SWIFT:

SWIM Industry Collaboration Workshop #10

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

FAA SWIM Program

Communications, Information and Network Programs

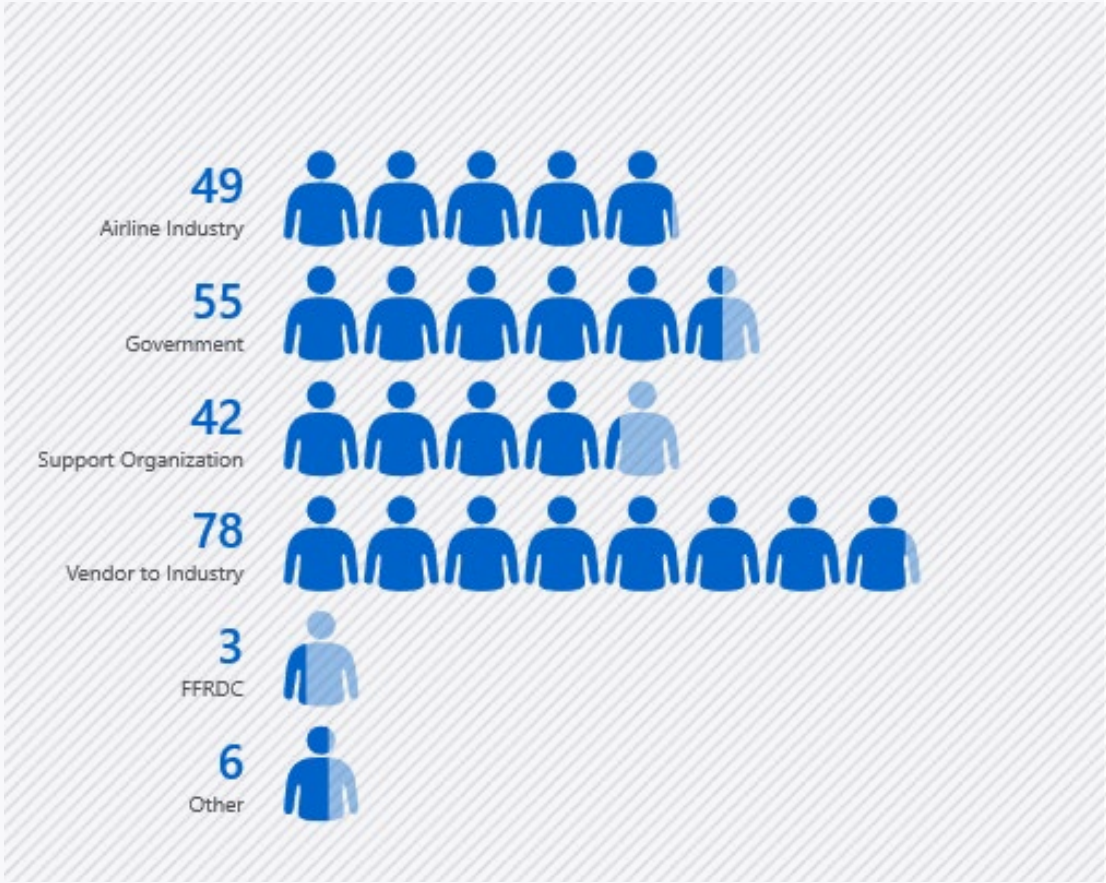
May 20th, 2020

SWIFT Collaborative Workshop #10
May 20, 2020 – Virtual Conference

- **On-line Virtual Conference Starts Promptly 1pm**
- **Welcome and Introductions** David Almeida
- **Agenda overview and SWIFT Updates**
- **Focus Group Report**
  - Operational Issue Focus Group: Chris Gottlieb
  - Development & Analytics Focus Group: Erin Cobbett
  - Operational Context Focus Group: Ray Mitchell
- **Aviation Widget Case Study**
  - Chris Gottlieb, Kevin Long, Joey Menzenski
- **Producer Program: AIMM – ACS (Aeronautical Common Services)**
  - Davy Andrew, Kevin Lew
- **Information Services Roadmap Update** David Almeida
  - SWIM On-Ramping Roadmap
  - TFDM Services: Doug Swol
    - Use Case & Ops Context Document Introduction: Xavier Pratt

Who is in the "Zoom Room" at SWIFT #10?

Attendee Organizations



Other defined as: R&,D, Researcher, Airport, Consultant, GA, and ATL IAP

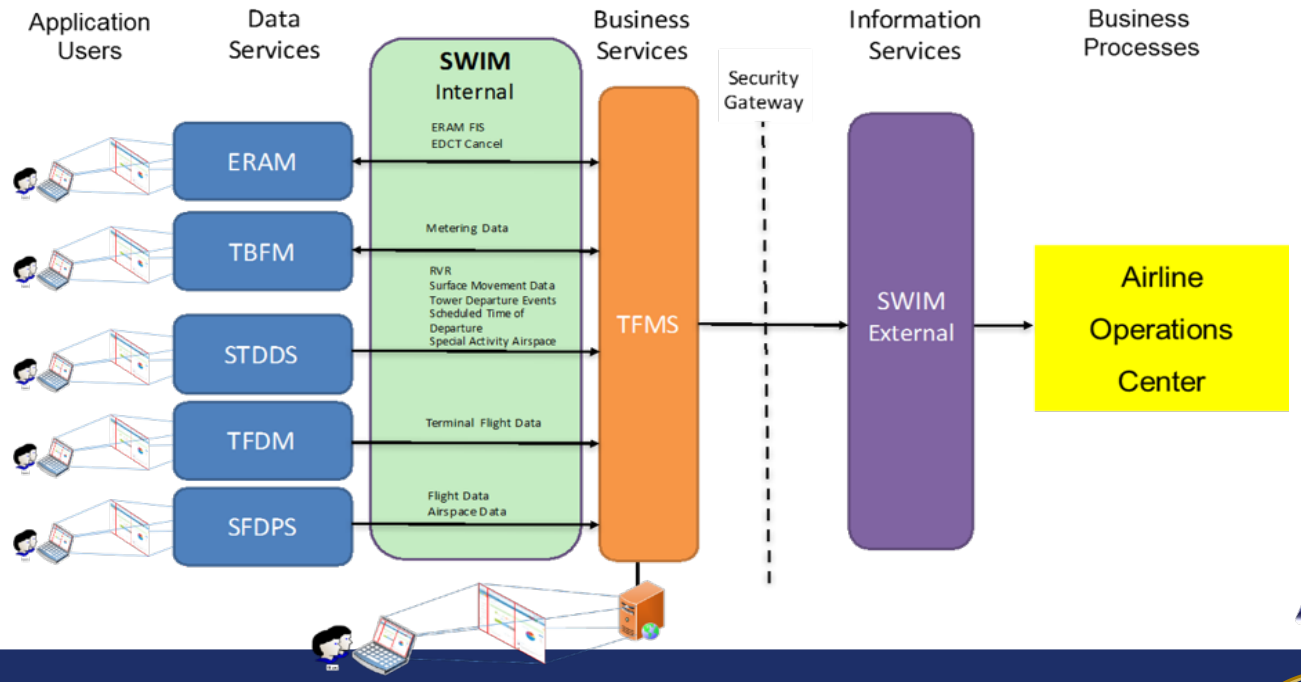
Attended a SWIFT Meeting Before?

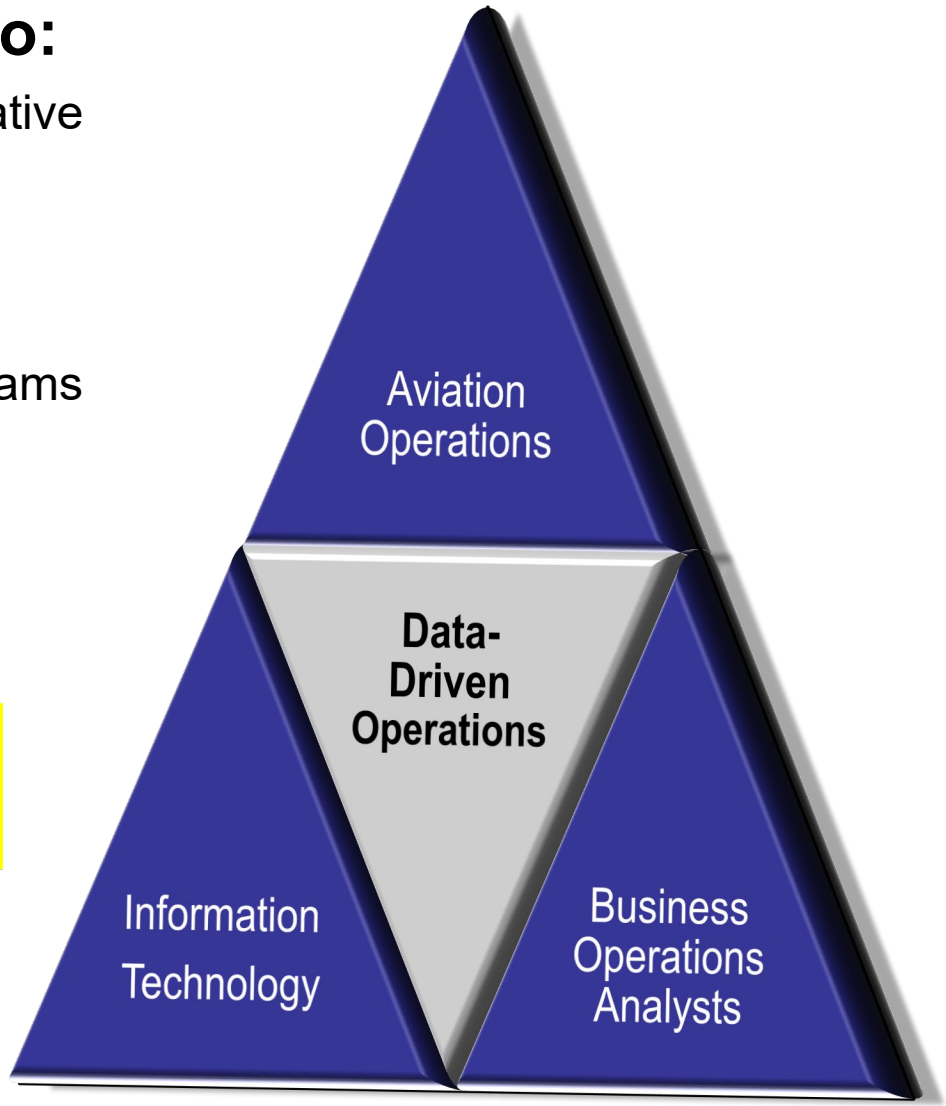
233Attendees

SWIFT

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





Two New Focus Groups: "Coalition of the Willing and Available"

Operational Issues

Identify systemic problems

Coordinate with FAA/Airline stakeholder to identify solutions

Feed solutions to Development/Analytics Focus Group for physical creation if applicable

Development & Analytics

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 of widget "App" to solve problem
- Develop widget "App" designed by group

Focus Groups
Interface as needed

Operational Issues Focus Group

SWIFT 10 Update

Chris Gottlieb, JetBlue

May 20, 2020

Operational Issues Focus Group

- **Goals: Address NAS-wide issues that are raised at the SWIFT that we never fully resolve**
  - Taxi-out return to gate, TBFM/TFMS interaction issues, Flight planning over IP, etc.

- **Requires input from other NAS programs/SMEs, focus group alone cannot solve these problems, but it can identify the main problems to bring up with other programs**

Initial Operational Issues for Focus Group

Current Prioritized Issues:

1. TBFM delays (United) who, what, why it matters
2. Flight Planning over IP (SWA)
3. Taxi Out Return to Gate (Delta)
4. TBFM/TFMS double delays
5. JFK has long taxi issues (JBU)

Operational Issue #1: TBFM Delays [United]

Scenario Example: Subbing into a metering delay

Scenario: There are a variety of TMIs in place in the NEC, Wash Mets, and Chicago

Flight UX123 operates from RIC to EWR at 19:45L and is on the CDF watch list for the fourth month. In order to preserve the flight we must protect the three segments prior to UX123 via substitutions in each program throughout the day. Three undesirable subs are necessary on the previous segments to tee up UX123 for success.

While departing RIC, flight UX123 was subbed with UA345, which has 50 more pax on board than UX123. UX123 pushes back for departure on time and is issued a TBFM metering EDTC for 20:30, thereby making it impossible for the flight to meet the Rule.

Without access to TBFM settings there is no way to study or measure know whether the TBFM application in combination with other TMIs is indeed the right thing for the NAS.

This occurs every single day at a handful of highly congested airports.

Prior Months	Next Carrier	Next Flt Num	Next Sch Dprt Time	Origin	Dest	MTD Ops.	Total Sch. Ops.	Current A30	Needs	Req. A30	Last 7 Flights Arrival Minutes (or Cnxl) 1	2	3	4	5	6	7	Best A30	Worst A30
4	C5	4929-7	19:45	SYR	EWR	5	16	20%	7	64%	C/XU	14	C/TA	124	39	C/XA	C/XA	75%	6%
4	C5	4969-7	20:30	DCA	EWR	5	26	0%	13	62%	C/XA	96	68	153	158	C/XA	24	81%	0%
4	C5	4989-7	19:30	SDF	EWR	6	31	33%	14	54%	157	-18	89	29	40	51	C/XA	87%	6%
4	EV	4455-7	18:15	SAV	EWR										C/XA	177	83	93%	11%
3	EV	3966-7	18:40	CLE	EWR									8	42	C/XU	120	81%	0%
3	EV	4257-7	21:00	EWR	CLE	5	26	0%	13	62%	C/XU	73	112	114	56	C/XU	111	81%	0%
3	C5	4938-7	18:30	EWR	DCA	5	26	0%	13	62%	C/XA	121	74	179	175	C/XA	130	81%	0%
3	C5	4902-7	17:10	MEM	EWR	6	30	17%	14	58%	C/XA	18	64	90	76	51	C/XU	83%	3%
3	C5	4888-7	21:59	EWR	BUF	5	26	20%	12	57%	0	92	-25	92	91	C/XF	C/XA	85%	4%
3	UA	503-7	20:55	EWR	DFW	5	26	20%	12	57%	130	0	43	93	94	C/XA	584	85%	4%

You can't manage what you can't measure!

Operational Issue #1: TBFM Delays [United]

Operational Problem

- **Environment: ATC programs are initiated by the FAA, managed within an airline AND by FAA, and often influenced or affected by DOT Rules and policy**

- **Problem: We lack access to real-time information on TBFM program settings and parameters that drive a variety of different TBFM applications. Without these data, carriers are unable to:**
  - Understand or measure the actions being taken that generate the impact to their flights
  - Assess potential airline-driven solutions
  - Inform potential areas for improvement to program parameters, applicability, or scenarios where playbook or policy modernization is needed to account for the NextGen Deployment

- **Operational/Economic Impact:**
  - Limited visibility into TBFM program parameters, particularly at highly congested airports, results in airlines having little control over their own destiny.
  - Lack of visibility in TBFM in conjunction with scenarios where metering times are regularly above :30 results in flights being delayed frequently enough to make the Chronically Delayed Flight Watch list with no option for substitution.

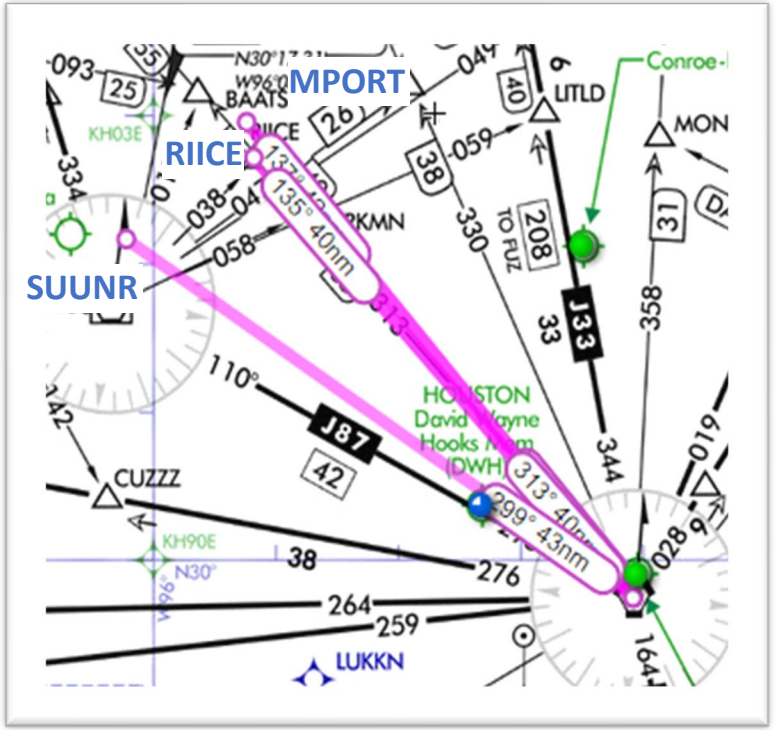
- **Goal: Improve access to the program parameters used in TBFM in order to inform airline's ability to work around the restriction, inform refinement of the way the tool is used, and ultimately modernize our National Playbooks to reflect the use and applicability of the new technology, particularly when used in combination with legacy TMIs.**

Operational Issue #1: TBFM Delays *[United]*

Operational Impact (Example)

IAH inbounds from west experienced increased delays

GUSHR3
RIICE8
SUUNR TTORO3

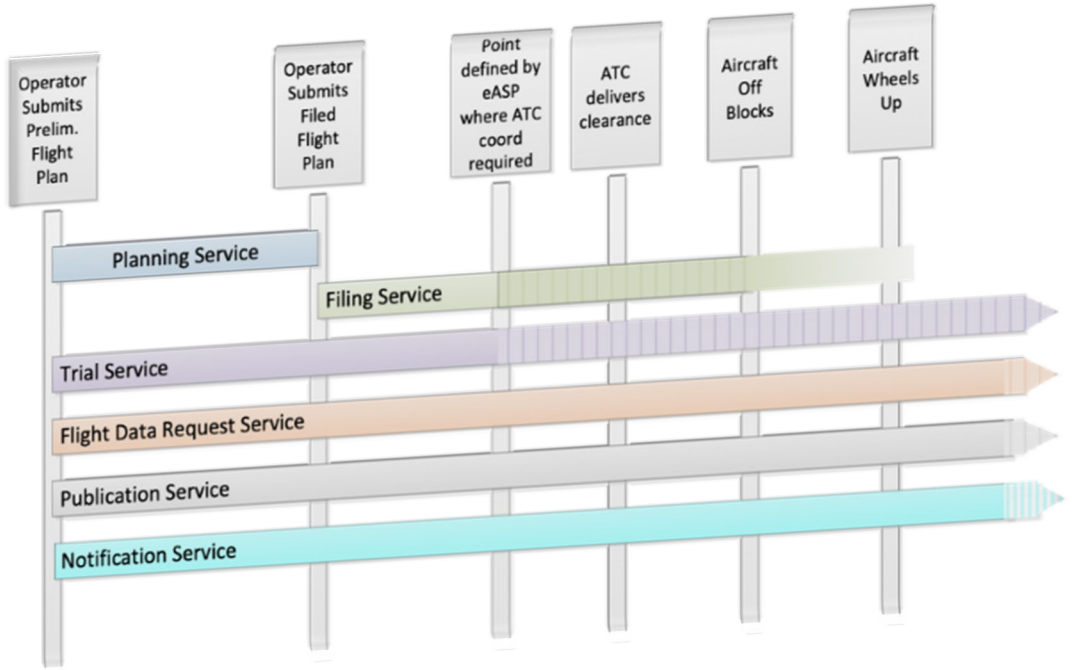


- United noticed increased inbound delays manifesting in longer flight times and ultimately lower Arrival On-Time 00
- Local FAA confirmed the issues in the northwest corner post
- Increased schedule from our west coast stations drove the issues

Flight Planning Modernization

Future Flight Planning over SWIM & Cloud

- **What we saw in Memphis…**
  - FF-ICE introducing new processes
  - Highly interactive business flow between FAA and AOC systems



- **The community seeks to:**
  - Understand impacts to flight plan business processes and data flows
  - Validate data standards and exchange models
  - Ensure infrastructure can support bi-directional exchange
  - Analyze behavior of cloud hosted services to support these capabilities
  - Understand security implications between FAA & Airspace User

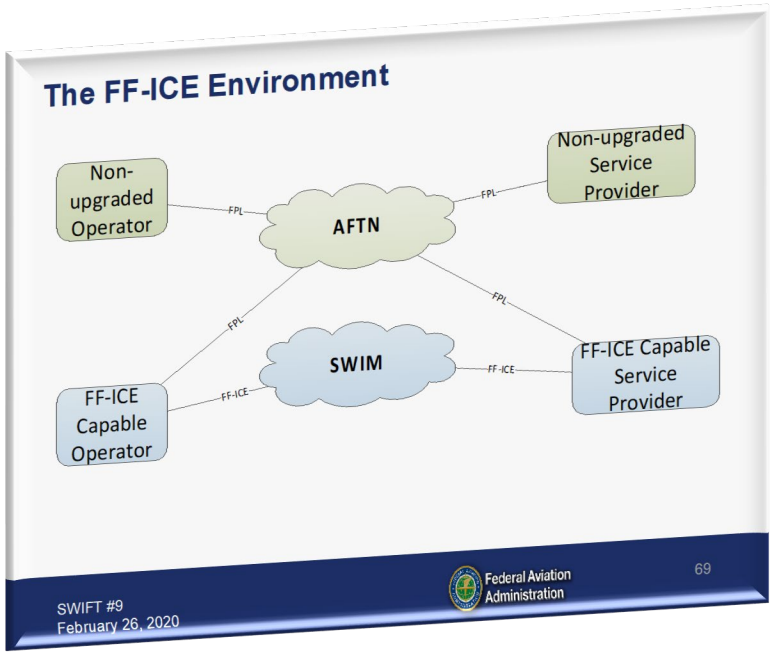
Adapted from Ray Ahlberg in Memphis SWIFT #9, February 26, 2020.

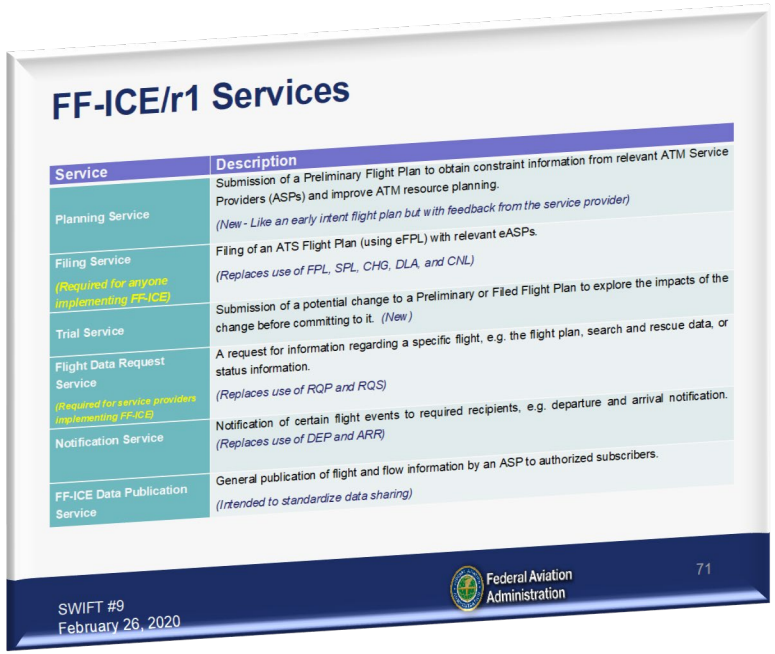
What we learned in Memphis…

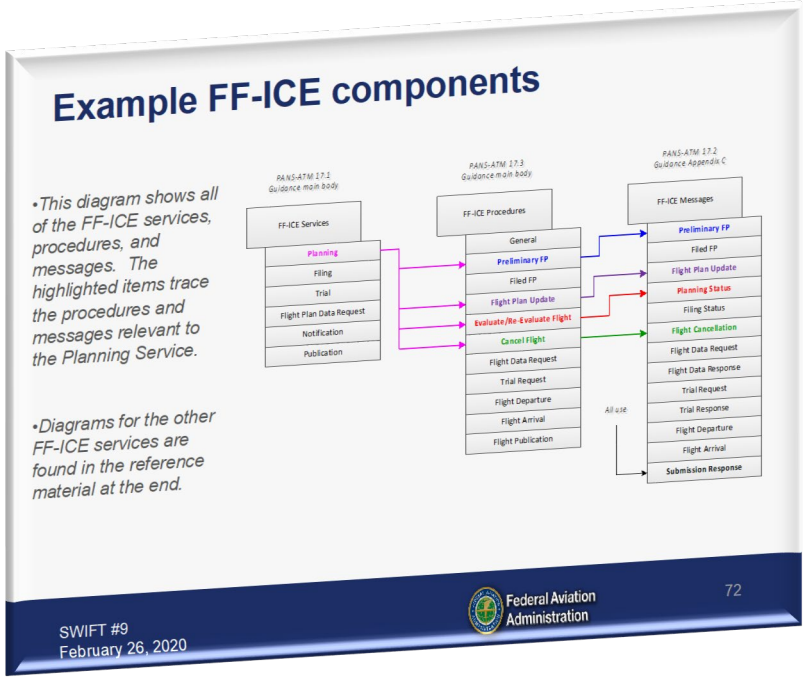
Flight Planning modernization will likely include hybrid implementation

There will be multiple information service interactions introduced

There are multiple scenarios driving business processes





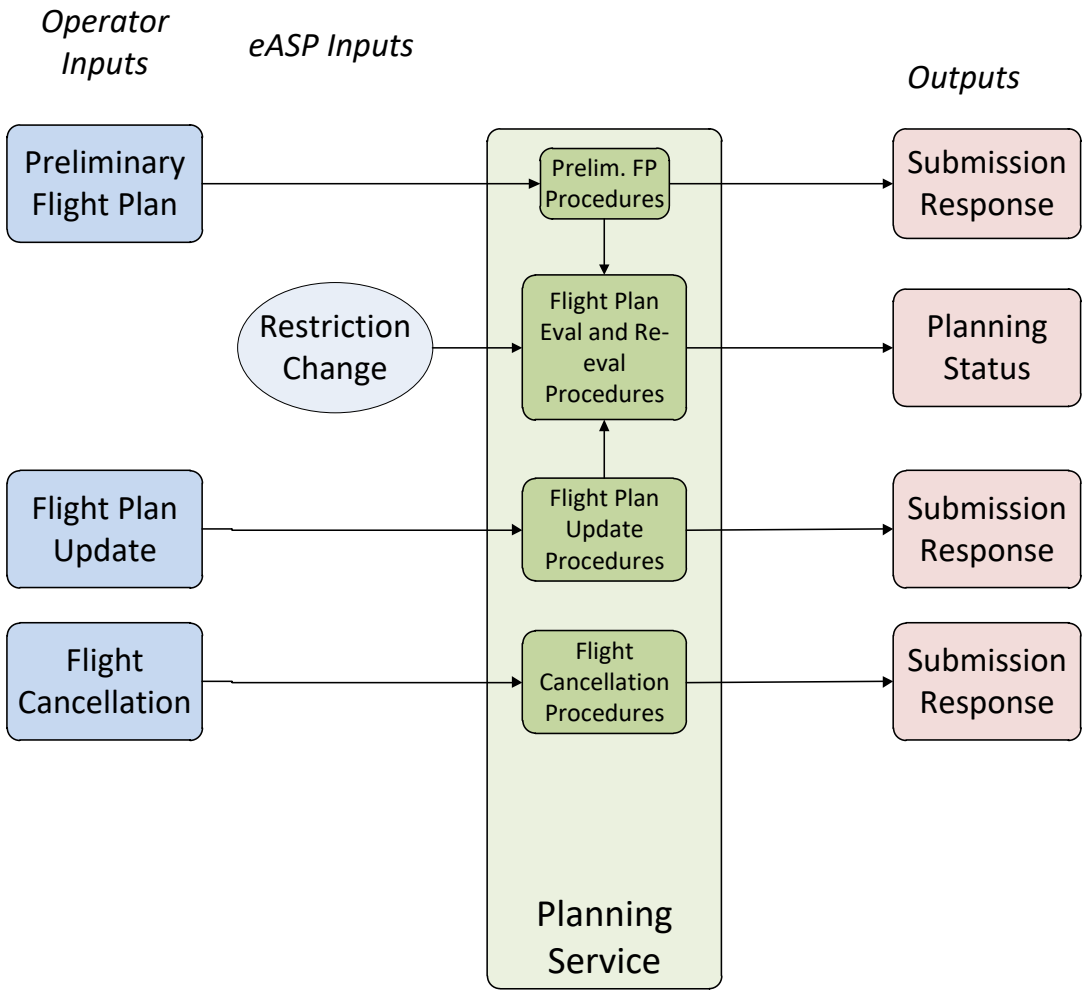


Looking to understand how infrastructure, standards and security will support this modernization effort

Planning Service Overview

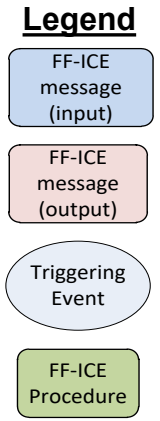
What do these interactions look like in real-time environment?

How do flight planning systems need to accommodate these new capabilities?



What if these interactions all operate within the cloud?

How do we maintain secure interactions to ensure data integrity?



Adapted from Ray Ahlberg in Memphis SWIFT #9, February 26, 2020.

Development & Analytics Focus Group

SWIFT 10 Update

Erin Cobbett, Delta Airlines

May 20, 2020

Development & Analytics Focus Group Introduction

- **Overview**
  - As Industry and Flight Operators have begun to ingest, store, and utilize SWIM data, many common challenges have arisen
  - This Focus Group works collaboratively to advance the functionality and value of SWIM for the community
  - Starting with Operational issues the team leverages the expertise of participants to present solutions using SWIM data
- **Participants**
  - Team is all volunteer with a mix of technical skills: Data Scientists, Business Analysts, Data Engineers, Software / App Developers, Operations personnel, and SMEs
  - Includes Academia, Industry, FAA, and Flight Operators

Mission: Let's collaboratively create a *speedy* transition from Information to Insights using SWIM

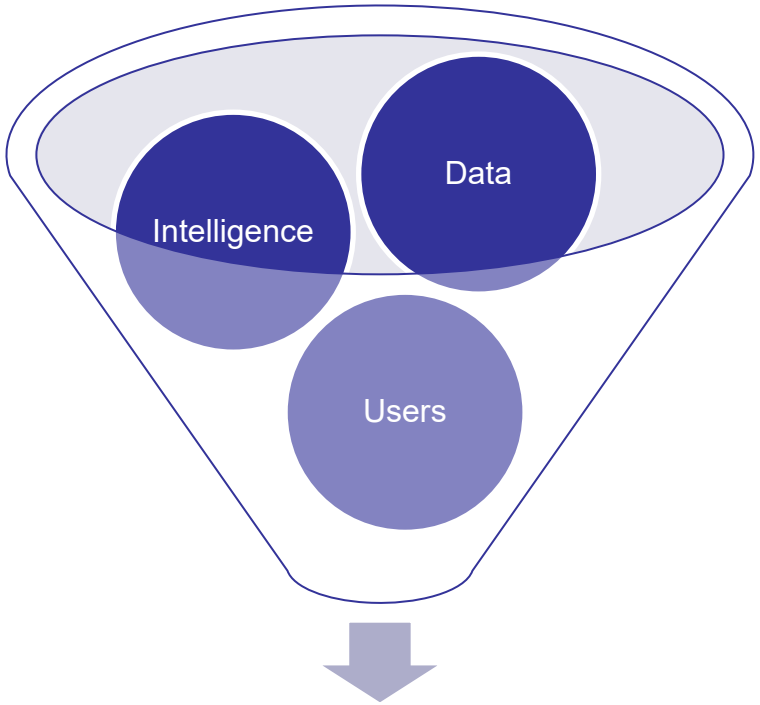
Why It Matters

- **FAA and Industry collaboration is not new to aviation**
  - CDM, customer forums, industry work groups, etc.
  - But we rarely see this in the *Data / Technology* space
- **Risk of not working together**
  - SWIMplexity – Creation of products that introduce different solutions
  - Slower paced development
  - Should leverage community of users to introduce needed changes
- **Collaboration in the time of COVID**
  - Cost control is Top of Mind for Industry
  - Precisely the time to leverage everyone's **BEST** to create the most efficient NAS possible

Mission: Let's collaboratively create a *speedy* transition from Information to Insights using SWIM

Why it Matters – Removing Silos, Gaining Value

- All organizations that use SWIM have unique experiences, perspectives, and contributions
  - Data
  - Intelligence
  - End Users
- Working as a team:
  - Maximizes benefit and investment for all parties
  - Makes the data more valuable and intelligence more reliable
  - Allows for efficiencies to be gained
- Value is not in the data itself, *but what we make of it*



D&A Focus Group Progress

Focus Group "Mothership"

- TBFM was identified as a top community priority at SWIFT meetings and by the Operational Focus Group
- Monthly meetings drew on prior SWIFT presentations and group expertise to further refine TBFM use case
- MS Teams was selected as collaborative platform

TBFM Sub Team – led by Al Capps, NASA

- A trial 4-week sprint with weekly update meetings was selected as a starting point for the team
- Work was subdivided into logical tasks
- Leads were identified and work began

Focus Group Timeline	
11/7	New Focus Groups Introduced
1/14	Kickoff Meeting
2/25	Developer Session at SWIFT 9
4/23 – 5/14	TBFM Sub Team Sprint 1 Session
5/26	Sprint 1 Outbrief Completed
5/27	Sprint 1 Outbrief available (MS Teams)
6/1	Sprint 1 Retrospective
6/4	Next D&A Meeting

If the question is...

How much delay will my flight incur because of TBFM?

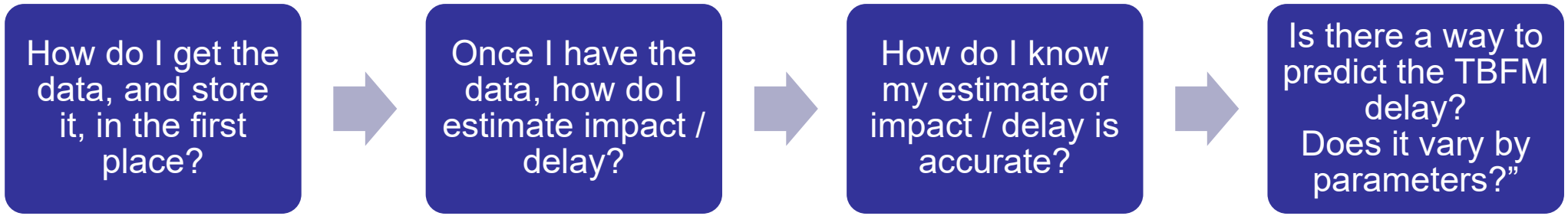
And we have a TBFM feed,

And many savvy industry professionals,

Why do we need D&A to work this?

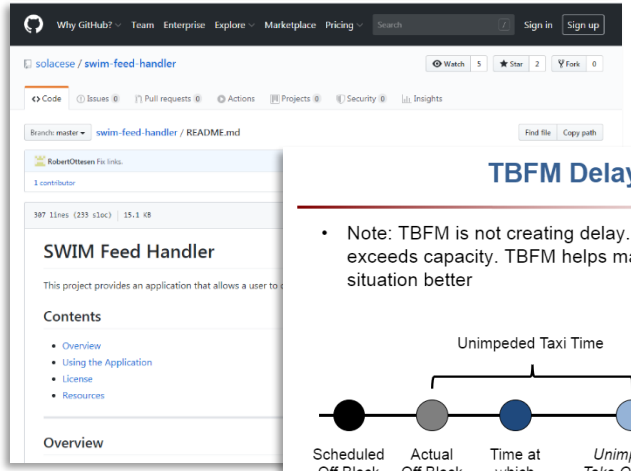
TBFM Delays Sub Team Tasks

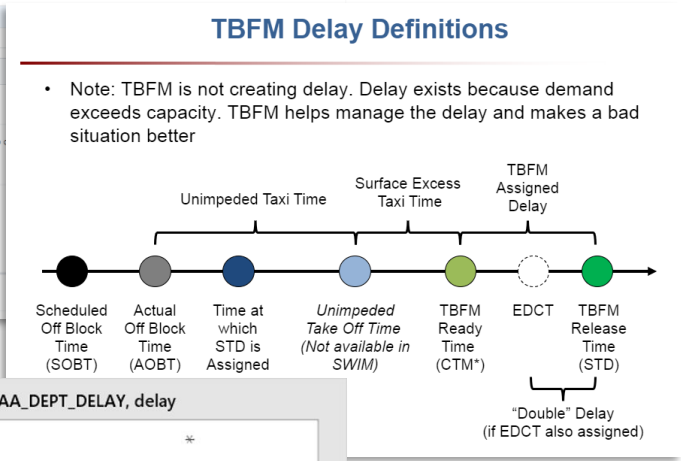
- **Consensus, Complexity, and Completion Time**
- TBFM is more of a black box than other systems, and this holds true for the data sent via SWIM
- The SWIM data is not the whole picture, and much of the source data is unavailable publicly
  - When it is available, it requires considerable processing to make it functional for analytical uses
- Analytical problems have layers and dependencies, and need to be worked in a logical order
- Currently, there isn't a field that denotes "TBFM Delay Minutes" in SWIM
  - Need to agree on a field or calculation that makes sense to a consensus of stakeholders
- To accommodate these dependencies, the team identified 7 tasks, and began work on 4:

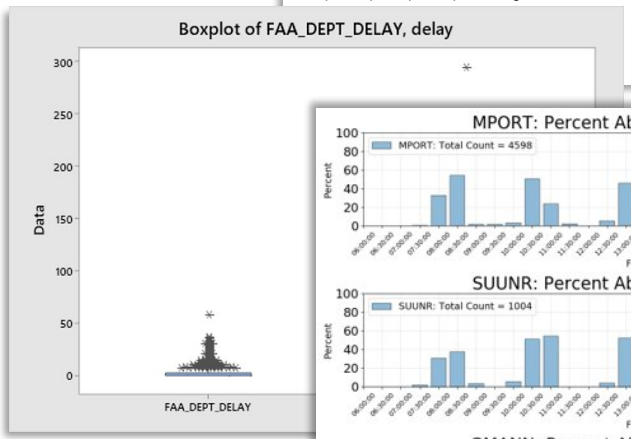


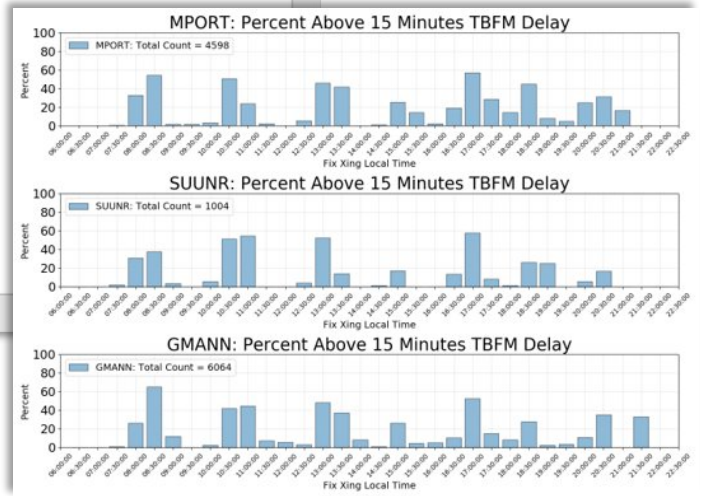
TBFM Delays Sub Team Progress

- **Several hundred hours of volunteer time have been contributed during Sprint 1**
  - Obtained / stored: Raw SWIM TBFM messages, “Truth Data”, and ATD-2 CLT comparison data
  - Created new / transformed data: Fused TFMS & TBFM data, hourly flat files from SCDS TBFM
  - Published code to consume and handle TBFM data from SCDS (GitHub)
  - Mapped all possible elements for TBFM delay definition
  - Created an initial delay definition and compared with “Truth Data” to understand size of disparities
  - Used initial definition to look for time and fix patterns into IAH









Lots of technical problems to solve, join us!

- **TBFM Sub Team Next Steps**
  - So much accomplished, but more to come
  - Outbrief will contain findings and work left to be done
  - Retrospective on Sprint 1 will give us additional insight in how to better collaborate and improve as a group
- **Focus Group "Mothership" Next Steps**
  - Long term, TBFM solutions will be looped back to Operational Focus Group
  - List of operational / data issues will be reprioritized based on what is now Top of Mind for Industry
    - What ideas do you have?

Contact Us: Erin Cobbett - Erin.Cobbett@delta.com
Ray Mitchell - Ray.Mitchell@lstechllc.com

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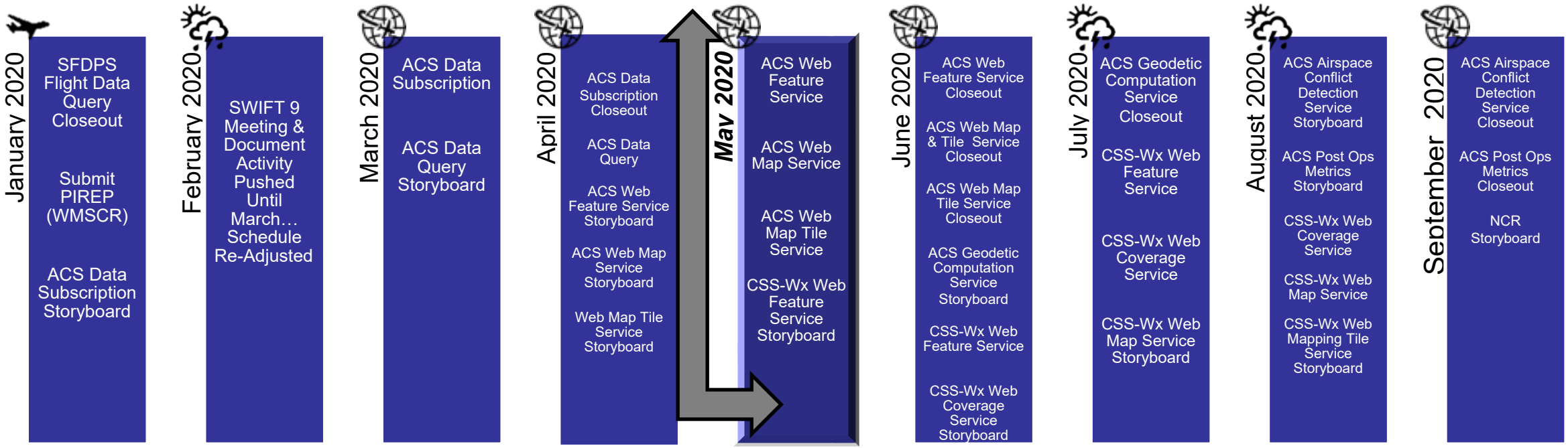
SWIFT Focus Group: Operational Context & Use Case Documents

Update on Focus Group

Ray Mitchell, LS Technologies

May 20, 2020

Operational Context Document Updates



- **In process of developing first Use Case document since June 19, Focused on TFDMU**
- **Schedule subject to change if service updates are released and existing Operational Context documents need to be updated**
- **Focus Group requested an escalation of TFDM TTP & TFCS services, teams integrate without impact to current schedule**

Operational Context Documents Produced

Surveillance	Aeronautical	Flight/Flow	Weather	Status
STDDS TAIS DELIVERED	SFDPS Airspace DELIVERED	TFMS Flow DELIVERED	ITWS DELIVERED	TFMS Status DELIVERED
STDDS SMES DELIVERED	FNS NDS DELIVERED	TFMS Flight * DELIVERED	STDDS APDS DELIVERED	STDDS ISMC DELIVERED
SFDPS Flight DELIVERED	DCNS DLD DELIVERED	TBFM MIS DELIVERED	WMSCR Submit PIREP DELIVERED	
	SFDPS Airspace Data Query DELIVERED	STDDS TDES DELIVERED		
	ACS Data Subscription DELIVERED	SFDPS General DELIVERED		
	ACS Data Query Service UNDER REVIEW	TFMData Request/Reply DELIVERED		
	ACS – Feature, Map, and Map Tile Services IN DEVELOPMENT	SFDPS Flight Data Query DELIVERED		
		TFDM IN DEVELOPMENT		

Interested in the SWIFT Focus Groups?

- **For more information please contact**

- **Ray Mitchell, SWIFT POC**
  - Phone: (703) 963-4979
  - Email: ray.mitchell@lstechllc.com

- **In addition to the NSRR, all SWIFT Documentation can also be found at:**
  - https://connect.lstechllc.com/index.cfm/main/swifthome

Aviation Widget Case Study:

Improving Effectiveness Through Early Route Deviation Detection

Chris Gottlieb, Jetblue
Kevin Long, MITRE
Joey Menzenski, MITRE

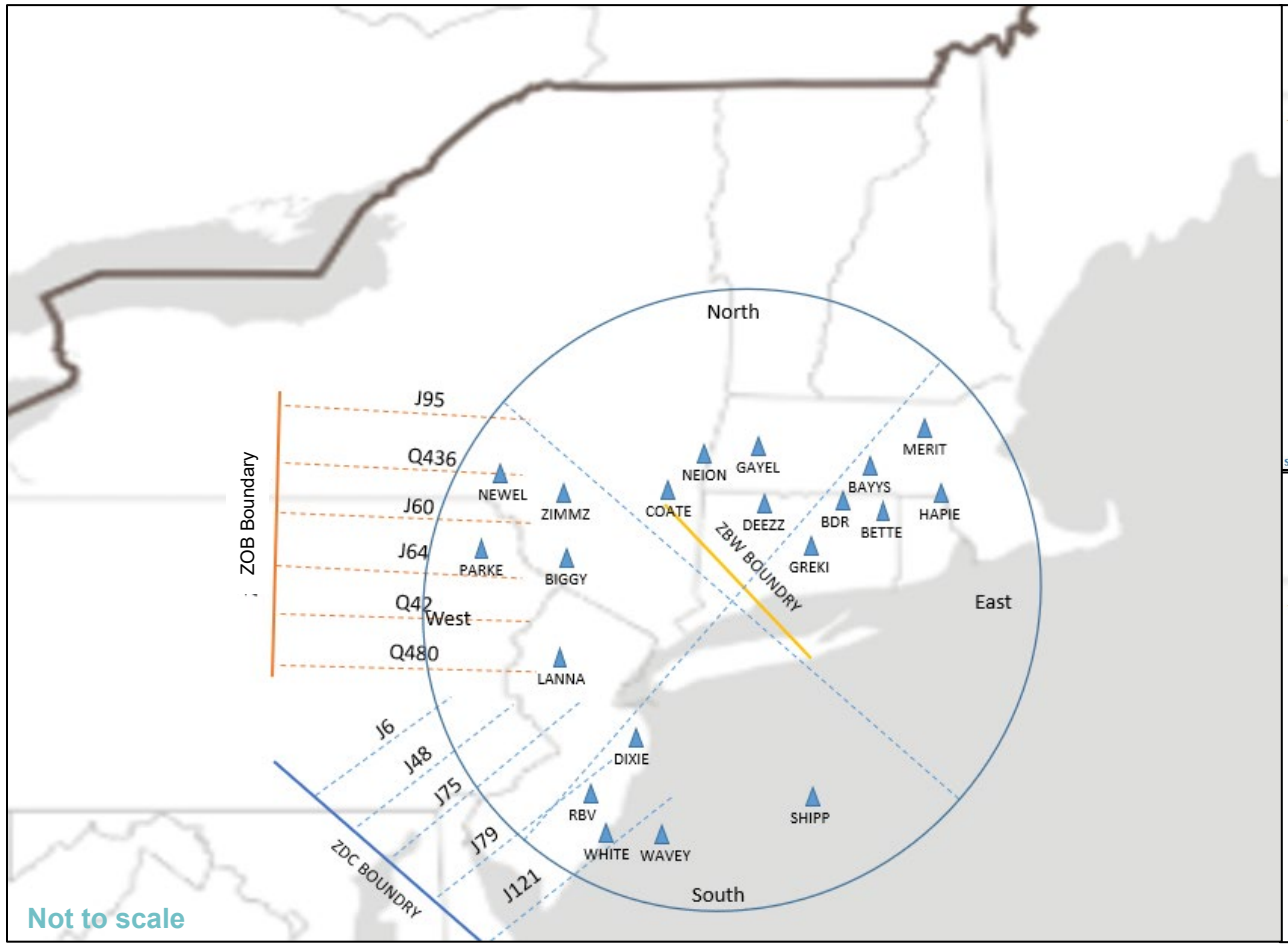
May 20, 2020

Federal Aviation Administration

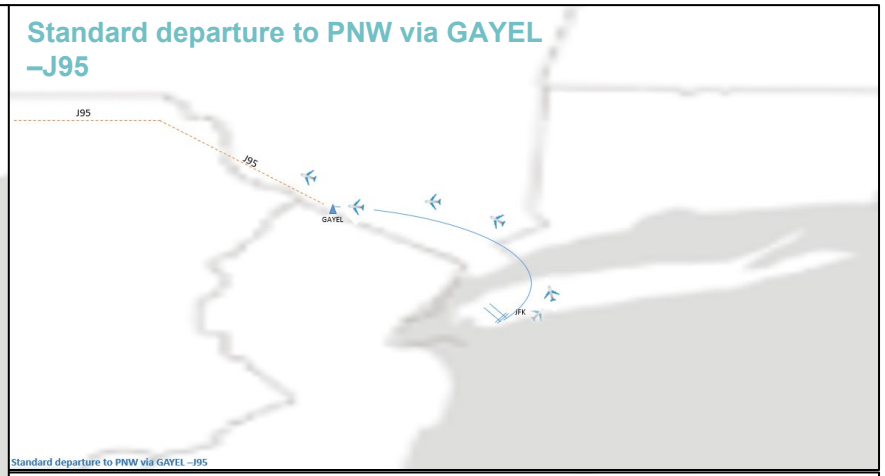
Executive Summary

- **Environment:**
  - Live NYC Metro terminal environment (adjacent to ZOB, ZBW and ZDC boundaries) has daily SWAP vulnerability
  - N90 TRACON north departure gates, fixes and airways impacted by weather events
    - GAYEL, NEION, COATE, DEEZZ, J95, Q436, J60, J64, Q42, Q480
- **Problem Statement:**
  - No clear tools available to observe or record departure environment metrics that track airspace optimization. Without analysis capability, we lack the ability to gauge how well airspace is managed, utilized for next day CDM calls, determine issue workload or quantify airspace capacity recovery times.
- **Impact:**
  - Earlier aircraft deviation detection at departure fixes/routes to alert surface traffic
    - Improved TRACON/Tower/AOC clearance coordination and workload management to reduce gate returns and extended taxi. Greater than 90mins.
    - Visibility into departure fix closure and recovery time to reduce vulnerability to SWAP
    - Route/Fix availability situational awareness for better reroute planning and fuel savings. Improve safety through better workload management and reducing error probability.
  - Ability to measure dispatcher accuracy to better inform multiple FAA and airline efficiencies
    - Assess center boundary route efficiency
  - Store and leverage data for post Ops analysis to assess accuracy of flight filings and delay estimates
    - Reference playbooks utilizing real historical data on SWAP events to plan and update accordingly
- **Goal:**
  - Geofence fixes to monitor impacted airspace resources via MIT vs traffic demand tracking for improved airway efficiency and FAA/airline carrier tactical decision-making.

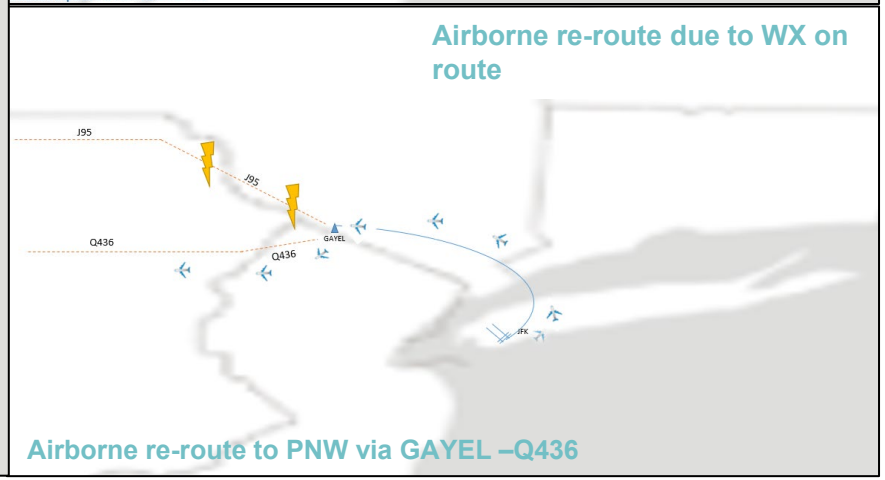
N90 TRACON Departure Fixes and Airways



Standard departure to PNW via GAYEL –J95



Airborne re-route due to WX on route

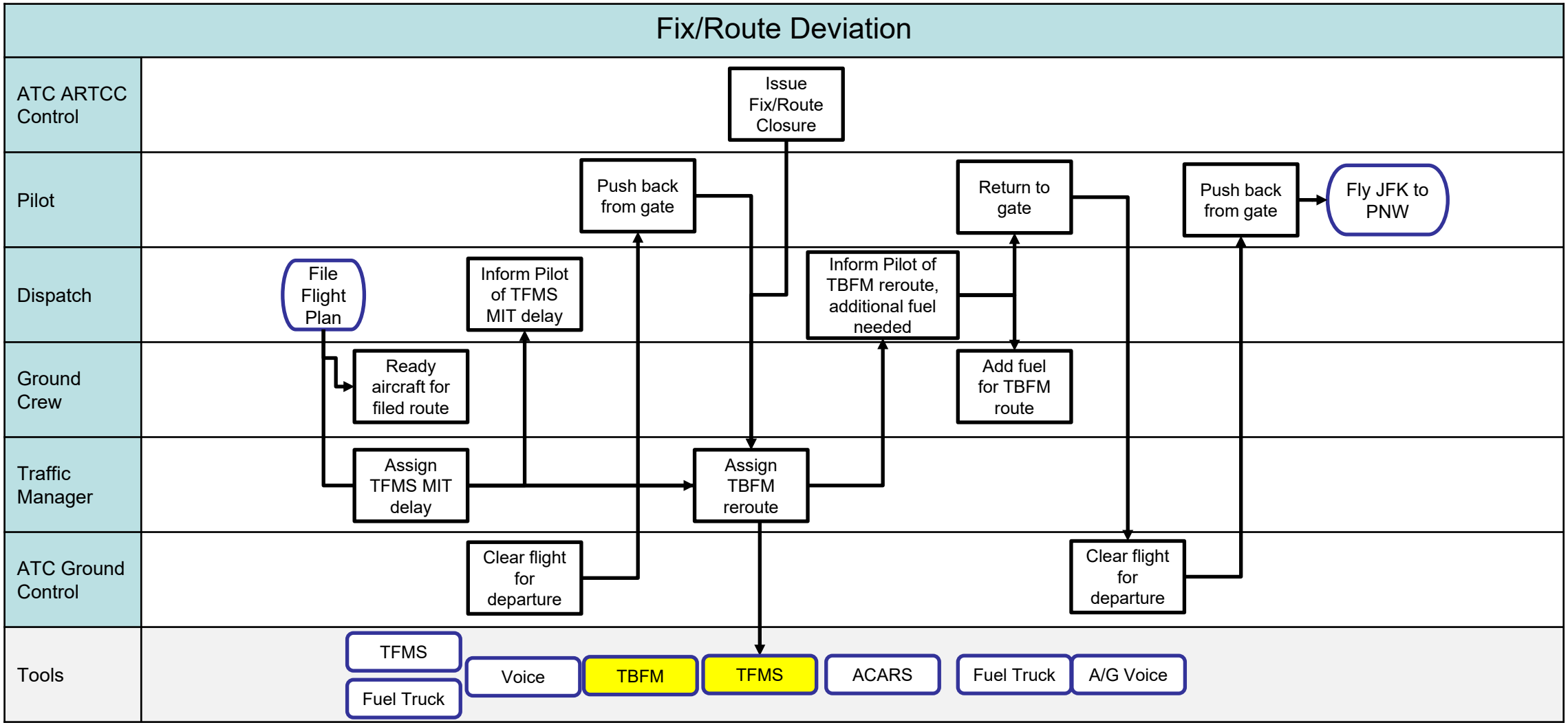


Airborne re-route to PNW via GAYEL –Q436

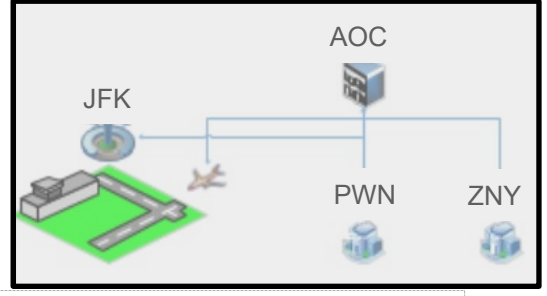
Operational Workflow

1. **JBU Dispatch files flight plan for JBU718**
   - JBU AOC acts as ATC coordinators (as necessary) relaying MIT EDCTs
2. **Airports above and below wing receive pertinent information from flight plan package.**
3. **Clearance Delivery confirms filed flight plan, ATC Facilities receive route strip.**
4. **ZNY issues GAYEL-J95 route closure due to severe weather**
   - JFK departure fix GAYEL now closed for westbound traffic
5. **Airborne flight JBU347 en route on J95 to ZOB provides PIREP**
   - Requests reroute via frequency to ATC.
6. **Dispatch relays route closure to AOC and JBU718**
7. **JBU 718 put in staging not in active taxi queue waiting on green route from ZNY**
8. **ZNY issues reroute to JBU718**
9. **JBU Dispatch coordinates reroute option with AOC and FAA**
10. **Reroute is accepted Dispatch issues accepted reroute to JBU718**
    - Issue: Dispatch must run reroute in flight queue
11. **JBU Dispatch does not have visibility to TBFM delay (not subscribers)**
    - Issue: Not all users sharing the same airspace have the same situational awareness
12. **JBU718 given an hour EDC from TBFM and offered reroute via COATE-Q436**
    - Issue: No delay reduction in TBFM, so pilot returns to gate to fuel for the re-route
13. **Pilot pushes back from gate**
    - JBU718 departs JFK with X delay
14. **JBU718 may have been off gate and can either return to the gate for required fuel or be put in active queue for departure**

Operational Business Process

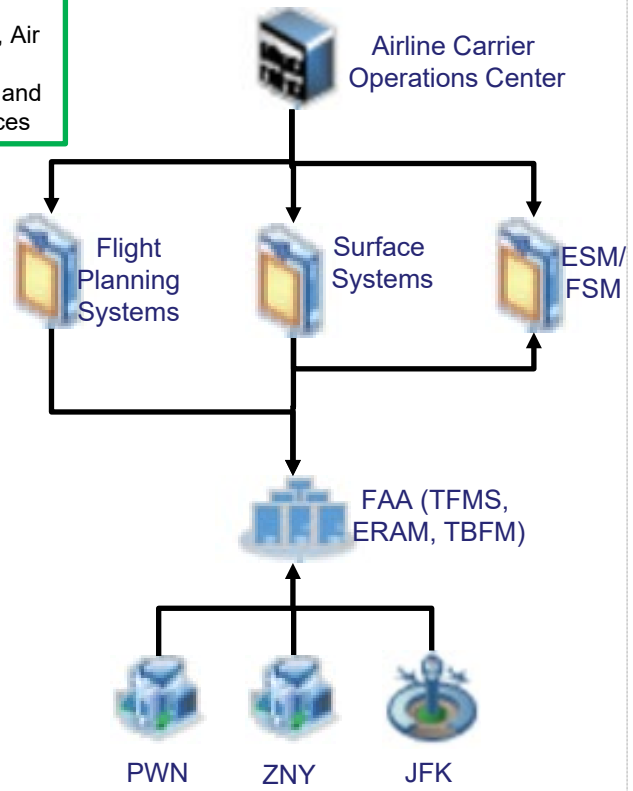


“As-Is” Systems/Data Flow View

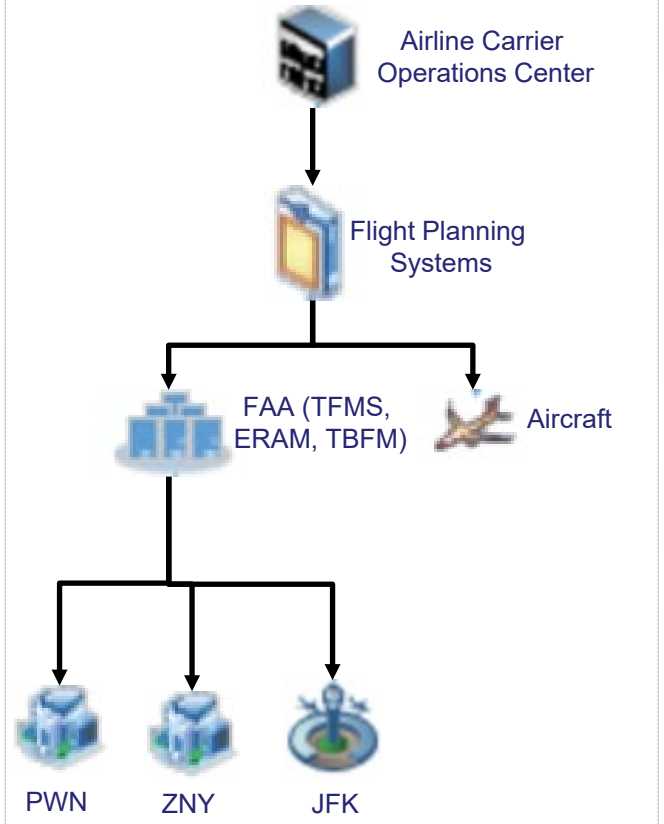


Mainly through a series of automated electronic communications, Air Carriers use communications and platform interfaces

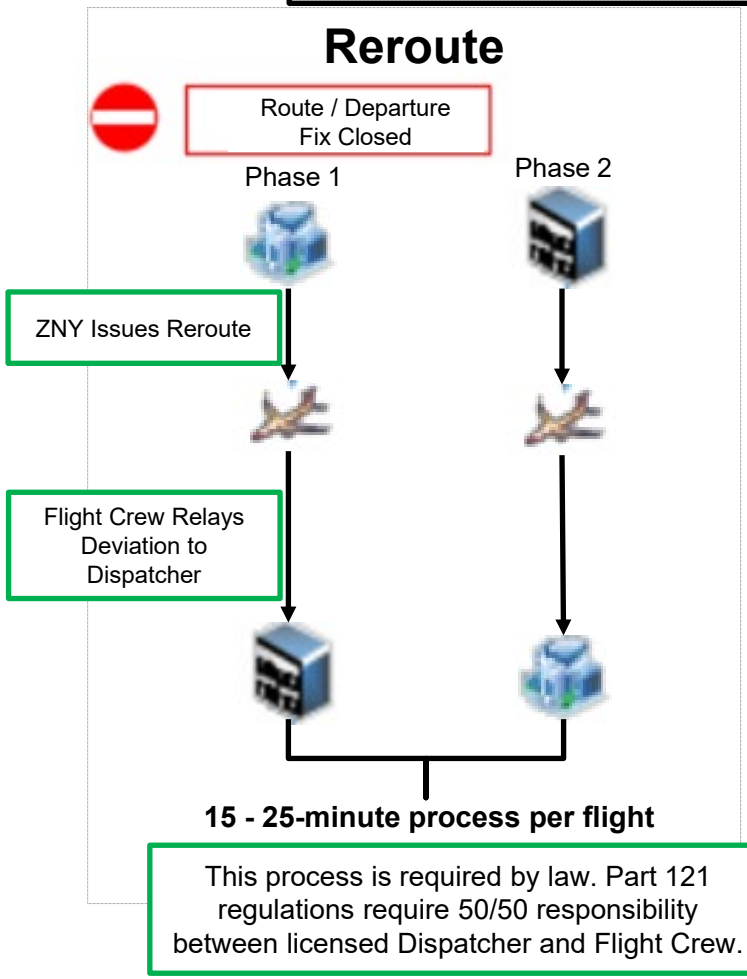
Airlines Operations Communications



Filing Flight Plan

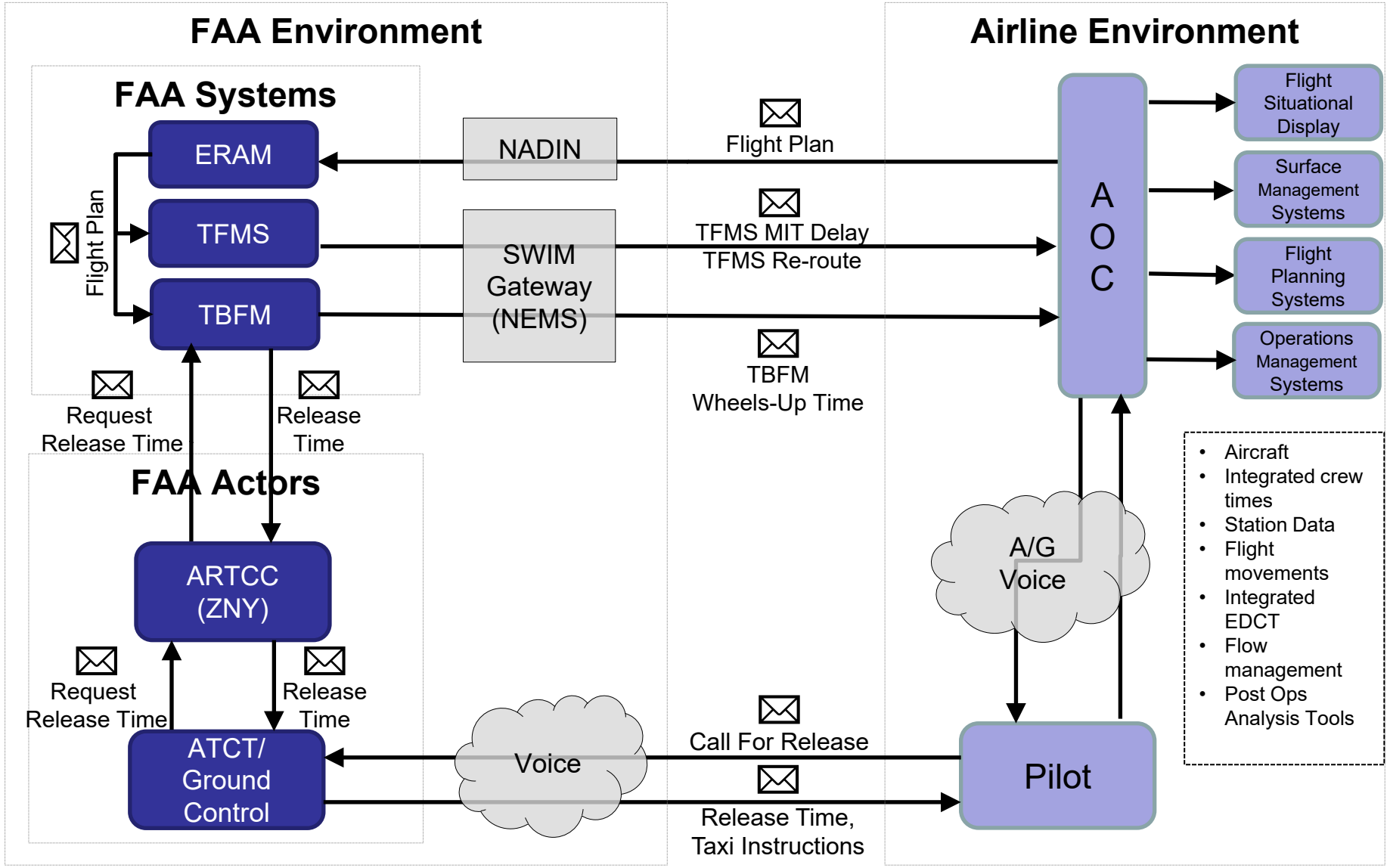


Reroute



This process is required by law. Part 121 regulations require 50/50 responsibility between licensed Dispatcher and Flight Crew.

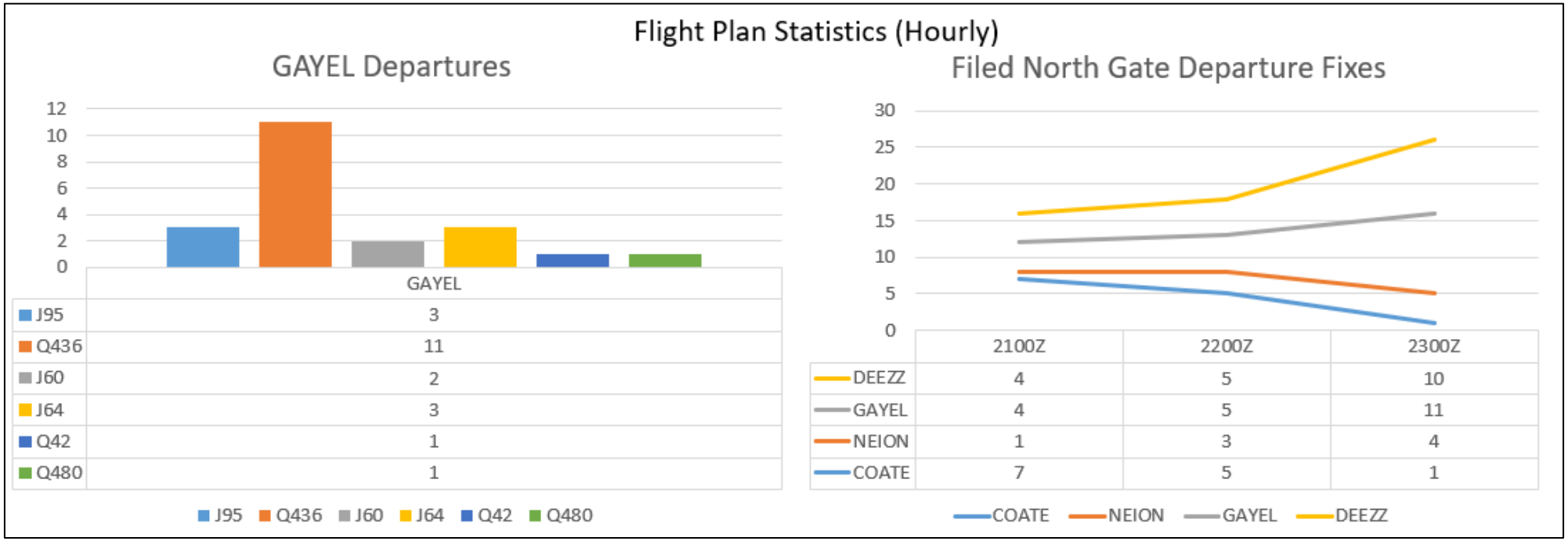
"To Be" Systems View



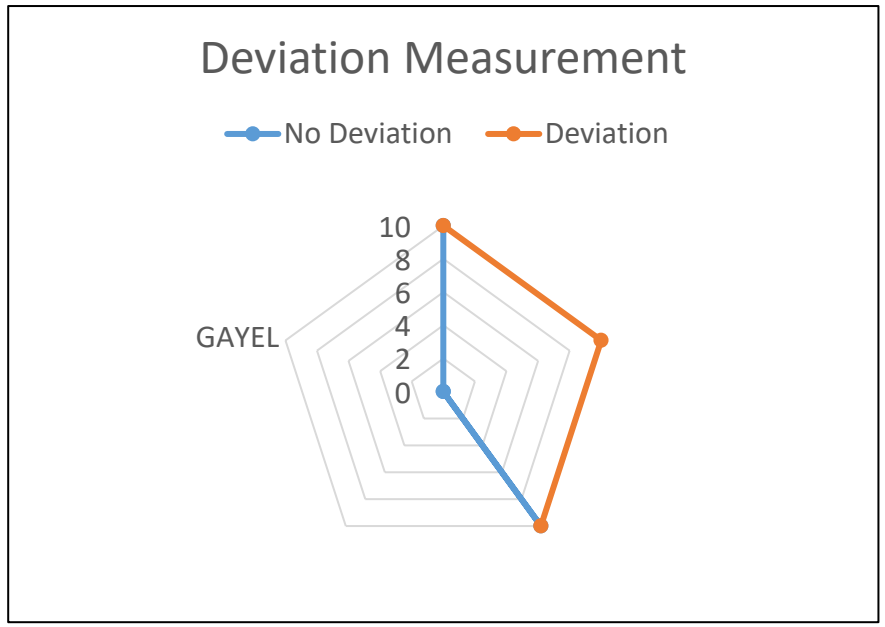
Widget Demonstration

Widget Development: Fix Deviation Count

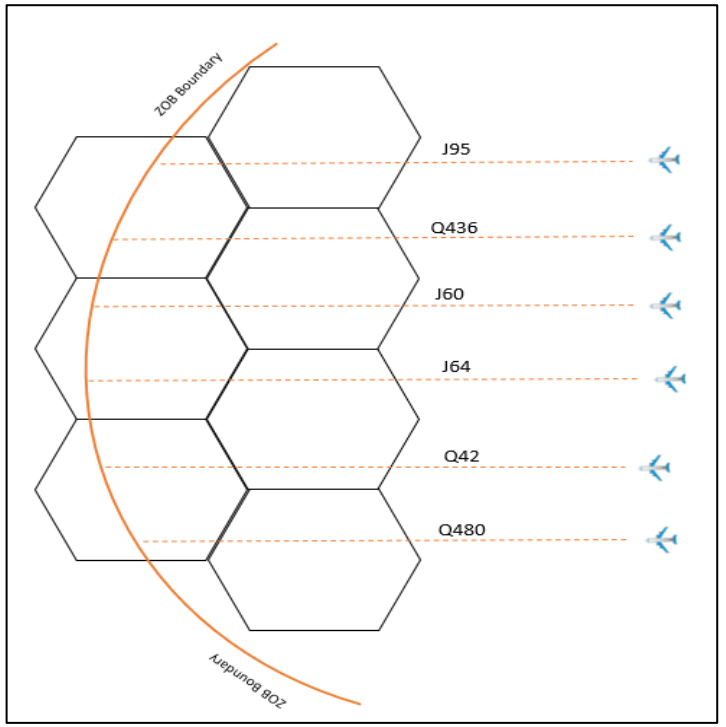
- Establish a baseline to track relevant data.
- Left graph would represent flights filed on a fix and airway in one-hour blocks from NYC Metro Airports.
- Right graph shows fix demand from NYC Metro airports per hour.



Widget Development: Deviation Measurement

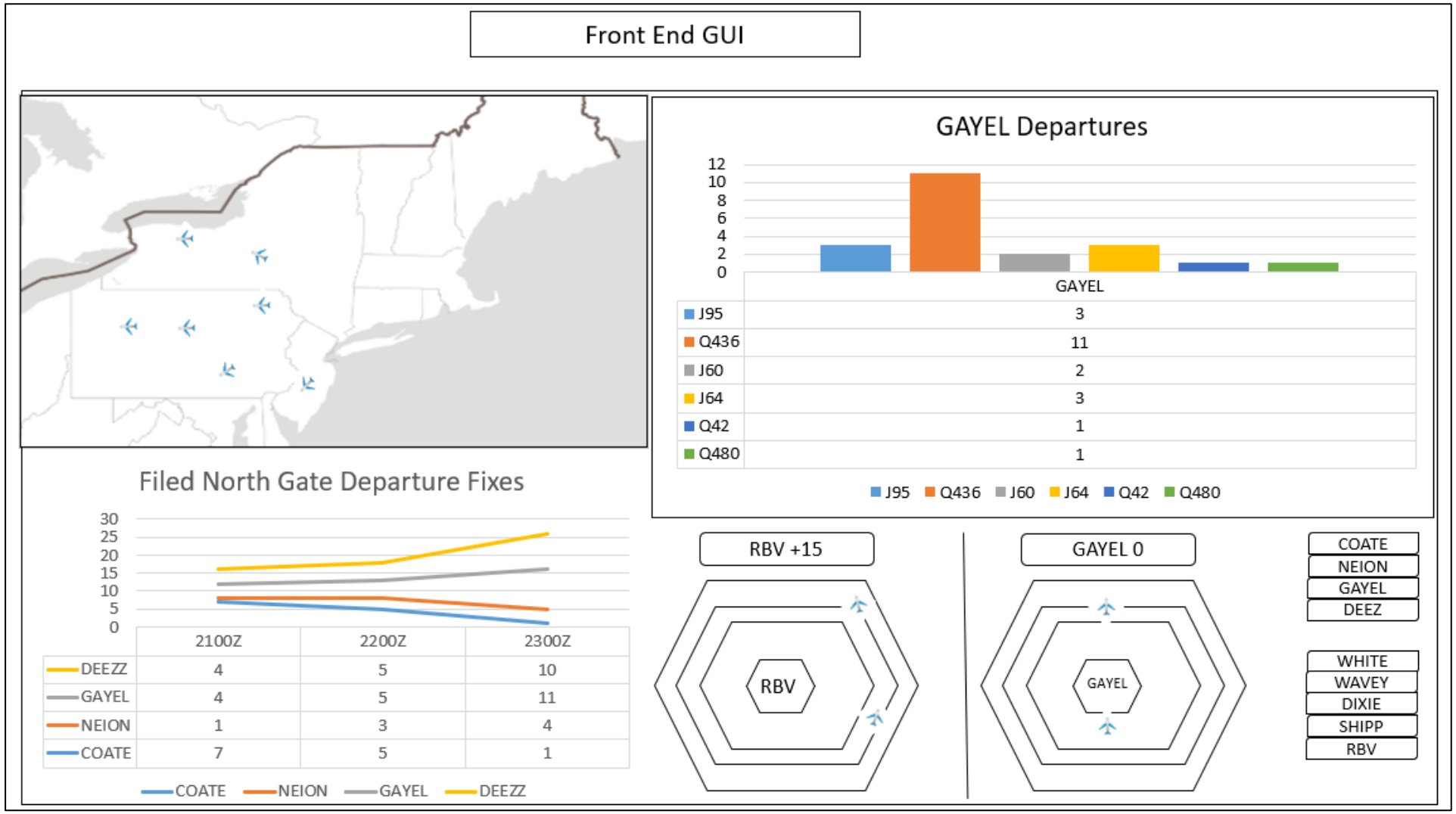


- Centered at 0 is the Departure fix GAYEL.
- Using our product we could detect a deviation from 0 by setting up a geo-fence.



- With the geospatial indexing we can accurately determine airway efficiency by tracking MIT vs Demand
- We can also monitor route closures due to weather better allowing dispatchers to plan

Widget Development: Notional Front-End Display



Widget Development: Notional Back-End Data & Analytics

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

departurefix.sql

```
1   SELECT
2       CASE WHEN Filedfix = Fixflown
3       THEN 'NoDeviation'
4       ELSE 'Deviated'
5   END
6   AS 'FixAnalysis'
7   FROM Departurefix
8
```

Departure Fix

ID	Flight ID	Departure	Filed Fix	Fix Flown	Result
1	JBU001	JFK	RBV	RBV	
2	JBU002	JFK	RBV	WHITE	Deviated
3	JBU003	JFK	COATE	GAYEL	Deviated
4	AA004	LGA	WAVEY	SHIPP	Deviated
5	AA005	LGA	WHITE	WAVEY	Deviated
6	DAL006	JFK	RBV	NEWEL	Deviated
7	DAL007	LGA	GREKI	GREKI	
8	UAL008	EWR	BETTE	HAPIE	Deviated
9	SWA009	LGA	SHIPP	SHIPP	

departurefix.sql

```
1   SELECT SUM(Result)
2   FROM Departure_fix
3   WHERE Deviated;
4
5   ROUND(CAST((Fix_flown * 100.0 / Filed_fixes) AS FLOAT), 2) AS Percentage
```

Between 1700z and 0000z 246 departures…
>> 141 flew original filed fix (57%).

Widget Development: Filed vs Flown Post-Ops

- **A key function will be filed vs flown.**
  - For post Ops analysis you can see how accurate your flight filings were.
  - The ability to measure how accurate dispatchers are helps with multiple efficiencies for airlines and FAA.
  - Operators can analyze post Ops analysis to identify flight plans filed 3, 2 or 1- hour(s) prior flew original filed fix.

Call Sign	Filed First Fix	Actual First Fix
DAL 001	RBV	RBV
DAL 002	RBV	WHITE
DAL 003	RBV	WHITE
AA 004	GAYEL	COATE
AA 005	GAYEL	NEION
JBU 006	WAVEY	WAVEY
JBU 007	WAVEY	WHITE
JBU 008	RBV	RBV
UAL 009	SHIPP	SHIPP

Widget Development: Notional Post-Ops Back-End Data

Back End Database & Analytics

Departure Fix

ID	Flight ID	Departure	Filed Fix	Fix Flown	Result	Taxi Time	IGTD	ATOT
1	JBU001	JFK	RBV	RBV		31	1730Z	1907Z
2	JBU002	JFK	RBV	WHITE	Deviated	44	1735Z	1911Z
3	JBU003	JFK	COATE	GAYEL	Deviated	26	1751Z	1904Z
4	AA004	LGA	WAVEY	SHIPP	Deviated	102	1705Z	1852Z
5	AA005	LGA	WHITE	WAVEY	Deviated	33	1715Z	1830Z
6	DAL006	JFK	RBV	NEWEL	Deviated	41	1645Z	1755Z
7	DAL007	LGA	GREKI	GREKI		27	1705Z	1901Z
8	UAL008	EWR	BETTE	HAPIE	Deviated	52	1800Z	2002Z
9	SWA009	LGA	SHIPP	SHIPP		43	1725Z	1810Z

Initial Database

Data Points

Actual total average delay by Airport

```
departurefix.sql
1  select * from departure;
2
3  select departure , (ATOT - IGTD) from departure;
```

Average Taxi Time

```
departurefix.sql
1  SELECT AVG(taxi_time)
2  FROM departurefix;
```

Daily Fix Demand

```
departurefix.sql
1  SELECT sum(filed_fix)
2  FROM departurefix;
3  WHERE RBV;
```

Questions

&

Next Steps

SWIFT Virtual Meeting

Aeronautical Common Service (ACS)

Davy Andrew
FAA AIMM S2, Project Manager

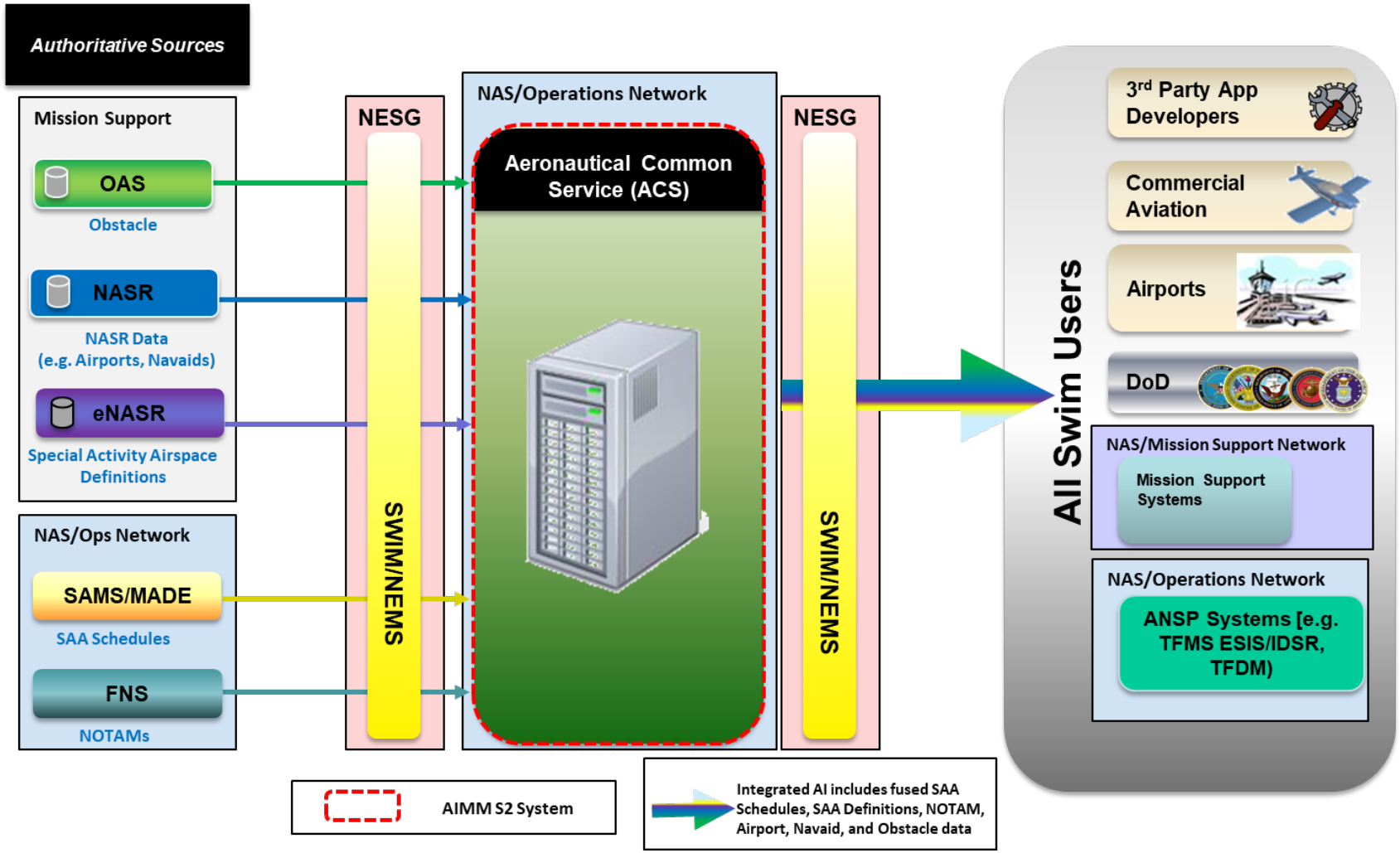
Kevin Lew
CNA, Systems Engineer

May 20, 2020

Agenda

- **ACS Overview**
- **ACS Data Sources**
- **AI Integration**
- **ACS Web Services**
- **Use Cases**
- **Roadmap**

ACS Overview



ACS Data Sources

ACS Data Sources

Static Aeronautical Information

NASR
- Airports
- NAVAIDs
- Services
- Other Supporting AI

Custom XML

eNASR
- Static SAA

AIXM 5.0

OAS
- Obstacles

AIXM 5.1

Dynamic Aeronautical Information

FNS
- NOTAMs

AIXM 5.1

SAMS
- SAA Schedules

AIXM 5.0

ACS and AIXM Timeslices

ACS transforms and provides AI in AIXM 5.1 format

- **AI features exchanged in AIXM are defined by timeslices**

Baseline Timeslice

- Defines the baseline set of values for an AI feature

Permdelta Timeslice

- Defines an update to an AI feature's static definition
  - Example: Runway is lengthened

Tempdelta Timeslice

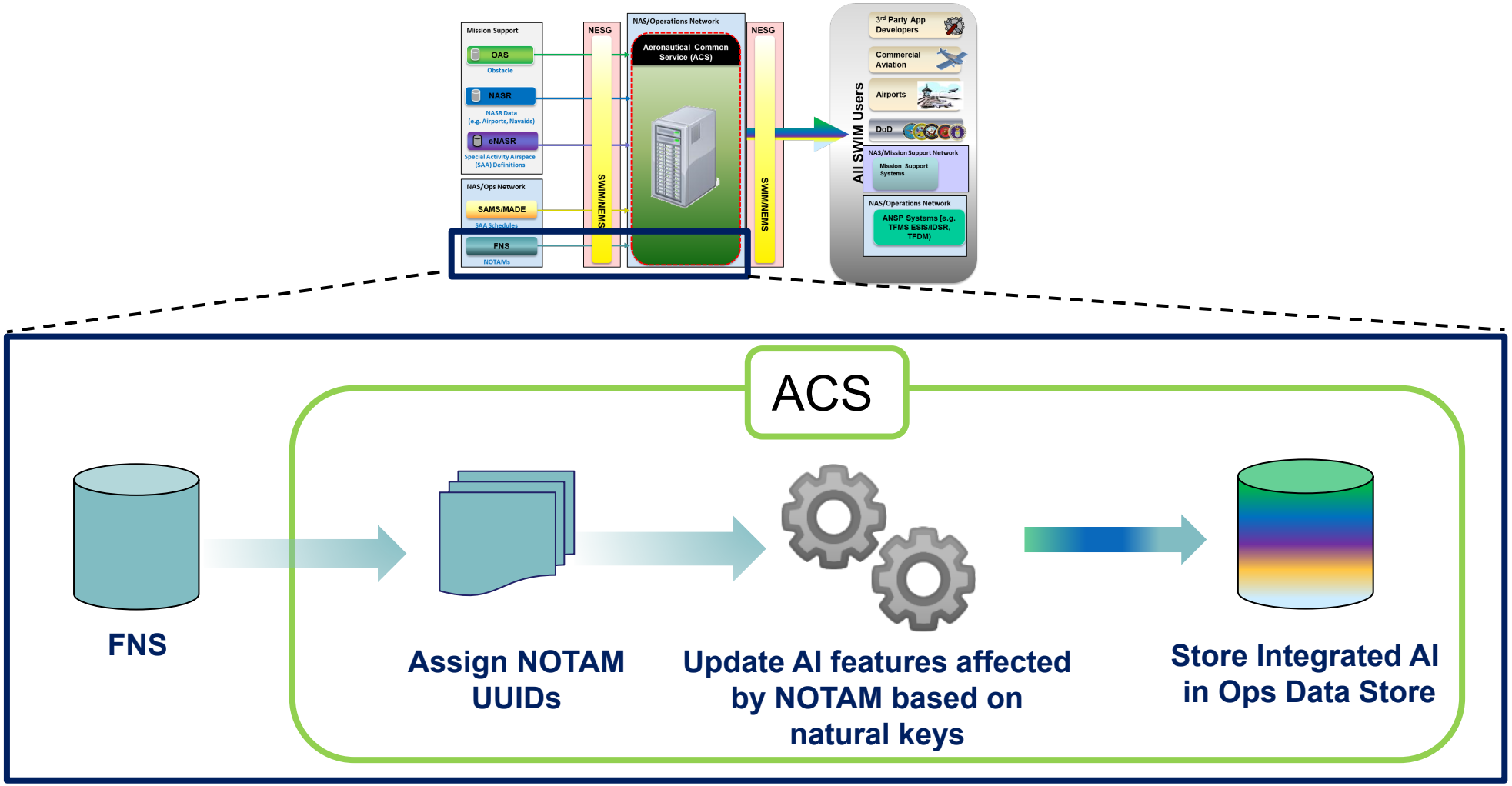
- Defines a temporary update to an AI feature
  - Example: NOTAM on runway surface conditions
- When it expires the changed values revert back to the baseline definition

NASR Chart Cycle vs ACS updates

	NASR Chart Cycle Updates	ACS Updates (for AI from NASR)
AI Updated	Full set of AI features provided in a subscriber file	Updates to individual AI features provided to subscribers
Frequency	Published with the chart cycle every 28 days	ACS receives updates as published in the National Flight Data Digest (NFDD) • Published every business day
Effective Dates	Effective date defined for the subscriber file as the chart cycle date	AIXM timeslice start dates set based on the effective dates defined in the NFDD

AI Integration

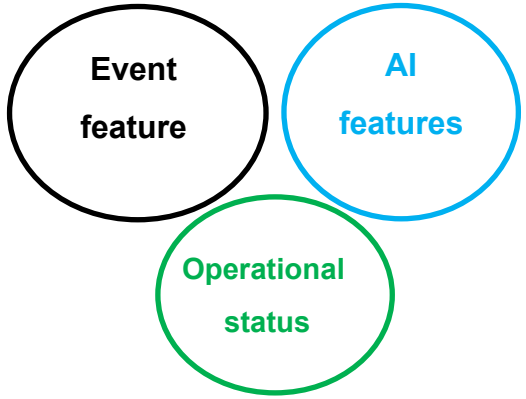
NOTAM Ingestion and Integration



ACS NOTAM Integration

LAX 03/005 LAX RWY 6L CLSD 201903041200-201903051200

Digital

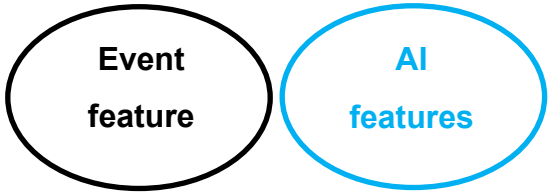


Features associated with the event

Affected feature status is updated

- **E.g., RWY 6L is closed at LAX**

Partially digital

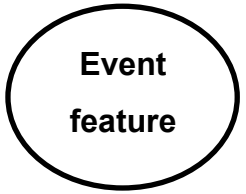


Features associated with the event

- **E.g., event relates to LAX and RWY 6L**

Status on features will not be updated

Non-digital

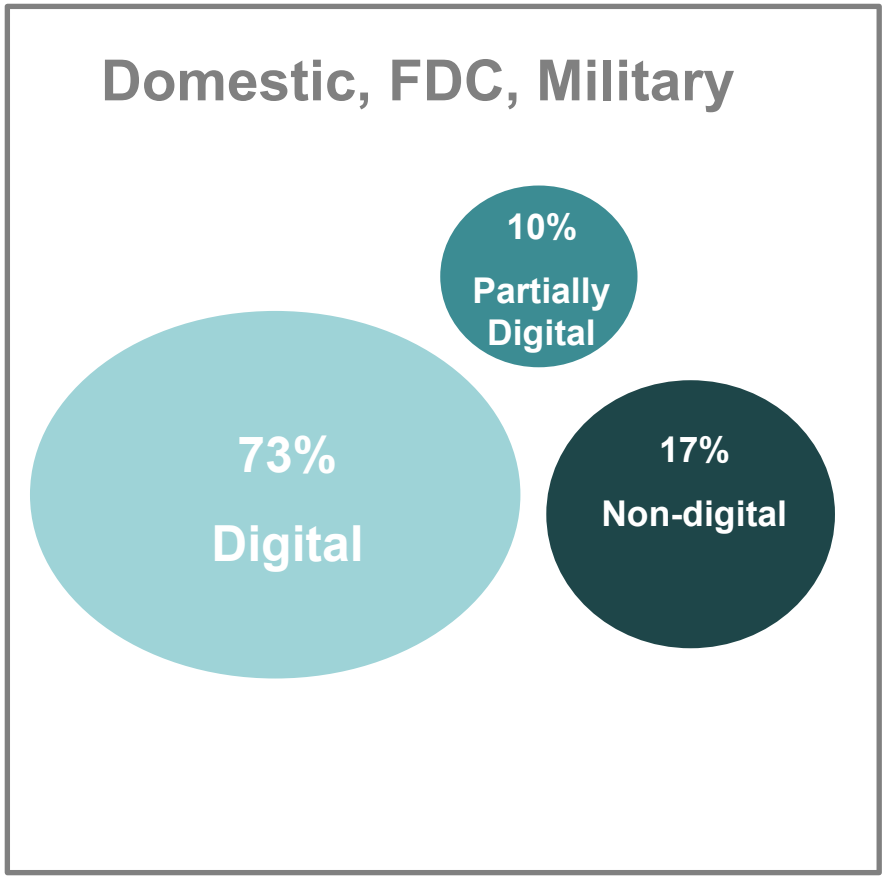


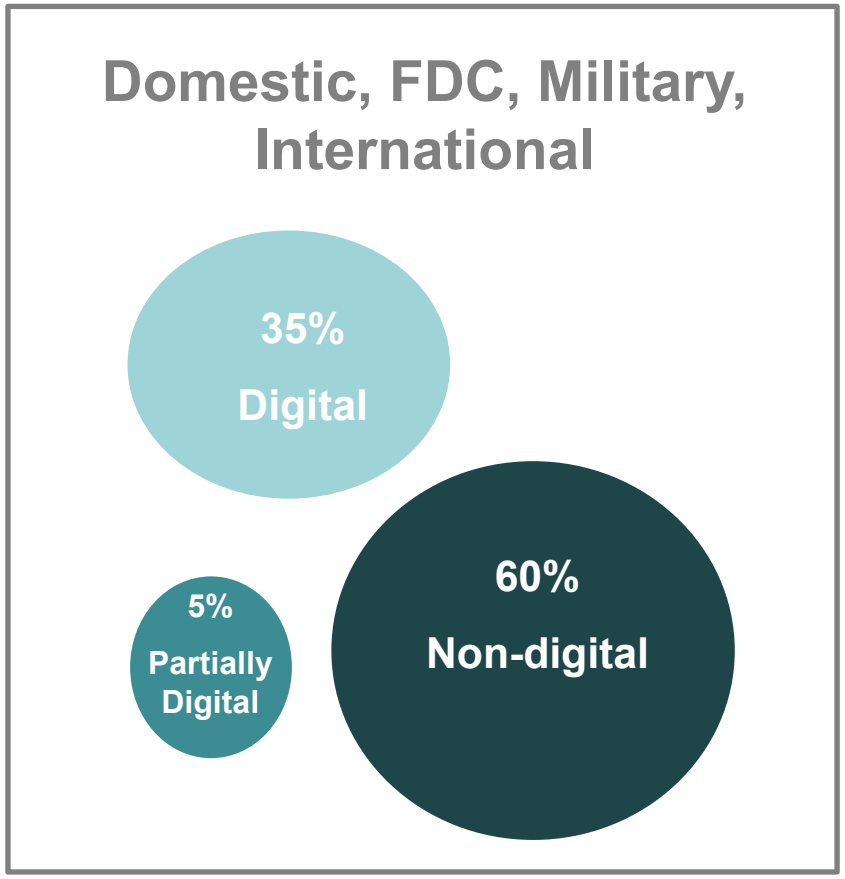
Does not receive associated features

- **Still provides the event containing NOTAM text and location**

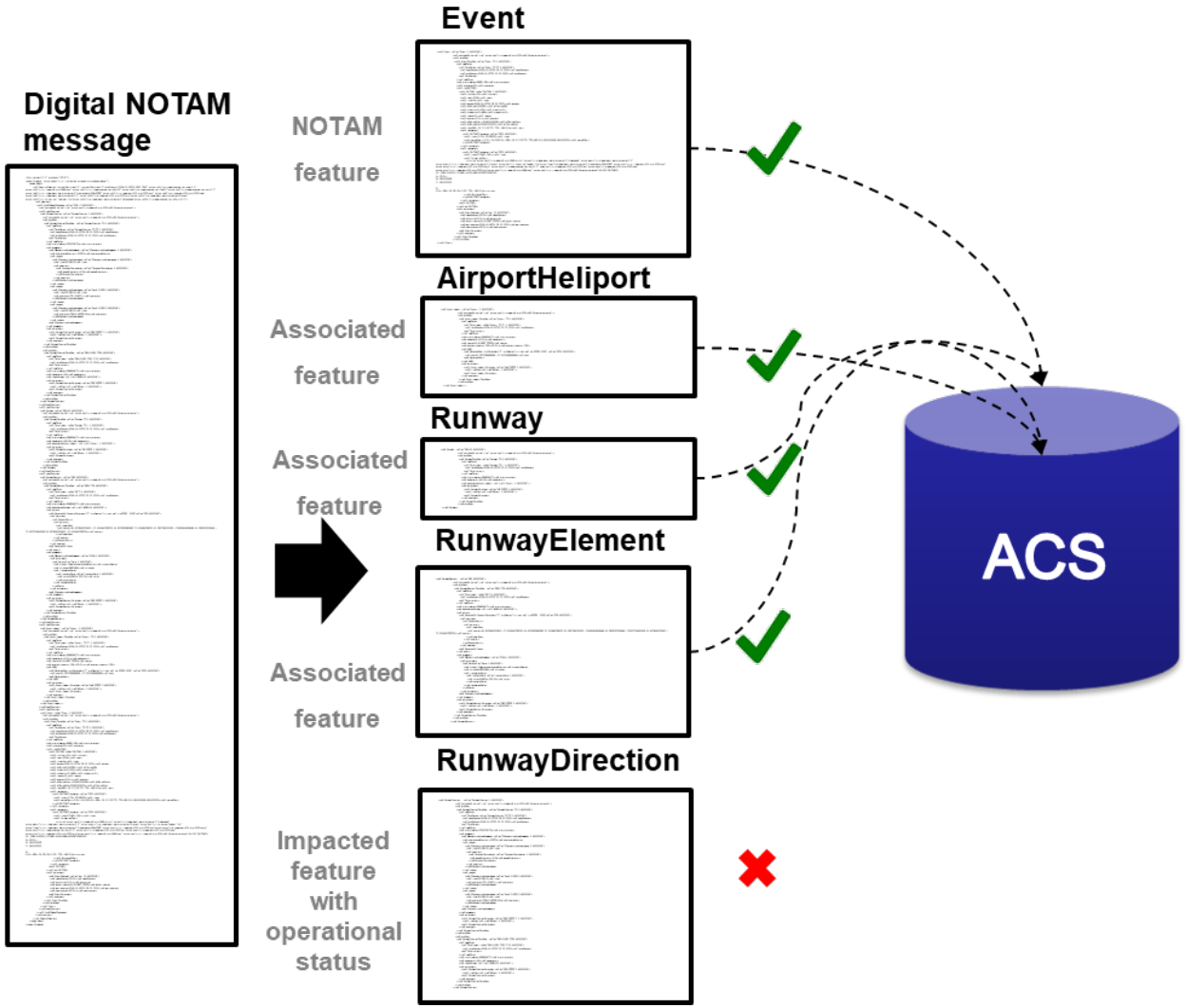
Also applies for non-integrated events

Landscape of NOTAMS in the NAS



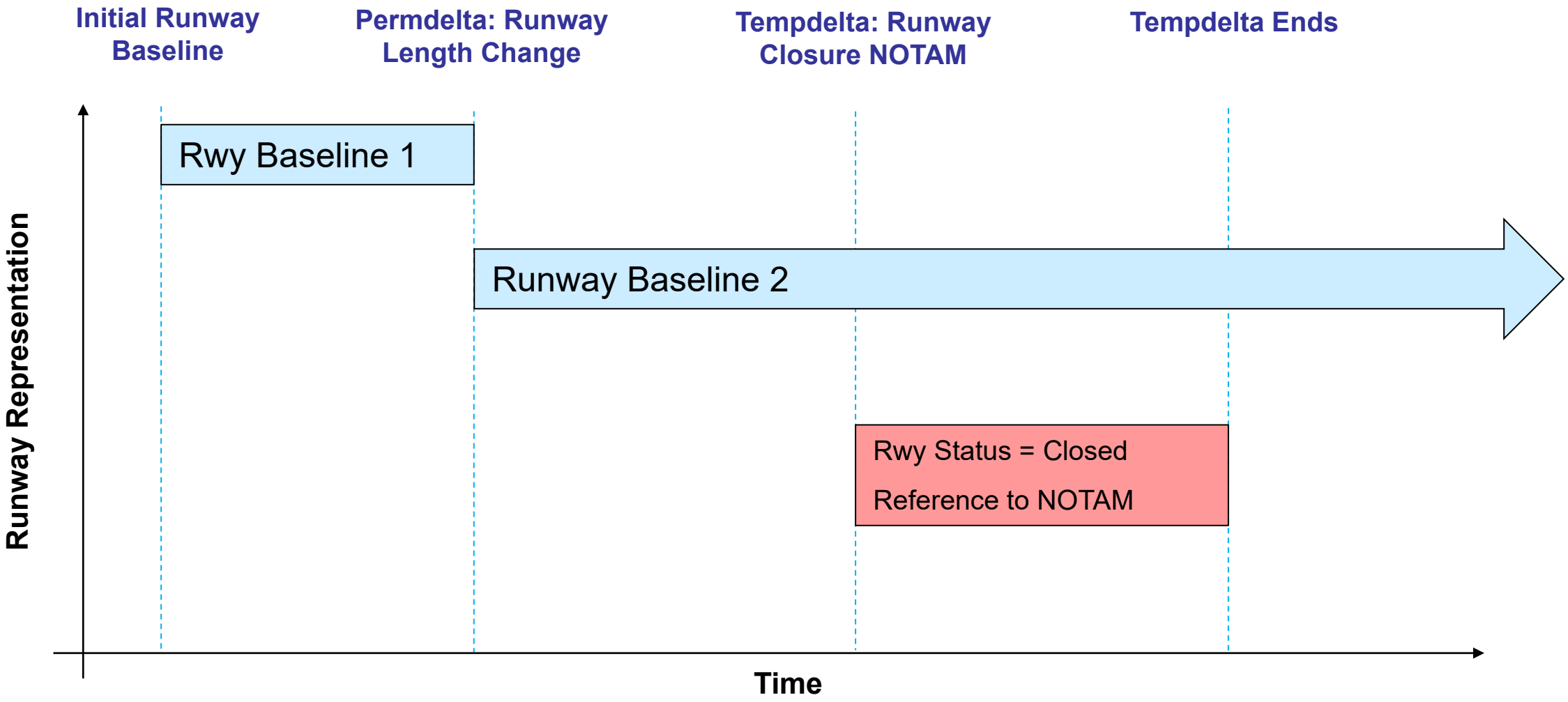


ACS ingests FNS NDS message

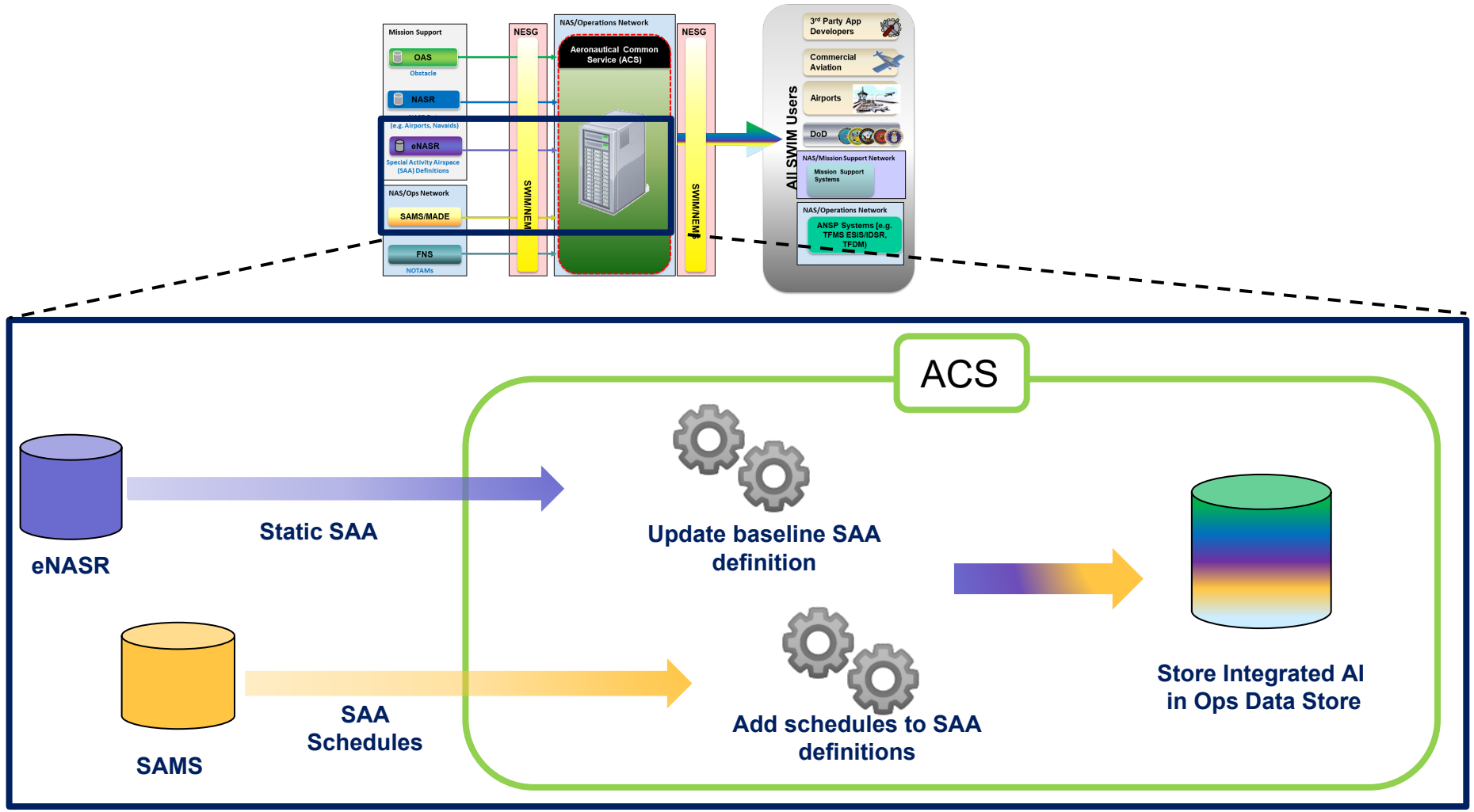


- ACS first validates the FNS message
- For each valid message, ACS first processes the event feature and then other features present in the message
- Digital NOTAM integration only occurs to available baseline data in the ACS
  - Partially and Non-digital NOTAMs do not integrate with baseline data

Timeline: Integrated Runway Closure NOTAM



SAA Ingestion and Integration



SAA Static Definitions

- **Defines**
  - SAA volume
  - Times of use
  - Controlling and using agencies
- **Source**
  - Static SAA Service
  - AIXM 5.0 representation of the SAA legal definition found in FAA JO 7400.10
- **Updated Infrequently**
  - Tied to chart cycle

Example Legal Definition

Lancer MOA, TX

Boundaries. Beginning at lat. 33°16'00"N., long. 101°53'00"W.; to lat. 33°16'00"N.; long. 100°33'00"W.; to lat. 32°58'00"N.; long. 100°20'00"W.; to lat. 32°33'00"N.; long. 100°23'00"W.; to lat. 32°35'00"N.; long. 101°57'00"W.; to the point of beginning.

Altitudes. 6,200 feet MSL up to, but not including FL 180.

Times of use. 0900-0000 local time, Monday-Friday; other times by NOTAM.

Controlling agency. FAA, Fort Worth ARTCC.

Using agency. U.S. Air Force, 7th Bomb Wing, Dyess AFB, TX.

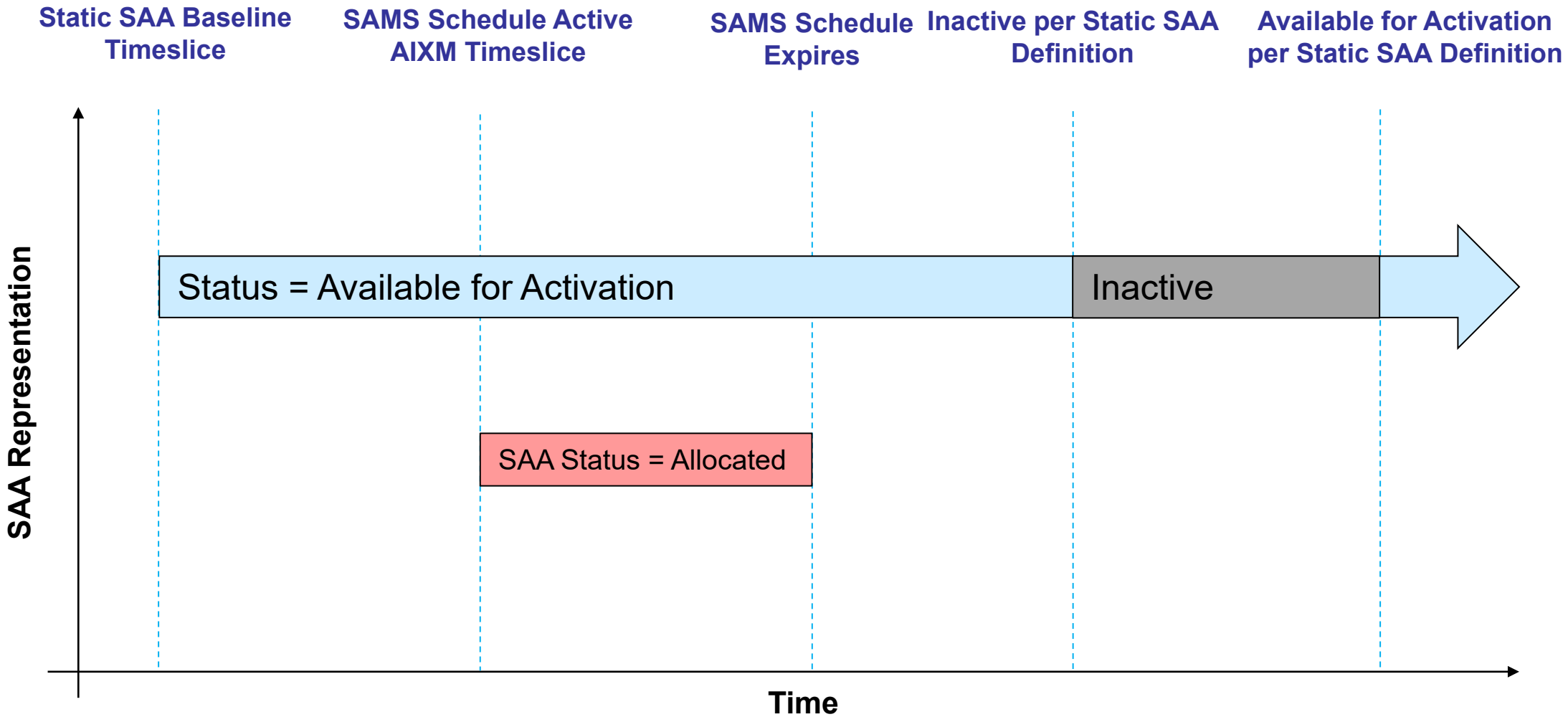
SAA Schedules

- **Defines**
  - Time period SAA is active
  - Altitudes scheduled
  - Does not capture when SAA is hot (aircraft present)
- **Source**
  - SAMS
- **Updated frequently**
  - Daily / weekly as needed

Schedules in SAMS

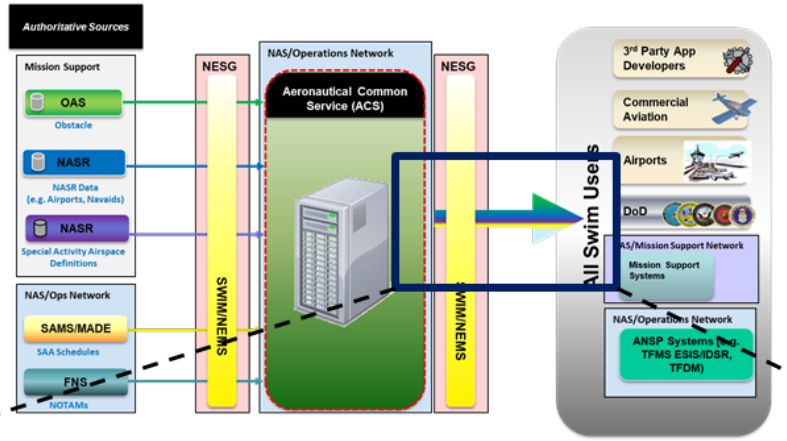
Action	Row	Airspace/Group Name*	Status	Start Date*	Start Time*	End Date*	End Time*	Airspeed	Entry Point	Exit Point	Low Alt*	Low AGL	High Alt
No Changes	1	3204B	P	02/14/2013	1130Z	02/14/2013	1500Z		-Entry-	-Exit-	001	☑	180
	1	3202 LOW	P	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	000	☑	180
	2	3202 HIGH	A	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	180	☐	290
	3	3204B	A	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	001	☑	180
	4	OWYHEE NORTH MOA	A	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	001	☐	180
	5	3204A	A	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	000	☑	001
	6	JARBIDGE NORTH MOA	A	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	001	☐	180
	7	3204C	A	02/15/2013	1000Z	02/15/2013	1600Z		-Entry-	-Exit-	180	☐	290

ACS Integrated SAA and SAA Schedules



ACS Web Services

ACS Web Services



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

ACS Web Services *(1 of 3)*

Web Feature Service

- Provides the ability for user submitted custom queries for AI features
- Implementing an Open Geospatial Consortium (OGC) standard

Data Query Service

- Provides a set of predefined queries for users
  - For example: Querying for airspaces along a flight path

Data Subscription Service

- Provides updates to AI features based on feature groups users are subscribed
- Users retrieve updates from pullpoints

ACS Web Services *(2 of 3)*

Web Map Service

- Allows users to query for map layers with AI feature imagery
- Users can submit filters to what is displayed
- Implementing an OGC standard

Web Map Tile Service

- Allows users to request map layers with AI feature imagery as tiles
- No user defined filtering for tiles
- Implementing an OGC standard

ACS Web Services *(3 of 3)*

Airspace Conflict Detection

- Identifies conflicts between existing airspaces in the ACS with a user submitted airspace
- Supports airspace design

Geodetic Computation

- Provides operations to perform a set of geodetic computations
  - For example: Calculating points based on line segment intersections

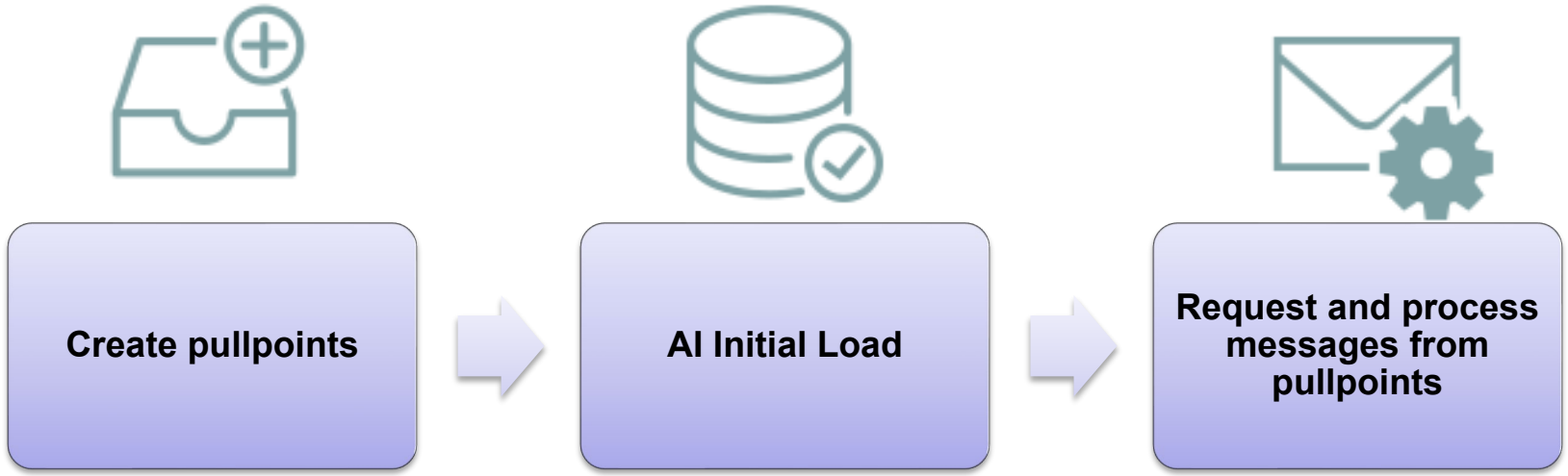
Post Operational Metrics

- Provides predefined metric reports
- Provides ability for user-defined metric reports

Use Cases

Use Case: AI Subscriber

User wants to subscribe to NOTAM and airport updates



Subscription: Create Pullpoints

- **User creates pullpoint subscriptions**
  - Response contains address of the pullpoint created
- **Feature groups of interest:**
  - IntegratedNotam
  - AirportGroup

Create pullpoint request

```
<soapenv:Body>
CreatePullPoint = IntegratedNotam
</soapenv:Body>
```

Create pullpoint response

```
<ns4:CreatePullPointResponse>
  <ns4:PullPoint>
    <ns3:Address>http://0.0.0.0:0000/*pullpoint address and identifier*</ns3:Address>
    <ns3:Metadata wsdli:wsdlLocation="http://cxf.apache.org/wsn/jaxws
bundle://208.0:1/org/apache/cxf/wsn/wsdl/wsn.wsdl" xmlns:wsdli="http://www.w3.org/ns/wsdl-
Address = http://0.0.0.0:0000/*pullpoint address and identifier*
        <wsdl:import location="bundle://0.0:0/org/apache/cxf/wsn/wsdl/wsn.wsdl"
namespace="http://cxf.apache.org/wsn/jaxws"/>
      </wsdl:definitions>
    </ns3:Metadata>
  </ns4:PullPoint>
  <ns4:any>Success</ns4:any>
</ns4:CreatePullPointResponse>
```

Subscription: Initial Data Load

ACS updates contain the changes to AI features, for full context users should have a baseline set of AI features

Identify Feature Types Desired	Download Initial Load	Process Initial Load
• Initial baseline data set for the NOTAMs and airport-related features (e.g., runway, runway directions)	• Contains the state of AI features at a given point in time in the future	• Process the features contained in the initial load files

Subscription: Pull & Process Messages

- **User requests messages from their pullpoints**
  - 200 message limit per request
    - If 200 messages are received, there may be more messages waiting on their pullpoint
  - High volume feature groups will require frequent calls to retrieve messages
- **User processes AI updates to their system**

A single NOTAM with Event and associated AI features

Request for pullpoint messages

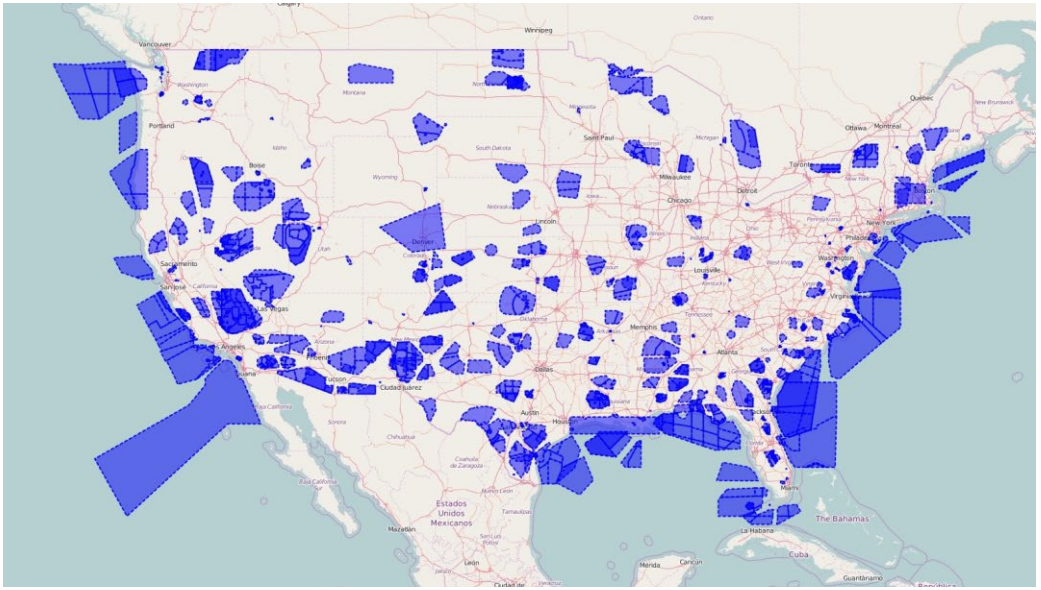
```
<urn:GetMessages>
      <b:GetMessages>
        <b:MaximumNumber>200</b:MaximumNumber>
      </b:GetMessages>
      <urn:PullPointReference>
        <add:Address>http://0.0.0.0:0000/*pullpoint address and identifier*</add:Address>
      </urn:PullPointReference>
    </urn:GetMessages>
```

Use Case: Querying SAA Status

Pre-Planning: User wants to see what SAAs along flight path are scheduled for the day

Using the ACS WFS getFeature operation, users can query for SAA based on UUID or airspace designator

- Create WFS GetFeature request
- Submit WFS GetFeature request
- Receive SAA definitions from the ACS WFS
- Process timeslices returned to identify when the SAAs are active



Querying SAA: UUID vs Designator

Querying on UUID

```
<ns2:GetFeature outputFormat="application/gml+xml; version=3.2" resolve="none"
resolveTimeout="300" resolveDepth="*" resultType="results" service="WFS" version="2.0.0"
xsi:schemaLocation="http://www.opengis.net/wfs/2.0 http://schemas.opengis.net/wfs/2.0/wfs.xsd"
xmlns:aixm="http://www.aixm.aero/schema/5.1" xmlns:fes="http://www.opengis.net/fes/2.0"
```

typeNames="aixm:Airspace"

gml:identifier = 62154725-2770-49A2-9D50-6164CCA0289C

Or

gml:identifier = 4C9CBE0B-43E1-82D3-3B9C-48BAC9494682

```
            </ns1:Or>
        </ns1:Filter>
    </ns2:Query>
</ns2:GetFeature>
```

Querying on Designator

```
<ns2:GetFeature outputFormat="application/gml+xml; version=3.2" resolve="none" resolveTimeout="300" resolveDepth="*"
resultType="results" service="WFS" version="2.0.0" xsi:schemaLocation="http://www.opengis.net/wfs/2.0
http://schemas.opengis.net/wfs/2.0/wfs.xsd" xmlns:aixm="http://www.aixm.aero/schema/5.1"
```

typeNames="aixm:Airspace"

aixm:timeSlice/aixm:AirspaceTimeSlice/aixm:type = OTHER:MOA
And
aixm:timeSlice/aixm:AirspaceTimeSlice/aixm:designator = MLINCOLN

Or

aixm:timeSlice/aixm:AirspaceTimeSlice/aixm:type = R
And
aixm:timeSlice/aixm:AirspaceTimeSlice/aixm:designator = R4001C

```
                </ns1:PropertyIsEqualTo>
            </ns1:And>
        </ns1:Or>
    </ns1:Filter>
</ns2:Query>
</ns2:GetFeature>
```

Querying SAA: Returned SAA Timeslices

SAA Baseline (Static SAA)

Airspace

gml:identifier = 62154725-2770-49A2-9D50-6164CCA0289C

<gml:endPosition indeterminatePosition="unknown"/>
</gml:TimePeriod>

AirspaceTimeSlice

beginPosition = 2013-01-10T09:01:00
endPosition indeterminatePosition=“unknown”

interpretation = BASELINE

type = OTHER:MOA
designator = MLINCOLN

<aixm:timeReference>UTC-5</aixm:timeReference>
<aixm:startDate>01-01</aixm:startDate>

AirspaceActivation

day = ANY
startTime = 00:00
endTime = 23:59
status = AVBL_FOR_ACTIVATION

SAA Tempdelta (SAMS)

Airspace

gml:identifier = 62154725-2770-49A2-9D50-6164CCA0289C

<aixm:interpretation>TEMPDELTA</aixm:interpretation>
+ <aixm:timeSliceMetadata>
<aixm:activation>

AirspaceTimeSlice

beginPosition = 2020-01-30T16:00:00
endPosition = 2020-01-30T18:00:00
interpretation = TEMPDELTA

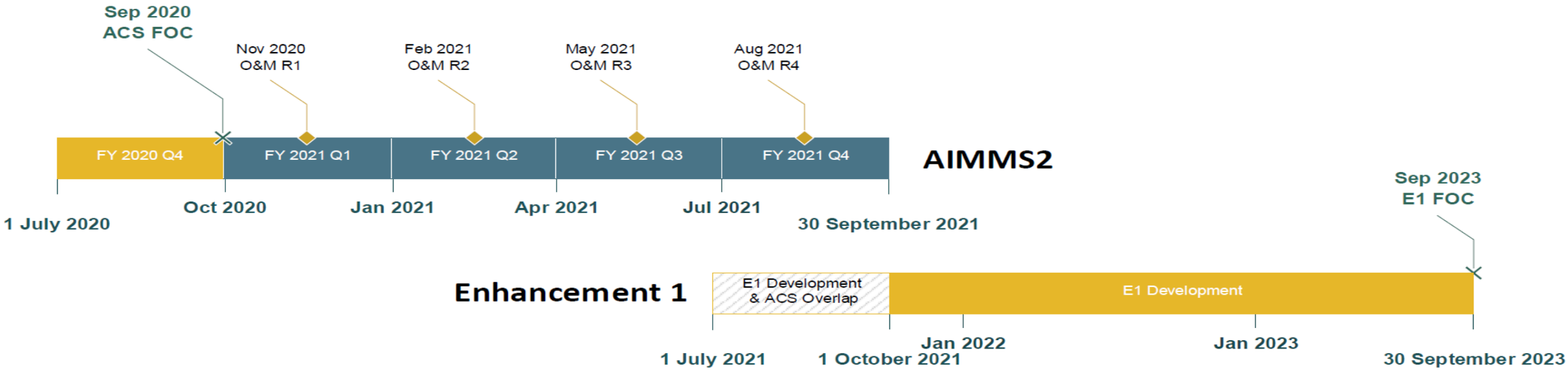
</aixm:timeInterval>
<aixm:activity>MILOPS</aixm:activity>
<aixm:status>OTHER:ALLOCATED</aixm:status>

AirspaceActivation

status = OTHER:ALLOCATED
upperLimit = 180 FL
lowerLimit = 80 FL

ACS Roadmap

AIMM S2 & Enhancement 1 Roadmap



AIMM S2 O&M

- **Performance Optimization**
- **User feedback**

Enhancement 1

- **ACS Enhancements**
  - **JMS Subscription capability**
  - **Expanded AI scope**
- **Enterprise Airspace Tool (EAST)**
- **NOTAM System Migration**

Questions

For technical and programmatic questions

Email: ACSConsumer@faa.gov

SWIFT

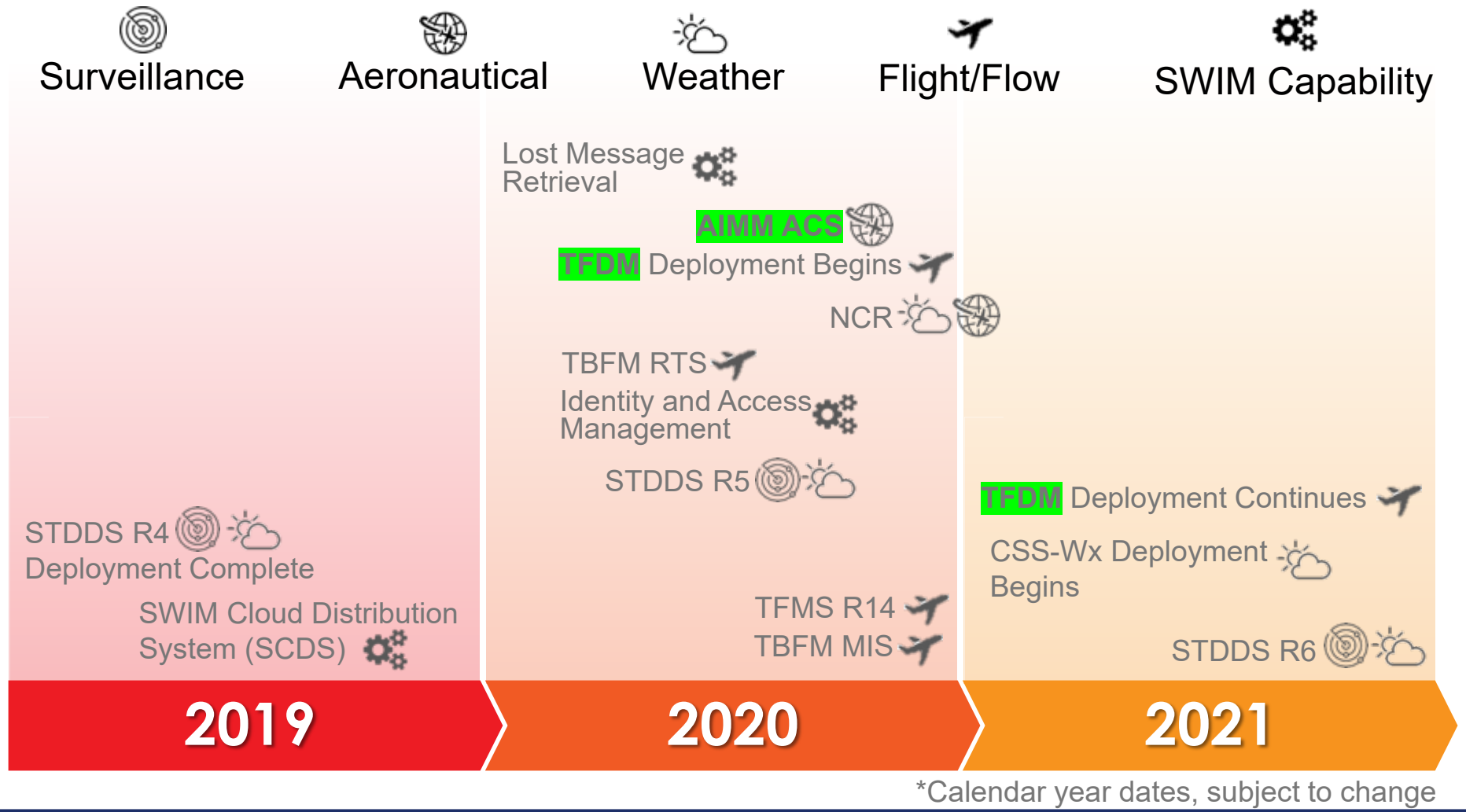
Information Services Roadmap

SWIFT 10

David Almeida, LS Technologies

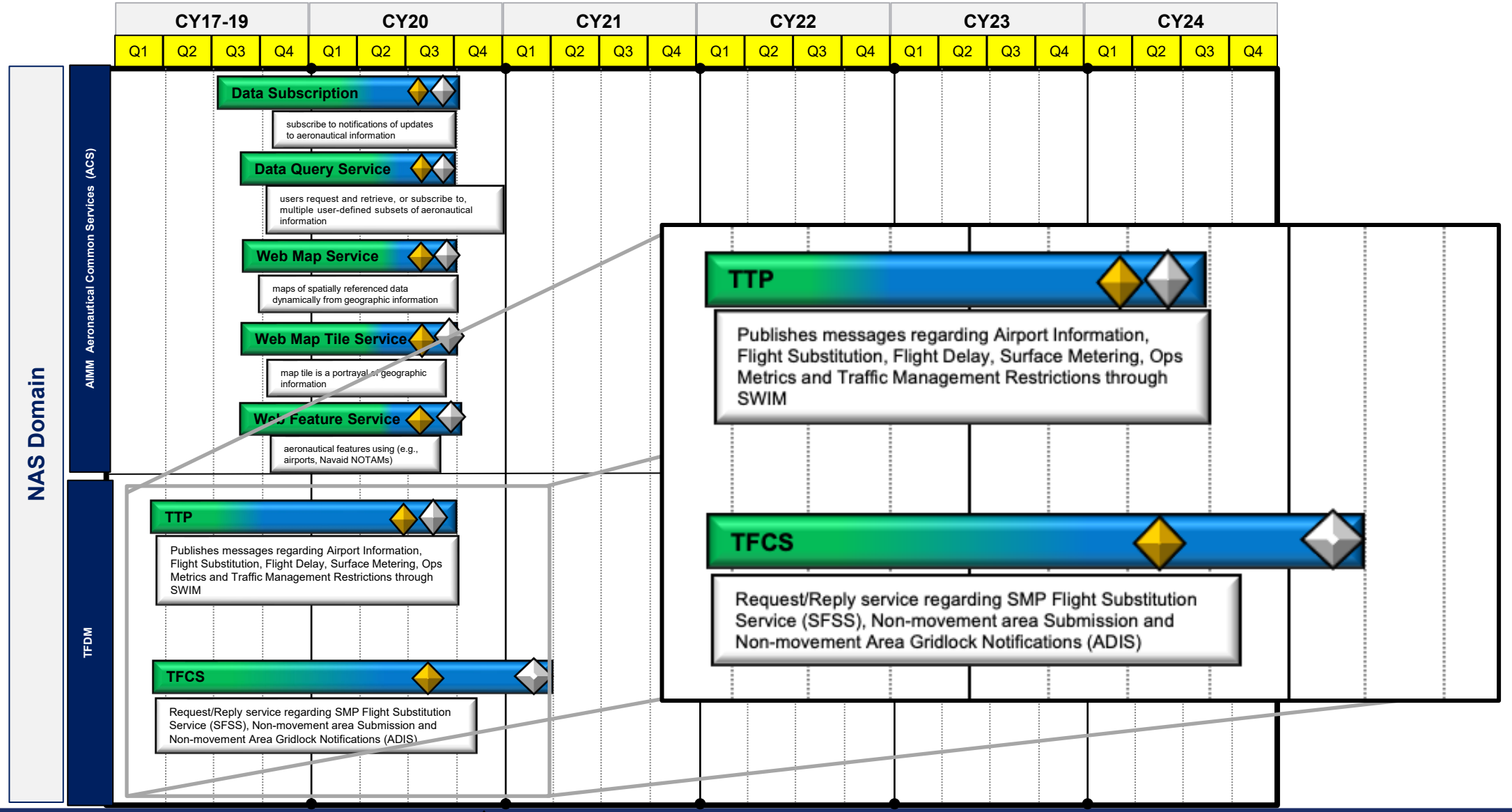
May 20, 2020

SWIM Planned Deployment Roadmap



*Calendar year dates, subject to change

Information Service Road Map – ACS & TFDM



Legend:

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

Information Service Road Map – TFDM

System Wide Information Management (SWIM)

TFDM

Use Case Document

Version .1

May 19, 2020

Appendix A –TFDM Metering Program Parameters

Data Field Name / Configuration Parameter	Description	Importance to Stakeholders
Average Metering Hold Threshold parameter	Configurable percentage of change in metering hold time associated with a rejected SMP required to	ATCT TM sets this parameter so future
Airport Metering Model parameter		
Compression Automatic Affirmation parameter (See Section 7.4 for more on Compression)		
Compression Minimum TMAT Adjustment Time parameter (See Section 7.4 for more on Compression)		
Controlled Time of Departure (CTD) Buffer		
Departure Target Queue Length		

Appendix B –TFDM TTP Flight Data Elements Examples

Data Element	Description	Importance to Stakeholders
Target Off Block Time (TOBT)	The departure stand time agreed upon between the flight operator and other interested parties (such as between the flight operator and air/ground services providers, airport authority) that is generated by TFDM due to a SMP. It is equal to the TMAT minus the Ramp Transit Time (RTT).	Indicates to the PIC when the surface scheduler recommends the aircraft should push back from the departure
TMAT	The movement area entry time agreed upon between the flight operator and Air Traffic Control (ATC) as a result of a SMP.	
Target Take Off Time (TTOT)	The runway departure time agreed upon between the flight operator and other interested parties, or directly derived from such a time. This is generated by TFMD due to a SMP.	
Total Estimated Taxi-Out Time (EXOT)	The total estimated taxi out time from the stand to take-off.	
Predicted Departure Queue Waiting Time	The predicted length of time for the flight in a departure queue.	

For a complete listing of all the data elements contained in t refer to the TTP Operational Metrics JMSDD [6].

Appendix C –TFDM Flight Delay

Data Element	Description
Aircraft Departure Delay Start Time	The delay start time.
Aircraft Departure Delay End Time	The delay end time.
Impacting	The reason for the delay.

Appendix G –TFDM TTP Operational Metrics Data Elements Examples

Data Element	Description	Importance to Stakeholders
Airport Arrival Demand KPI	The arrival demand count for the specified time interval.	KPI for all stakeholders to monitor to maintain awareness of the airport arrival demand and make informed planning decisions.
Airport Departure Demand KPI	The departure demand count for the specified time interval.	KPI for all stakeholders to monitor to maintain awareness of the airport departure demand and make informed planning decisions.
Metering Time Compliance KPI	The percentage of departures where the absolute value of the flight's start of taxi for departure time minus its TMAT is less than or equal to the metering time compliance window parameter.	KPI for all stakeholders to monitor to maintain awareness of metering time compliance. When metering time compliance is below the optimal level, stakeholders should work together to improve it.
Calculated Fuel Burn KPI	The amount of fuel burn provided in gallons calculated for the time interval requested.	KPI for flight operators, GA, and FBOs to monitor to be aware of aircraft fuel burn.
Queue Length Accuracy KPI	Comparison of the actual departure queue length to the target queue length.	KPI ATCT TM will monitor to determine if the queue length parameters are being adhered to.

For a complete listing of all the data elements contained in the TTP Operational Metrics service, please refer to the TTP Operational Metrics JMSDD [6].

TFDM Introduction

SWIFT 10

Doug Swol, FAA

May 20, 2020

TFDM Background

- **Terminal Flight Data Manager (TFDM) is a tower-based FAA Next Generation (NextGen) Air Transportation System program. TFDM serves as an airport surface management solution by:**
  - Improving surface management and efficiency
  - Supporting new services that provide automation to current, manually-intensive operations
  - Replacing critical, outdated systems in the NAS
- **TFDM functionality and capabilities enable:**
  - Streamlining the flow of departures on the surface
  - Enabling stakeholders to more efficiently stage arrivals and departures and manage surface traffic flow
  - Providing shared awareness of flights on the ground
  - Facilitating the exchange of data electronically
  - Providing more accurate predictive modeling tools for improved flight efficiency
- **SWIM will provide TFDM data through the TTP and TFCS services to industry and aviation community to achieve the following benefits.**
  - Receives real-time surface data along with demand and constraints
  - Optimized Ops by improving the collaboration and decision-making capabilities between the gate and the tower. Results in most efficient use of non-movement and ATC airport surfaces
  - Accurate data so demand predictions can be more accurate
  - Early data allows for better Ops planning and predictability
  - Combines several data sources so the data is higher quality and system digestible for fast retrieval and analysis

TFDM NAS Systems Integration

- **Flight Data Input / Output (FDIO)**
  - ERAM flight and other data
- **ASDE-X or Airport Surface Surveillance Capability (ASSC)**
  - Surface surveillance data
- **Standard Terminal Automation Replacement System (STARS)**
  - Arrival data including scratchpad data
- **Tower Data Link System (TDLS)**
  - Pre-departure clearance (PDC)/Departure Clearance (DCL) clearance data
- **TFMS/TBFM**
  - TFM data via SWIM
- **Flight Operations Systems**
  - Integration of CDM and airport data with flight operator systems via SWIM
- **FAA Telecommunications Infrastructure (FTI)**
  - Ensures secure communications and connectivity
- **Remote Monitoring and Logging System (RMLS) via SWIM**
  - Concerns maintenance and operational availability/reliability of service for NAS systems

TDFM Terminal Publication (TTP) Overview

- **Service Description**
  - A SWIM Pub/Sub service that gives a consumer the capability to subscribe to TFDM Airport Information.
- **Service Consumers**
  - FAA Consumers
  - Non-FAA Consumers (military or other agency)
  - Collaborative Decision Making (CDM) Participants
- **Service Interface**
  - Publishes airport information to SWIM for authorized consumers utilizing JMS 1.1 to send JMS messages
  - Makes use of a Pub/Sub Message Exchange Pattern (MEP)
  - All subscription requests are statically defined at design time by consumers when they on-ramp to NEMS
  - Consumers create static subscriptions with user specified filtering criteria
- **Service Business Functions**
  - The TTP service allows authorized subscribers to receive the following types of information about surface events
    - Airport Information
    - Flight Data
    - Flight Delays
    - Operational Metrics
    - Surface Metering Program
    - Traffic Management Restrictions

TFDM Flight-operator system Collaboration Service (TFCS) Overview

- **Service Description**
  - A SWIM service which allows for data exchange between TFDM, NAS Systems, and NAS users using a Request-Reply message exchange pattern.
- **Service Consumers**
  - Non-FAA Consumers (military or other agencies)
  - Collaborative Decision Making (CDM) Participants
  - Non-CDM Participants (commercial air carrier personnel or private NAS users that have not agreed to the terms of the CDM MOA)
- **Service Interface**
  - Follows a request/reply messaging model and makes use of a Request-Reply Message Exchange Pattern (MEP).
  - The interface to each service operation is defined by the messages exchanged in the MEP.
  - Service users exchange messages with TFCS via NEMS.
- **Service Business Functions**
  - The TFCS service allows authorized subscribers to submit/receive the following types of information
    - SMP Flight Substitution Service (SFSS)
    - Airport Data Information Service (ADIS) - *non-movement area closure data*
    - Airport Data Information Service (ADIS) - *non-movement area gridlock notifications*

What's Next?

- **Service Documentation**
  - Available
    - TTP Pub/Sub Service JMSDD
    - TTP NAS Business Service Description Documents
    - TFCS Request/Reply JMSDD
  - In Development
    - TTP and TFC Use Cases
    - TTP and TFCS Ops Context Documents

- **TTP Service Availability**
  - TFDM IOC at PHX expected Fall 2020

- **TFCS Service Availability**
  - TFDM Build 2 deployment targeted late 2021 or early 2022
  - TDFM B2 IOC at CLT

SWIFT:

SWIM Industry

Collaboration

Workshop #10

CLOSE OUT

Final Announcements

SWIFT Workshop #11

- **Date**
  - **August 2020**
- **Location**
  - **TBD**

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

Joshua Gustin, SWIFT Sponsor & Manager

- Communications, Information & Network Programs
- Email: Joshua.Gustin@faa.gov

Felisa White, SWIFT Chair & FAA Lead

- Email: Felisa.White@faa.gov
- Email: SWIFT@faa.gov

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

Back-up Information