



FAA
Air Traffic Organization



SWIM and Data Exchange

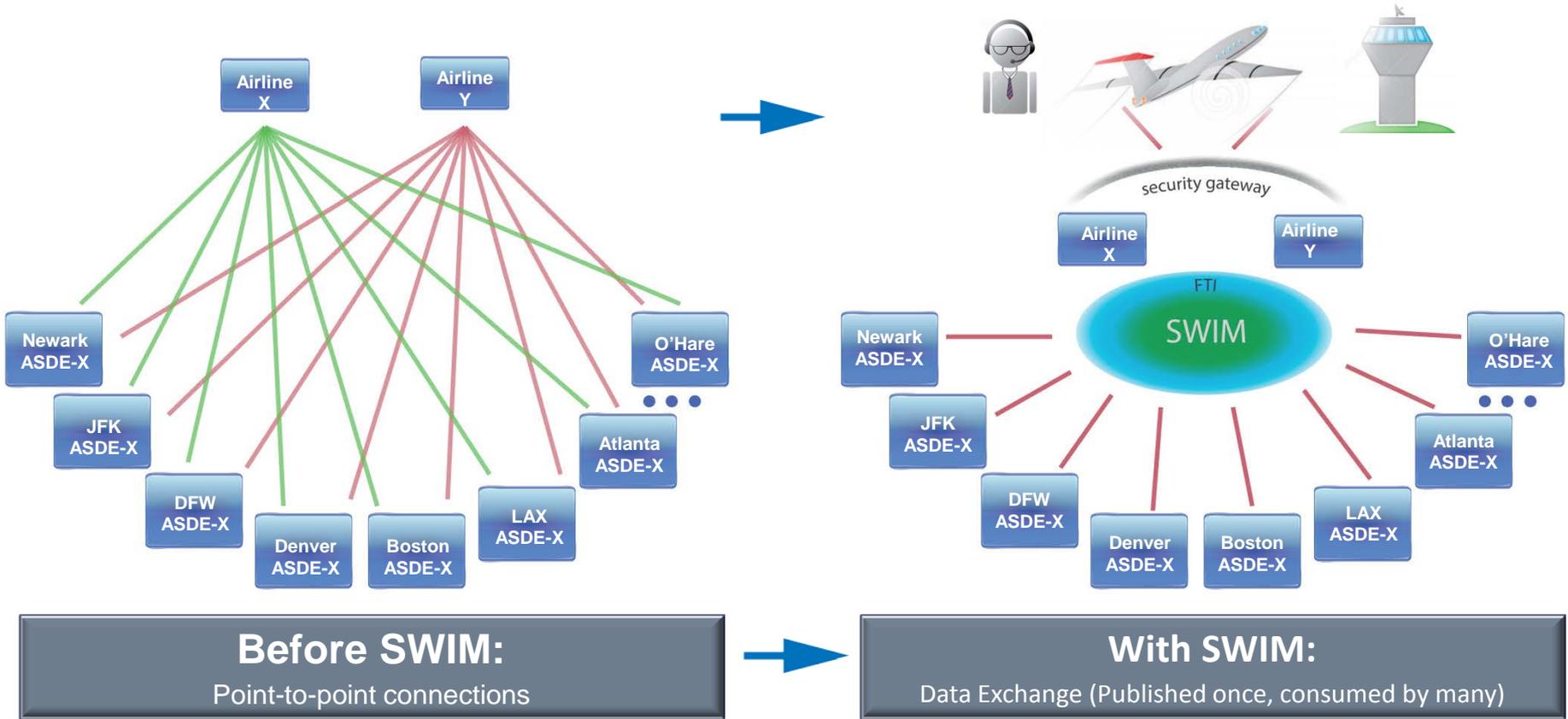
Prepared by: M. Tanino, ATO International NextGen Lead
For: Coordination Meeting between MET/AIM/ATM
Date: July 26-28, 2016

Major FAA Systems Supporting ATFM

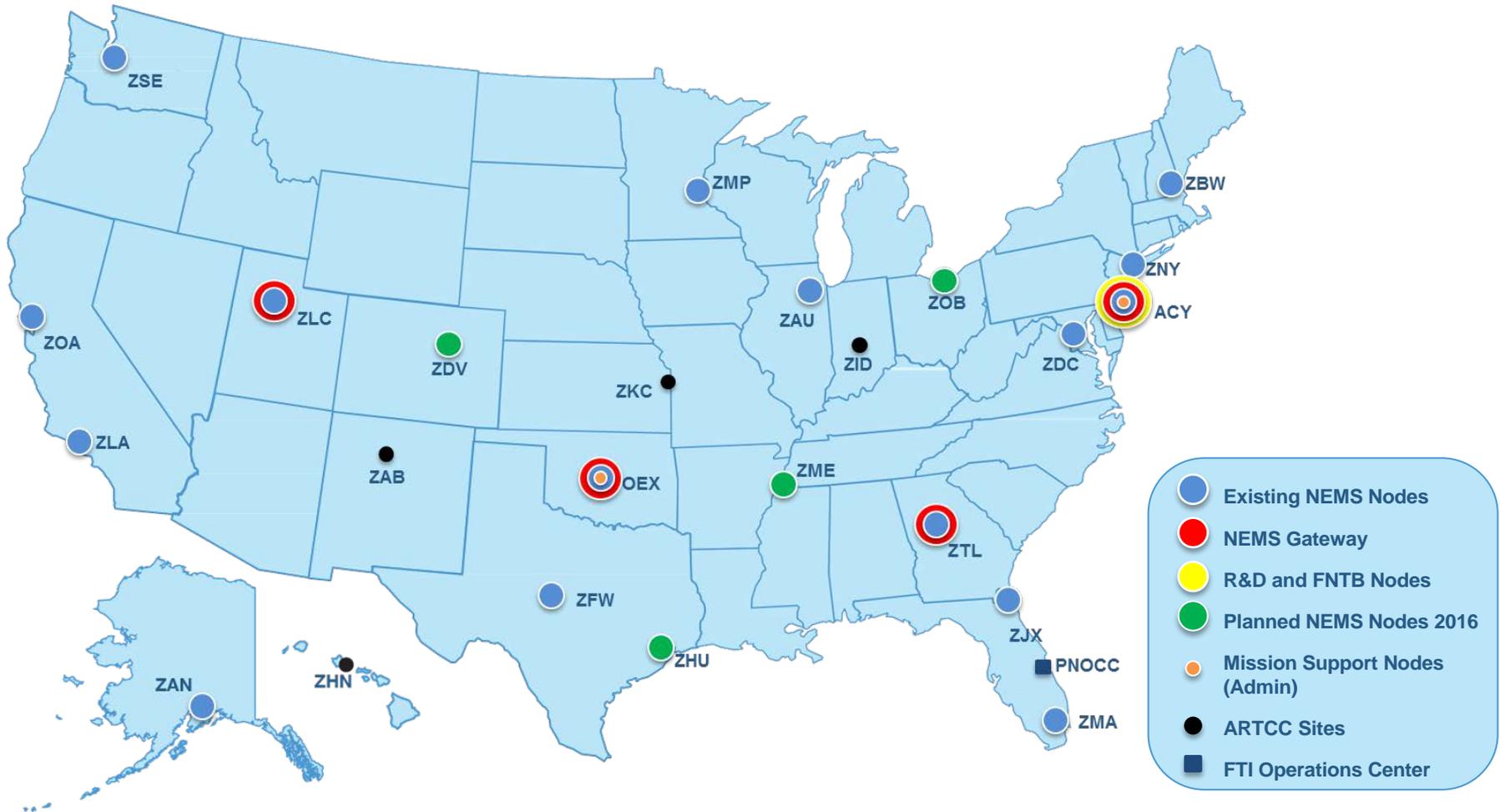
- System Wide Information Management (**SWIM**) – infrastructure that allows stakeholders to access real-time, aeronautical, flight, and weather information.
- Traffic Flow Management System (**TFMS**) – **data exchange system** that processes available data sources to support the management of air traffic flow.



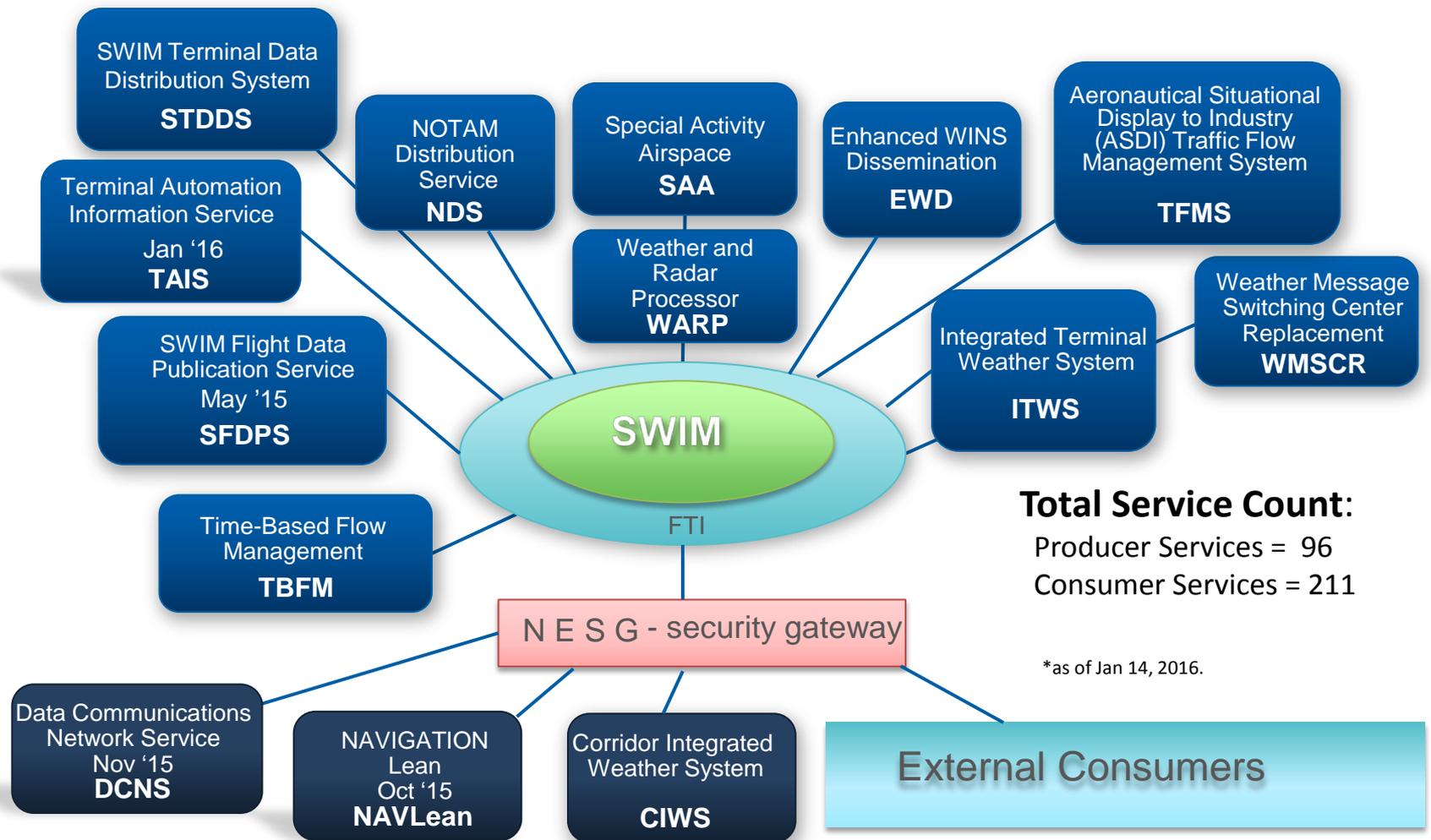
SWIM: Information Access to Transform the Aviation Community



SWIM Infrastructure Deployment NAS Enterprise Messaging Service (NEMS)



Status of SWIM Services



Current SWIM Product Portfolio (1 of 2)

Flight and Flow Data

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

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

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

Surface Movement Event Service

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

Airport Data Service

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

Terminal Automation Info. Service

Flight Plan (FP)

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

Track

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

Tower Departure Event Service

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

Time Based Flow Management (TBFM): Provides metering information

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

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

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

Airspace Data Publication Service: Published by SFDPS

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

Operational Data Publication Service: Published by SFDPS

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

General Information Message Publication Service: Published by SFDPS

- ✓ General Information



Current SWIM Product Portfolio (2 of 2)

Weather Data

Integrated Terminal Weather System (ITWS) Data Publication:

Provides specialized weather products in the terminal area

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

Corridor Integrated Weather System (CIWS) Data Publication*:

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

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

Weather Message Switching Center Replacement (WMSCR)

Publications: Provides NWS textual aviation weather products

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

Enhanced Weather Information Network System

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

Weather and Radar Processor (WARP) Publications

- ✓ Next Generation Weather Radar (NEXRAD)

Aeronautical Data

Aeronautical Information Management (AIM) Special Use Airspace (SUA) Data Exchange: Provides notification and status regarding airspace

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

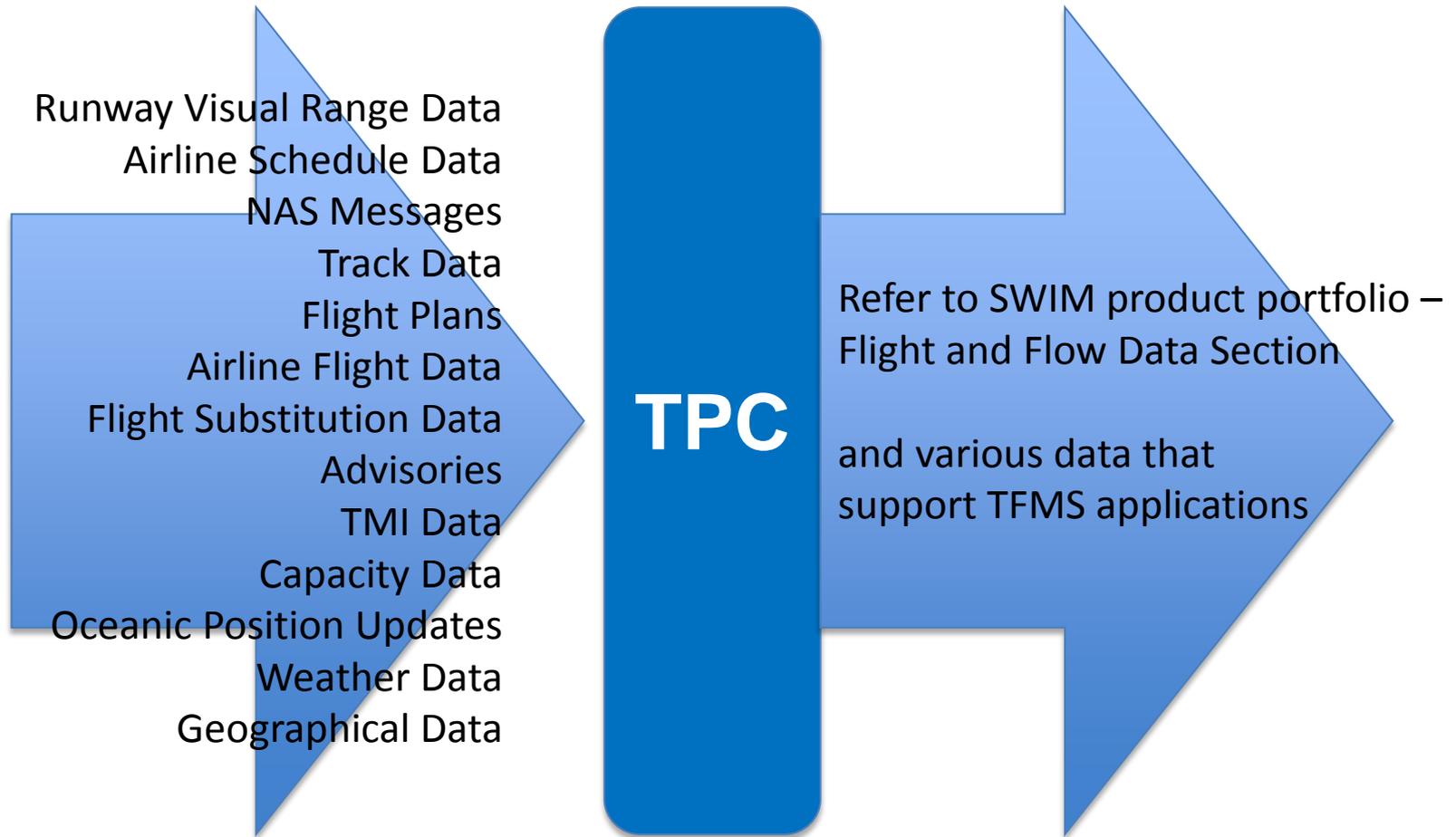
Notices to Airmen (NOTAM) Distribution Service

- ✓ Digital NOTAMs AIXM 5.1

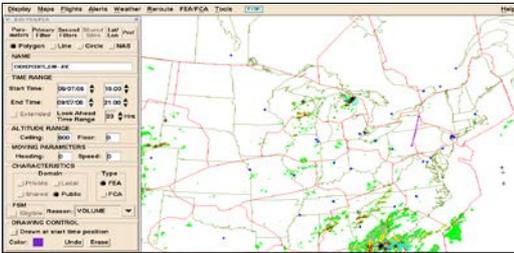
*Service in development or on-ramping process



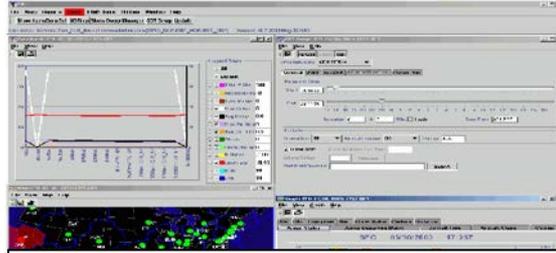
TFMS Data Flow



TFMS – Collection of Systems and Interfaces



Traffic Situation Display



Flight Schedule Monitor

Options Edit View Tools Information Print Reports Link Search Help

Misc
RSTN **Paul Hawkins**
MFSTN
GSStop
APREQ

Entry Time: 2106

Delay	April	Time	Type	Fac	Message	Status
					EWV AM via WHITE 15 MI	ZAU : Y
					1746-1900, WX:SNOWICE, ZDC-ZAU,ZNY,ZTL, RSTN: APVD	ZNY : Y
					DISAPPROVED: CLE AM via WHITE 12 MI	ZTL : Y
					1800-2100, WX:SNOWICE, ZDC-ZAU,ZOB, RSTN:	ZAU : Y
						ZOB : Y

Log

National Traffic Management Log

ESIS Display - Connected TPOPS at: [ZDC, ARA5] - 03 Aug 2007 1728

Restrictions
BOS WHITE 6MIT JETS SPD: 210 ALT: AOA333 1900-2100 ZDC:ZBW
SEA WHITE 12MIT 2100-2200 ZDC:ZSE
MSP WHITE 5MIT 1939-1942 ZDC:ZMP

Ground Stops
GS All ARR BWI 1941-1945 WX:SNOWICE
GS All ARR DTW 2100-2200 WX:SNOWICE

MISC Entries
Blank spaces can be added before entries.

Outages
DCC ARTS 111-A OTS 1941-UFA

Hard returns
may be added to ESIS entries.

Enhanced Status Info System

NATIONAL PROGRAMS

CONTROL ELEMENT	START	END	SCOPE	REASON	AVG AAR	PR	ADVZY	DA
IAN	1179	1939	ALL	WEATHER / TURBULENCE	73	36	39	121 DA

GROUND STOPS

ARPT. UPDATE	POE	SCOPE	REASON	ADVZY
ARPT AD DO TIME				
EWV	1101	1111	TM Initiatives-DTP-VLE	

DELAY INFO

ARPT	TYPE	TIME CANCELLED	REASON	AREA	REQ ADVZY	ALTIMUTE TIME	REMARKS
BOI	GA	12-1136					

CANCELLED INITIATIVES

ARPT	TYPE	TIME CANCELLED	REASON	REOPEN
BOI	GA	12-1136		

PRECISION RUNWAY MONITOR UTILIZATION

PRECISION	START	END	AAR

MISCELLANEOUS

NEXT PLANNING TELECON: 1115Z

WEST FLIGHT CHECK INFO

Airport	Zulu Date/Time	Local Time	Description

Operational Info System



Airport Monitor EWR

Selection	ACID/CID	Type	Hwy	DSP#	St	CS	Fbk	Fbk	Dest	Delay
	MAR51/091	BFSB/G	4L	1855	C		BRZY	GFRKT	BTW	0
	COA229/128	0238/H	41	1923	D		DTXTE	BAKTA	HSD	0
	COA33/942	H/DG/D	H 40	0223-20	I		CAP	DTX1	BAKTA	SRG 328

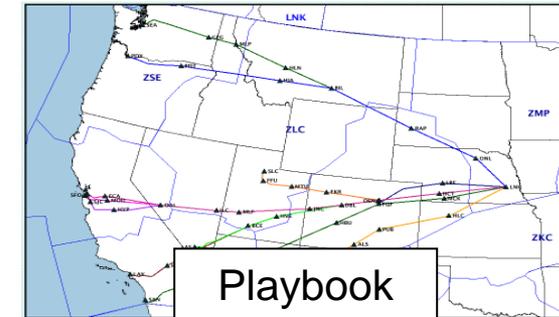
ACID/CID: COA33/942
Requested ALTITUDE: 290

IZ: Boston

KEWR, D121K, V276, PRRP1, CMREG, LINND, KMIND, GABRS, G523, GRANN, A312, ODKAM, UA312, BRS, UA317, PA1, CAX, SBGL/0837

CLASS	H/DCL/W	MIBB	942	BT	KEWR P1050	ZOB	KEWR D01E V276	PRFP OWENZ LINND	KWRM GABRS A323	GRANN A312 ODKAM	UA312 BRS SBGL	OCAD GABRS/MIBB/310	NB3 NN4	ND4 EWR

Departure Spacing Program



30+ user/data interfaces



SWIM TFMDData Interfaces

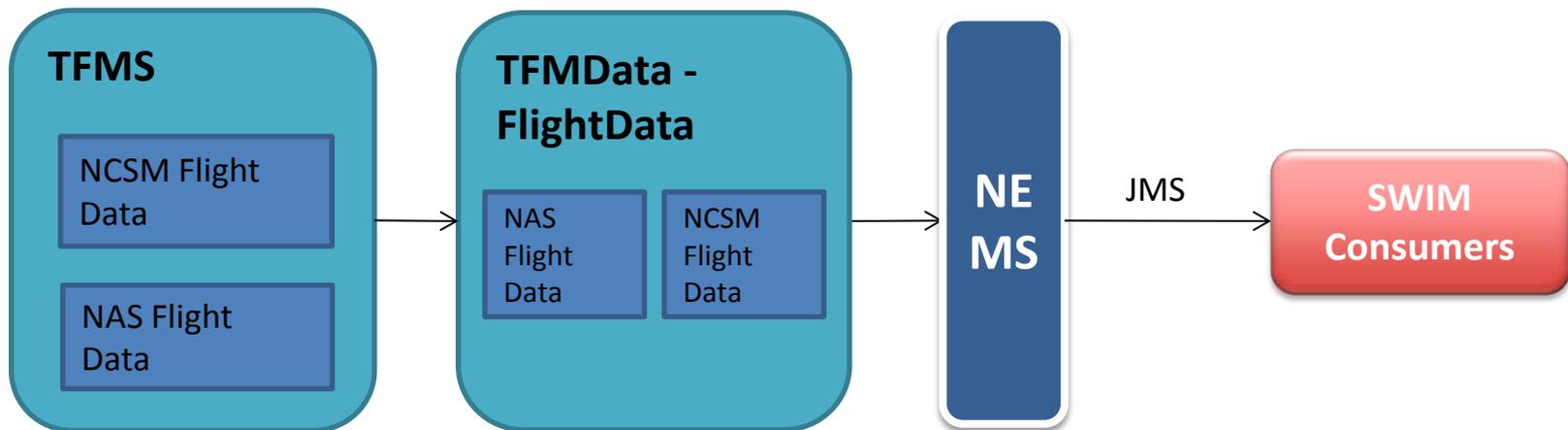
- In TFMS R10 (Nov 2014 RO), TFMDData included:
 - 1) **Flight Data**
 - 2) Flow Information
- Available to SWIM consumers via NEMS
(NAS Enterprise Messaging Service)
- Additional TFMDData interfaces added in TFMS R13: (Deployed on April 30, 2016)
 - 3) Terminal Flight Data
 - 4) TFM Request/Reply
 - 5) **International Data Provider (IDP)**
 - 6) TFMS Status

No new data being sent out. Just change in distribution mechanism.
- **NCP to baseline JMSDD approved by NAS CCB (CCD # N36098, 2/1/2016).** JMSDD and schema posted to NSRR (NAS Service Registry / Repository).



Flight Data Business Function

- One way interface for consumers to receive enhanced flight data
 - NAS Flight Data: Flight data updates based on received flight data messages
 - NCSM Flight Data: Flight data updates computed by TFMS based on internal events (Traffic Management Initiative control data, scheduled flight activation, flight trajectory updates ...)



Flight Data (1 of 2)

Description	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
Flight Plan Amendment *	flightPlanAmendmentInformation	✓	✓ <i>(if not "R")</i>	
Flight Plan Arrival (AZ)	arrivalInformation			
Flight Plan Departure (DZ)	departureInformation			
Flight Plan (FZ)	flightPlanInformation			
Flight Plan Cancel (RZ)	flightPlanCancellation			
Boundary Crossing (UZ)	boundaryCrossingUpdate			
Track Message (TZ)	trackInformation			
Oceanic Position Report (TO)	oceanicReport			
ncsmFlightCreate	ncsmFlightCreate			
ncsmFlightModify	ncsmFlightModify			
ncsmFlightScheduleActivate	ncsmFlightScheduleActivate			
ncsmFlightRoute	ncsmFlightRoute			
ncsmFlightSectors	ncsmFlightSectors			
ncsmFlightTimes	ncsmFlightTimes			
Beacon Code (BZ)	beaconCodeInformation	✓		
ncsmFlightControl <i>(contains control times)</i>	ncsmFlightControl			

* *If amendment message contains a beacon code, then amendment message split into beacon code message (tagged "Restricted") and an amendment message without the beacon code (tagged "All") (transparent to NEMS)*



Flight Data (2 of 2)

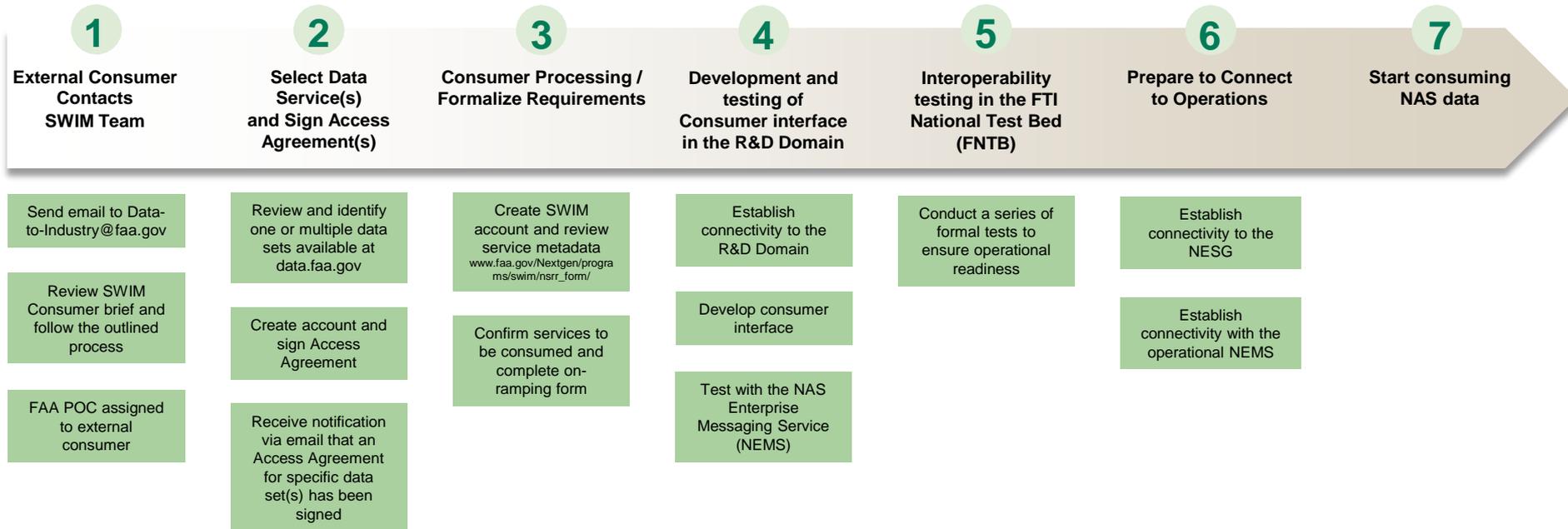
- Below messages are generated from CDM action, so CDM Participant flag set true on all (except Early Intent)

Flight Data Sessions	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
Early Intent (EI)	ncsmFlightRoute	✓		
Flight Create (FC)	ncsmFlightCreate	✓		✓ <i>(if not "R")</i>
Flight Modify (FM)	ncsmFlightModify			
Flight Cancel (FX)	flightPlanCancellation			

Simplified Substitution	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
Flight Modify (FM)	ncsmFlightControl	✓		✓ <i>(if not "R")</i>
Slot Create (SC)	ncsmFlightControl			
Slot Create Substitution (SCS)	ncsmFlightControl			
Hold All Slot	ncsmFlightControl			
Release All Slot	ncsmFlightControl			



As TFMS Flight Data Consumer



International Data Business Function

Caribbean Sea FIRs



FAA Automation provides TT Flight Messages while FAA tracks flight

TT Automation provides FAA Flight Messages while TT tracks flight



International Data Business Function

- Provides for 2-way data exchange of flight data between TFMS and IDPs
 - IDPs provide flight data for flights that will traverse FAA airspace when the flight is in the IDPs airspace
 - Optionally an IDP can provide flight data for flights that do not intersect FAA airspace
 - Can enable an IDP to take advantage of TFMS services
 - TFMS will provide an IDP flight data for flights that will traverse that IDPs airspace while the flight is in FAA airspace
- Flight Planning data, Arrival/Departure data, Flight Delay data, Position report data



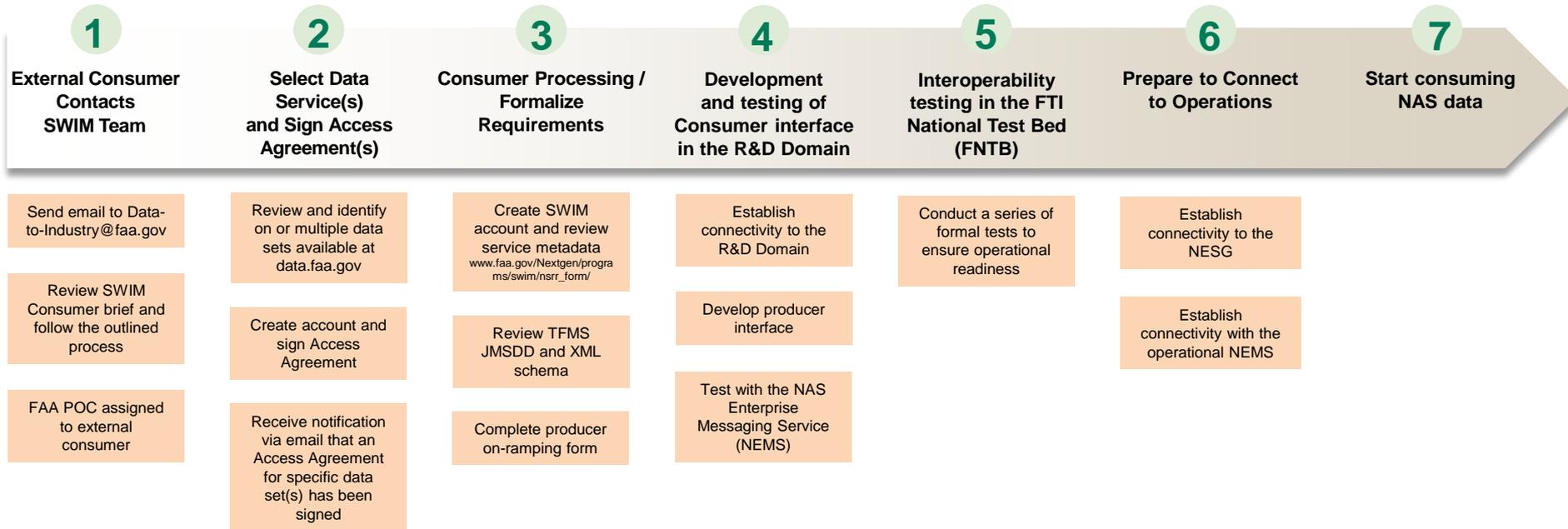
International Data Provider (IDP)

- Access by International consumers not considered for approval by NAS DRB until after FAA International has created MOA for that consumer
- IDP users receive Flight Data only for flights that intersect their airspace
- TFMS will direct IDP flight data to more than one IDP user if the flight traverses multiple IDP airspaces
- No Restricted Data sent to IDP users (by design), so all msgs available to all approved consumers (provided flights intersect their airspace)

Description	Message Name	Distribution			
		US Govt Consumer	External Consumer	CDM Participant	International Consumer
<p>All International Data is sent and received in one FIXM message – Flight.</p> <p>Includes:</p> <ul style="list-style-type: none"> • Flight Plan Information (FPL) • Flight Plan Amendment (CHG) • Arrival Information (ARR) • Departure Information (DEP) • Flight Plan Cancellation (CNL) • Flight Delay Information (DLA) • Track Information (TIZ) • Oceanic Report (TIO) • Data Close Information (CLS) 	intdOutput->flight	<p>✓</p> <p><i>(directed to specific users)</i></p>			<p>✓</p> <p><i>(directed to specific users)</i></p>



As TFMS IDP Producer





Questions?

Thank you!

Midori.Tanino@faa.gov



Backups



Current SWIM External Consumers (Partial)

Airports, FAA Facilities
AIM
ASH/EON
ATAC-PDARS
ATCSCC
Obstruction Evaluation Airport Airspace Analysis CRCT at ATCSCC and N90
MS Viewer A90 (Boston TRACON)
MS Viewer ASH/EON
MS Viewer C90 (Chicago TRACON)
MS Viewer ELG
MS Viewer I90 (Houston TRACON)
MS Viewer N90 (New York TRACON)
MS Viewer NCT (Northern California TRACON)
MS Viewer PCT (Potomac TRACON)
MS Viewer SDFZ
MS Viewer SCT (Southern California TRACON)
MS Viewer ZLA (Los Angeles Center)
MS Viewer ZNY (New York Center)
Non FAA Government Entities
DoD Aeronautical Information Portal (DAIP)
Atlanta Port Authority
Broward County
DFW
Eurocontrol
Hickam_AFB_SVT
NASA Airborne Sciences
NASA Ames
NASA ATD-2

Non FAA Government Entities
NDW
NOAA AWC
Seattle Port Authority
Volpe National Transportation Systems Center
Airlines
American
Delta
FedEx
JetBlue
SWA
United
UPS
Industry
Aerospace Engineering
AirNav
Alliance Lab
Arch Tech Corp
ARINC
AVConnect
AVFinity
Aviation Data Systems
AVMet
B&K
Boeing ATM
Boeing Digital Aviation
Booz Allen
Business Aviation Tech
CAMP Systems
CGH



Flow Information

Description	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
Air Flow Program Advisory (AFP)	afpAdvisory afpCancel afpCompression	✓	✓ <i>(if not "R")</i>	
Ground Delay Program Advisory (GDP)	gdpAdvisory gdpCancel gdpBlanket gdpCompression			
Ground Stop Advisory (GS)	gsAdvisory gsCancel			
CTOP Advisory	ctopDefinition ctopCancel			
Reroute Advisory	reroute			
Parameter Updates	paramAfpGdpUpdt paramGsUpdt paramBlanketUpdt paramComprUpdt paramDelete	✓		
Airport Configuration (APTC)	airportConfigMessage			
Deicing (DICE)	deicingMessage			
Restriction (RSTR)	restrictionMessage			
RAPT Timeline (RAPT)	raptTimelineMessage			
General Advisory (GADV)	generalAdvisory			



Flow Information

Description	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
TMI/CDM Update Data	cdmUpdateData	✓ <i>(directed to specific users)</i>	✓ <i>(if not "R")</i> <i>(directed to specific users)</i>	
FOS Update	fosData			
FADT Broadcast (FADT)	fadtBcast			
TMI Flight List	tmiFlightDataList			
Flow Constrained Area / Flow Evaluation Area (FXA)	feaFca	✓ <i>(directed to specific users)</i>	✓ <i>(directed to specific users)</i>	
FXA Secondary Filters (FXASF)	fxaSecFiltersUpd fxaSecFiltersDel			



Terminal Flight Data

- CDM Participant flag set on all Terminal Flight Data messages

Flight Data Sessions	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
All Terminal Flight Data is sent and received in one TFM extended FIXM message - Flight	tfdOutput->flight	✓		✓ <i>(if not "R")</i>



TFM Request/Reply (1 of 2)

Description	Request Message Name	Response Message Name	Distribution			
			FAA or selected Intl	US Govt Consumer	External Consumer	CDM Participant
General Advisory Request	advisoryRequest	advisoryReply	<div style="text-align: center;">  <i>(reply directed back to requestor)</i> </div>			
Request for a new TMI ID	tmildRequest	tmildReply				
Request for flight data associated with an airport	arptRequest	responseMessage				
Request to delete parameters for any Fuel Advisory Delay TMI	paramDeleteReq	responseMessage				
Identifies the airports for which arrival and departure fixes are to be provided	airportFixRequest	airportFixReplyData				
Request any of the EDCT commands	edctRequest	edctCheckReport edctListReport edctShowReport edctSListReport edctSubShow edctUnassignedSlotsReport				
AOC Flight Data Requests	flightBlockReqData	responseMessage				
Request to create or update Air Flow Program (AFP) or Ground Delay Program (GDP) TMI	paramAfpGdpUpdtReq	responseMessage	<div style="text-align: center;">  <i>(reply directed back to requestor)</i> </div>			
Request to create or update a Ground Stop Program (GS) TMI	paramGsUpdtReq	responseMessage				
Request to create or update an AFP/GDP Blanket parameters for TMI	paramBlanketUpdtReq	responseMessage				
Request to create or update an AFP/GDP Compression TMI	paramComprUpdtReq	responseMessage				



TFM Request/Reply (2 of 2)

Description	Request Message Name	Response Message Name	Distribution		
			US Govt Consumer	External Consumer	CDM Participant
Oceanic Position Report	oceanicPositionReport	responseMessage	✓ <i>(reply directed back to requestor)</i>		
Schedule Management Requests	flightScheduleRequest	responseMessage			
FCA or FEA Request	fxaRequest	responseMessage			
Reroute TIM request	rerouteRequest	responseMessage mergeReplyData previewAmendmentReply waypointReply			
Request historical Popup data	histPopupRequest	histPopupData			
Reroute Model Request	rrModelRequest	responseMessage rerouteModelReply reroutePreviewReply fxaRRModelReply tmiListReply			
Simplified Substitution (SS) Request	subBlockReq	substitutionResponseData			
Resync TMI Identifications	tmiResyncRequest	resyncMessage			
Request CTOP TMI	ctopRequest	ctopReplyData			
Request for Flight Data reconstitution	flightReconRequest	flowFlightData			
Flight Operator System (FOS) Request	fosRequest	responseMessage ctopSubReplyData tosReplyData tosResyncData	✓ <i>(reply directed back to requestor)</i>	✓ <i>(if not "R") (reply directed back to requestor)</i>	
Request to create or update any Fuel Advisory Delay TMI	fadtReq	responseMessage			



TFMS Status

- Reports status of all TFMS consumer and producer services which directly impact publication of data to NEMS
- Status sent to all subscribers

Description	Message Name	Distribution		
		US Govt Consumer	External Consumer	CDM Participant
TFMS Status of all consumer services and TFM producer services. Includes: <ul style="list-style-type: none"> • TBFM Flight Data • STDDS RVR, Surface Movement Events, and Tower Departure Events • AIM SAA Schedule Events • TFMDData - Flight Data • TFMDData - Flow Information • TFMDData - Terminal Flight Data (Input & Output) • TFMDData - International (IDP) (Input & Output) • TFMDData - TFM Request/Reply 	tfmsStatusOutput->status	✓		

