



Federal Aviation
Administration

API Management and Gateway Demonstration

SWIM Implementation Pioneer Group 3 (SIPG/3)

June 1-5, 2026

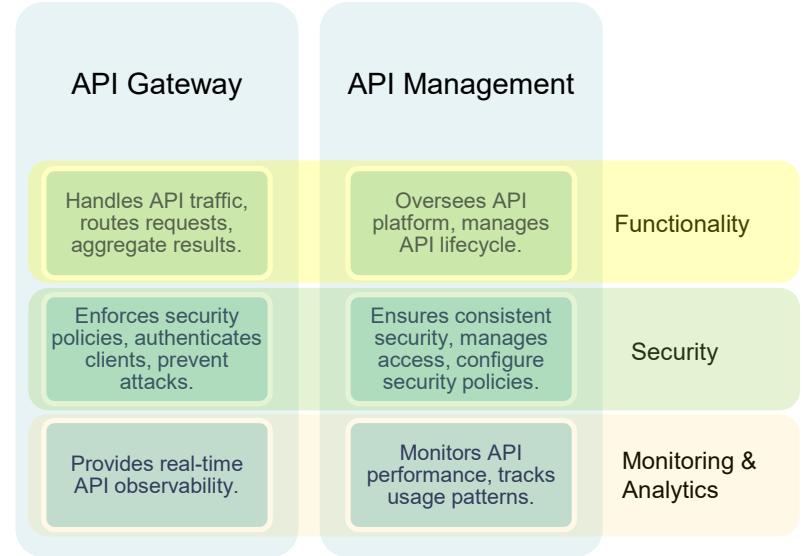
Presented By:
FAA SWIM Program Office



API Gateway and API Management

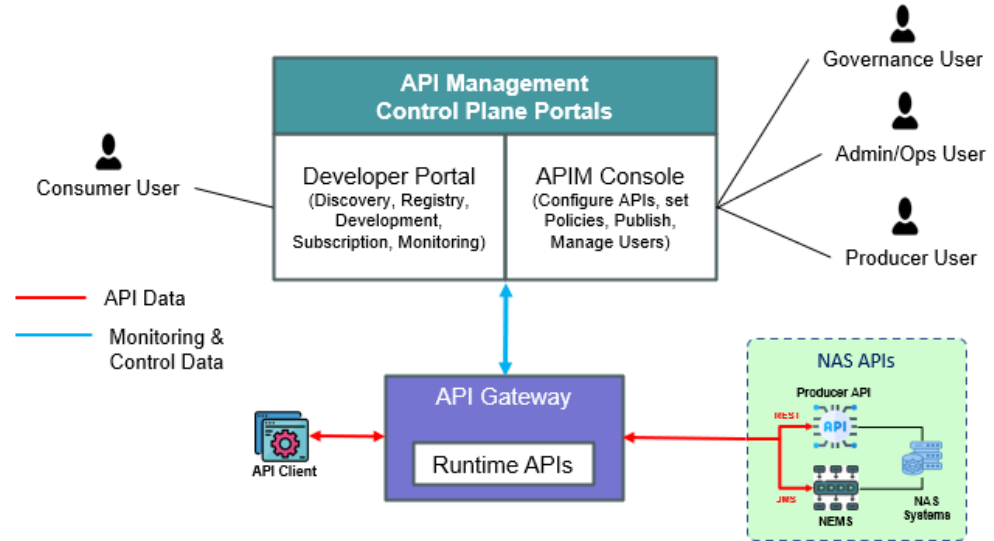
With emerging web technologies for future of flight planning and data sharing, the Federal Aviation Administration (FAA) and Asia-Pacific (APAC) region are considering Application Programming Interface (API) Management and Gateway solutions for Request-Reply SWIM data message exchange—in addition to using event brokers for asynchronous (pub-sub) messaging for comprehensive messaging avenues in alignment with industry best practices.

- ❑ **APIs** enable standardized communication and cross-border data sharing between aviation stakeholders, improving collaborative decision-making and real-time operational coordination.
- ❑ **API Gateways** provide centralized security and traffic management, including authentication, authorization, encryption, protocol mediation, and prioritization of critical aviation services.
- ❑ **API Management** platforms support governance and lifecycle management through monitoring, analytics, developer portals, service publication, and SLA oversight.



Simplified API Management Architecture

- ❑ APIs, API gateways, and API management platforms work together to enable secure, controlled access to backend systems
- ❑ NAS systems expose producer APIs, which are accessed through an API Gateway
- ❑ API Management Control Plane, which provides governance and lifecycle management through two main portals:
 - ❑ **Developer Portal** for discovery, registry access
 - ❑ **Admin Console** for control plane, gateway configuration and management



Functions of API Gateway



Centralized Platform & Registry

Unified **routing, governance, and publishing** for seamless service discovery across aviation boundaries.



Enhanced Security & Trust

Advanced **authn, authz, mTLS**, and Zero-Trust credential management for sensitive flight data.



Performance Optimization

High-availability delivery via **caching, load balancing**, and intelligent traffic steering.



Infrastructure Agnostic

Scalable support for **Cloud, VPN, Hybrid**, and legacy on-premise infrastructure environments.



Multi-protocol Support

Seamless handling of **REST, SOAP, gRPC**, and GraphQL APIs in a single gateway layer.



Protocol Mediation

Bridging **modern standards and legacy systems** with automated interoperability translation.



Event Broker Integration

Native hooks for **pub/sub, queuing, and streaming** for real-time event-driven SWIM architectures.



Schema Validation

Strict **compliance enforcement** for FIXM, AIXM, and IWXXM structured data messages.



Real-time Monitoring

Full **traffic visibility, SLA tracking**, and detailed operational auditing and logging.



API Version Management

Lifecycle management for **phased upgrades**, deprecation, and controlled consumer migration.



Reduced Complexity

Offload **security and traffic logic** to the APIM layer to simplify backend application development.



Traffic Control

Advanced **rate limiting and DDoS protection** to maintain system stability under load.

Provides inheritance of enterprise level controls to simplify system level design for SWIM information Service providers and access for SWIM Information Service Consumers



Federal Aviation
Administration



FAA Data Exchange Architecture with Solace & Gravitee

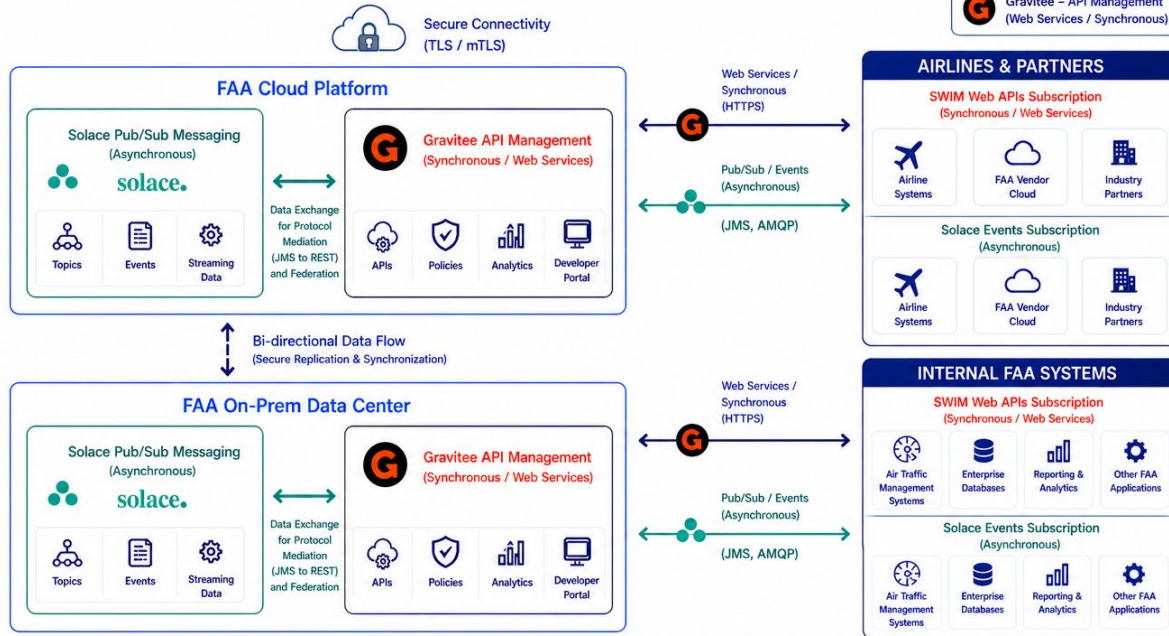
Secure, Scalable, and Hybrid API & Messaging Platform



CLOUD
(FAA Cloud Environment)



ON-PREM
(FAA On-Prem Environment)



- Solace – Pub/Sub Messaging (Asynchronous)
- Gravitee – API Management (Web Services / Synchronous)

- Solace and Gravitee power FAA's Event broker and API Management and Gateway solution .
- Event-brokers and API Gateways solve different problems .
- API gateways are best geared for to handle synchronous request/response interactions where a client needs an immediate answer (ex: submitting and acknowledging a flight plan).
- Event brokers handle asynchronous events distribution between loosely coupled services, where direct response isn't required.
- Event-brokers and API Gateways integrated together offer a comprehensive and unified data management platform for SIWM messaging.

FOUNDATIONAL CAPABILITIES

- Security (TLS/mTLS, OAuth2, RBAC)
- Governance & Policy Enforcement
- Monitoring & Observability (Logs, Metrics, Traces)
- High Availability & Scalability
- Hybrid (Cloud & On-Prem) Flexibility
- Developer Experience (Self-Service)

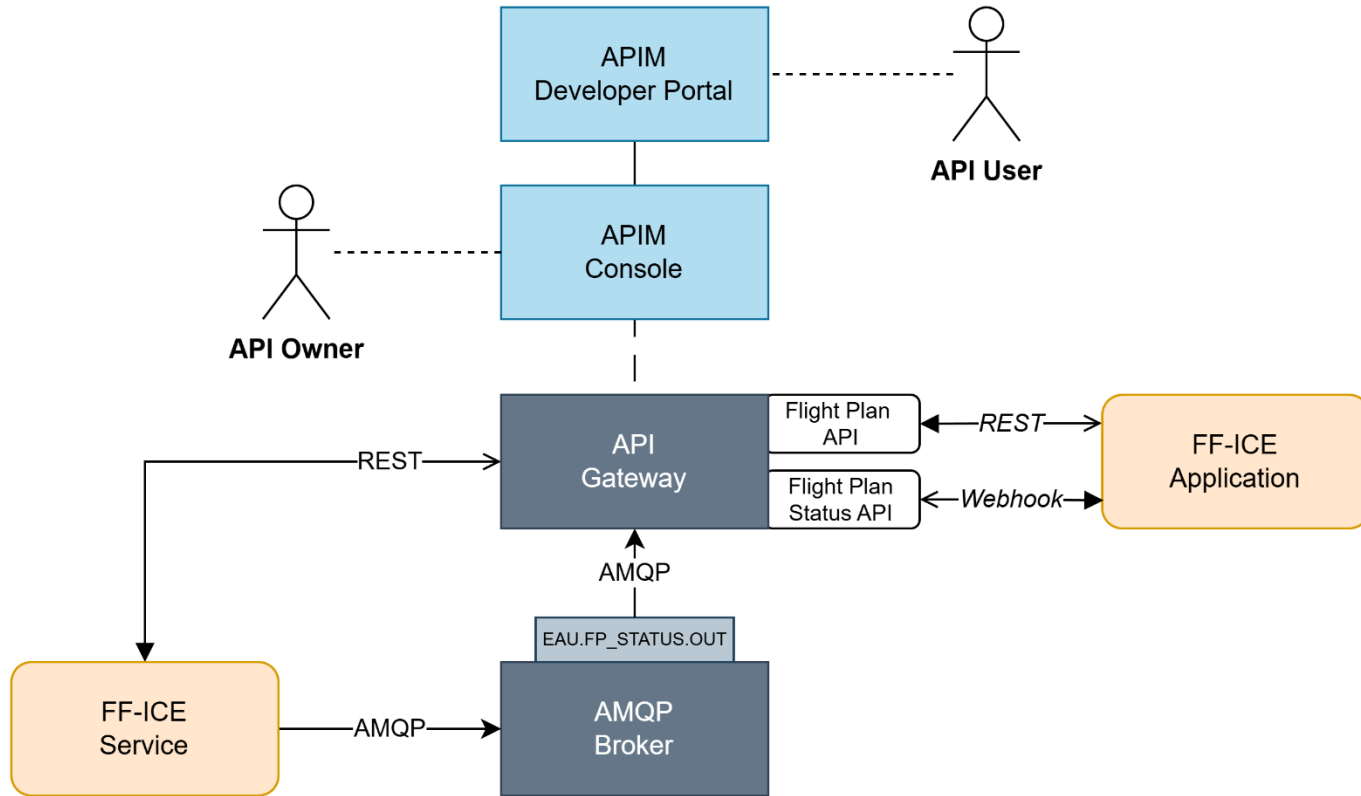
KEY ARCHITECTURE PRINCIPLES

- Airlines & Partners, External FAA Vendor Managed Clouds, and Internal FAA Systems consume data via Gravitee (synchronous) and Solace (asynchronous).
- Airlines & Partners exchange data only with the FAA Cloud Platform.
- On-Prem platform replicated with Cloud for resilience and consistency.
- Internal FAA Systems consume data from On-Prem via asynchronous messaging (JMS).



Federal Aviation Administration

FF-ICE Example via API GW and Event Broker



Demo Agenda

Today's demo provides a comprehensive end-to-end walkthrough on how API Management and Gateway platforms are a candidate solution for unified access and management of synchronous and asynchronous SWIM services for both information service providers and consumers.

Information Service Provider

- API creation and deployment (synchronous, asynchronous)
- Protocol Mediation (AMQP/JMS to REST)
- Configure API plans and policies
- API Registering/Publication
- Version Management
- Service Monitoring and Analytics
- Consumer Management

Information Service Consumer

- Registry/Dev Portal walkthrough
- API Discovery
- API Subscription

API Governance

- API Compliance Review
- API Rulesets and Scoring
- Lifecycle management
- Schema validation
- Naming conventions

Security

- Mutual TLS
- Service Authentication and Authorization (OAuth 2.0, JWT, IAM, API Keys, etc.)



Live Demo



Federal Aviation
Administration

Next Steps

Support SIPG tasks in following activities:

- Development of API Gateway functions
- Message Exchange Pattern analysis for Req/Reply vs Pub/Sub use cases
- Development of best practices and governance framework for API lifecycle management
- Development of governance framework (post functional analysis on API Gateway)

Collaborate with SIPG task 2 & 3 SDS given FAA and APAC synergy of leveraging API GWs for req/reply messaging and event- brokers (pub-sub) for asynchronous messaging



Questions?



**Federal Aviation
Administration**

Back Up



Federal Aviation
Administration

API Management Enterprise Benefits



Simplified API Design: Create web APIs of all types (REST, SOAP, gRPC, GraphQL, Webhooks etc.); and Full API lifecycle management.



Comprehensive management and security: Centrally integrated IAM, advanced security, governance, automated workflows, testing, traffic management.



Telco and Environment agnostic solution: Can be deployed in any environment independent of the network infrastructure. Harmonized SWIM modernization on-prem and in cloud.



Monitoring & SLA Tracking: Built-in monitoring/logging, SLA tracking. Native integration with enterprise monitoring tool, Datadog, for 1st and 2nd level support.



Unified Management and Developer Portal: Discovery and access to all NAS information services from a common interface. Native federation with COTS Messaging Platforms across the NAS portfolio (Solace, Google/Apigee, AWS etc.).



Integration with Event-Brokers. Protocol mediation to expose async events as web services (ex: JMS/AMQP to REST) or federation for discovery.



Cost savings and Enterprise inheritance: Prevents duplicative costs and conflicting governance, security, and implementation from standalone solutions. Inherit cross cutting enterprise controls to simplify system design.



Decouples Service Providers and consumers: Introduce an abstraction layer between consumer facing interfaces and backend implementations



Recommended framework for API Governance and Best Practices

Best Practice	Description
Service description and Nomenclature	<ul style="list-style-type: none">▪ Leverage standard naming conventions (ex: URI) for consistent documentation and simplified lifecycle management▪ Leverage industry standard templates such as OpenAPI specifications to leverage universally established machine-readable formats to describe web services
API Versioning	<ul style="list-style-type: none">▪ Leverage structured mechanisms for managing evolution of APIs.▪ Manage multiple versions of the same API and facilitate consumer management and migration▪ Identify versioning strategy such as URI path versioning, Header Versioning, semantic versioning,
API Registry	<ul style="list-style-type: none">▪ All APIs shall be registered and published to the API registry for user discovery▪ Developers shall also provide detailed documentation such as API specifications, schema definitions, access controls, use limitations, error handling guidance etc.
Authentication and Authorization	<ul style="list-style-type: none">▪ All SWIM APIs shall be enforced with certificate based authentication and leverage mutual TLS for end to end encrypted data exchange▪ All APIs shall include policy enforcement such as OAuth 2.0, JWT▪ All APIs shall be integrated with Identity Access Management solutions for Role Based Access Control and Certificate management▪ Leverage API keys or secrets to manage API access and credentials



Recommended framework for API Governance and Best Practices cont'd.

Best Practice	Description
Schema Validation	<ul style="list-style-type: none">▪ API Gateways shall perform XML schema validation to ensure message payload satisfies expected data structure and that any malformed and non-compliant messages are rejected
Traffic Management	<ul style="list-style-type: none">▪ Implement rate limits and throttling at Gateway level to manage incoming traffic requests per minute and minimize system overload
Decoupled services	<ul style="list-style-type: none">▪ Establish API proxies to isolate external APIs from backend APIs and enable users to simply discover and consume from API endpoint without requiring knowledge of underlying infrastructure
SLAs	<ul style="list-style-type: none">▪ Establish Service Level Agreements as appropriate for service uptime
API contracts	<ul style="list-style-type: none">▪ Implement API contracts to establish how an API provider and consumer application will interact with each other (ex: endpoint, HTTP method, authentication)



References

- ❑ [SP02_US-WP18-APAC-SWIM-TF11-FAA-APIM-presentation-05052026.pdf](#)
- ❑ [WP18-FAA-AI.7-SWIM-API Management and Gateway SWIM-TF11-Final.pdf](#)

