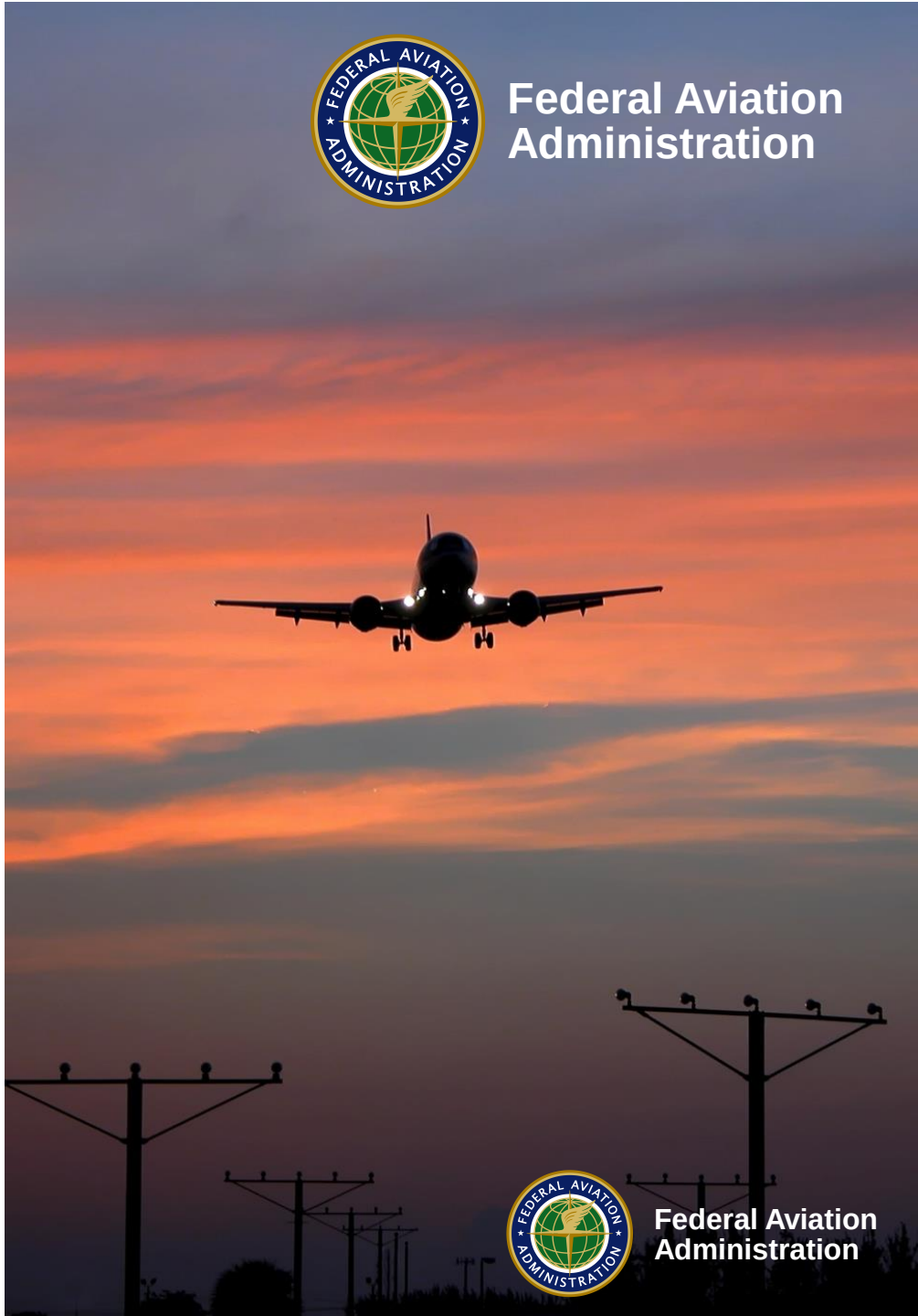
Asia Pacific Region (APAC) Presentation

System Wide Information Management

Presented to:
SWIM Seminar 2023

By:
Kristin Cropf
FAA SWIM Program Manager

Date:
8 May 2023



Agenda

- **Introduction to US SWIM**
- **Current US SWIM Environment**
- **Lessons Learned**
- **Future of SWIM**

At-a-Glance: SWIM in the US

SWIM BY THE NUMBERS

28 NUMBER OF PRODUCERS

100+ NUMBER OF SERVICES

400+ NUMBER OF CONSUMERS

- NEMS Internal
- NEMS External
- SCDS

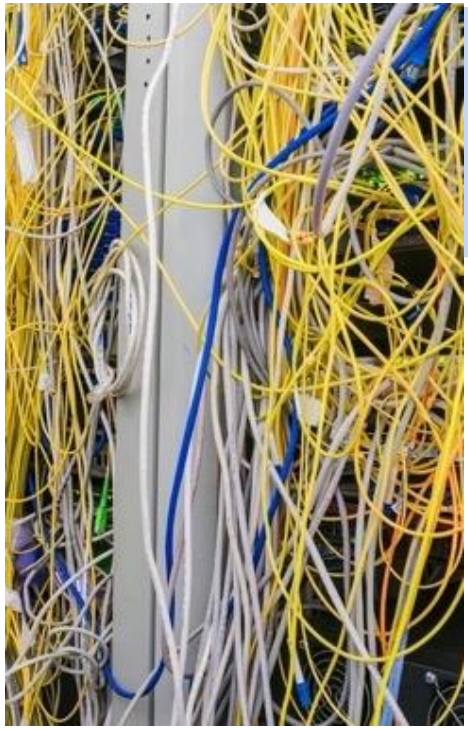
70% OF FAA'S CLOUD DATA EXCHANGE

SWIM CLOUD DISTRIBUTION SERVICE (SCDS)

259M TOTAL MESSAGES DELIVERED PER DAY

*Metrics updated as of October 17, 2022

SWIM in the FAA



SWIM is the platform that enables **operations** between **air traffic** systems, **mission support** tools, **airlines**, **government agencies**, and the **general public**

The SWIM program provides:

- Core Messaging / Infrastructure
- Business Services
- Governance / Standardization

SWIM Operationalizes Cross-Application, Cross-Domain, and Cross-Organization Services

SWIM's Role in FAA Operations

Air Traffic systems are integrated with the SWIM platform and capabilities to support daily operations with other systems in support of ATM operations

Airlines, airports, service providers, international partners and other government agencies rely on SWIM for their operations with the FAA

SWIM capability and infrastructure is a key component to protect FAA systems and sensitive information

$$$$

SWIM infrastructure reduces and avoids telecommunications costs for applications associated with information exchanges

Scope of SWIM

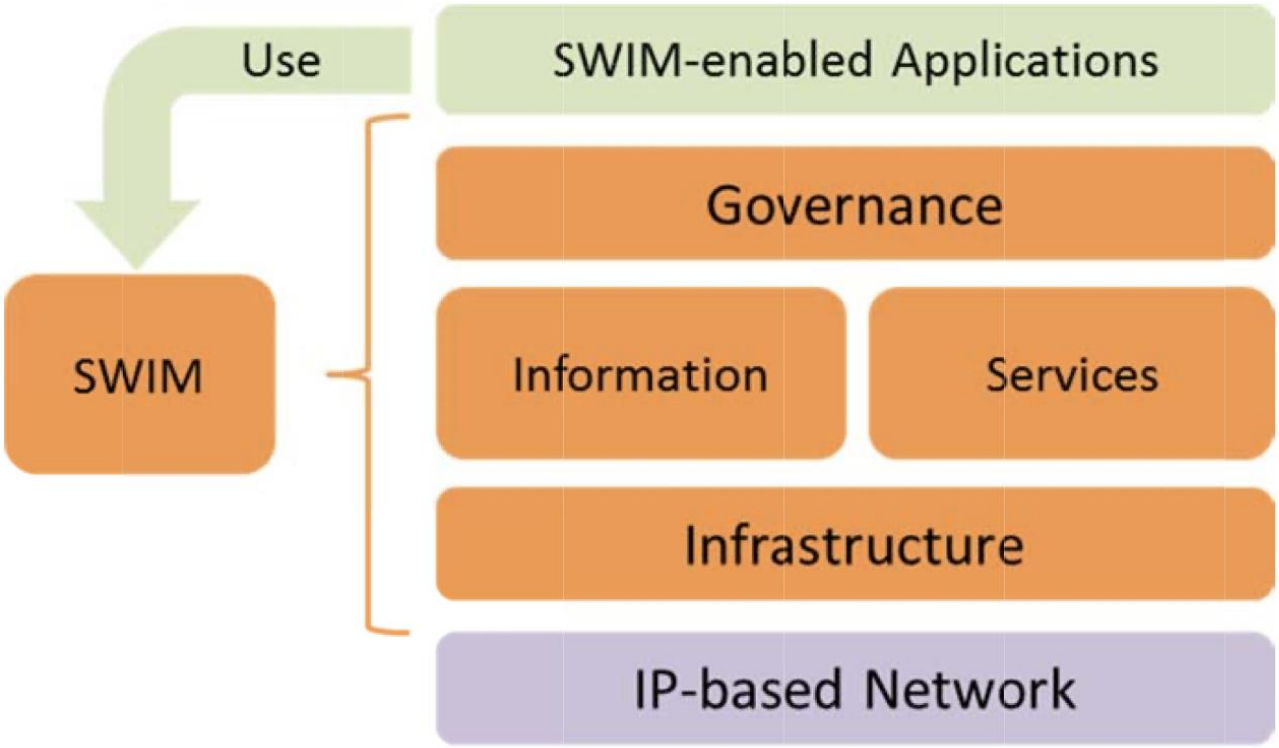


Figure 1. The Scope of SWIM

Reference: ICAO Doc 10039, Figure 1

Federal Aviation Administration

Current US SWIM Environment

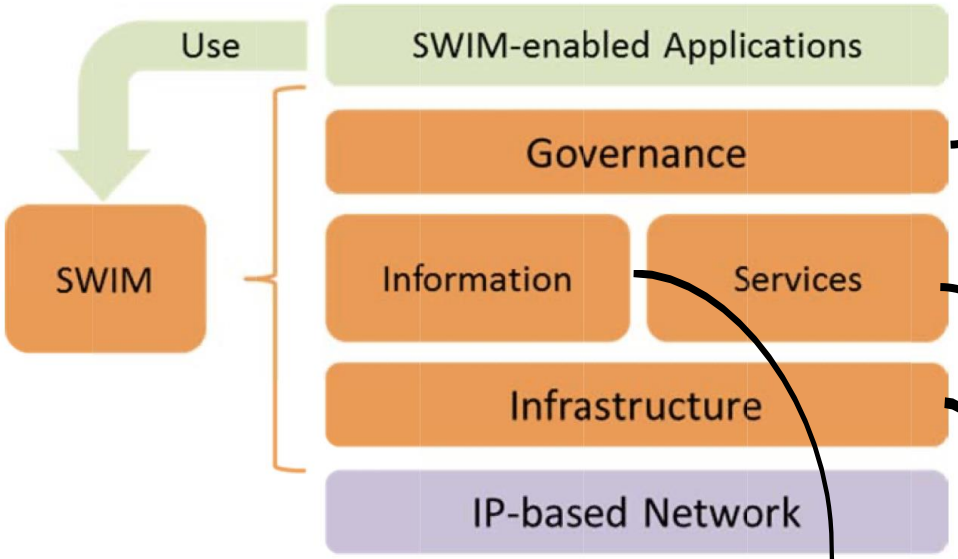


Figure 1. The Scope of SWIM

Robust processes to manage lifecycle of SWIM Services

Many services providing information, including from legacy systems

Enterprise infrastructure available for all FAA ATM systems

Some information available in common aviation exchange models

Reference: ICAO Doc 10039, Figure 1

Lessons Learned…

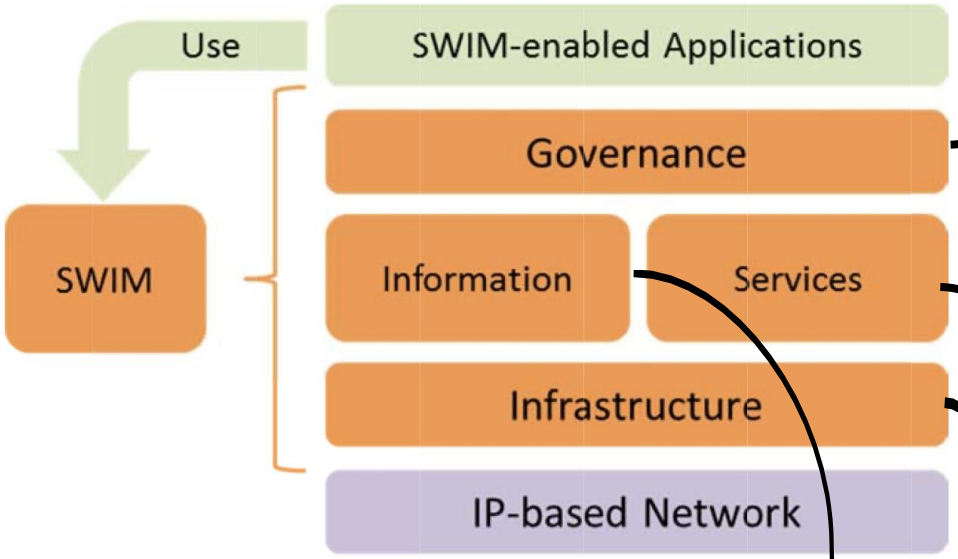


Figure 1. The Scope of SWIM

Robust, but too manual and rigid. Users need guidance and enforcement.

Having information is a start, but the ability to use and exchange information is the goal

Flexible infrastructure needed to support more performance and quicker on-boarding

Manage information as an enterprise and leverage standards as much as practical

Reference: ICAO Doc 10039, Figure 1

What's Next for SWIM in the US?

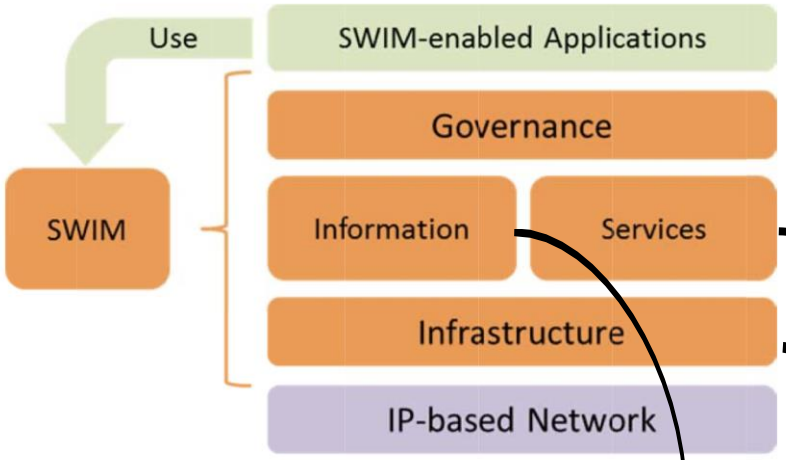


Figure 1. The Scope of SWIM

Leverage tools for change management and enforcement. Develop guidance material and providing support teams.

Deploying new systems with SWIM and information as a core

Implementation of higher performance infrastructure where needed. Automated provisioning where possible.

Designing systems to use exchange models from the start and using enterprise data services to manage information between systems

Reference: ICAO Doc 10039, Figure 1

Other Considerations

- Zero-trust / Trust-Framework
- Balancing security without locking all applications down
- Allocations of controls at infrastructure vs. system
- Incident monitoring and response

- Decoupled services requires more robust monitoring
- Understanding impact of service outages
- Service maintenance and change management processes

SWIM TF Considerations

- **Regional governance policies and processes**
  - Consider full-lifecycle from planning through retirement, including change management
- **Develop guidance and supporting material to guide implementations**
- **Operations management processes**
  - Monitoring, support, etc.
  - Troubleshooting problems in a decoupled environment can be more complex

Questions?

Contact Info

Kristin Cropf | FAA SWIM Program Manager
kristin.m.cropf@faa.gov

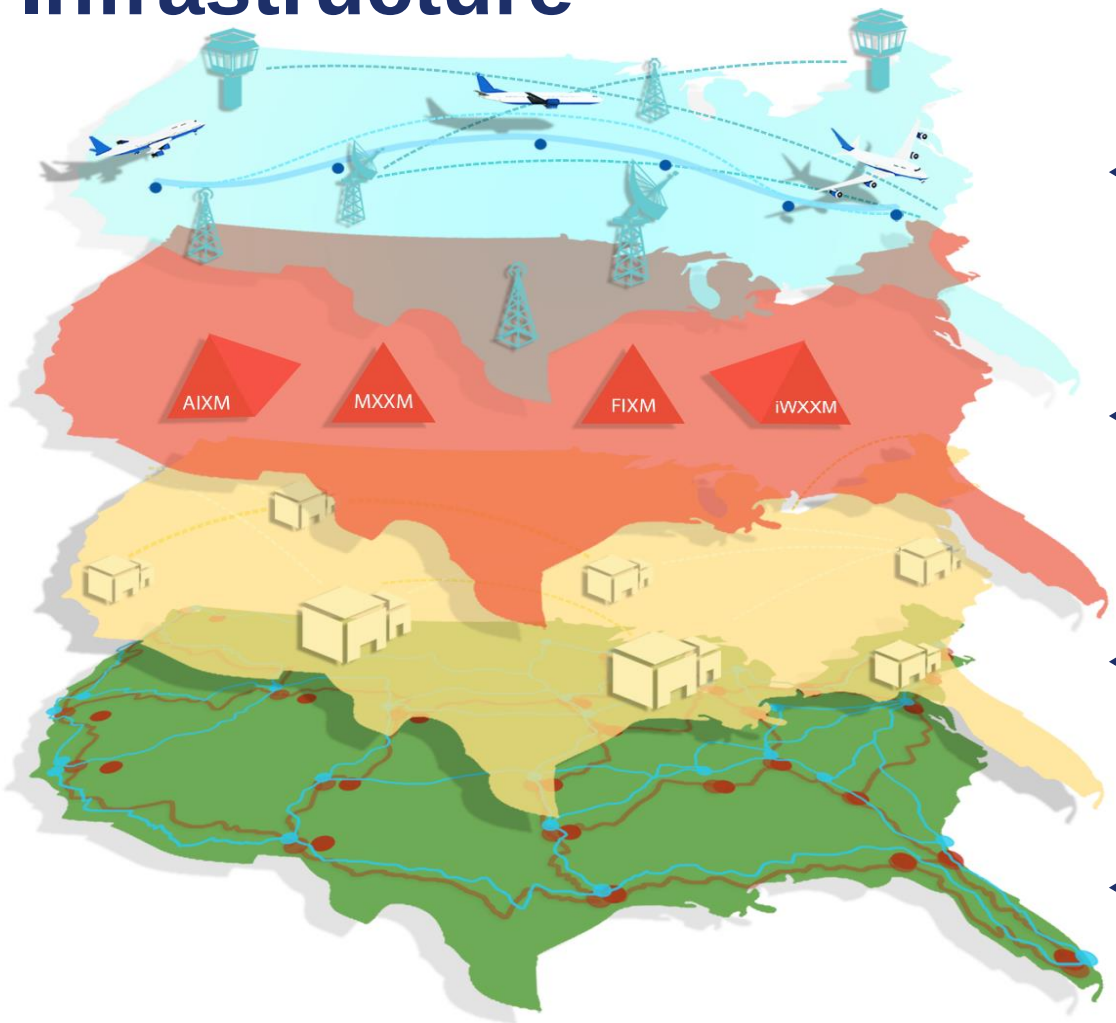
What Is SWIM?

SWIM provides the following for the aviation community:

- Single point of access for real-time, relevant, and reliable aeronautical, flight, weather, and surveillance information
- Governance, standards and policies to achieve interoperability across aviation systems

SWIM provides the infrastructure, standards, and services needed to optimize the secure exchange of relevant data for FAA systems and the aviation community.

SWIM Provides Data Exchange and Infrastructure



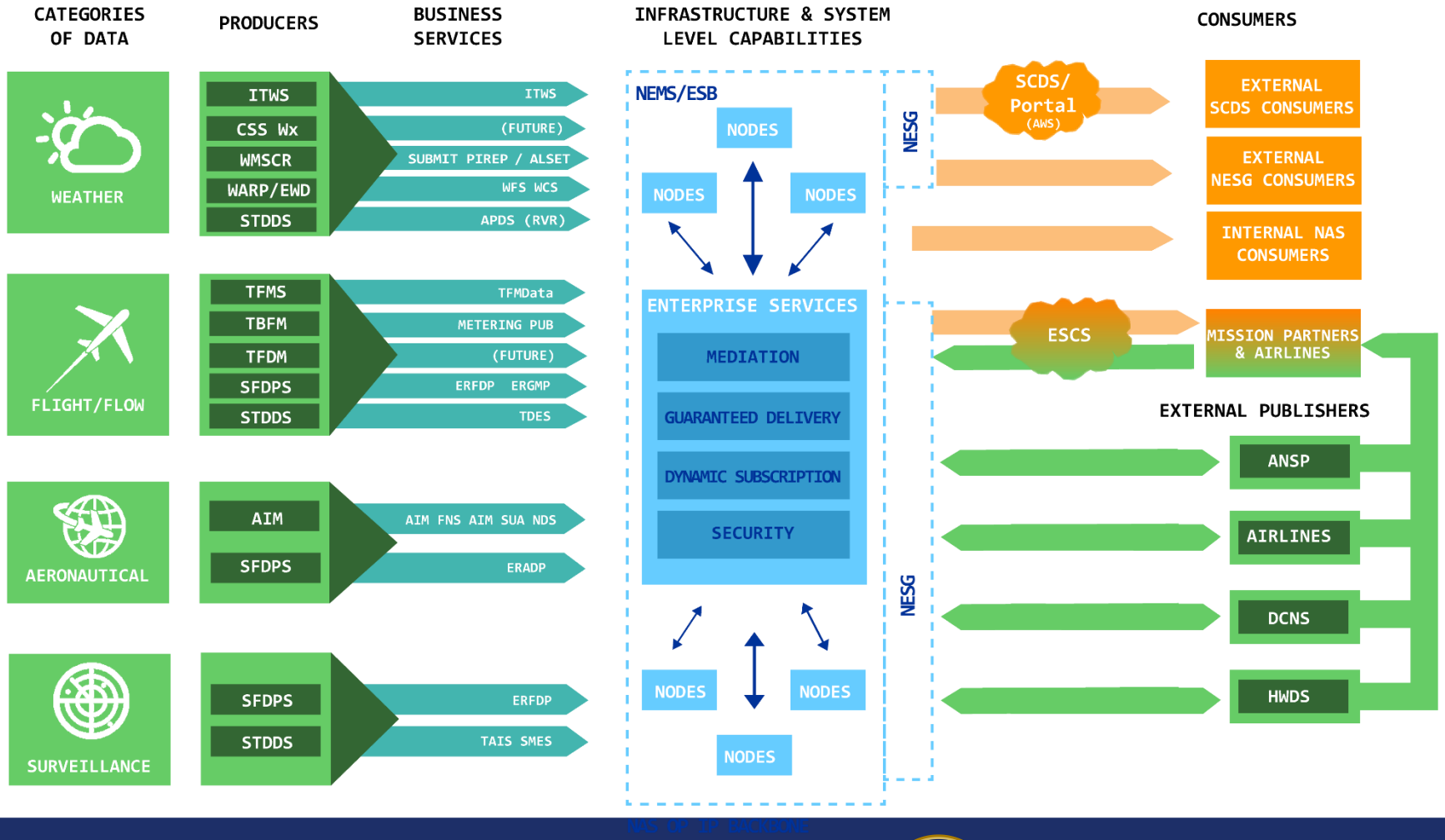
FAA Applications

Standards for Data Exchange

SWIM Messaging Infrastructure

IP Backbone

SWIM Business Services



Producers

- ITWS
- CSS-Wx
- WMSCR
- WARP
- STDDS

- TFMS
- TBFM
- TFDM
- SFDPS
- STDDS

- AIM
- SFPDS

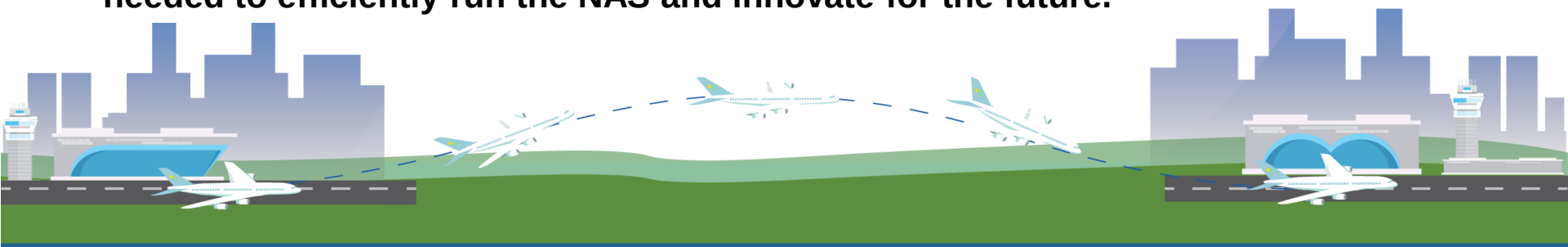
- SFDPS
- STDDS

Benefits

- Standardized Data Formats
- Guaranteed Messaging
- Mediation / Advanced Mediation
- Producer / Consumer Service Level Agreements (SLAs)
- Availability and Performance
- Security Services

SWIM by the Numbers

The SWIM infrastructure allows the Aviation Community to access the data needed to efficiently run the NAS and innovate for the future.



80 unique information services available

600+ users consuming **3,000+** services
(as of July 2020)

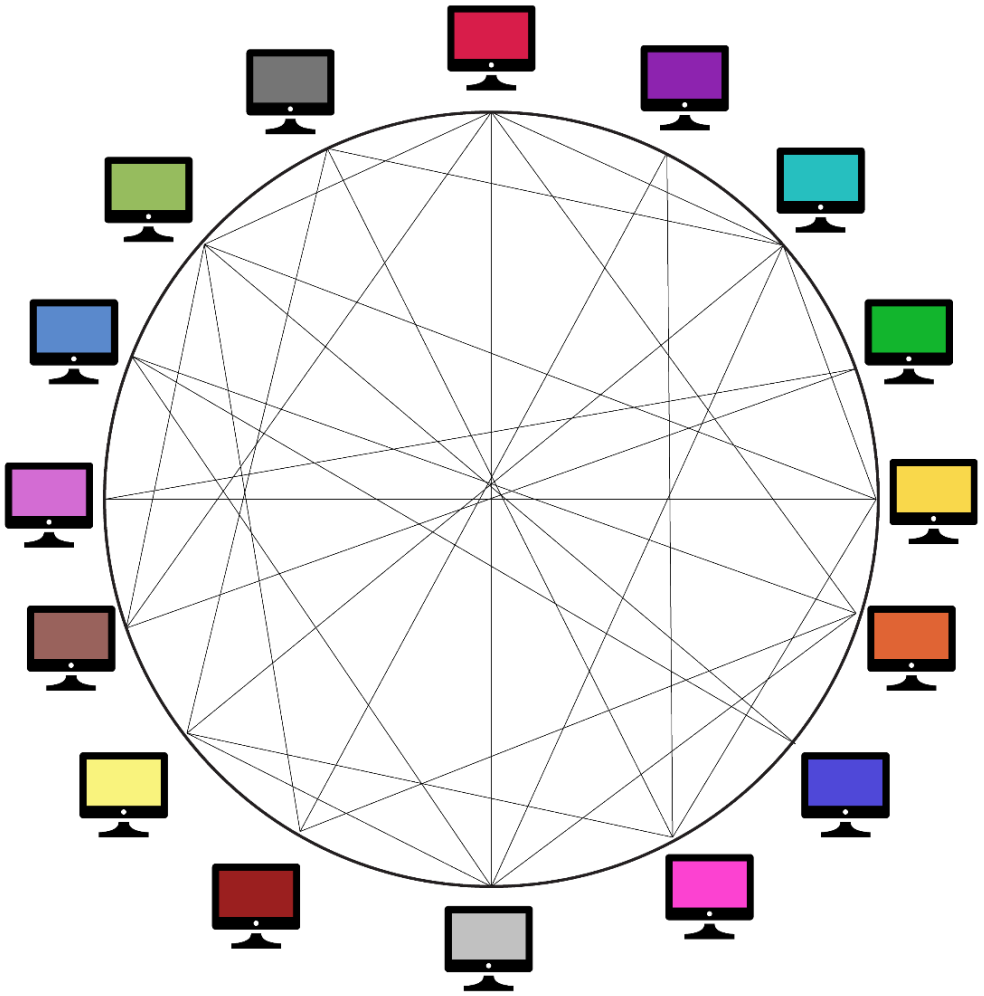
7+ Terabytes consumed per day
*Includes NESG and SCDS

jetBlue AIRWAYS · Alaska AIRLINES · FlightAware · Microsoft · Southwest · FedEx Express · Google · American Airlines · DELTA · UNITED · ups · UBER Elevate

Federal Aviation Administration

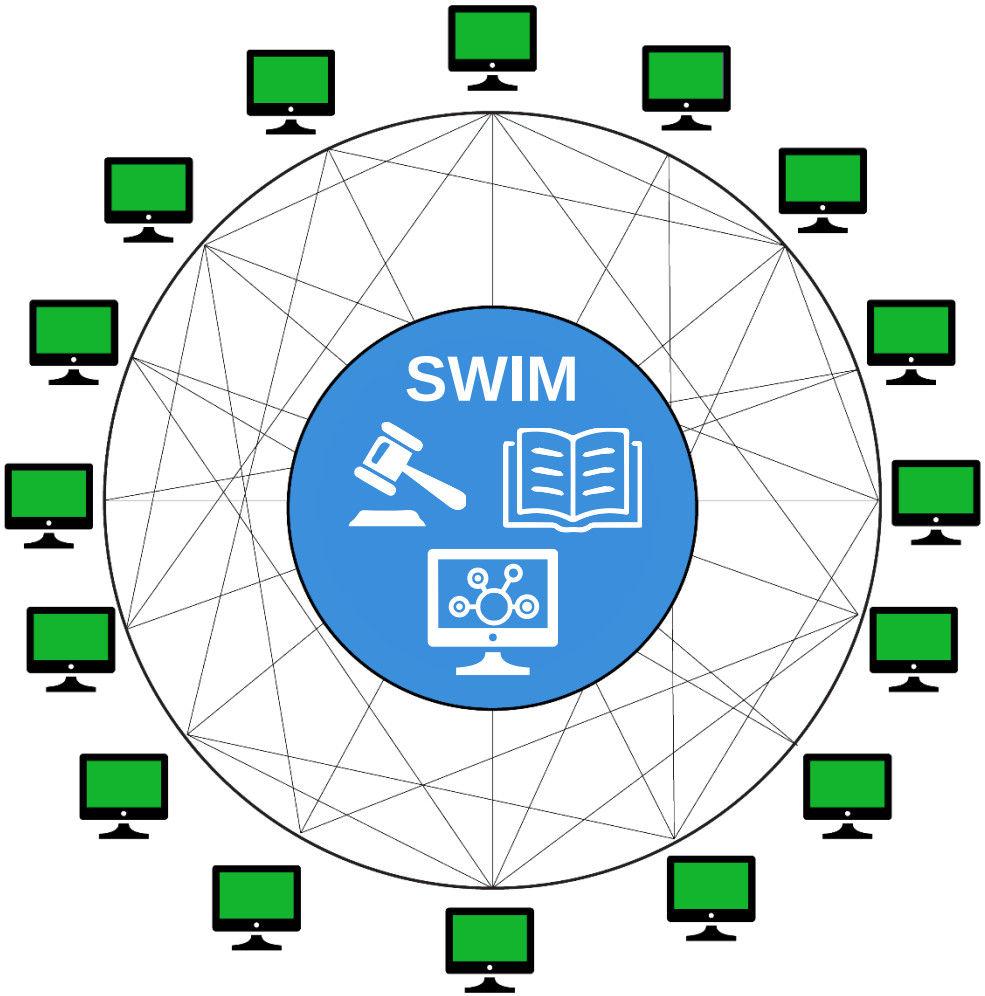
Evolution of SWIM

Before SWIM



- **In the past, connecting two systems required a fixed network connection and custom, point-to-point, application-level data interfaces.**
- **Identified a need to reduce the high degree of interdependence among systems and move away from the proliferation of unique, point-to-point application interfaces.**

Sharing the Data

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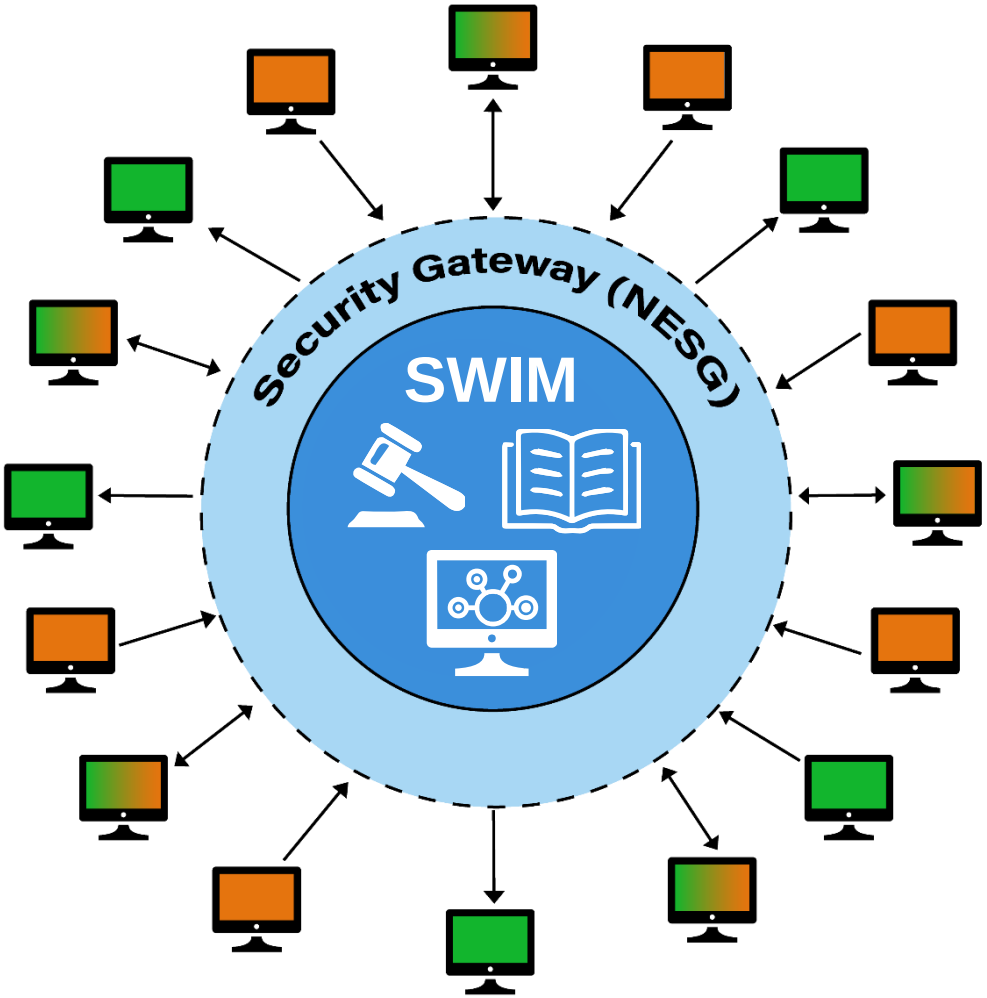
Governance & the NSRR

SWIM Governance establishes policies, processes, and standards for managing the lifecycle of services, service acquisitions, service components and registries, service providers, and service consumers.

The NAS Services Registry Repository (NSRR) is a registry established by the FAA's SWIM program to:

- Share and track information about SWIM-enabled services
- Manage services throughout their lifecycle
- Notify users about changes in service descriptions and lifecycle status
- Manage service-related documents

Enterprise Messaging

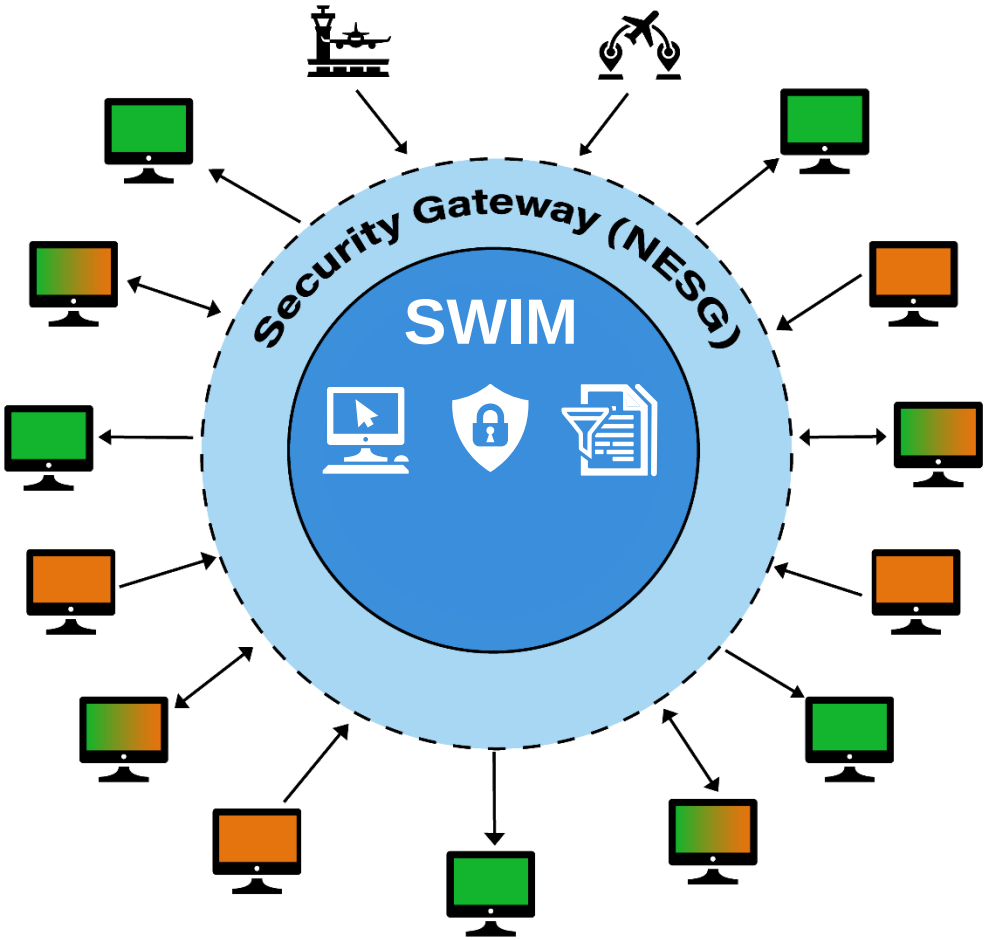


Producers

Consumers

Producers/Consumers

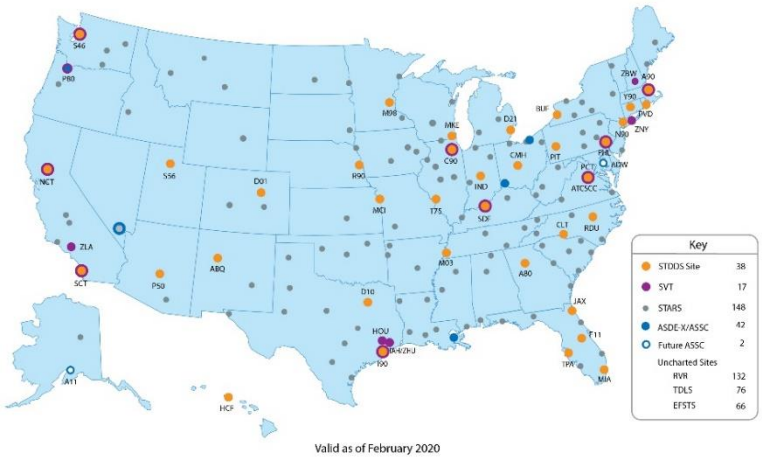
Systems and Services



- Enterprise Service Monitoring (ESM)
- Identity and Access Management (IAM)
- NAS Common Reference (NCR)
- SWIM Terminal Data Distribution System (STDDS)
- SWIM Flight Data Publication Service (SFDPS)

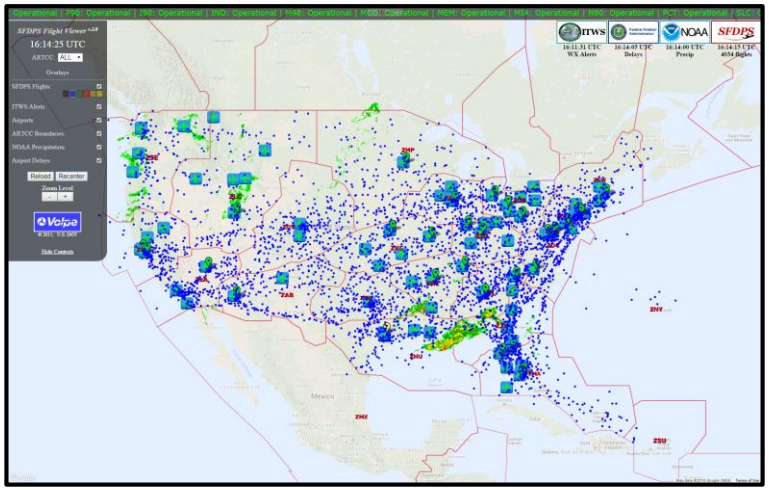
Legacy Systems

SWIM Terminal Data Distribution System (STDDS)



Converts legacy terminal data collected from airport towers and terminal facilities into easily accessible information, which is published via the SWIM.

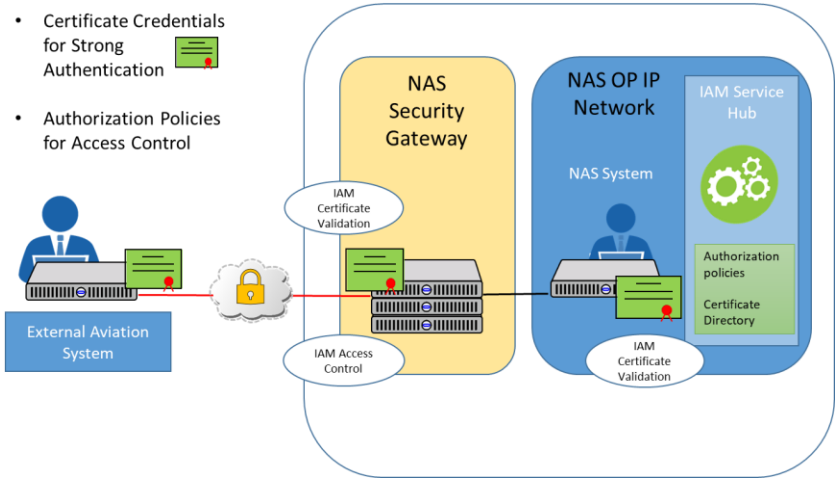
SWIM Flight Data Publication Service (SFDPS)



Provides en route flight data to FAA consumers and allows consumers to receive real-time data for analytics, business processes, research, and other activities.

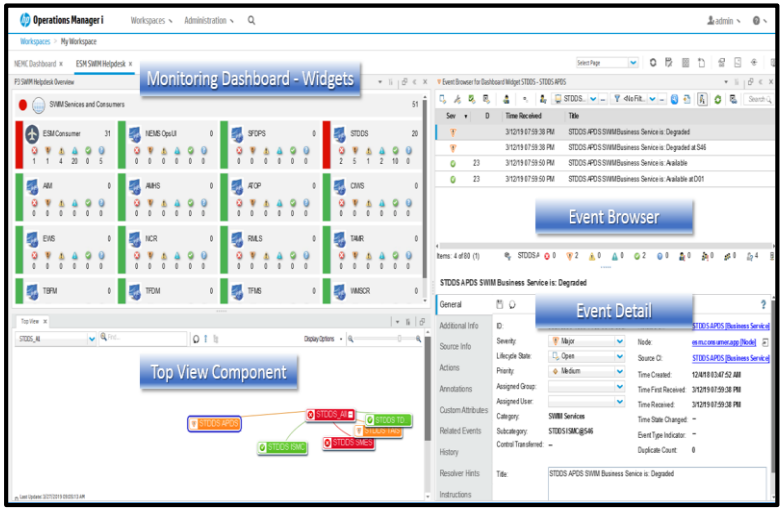
SWIM Services

Identity and Access Management (IAM)



Reduces FAA security vulnerabilities by providing a digital certificate service capability to issue and validate digital certificates to positively identify FAA systems and applications when sharing information.

Enterprise Service Monitoring (ESM)

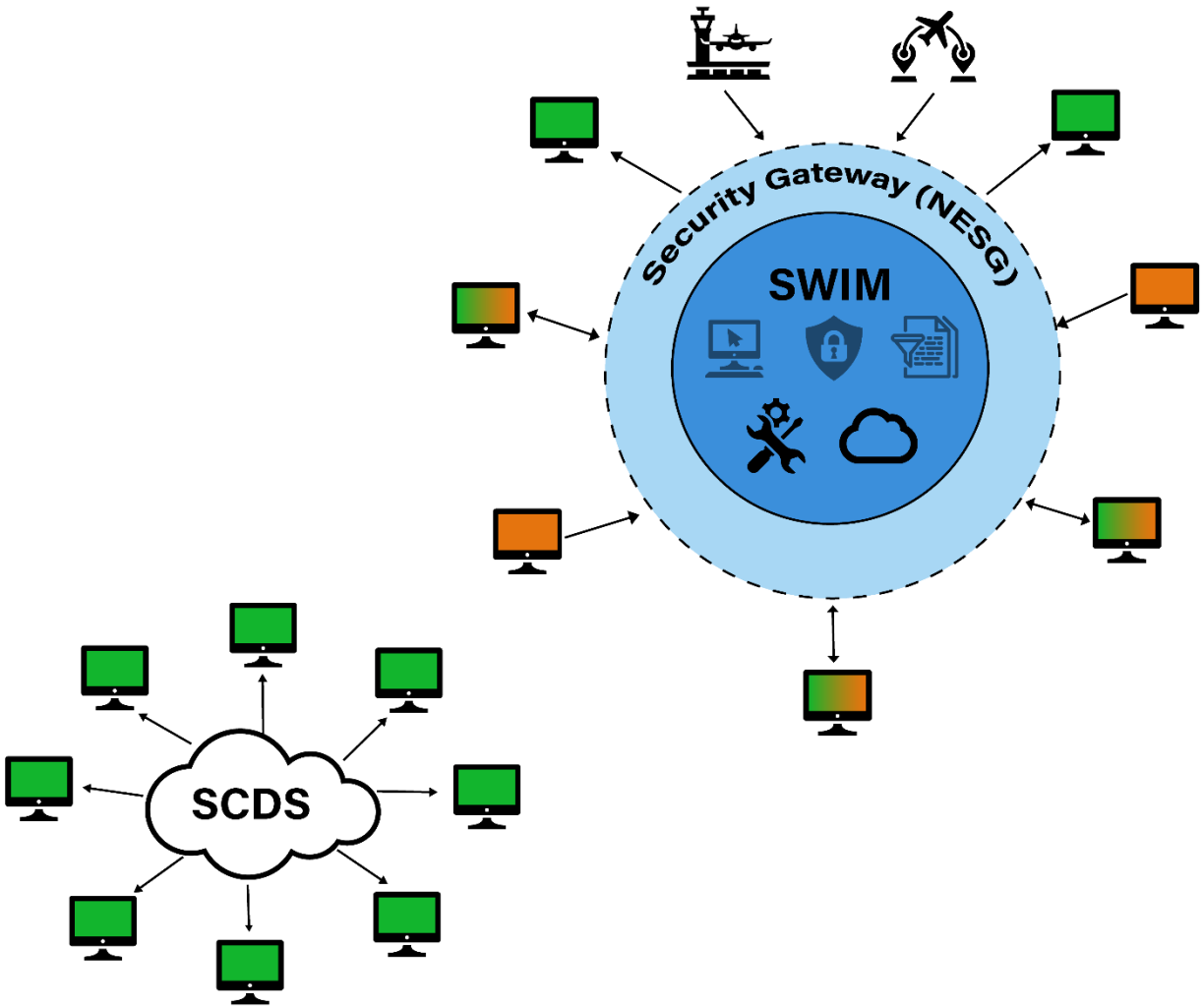


Provides the capability for the centralized monitoring of SWIM Business Service status.

Current SWIM Security Activities

- **FAA Policy requires mutual strong authentication (Mutual TLS) in some cases (FAA Order 1370.123)**
  - For data flows into FAA Operations Domain
  - For sensitive information distributed by FAA
  - Use of PKI (Public Key Infrastructure)
- **SWIM IAM capability is single source of device certificates for FAA Operational systems**
  - External users provide their own certificates for authentication
- **Internal Certificate Validation**
  - SWIM IAM has implemented Online Certificate Status Protocol (OCSP) validation services within the internal FAA network, and at FAA boundaries
  - OCSP services will support FAA certificates as well as external certificates
- **Recently established a dedicated FAA Root Certificate Authority (CA) for FAA devices**
  - Migrating from the US Federal PKI federal bridge to an FAA-only root
  - New root CA provided by DigiCert

Infrastructure

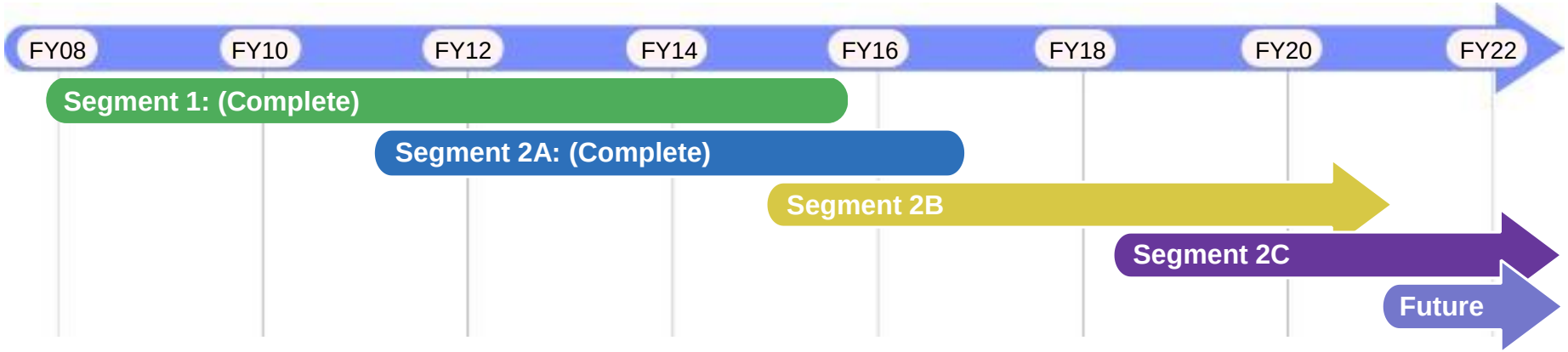


Tech Refresh

Cloud Technology

SWIM Cloud Distribution Service (SCDS)

SWIM Program Overview



Segment 1: Introduction to SOA (Complete)	Segment 2A: Enterprise Messaging (Complete)	Segment 2B: Capabilities	Segment 2C: Infrastructure	Future
- Implementing Programs - Common infrastructure - Governance - Service registry/ repository	- Base Capabilities - SWIM/NEMS Nodes - On-ramping - NAS data sharing transformation	- Four Capabilities: - ESM - IAM - NCR - STDDS Ph2	- SWIM Tech Refresh - SFDPS Tech Refresh - Infrastructure Upgrades - SWIM Cloud Distribution Services (SCDS) with SWIFT Portal	- Enhanced utilization of public and private cloud - Enhance messaging service to support efficiency critical operations - FF-ICE/R1 - Enhanced security to provide signing as a service and validation as a service - Enhanced business operations

Lessons Learned

SWIM Industry-FAA Team (SWIFT)

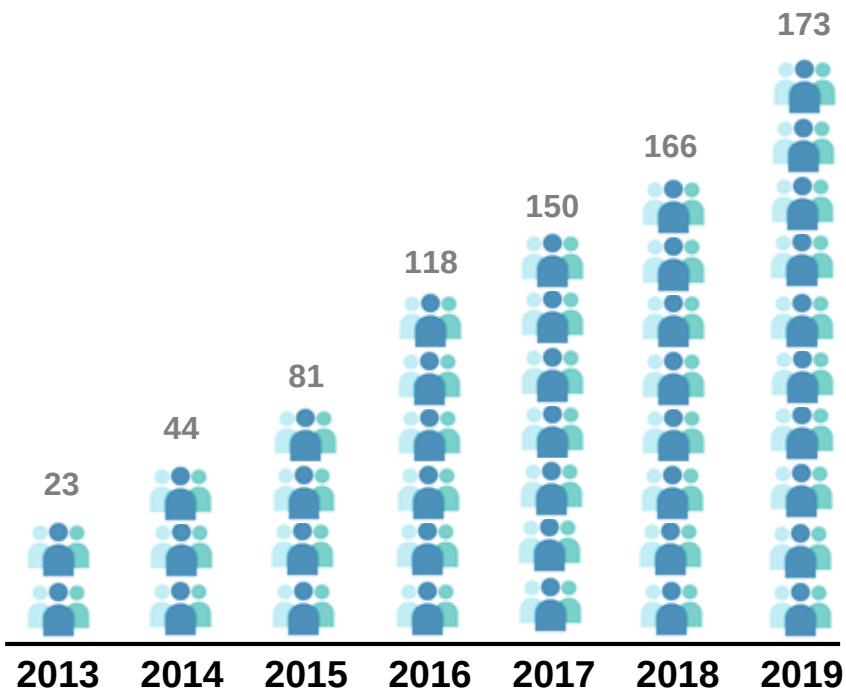
A partnership with industry to bring together operations, business, and technical minds to better leverage NAS Information Services that drive tangible operational improvements and innovation.

SWIFT Stakeholders

https://www.faa.gov/air_traffic/technology/swim/swift/

Increase in External Consumer Demand

SWIM External NAS Enterprise Service Gateway (NESG) users by year



*2019 number as of December 2019

Challenge - External Consumer Demand:

- 2013: Executive Order - Open Data Policy – 23 External Consumers
- 2016: FAA External Data Access initiative (EDAi)

Impact:

- Growing number of external users straining gateway capacity
- 600+ consumer services, estimated at over 7 terabytes of data consumed per day

Solution:

- Move external non-aviation partners to a cloud solution
- 2019: Began on-boarding users onto SCDS in waves beginning in August

SWIM Cloud Distribution Service

- Publicly accessible cloud-based infrastructure
- Provides near real-time SWIM data to the public
  - Same public data that is currently offered via the NESG SWIM implementation

Self-service Provisioning: Ability to create connections in real time

Service Management: Fine-grained filtering ability

Subscription Level Metrics: Detailed view of message rates, bandwidth and other metrics

Security Controls: Utilizes TLS connection technology

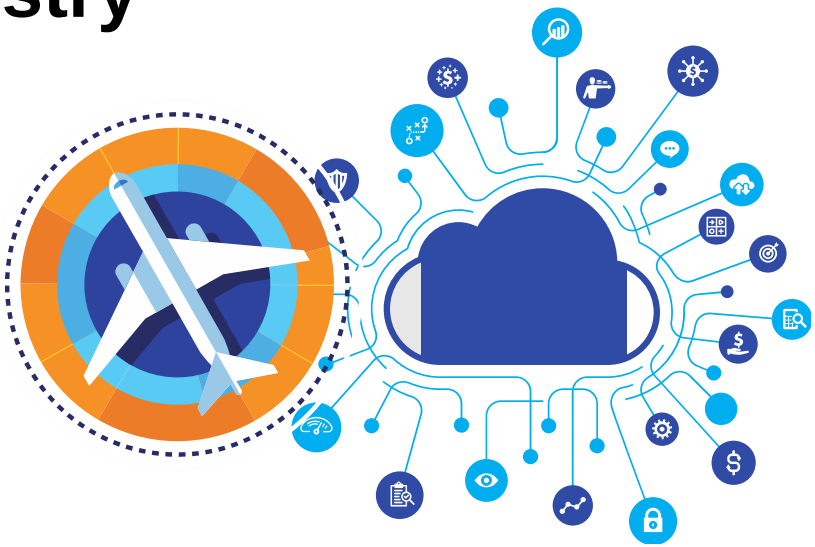
Managed Failover: Redundant connections and cloud technology, to create a reliable environment

Help Desk Support: Dedicated Help Desk

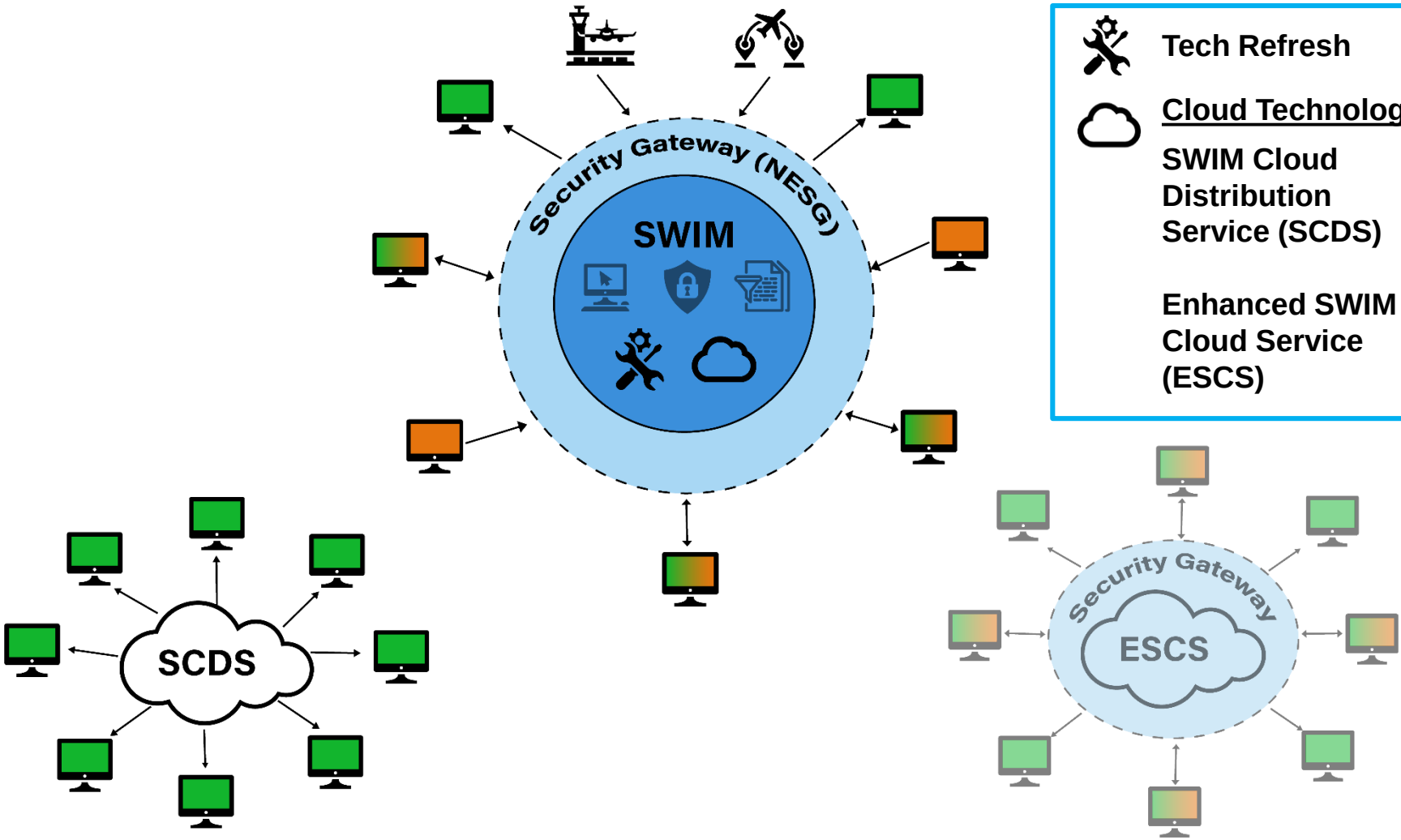
Future Focus

Future Focus

- **ESCS**
- **SWIM Services**
- **Security (IAM, PKI, IATF)**
- **Governance / SWIM Registry**

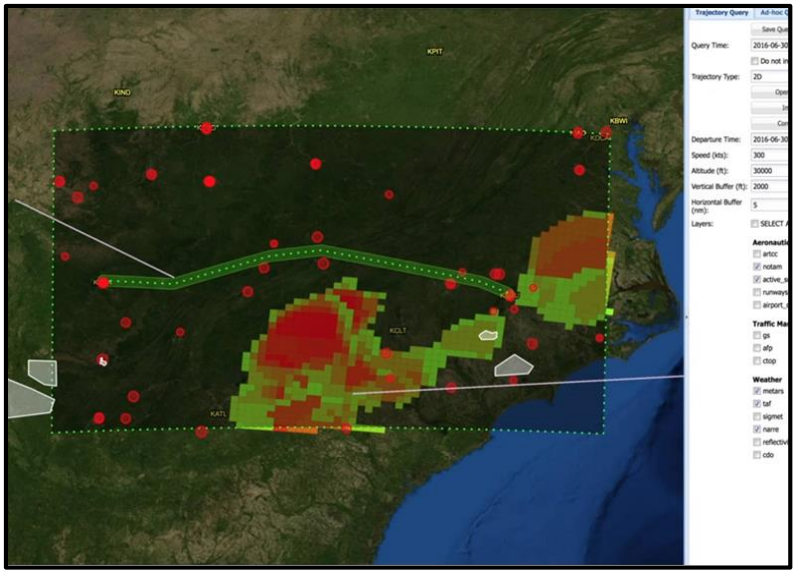


Enhanced SWIM Cloud Service (ESCS)



SWIM Services

NAS Common Reference (NCR)



Will enable FAA systems & authorized users to customize requests for real-time SWIM data using standards-based geospatial, temporal, and attribute filters.

Flight and Flow – Information for a Collaborative Environment FF-ICE/R1 Through CSS-FD

Deployment of services to enable FAA and airspace users to exchange flight information in support of FF-ICE/R1

Security Enhancements

- **Automated Certificate Management Environment (ACME)**
  - FAA SWIM is evaluating certificate management products that can be used to improve how certificates are issued within the FAA
- **International Aviation Trust Framework (IATF)**
  - Planning for implementation
- **Lessons learned from validation activities**
  - Enterprise Security Harmonization Proof of Concept
  - UAS Traffic Management Pilot Program
  - Multi-Regional TBO Demonstration
- **Authorization Services (under consideration)**
  - Include enterprise level access control - role-based or attribute-based

Governance / SWIM Registry

- **Enhanced governance measures to support:**
  - New operations
    - FF-ICE
    - Operational use
  - Increased services
    - Producer accountability
    - Promotion of available information services
  - New airspace entrants
    - UAS

Questions?

Contact Info

Kristin Cropf | SWIM Program Manager
kristin.m.cropf@faa.gov