SWIFT: Day 1

SWIM Developer's Workshop

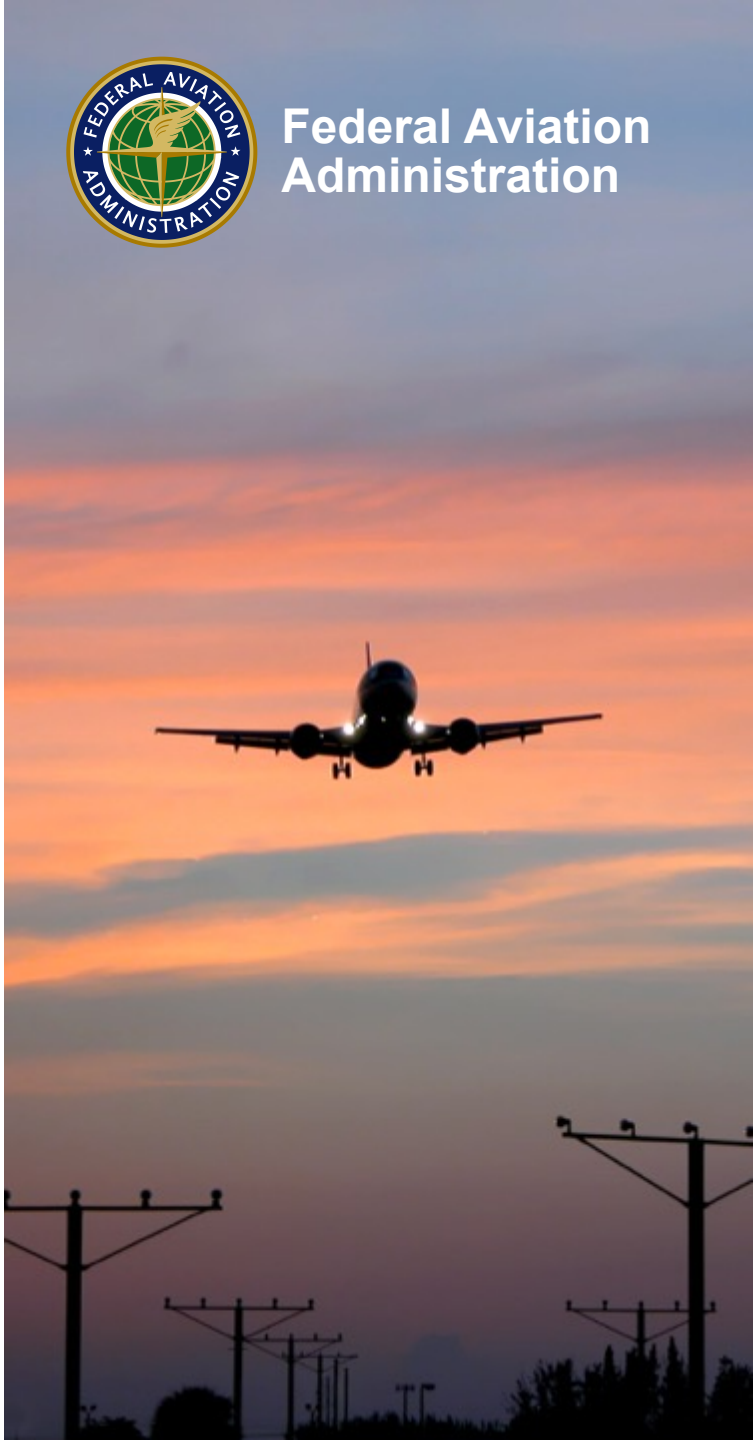
SWIM, Services & SWIFT (SWIM Industry-FAA Team)

FAA SWIM Program

Communications, Information and Network Programs

February 25th, 2020

Federal Aviation Administration



Welcome to FedEX - UOM

- **Internet Access Credentials:**
  - *Network: ftc-conf*
  - *Password: fedex-conf*

SWIFT Collaborative Workshop #9 Day 1
February 25, 2020 – Memphis, TN

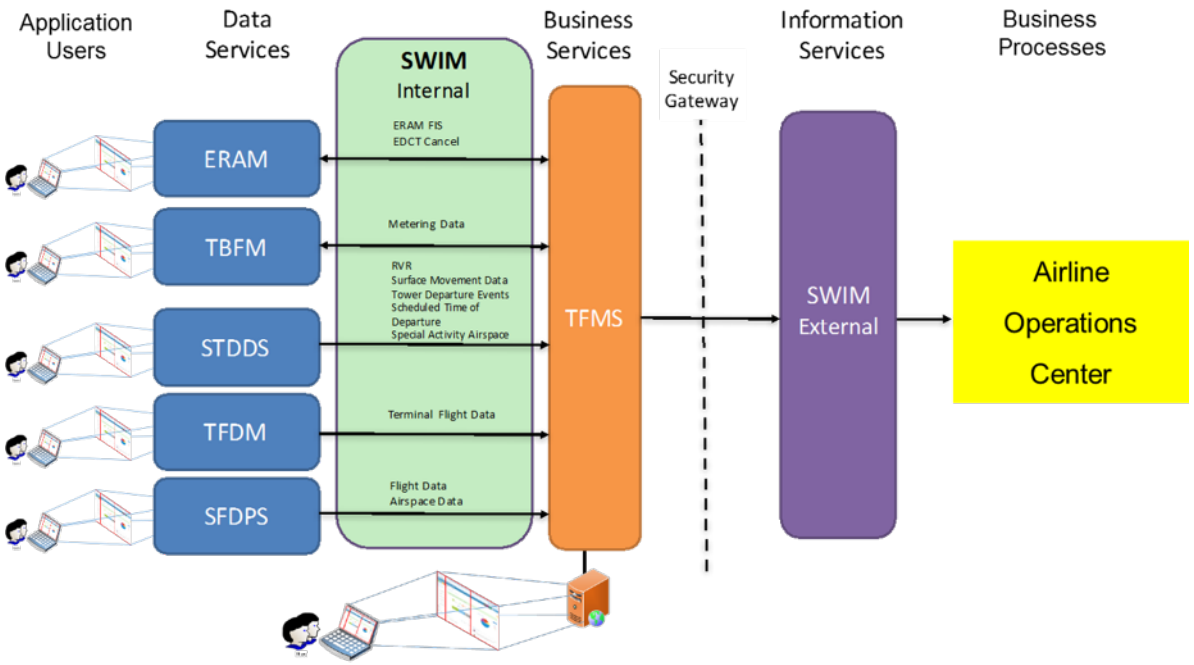
- Welcome, initial high level SWIFT introduction and agenda overview
- Accessing SWIM & Subscribing to data services via SCDS
- SWIFT Operational Context Focus Group & Ops Context Docs
- Using Jumpstart Kits to advance data collection & development
- Hands-on development activities

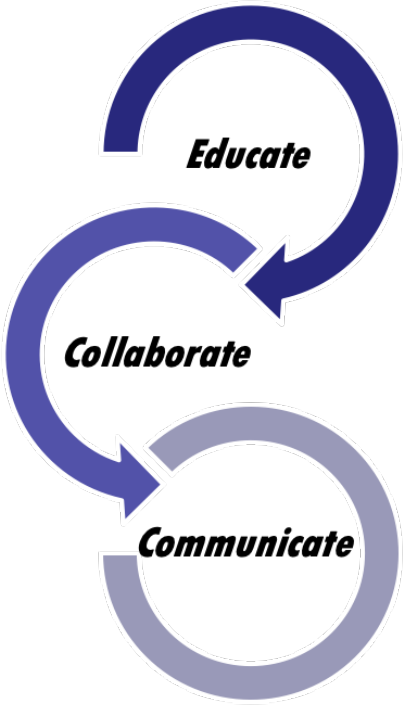
Class Pre-requisites:

- Users come in with SCDS logins already established
- A small, notional problem statement identifying a problem they might want to solve
- Consider the type of data services that might apply
- Download and review Ops Context document, if available, for the relevant data set

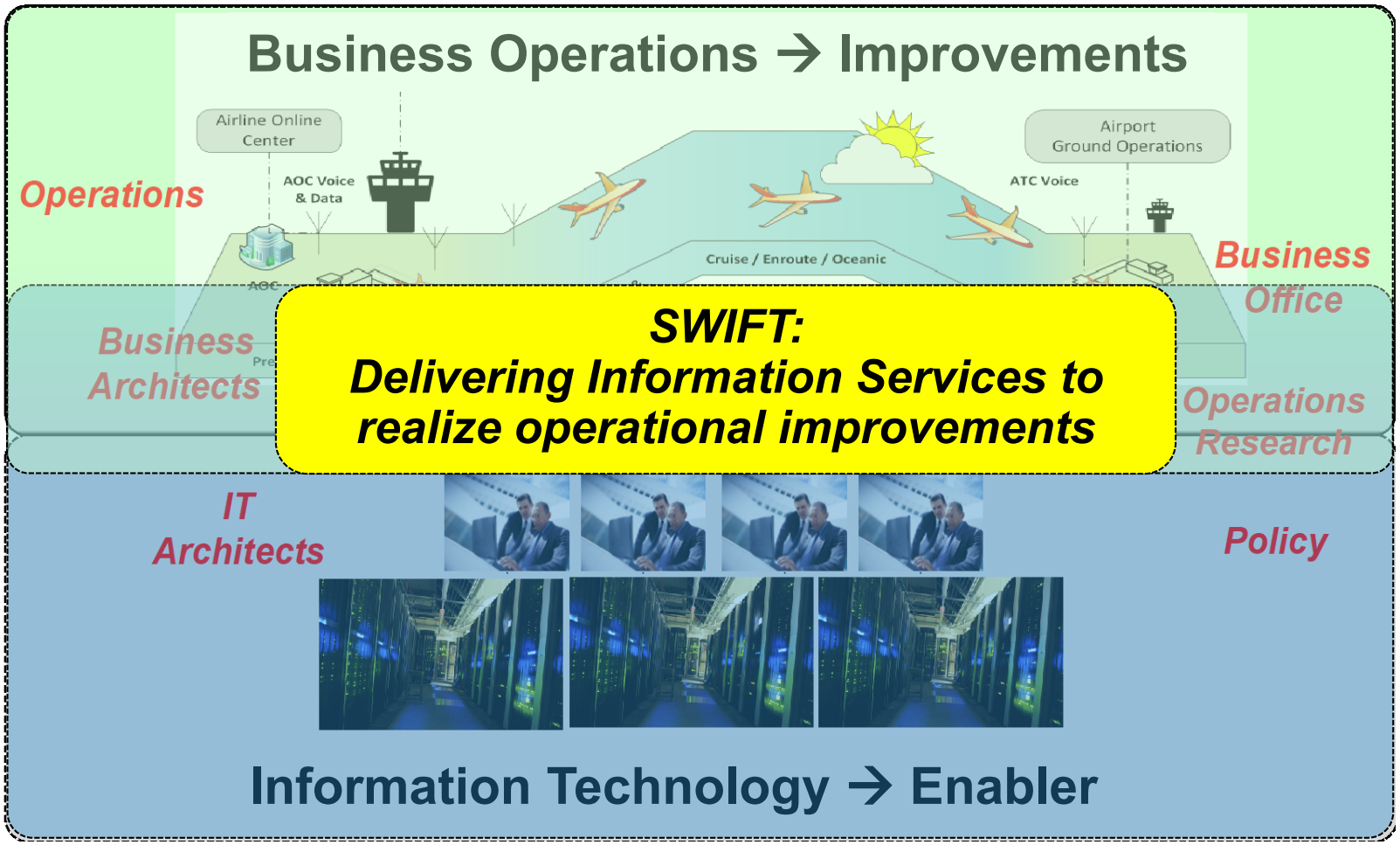
SWIM Industry FAA Team (SWIFT)

- **SWIFT addresses industry recommendation to:**
  - Establish a community forum that acts as a single environment 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





Technology: Enabling Operational Improvements



Educate: SWIM Information Services & AvOps

Executive Summary

- **Environment:**
  - Summary of the situation (area within operations affected, etc.)
  - This is intended to help set the stage for the topic to be addressed
- **Problem statement:**
  - Single statement that concisely defines the nature of the problem
  - The goal is to narrow the nature of the problem helping to identify the type of NAS systems and decision-making is involved
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- **Goal:**
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Case Study Overview

- **Case study overview**
  - Maximum 1 to 2 slides
  - Words that elaborate the problem statement & discussion
  - Discussion points as necessary to describe the problem
  - Information here may include relevant business process references involved in executing the operation
- **Slide that illustrates the environment & operational systems involved in the case study**
  - 1 to
  - Gra
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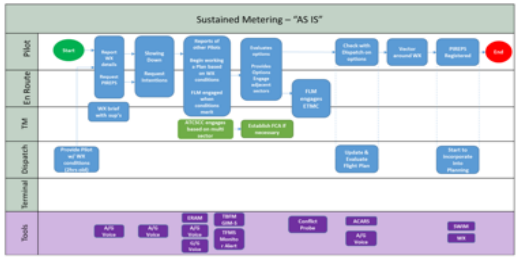
Operational Workflow

- **Description of the workflow**
  - Actors involved in the operation & work being performed
  - This can include process flow charts, etc.
  - How actors achieve their work (ie, references to relevant systems)
  - Associated performance metrics that are affected by the operation



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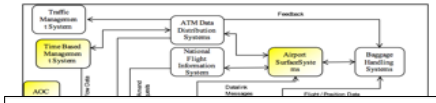
Operational Support Systems

- **Identification Systems Involved**
  - List of systems involved in the work being performed
    - Examples include tools used by the Actors in executing the work
  - Generic system names (internal system, or 3rd party COTS, etc.)
  - Example: airport surface tool, or 3rd party airport surface viewer



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Open Discussion Q&A Forum

- **Questions**
  - These are questions you'd like to ask about the NAS operation
  - The goal of this discussion is to:
    - Generate discussion between the operations folks
    - Identifying the underlying NAS system
    - Identify currently available SWIM information services that might help
    - Engage in discussion on context of data, as it relates to the problem

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ALTERNATIVE VIGNETTES

Enhanced Situational Awareness and CDM Interaction

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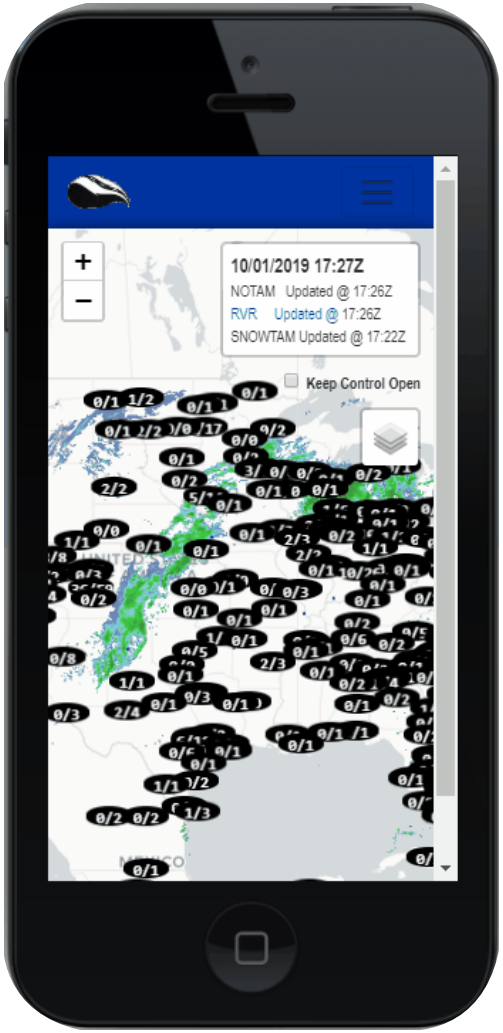
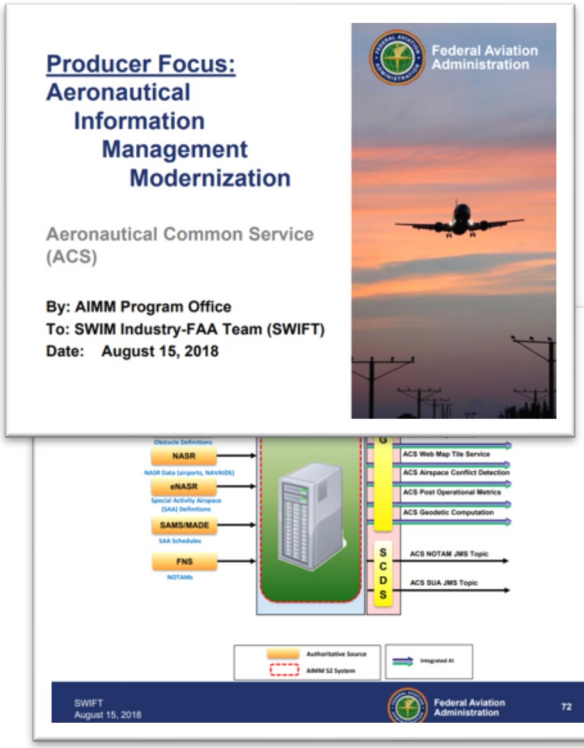
Collaborate: SWIFT Community Concepts
SWIM Applications Developed by Industry

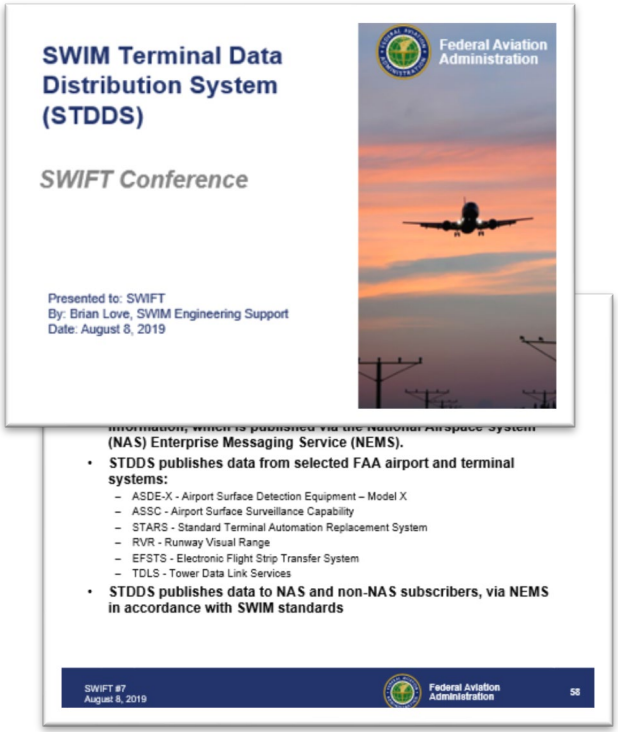
- **Prototype Developed by United Airlines Developers**
  - Alternate airport availability
  - Traffic Management Initiatives
  - Traffic Flow Management Restrictions
  - Runway Configuration
  - Runway Visual Range
  - D-ATIS
  - Terminal Area Forecast
  - Departure Route Availability
  - More!



Communicate: Operational Context Documents

New Information Service and Operational Implications





SWIFT Focus Group: Operational Context & Use Case Documents

Update on Focus Group

Ray Mitchell

SWIFT Support Engineering

February 25th , 2020

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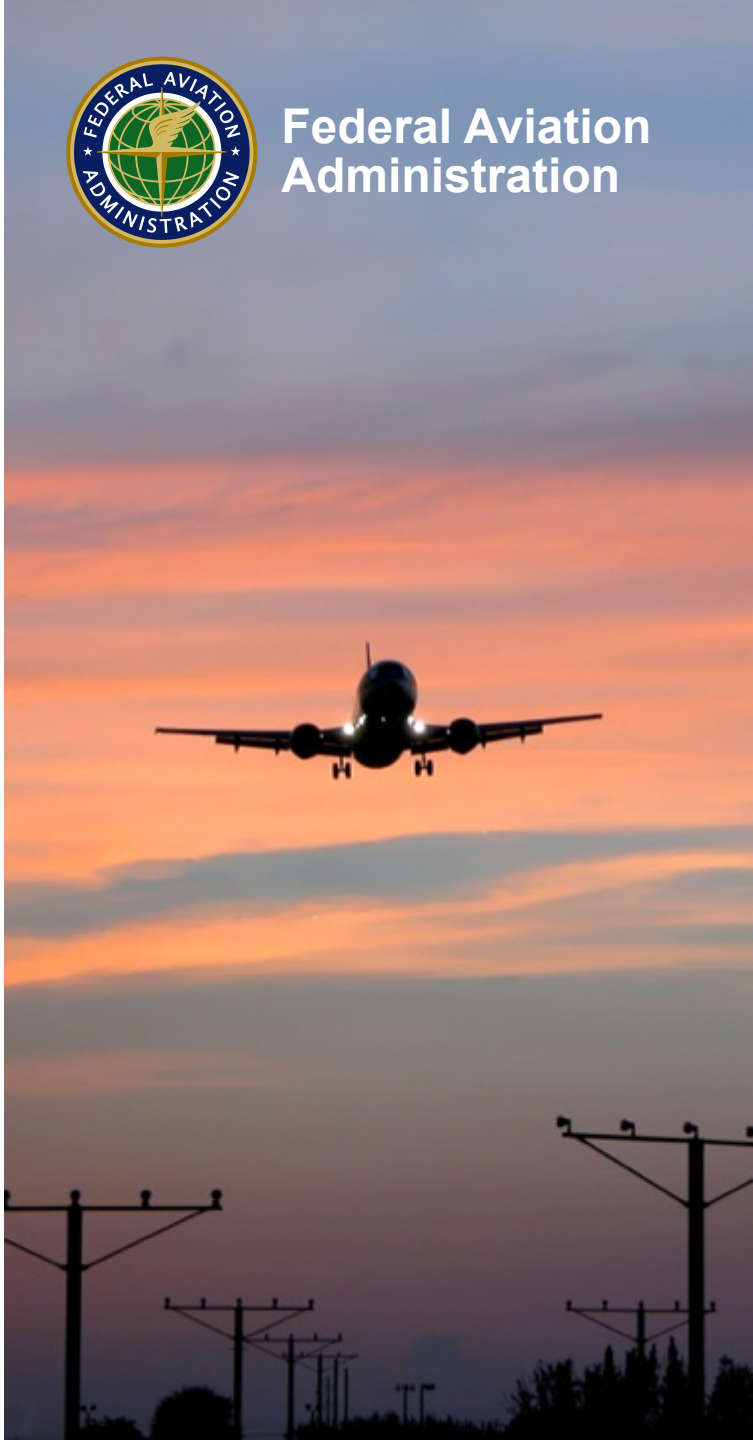
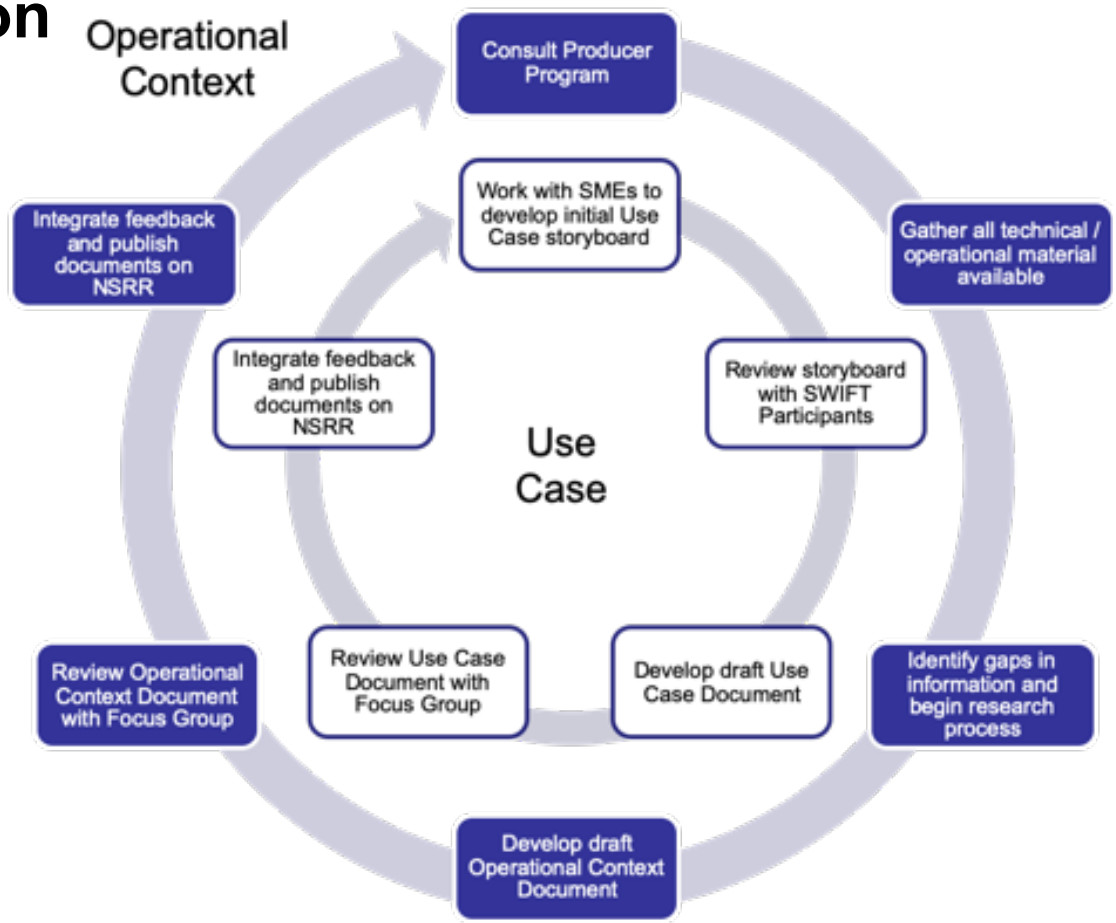


Focus Groups

Operational Context for SWIM Data

- **SWIFT Participation on Operational Context and Use Case Documents**
  - Participants provide comments
  - Structure of feedback & nature of questions answered meeting
- **Engage SWIFT Participants in development of Ops Context & Use Case Documents**



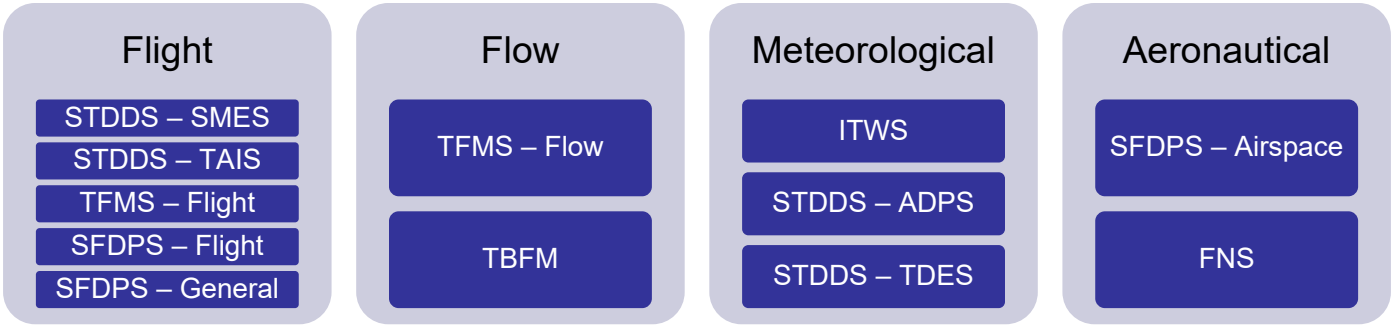
Operational Context Documents Produced

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 UNDER REVIEW	
	SFDPS Airspace Data Query DELIVERED	STDDS TDES DELIVERED		
	ACS Data Subscription IN DEVELOPMENT	SFDPS General DELIVERED		
		TFMData Request/Reply DELIVERED		
		SFDPS Flight Data Query UNDER REVIEW		

Focus Group will continue to develop documents as new SWIM services come online

Use Case Documents

- **Documents Produced**
  - Individual Information Service Documents
    - STDDS – SMES ✓ DELIVERED
    - TFMS Flow ✓ DELIVERED
    - TFMS Flight ✓ DELIVERED
    - TBFM – MIS ✓ DELIVERED
    - SFDPS – Flight ✓ DELIVERED
  - Domain Information Service Documents
    - Flight Domain ✓ DELIVERED
    - Flow Domain ✓ DELIVERED
    - Meteorological Domain ✓ DELIVERED
    - Aeronautical Domain ✓ DELIVERED
- **Focus Group will revisit existing use cases as new SWIM information services come online to see if they need to be updated**



Where to Find SWIFT Documentation?

- **NAS Service Registry and Repository (NSRR) is the FAA web site with detailed information about all existing and planned SWIM services**
- **Site registration takes seconds, recommended for all SWIM users**
- **SWIFT Operational Context and Use Case documents can be found at: https://nsrr.faa.gov/library**

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

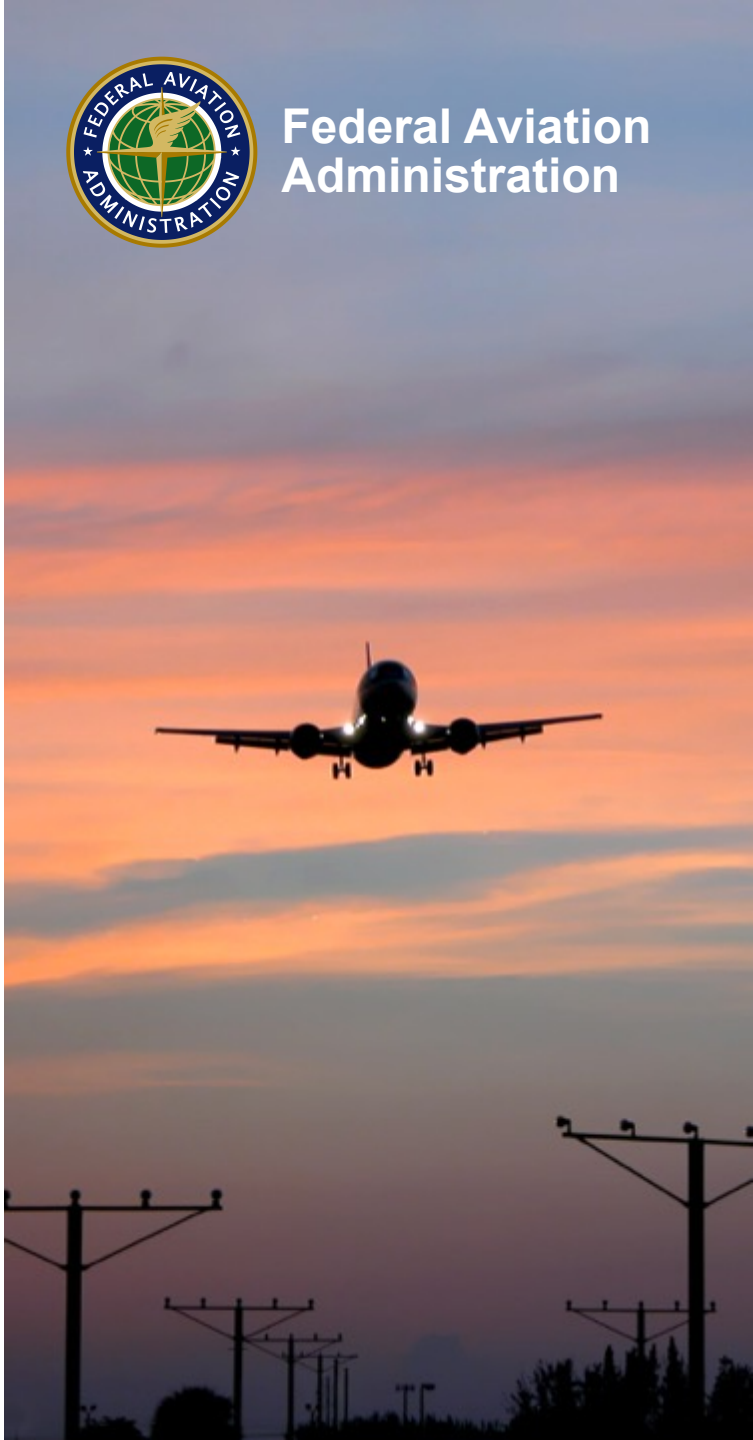
SWIFT

Developer Activities

Alex Murray

SWIM Engineering Support

February 25th , 2020

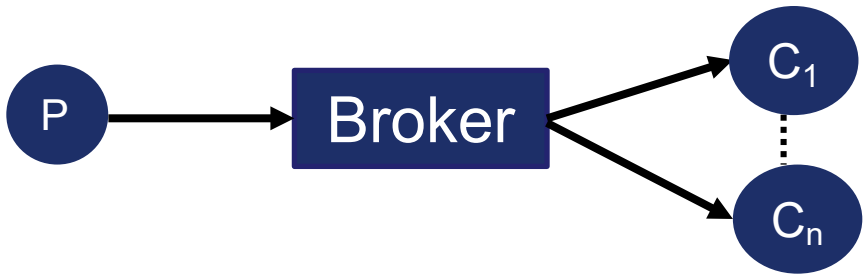


SWIM JMS Overview

- **Java Messaging Service (JMS)**
  - A Java messaging API for sending messages between two or more clients and was primarily introduced to solve the producer-consumer problem.
  - Requires messaging middleware, such as a broker, to facilitate the transfer of messages between endpoints.
  - Assumes responsibility for the message distribution, providing for a complete decoupling of the producer and consumer.

- **JMS in FAA SWIM**
  - JMS provide the publish/subscribe message exchange pattern to support event based notifications of NAS state changes to:
    - Airspace, Flights, Weather, and Aeronautical Information (e.g. NOTAMs)
  - Some services, such as TBFM MIS, also use JMS to provide a reconstitution capability via the publish/subscribe pattern.
  - JMS can also support, and is used by TFMS, to provide a request/replay messaging pattern.
  - Subscriptions provide routing of messages to only consumers who subscribe to them.

Event A: Flight Plan Filed
→ Publish Flight Plan Message
Event B: Flight Departs
→ Publish Departure Message
Event C: Radar Track Update
→ Publish Track Message
Event D: Flight Arrives
→ Publish Arrival Message



Subscription
Flight Plan Message
Departure Message
Arrival Message

Subscription
Flight Plan Message
Track Message

Development Activity Overview

Connect and Consume TFMS Flight, Flow, Status

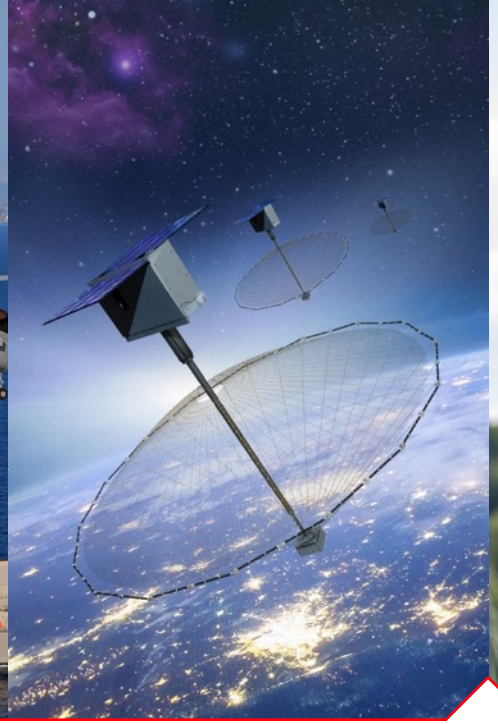
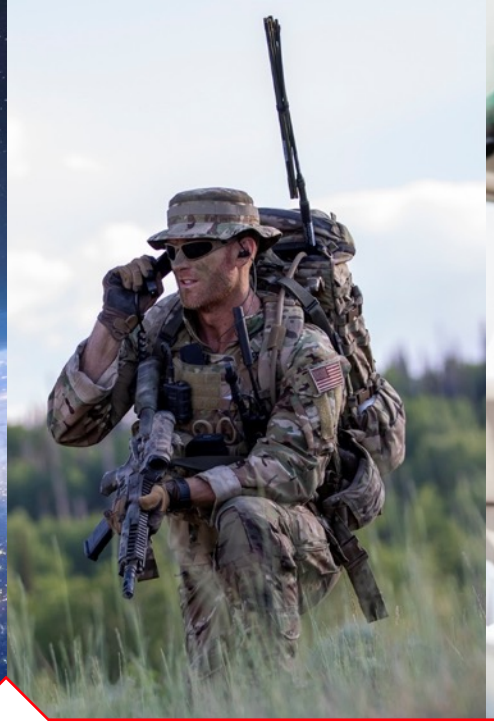
Create a Simple TFMData Microservice from the JumpstartKit

Create JAXB Bindings to Unmarshal XML into Object

Create a simple TFM Flight, Flow, and Status Database

Expose the TFM Data via a set of RESTful APIs

Demonstrations Using the API and a Real-Time Dashboard Using a BI Tool


L3HARRIS™

SWIFT #9 DEVELOPER DAY: USING THE JUMPSTART KIT

To jumpstart your use of SWIM data

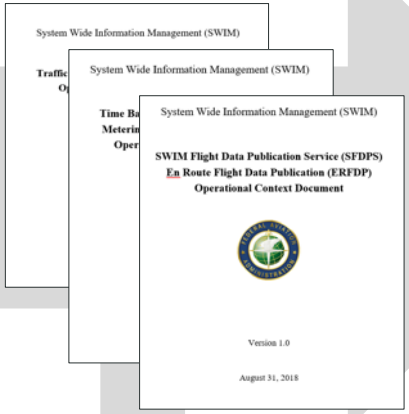
February 25th , 2020 **DOUG HARVEY**

The Concept

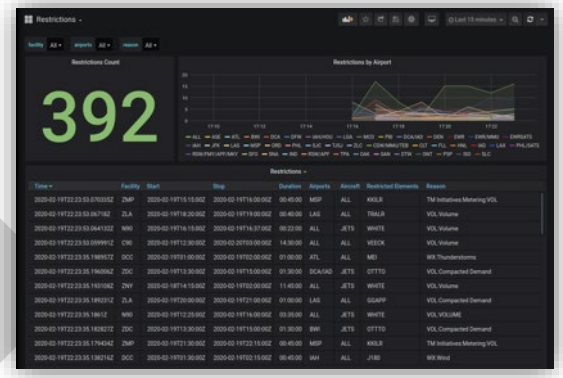
https://nsrr.faa.gov

https://scds.swim.faa.gov

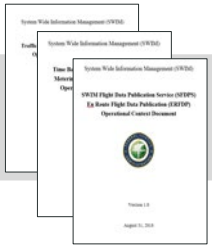
Operational Context & Technical Docs



Sample Widgets



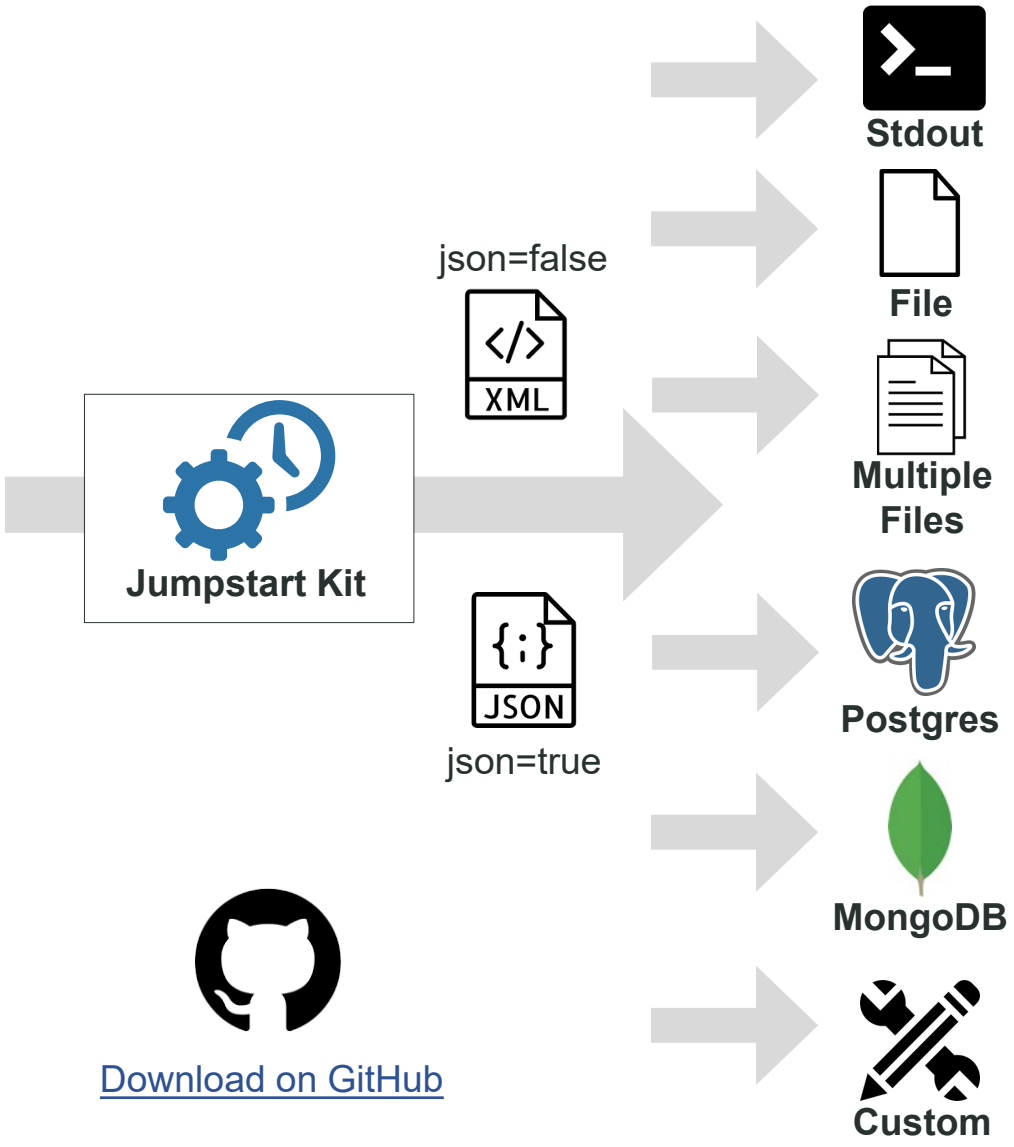
The Research



Operational Context & Technical Docs (JMSDD)

STDDS	TFMS	TFMS
TDES	**Flow**	**Flow**
DATISData	airportConfigMessage	restrictionMessage
STDDS repeats periodically (nominally every 60 seconds) the latest combined, arrival or departure DATISData message(s) received from either type of TDLS configuration until a new update is received from TDLS. airportID • Page 13 section 4.1.1 srcAddr • Page 13 section 4.1.2 DATISTime • Page 13 section 4.1.3 dataHeader • Page 14 section 4.1.4 dataBody • Page 14 section 4.1.5	Defines an airport runway configuration. Sent when the configuration changes. eventTime • Page 163 section 3.19.1 entryTime • Page 163 section 3.19.2 facility • Page 164 section 3.19.3 airport • Page 164 section 3.19.4 arrRunwayConf • Page 164 section 3.19.5 depRunwayConf • Page 164 section 3.19.6 arrRate • Page 164 section 3.19.7 depRate • Page 164 section 3.19.8 updateTime • Page 164 section 3.19.9	Defines an NTML restriction. NTML restrictions include MITs, altitude, and speed restrictions. Sent when a restriction is created, modified, or cancelled. restrictionMessage structure • Page 162 figure 211 eventTime • Page 161 section 3.18.1 entryTime • Page 161 section 3.18.2 facility • Page 161 section 3.18.3

The Jumpstart Kit



[Download on GitHub]

Jumpstart README.md

Consumer Jumpstart

This is a simple JMS Consumer that allows for testing the connection to SWIM. It is not intended to be used for a realworld application.

The Jumpstart allows you to log the message rate metrics and/or messages to the console.

Configuration Options

The following configuration options will be provided when you create a subscription:

providerUrl: url of the message broker including the port (e.g. tcps://hostname:55443)

queue: the name of the queue to connect to receive data

connectionFactory: the connection factory used for connecting which contains specific configuration parameters defined by an administrator

username: the connection username for authentication

password: the connection password for authentication

vpn: the message vpn to connect to on the broker

metrics (Optional): log message rate metrics to the console and defaults to `true`. Set it to `false` for disabling metrics.

output (Optional): log messages to a specific output and defaults to `com.l3harris.swim.outputs.NoopOutput`.

- **com.l3harris.swim.outputs.NoopOutput**: does not output message
- **com.l3harris.swim.outputs.StdoutOutput**: outputs the messages to standard out
- **com.l3harris.swim.outputs.FileOutput**: outputs the messages to a single rotating file log located in `./log/messages.log`
- **com.l3harris.swim.outputs.MessageFileOutput**: outputs each message to a separate file located in `./log/`
- **com.l3harris.swim.outputs.database.MongoOutput**: outputs each message to a document in a mongo collection in **json** format
- **com.l3harris.swim.outputs.database.PostgresOutput**: outputs each message to a row in a postgres table in **json** format

Custom Outputs

- **com.l3harris.swim.outputs.custom.TfmsFlowPostgresOutput**: outputs each TFMS restriction and airport configuration message to postgres
- **com.l3harris.swim.outputs.json.TDESPostgresOutput**: outputs each TDES message to postgres

json (Optional): attempt to convert the xml messages to json and defaults to `false`. Set it to `true` for json output

postgres: configuration options for postgres

- **postgres.uri**: uri of the postgres database with the database name (e.g. "jdbc:postgresql://localhost:5432/test")
- **postgres.user**: the username for login to postgres
- **postgres.password**: the password for login to postgres

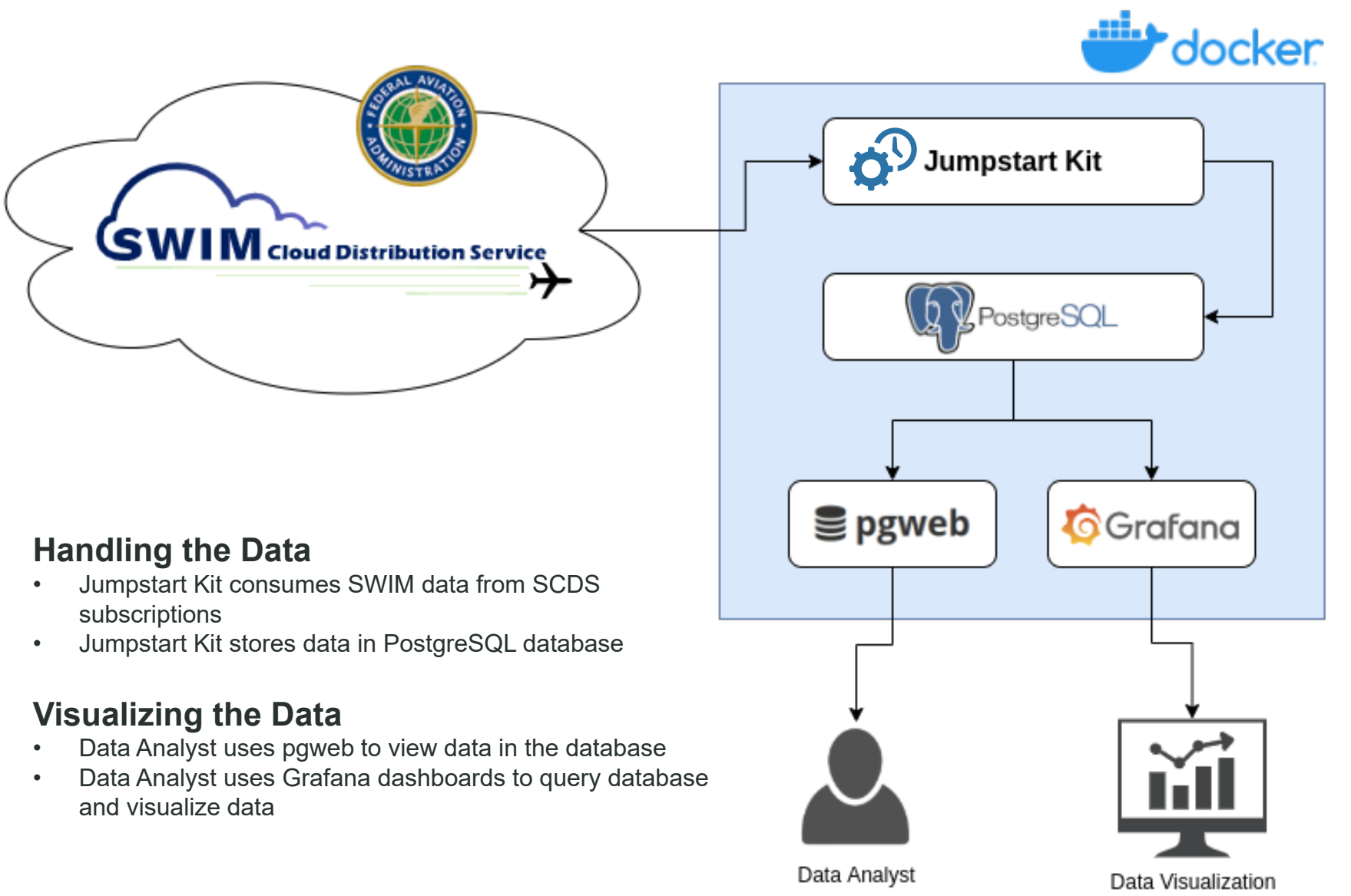
Running with cli options

```
./bin/run -DproviderUrl= -Dqueue= -DconnectionFactory= -Dusername= -Dpassword= -Dvpn=
```

Running with config file

```
./bin/run -Dconfig.file=path/to/config-file
```

The Design



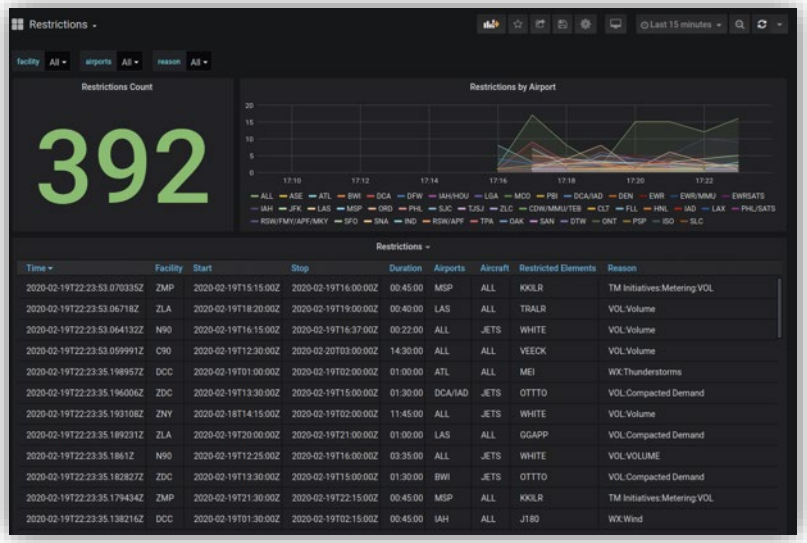
Handling the Data

- Jumpstart Kit consumes SWIM data from SCDS subscriptions
- Jumpstart Kit stores data in PostgreSQL database

Visualizing the Data

- Data Analyst uses pgweb to view data in the database
- Data Analyst uses Grafana dashboards to query database and visualize data

The Demo


Restrictions
Restrictions Count
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Restrictions by Airport
Restrictions
Time
Facility
Start
Stop
Duration
Airports
Aircraft
Restricted Elements
Reason


Airport Configuration
airport
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Active Departure Runway
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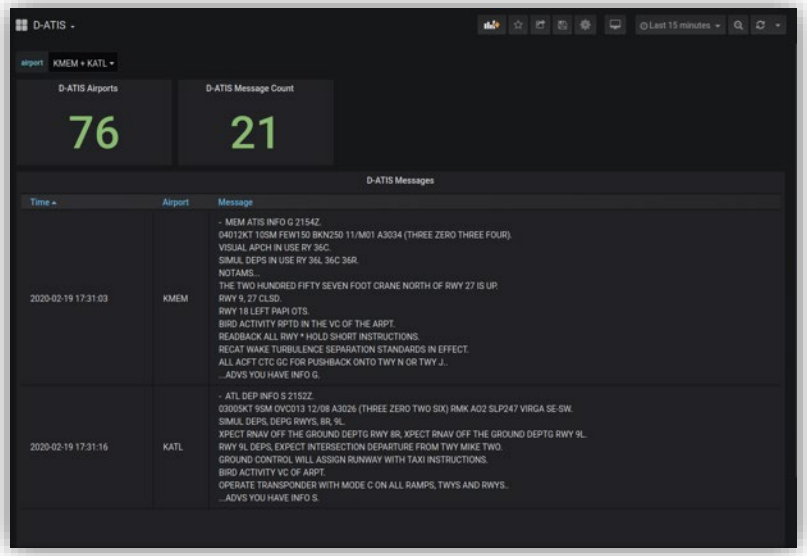
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KMEM + KATL
D-ATIS Airports
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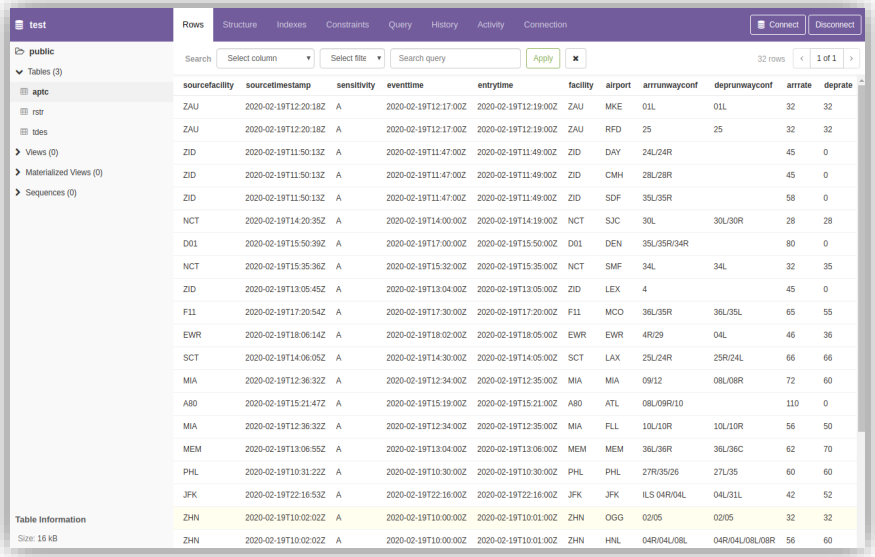
2020-02-19 17:31:16
KATL


test
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Constraints
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Views (0)
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Sequences (0)
Table Information
Size: 16 kB
sourcefacility
sourcetimestamp
sensitivity
eventtime
entrytime
facility
airport
arrrunwayconf
deprunwayconf
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deprate