Enabling Information Sharing thru Common Services

A Developer's Experience with SWIM

Presented To: Air Transportation Information Exchange Conference

Presented By: Panel Members from SWIM & Service Provider Community

Date: August 31, 2011

Agenda

- **Introduction**
- SWIM in the FAA
- Panel Discussion
- Q&A

Introduction

- This panel discussion will begin with an overview of the System Wide Information Management (SWIM) Program.

- It will continue with a panel discussion where the various roles in developing services will be discussed by members of SWIM, Service Provider Organizations (Developers, Architects and Information managers) and other supporting roles.

- Finally, there will be an open question and answer session

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SWIM Program Concept

SWIM is an IT infrastructure program that will operate in the background to provide data to authorized users

SWIM will:

Implement a Service-Oriented Architecture (SOA) in the National Airspace System (NAS)

Allow the FAA to create new system interfaces more quickly and more cheaply than is possible today

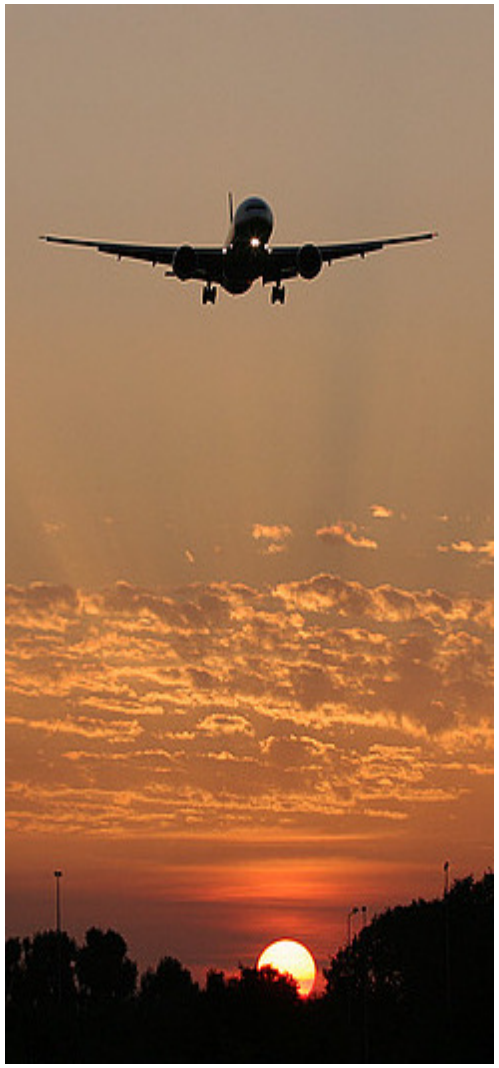
Facilitate the increased data-sharing that is required for NextGen

SWIM is *not*:

A set of avionics equipment

A substitute for NAS modernization programs

A telecom program



SWIM Functions

- **Discovery function**: lists all services and brokers interactions between providers and consumers
- **Requirements function**: ensures interoperability and maximizes opportunities for reuse
- **Service Governance function**: supports the registration of services and make sure they comply with standards
- **SWIM Common Service developer/provider**: develops those things that many can use, e.g., NAS Enterprise Messaging Service

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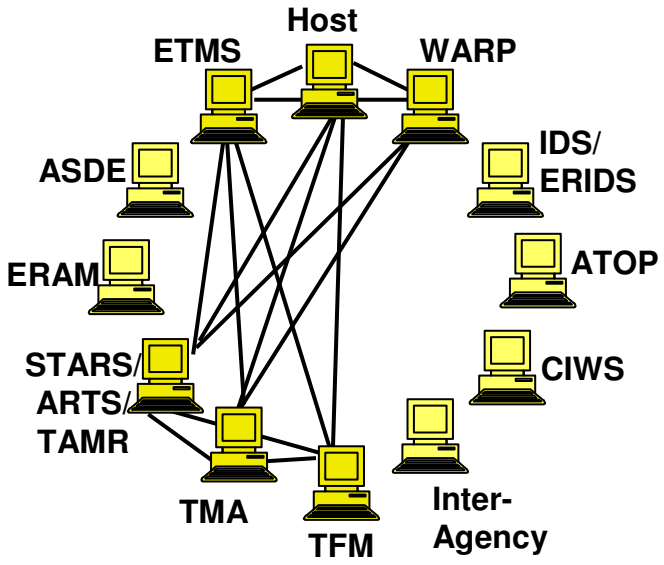
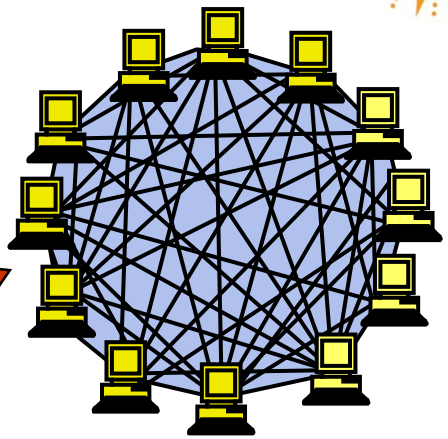
State of the System

Today



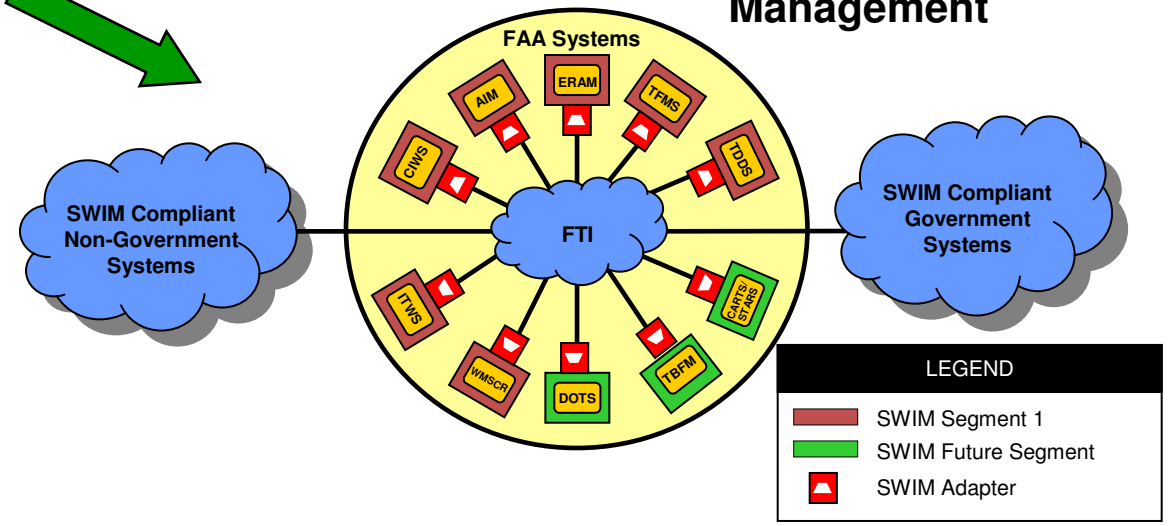
- Existing point-to-point hardwired NAS
- Unique interfaces, custom designs



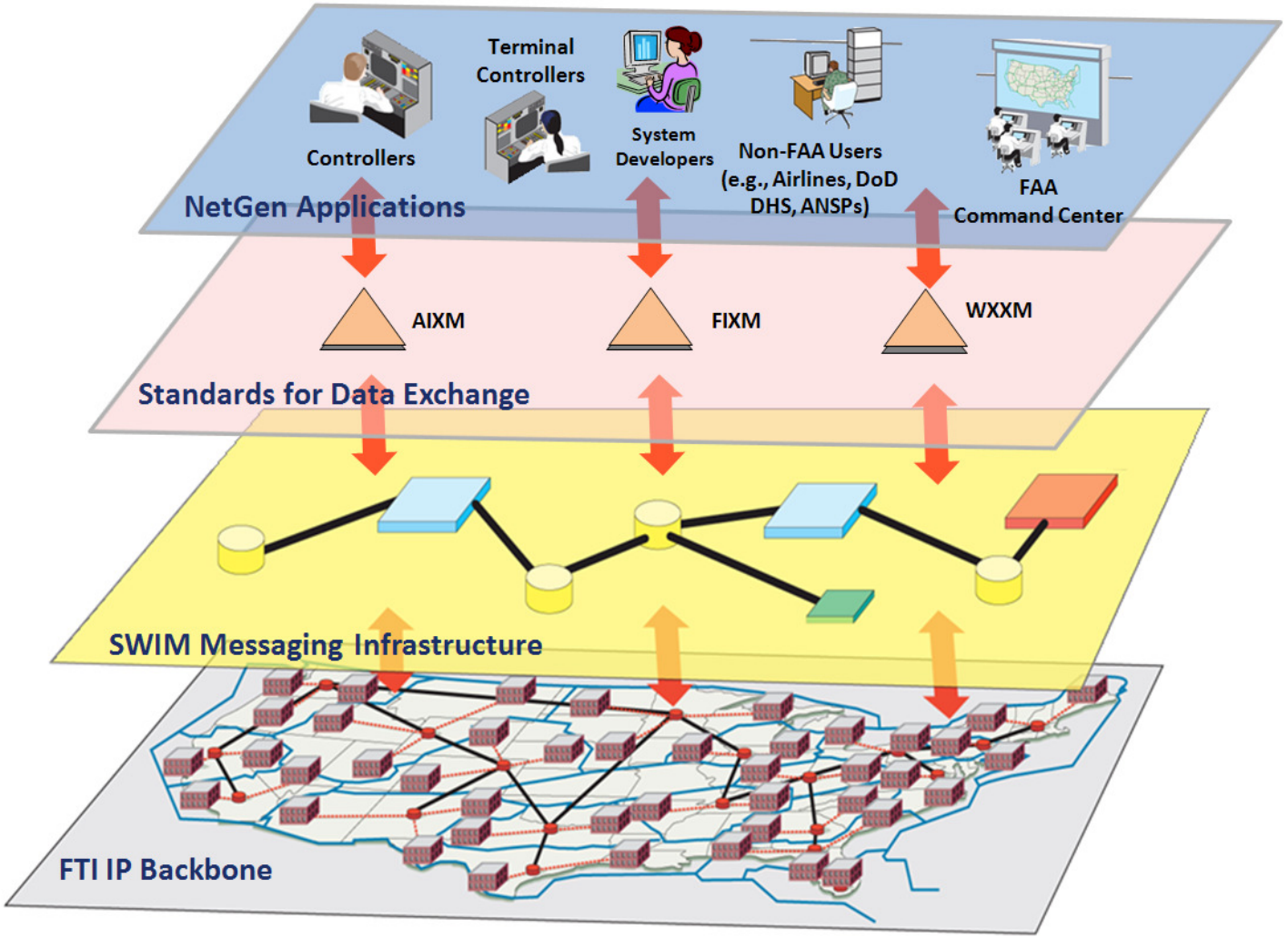
Business as Usual

- More point-to-point unique interfaces
- Costly development, test, maintenance, CM
- New decisions linked to old data constructs
- Cumbersome data access outside the NAS

Enterprise Management



Conceptual Overview



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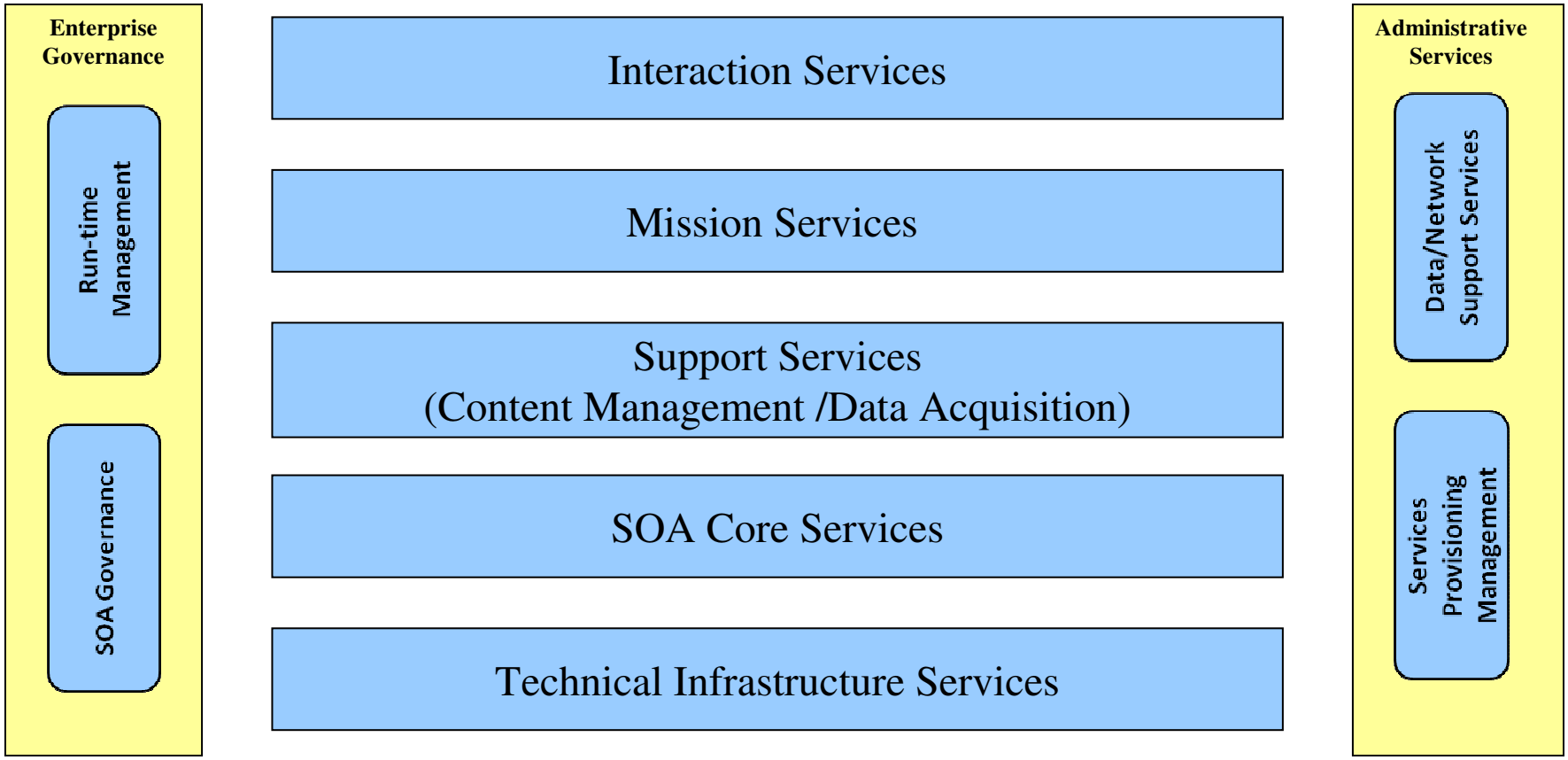
Simplified NextGen NAS SV-4 Framework



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Panel Roles

- Panel Moderator – **Ahmad Usmani**
- AIM Service Provider – **Navin Vembar**
- Weather Service Provider – **Oliver Newell**
- SWIM Service Governance - **Paul Jackson**

Scenario

- Acme Airlines wants to enable their pilots to access pre-flight briefing information to determine which route they want to take to their destination.
  - What weather may impact my flight?
  - What aeronautical events (airspace status, airport configuration, etc.) impact my flight?

Based on this scenario, we will review the steps necessary to respond and what services are currently available including how they were developed.

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Locating Information Services Offerings

- First a service that provides **Weather or Aeronautical Information** must be discovered
  - Search the NAS Service Registry/Repository (NSRR) for an appropriate services
  - Contact the service provider
- Acme Airlines determines that the FAA can provide information in support of a mash-up of **services to meet their need**

Service Governance

- How did the FAA ensure that the program developing the service created the necessary metadata for the NAS Service Registry/Repository?

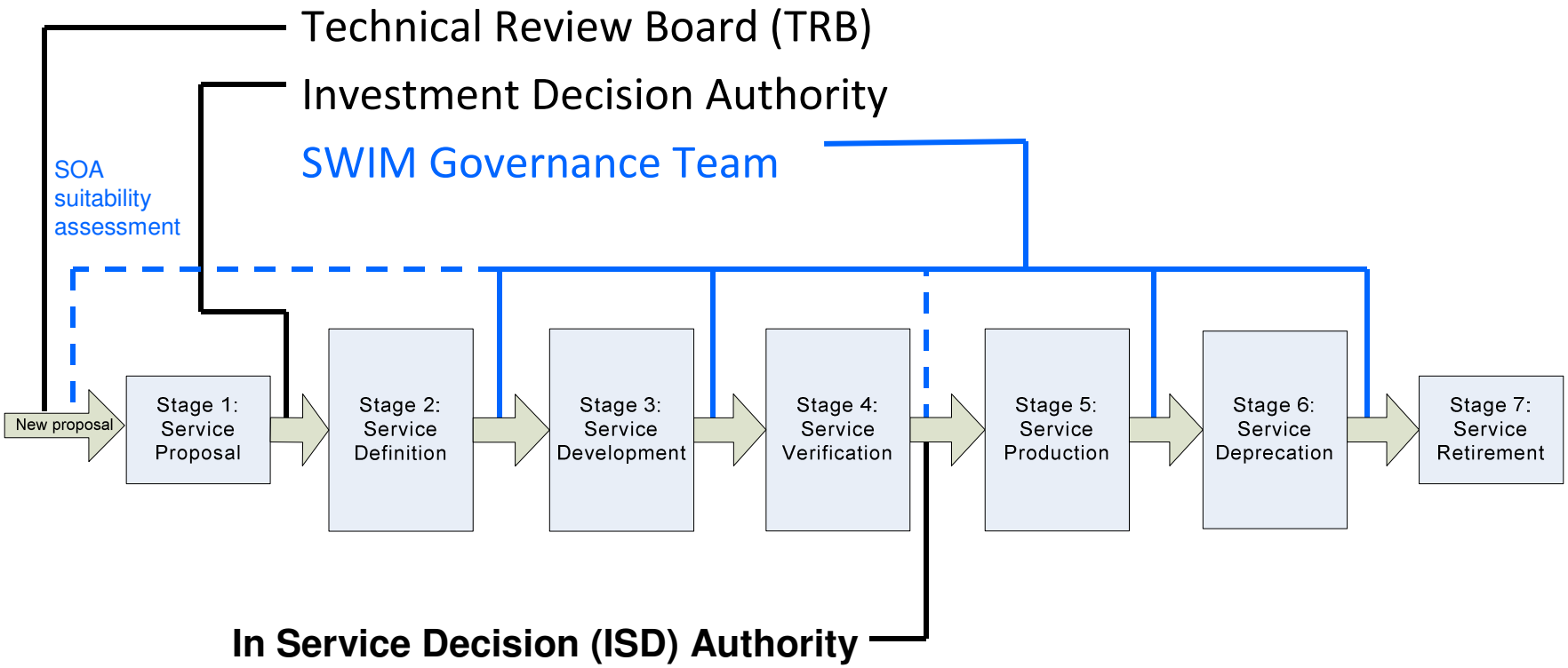
Service Governance – SWIM Policies

- **WHAT must be done**
  - SWIM Governance Policies
  - Templates and schemas for Service Contract artifacts
- **WHO is responsible**
  - Governance Authority
    - Initial Service Candidate Approval by Technical Review Board (TRB)
    - SWIM manages remainder of lifecycle for approved programs
  - Policy responsibility allocated to:
    - SWIM Program Office
    - Service Providers
    - Service Consumers

Service Governance - Standards

- **HOW Policies are implemented**
  - Technical Standards coordinated with NAS Enterprise Architecture
    - TV-1 Technical Standards Profile
    - TV-2 Technical Standards Forecast
  - FAA Standards
    - FAA-STD-063 XML Namespaces
    - FAA-STD-064 Web Service Registration
    - FAA-STD-065 Web Service Description Documents
    - FAA-STD-066 Web Service Taxonomies
    - FAA-STD-070 (Draft) Web Service Requirements Documents
  - SWIM Service Lifecycle Management Processes
  - SWIM Version Management Processes

Service Lifecycle Management Decisions



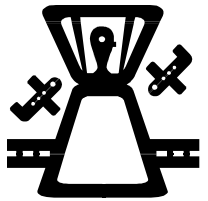
SWIM Compliance

- **SWIM Compliance Definition**:
  - "verified conformance to SWIM Policies."
- **Verification Mechanisms**
  - Manual review of artifacts
  - Coordinate with FAA Data Registrar
    - Namespaces
    - Data Elements
    - Taxonomies
  - Governance-enabling Technology
    - NAS Service Registry/Repository (NSRR)
    - Testing Tools (Actional, Lisa, etc…)
    - SWIM Web Service Security Compliance Test Kit (SWIM WS-S CTK)
    - Policy Servers
    - XML Gateways
    - Enterprise Service Management (ESM) software

Service Development

- How did those services get into the registry?
- How were existing services architected and developed?
- How do we know that the services provide authoritative information?

Conceptualizing an AI Service



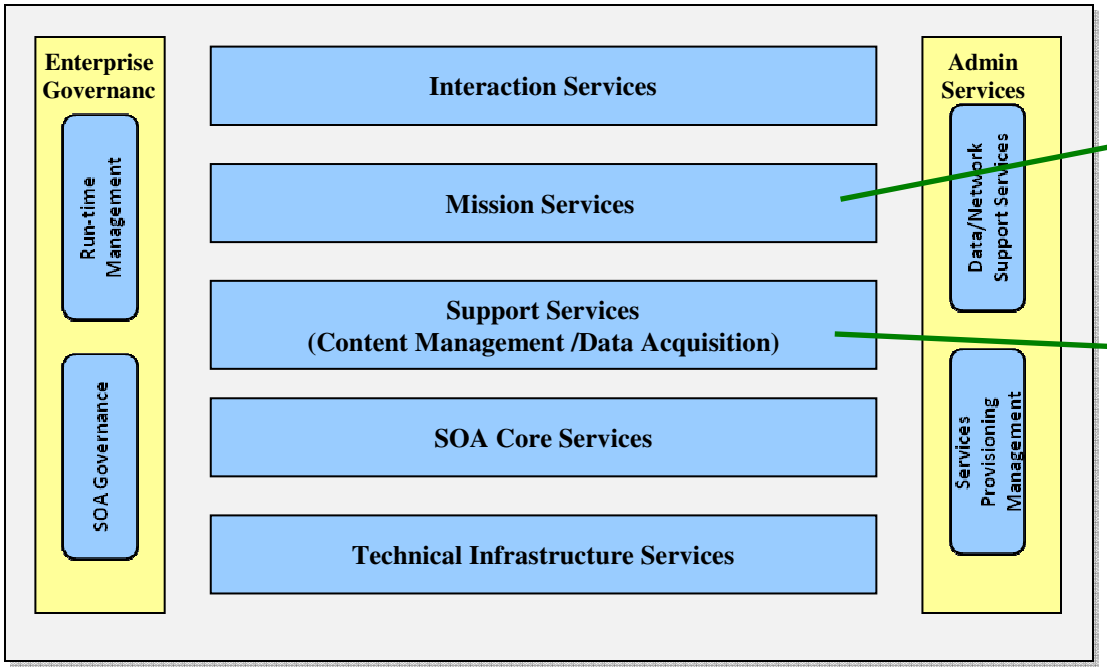
- **Capture information flow**
  - From where? To where? What processing has to occur in between?
- **Determine messaging and exchange structure**
  - Are there existing definitions and extensions representing the messages?
  - How should AIXM be extended?
  - Within what namespace and taxonomy?
  - How does legacy need to be adapted (hopefully using SOA capabilities)
- **Define the messages and capture the information for registration**
  - Put together the information to register a service in the early stages of development

Development & Publication of a Service

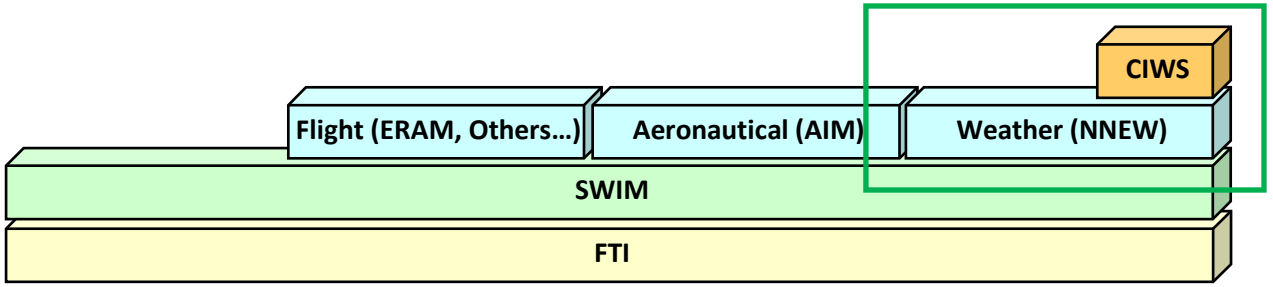
The development of a common service like the ACS is facilitated by:

- **Data Exchange Standards**
  - By using AIXM (or WXXM or FIXM), understanding the data and its semantics is largely understood and the process by which information is conveyed is more clear
- **Service Standards**
  - OGC and SWIM standards lower the bar to entry in getting, querying and presenting information
- **Use of COTS tools**
  - The actual cost of using the information (visualization, automation, etc) is lowered because the work has been done by vendors already
- **Publication through the registry**
  - Update the metadata: Service Profile, WSDDs

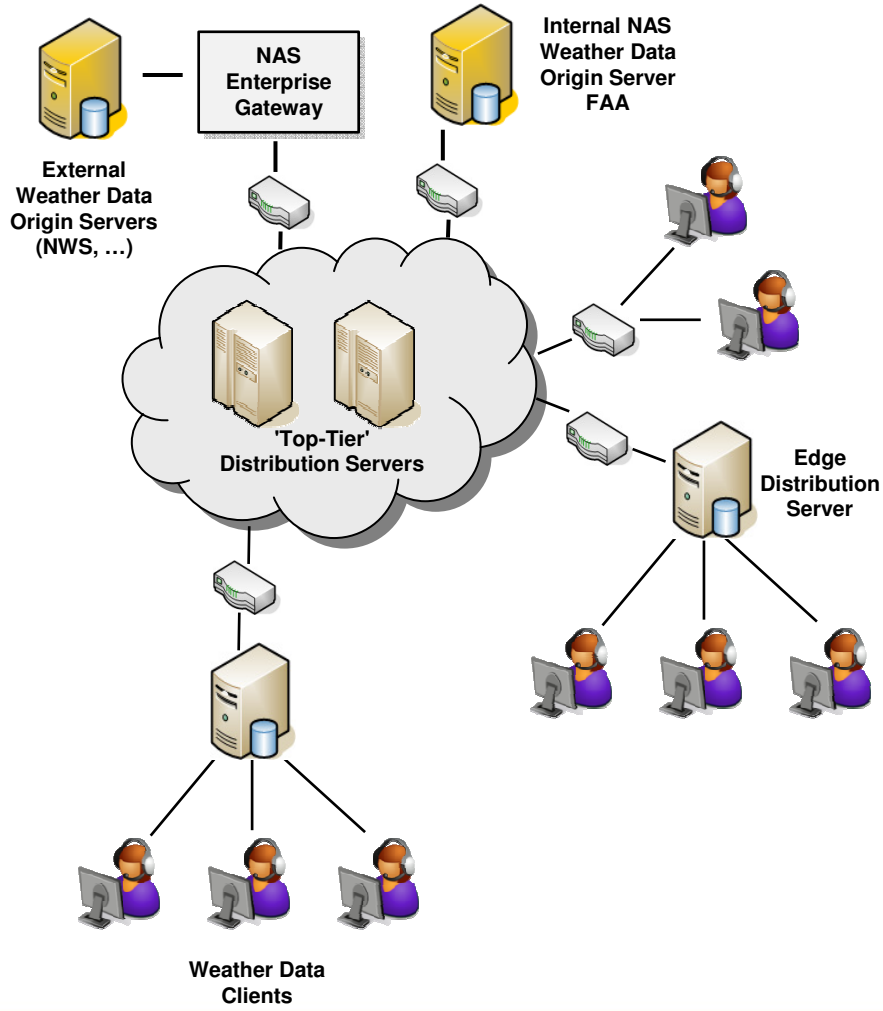
Weather Information Services



- **Corridor Integrated Weather System (CIWS)**
  - ***En-route weather avoidance and planning***
- **NextGen Network-Enabled Weather (NNEW)**
  - ***Shared Weather Information Services***

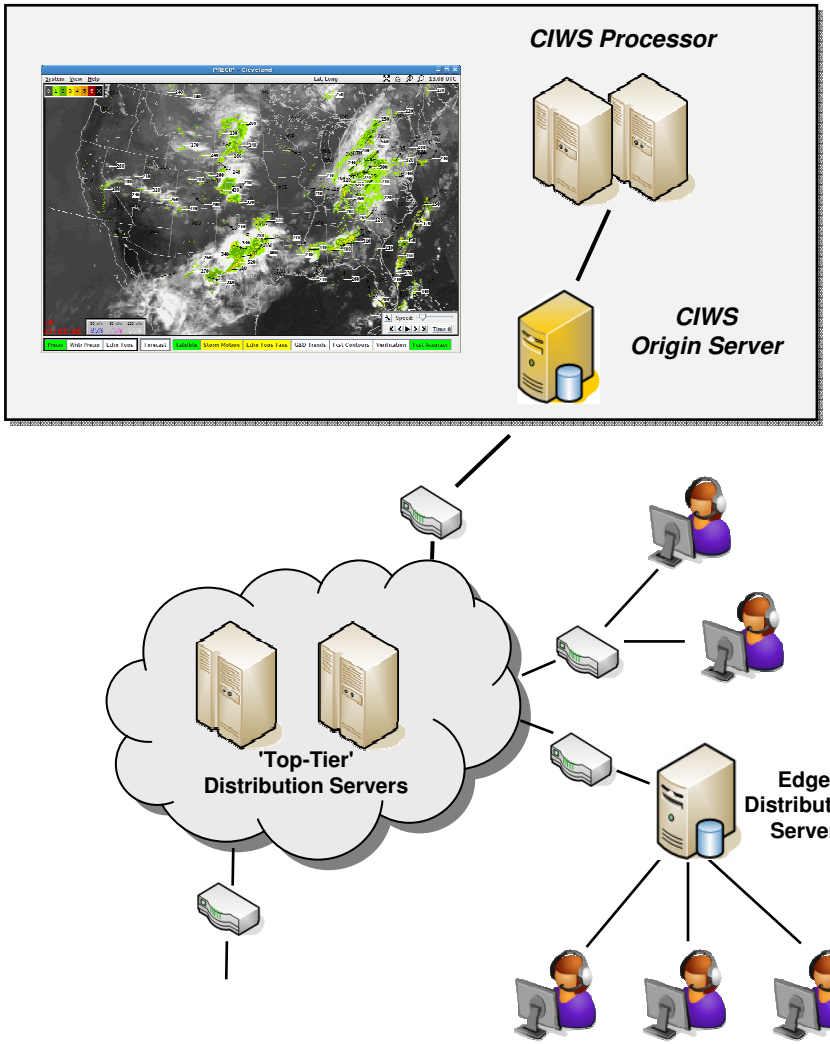


NNEW Shared Information Services



- **Content Delivery Network (CDN) for Weather Data**
  - *Origin Servers*
  - *Distribution Servers*
  - *Flexible Topology (can shift over time)*
- **Common Interfaces**
  - *OGC WFS, WCS, WMS, with extensions*
  - *Leverages NAS Enterprise Messaging Service (NEMS)*
- **Common Data Models**
  - *"Get latest convective weather contour (WXXM, NetCDF) in airspace XYZ (AIXM)"*
- **SWIM-Compliant Standards and Implementation Technologies**
  - *XML, Security, Monitoring, Messaging*
  - *Progress FUSE*
- **Web Service Description Documents (WSDDs)**
  - *Service 'profiles' for NNEW implementations of OGC WFS, WCS, WMS*
  - *Endpoints of distribution servers*
  - *Stored in SWIM Registry*
  - *NNEW WSSD can be referenced by weather providers*

CIWS Data Distribution Service



- **Define CIWS-specific data models**
  - *Compliance with NNEW metadata, data standards (ISO 19115, WXXM, NetCDF)*
  - *Compliance with SWIM metadata, data standards*
  - *CIWS-specific extensions as necessary*
- **Develop Origin Server**
  - *Download and test NNEW software with CIWS adatper in local environment*
- **Web Service Description Documents**
  - *Leverage NNEW WSDDs (by reference)*
  - *Include Endpoint(s) of Origin Server*
  - *Service instance namespace coordinated with FDR*
  - *Submit WSDDs to SWIM Governance Process*
- **Network Communications**
  - *Establish necessary FTI connection(s) to NNEW distribution server 'cloud', specifying bandwidths and protocols*
- **Testing**
  - *Initial testing conducted in NAS test environment*
  - *Security Testing*
  - *Interface Protocol Testing*
- **Operational Phase**
  - *Status updated in SWIM registry*
  - *Prospective clients contact CIWS and/or NNEW program to establish data access requirements and service level agreements*

Service Level Agreements

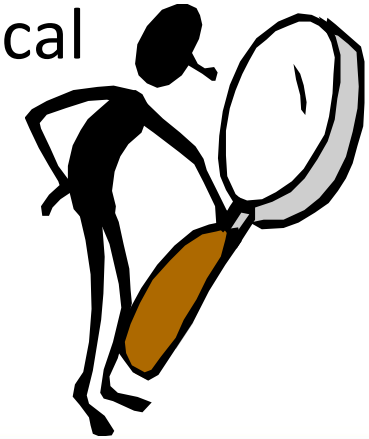
- What communication occurred between the consumer and provider once the consumer requested access to the service?
- What activity assures the agreements between consumer and provider are enforced?

Consumer and Provider Negotiations

- To set the terms of the consumer's use of the service:
  - Provider conveys the options for **Service Level Agreements (SLAs)**
  - Consumer contacts the provider to request access to the service
  - Consumer and Provider agree on specific Service Level Agreement (SLA)

Enforcing Service Level Agreements

- Service Level Agreements (SLAs) are:
  - Defined in a Policy Enforcement Point
    - Use metrics for the definition
    - E.g. Average Response Time, Hours of Operation
- Policy Enforcement Points
  - Monitors communication to the Aeronautical and Weather Services
  - Alerts the provider when SLAs are violated



Conclusion

- This scenario was designed to give a **high-level overview** of service development and provision in the FAA
  - Not every role was discussed
- **Future Work**
  - Develop and document Air Transportation Semantic Models
  - Expand existing FAA registry capabilities to house schemas
  - Machine-readable Web Service Description Documents

Questions & Answers / Feedback

More Information

SWIM Program

- **Ahmad Usmani (SWIM Program Manager)**
  - Ahmad.Usmani@faa.gov
- **Paul Jackson (SWIM Governance)**
  - Paul.Jackson@faa.gov
- FAA SWIM Web Site at www.swim.gov

Data Registry

- **Mojdeh Supola (FAA Data Registrar)**
  - Mojdeh.Supola@faa.gov; **tel (202) 385-8022**
- FAA Federal Data Registry Web Site at www.fdr.gov

Other Points of Contact

- **Navin Vembar (AIM Service Provider)**
  - Navin.Vembar@faa.gov
- **Oliver Newell (MIT Lincoln Laboratories)**
  - olivern@ll.mit.edu