

Decision Support Systems (DSS) Status



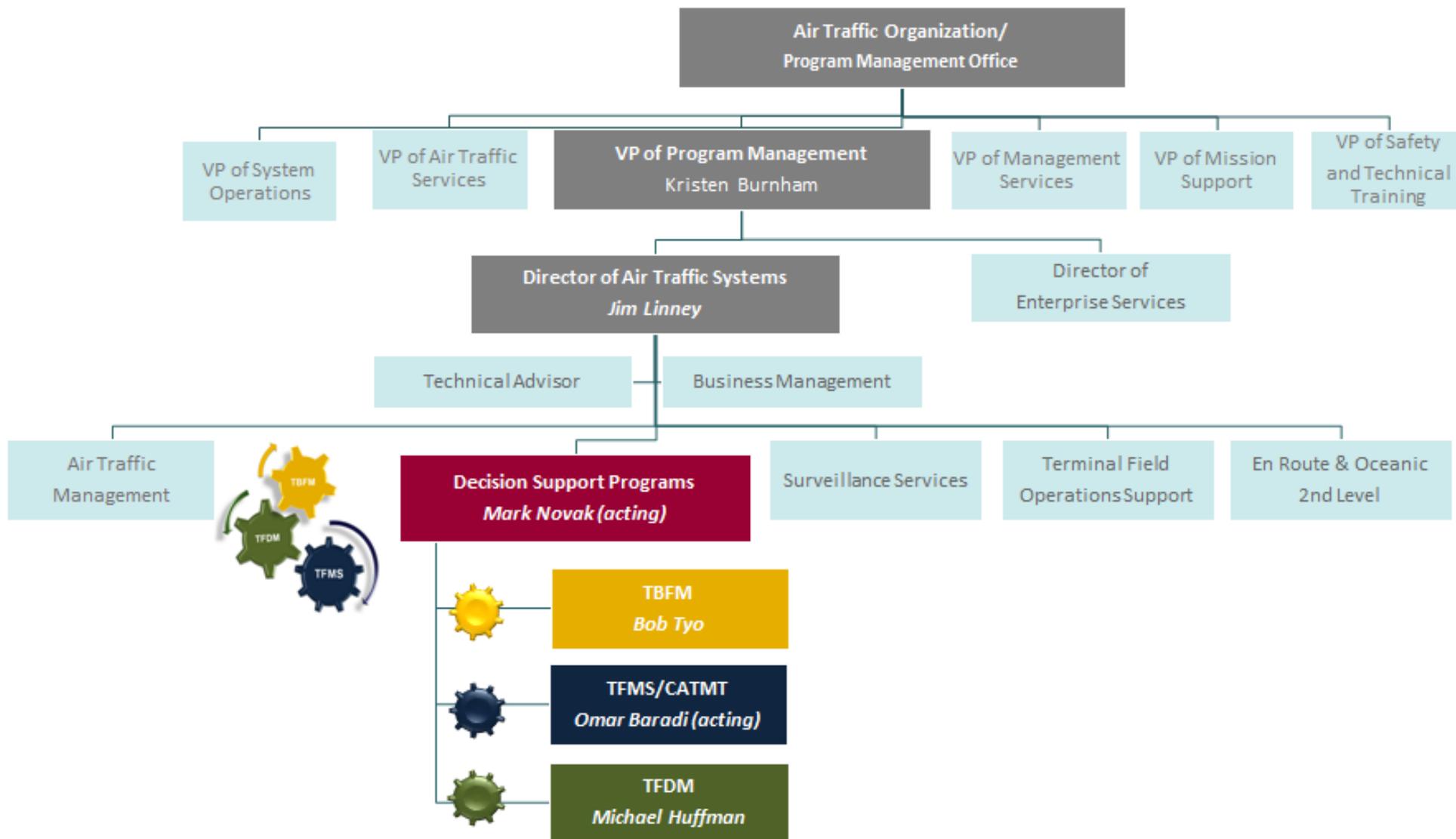
Federal Aviation
Administration



CDM
Collaborative
Decision Making



DSS: Who are we?



DSS Vision: Enabling NextGen



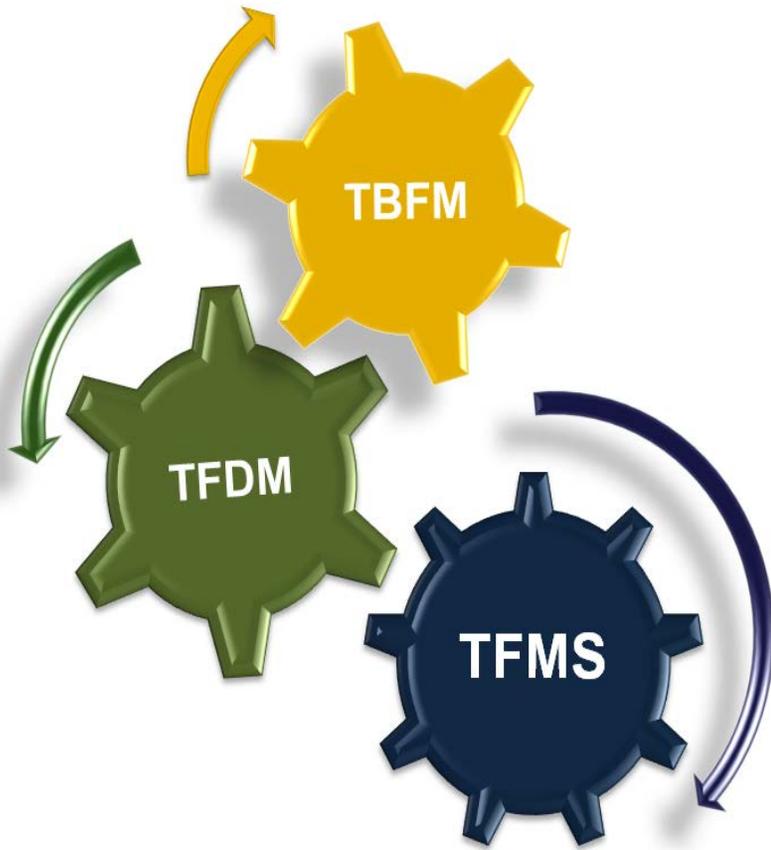
✈ Enable NextGen technologies in TFM operations

- Performance Based Navigation (PBN) –use of RNAV/RNP and Optimized Profile Descent (OPD) technologies in TBFM
- ABRR / PDRR connection to DataComm
- System Wide Information Management (SWIM) – TFM data exchange with external systems through SWIM
- System-wide solutions that are able to be tailored for individual aircraft –
 - Surface / Routes- Utilizing user preferences

✈ Provide integrated, responsive and collaborative TFM solutions that maximize efficiency and reduce delay.

- ✓ **INTEGRATED:** Strategic and tactical TFM strategies are modeled and implemented as a single cohesive strategy.
- ✓ **RESPONSIVE:** Faster more effective responses to evolving conditions in the NAS.
- ✓ **COLLABORATIVE:** Data sharing among stakeholders facilitates solutions that impose no more controls on flights than needed, allowing flight operators to fly their preferred routes at preferred times.

DSS Components: 3Ts are the engines



Time-Based Flow Management (TBFM)

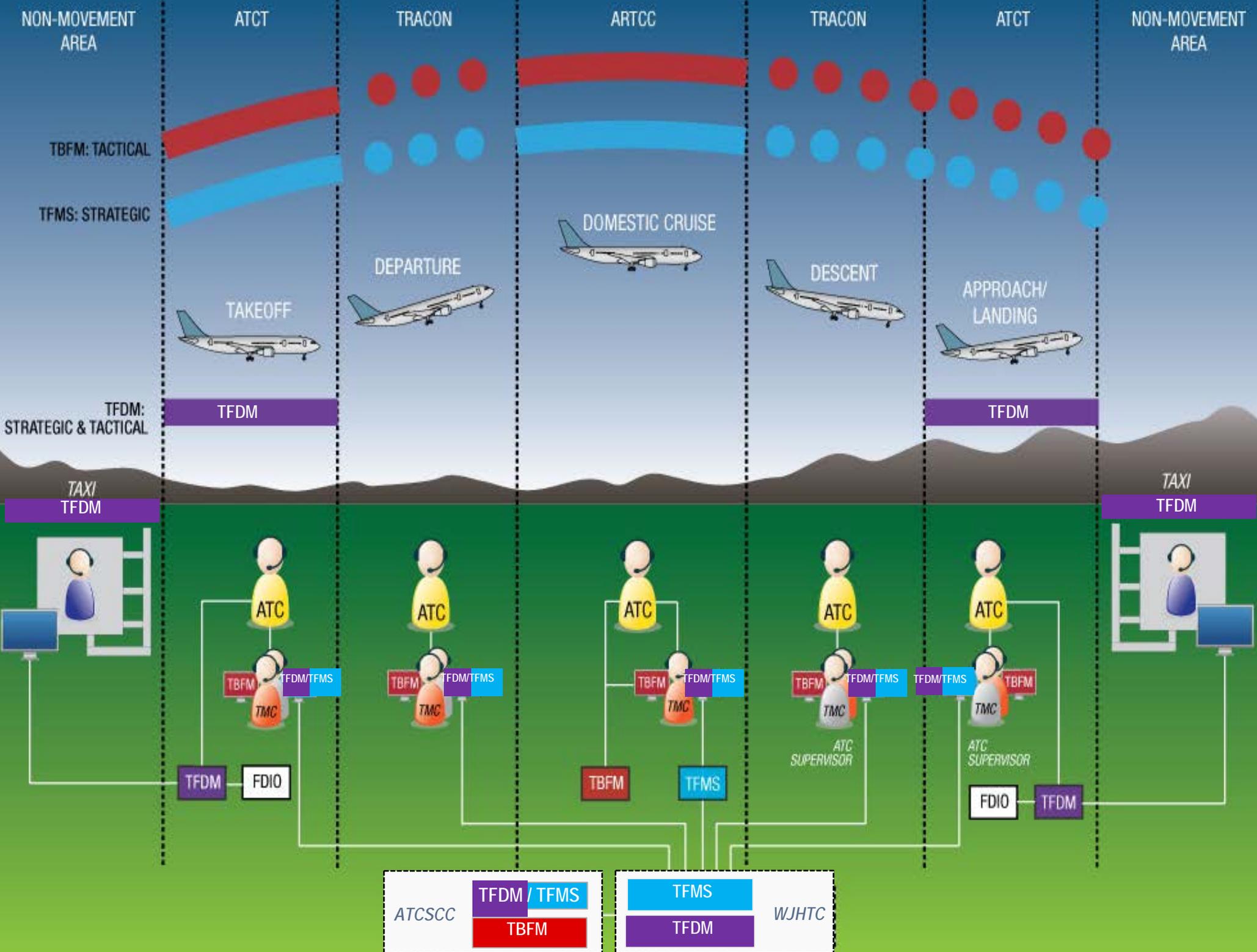
Decision support system for **metering** based on time to **optimize the flow of aircraft**.

Terminal Flight Data Management (TFDM)

A new decision support system for airport **surface management** and ATC tower functions.

Traffic Flow Management System (TFMS)

Decision support system for planning and mitigating demand-capacity imbalances in the NAS.



Communication

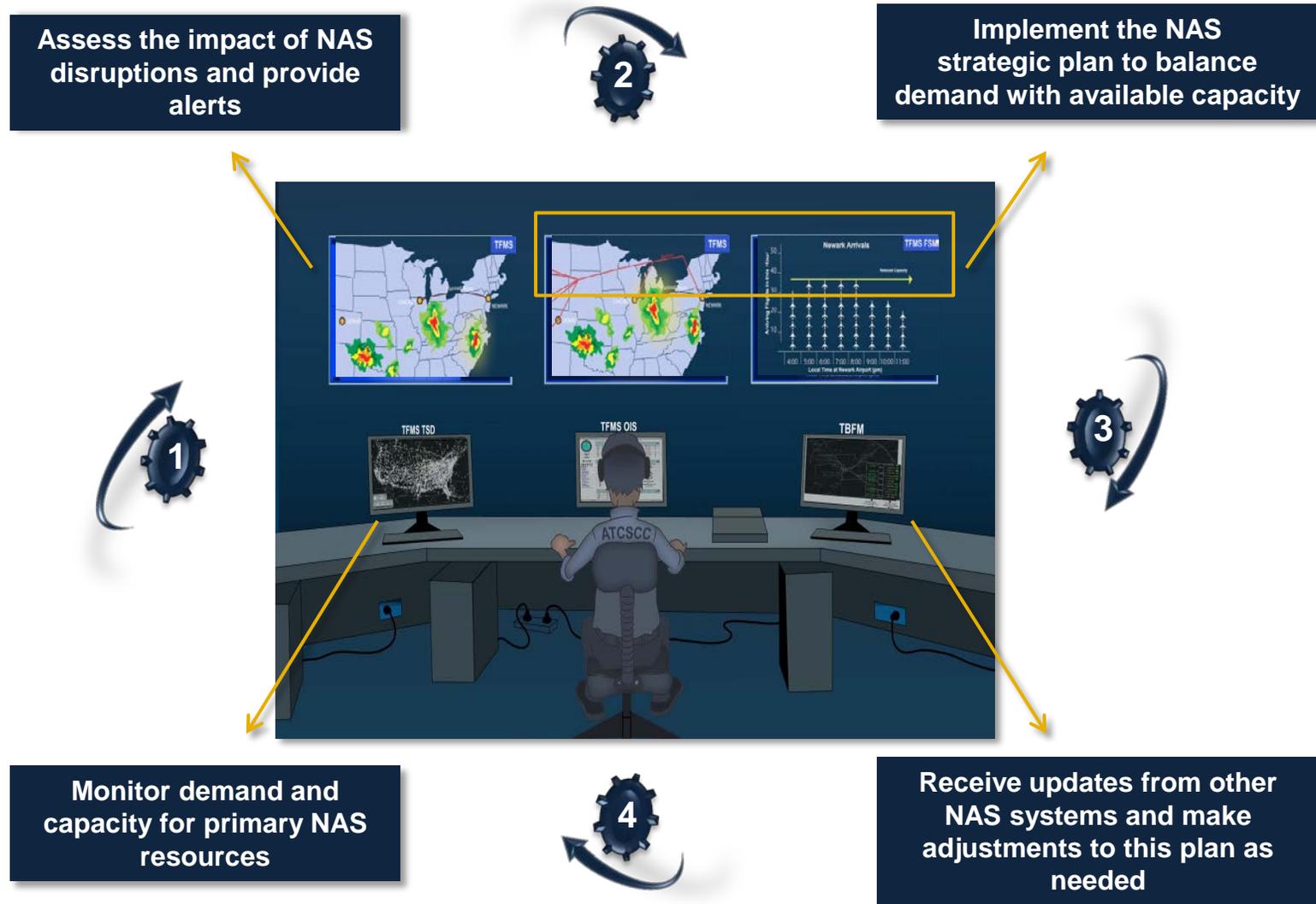


- Monthly telcons
- CDM Exploder emails?
- Industry Forum website
 - www.faaindustryforum.org
 - ASDI to TFM comparison
- Starter kits
 - TFMData
 - TBFM – In progress
- Next Industry Outreach?
 - Format?
 - Forum
 - Outreach
 - Developers workshop

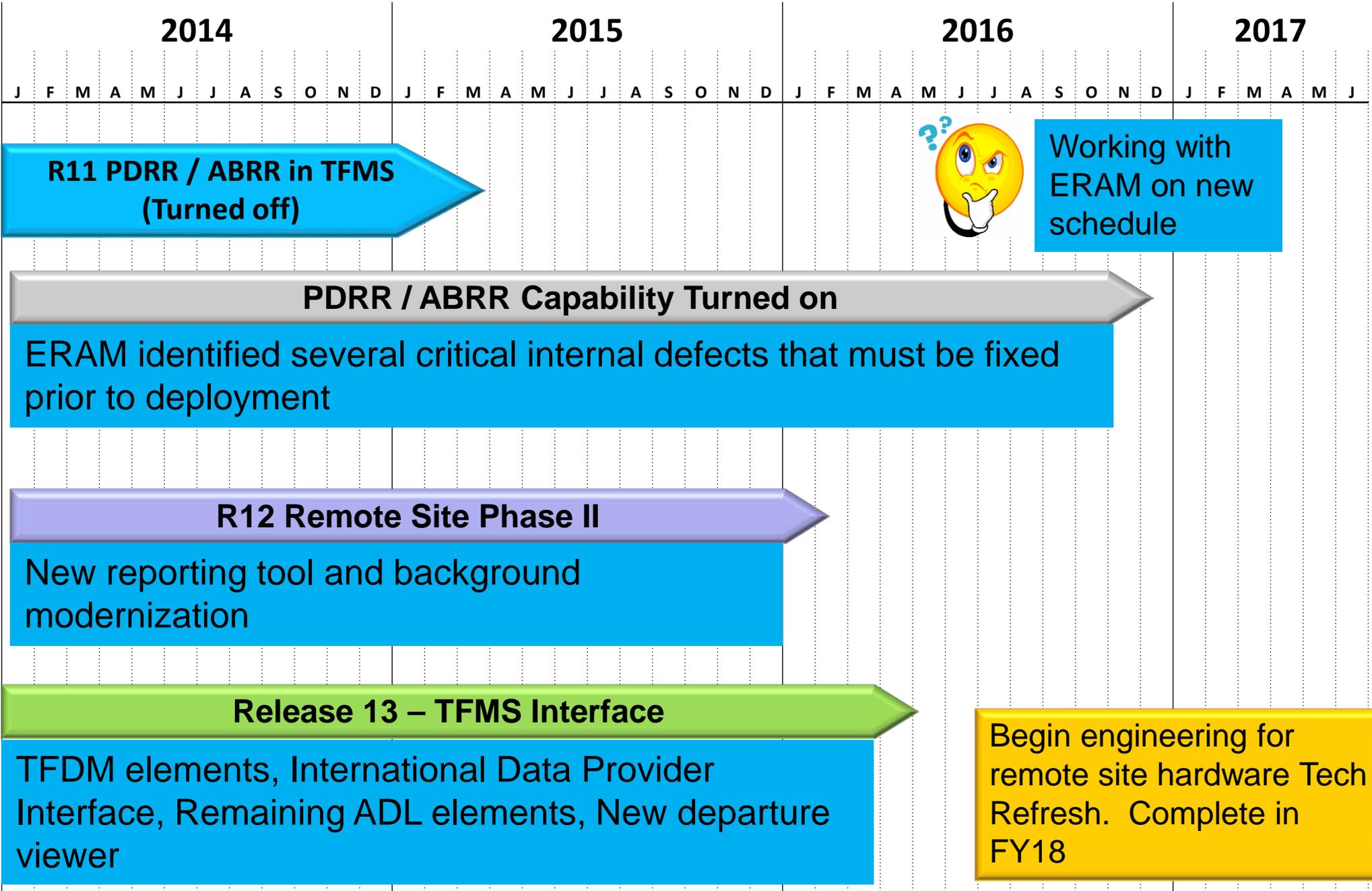




TFMS: Focuses on efficiently improving the “greater NAS”



TFMS Release Summary



Working with ERAM on new schedule

Pre-Departure ReRoute (PDRR) Airborne ReRoutes (ABRR)



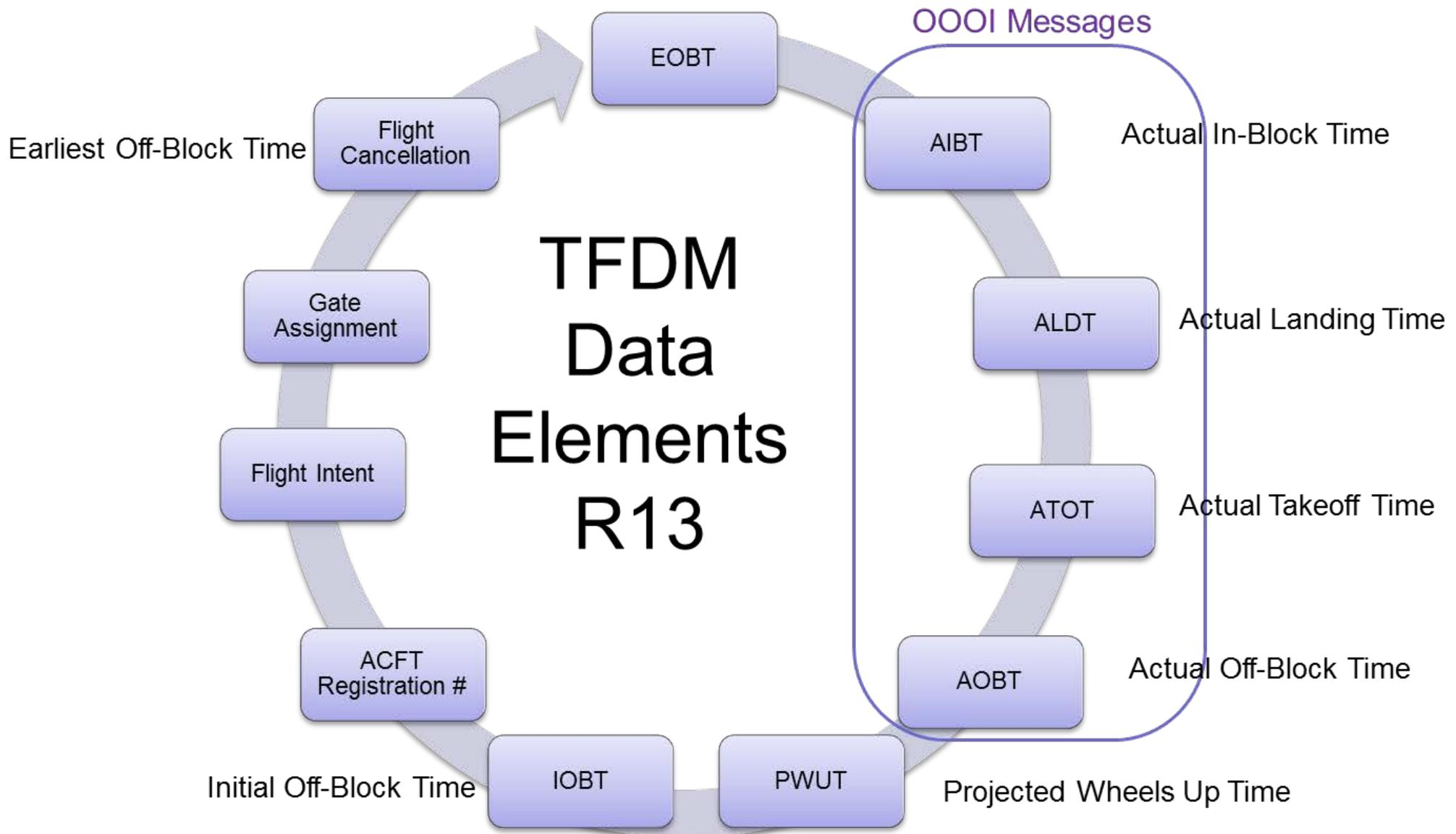
- Communicates protected reroute segment
- Allows reroute of multiple flights from one interface in TSD
- TOS is listed in the route amendment dialogue box
- Deployed in TFMS “turned off” waiting on ERAM
- Targeted December (conformant flights only)
PDRR and ABRR
 - Remaining deployment TBD

Release 13- April 30 2016



- TFDM early implementation interface
 - Improved TFMS modeling
 - Distributed based on rights via TFMDData
- Remaining ADL fields added to TFMDData
- Replace legacy email / advisory delivery
 - Fully formed XML in TFMDData
 - No change on user end
- Update the ETD in FSM to reflect TBFM dept time
 - TSD and FSM will display prefix on ETD “M”
 - Flight list can be sorted by TBFM-RT times
- **ASDI Sunsets!!!!**
 - Joe Lahoud briefing NCF

Release 13- April 30 2016



Release 13 Deployment Info

- 10 Webinars scheduled 2/24/2016 – 4/30/2016
- Every Wednesday 10:00 AM to 11:00 AM (Eastern Time)

<https://global.gotomeeting.com/join/358591933>

(646) 749-3122

Access Code: 358-591-933

Additional Items

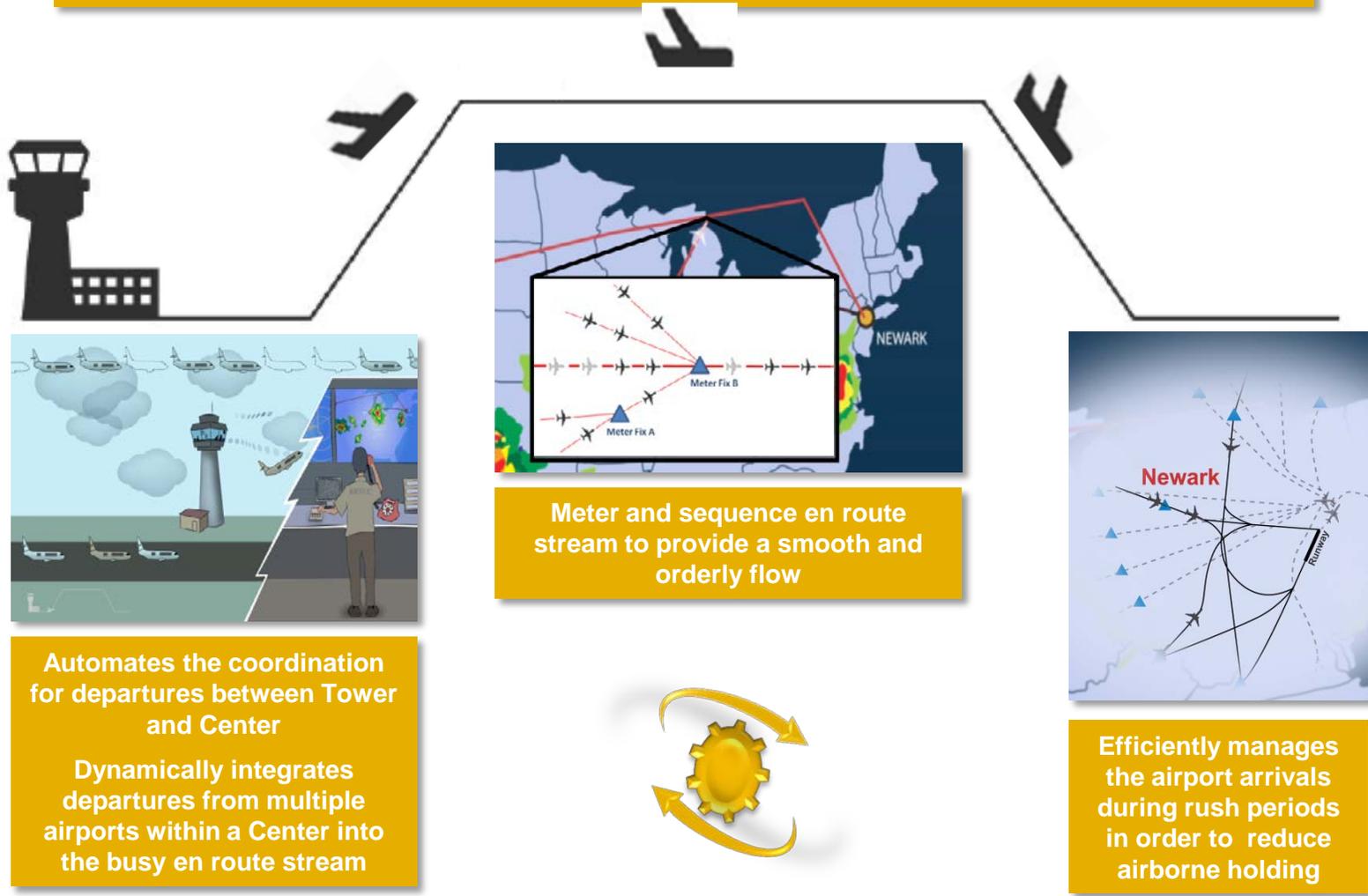


- TSD-C user accounts on TAP (requested by CSG)
 - May / June
- Two GDP CRs requested by CSG
 - When GDP is implemented after a AFP/CTOP, flights controlled by the AFP/CTOP are placed in Q2 for the GDP. The flights in Q3 for the GDP typically end up with exorbitant delays. DCC 'work-around' is to implement GDP first when it is anticipated GDP will be needed, which causes larger delays for AFP flights not destined to GDP airport(s)
 - TFMS calculation of ETD will be amended to use P-Time for ETD computation when L-Times are in the past and the P-Time is in the future.
- TBFM Metering times posted to NTML / OIS - TBD
- Every FP as a TOS - working with AJV-7
 - Target Fall / Winter 2016

TBFM: Metering and Sequencing



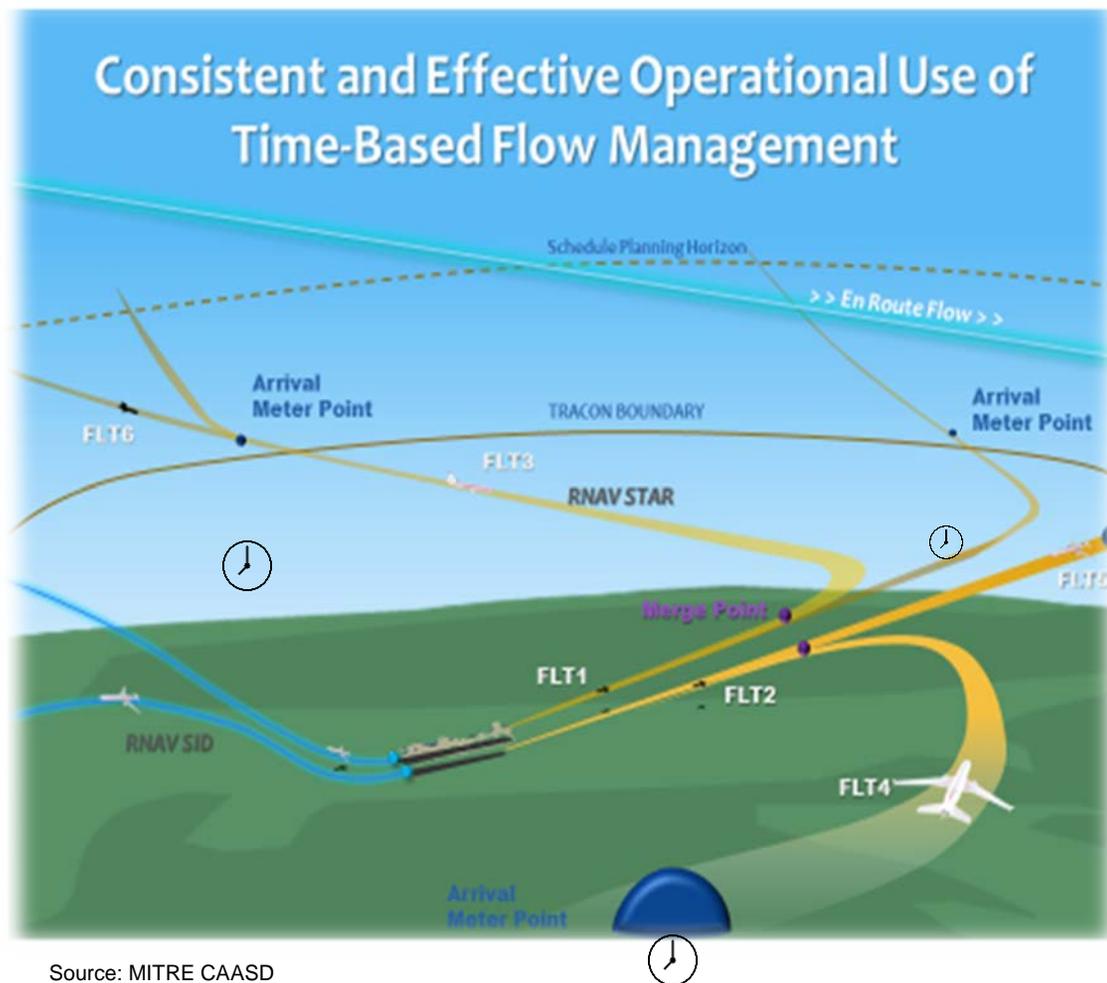
TBFM utilizes available airport and airspace capacity more efficiently by metering and sequencing flights while avoiding unnecessary delay when complying with all operational constraints



What do we want to Achieve? NAS Vision for TBFM



The vision for Time-Based Flow Management (TBFM) is the expanded use of time-based metering to enable **gate-to-gate improvements** in both fuel and throughput efficiencies by **applying spacing only where needed**, allowing for the routine use of **Performance Based Operations (PBO)** to capitalize on cockpit Flight Management System (FMS) capabilities, and adding more **predictability** to the ATC system.



Source: MITRE CAASD

TBFM Overview



- Information Sharing
 - December 2015 – TBFM-TFMS Information Sharing Enabled
 - Feb 2106 – all sites publishing data to SWIM.
- Classroom Training
 - FY15 - 113
 - Projected: FY16 - 250, FY17 - 250
- Working on TBFM starter kit – In progress
- Industry training
 - 4/29 delivery to CDM Training team
 - Looking for feedback

Integrated Departure Arrival Capability (IDAC)

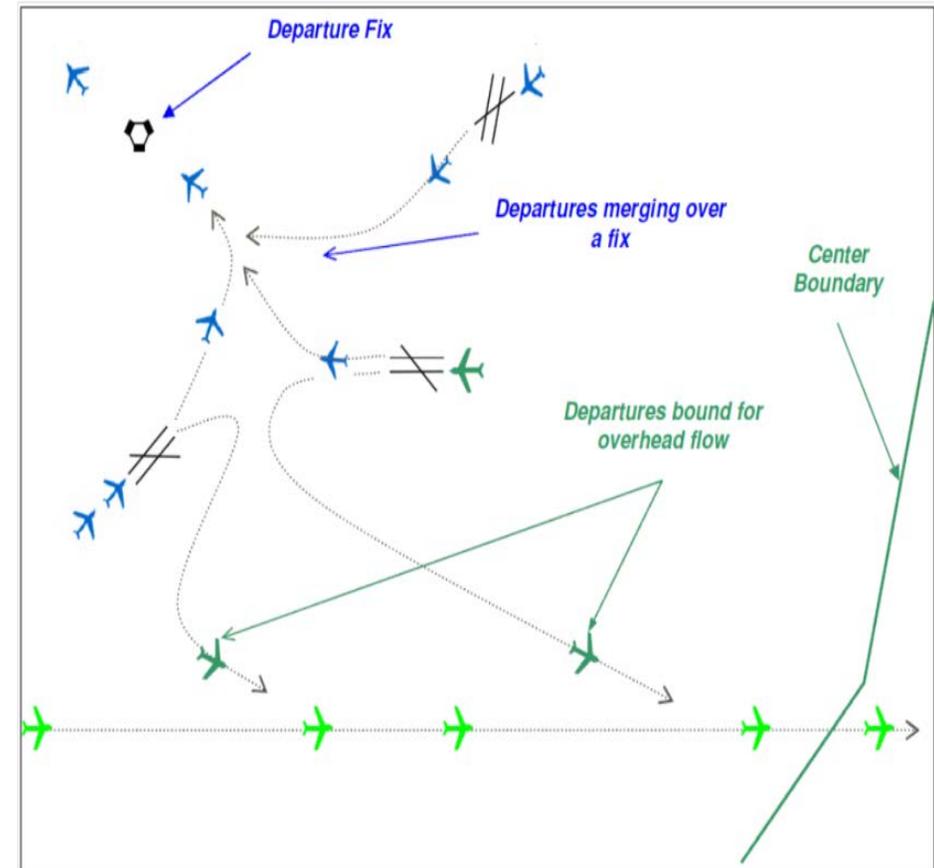


IDAC automates the process of monitoring departure demand and identifying departure slots.

- Provides displays in towers/terminals to allow TMCs or controllers to schedule departures
- Reduces need for APREQ phone calls to Center TMCs
- Completed: ZLA, ZID
- Targeted CY: ZBW, ZDC, ZOB

Benefit:

More efficient departure flows and less delay



Next 5 deployments –
Complete by 2019; ZAB, ZJX,
ZME, ZTL

Ground-based Interval Management – Spacing (GIM-S)



Extended Metering | Coupled Scheduling | Speed Advisories

Deployment Plan

•Completed

- ZAB IOC (EAGUL arrival into PHX) on 9/22/14
- Implemented GIM-S on ZAB's PINNG arrival into PHX on 3/18/15.
- Implemented Extended metering ZDV/ZAB into PHX on 8/3/15.

•Tier 1

- ZDV: Q2 FY16 (March 14, 2016)
- ZLC: Q3 FY16 (April 30, 2016)
- ZSE: Q3 FY16 (May 16, 2016)
- ZHU: Q4 FY16
- ZME: Q4 FY16

•Tier 2

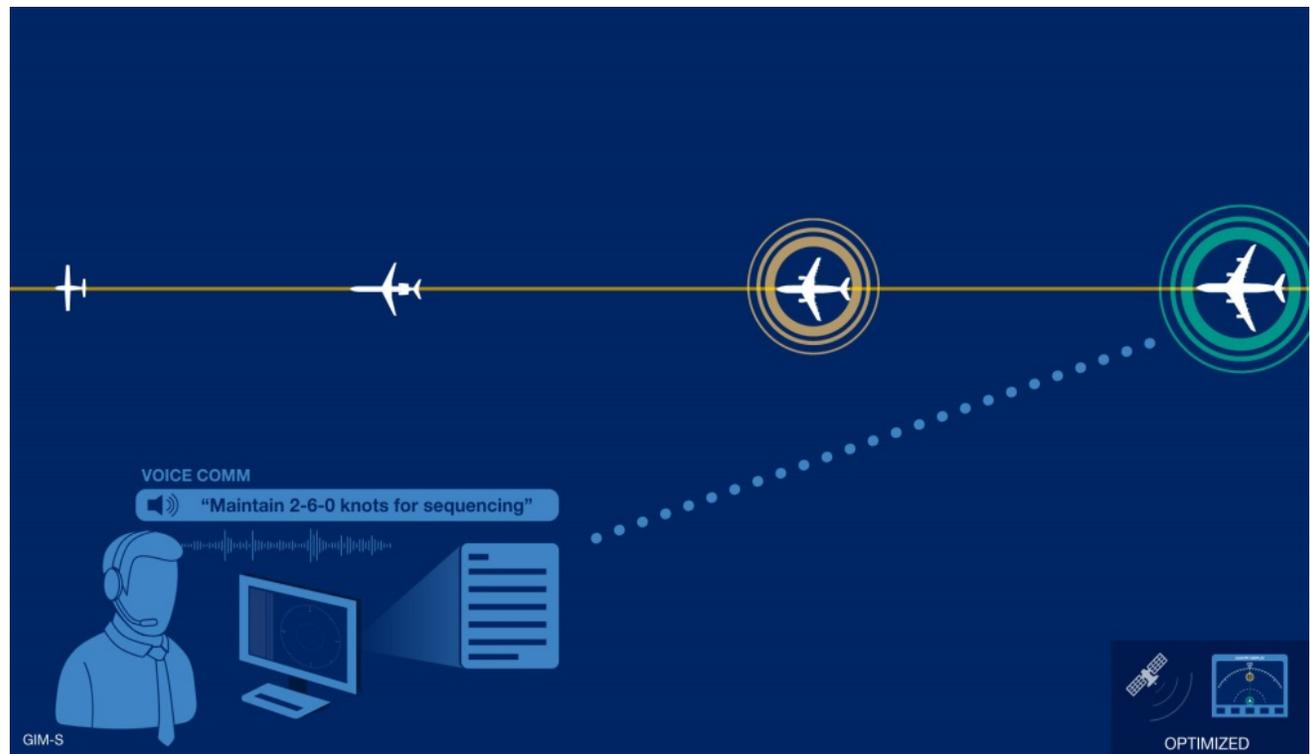
- ZFW: Jul 2016 – Dec 2016
- ZOA: Oct 2016 – Mar 2017
- ZLA: Jan 2017 – Jun 2017
- ZTL: May 2017 – Dec 2017

•Tier 3

- ZDC: Feb 2018 – Oct 2018
- ZBW: Mar 2018 – Oct 2018
- ZMA: Mar 2018 – Oct 2018

•Tier 4

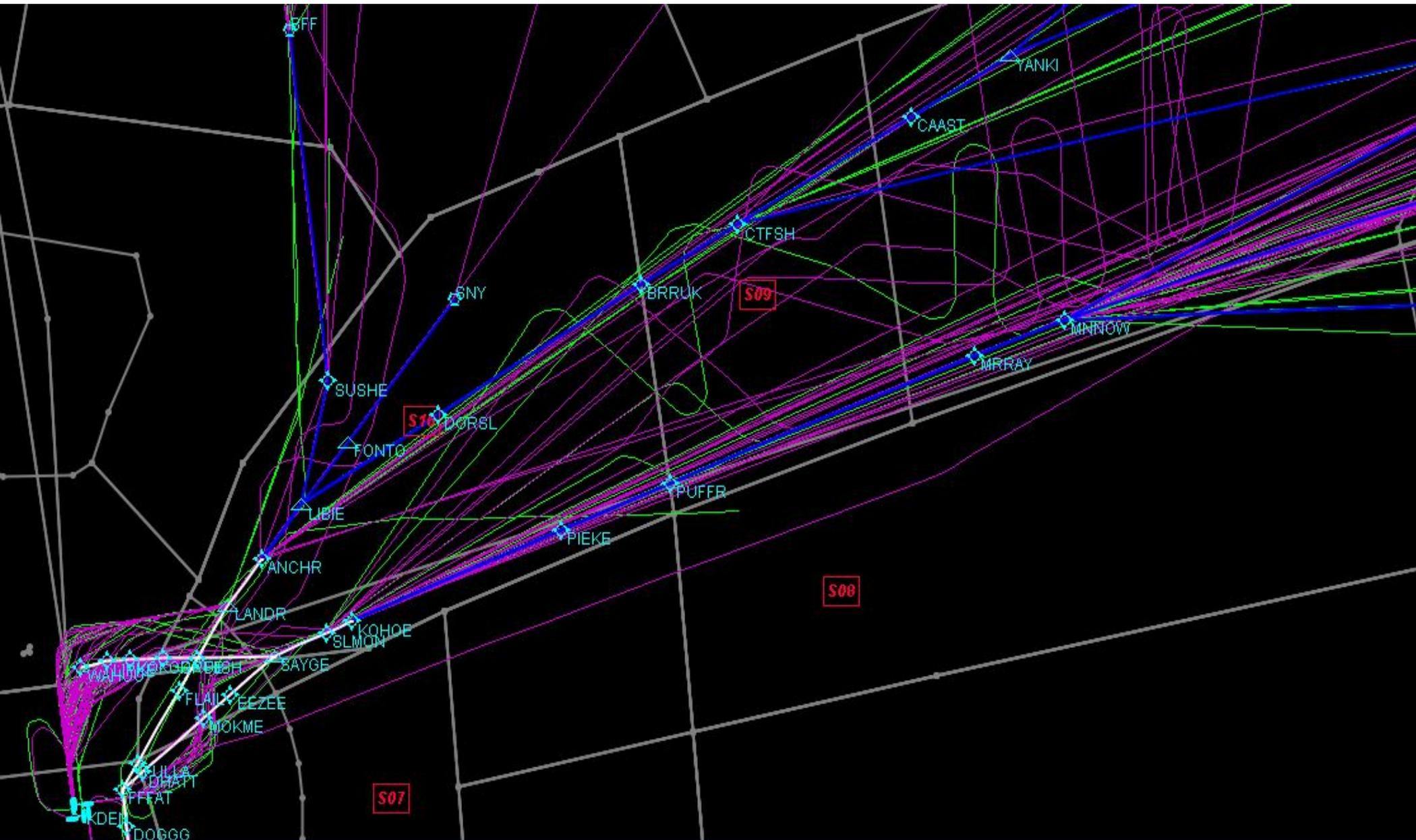
- ZNY: TBD
- ZAU: TBD
- ZMP: TBD



Track Data Visualization Demonstration



- **Denver Operations: Purple = Pre GIM-S (3/7/16), Green = Post GIM-S (3/14/16)**
 - Source: NASQUEST (ERAM Track (TH) messages)

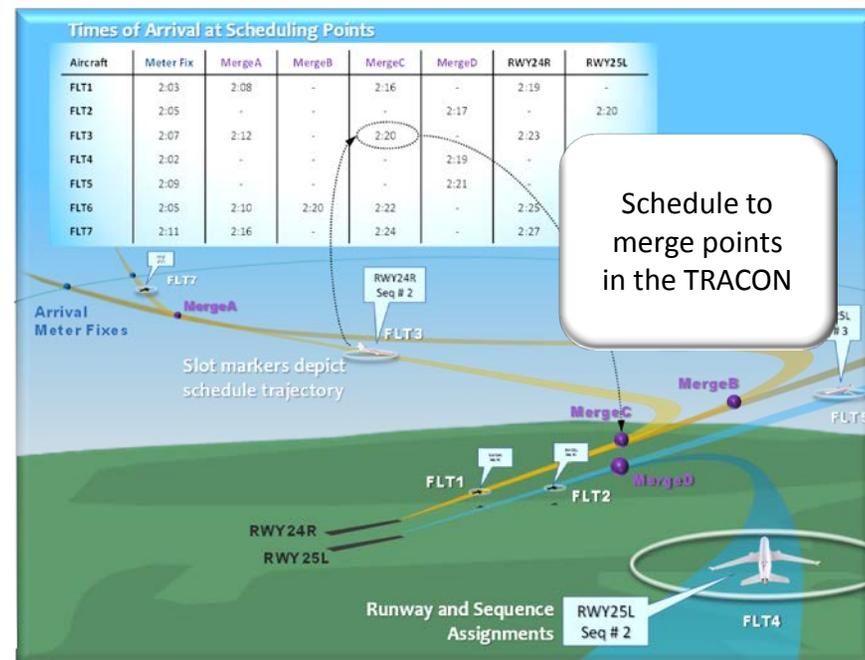


March 22, 2016

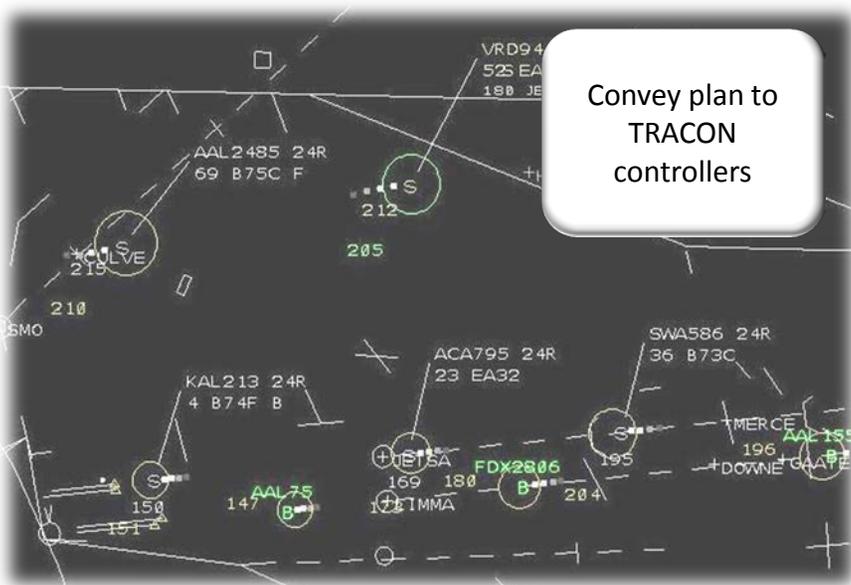
TBFM: Terminal Sequencing and Spacing (TSAS) ~2019 first IOC



- Introduction of Terminal Metering Operations:
 - Arrival schedule to merge points in the TRACON
 - Provides assistance to TRACON controllers in meeting meter times
 - Provides sequence and runway assignments to TRACON controllers to facilitate smooth flow to runways



Source: MITRE CAASD

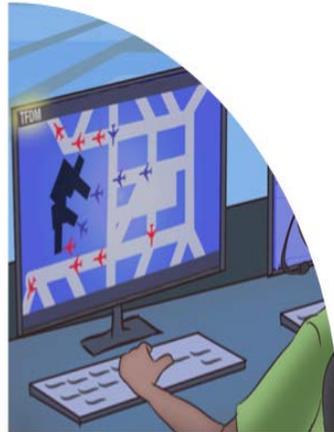


TFDM: Surface Management and Electronic Flight Data



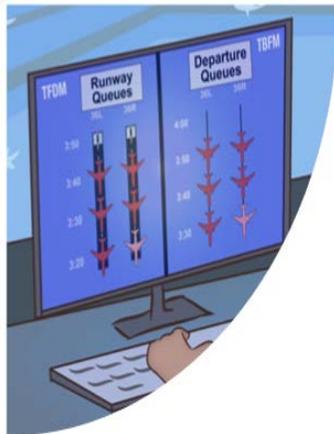
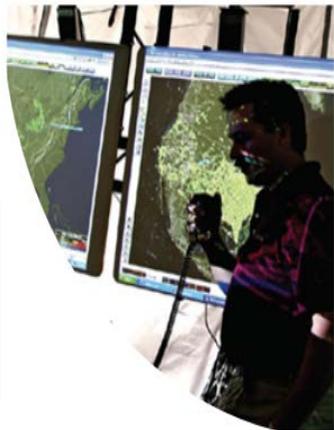
TFDM is an acquisition program with four components

Electronic Flight Data
Integrated flight, surveillance and traffic management information in the Control Tower



Surface CDM
Departure Queue Management (DQM)

System Consolidation
AEFS, DSP, EFSTS, SMA, ARMT



Surface TFM
Strategic Runway Balancing



Notional Implementation Overview

- **Where are we?**
 - Completing business case analysis
 - Source selection
 - FID targeted for May 2016
- **Program risks:**
 - FAA Funding
 - Participation concerns

Multi-build Implementation Strategy



Build 1

Full hardware development to support the deployment of Builds 2&3, EFS/EFD, Interfaces, Runway Assignment Predications, Basic Load Balancing, SSA viewer (through TFMS)

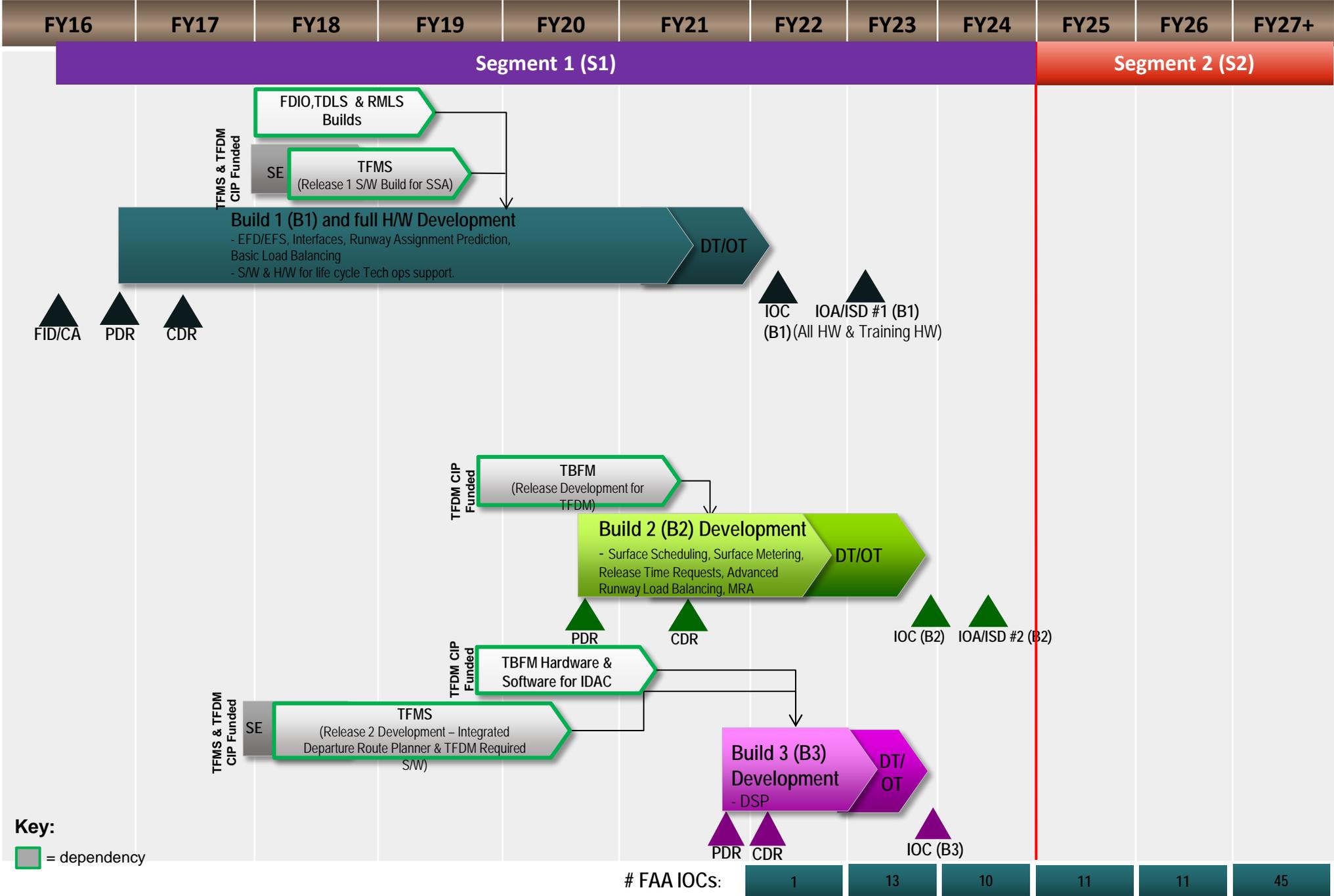
Build 2

Surface Scheduling, Surface Metering, Advanced Runway Load Balancing

Build 3

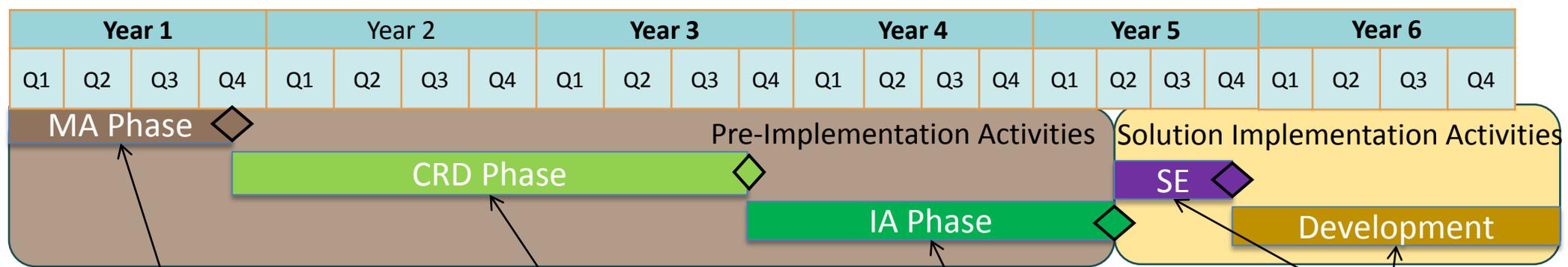
DSP Replacement

TFDM Notional Implementation Timeline





How do Things get into the System



Ends in Concept & Requirements Definition Readiness (CRDR) Decision

1. Shortfall documented.
2. Plan for addressing shortfall.

Effort lead by: AJV-7, AJM-22 awareness.

OPS and Industry Stakeholder input: Moderate – What problems to address, definition of needs/solution space.

Ends in Investment Analysis Readiness Decision (IARD)

1. Concept of Operations.
2. Functional Analysis.
3. Shortfall Quantified (Benefits pool).
4. Preliminary Program Requirements.
5. Range of Alternatives (historically waived for CATMT WPs due to set implementation path).

Effort lead by: AJV-7, AJM-22 involvement increases to take over lead during IA phase.

OPS and Industry Stakeholder input: High – Concept and Requirements development/validation.

Ends in Final Investment Decision (FID)

1. Final Program Requirements.
2. Business case development
3. Implementation Strategy.

Effort lead by: AJM-22, AJV-7 awareness.

OPS and Industry Stakeholder input: Low – Requirements near final.

Ends in System Design

1. Changes to SSS, IRS, SSDD, HAD.
2. ECP
3. Transition Strategy.

Effort lead by: AJM-22.

OPS and Industry Stakeholder input: Low – transition.

Ends in Deployment

1. SW Req'ts & Design.
2. Testing
3. Deployment.

Effort lead by: AJM-22, AJV-7 & NextGen awareness.

OPS and Industry Stakeholder input: High – CHI, Procedures, Testing.



Candidates for TFMS WP4 (FY16 – FY20)

- Working toward FID in September
 - Resized from 5 capabilities to two (50% cut)
- Possible Candidates

Final Prioritization – Based on Initial list with Cross-Domain Analysis

1. Integrated Departure Route Planning (TFDM Dependency)
2. Improving Demand Predictions
3. AAR Decision Support
4. Integrated TMI Modeling 
5. Arrival Route Status and Impact

Candidates for TFMS WP5 (FY20 – FY25)

- **AJV-7 Working future enhancements**
 - CDM workgroups included in HITLS
- **Possible Candidates**
 - Advanced Rerouting
 - Constraint Prediction, Monitoring, and Alerting improvements
 - Operational Response Demand improvements
 - TFM System Performance Analysis Capability

Note: Capabilities that may be deferred from CATM-T WP4 would be candidates for CATM-T WP5.

Advanced Rerouting Concept

1) What if flights could remain on their desired trajectories longer, only receiving reroutes when certainty of weather is high?

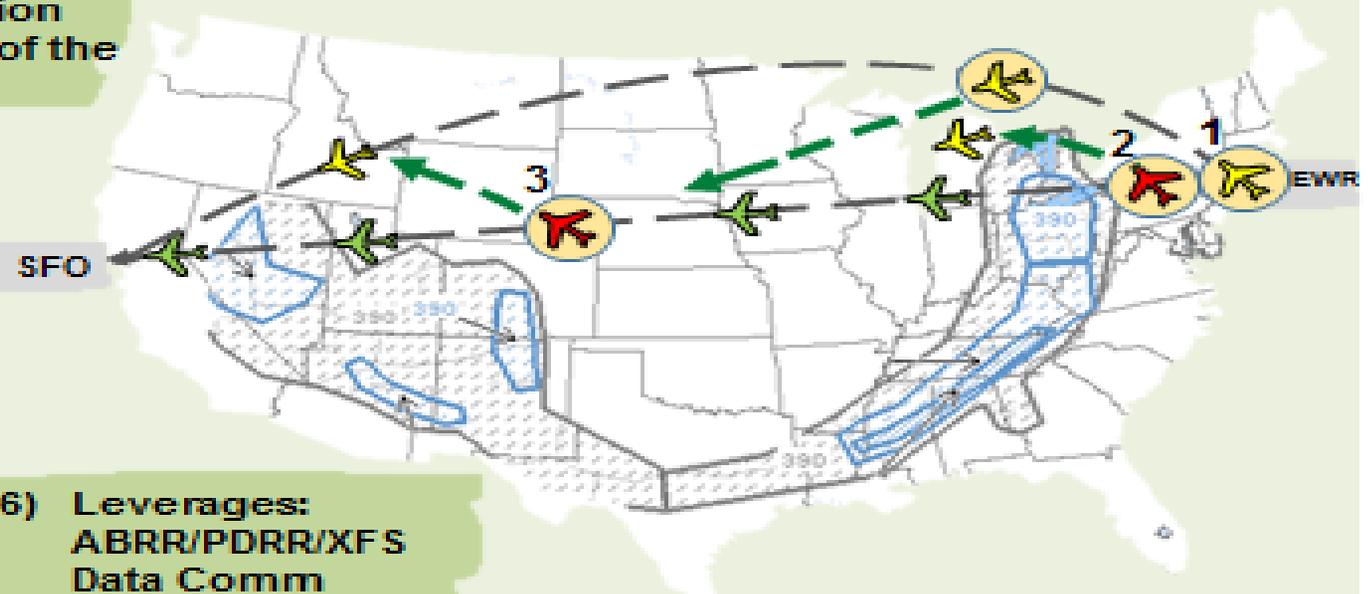
2) As constraints develop, most flights are permitted to depart on desired routes.

3) While en route, automation detects a delay reduction opportunity for flight 1.

4) As Data Comm equipped flights 2 and 3 approach constraints, automation identifies the effects of the constraints.

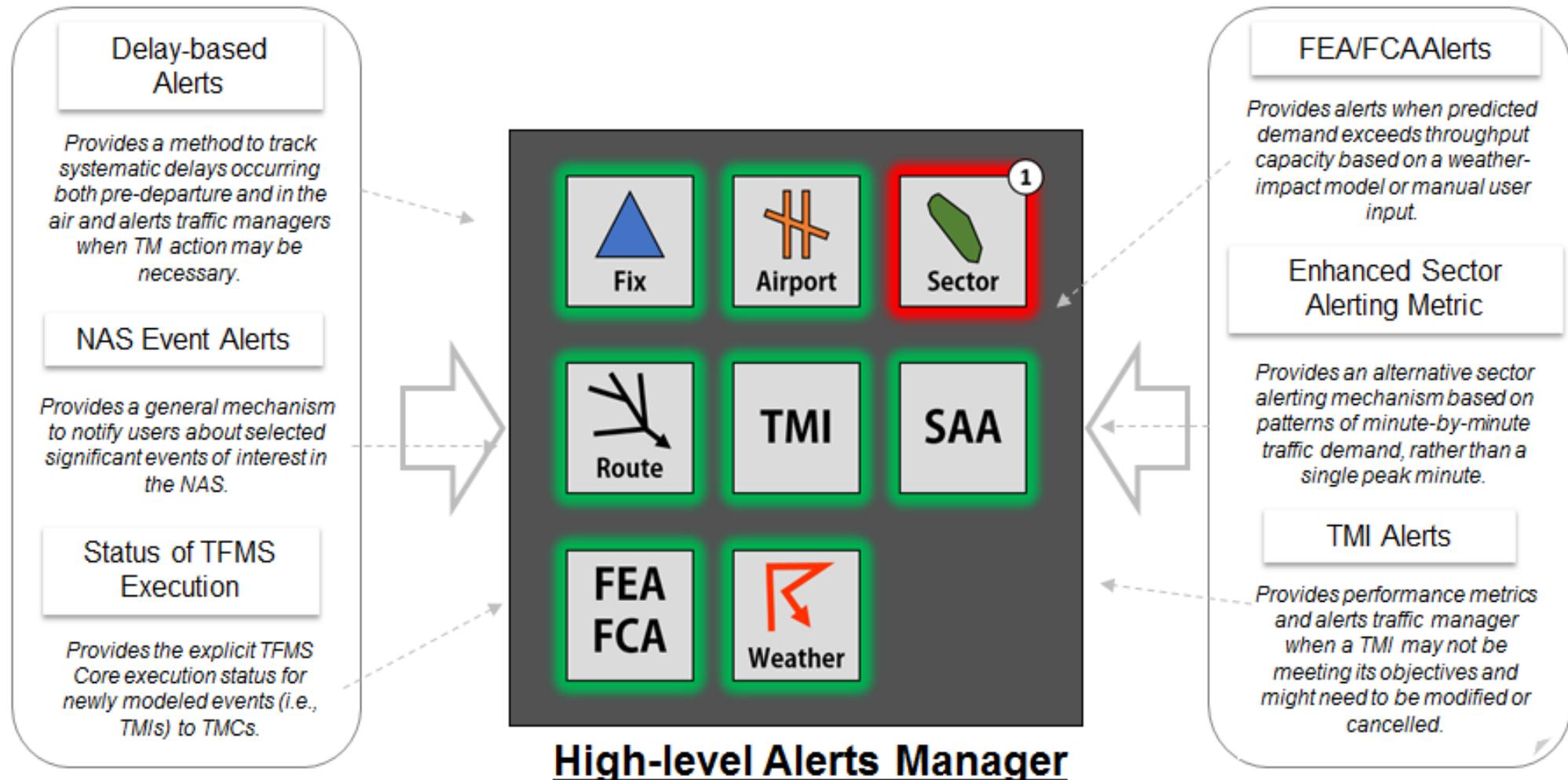
5) To mitigate effects, automation develops trajectory modifications, facilitates coordination and facilitates rapid execution.

6) Leverages:
ABRR/PDRR/XFS
Data Comm



Constraint Prediction, Monitoring and Alerting

Enhanced Alerting Capabilities provides new alerting capabilities and improvements to existing alert functions.



A high-level alerting capability that allows traffic managers to **customize** their interface based on their assigned tasks and on individual and regional sensitivities and/or preferences.

Operational Response Development

Every 2 hrs. (or as needed)

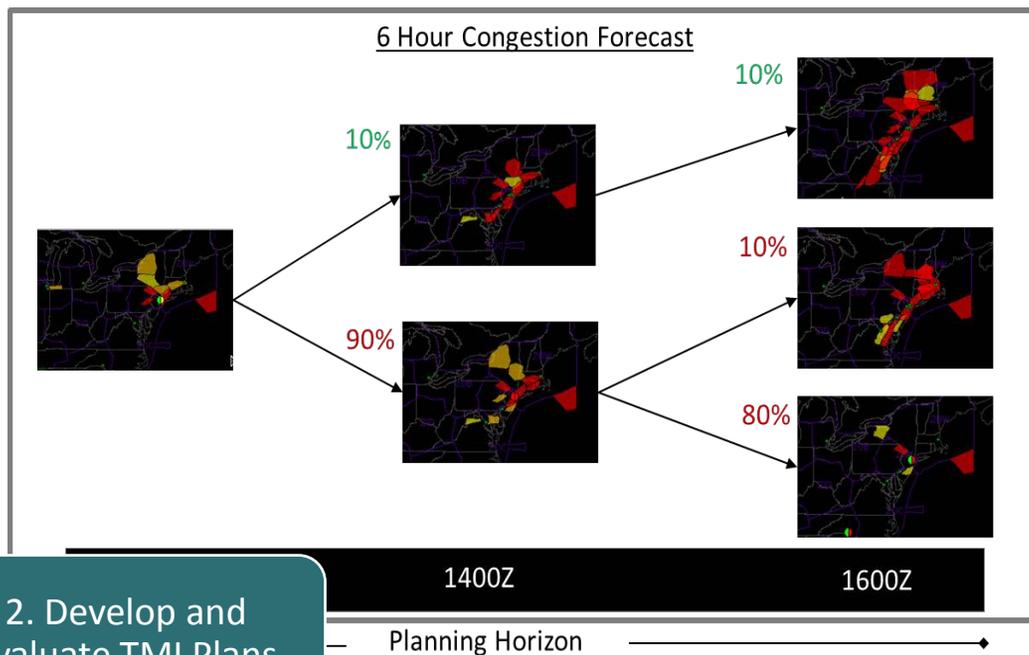
1. Predict Congestion

4. Implement TMI Plan



3. Select TMI Plan

2. Develop and Evaluate TMI Plans



ORD augments the process by integrating information and automation to *reduce* cognitive workload, *promote* transparency, and *improve* performance.

TFM System Performance Analysis Capability (TFM-PAC)

- Similar Event Analysis

Reference Day

Similar Search Match

Other Comparison Analysis Data

Reference Day TMIs

Similar Day TMIs

Region	City	Time	Severity	Category	Impact
Midwest	ORD	GS 1423 1630	2	WEATHER / THUNDERSTORMS	(Manual) ZAB ZLC ZAU ZDC ZFW ZKC ZME ZMP ZDV ZBV ZOB ZJX ZID ZTL ZNY CYHZ CYOW CYUL CYYZ
Midwest	ORD	GS 1915 2045	0	WEATHER / THUNDERSTORMS	(Manual) ZAU ZKC ZMP ZOB ZID CYH CYOW CYUL CYYZ
Midwest	ORD	GS 2307 0010	1	WEATHER / THUNDERSTORMS	(Manual) ZAU ZKC ZMP ZOB ZID CYH CYOW CYUL CYYZ
Midwest	ORD	GS 0010 0130	1	WEATHER / THUNDERSTORMS	(Manual) ZAU ZKC ZMP ZOB CYHZ CYOW CYUL CYYZ

Region	City	Time	Severity	Category	Impact
Midwest	ORD	GS 1314 1412	0	WEATHER / THUNDERSTORMS	(Manual) ZBW ZOB ZNY CYHZ CYOW CYUL CYYZ
Midwest	ORD	GDP 2300 0142	1	WEATHER / THUNDERSTORMS	1400
Midwest	ORD	GS 2310 0007	4	WEATHER / THUNDERSTORMS	(1stTier)
Midwest	ORD	GS 0007 0050	4	WEATHER / THUNDERSTORMS	(2ndTier)
Midwest	ORD	GS 0050 0154	4	WEATHER / THUNDERSTORMS	ALL
Midwest	ORD	GDP 0142 0154	1	WEATHER / THUNDERSTORMS	



BACKUP

The word "BACKUP" is rendered in large, 3D, blue block letters. A thin, grey cord is attached to the top of the letter 'K' and extends downwards and to the right, ending in a blue and white computer mouse. The entire scene is set against a plain white background with soft shadows beneath the letters and mouse.

TFMData Documents

- NAS Service Registry/Repository (NSRR)
 - <https://nsrr.faa.gov/>
 - Purpose: Provides a central, authoritative source of information about all SWIM services available or currently under development. A service enrollment in the NSRR includes:
 - human and machine readable documentation including the XML Schema, WSDL, Interface Control Document replacement (WSDD/JMSDD)
 - R10 TFMData
 - V1.7 Schema
 - V1.9 WSDD
 - R13 TFMData
 - V2.0.5 Schema and JMSDD

DSS Data Client Starter Kit

- **What's included:**

- Sample Java Client
- Tools for MySQL database installation and configuration
- Cloud configuration utilities

- **Fully developed, package will:**

- Ingest Data from NEMS
- Translate XML data into SQL insert statements and write to MySQL database installation
- Enable standard SQL queries on Data

TFMS Technical Webinar Schedule

Next TELCON May 12th, 2016 1:00EST

- Webinar Meeting address:

<https://www4.gotomeeting.com/register/803358471>

- Register ahead of time to receive the bridge number and passcode.
- Send questions or advance TELCON topics to Chris.Burdick@faa.gov and/or Thomas.CTR.Paccione@faa.gov



Acronyms

Acronym	Description	Acronym	Description	Acronym	Description	Acronym	Description
A90	Boston Consolidated TRACON	EA	Enterprise Architecture	Infrast.	Infrastructure	SMA	Surface Movement Advisor
AAR	Airport Arrival Rate	ECP	Engineering Change Proposal	IOA	Independent Operational Assessment	SMD	Surface Management Display
AARDS	AAR Decision Support	eCVRS	Electronic Computerized Voice Reservation System	IOC	Initial Operating Capability	SOW	Statement of Work
ABRR	Airborne Rerouting	EDC	En Route Departure Capability	IP&A	Investment Planning & Analysis	SRM	Safety Risk Management
AEFS	Advanced Electronic Flight Strips	EDCT	Expect Departure Clearance Time	IPRD	Initial Program Requirements Document	SSA	Surface Situational Awareness
AFP	Airspace Flow Program	EDF	Electronic Flight Data	IRS	Interface Requirements Specifications	SSDD	System/Segment Design Document
AIM	Aeronautical Information Manual	EFS	Electronic Flight Strips	ISD	In-Service Decision	SSS	System/Subsystem Specification
AJE	En Route and Oceanic Services	EFSTS	Electronic Flight Strip Transfer System	ISPD	Implementation Strategy Plan Document	STA	Scheduled Time of Arrival
AJM	Program Management Office	EIS	Enterprise Infrastructures Services	ITM	Integrated TMI Modeling	STARS	Standard Terminal Automation Replacement System
AJV	Mission Support Services	EOBT	Estimated Off Block Time	JPDO	Joint Planning and Development Office	STD	Scheduled Time of Departure
AMS	Acquisition Management System	ERAM	En Route Automation Modernization	JRC	Joint Resources Council	STDDS	SWIM Terminal Data Distribution System
ARMT	Airport Resource Management Tool	ETA	Estimated Time of Arrival	LAS	McCarran International Airport	SVT	Surface Visualization Tool
ARSI	Arrival Route Status and Impact	ETD	Estimated Time of Departure	MA	Mission Analysis	SW	Software
ARTCC	Air Route Traffic Control Center	ETMS	Enhanced Traffic Management System	MMAC	Mike Maroney Aeronautical Center	SWIM	System Wide Information Management
ASDE-X	Airport Surface Detection Equipment Model X	Eval.	Evaluation	MTG	Meeting	TAMR	Terminal Automation Modernization and Replacement
ASSC	Airport Surface Surveillance Capability	EVM	Earned Value Management	N90	New York TRACON	TBM	Time Based Metering
ASDI	Aircraft Situation Display to Industry	EWR	Newark Liberty International Airport	NAS	National Airspace System	TBFM	Time Based Flow Management
ATC	Air Traffic Control	F&E	Facilities and Equipment	NCT	Northern California Control Center	TCA	Tactical Consumer Advocate
ATCSCC	ATC System Command Center	FAA	Federal Aviation Administration	NEMS	NAS Enterprise Messaging Service	TDLS	Tower Data Link Services
ATCT	Air Traffic Control Tower	FADE	FAA Airline Data Exchange	NTML	National Traffic Management Log	TDS	Tactical Departure Scheduling
ATS	Air Traffic Systems	FCA	Flow Constraint Area	OIS	Operational Information System	Tech Ops	Technical Operations
C90	Chicago O'Hare TRACON	FDIO	Flight Data Input / Output	OT&E	Operational Test & Evaluation	TFM	Traffic Flow Management
CACR	Collaborative Airspace Constraint Resolution	FEA	Flow Evaluation Area	P ½	Phase 1/2	TFDM	Terminal Flight Data Manager
CATM	Collaborative Air Traffic Management	FIAP	Final Investment Analysis Plan	PBO	Performance Based Operations	TFM-M	Traffic Flow Management Modernization
CATMT	CATM Technologies	FID	Final Investment Decision	PCT	Potomac Consolidated TRACON	TFMS	Traffic Flow Management System
CCFP	Collaborative Convective Forecast Product	FMS	Flight Management System	PDC	Pre-Departure Clearance	TMA	Traffic Management Advisor
CDM	Collaborative Decision Making	FSM	Flight Schedule Monitor	PDMP	Pre-Determined Meter Point	TMI	Traffic Management Initiative
CDR	Critical Design Review	FXA	FCA & FEA	PDR	Preliminary Design Review	TMU	Traffic Management Unit
CIP	Capital Investment Plan	FY	Fiscal Year	PDRC	Precision Departure Release Capability	TPC	TFMS Production Center
CIT	Capital Investment Team	GDPE	Ground Delay Program Enhancements	PDRR	Pre-Departure Reroute	TRACON	Terminal Radar Approach Control
CIWS	Corridor Integrated Weather Systems	GIM-S	Ground Based Interval Management for Spacing	PMO	Program Management Office	TRS-R	TFM Remote Site Re-engineering (Field site software)
CLE	Cleveland Hopkins International Airport	GUI	Graphical User Interface	PO	Program Office	TSD	Traffic Situation Display
CLT	Charlotte Douglas International Airport	HAD	Hardware Architecture Documents	RAPT	Route Availability Planning Tool	UDP	Unified Delay Program
CRD	Concept & Requirements Definition Decision	HITL	Human-in-the-loop	RFI	Request for Information	VP	Vice President
CRDR	Concept & Requirements Definition Readiness Decision	HW	Hardware	RMLS	Remote Monitoring and Logging System	WJHTC	William J. Hughes Technical Center
CSG	CDM Stakeholder Group	I90	Houston Intercontinental TRACON	RNAV	Area Navigation	WP	Work Package
CTOP	Collaborative Trajectory Options Program	IA	Investment Analysis.	RNP	Required Navigation Performance	XFS	Execution of Flow Strategies
CY	Calendar Year	IAD	Washington Dulles	RRIA	Reroute Impact Assessment	ZHU	Houston Air Route Traffic Control Center
DCC	ATCSCC	IARD	Investment Analysis Readiness Decision	S-CDM	Surface CDM	ZLA	Los Angeles Air Route Traffic Control Center
DEN	Denver International Airport	ICR	Integrated Collaborative Routing	SCT	Southern California TRACON	ZMA	Miami Air Route Traffic Control Center
DFW	Dallas Fort Worth International Airport	IDAC	Integrated Departure Arrival Capability	SDF	Louisville TRACON	ZNY	New York Air Route Traffic Control Center
DLC	Departure Clearance Request	IDP	Improved Demand Prediction	SE	System Engineering	ZOB	Cleveland Air Route Traffic Control Center
DoD	Department of Defense	IDRP	Integrated Departure Route Planning	Seg.	Segment		
DSP	Departure Spacing Programs	IDST	Integrated Departure Scheduling Tool	SFO	San Francisco International Airport		
DSS	Decision Support Systems	IID	Initial Investment Decision	SIR	Screening Information Request		
DT	Developmental Test	Info.	Information	SLE	Second Level Engineering		