

*This White Paper forms part of a series detailing Snowflake Software's experience with the FAA System Wide Information Management (SWIM) feeds and how consumers can begin to realise the value of this data. In this first installment, we will explore the Traffic Flow Management (TFM) feed, its structure, contents and potential industry use-cases.*

Since on-ramping to the FAA SWIM feeds in November 2014, the Snowflake Software team has learned a great deal about how SWIM is being utilized and implemented within the ATM industry. In that time, we have had the opportunity to work with an incredibly varied group of organizations globally who, as well as highlighting some of the challenges that come with trying to manage and interpret this data, have clearly demonstrated how invaluable the FAA SWIM program is as a freely available resource.

The FAA SWIM program provides an infrastructure which allows a diverse group of stakeholders, organizations and systems globally to exchange National Airspace (NAS) information, using a common network-centric interface. This reduces the inefficiencies previously caused by exchanging information via point-to-point interfaces. In this paper, we share our experience with the FAA TFM Data SWIM feed and answer some key questions around this valuable data resource.

### TFM Data

The TFMData SWIM feed contains data that is used by the **FAA Traffic Flow Management System (TFMS)**. The FAA uses the TFM feed to balance the **capacity** and **demand** of NAS resources. This feed has two primary business services: **TFMData Flight** and **TFMData Flow**.

### TFMData: Flight

The FAA models the demand picture of the NAS by ingesting flight schedules, flight plans, and current airborne flight positions. This data is provided in the TFM Flight business service and includes the following:

- Flight Plans
- Flight Plan Amendments
- Flight Plan Cancellations
- Track positions
- Departure/Arrival Time Notifications
- Boundary Crossings

#### LOTS OF DATA!

Snowflake's internal tests averaged between 15 and 20 messages per second for the TFM Flight business service. This translates to 1 to 2 million messages per day!

### TFMData: Flow

The FAA models and implements Traffic Management Initiatives (TMIs) to balance demand with capacity. Information pertaining to these TMIs are provided in the TFM Flow business service and includes the following:

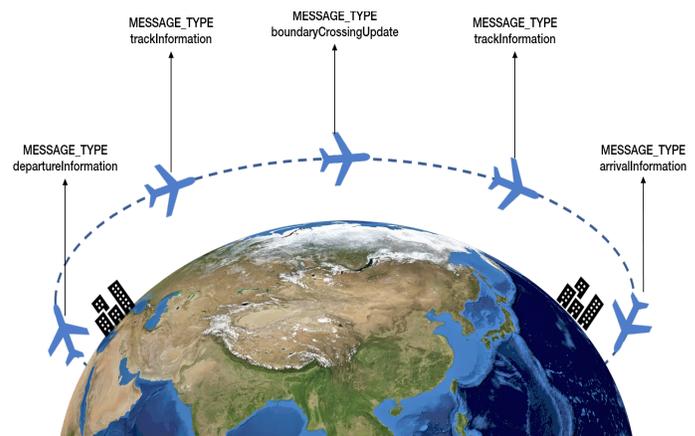
- Ground Delay Programs
- Ground Stops
- Airspace Flow Program
- Command Center Advisories
- Miles-in-Trail Restrictions
- Airport Runway Configuration and Rates
- Reroutes

#### TFM FLOW MESSAGE VOLUME

Our internal tests showed that the TFM Flow message volume is approximately **10% of the volume** of the TFM Flight service

### What can I do with this valuable data?

The TFM feed hosts a rich source of flight data. Each flight will have various types of associated messages that correspond to an event, such as a flight plan update, track position update or a boundary crossing notification. The history of flight messages can be correlated by a flight reference number and the sequence of these associated messages is used to analyze a flight's history, as shown by the example below.



Since on-ramping to SWIM, we have heard from many organizations on how they are consuming TFM data and what they use this data for. Due to the sheer amount of flight and TMI data available on this feed, the spectrum of use cases range from simple to complex. Here are examples of how the TFM feed is being utilized in the ATM industry:

### Simple TFM Use Case

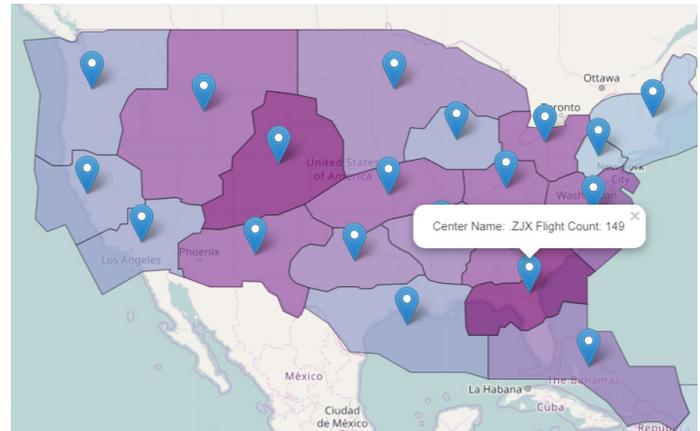
Many users archive data from the TFM services and conduct analysis on the archived data. Historical information and post-operations analysis are valuable to both government and ATM organizations as they guide development of better processes, procedures, and decision support tools - all with the aim of increasing efficiency or savings. One common use case consists of creating a tabular summary of flights that were completed within a specific time frame. This can be achieved by correlating messaging associated with a unique flight reference number. An example of a flights summary list, containing basic information such as call sign, aircraft type, origin, destination, departure and arrival time, is shown below.

AircraftCallSign	IcaoAircraftType	OriginAirportCodeIcao	ArrivalAirportCodeIcao	TakeOffDateTime(UTC)	ArrivalDateTime(UTC)
N343CC	C56X	KRIC	KPOK	8/1/2016 10:42	8/1/2016 11:57
CNS2000	PC12	KLCI	KHPN	8/1/2016 10:46	8/1/2016 11:42
CN58	PC12	KMYY	KBOS	8/1/2016 10:46	8/1/2016 11:10
N1104LV	C56X	KPWA	KJWY	8/1/2016 10:49	8/1/2016 11:28
N417JD	C56X	KLOM	KSWF	8/1/2016 10:57	8/1/2016 11:32
CNS176	PC12	KACK	KHPN	8/1/2016 11:00	8/1/2016 11:55
CNS64	PC12	KMYY	KBOS	8/1/2016 11:01	8/1/2016 11:25
GP0510	PC12	TJSJ	TFFJ	8/1/2016 11:03	8/1/2016 11:54
BTQ481	PC12	GLH	BNA	8/1/2016 11:04	8/1/2016 12:20
N408NG	PC12	KAUW	KRAP	8/1/2016 11:04	8/1/2016 13:39
N607AH	PC12	KBED	KBST	8/1/2016 11:05	8/1/2016 11:46
GAU514	C56X	KACK	KBOS	8/1/2016 11:08	8/1/2016 11:33

Although the above table looks simple, it involves parsing and collating data from various types of messages that can be produced from a flight. The TFM flight data contains highly detailed information about a flight's actual route, modeled route, filed route and associated airframe characteristics which can also be collated in a similar fashion to produce a more detailed summary of flights.

### Advanced TFM Use Case

TFM Data consumers can also use the detailed information provided in the TFMData feed to perform more complex analysis to enhance real-time common situational awareness in the NAS. An example of a valuable use for this data is stakeholders using real-time track position updates to identify the number of flights within each Air Route Traffic Control Center (ARTCC) or Flight Information Region (FIR), as shown in the map to the right.



Since predicted track positions are also provided in the TFM Data feed, tools can then be developed using both predicted and actual demand on the National Airspace System. These tools can aid informed decision-making by all the stakeholders who are either interested in a particular ARTCC or in flights that may use a particular FIR on their route.

### How can Snowflake Software help?

Snowflake Software seeks to accelerate innovation in the aviation industry by making the world's aviation data accessible and easy to use. Our SWIM Service Connector provides an out-of-the-box solution that enables users to connect to a SWIM feed and store their data in a fully configured database. No custom coding is necessary: The SWIM Service Connector will even take care of database normalization and convert positional data into native database geometries that can be viewed in a GIS tool.

But just as important: Snowflake Software can help you understand the data, empowering you to fully utilize the data to fit your enterprise needs. Our participation in SWIM user forums, our leadership in SWIM developer workshops, and our innovative work with SWIM consumers has provided us a unique insight into the nature of the data and how it can be useful for your organization.

*If you have any questions about anything in this White Paper or would like some more information, please contact [sales@snowflakesoftware.com](mailto:sales@snowflakesoftware.com).*

Stay tuned for our next installment of our white paper series, where we discuss our experience with STDDS!