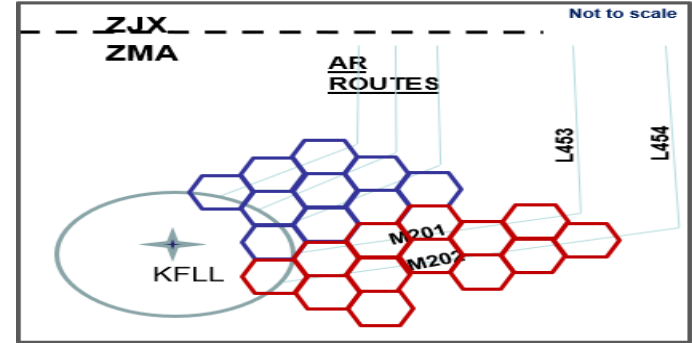
Issue: Early Planning for Disruptions

• Case #1: Delay Route Deviations

- Need tools to observe or record departure and en route flight metrics to correlate constraint impacts
- Use Honeycomb geospatial feature to visualize flight deviations, then query preferred routes in NCR to get current constraints/restrictions
- Goal: Facilitates watching flights and looking ahead to make surface Ops decisions

• Case #2: Delay Prediction & Traffic Count Monitoring [Future exploration]

- Look into using elements of the previous widget case study to look at different aspect in planning for disruptions
- Potentially use Honeycomb geospatial feature at Northeast Center Boundary and Route Crossing to monitor high altitude traffic counts. Then use NCR to identify flights going through MIT areas prior to pushing back
- Goal: Observe for real-time data with better accuracy than AFP/FEAs and provide historical data or reference points for post-Ops archiving



Development & Analytics Focus Group

SWIFT 12 Update

Presented to: SWIFT

By: Mike Jagmin – United Air Lines

Date: November 19, 2020



**Federal Aviation
Administration**



Development & Analytics Focus Group

Interim Lead: Mike Jagmin, United

Background & Purpose Recap:

- Collaborate with Operational Issues Focus Group
- Leverage the expertise of participants to present solutions using SWIM data
- Identify top community priorities via SWIFT meetings and by the Operational Focus Group

Status:

- April and May dedicated to Sprint 1
- June reflection of Sprint 1 Activities/Completion
- Late June – Sprint 2 Activities Began
- September SWIM ETA Full Timeline Kickoff

TBFM Delays Sub Team Sprint 2

Goal remains the same – determine the departure delay given to a flight by TBFM

- Delay should be the difference between aircraft ready time and the scheduled departure time
- CTM / ETD fields initially set as ready time, but can be updated for many reasons, not transparent to the end SWIM user

rfd	arto	aid	aty	ctm	etd	stb
2019-09-24T13:33:32Z	ZLA	AAL1808	NEW	2019-09-24T13:45:00Z		
2019-09-24T13:46:55Z	ZLA	AAL1808	AMD		2019-09-24T14:09:00Z	
2019-09-24T13:46:55Z	ZLA	AAL1808	AMD	2019-09-24T14:09:00Z		2
2019-09-24T13:46:55Z	ZLA	AAL1808	AMD		2019-09-24T14:09:21Z	
2019-09-24T13:46:55Z	ZLA	AAL1808	AMD	2019-09-24T14:09:21Z		3
2019-09-24T13:47:01Z	ZLA	AAL1808	AMD		2019-09-24T14:41:00Z	
2019-09-24T13:47:13Z	ZLA	AAL1808	AMD	2019-09-24T14:41:00Z		4
2019-09-24T13:47:14Z	ZLA	AAL1808	AMD		2019-09-24T14:41:00Z	
2019-09-24T13:47:16Z	ZLA	AAL1808	AMD		2019-09-24T14:41:00Z	
2019-09-24T13:47:29Z	ZLA	AAL1808	AMD		2019-09-24T14:41:00Z	
2019-09-24T13:48:27Z	ZLA	AAL1808	AMD	2019-09-24T14:22:28Z		6
2019-09-24T13:48:27Z	ZLA	AAL1808	AMD			2019-09-24T14:22:28Z

1. ctm initially set to pTIME provided from ERAM
2. etd/ctm is incrementally updated to aircraft ready time
3. etd/ctm is incrementally updated to first available departure time based on provided ready time
4. ctm is updated to TGUI (ARTCC) reschedule departure time (initial returned time from ZAB arrival scheduled)
5. ctm/etd/stb are updated to first available departure time based on updated ARTCC departure time
• Scheduled departure time is accepted.
6. ctm/stb are updated to the manually assigned schedule departure time by ARTCC

Current Activities & Status

- TBFM producer group have been busy analyzing data points provided by D&A Team
- TBFM team has captured 5 issues/enhancement areas on MIS. Currently assessing these issues internally, are seeking to develop a plan that will both improve the MIS and meet the constraints of the program
- Efforts continue with Bi-weekly Meetings to achieve longer term solution

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Pg. 3

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SWIM ETA Full Timeline

Problem Statement:

- Airlines lack the ability to easily see downstream impacts on the NAS from their modifications to the ETA (and other data points) submitted to the FAA. Currently this leads to ambiguity between input and output data, and no insight into the full impact on ETA. Aggregating and analyzing a full set of inputs and outputs from the FAA systems will provide a better understanding of how these changes impact flights, as well as foster change to benefit the industry as a whole.

Status:

- **Held official Kickoff October 8, 2020**
 - Group discussed the initial problem description, objectives, and end goal.
- **Currently**
 - Sub team has started providing example data to further support the problem statement
 - Next Steps are to solidify problem statement, join TBFM working session for outreach and potential collaboration to finding resolution
 - Next SWIM ETA Sub Team meeting – targeted for week of Dec 1st

What's that... you want more Data & Analytics?? Join us!

Next full D&A to be scheduled for the week of Dec 14th

- Huddle as team before we head into the New Year
- Provide out brief on Sprint 2 & SWIM ETA Full Timeline
- Revisit Project List for 2021:
 - Double delays
 - Gate Returns
 - NE SWAP Routing issues
 - FFICE
 - Demand over an Entity
 - Estimated Times

Contact Us: Mike Jagmin - Michael.Jagmin@united.com
Ray Mitchell - Ray.Mitchell@lstechllc.com

Aviation Case Study

Delay Route Deviation

Presented to: SWIFT

By: Chris Gottlieb, JetBlue

Date: November 19, 2020



**Federal Aviation
Administration**



Case Study Objectives

Solicit industry feedback...

- Is there interest in this problem?
- Is there interest in the data driving this?
- How should we demo this problem space?
- Deep-dive in Ops Issues Focus Group
 - Investigation timeframe (~ 6-month effort)
 - Industry/Community resources
 - Industry information availability and sharing

Executive Summary

- **Environment:**

- En route environment with flight departures from Fort Lauderdale (KFLL) crossing Jacksonville and Miami Center boundary (ZJX, ZMA)
- Airways and Atlantic routes impacted by Traffic Management Initiatives (TMI) events
 - M201 and M202 occasionally shut down
 - L453, L454

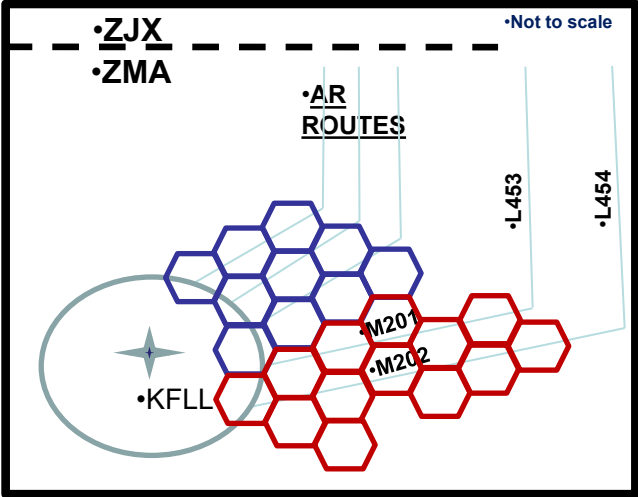
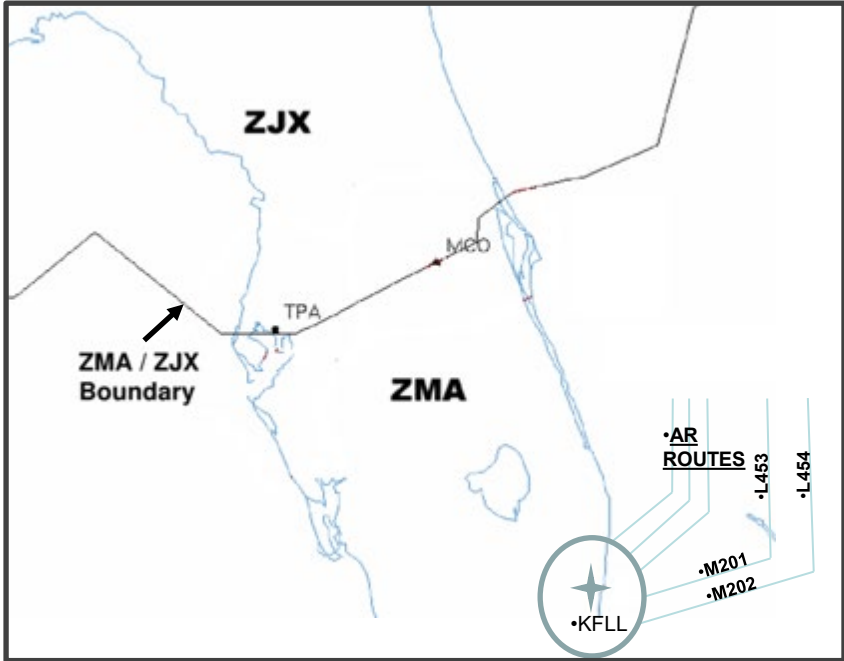
- **Problem Statement:**

- No clear way to readily identify or record aircraft diversion causes (e.g. due to traffic volume or weather). Without this capability, we lack the means to anticipate traffic route closures or aircraft reroutes during en route & surface operations. Currently, we **have limited analytical approaches for gauging how well airspace is managed or utilize data** for industry and ATC **post-analysis collaboration** for more efficient use of airspace. Such a tool or capability would provide a more unified operational view of ATM metrics that are often disjointed or difficult to interpret.

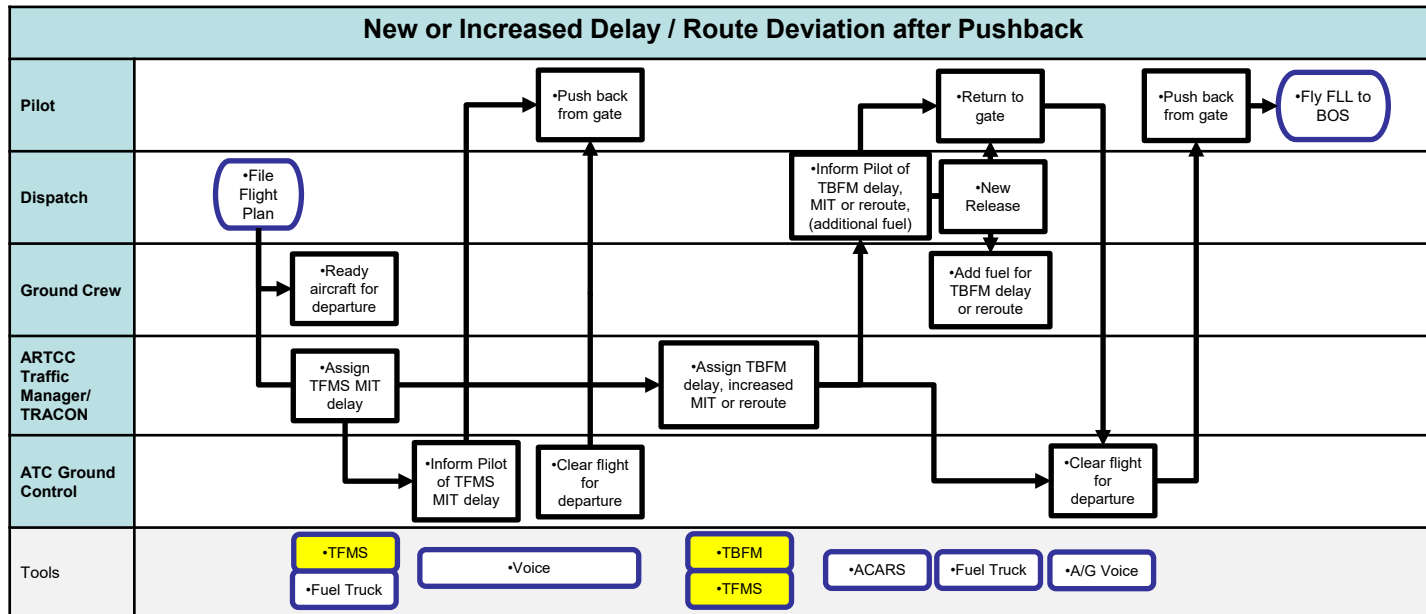
- **Goal:**

- Record tolerance of aircraft deviation on initial leg of KFLL departure gates to better identify/predict constrained routes and minimize TMI delay impacts to surface operations.

KFLL Atlantic Routes and Airways



As-Is Operational Business Process



What has been your experience with work-arounds for route deviation?

Key SWIM Information Services

En Route Flight & Airspace Data Query Services

ERFDQ is a feature of the SFDPS service providing flight plan, track, and other flight-related data from ERAM via HADDS.

- Retrieve data from the SFDPS database based on filtering criteria specified by consumers
- Flight Plans, Updates & Amendment Information, Hold Status & Handoff Information, Converted Route, Cancellations, etc.

ERADQ is a feature of the SFDPS service providing airspace assignment, status, and other airspace-related messages from ERAM via HADDS.

- Retrieve data from the SFDPS database based on filtering criteria specified by consumers
- Sector Assignment Status Information, Route Status Information, Special Activities Airspace Information, Altimeter Setting Information

NAS Common Reference

NCR is a NAS Program that provides SWIM Services for parsing, storing, and correlating NAS data.

- Ingests multiple SWIM products from several NAS producers
- Aeronautical (e.g., Aeronautical Common Services (ACS))
- Weather Information

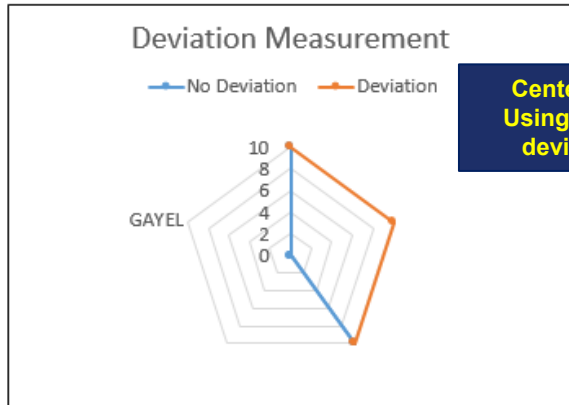
NCR enables dynamic queries for NAS data

- Route of flight or airspace geometry
- Any combination of geospatial, temporal, and attribute filters – like a database query

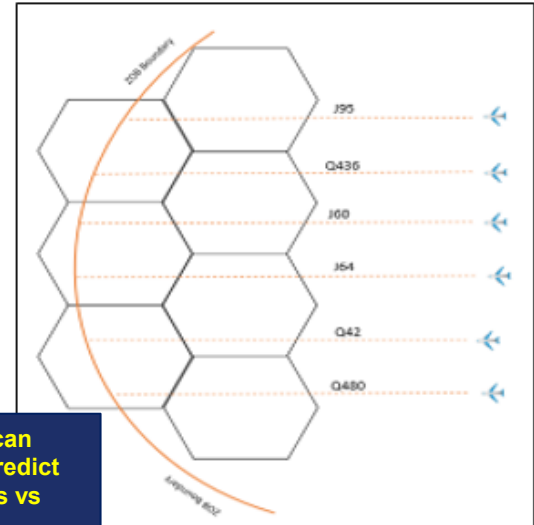
Honeycomb Application

From SWIFT 10...

- Establish a baseline to track relevant data for N90 TRACON departure fixes and airways



Centered at 0 is the DEP fix GAYEL.
Using Honeycomb, we could detect a deviation from 0 with a geo-fence.



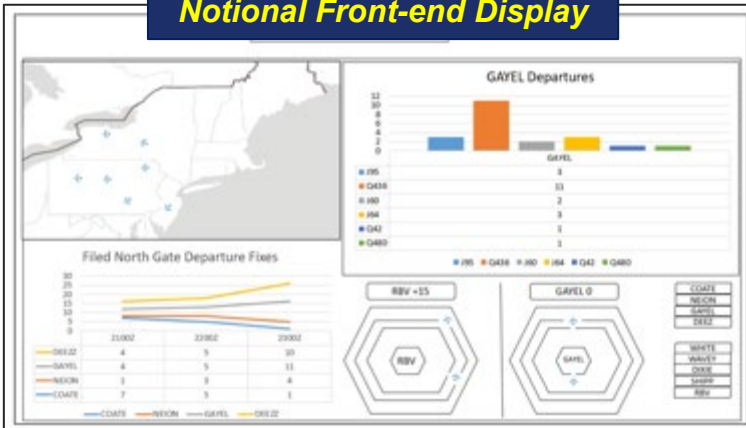
With geospatial indexing, we can determine airway efficiency or predict route closures by tracking MITs vs Demand

Honeycomb Application

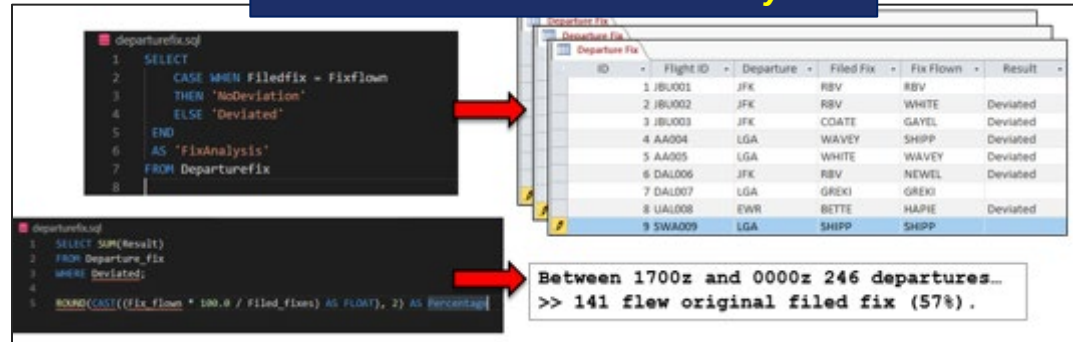
From SWIFT 10...

- A report can be printed for Post Ops analysis
- Glean planning efficiency, irrespective of current volume

Notional Front-end Display



Notional Back-End Data & Analytics



Notional Widget Application Approach

Honeycomb Features

- Monitor Deviation from given geometric boundary (i.e., ATC preferred route on this widget).
- Deviations greater than 25NM from departure fix or route are recorded.

NCR Features

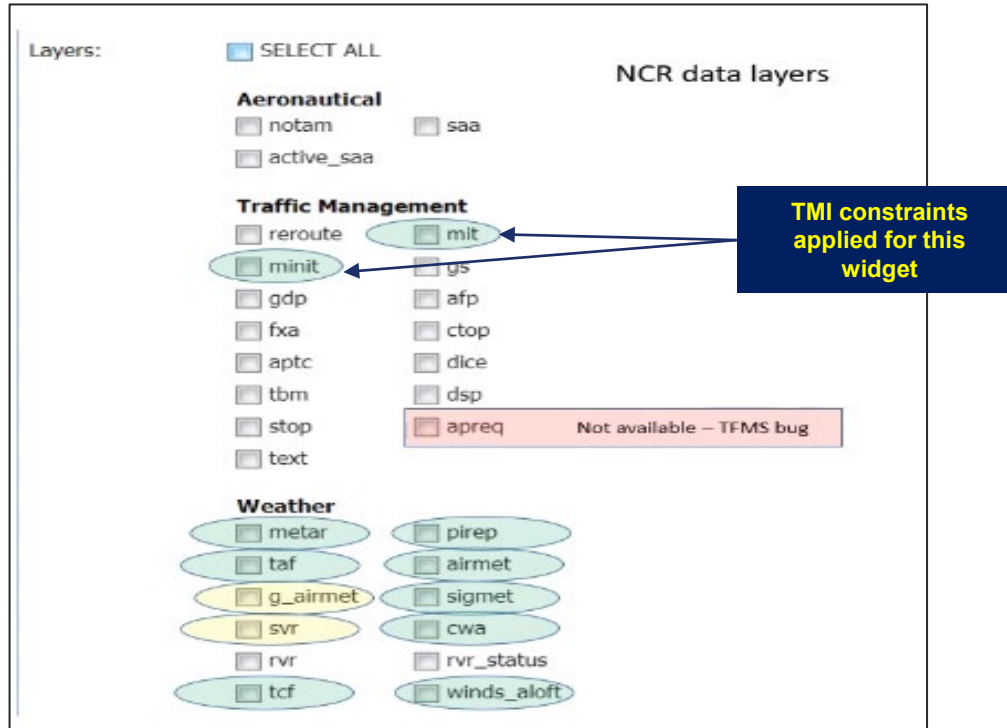
- Query NCR to see if area of airspace or route of flight intersects any TFMS reroute advisories or TMI restrictions (TFMData)
- Real Time Early Alert using query as a subscription (Based on NTML logs)

Combining applications will provide...

- Post Ops Analysis on key drivers for reroutes.
- Real time alerting to dispatchers of possible delay (MIT, Route Closure) derived from NTML Log.
- Use Honeycomb deviation data to record tolerance of deviation on the initial leg of Jet Route.

****Note: Can apply Honeycomb/NCR widget for tracking FCA volumes***

Notional NCR Functionality



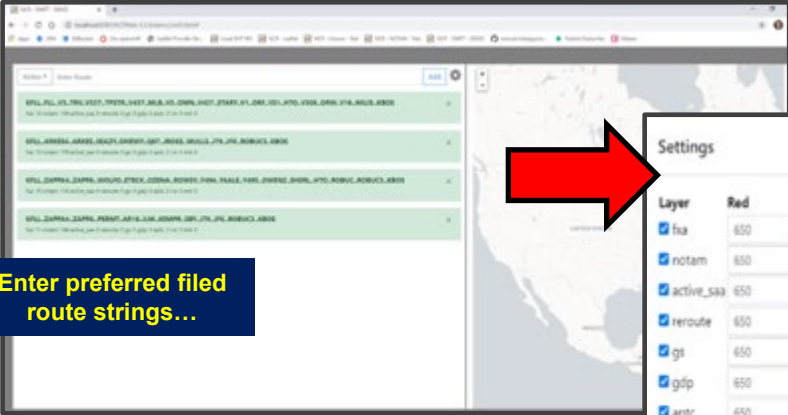
Notional Widget User Display

The screenshot displays a web application interface for flight routes. On the left, there is a list of routes with their respective flight numbers and status. On the right, there is a map of the United States with a green line indicating a specific flight path. A callout box with the text "Routes of interest from Honeycomb, entered into NCR" points to the routes list and the map area.

Routes of interest from Honeycomb, entered into NCR

Route	Flight Number	Status
KFLL_FLL_V3_TRV_V537_TPSTR_V437_MLB_V3_OMN_V437_STARY_V1_ORF_V51_HTO_V308_ORW_V16_MILIS_KBOS	13 notam: 139 active_sas: 0 reroute: 0 gc: 0 gdp: 0 aplo: 2 nr: 0 ml: 0	Active
KFLL_ARKES4_ARKES_SEAZY_ONEWY_Q87_JROSS_MULLS_J79_JFK_ROBUC3_KBOS	13 notam: 178 active_sas: 0 reroute: 0 gc: 0 gdp: 0 aplo: 2 nr: 0 ml: 0	Active
KFLL_ZAPPA4_ZAPPA_WOLFO_ETECK_OZENA_ROWSY_Y494_YAALY_Y495_OWENZ_SHERL_HTO_ROBUC3_KBOS	10 notam: 116 active_sas: 0 reroute: 0 gc: 0 gdp: 0 aplo: 2 nr: 0 ml: 0	Active
KFLL_ZAPPA4_ZAPPA_PERMT_AR16_ILM_KEMPR_SBY_J79_JFK_ROBUC3_KBOS	11 notam: 146 active_sas: 0 reroute: 0 gc: 0 gdp: 0 aplo: 2 nr: 0 ml: 0	Active

Notional Widget Application

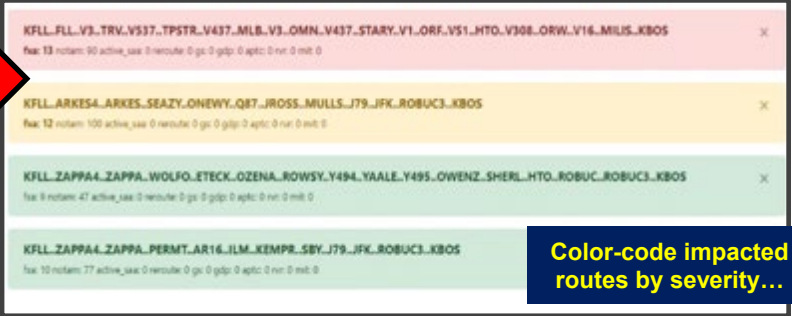


Settings

Layer	Red	Yellow
<input checked="" type="checkbox"/> fua	650	350
<input checked="" type="checkbox"/> notam	650	350
<input checked="" type="checkbox"/> active_saa	650	350
<input checked="" type="checkbox"/> reroute	650	350
<input checked="" type="checkbox"/> gt	650	350
<input checked="" type="checkbox"/> gdp	650	350
<input checked="" type="checkbox"/> aptc	650	350
<input checked="" type="checkbox"/> rnr	650	350
<input checked="" type="checkbox"/> mit	650	350

Save Cancel

Set TFM evaluation for impacted flight routes...



Notional Widget User Interface

The screenshot displays the NCR Web Client interface, which is a web-based tool for flight planning. The main area shows a map of the United States with several flight routes plotted in green. Five data popups are visible, each providing detailed information for a specific flight segment. The popups include fields for issue time, start time, end time, expiration time, max altitude, archive ID, and global ID. The interface also features a left sidebar with a 'Map Layers' panel, a top navigation bar, and a right sidebar with a 'Route Query' and 'General Query' panel, along with a 'Temporal Filter' section. A blue callout box with white text is overlaid on the map, pointing to the flight routes and popups.

With this visualization tool, Honeycomb/NCR could help flight operators evaluate trade-offs of potential routes by identifying:

- Aeronautical constraints
- Traffic flow constraints
- Weather constraints

Notional Widget Application Benefits

A notional widget that combines Honeycomb and NCR features could benefit AOC Ops and NAS efficiency by providing:

- Visibility into MIT/MINIT triggers and resulting delay effects
 - Reduce cascading effects from unpredictable delay (e.g., crew misconnects, aircraft swaps, last minute gate changes)
- Ability to fuse/correlate TMI restrictions to impacted flight plan filings
 - Improved accuracy on impacted flights better informs tactical decision-making for work-arounds. Greater airline performance metrics and customer satisfaction rating.
- Earlier aircraft deviation detection at departure routes to alert surface traffic
 - Improved TRACON/Tower/AOC clearance coordination and workload management to reduce gate returns, gate utilization and extended taxi
 - Visibility into route closure and recovery time to reduce vulnerability to SWAP
 - Route availability situational awareness for better reroute planning and fuel savings. Improve safety through better workload management and reducing error probability.
- Ability to measure key drivers for reroutes to better inform FAA-airline CDM
 - Assess center boundary route efficiency
 - Reduce overly- or under- prescriptive TMI implementation
- Store and leverage data for post Ops analysis to assess accuracy of delay estimates and recovery times
 - Reference playbooks utilizing real historical data on route diversions to plan and update accordingly

Questions



TFDM Program Status Update & Technical Topic:

Identifying Flights Impacted by Local Restrictions from the TFDM TTP SWIM Interfaces

Presented to: SWIFT

By: Doug Swol TFDM (FAA)

Date: November 19, 2020



**Federal Aviation
Administration**



Purpose

- Brief Status Update on TFDM Program
- Overview of how subscribers to the TFDM SWIM Terminal Flight Data Publication (TTP) Services can identify which flights are impacted by local TMIs, i.e., Departure MITs, Departure Stops, etc., and the new TFDM Surface Management Procedure (SMP) TMIs.

TFDM Program Status Update

Pandemic Impacts on TFDM:

- No travel or access to FAA air traffic facilities
 - Prevents Air Traffic Controller and Tech Ops Technician Training
 - Prevents Operational Test of the TFDM system
 - Prevents other FAA systems from making improvements needed to support TFDM
 - Unable to achieve Operational Suitability or In-Service Decision milestones

Progress During Pandemic:

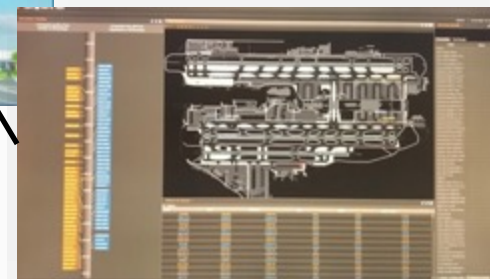
- Software development of Build 1 and Build 2 continues
- Completed Build 1.1a Developmental Testing remotely
- Limited access to Tech Center

Program Challenges and Impacts:

- Unknown when the program will be able to travel, test, train or access facilities
- Schedule impact 17 months to Key site IOC which carries through 89 site waterfall
 - **PHX B1 IOC Projected: November 2021**
 - **CLT B2 IOC Projected: November 2022**



Build 1: Config A and B Sites



Build 2: Config A Sites Only

TFDM Hardware Installation Dashboard



- PSS = Pre-Site Survey
- SS = Site Survey
- HW = Hardware Install
- SAT = Site Acceptance Test
- CAI = Contractor Acceptance Inspection

POSTPONED ITEMS (due to COVID restrictions)

- LAX HW Install
- DAY SS
- PHL HW Install
- SFO PSS
- SMF PSS
- EWR HW Install
- SFO SS
- IAH PSS
- SMF SS
- JFK HW Install
- ATL PSS
- IAH PSS

Identifying Flights Impacted by Local Restrictions from the TFDM TTP SWIM Interfaces



The Relevant TTP Services

- **Traffic Management Restriction (TMR) Service**
 - Provides the list of non-SMP local TMs*
- **Flight Data Service**
 - Provides the mapping of flights to non-SMP local TMs
- **Surface Metering Program (SMP) Service**
 - Provides the list of SMP TMs as well as the mapping of flights to SMP TMs

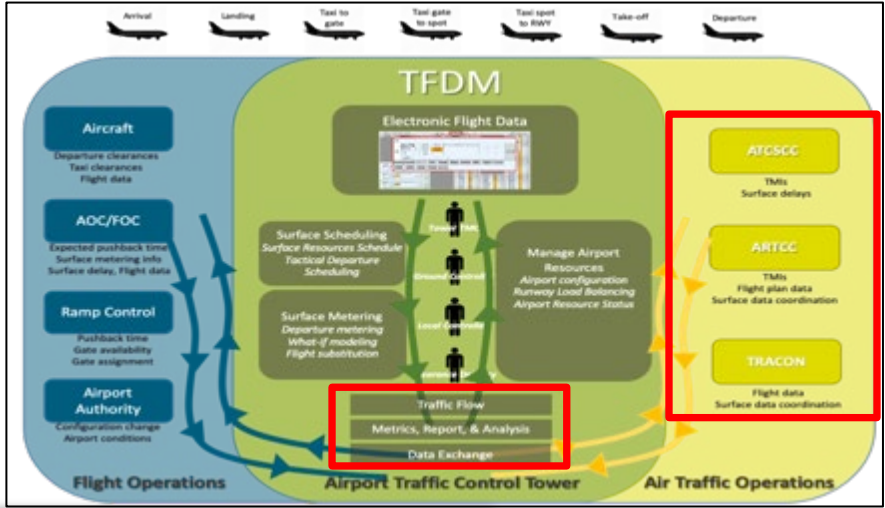
** National TMs (AFP, CTOP, GDP and GS) will also be published by this service starting with build 2.1 of TFDM, but the subject of this brief is local TMs.*

Traffic Management Restriction (TMR) Service

TTP: Traffic Management Restrictions Service

Sample Message Data Elements:

- TMR source aerodrome
- General parameters for APREQ, MIT, MINIT, departure stop lists
 - TFDM identifier
 - Action (Add, Update, Delete)
 - TMR element (NAVAIDS, facilities, airways, sectors, or free format text)
 - Affected airports
 - Start/stop time
- Unique elements
 - MIT – spacing in nautical miles
 - MINIT – minutes in trail spacing
 - Departure stop – reason



Traffic Management Restrictions Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Approval Request (APREQ)	Steady state	2.4 kb	6 kbps
Miles in Trail (MIT)	Steady state	2.6 kb	6 kbps
Minutes in Trail (MINIT)	Steady state	2.6 kb	6 kbps
Departure Stop	Steady state	8.2 kb	11 kbps
Resync	Resync	12.8 kb	15 kbps
Periodic Start	Resync	0.5 kb	Not specified
Periodic End	Resync	0.5 kb	Not specified
System Start	Resync	0.5 kb	Not specified

TMR Service

- **The TMR service publishes the following types of local restrictions:**
 - Departure Stop
 - Departure MIT
 - Departure MNIT
 - APREQ
 - DSP
 - TBM
 - Airport
 - SWAP

Each TMR message includes one of the following “TMR action types”:

- **ADD**
- **UPDATE**
- **DELETE**

TMR Data Elements

- Aerodrome
- Original Timestamp
- Original Producer
- Last Timestamp
- Last Producer
- **TFDM TMI ID**
 - **This field is used in the Flight Data service to identify flights impacted by the TMR**
- TMR Action (ADD, UPDATE, DELETE)
- NAS Element
- Start Time
- End Time
- Departure Stop Reason*
- Miles in Trail Spacing*
- Minutes in Trail Spacing*

** These fields are not included in all TMI types*

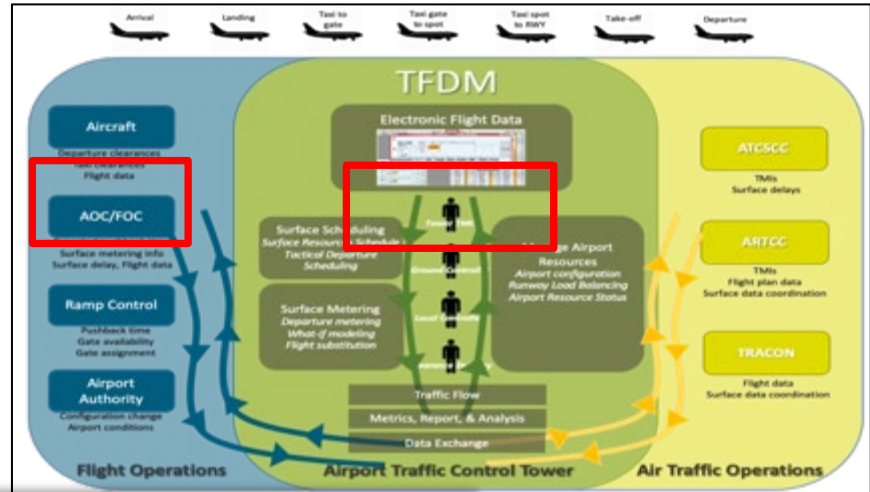
This this the key field for mapping flights to local TMIs

Flight Data Service

TTP: Flight Data Service

Sample Message Data Elements:

- Flight matching fields
- Flight creation date time
- SMP exemption status
- Reason for SMP exemption (CFR, EDCT, lifeguard, diversion recovery, metering in trail, deice, other)
- Flight state (Scheduled, ramp taxi, movement area taxi, departure queue, departed)
- ATC flight state
- Departure ready status
- Diversion recovery status
- Clearance delivery time
- APREQ release time
- TMIs associated with flight
- Aircraft registration



Flight Data Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Flight Add	Steady state	5.1 kb departure/2.9 kb arrival	Total: 28 kbps producer/14 kbps consumer
Flight Update	Steady state	1.3 kb	
Flight Notification	Steady state	2.0 kb	
Flight Delete	Steady state	2.0 kb	
Heartbeat	Steady state	0.6 kb	Not specified
Resync	Resync	75.0 kb	154 kbps producer/77 kbps consumer
Periodic Start	Resync	0.6 kb	Not specified
Periodic End	Resync	0.6 kb	Not specified
System Start	Resync	0.6 kb	Not specified

Flight Data – Message Types

- **Flight Add**
- **Flight Update**
- **Flight Delete**
- **Flight Notification ***

** Flight Notification messages publish information, unrelated to TMRs, that is not persistent in the TFDM Flight Object data store.*

Flight Data Add/Update Messages

- **The Flight Data Add and Update messages are used to map flights to local TMI. These messages include:**
 - Flight matching data (ACID, IGTID, etc.)
 - Other flight ID data (Aircraft Registration Mark, Creation Time, etc.)
 - Assigned parking gate and runway
 - Predicted and actual event times
 - ...and many other data elements
 - **These messages also include a list of the TFDM TMI IDs of the TMIs from the TMR service that impact the flight**

Mapping Flights to Local TMIs*

** National TMIs will be mapped to flights in the same way that Local TMIs are*

Mapping Flights to Local TMIs – The Xpaths

- **The TFDM TMR ID in the TMR service messages:**
 - Xpath (examples):
 - TrafficManagementRestrictions/approvalRequestList/approvalRequestData/tfdmTmilld
 - TrafficManagementRestrictions/milesInTrailList/milesInTrailData/tfdmTmilld
- **The TFDM TMR ID list in the Flight Data service Add/Update messages:**
 - Xpath:
 - NasMessage/flight/departure/departureDelay/@tmildentifier

Each TMR has a unique ID



Each flight has a list of the IDs of the TMRs to which it is subject



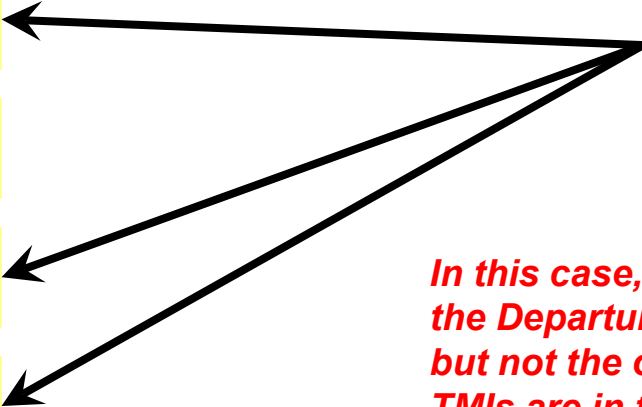
Mapping Flights to Local TMIs – Example

List of TMIs from the TTP TRM Service

- Departure MIT 1
 - TFDM TMR ID = 101
- Departure MIT 2
 - TFDM TMR ID = 202
- Departure STOP 1
 - TFDM TMR ID = 303
- APREQ 1
 - TFDM TMR ID = 404
- Airport 1
 - TFDM TMR ID = 505

Flight Update Message from Flight Data Service

ACID = ABC123
IGTD = 10/06/2021 18:05z
.
.
.
TMR Identifier List = (202, 404, 505)



In this case, flight ABC123 would be impacted by the Departure MIT 2, APREQ 1 and Airport 1 TMIs, but not the other two, since the IDs of those three TMIs are in the TMR ID List for the flight

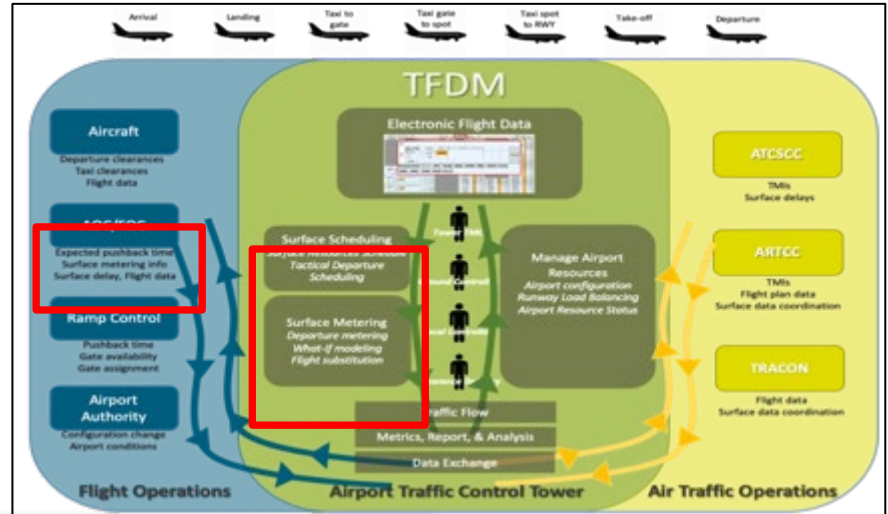
Surface Metering Program (SMP) Service



TTP: Surface Metering Program Service

Sample Message Data Elements:

- **Configurable SMP parameters**
 - e.g. CFR Metering Exempt, Departure Fix Queue Percentage List, Planning Horizon, Static Time Horizon, TMAP Compliance Window
- **Airport metering configuration**
 - Configured metered resources with optimal, lower, and upper target queue lengths
- **List of SMPs in various states: recommended, deferred, rejected, expired, obsolete, affirmed, active, or completed**
 - Includes flight list of flights affected by SMP and their corresponding TMAPs
- **Notifications**
 - Changes to SMP parameters
 - Changes to SMP state



Surface Metering Program Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Parameters	Steady state	2.1 kb	6 kbps
Configuration	Steady state	3.0 kb	6 kbps
SMP	Steady state	72.7 kb	62 kbps
SMP Flight List Update	Steady state	9.7 kb	12 kbps
Heartbeat	Steady state	0.5 kb	Not specified
Resync	Resync	75.0 kb	60 kbps
Periodic Start	Resync	0.5 kb	Not specified
Periodic End	Resync	0.5 kb	Not specified
System Start	Resync	0.5 kb	Not specified

SMP Service

- **Identifying the list of flights impacted by an SMP TMI is straightforward, i.e., the SMP messages include both the SMP ID and the list of flights impacted it**
- **The SMP Service includes two messages that define SMP TMIs:**
 - The TFDM SMP Data Message
 - The TFDM SMP Flight List Update
- **TFDM SMP Data Messages:**
 - Define new SMPs
 - Reference existing SMPs
 - Define adjustments** to existing SMPs
- **TFDM SMP Flight List Update messages update the list of flights impacted by an existing SMP**

** Adjustments involve changes to the TMATs of a subset of the flights impacted by an SMP*

SMP Service – Xpaths

- **TFDM SMP Data Messages (for new and existing SMPs)**

- Xpaths:

- SMP ID = SurfaceMeteringProgram/smpDataMessage/smp/smpData/smpIdentifier
- Flight List = SurfaceMeteringProgram/smpDataMessage/smp/smpData/flightList

- **TFDM SMP Data Messages (for SMP adjustments)**

- Xpaths:

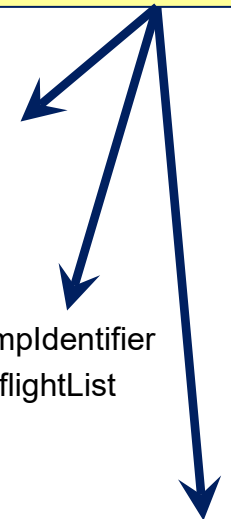
- SMP ID = SurfaceMeteringProgram/smpDataMessage/smp/smpAdjustmentData/smpIdentifier
- Flight List = SurfaceMeteringProgram/smpDataMessage/smp/smpAdjustmentData/flightList

- **TFDM Flight List Updates**

- Flight list Xpath:

- SMP ID = SurfaceMeteringProgram/smpFlightListUpdate/smpUpdateList/smpUpdate/smpIdentifier
- Flight List = SurfaceMeteringProgram/smpFlightListUpdate/smpUpdateList/smpUpdate/flightList

Each SMP message includes the SMP ID and a list of the flights impacted by it



SMP Service – Flight Lists*

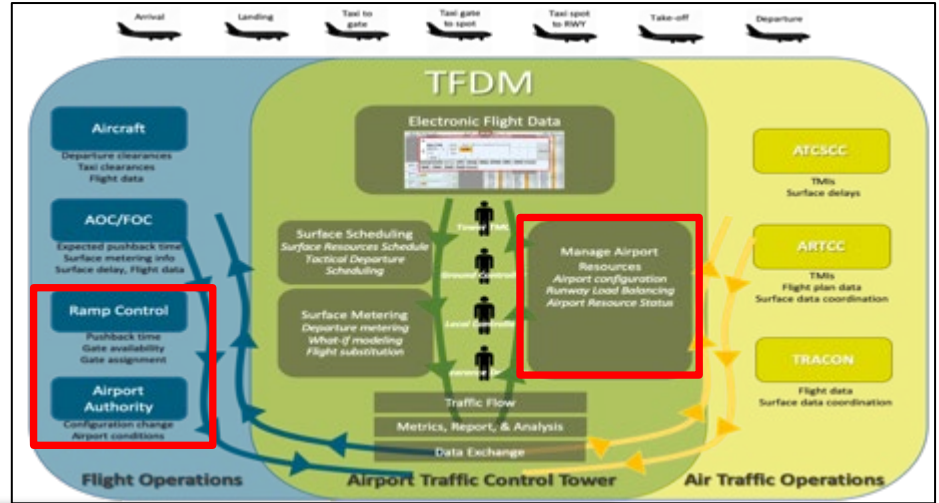
- **The flight lists in SMP messages are composed of a list of elements in FIXM format**
- **Each element contains the standard TFDM flight matching fields:**
 - Aircraft ID
 - Departure Point
 - Arrival Point
 - IGTD
 - ERAM GUF1
 - CID
 - CID Creator Unit
 - TFDM ID
 - TFD Creator Airport
- **The Flight Lists also contain the current TMAT for the flight**

** There is a “change request” in development that would remove flight lists from SMP messages for “affirmed” SMPs and add SMP_IDs to the TTP Flight Data service in a similar fashion to how TMR IDs are handled, per previous slides in this deck. (TMATs are already included in the TTP Flight Data service.)*

TTP: Flight Delay Service

Sample Message Data Elements:

- **Flight matching fields**
- **Flight class (Air carrier, Air taxi, GA, Military)**
- **Aircraft departure delay start time, end time, and duration**
- **TMIs associated with flight and corresponding impacting condition**
 - Primary reason – weather, equipment, runway/taxiway, volume, other
 - Secondary reason – see FAA Order JO 7210.55 Operational Data Reporting Requirements
 - Remarks – free text
- **Charge to – airport facility for TMI associated with flight**
- **Flight operator**



Surface Metering Program Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Flight Delay	Steady state	1.8 kb	8.0 kbps
Heartbeat	Steady state	0.6 kb	Not specified
Resync	Resync	2.3 kb	59.0 kbps
Periodic Start	Resync	0.6 kb	Not specified
Periodic End	Resync	0.6 kb	Not specified
System Start	Resync	0.6 kb	Not specified

Discussion

SWIFT WINDS

United ITWS Widget

Presented to: SWIFT

By: Mike Jagmin

Date: November 19, 2020



**Federal Aviation
Administration**



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

```

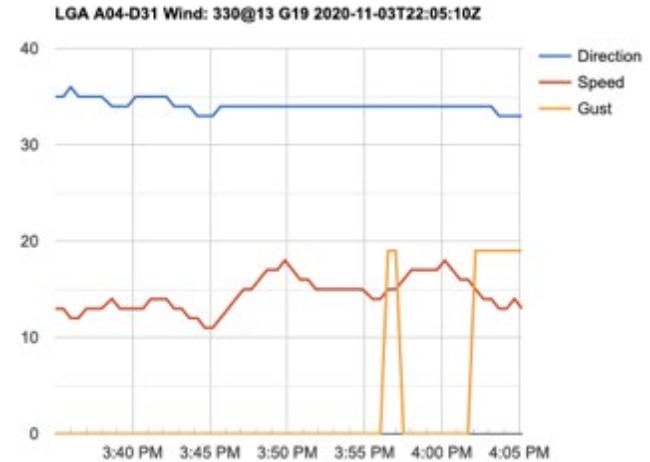
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  <ca_seconds gregorian="2020-11-03 00:34:44" unit="epoch_time">1604363684</ca_seconds>
  <ca_milliseconds unit="milliseconds">0</ca_milliseconds>
  <ca_rwy_name>IAD-19L-19C-30</ca_rwy_name>
  <ca_aw_wind_dir unit="degrees">260</ca_aw_wind_dir>
  <ca_aw_wind_speed unit="knots">6</ca_aw_wind_speed>
  <ca_aw_gust_speed unit="knots">0</ca_aw_gust_speed>
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  <ca_aw_milliseconds unit="milliseconds">980</ca_aw_milliseconds>
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  <ca_rwy_valid_seconds gregorian="2020-11-03 00:27:04" unit="epoch_time">1604363224</ca_rwy_valid_seconds>
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  <ca_rwy_alert count="1">
    <ca_ra_region_id>30 D</ca_ra_region_id>
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    <ca_ra_value unit="knots">0</ca_ra_value>
    <ca_ra_first_loc>RWY</ca_ra_first_loc>
    <ca_ra_last_loc>RWY</ca_ra_last_loc>
    <ca_ra_llwas_wind_dir unit="degrees">999</ca_ra_llwas_wind_dir>
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    <ca_ra_num_rbdts>3</ca_ra_num_rbdts>
  </ca_rwy_alert>
</configured_alert>
  
```



Runway	Dir	Speed	Hazard
30 D	999	99	
19CA	999	99	
19CD	999	99	
19LA	999	99	
19LD	999	99	
19RA	999	99	
19RD	999	99	

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



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



Information Services Roadmap

SWIFT 12 Update

Presented to: SWIFT

By: Xavier Pratt

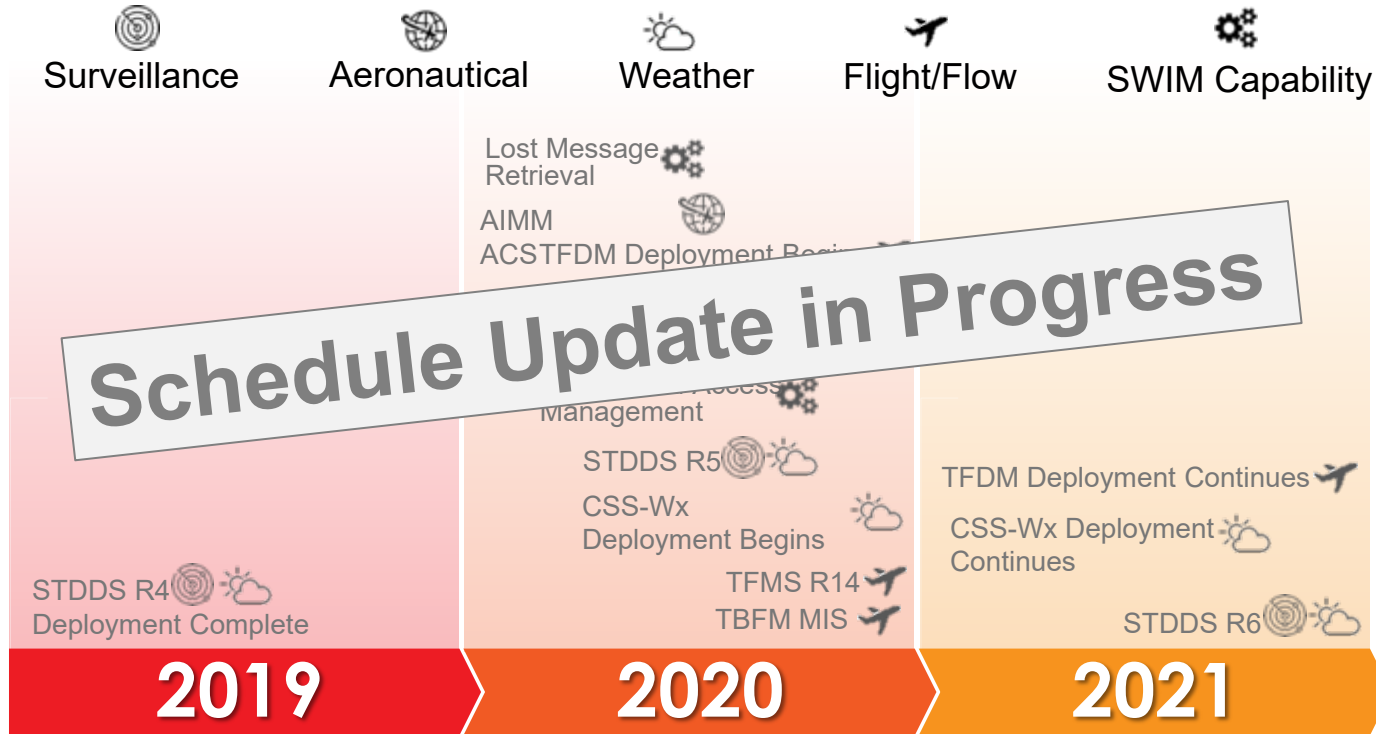
Date: November 19, 2020



**Federal Aviation
Administration**

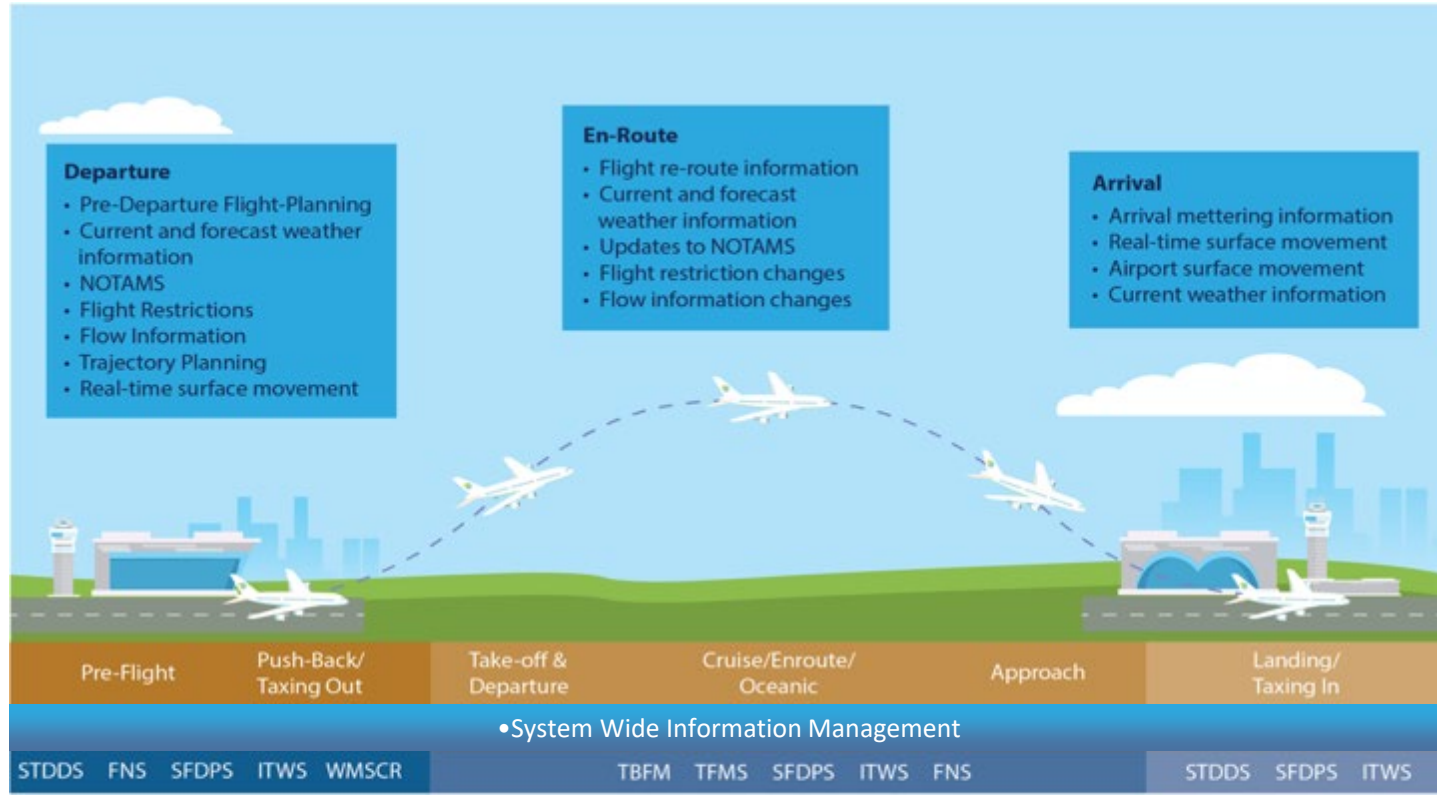


SWIM Planned Deployment Roadmap

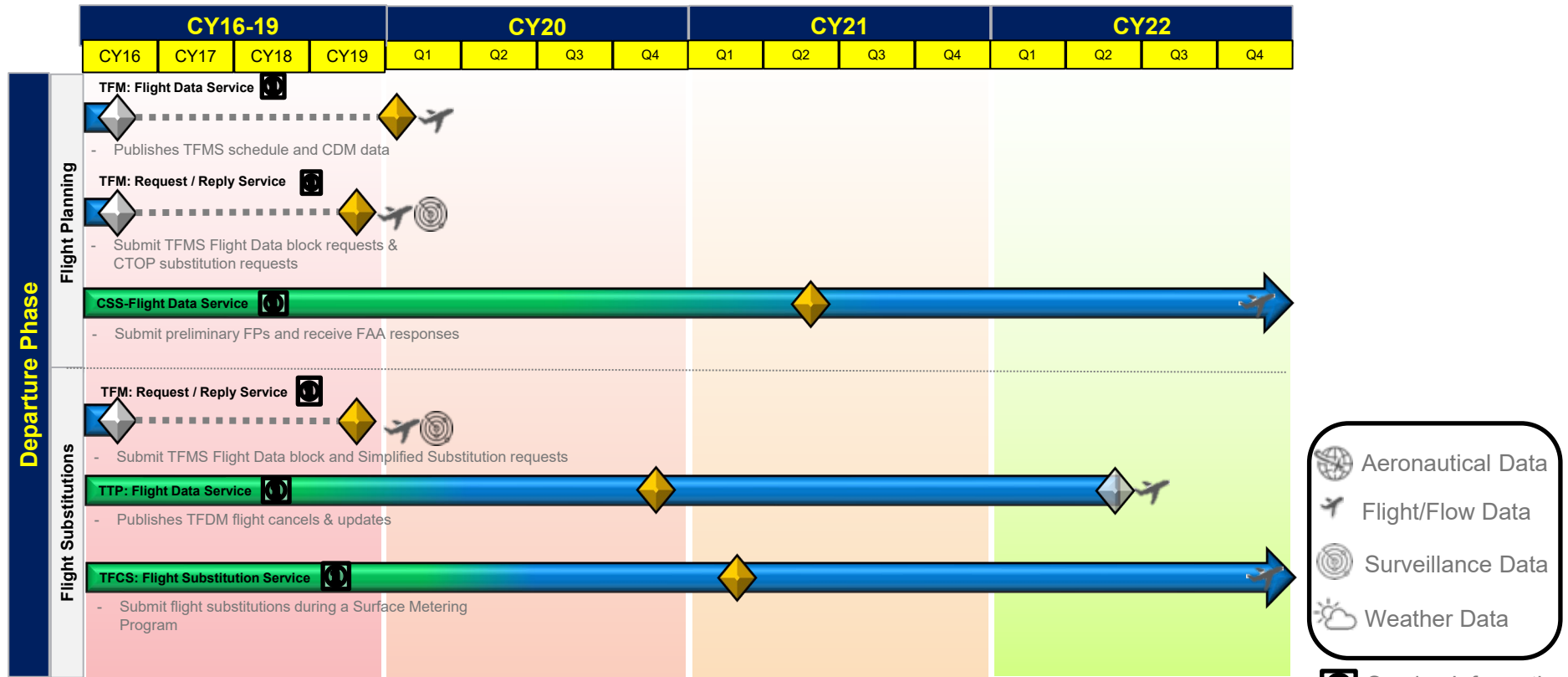


*Calendar year dates, subject to change

SWIM Services By Phase of Flight



SWIM Information Services Roadmap



- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

*Calendar year dates, subject to change Service Information

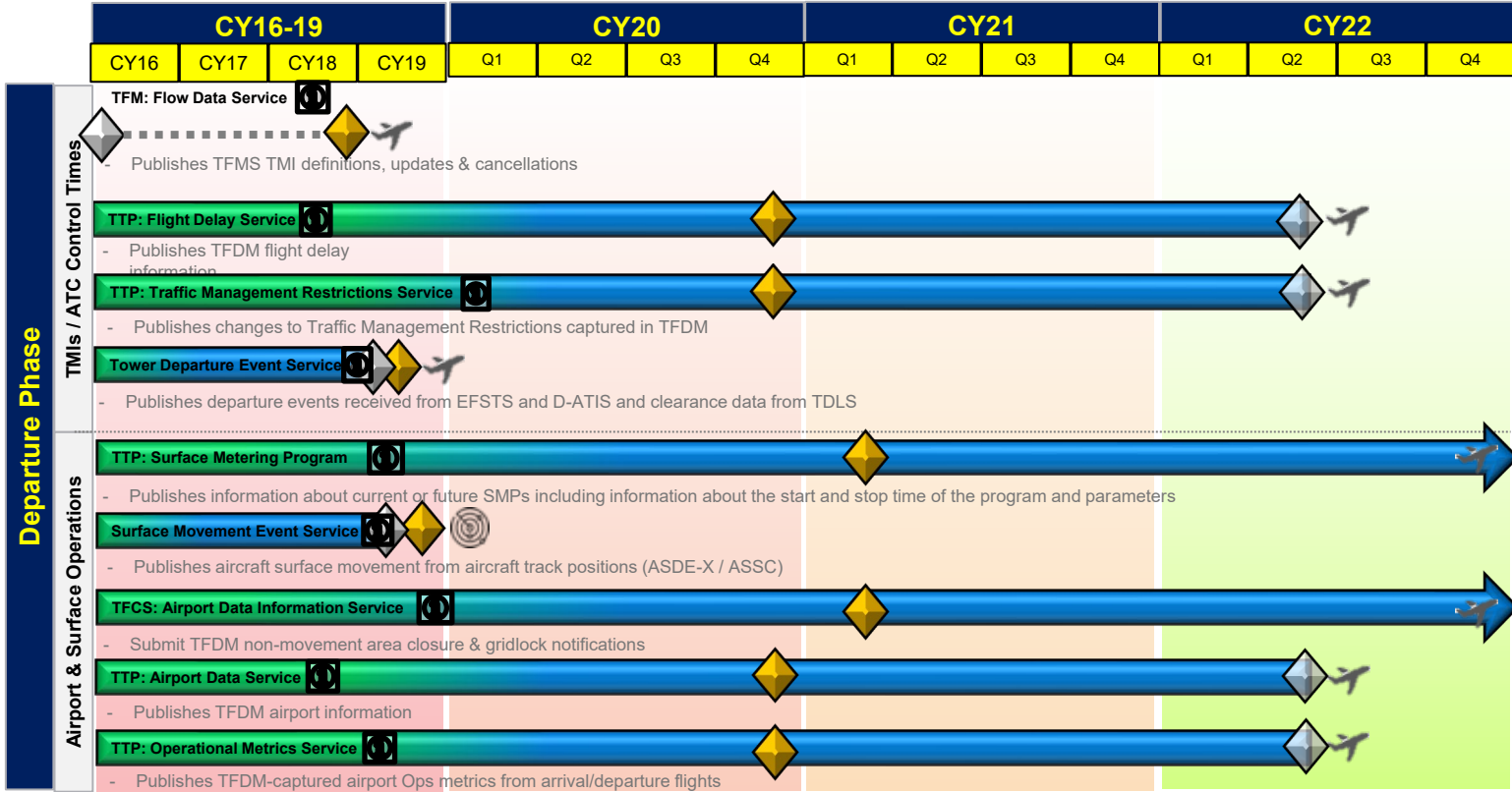
SWIFT 12 November 19th 2020

Legend

- Analysis/Design Phase
- Implementation/Development Phase
- Service Description
- Service Available Milestone
- Ops Context Document Available Milestone



SWIM Information Services Roadmap



- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

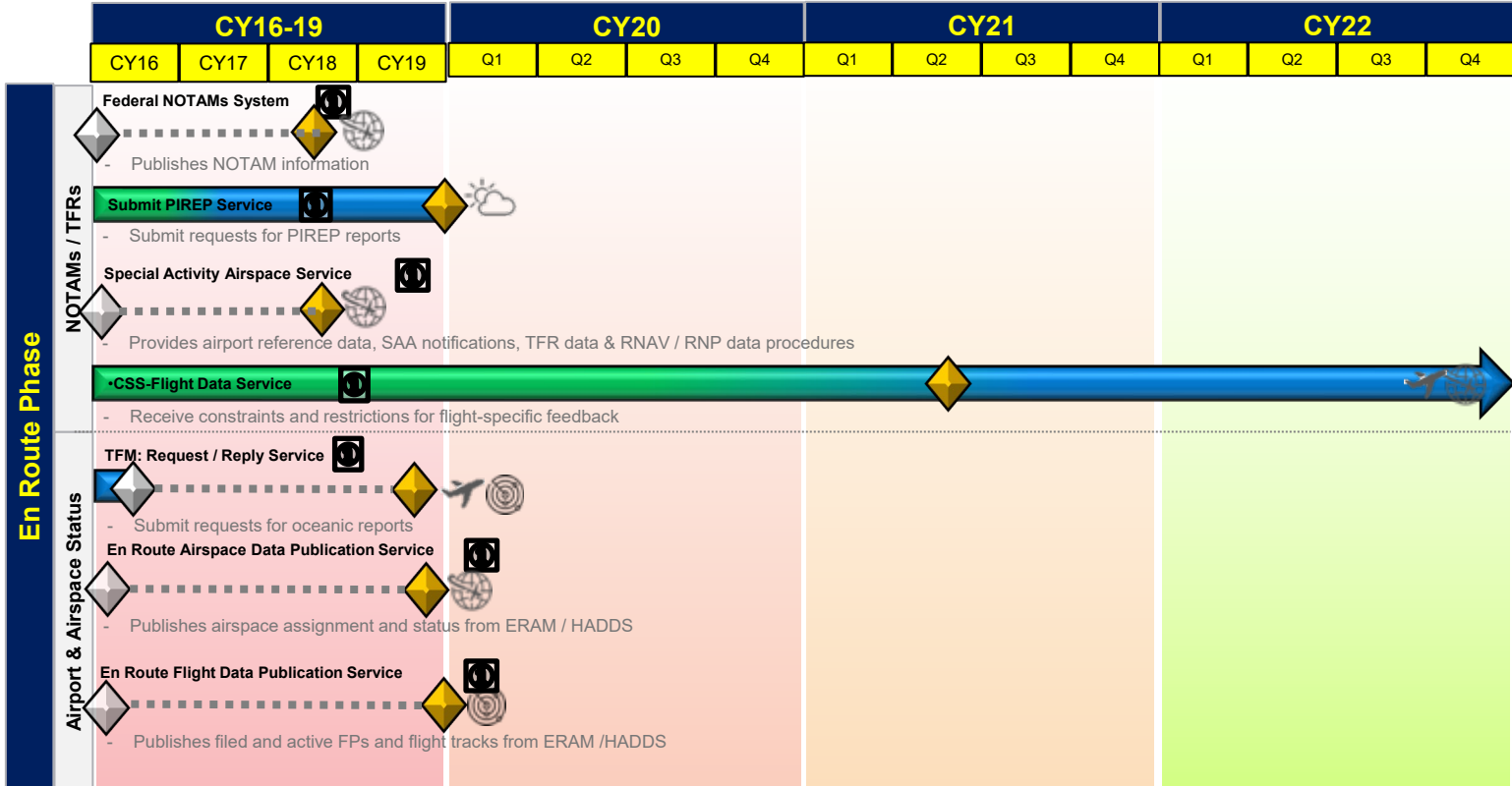
Service Information

*Calendar year dates, subject to change

Legend

- Analysis/Design Phase
- Implementation/Development Phase
- Service Description
- Service Available Milestone
- Ops Context Document Available Milestone

SWIM Information Services Roadmap



- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

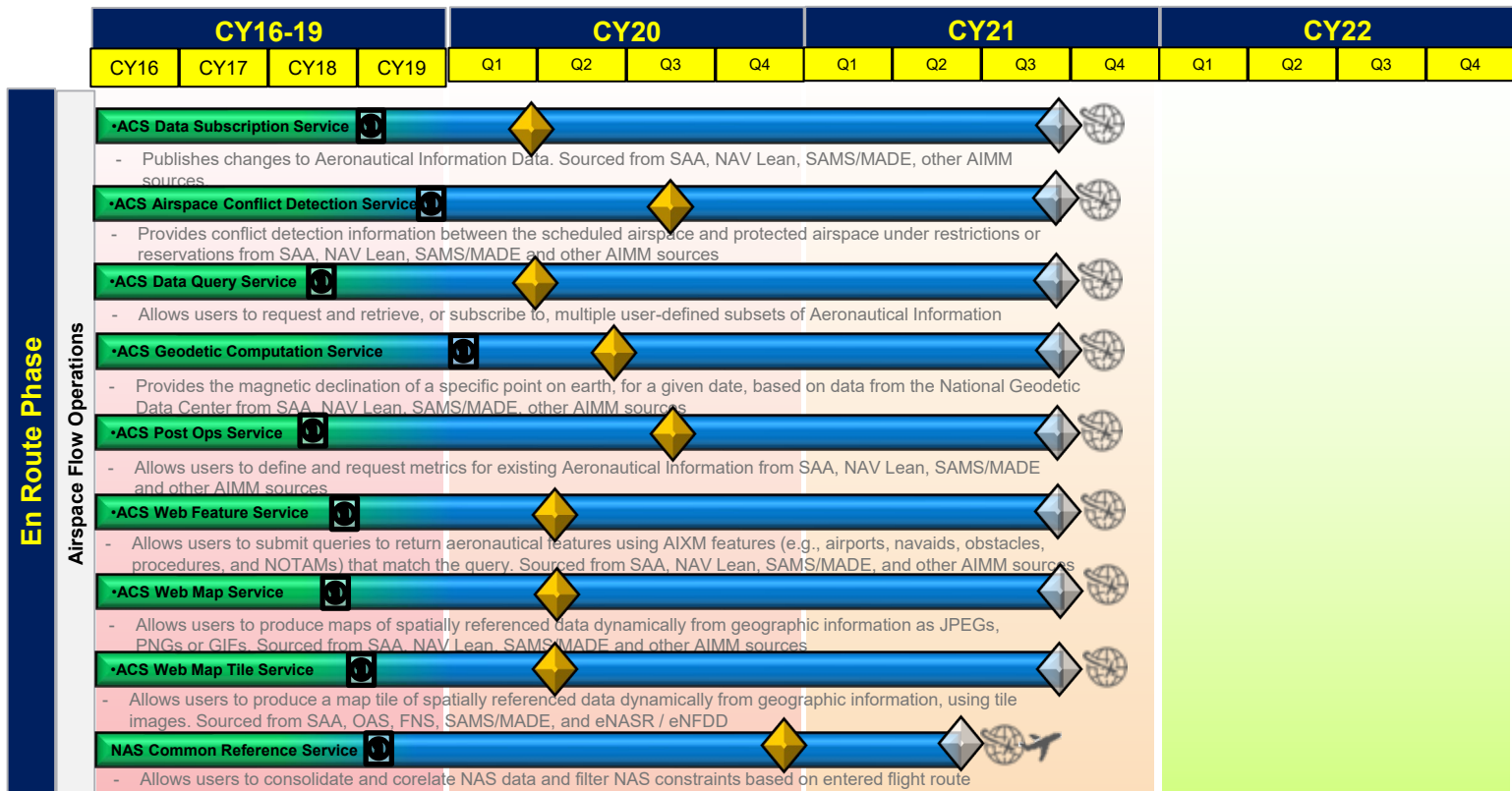
Service Information

*Calendar year dates, subject to change

Legend

- Analysis/Design Phase
- Implementation/Development Phase
- Service Description
- Service Available Milestone
- Ops Context Document Available Milestone

SWIM Information Services Roadmap



-  Aeronautical Data
-  Flight/Flow Data
-  Surveillance Data
-  Weather Data

 Service Information

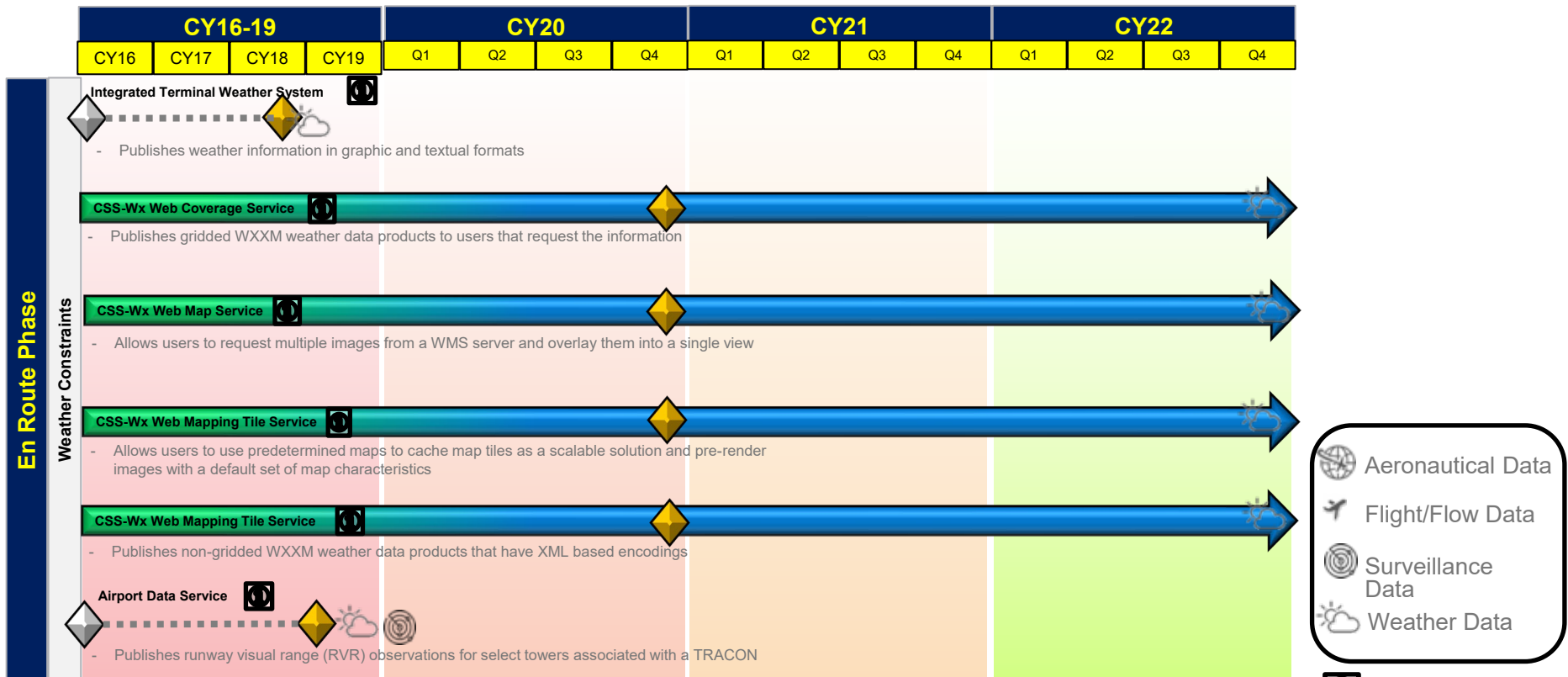
*Calendar year dates, subject to change

Legend

-  Analysis/Design Phase
-  Implementation/Development Phase
-  Service Description
-  Service Available Milestone
-  Ops Context Document Available Milestone



SWIM Information Services Roadmap



- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

*Calendar year dates, subject to change ☑ Service Information

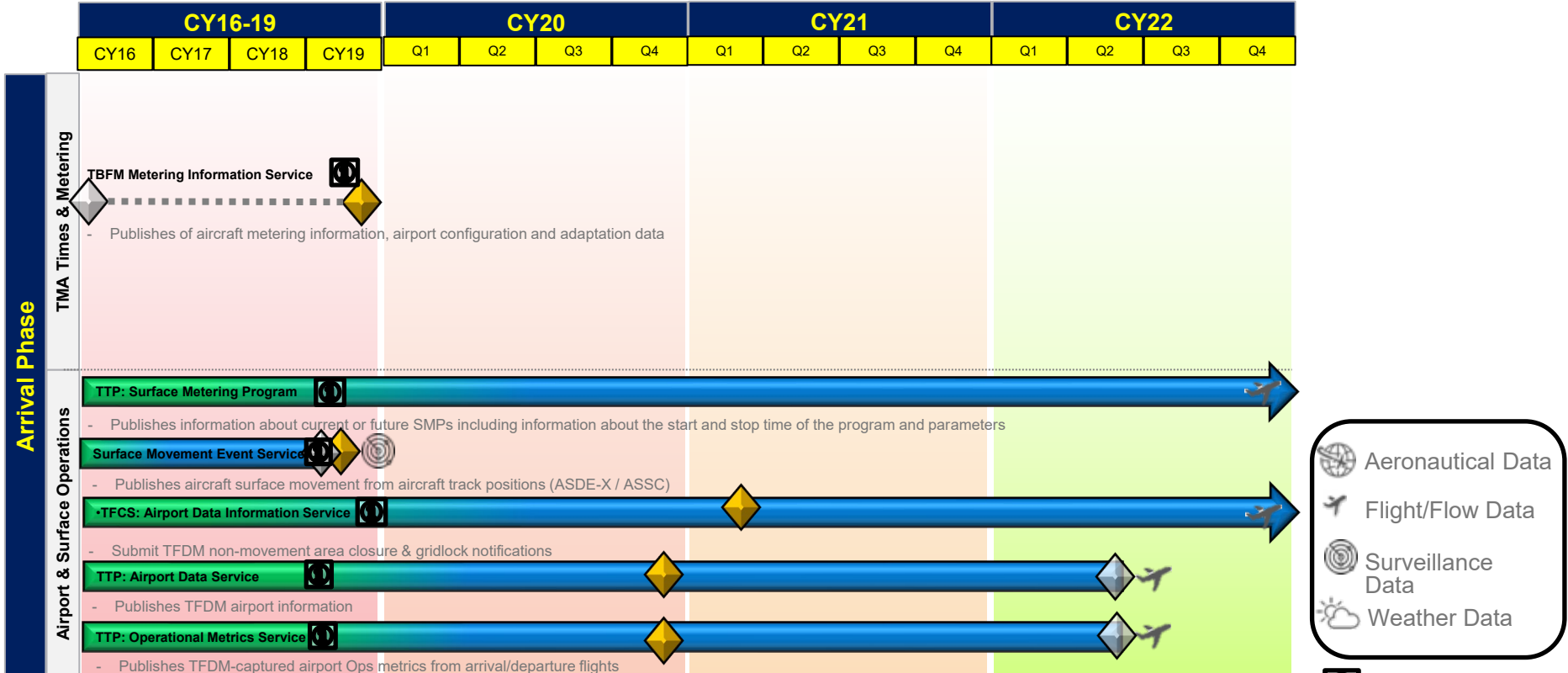
SWIFT 12 November 19th 2020

Legend

- Analysis/Design Phase
- Implementation/Development Phase
- Service Description
- Service Available Milestone
- Ops Context Document Available Milestone



SWIM Information Services Roadmap



- Aeronautical Data
- Flight/Flow Data
- Surveillance Data
- Weather Data

Service Information

*Calendar year dates, subject to change

SWIFT 12 November 19th 2020

Legend

- Analysis/Design Phase
- Implementation/Development Phase
- Service Description
- Service Available Milestone
- Ops Context Document Available Milestone



Widgets

SWIFT 12 Update

Presented to: SWIFT

By: Sandie Steele

Date: November 19, 2020



**Federal Aviation
Administration**



Coming Soon

SWIFT WIDGETS: Rated “E” – Shareable Source Code highlighting the “Art of Possible”

Fix Availability Ticker

Ticker

Metroplex Filter

15 Min Outlook	WAVEY	JFK RBV Q480	JFK RBV Q42	JFK DEEZZ J64	JFK DEEZZ J60	LGA COATE Q436	BAE	PETTY	JFK HAPIE
30 Min Outlook	JFK GAYEL J95	EWR GREKI WEST	LGA GAYEL J95	PEKUE IANNA	EWR GREKI NE	EWR MERIT	EWR COATE Q436		

Over Capacity
Near Capacity
Below Capacity

The ticker represents the throughput capacity of various arrival fixes based on various airspace constraints.

This website and underlying code and data are intended for informational purpose only and should NOT be used for operational decision making

TBFM Assigned Delay – SPRINT 2 Visualization

TBFM Data Assigned Delay

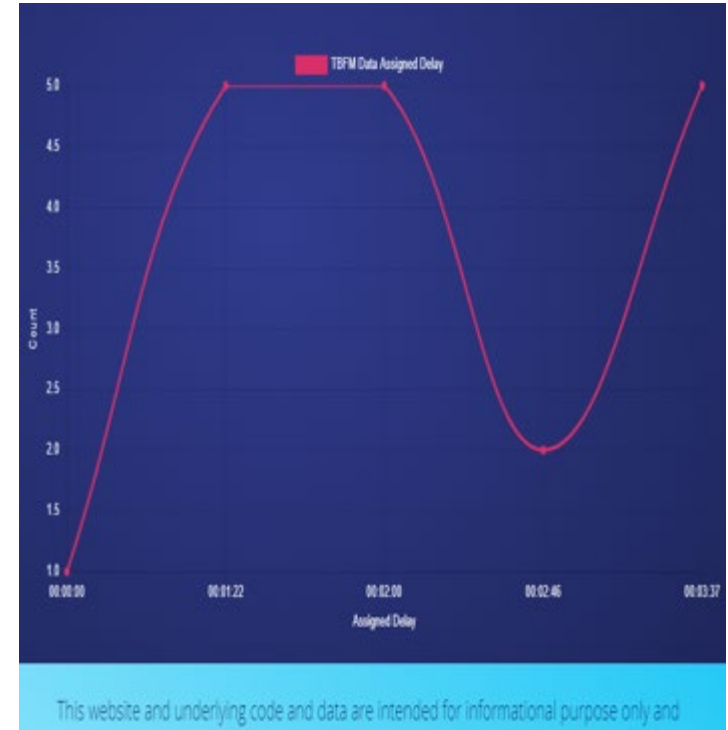
Display: 5 records per page

Search:

ID	MSG TIME	AIR TYPE	AID	FPS	ACS	CTM
DATA GROUP	ARTCC	TMAID	SPD	STD		
3398	02:00:26.53	NEW	SIWA420	ACTIVE	02:00:22.00	
FLT	ZLA	L01497	441	TRACKED	02:00:25.37	
3484	02:00:30.13	NEW	SIWA420	ACTIVE	02:00:22.00	
FLT	ZAB	A00909	441	TRACKED	02:00:23.22	
3769	02:00:41.53	NEW	SIWA420	ACTIVE	02:00:22.00	
FLT	ZLA	L01497	441	TRACKED	02:00:25.37	
3841	02:00:45.13	NEW	SIWA420	ACTIVE	02:00:22.00	
FLT	ZAB	A00909	441	TRACKED	02:00:23.22	
3910	02:00:56.53	NEW	SIWA420	ACTIVE	02:00:22.00	
FLT	ZLA	L01497	441	TRACKED	02:00:25.37	

Showing page 1 of 4

First Previous 1 2 3 4 Next Last



Flight Restrictions

FLIGHT RESTRICTIONS										
Display	▼ records per page		Search: <input type="text"/>							
Airports	Element	Restriction	Start	Stop	Exclusions	Reporting	Providers	Type	Action	Remarks
ALL	WAVEY	15 MIT	07/2145	08/0000	ZDC LTFC	DCC	N60	DEP	EXTEND	
ALL	WAVEY	15 MIT	07/2145	08/0000	ZDC LTFC	DCC	ZNY	ENR	EXTEND	
ALL	WAVEY	15 MIT	07/2145	08/0000	NORMAL EXCLUSIONS	N90	JFK	DEP	EXTEND	
ALL	WHITE	5 MINT	07/2025	08/0000	NORMAL	N90	TEB, REQ	DEP	EXTEND	
ALL	WHITE	7 MINT	07/2025	08/0000	NORMAL	N90	EWR	DEP	EXTEND	
ALL	WHITE	5 MINT	07/2025	08/0000	NORMAL	N90	LGA	DEP	EXTEND	
ALL	WHITE	10 MIT	07/2025	08/0000	ZDC LTFC	ZNY	N90	ENR	EXTEND	WORK INTO IT PLEASE
ALL	J174	30 MIT	07/2030	08/0000	ZDC LTFC	DCC	ZBW	ENR	EXTEND	STRAT AOB FL350/ADA
ALL	NGATES	15 MIT	07/2200	08/0030		DCC	N90	DEP	INITIATE	

En Route Fix Load View

EnRoute Fix Load

Display 10 records per page Search:

Fix	Miles In Trail	Minutes In Trail	Fix Crossing Time			
			1000 - 1015	1016 - 1030	1031 - 1045	1046 - 1100
BIGGY	10		75	70	75	80
GAYEL	5		60	70	65	60
NEION			60	50	45	40
REV	15		90	100	95	90
WAVEY		10	80	75	60	40
WHITE			50	40	45	50

Showing page 1 of 1 First Previous 1 Next Last

This table presents current MIT and MINIT restrictions at specific fixes. The table presents fix loading projections for next hour from 0-100%, with 100% being fully allocated and no available capacity is left.

This website and underlying code and data are intended for informational purpose only and should NOT be used for operational decision making.

Final Announcements

SWIFT **#13 Virtual Workshop**

- **Date**
 - February 18th, 2021
 - Time 12:30pm 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

SCAN ME



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Stefanie Calabrese, SWIFT Chair & FAA Lead

- Email: Stefanie.C.Cabrese@faa.gov
- Email: SWIFT@faa.gov



David Almeida, SWIFT Community Moderator

- Phone: (321) 735-2774
- Email: David.Almeida@LSTechLLC.com



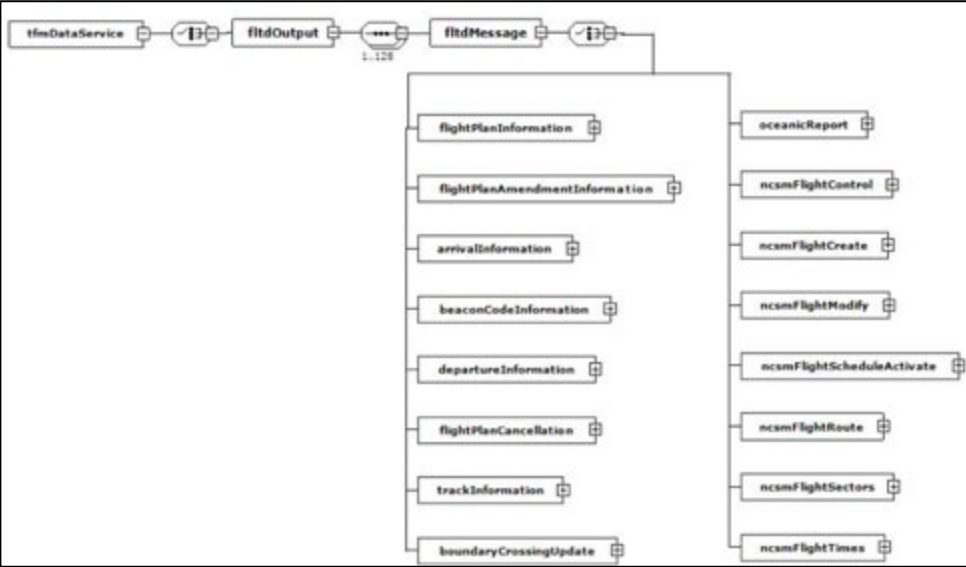
Back Up



TFM: Flight Data Service



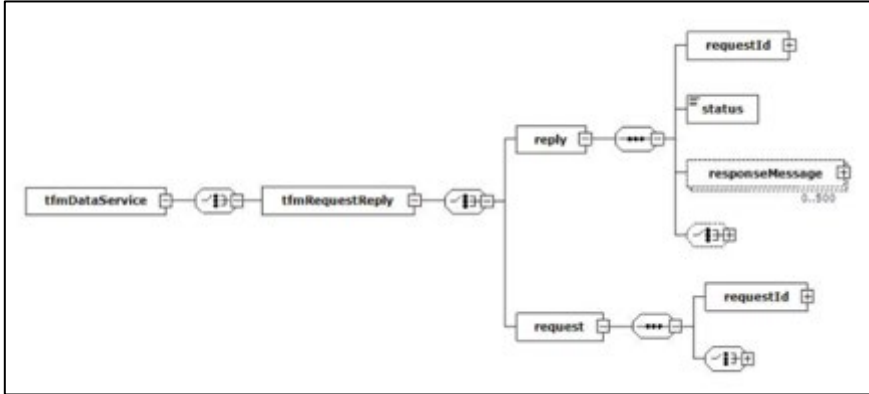
Sample Message Data Elements:





TFM: Request/Reply Service

Sample Message Data Elements:



Common Support Services - Flight Data Service



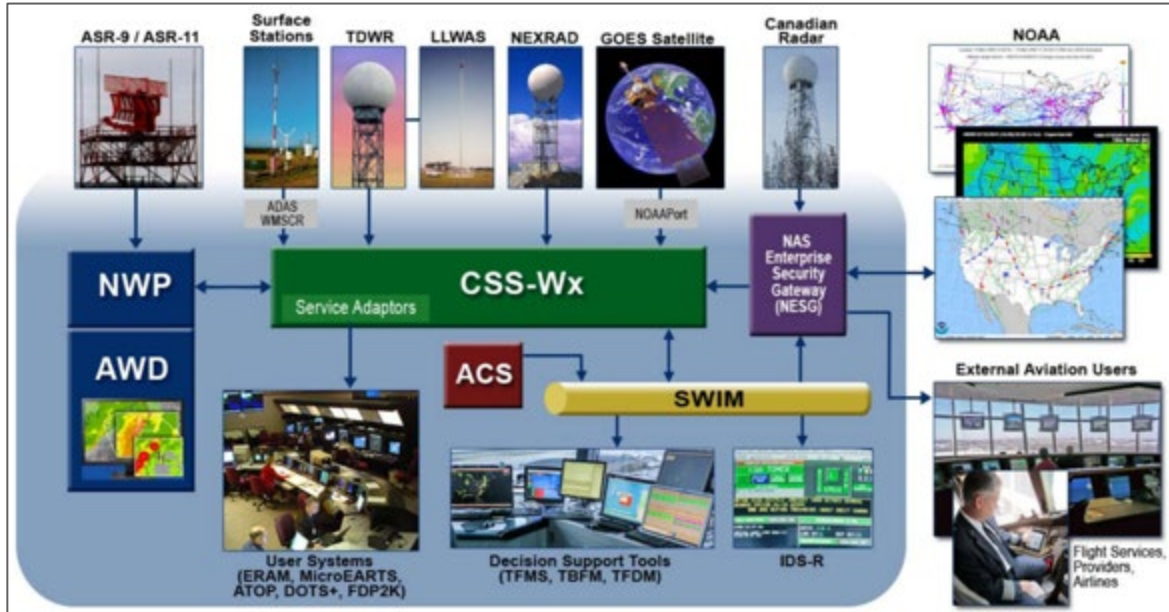
- Sample Message Data Elements / System Architecture Updates:
- **Coming Soon (TBD)**



Common Support Services - Weather Service



- Sample Message Data Elements / System Architecture Updates:
- **Coming Soon (TBD)**

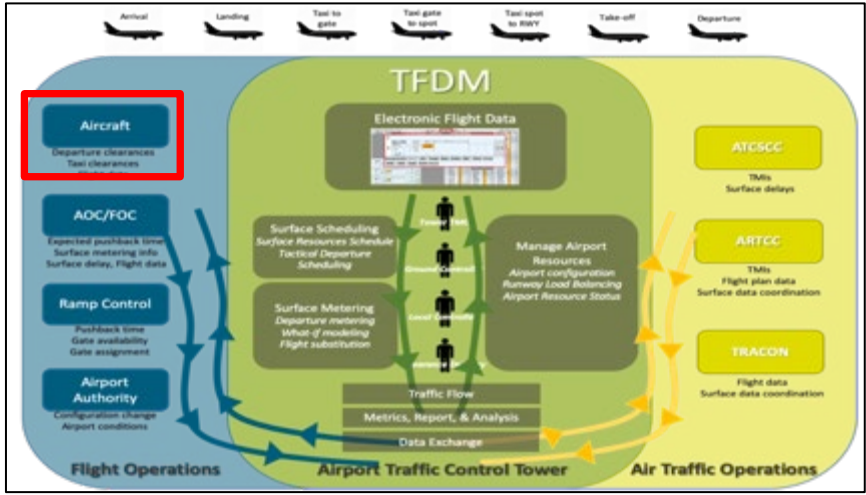




TTP: Flight Data Service

Sample Message Data Elements:

- Flight matching fields
- Flight creation date time
- SMP exemption status
- Reason for SMP exemption (CFR, EDCT, lifeguard, diversion recovery, metering in trail, deice, other)
- Flight state (Scheduled, ramp taxi, movement area taxi, departure queue, departed)
- ATC flight state
- Departure ready status
- Diversion recovery status
- Clearance delivery time
- APREQ release time
- TMIs associated with flight
- Aircraft registration



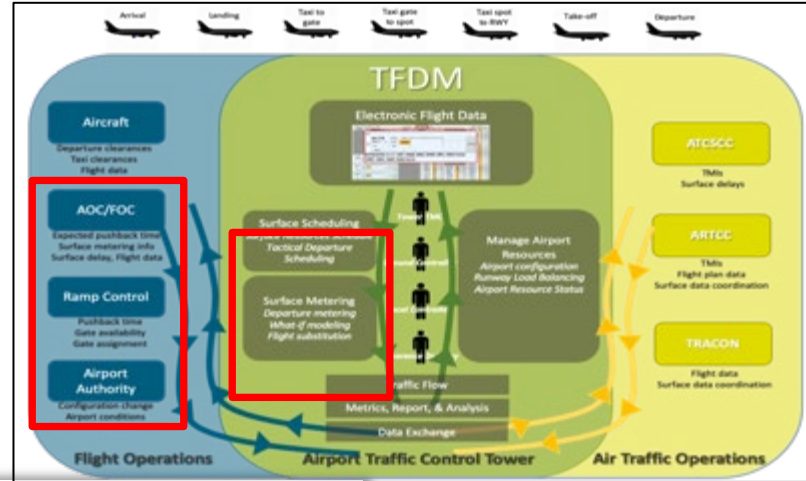
Flight Data Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Flight Add	Steady state	5.1 kb departure/2.9 kb arrival	Total: 28 kbps producer/14 kbps consumer
Flight Update	Steady state	1.3 kb	
Flight Notification	Steady state	2.0 kb	
Flight Delete	Steady state	2.0 kb	
Heartbeat	Steady state	0.6 kb	Not specified
Resync	Resync	75.0 kb	154 kbps producer/77 kbps consumer
Periodic Start	Resync	0.6 kb	Not specified
Periodic End	Resync	0.6 kb	Not specified
System Start	Resync	0.6 kb	Not specified



TTP: Surface Metering Program

Sample Message Data Elements:

- **Configurable SMP parameters**
 - e.g. CFR Metering Exempt, Departure Fix Queue Percentage List, Planning Horizon, Static Time Horizon, TMAT Compliance Window
- **Airport metering configuration**
 - Configured metered resources with optimal, lower, and upper target queue lengths
- **List of SMPs in various states: recommended, deferred, rejected, expired, obsolete, affirmed, active, or completed**
 - Includes flight list of flights affected by SMP and their corresponding TMATs
- **Notifications**
 - Changes to SMP parameters
 - Changes to SMP state



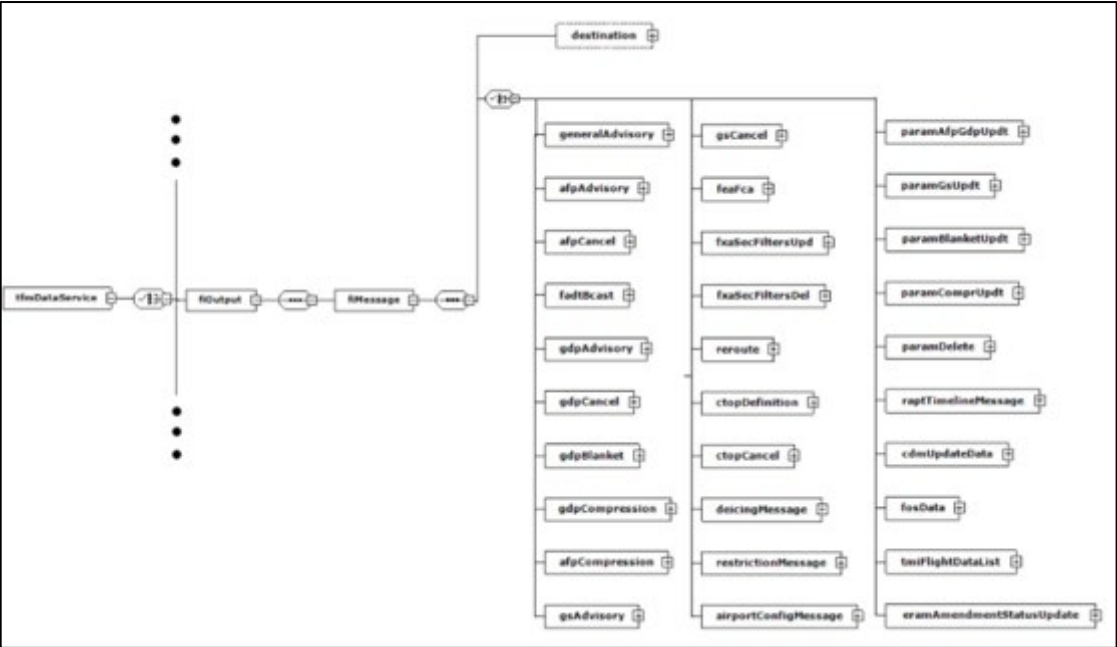
Surface Metering Program Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Parameters	Steady state	2.1 kb	6 kbps
Configuration	Steady state	3.0 kb	6 kbps
SMP	Steady state	72.7 kb	62 kbps
SMP Flight List Update	Steady state	9.7 kb	12 kbps
Heartbeat	Steady state	0.5 kb	Not specified
Resync	Resync	75.0 kb	60 kbps
Periodic Start	Resync	0.5 kb	Not specified
Periodic End	Resync	0.5 kb	Not specified
System Start	Resync	0.5 kb	Not specified





TFM: Flow Data Service

Sample Message Data Elements:

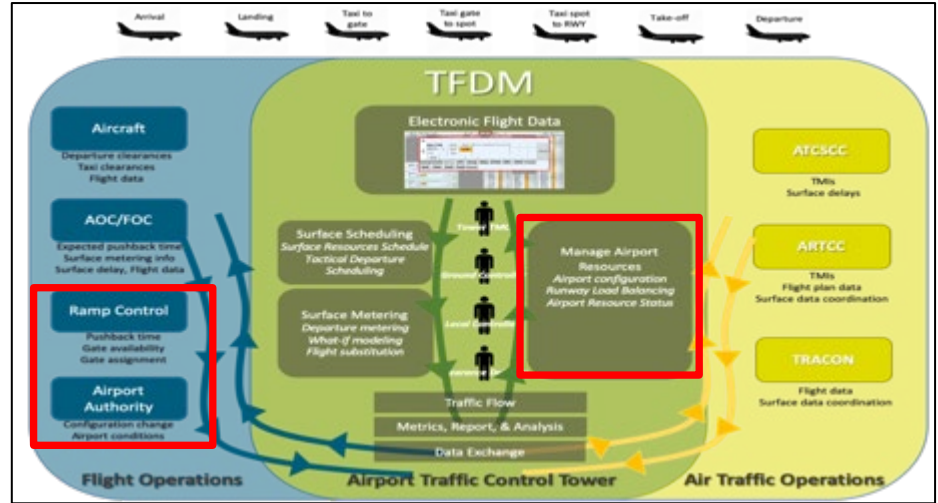




TTP: Flight Delay Service

Sample Message Data Elements:

- **Flight matching fields**
- **Flight class (Air carrier, Air taxi, GA, Military)**
- **Aircraft departure delay start time, end time, and duration**
- **TMIs associated with flight and corresponding impacting condition**
 - Primary reason – weather, equipment, runway/taxiway, volume, other
 - Secondary reason – see FAA Order JO 7210.55 Operational Data Reporting Requirements
 - Remarks – free text
- **Charge to – airport facility for TMI associated with flight**
- **Flight operator**



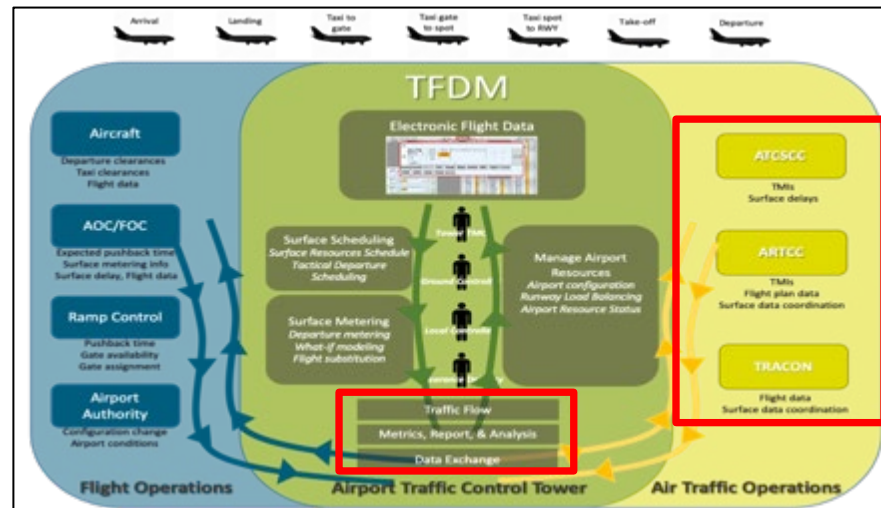
Surface Metering Program Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Flight Delay	Steady state	1.8 kb	8.0 kbps
Heartbeat	Steady state	0.6 kb	Not specified
Resync	Resync	2.3 kb	59.0 kbps
Periodic Start	Resync	0.6 kb	Not specified
Periodic End	Resync	0.6 kb	Not specified
System Start	Resync	0.6 kb	Not specified

TTP: Traffic Management Restrictions Service



Sample Message Data Elements:

- TMR source aerodrome
- General parameters for APREQ, MIT, MINIT, departure stop lists
 - TFDM identifier
 - Action (Add, Update, Delete)
 - TMR element (NAVAIDS, facilities, airways, sectors, or free format text)
 - Affected airports
 - Start/stop time
- Unique elements
 - MIT – spacing in nautical miles
 - MINIT – minutes in trail spacing
 - Departure stop – reason



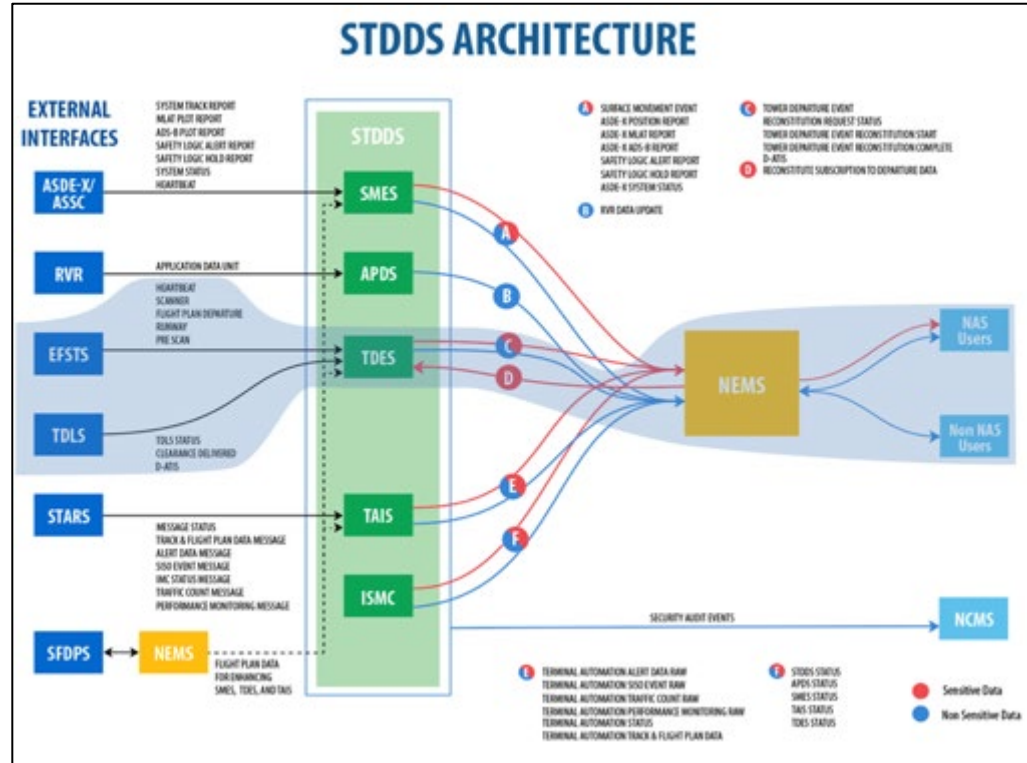
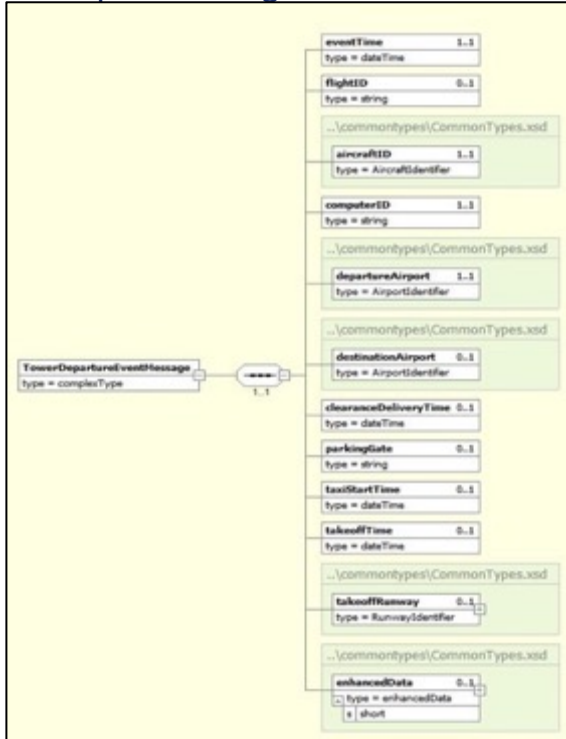
Traffic Management Restrictions Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Approval Request (APREQ)	Steady state	2.4 kb	6 kbps
Miles in Trail (MIT)	Steady state	2.6 kb	6 kbps
Minutes in Trail (MINIT)	Steady state	2.6 kb	6 kbps
Departure Stop	Steady state	8.2 kb	11 kbps
Resync	Resync	12.8 kb	15 kbps
Periodic Start	Resync	0.5 kb	Not specified
Periodic End	Resync	0.5 kb	Not specified
System Start	Resync	0.5 kb	Not specified



Tower Departure Event Service



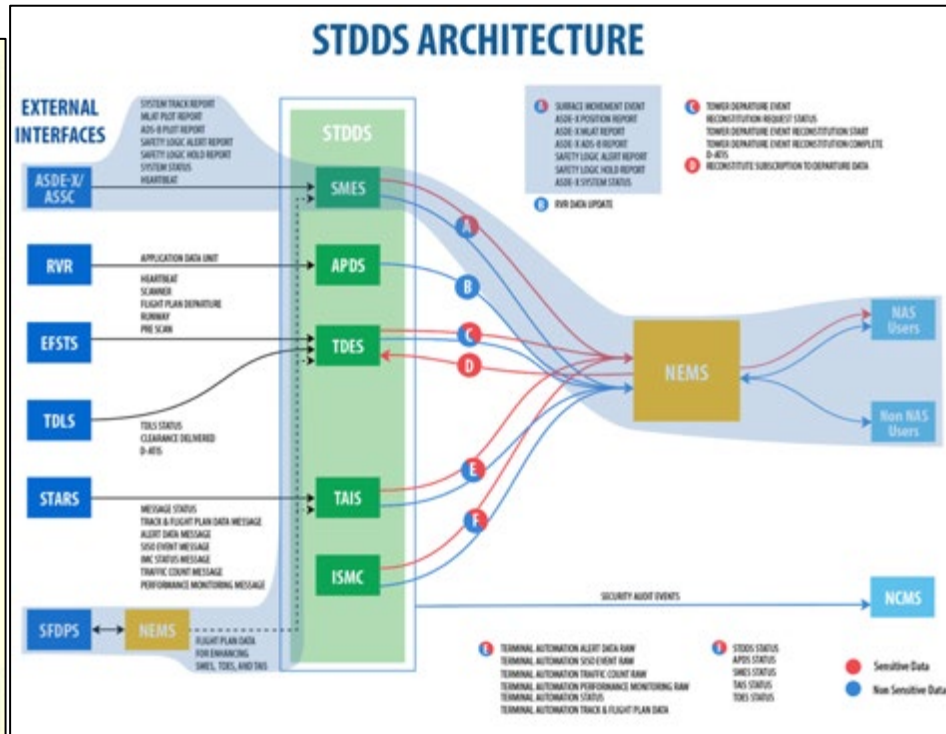
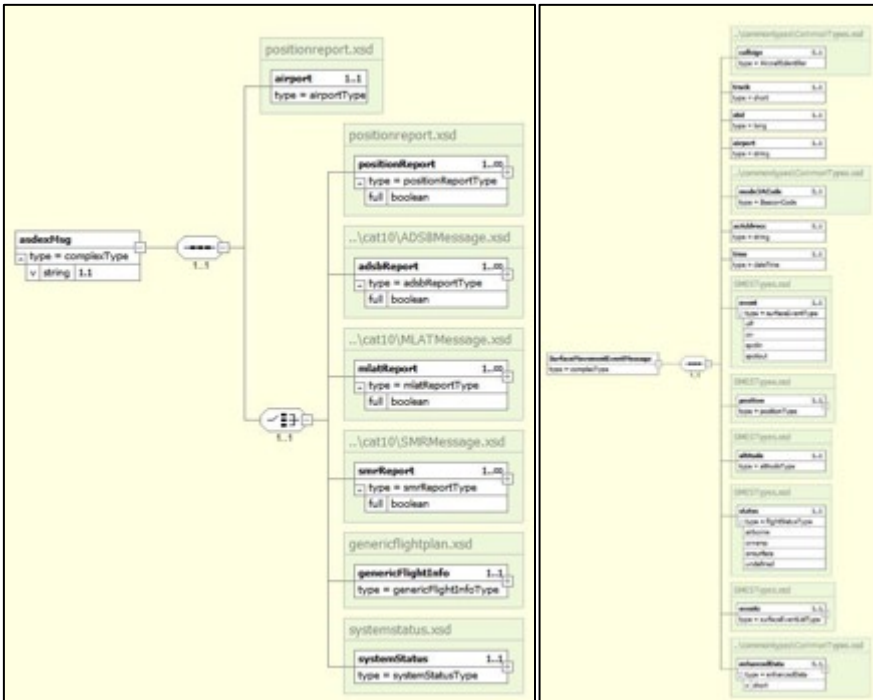
Sample Message Data Elements:



Surface Movement Event Service



Sample Message Data Elements:



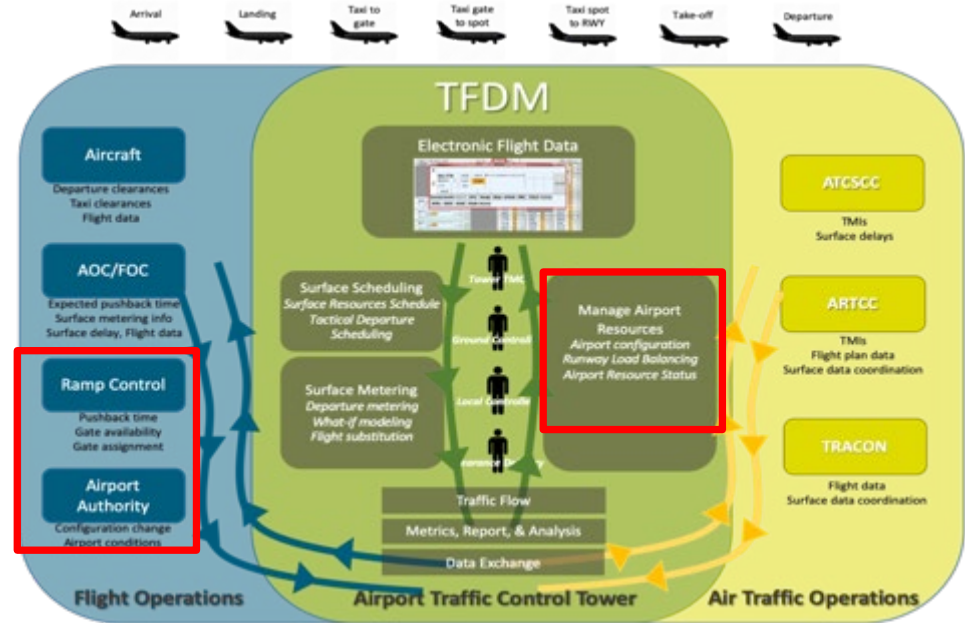


TFCS: Airport Data Information Service

Sample Message Data Elements:

Message	Direction
NonMovementAreaClosureRequest	In
NonMovementAreaClosureResponse	Out
NonMovementAreaGridlockNotification	In
NonMovementAreaGridlockResponse	Out
Heartbeat	Out

Message	SERVICE_CODE
Heartbeat	HEARTBEAT
NonMovementAreaClosureRequest	CLOSURE
NonMovementAreaClosureResponse	CLOSURE
NonMovementAreaGridlockNotification	GRIDLOCK
NonMovementAreaGridlockResponse	GRIDLOCK

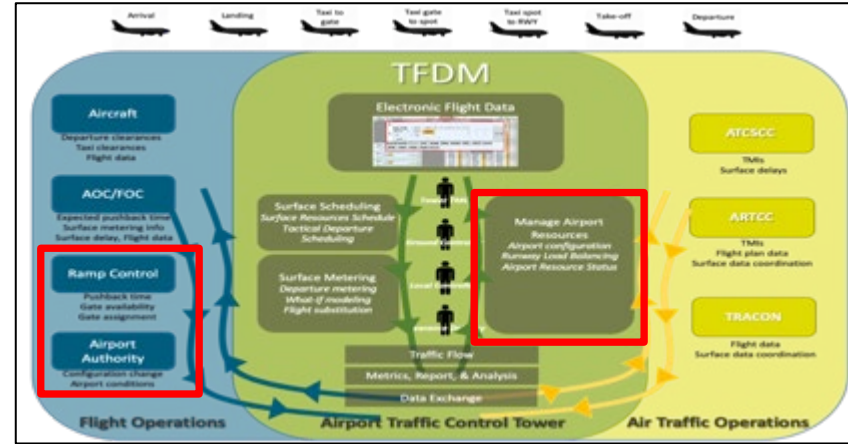


TTP: Airport Data Service



Sample Message Data Elements:

- **Airport configurations (start time, AAR, ADR, RAR, RDR)**
 - Current
 - Scheduled
- **Queue lengths (airport, runway, airspace element)**
 - Actual
 - Predicted
- **Gridlock**
 - Airport predicted (start and end time, aircraft count)
 - AMA predicted (start and end time, aircraft count)
 - NMA, as reported by a FOS (start time, end time, status, aircraft count, regions)
- **Closures (start time, end time, closed AMA and NMA regions)**
- **Notifications (warning and reminders)**
- **Predicted demand (start time, end time, airport, runway)**
- **Delays**
 - Time when calculation performed
 - Airport (duration)
 - Runway (flight count)



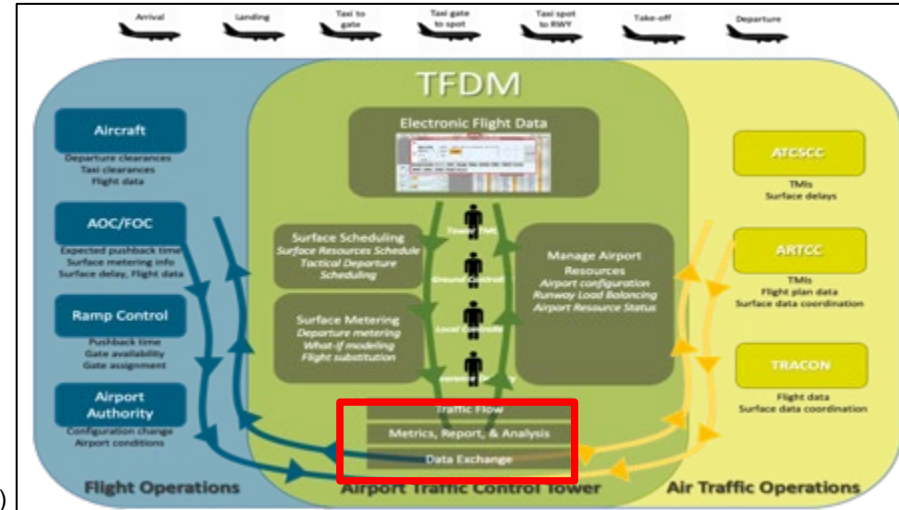
Airport Information Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Airport Configuration	Steady state	27 kb	25 kbps
Airport Predicted/AMA Predicted Gridlock	Steady state	9.1 kb	11 kbps
NMA Gridlock	Steady state	8.4 kb	11 kbps
Demand	Steady state	8.7 kb	11 kbps
Actual/Predicted Queue Lengths	Steady state	21.6 kb	21 kbps
Closures	Steady state	35.4 kb	32 kbps
Notifications	Steady state	7.1 kb	Not specified
Delays	Steady state	8.2 kb	10 kbps
Heartbeat	Steady state	0.5 kb	Not specified
Resync	Resync	74.4 kb	64 kbps
Periodic Start	Resync	0.5 kb	Not specified
Periodic End	Resync	0.5 kb	Not specified
System Start	Resync	0.5 kb	Not specified



TTP: Operational Metrics Service

Sample Message Data Elements:

- Start/end time for KPI calculation interval
- Airport Throughput KPI
- Airport Cancelled Departure Demand KPI
- Flight Data Quality
- Metering Ready Time Compliance KPI
- Metering Time Compliance KPI
- Metering Hold KPI (minutes per flight)
- Calculated Fuel Burn KPI (gal)
- Emissions KPI (lbs)
- Queue Length Accuracy KPI
- RDR Accuracy KPI
- Flight Times Actual vs. Predicted
- SMP Changes KPI
- Rejected SMPs KPI
- Missed Departure Opportunities KPI
- Stability of Metering Times KPI (TMAT changes)
- Phase of Taxi Operations KPI (minutes)



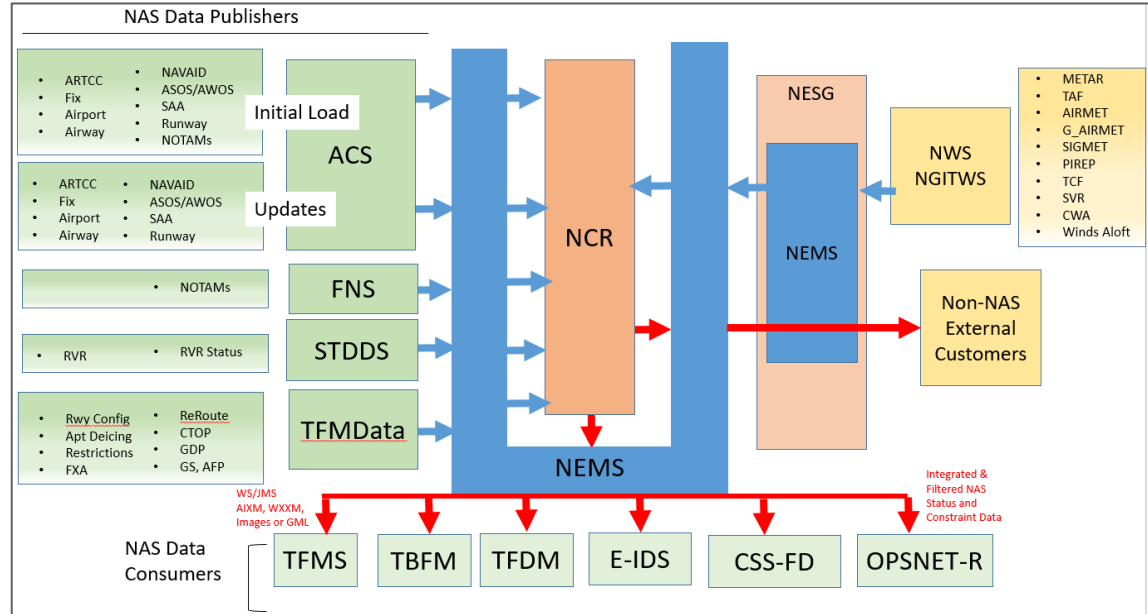
Operational Metrics Message Contents or Type	Flow Type	Average Message Size (Single Site) - uncompressed	Predicted Bandwidth Requirement (Entire NAS) - compressed
Operational Metrics	Steady state	314.0 kb	255 kbps
Heartbeat	Steady state	0.5 kb	Not specified



NAS Common Reference Service

Sample Message Data Elements:

- Consumers multiple SWIM producers across NAS domains
 - aeronautical
 - weather
 - traffic flow management
- 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

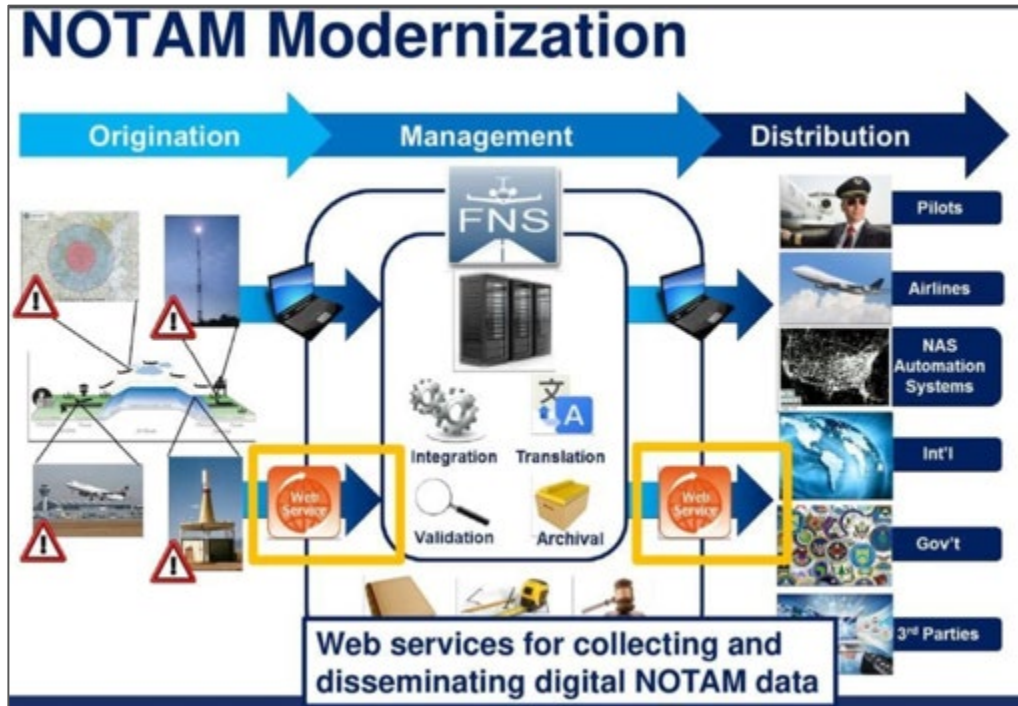




AIM Federal NOTAMs System (FNS)

Sample Message Data Elements:

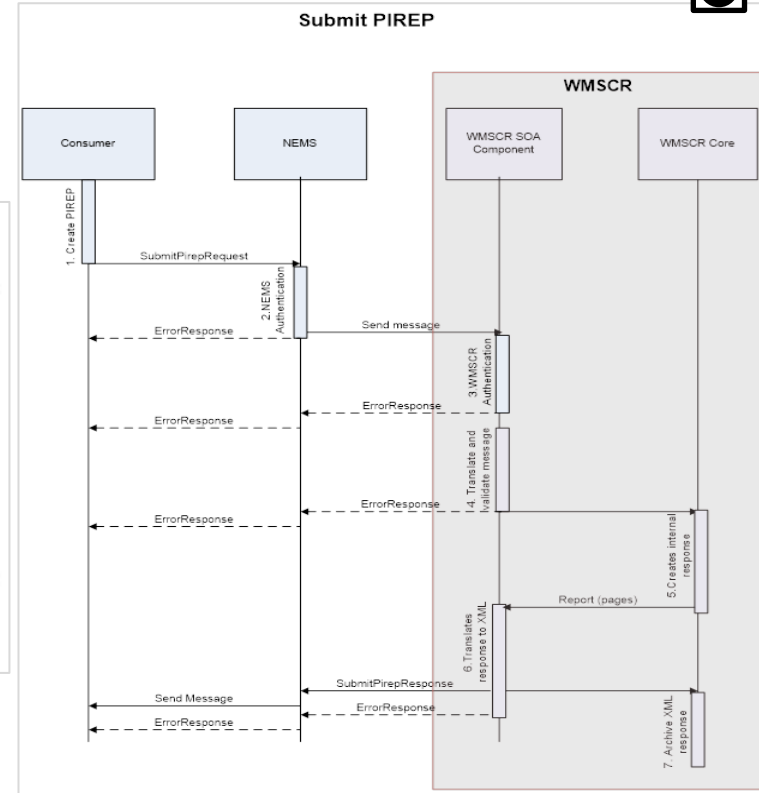
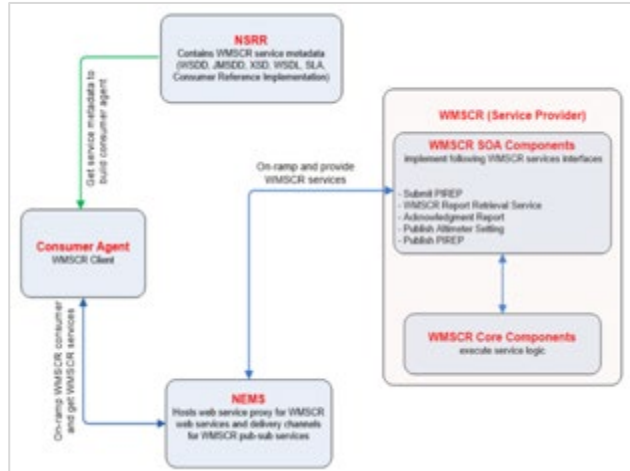
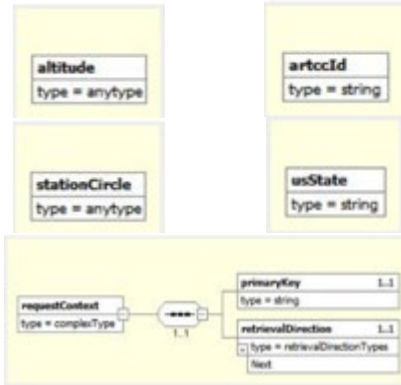
Property Name	Description	Permissible Values
us_gov_dot_faa_fns_nds_SourceType	Specifies the NOTAM classification	NOTAM classification values: <ul style="list-style-type: none"> • Domestic (D) • FDC (F) • Military (M) • Local Military (L) • International (I) • Others (O)
us_gov_dot_faa_fns_nds_LocationDesignator	NOTAM location designator of the affected airport/heliport or facility	Any active NOTAM location identifier
us_gov_dot_faa_fns_nds_NOTAMFunction	Function of the NOTAM <ul style="list-style-type: none"> • New • Replacement • Cancelled 	<ul style="list-style-type: none"> • NOTAMN • NOTAMR • NOTAMC
us_gov_dot_faa_fns_nds_NOTAMKeyword	Keyword associated with the NOTAM	<ul style="list-style-type: none"> • AD • APRON • AIRSPACE • CHART • COM • IAP • NAV • OBST • ODP • ROUTE • RWY • SECURITY • SID • SPECIAL • STAR • SVC • TWY • VFP • CONSTRUCTION • LTA
us_gov_dot_faa_fns_nds_AirspaceUsage	Additional message property to filter airspace related NOTAMs	<ul style="list-style-type: none"> • TFR • SUA • CARF
us_gov_dot_faa_fns_nds_NOTAMStatus	Status of the NOTAM	<ul style="list-style-type: none"> • ACTIVE • CANCELLED





WMSCR Submit PIREP

Sample Message Data Elements:

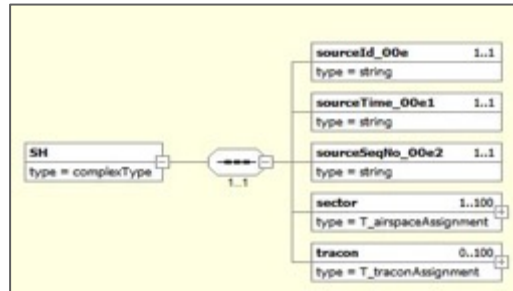




En Route Airspace Data Publication

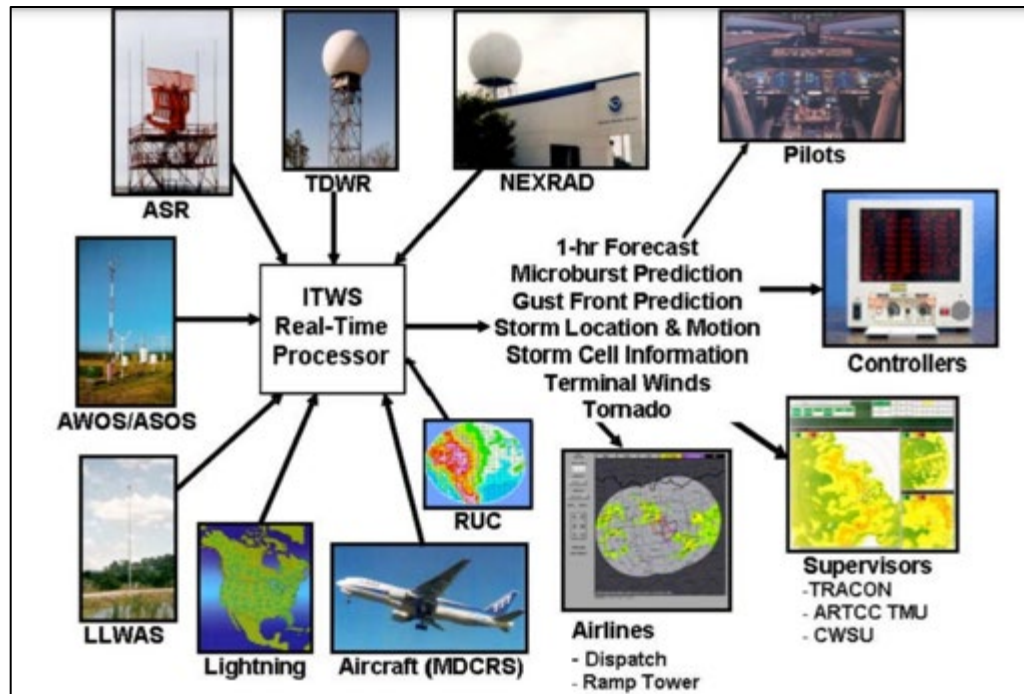
Sample Message Data Elements:

Message Name	Message Code
Sector Assignment Status	SH/SH_AIXM
Route Status	HR/HR_AIXM
Special Activities Airspace (SAA)	SU/SU_AIXM
Altimeter Setting	HA
Adapted Route Status Reconstitution	DBRTRI/ DBRTRI_AIXM
Altimeter Status Reconstitution	DBRTAI
Sector Assignment Reconstitution	DBRTSI/ DBRTSI_AIXM





Integrated Terminal Weather System

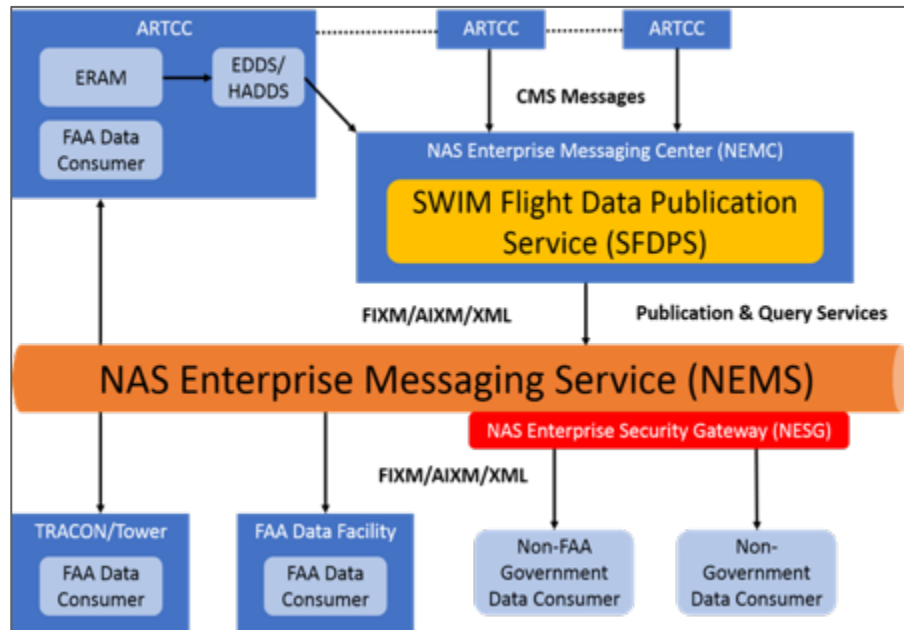




En Route Flight Data Publication

Sample Message Data Elements:

Message Name	Message Code
Flight Plan Information	FH/FH_FIXM
Flight Amendment Information	AF/AH_FIXM
Converted Route Information	HX/HX_FIXM
Cancellation Information	CL/CL_FIXM
Departure Information	DH/DH_FIXM
Aircraft Identification Amendment Information	IB/IB_FIXM
Hold Information	HH/HH_FIXM
Progress Report Information	PH/PH_FIXM
Flight Arrival Information	HV/HV_FIXM
Flight Plan Update Information	HU/HU_FIXM
Expected Departure Time Information	ET/ET_FIXM
Position Update Information	HP/HP_FIXM
Tentative Flight Plan Information	NP/NP_FIXM
Tentative Aircraft Identification Amendment Information	NI/NI_FIXM
Tentative Flight Plan Removal	NL/NL_FIXM
Tentative Flight Plan Amendment Information	NU/NU_FIXM
Batch Track Information	BATCH_TH/ BATCH_TH_FIXM
Drop Track Information	RJ/RJ_FIXM
Interim Altitude Information	LH/LH_FIXM
Automated Radar Terminal System (ARTS) Flow Control Track/Full Data Block Information	HZ/HZ_FIXM
Beacon Code Reassignment	BA/BA_FIXM
Beacon Code Restricted	RE/RE_FIXM
FDB Fourth Line Information	HF/HF_FIXM
Point Out Information	HT/HT_FIXM
Inbound Point Out Information	PT/PT_FIXM
Handoff Status	OH/OH_FIXM
Flight Plan Reconstruction Message	DBRTFPI/ DBRTFPI_FIXM





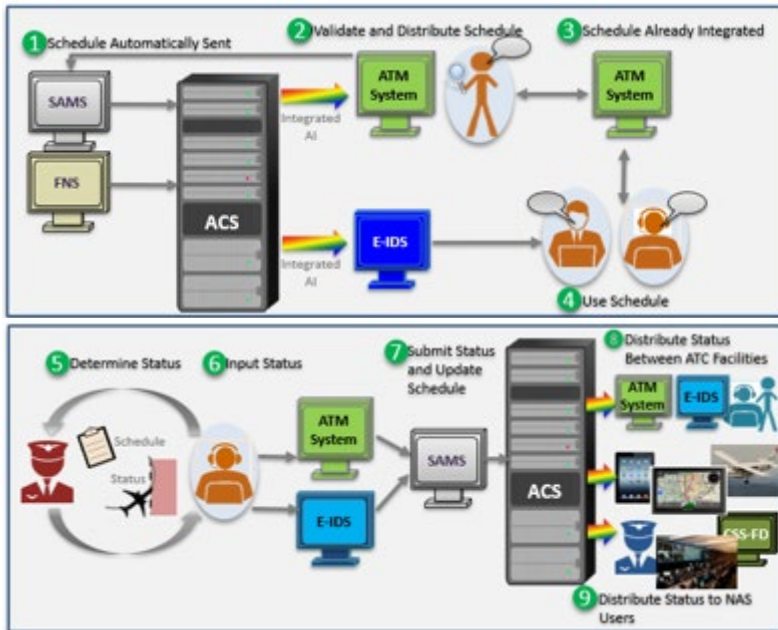
Special Activity Airspace Service

Sample Message Data Elements:

- Get Static SAA
- Put Static SAA
- SAA Operational Schedule
- SAA Schedule Notification
- Static SAA Update

Notification:

- SUA
- ATCAA and other locally defined SAAs
- MTRs
- TFRs
- ALTRVs



Schedule Integration Capabilities

1. Automated delivery of SAA Schedule to ATM systems & E-IDS
2. Schedule review and automated distribution
3. After review, dynamic integration into ATM systems

Schedule Integration Capabilities

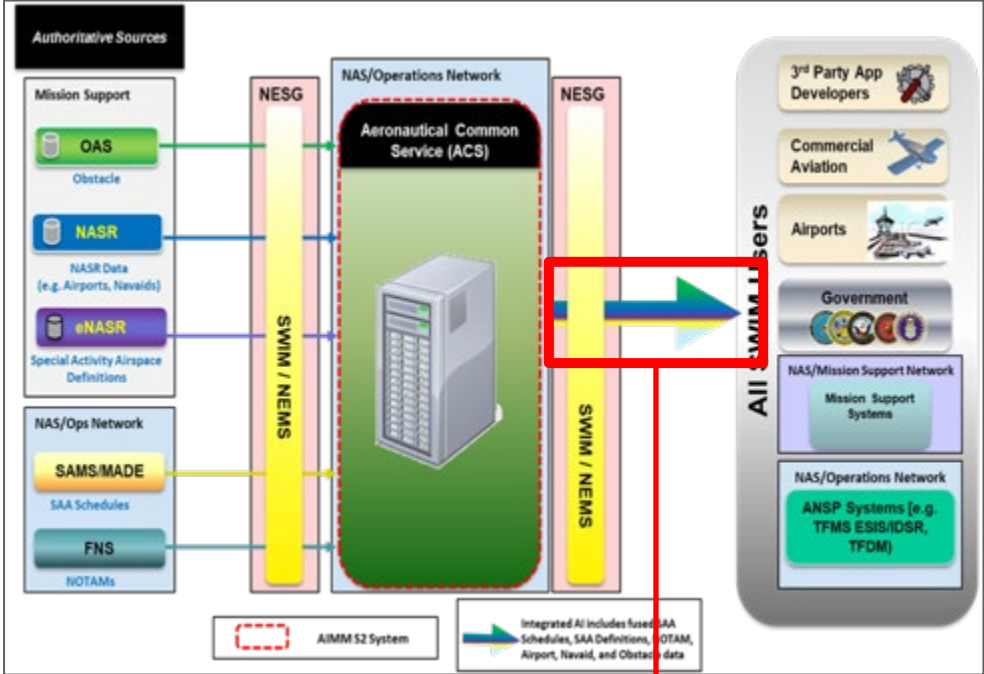
1. Automated delivery of SAA status info to E-IDS and SAMS
2. SAMS integration of status
3. ACS distribution of SAA status



Aeronautical Common Services

Sample Message Data Elements:

- Web Feature Service
- Data Query Service
- Data Subscription Service
- Web Map Service
- Web Map Tile Service
- Airspace Conflict Detection
- Geodetic Computation
- Post Operational Metrics

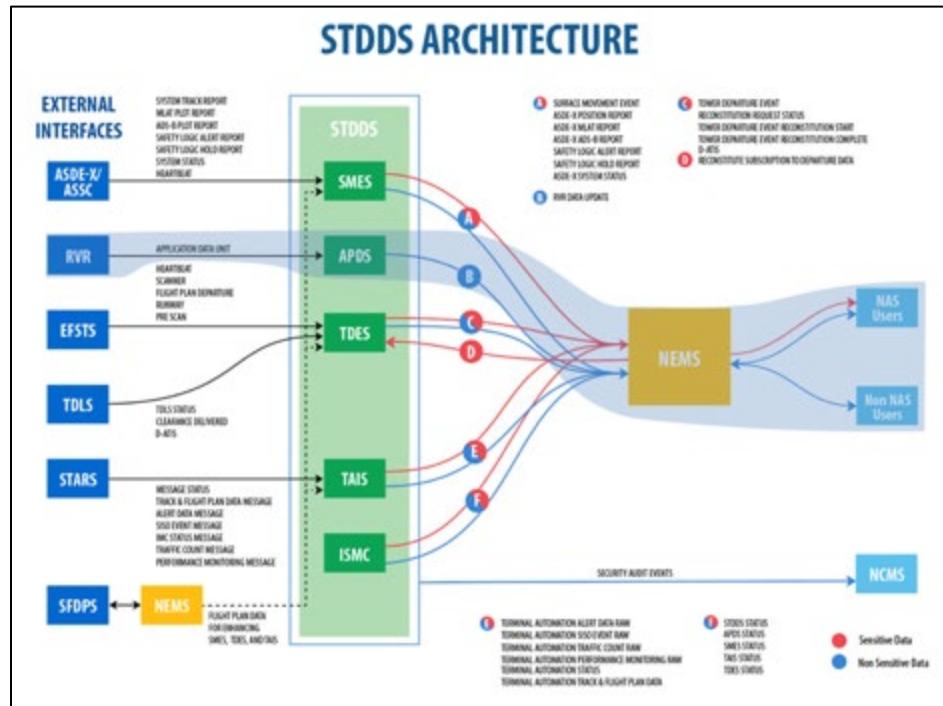
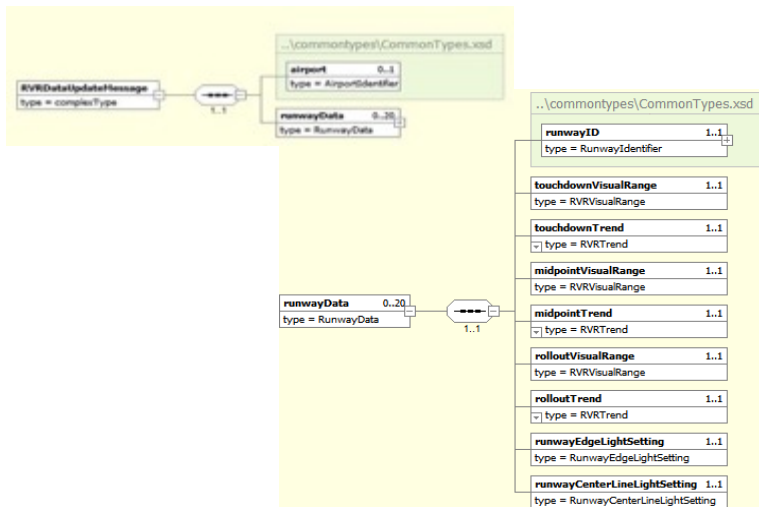




Airport Data Service

Sample Message Data Elements:

Message Name	Message Code	Message Type
RVRDataUpdateMessage	Sent periodically (nominally every 60 seconds) and upon change of any published fields received from RVR.	RR ³

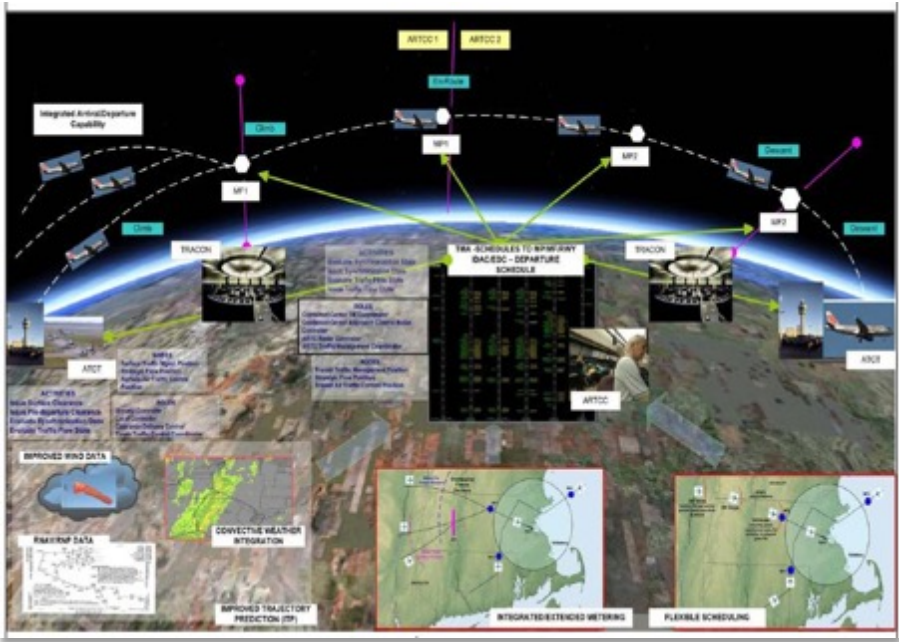




TBFM Metering Information Service

Sample Message Data Elements:

Message Category	Message Group	Message
"air" (Aircraft Information)	<flt>	Flight Plan Information
	<trk>	Tracking Information
	<mrp>	Meter Reference Element (MRE) Assignments
	<eta>	Estimated Time of Arrival (ETA)s
	<sta>	Scheduled Time of Arrival (STA)s
"con" (Configuration Information)	<sch>	Scheduling Information
	<aac>	Arrival Airport Configuration Information
	<mar>	Meter Point Acceptance Rate
	<sac>	Satellite Airport Configuration
	<rar>	Runway Acceptance Rate
	<aar>	Airport Acceptance Rate
	<scs>	Super Stream Class Configuration
	<tar>	TRACON Acceptance Rate
	<gar>	Gate Acceptance Rate
"oth" (Other Information)	<int>	TBFM Interface Status Information Group
	<tmg>	TBFM Metering Status Information Group
"adp" (Adaptation Information)	<trn>	TRACON Name Group
	<gans>	Gate Names
	<agns>	Airport/Runway/Configuration Names
	<mrns>	MRE Names
	<scns>	Stream Class Names
"sync" (Synchronization)	<system_start>	System Sync Start
	<periodic_start>	Periodic Sync Start
	<periodic_end>	Periodic Sync End

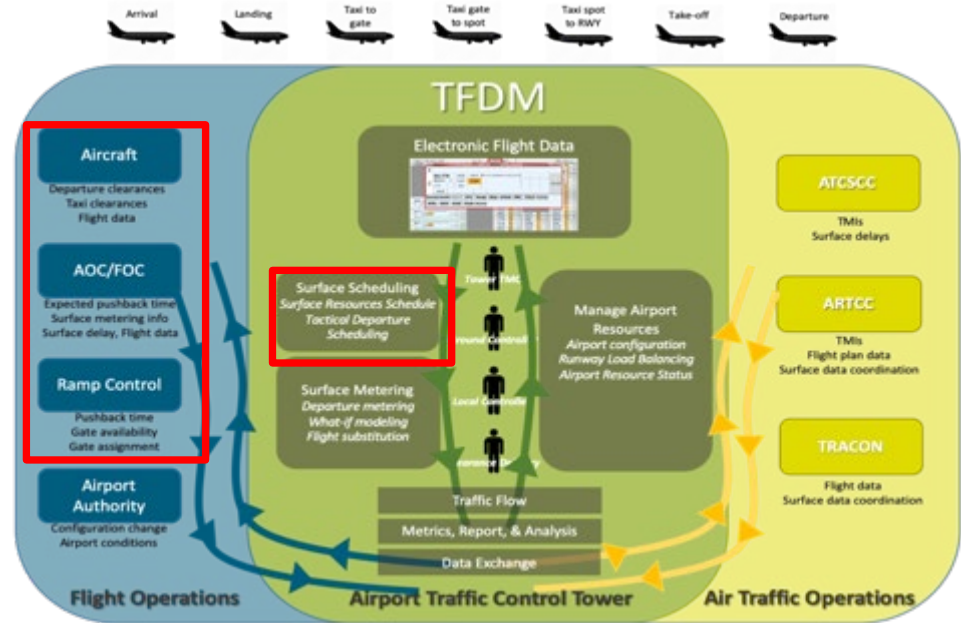




TFCS: Flight Substitution Service

Sample Message Data Elements:

- Interact with the TFDM to request flight data for substitutions during SMP
- Valid Flight Substitution Requests update TFDM's flight data.
 - TFDM replies with a Flight Substitution Response indicating the request was successful.
- Invalid requests results in a Flight Substitution Response message indicating an error from TFDM.



Message	Direction
FlightSubstitutionRequest	In
FlightSubstitutionResponse	Out
Heartbeat	Out

Message	SERVICE_CODE
Heartbeat	HEARTBEAT
FlightSubstitutionRequest	FLIGHT_SUBSTITUTION
FlightSubstitutionResponse	FLIGHT_SUBSTITUTION