Airspace Technology Demonstration 2 (ATD-2)

ATD-2 Data Sharing via TFDM Terminal Publication (TTP) Prototype

July 12th, 2018

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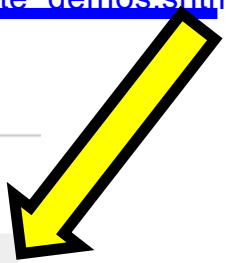
ATD-2 Remote Demo Objectives

- Keep broad group of ATD-2 stakeholders informed of progress in an inexpensive and unobtrusive manner
- Demonstrate actual system capability and lessons learned (as opposed to documents/plans)
- Take input from stakeholders that can be used to improve the ATD-2 system, processes and/or outreach
- Identify areas where more detailed discussion is desired/warranted

Upcoming Demos!

Go to https://www.aviationsystemsdivision.arc.nasa.gov/research/tactical/atd2_remote_demos.shtml to learn about upcoming ATD-2 remote demos!



ATD-2 Remote Demos

To Join…

1. Go to: **https://ac.arc.nasa.gov/atd2/**
   Enter as a guest and type your name. NASA Employees can log-in with their email and password (NDC Credentials).
2. Dial the Telecon Number: **1-844-467-6272**, **Passcode: 592382#**

Demo Objectives

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Upcoming Demos

ATD-2 Data Sharing via TFDM Terminal Publication (TTP) Prototype and Mobile App Use Case	July 12, 7:30-9:00 am PT

Demo Recordings

- The audio and video from this demo are being recorded

ATD-2 Data Sharing Problem

- Sharing of ATD-2 data was in the ATD-2 design and plans from day one.
- Challenges
  - There was no existing data feed that was a fit
  - Can't expect everyone to use ATD-2 tools
  - Even if they could use ATD-2 tools they may still need the data
  - Can't publish over the internet for security reasons
  - Creating individual point to point connections is very time consuming and costly
  - What should the feed look like
  - **We did not want users of the feed to have to throw away any investment and start over when TFDM comes along**

ATD-2 Data Sharing Solution

- Figure out what TFDM is doing
- Implement a prototype based on their requirements and specifications
- Pros
  - Consumers that invest in consuming the data will be able to reuse that same investment when TFDM comes along
  - We can pass lessons learned and recommendations back to TFDM
- Cons
  - The design was still in flux while we were developing

TFDM Terminal Publication (TTP)

- The TFDM TTP Services to be implemented, enable data exchange between TFDM, NAS Systems and the National Airspace System (NAS) users (airlines, air carriers, air freight, military or general aviation/business aviation operators).
- TFDM TTP will transmit data to the data consumers through the National Airspace (NAS) Enterprise Messaging Service (NEMS).
- TFDM TTP will use the publish-subscribe (pub-sub) Message Exchange Pattern (MEP).
- The primary functionality of the TFDM TTP service is to distribute flight and flow data to consumers.

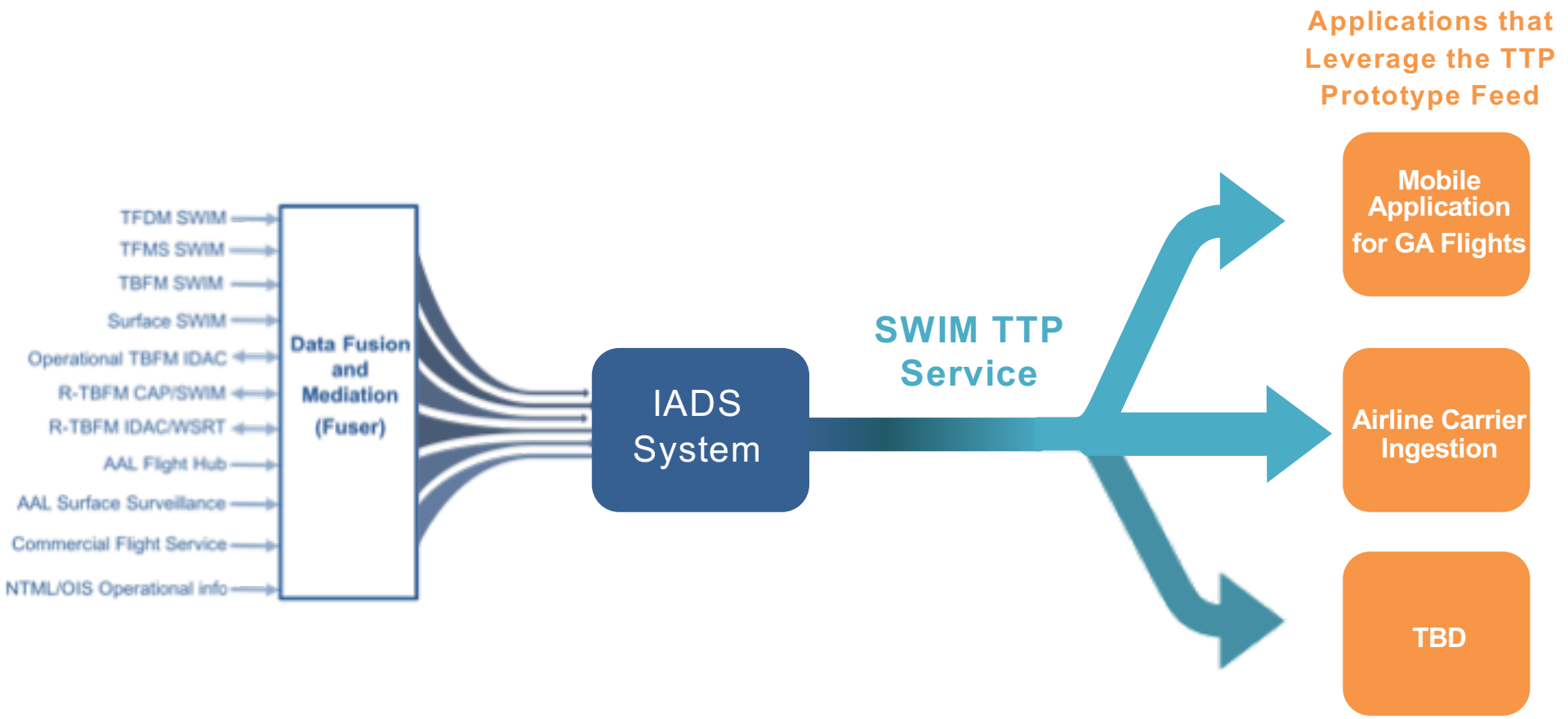
Why TTP?

- Share valuable data with other stake holders
- Automate data sharing avoiding manual inputs
- Data doesn't exist in other feeds
- Doesn't naturally fit into any existing feeds

ATD-2 Implementation of TTP

- Based on TFDM specifications
  - Currently no deviations from TFDM specifications
  - Currently implementation is based on the latest TFDM Build 2 draft specifications.
- Goal - work invested in integrating with ATD-2 via TTP could be utilized with TFDM

IADS and Data Sharing



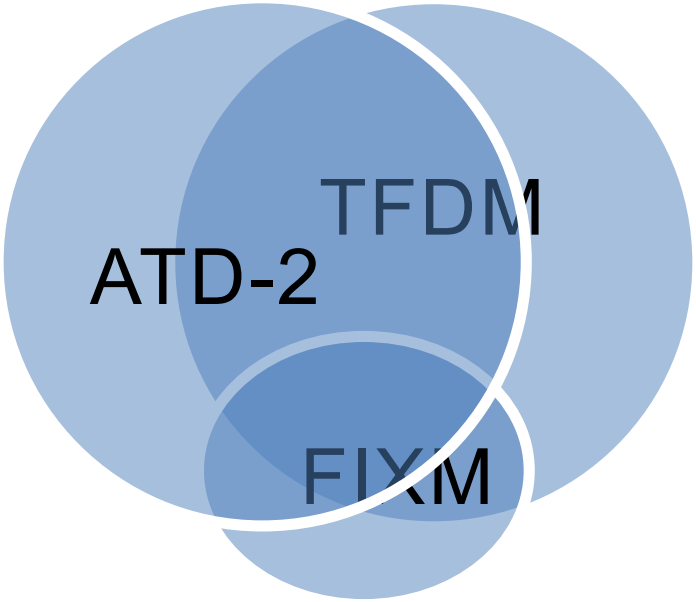
TFDM Terminal Publication (TTP)

- Consists of 6 services
  - Flight Data
  - Airport Information
  - Traffic Management Restrictions
  - Flight Delay Information
  - Operational Metrics
  - Departure Metering Procedure (Not yet implemented)

Data Format

- XML
  - Flight data is in FIXM format
  - Airport Information and Traffic Management Restrictions use a schema defined by the TFDM team

Limitations



- Program intersection limitation
  - NASA ATD-2 has data that is not in the TFDM requirements
  - NASA ATD-2 does not have all the data to fill the TFDM requirements.
  - TFDM is expected to produce all flight data in FIXM format
  - FIXM does not currently support everything TFDM will need to publish
- Not a one stop shop
  - TTP generally not intended to include data that is found in other feeds

TTP Services

Service	Includes
Flight Data	Individual flight updates containing flight identifiers, targeted times, actual times, runway, parking gate, spot, departure fix (predicted, assigned, actual as appropriate), flight states, and more
Airport Information	Airport configurations, airport and runway rates, ramp closures, runway closures, taxiway closures
Traffic Management Restrictions	Call for Release programs departure MIT/MINIT restrictions, departure stop/ground stop programs. Along with list of impacted flights for each
Flight Delay	Airport and runway delay by arrival, departure, and total
Operational Metrics	Metrics on airport throughput and individual flight metrics
Departure Metering Procedure	Departure metering procedure data and parameters

TTP Services

Name	Event Driven	Full Update	TFDM Requirements	Implemented
Flight Data	Yes	Every 15 minutes	Build 2	Yes
Airport Information	Yes	Every 15 minutes	Build 2	Yes (subset)
Traffic Management Restrictions	Yes	Every 15 minutes	Build 2	Yes (subset)
Flight Delay	Yes	Every 15 minutes	Build 2	Yes (subset)
Operational Metrics	No	Every 1 minute	Build 2	Yes (subset)
DMP	Yes	Every 15 minutes	Build 2	No

We will continue to track and align with TFDM as much as possible

TTP Message Types

Name	Message Types
Flight Data	Flight Add, Flight Update, Flight Delete, Flight Notification, System Start, Periodic Start, Periodic End, Heartbeat
Airport Information	AirportInformation, System Start, Periodic Start, Periodic End, Heartbeat
Traffic Management Restrictions	TrafficManagementRestrictions, System Start, Periodic Start, Periodic End, Heartbeat
Flight Delay	Flight Delay, System Start, Periodic Start, Periodic End, Heartbeat
Operational Metrics	OperationalMetrics, Heartbeat
DMP	DepartureMeteringProcedure, DmpParameter, System Start, Periodic Start, Periodic End, Heartbeat

Headers are Important

- Use to filter data
- Use to route data
- Some messages do not have a body
  - Heartbeat
  - SystemStart
  - PeriodicStart
  - PeriodicEnd
- Indicate sync vs. real time message

TTP Headers

Header	Flight Data	Airport Information	Traffic Management Restrictions	Flight Delay	Operational Metrics
DATA_GROUP	Yes	Yes	Yes	Yes	Yes
MESSAGE_TYPE	Yes	Yes	Yes	Yes	Yes
AERODROME	Yes	Yes	Yes	Yes	Yes
AIRLINE	Yes	No	No	Yes	No
SYNC	Yes	Yes	Yes	Yes	No
TIME_STAMP	Yes	Yes	Yes	Yes	Yes
PRIVACY_LEVEL	Yes	No	No	Yes	Yes
TFDM_RELEASE	Yes	Yes	Yes	Yes	Yes
SCHEMA_VERSION	Yes	Yes	Yes	Yes	Yes
TIME_STAMP	Yes	Yes	Yes	Yes	Yes
UUID	Yes	Yes	Yes	Yes	Yes

Sync

- Pay attention to the sync
  - Most services have a periodic sync
  - Occurs every 15 minutes (configurable on the server side)
  - A full dump of all the latest data for that service is published
  - Pros and Cons:
    - Pros
      - You are guaranteed to know about all data within 15 minutes.
      - If you miss or drop a message you get the full state the next 15 minute sync
    - Cons
      - You can not request a sync
      - Can be confusing if not accounted for in the data processing
      - Additional processing load
      - Could be getting messages and nothing has changed

Flight Data Sync Example

- A sequence of messages are published
  - Periodic Start Message
  - A Flight Add Message for each flight
  - Periodic End Message

DATA_GROUP	MESSAGE_TYPE	SYNC	MESSAGE BODY	Notes
FlightData	PeriodicStart	per	Empty	Periodic sync has started
FlightData	FlightAdd	per	xml	All data on flight1
FlightData	FlightAdd	per	xml	All data on flight2
FlightData	FlightAdd	per	xml	All data on flight3
FlightData	PeriodicEnd	per	Empty	Periodic sync has ended

What are we doing with TTP

- Use cases
  - Mobile App
  - TOBT Sharing with airlines

Mobile App Use Case

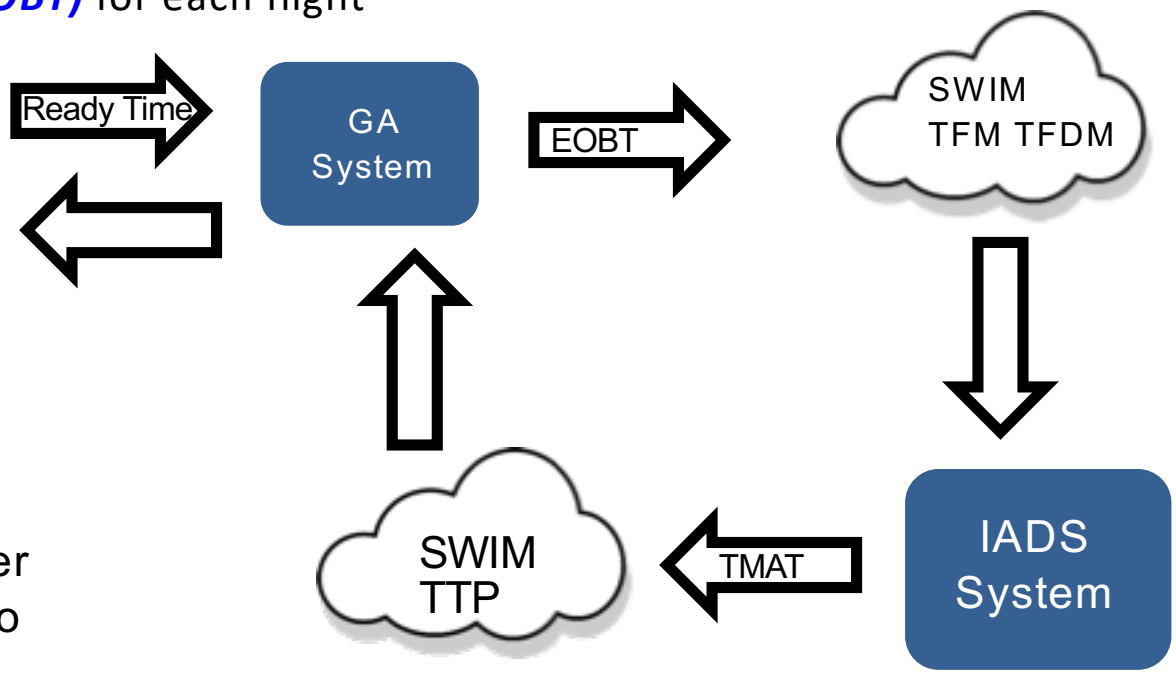
Mobile App

- Prototype App developed by MITRE (sponsored by FAA/ANG)
- Purpose: Enable General Aviation (GA) flights to participate in ATD-2 by submitting a ready-time for each flight
- MITRE Beta-Test (Phase 1): October 2017 – Present
- Participants: (5) GA Flight Operators (~17 pilots installed App)
- Overall participation rate: 25% – 35% (as of January '18):
  - Sonic Aviation* (60%), Family Dollar (40%), Davinci Jets (15%), Bank of America, Coca-Cola Bottling Company*

    *GA User Forum attendee
- Mobile device: iPhones

Information Sharing via Mobile App and TTP

Pilots submit a ***Ready-to-Taxi Time (RTT) / Earliest Off-Block Time (EOBT)*** for each flight via App



Pilot can now tell passengers to either relax or get ready to leave

OR

TOBT Sharing Use Case

Sharing of TOBT with Airlines

- Potential areas where planning can be improved with advanced notice of gate hold
  - Decision to keep the doors open longer to allow passengers to make connections
  - Baggage loading
  - Pushback crews

- TTP would allow for an automated way to receive the data to be integrated into other systems

Where are we now?

- Consuming EOBT from AAL and other airlines via TFM TFDM
- Consuming EOBT from some GA flights via Mitre Mobile App
- ATD-2 System ready to publishing TTP data to SWIM R&D for CLT
- Mitre Connected
- AAL On ramped and will be consuming soon

How to access ATD-2 TTP feed

- Work with SWIM to establish a connection to SWIM R&D if you don't already have a connection
  - If you already have a connection getting access to TTP will be pretty straight forward.

- Subscribe to SWIM R&D TTP feed via a new queue that will be established for each stake holder

- Work with ATD-2 team on how to utilize the information

Next steps

- Continue working with stake holders to consume TTP data
- Continue to incorporate additional build 2 features and modifications from TFDM
- Provide continuous feedback to TFDM

Questions