Digital Information Exchange
Digital Convergence on the Common Operating Picture

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Key Point to Briefing

- **The System Wide Information Management (SWIM) Program facilitates Digital Convergence on the Common Operating Picture through Web Services**

Agenda

- **Introduction**
- **What is SWIM?**
- **Capabilities to Services**
- **What is SOA?**
- **Web Services**
- **Benefits of Digital Information Exchange**
- **Prototypes evolving to Capabilities**
- **Integrated Terminal Weather Service Prototype**
- **Corridor Integrated Weather System Prototype**
- **Summary**

Introduction

- Advances in information technology (IT) are changing the way businesses work.

- This information revolution presents challenges and opportunities for the Federal Aviation Administration (FAA).

- Government agencies and private-sector partners rely on the exchange of information for business decision-making.

- In the Internet-era, more sophisticated customers are asking for the same accurate information to be delivered in faster and more user-friendly formats while ensuring the same reliability of service.

- FAA leaders agree improved services will evolve by redesigning operations oriented around digital services.

- Digital services provided through the System Wide Information Management (SWIM) will support the growing demand for digital information.

- Cultural and technical changes will be necessary to transform operations successfully.

What is SWIM?

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

SWIM will:

- **Identify industry standards, best practices and COTS products for use by NAS programs**
- **Establish governance policy, process, mechanisms and metrics**
- **Implement a Service-Oriented Architecture (SOA) in the NAS**

In order to:

- **Ensure interoperability between systems as required by NextGen**
- **Lower costs for information exchange**
- **Reduce time needed to establish new interfaces**
- **Increase common situational awareness**
- **Increase NAS agility**

SWIM Details

- **The SWIM Program will promote state-of-the-art information management and exchange technologies to:**
  - **ensure information is available to SWIM-enabled systems**
  - **allow more distributed decision-making**
  - **improve the speed, efficiency, and quality of distributed decision-making**

- **SWIM-enabled systems will have the ability to:**
  - **request and receive information when they need it**
  - **subscribe for automatic receipt of new or updated data**
  - **publish information and services as appropriate**

- **The SWIM Program**
  - **is an integral part of the NAS Enterprise Architecture roadmap and will close the performance gap by promoting the development of a secure NAS-wide information web to connect FAA systems**
  - **will enable interaction with other members of the decision-making community including other agencies, air navigation service providers, and airspace users**

Capabilities to Services

- **SWIM facilitates more efficient sharing of air traffic management (ATM) system information**

- **Nine Segment 1 capabilities were derived from Communities of Interest:**
  - Aeronautical Information Management (AIM)
    - SUA
  - Flight & Flow Management (F&FM)
    - Flight Data Publication
    - Terminal Data Distribution (ASDE-X, RVR, TDLS, EFSTS)
    - Flow Information Publication
    - RVR Publication
    - Reroute Data Exchange
  - Weather
    - CIWS
    - ITWS
    - PIREP

SWIM High Level Schedule
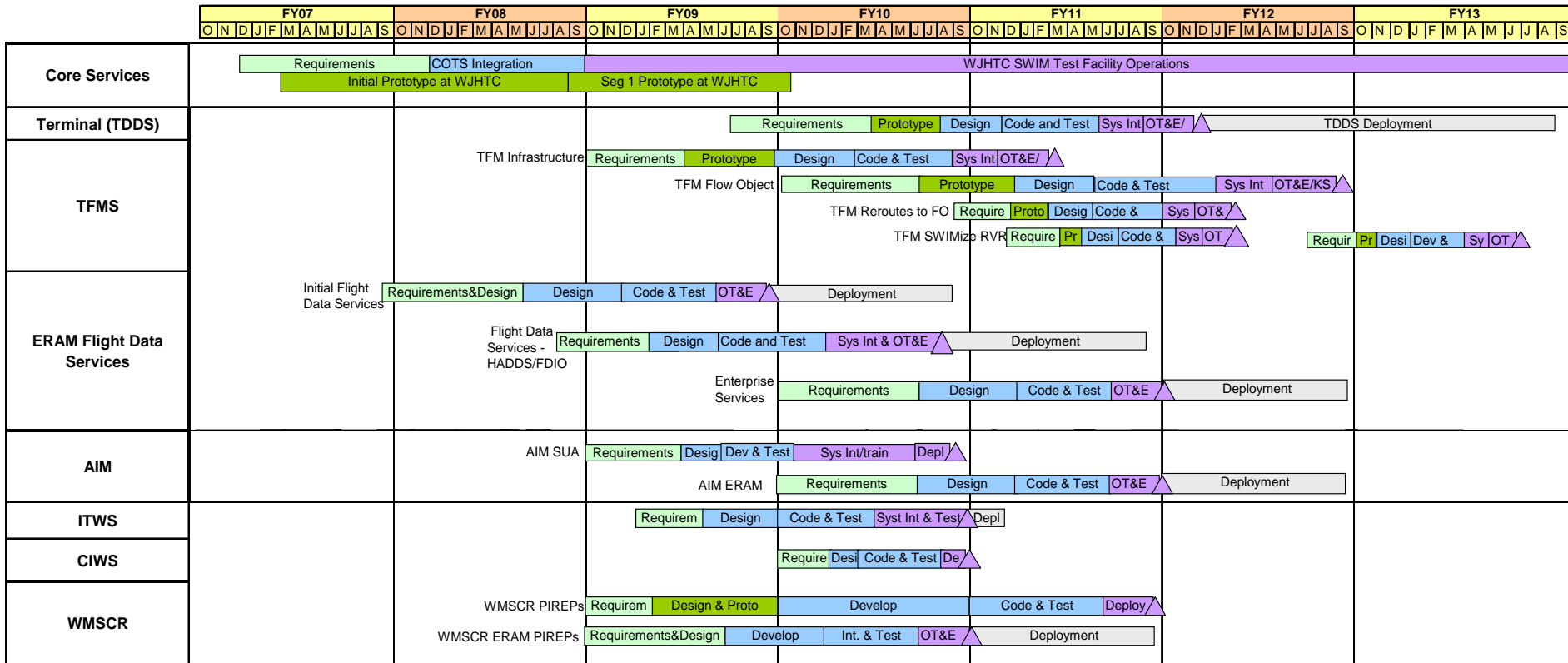
What is SOA?

- **SOA implementations rely on a mesh of software services.**
  - Services comprise unassociated, loosely coupled units of functionality.
  - Each service implements one action, such as submitting a Pilot Report (PIREP) or viewing a Microburst TRACON Map.
  - Instead of services embedding calls to each other in their source code they use defined protocols that describe how services pass and parse messages, using description metadata.
- **Underlying and enabling all of this requires metadata in sufficient detail to describe not only the characteristics of these services, but also the data that drives them.**
- **The great promise of SOA suggests that the marginal cost of creating the n-th application is low, as all of the software required already exists to satisfy the requirements of other applications.**
  - This has the potential to spread costs over many consumers and consumer uses, and promotes standardization both in and across industries.
- **SOA as an architecture relies on service-orientation as its fundamental design-principle.**
  - If a service presents a simple interface that abstracts away its underlying complexity, users can access independent services without knowledge of the service's platform implementation.
  - SOA relies on services exposing their functionality via interfaces that other applications and services can read to understand how to utilize those services.

Web Services

- **Web services can implement a service-oriented architecture as with the case of SWIM Segment 1.**
    - Web services make functional building-blocks accessible over standard Internet protocols independent of platforms and programming languages
    - These services can represent either new applications or just wrappers around existing legacy systems to make them network-enabled
- **Each SOA building block can play one or both of two roles:**
    - Service Provider
        - creates a web service
        - publishes its interface and access information to the service registry.
        - decide which services to expose,
        - how to make trade-offs between security and easy availability,
        - how to price the services if charges apply.
        - The provider also has to decide what sorts of partner agreements are required to use the service.
        - It registers what services are available within it, and lists all the potential service recipients.   The Universal Description Discovery and Integration (UDDI) specification defines a way to publish and discover information about Web services.

Web Services

- – Service consumer
  - • The service consumer or web service client locates entries in the registry using various find operations
  - • completes the required agreements
  - • binds to the service provider in order to invoke one of its web services and then use it
  - • They can access multiple services if the service provides multiple services
- – The SWIM Program is the process of standing up a National Airspace System (NAS) UDDI SWIM Service Registry/Repository
  - • A contract was awarded to Hewlett Packard on April 27, 2010 for software, training, and consulting
  - • The Hewlett Packard Systinet V3.2. Product will be used to implement the NAS SWIM Service Registry/Repository that will be available operational on July 1, 2010.

Benefits of Digital Information Exchange

- The following is a list of the primary benefits that can be realized by both the Service Provider and the Service Consumer:
    - Rapid delivery of new capabilities/reduced time to delivery
    - Enables a dynamic selection of services and processes based on real-time situation
    - Provides the best components to develop an integrated whole, as opposed to stove- piped systems
    - Increased flexibility, enabling on-demand changes and restructuring to meet business needs
    - Facilitates integration with multiple solutions
    - Ensures the delivery of an integrated set of capabilities
    - More timely and consistent information
    - Promotes scalability - information is more widely distributed, enabling wider access to a capability
    - Decreased cost of ownership
    - Improved access to information

Prototypes evolving to Capabilities

- **Two programs that are part of the SWIM Segment 1 capabilities, are actively participating in SWIM prototyping with both having SWIM-Compliant data products available for consumers.**
  - Integrated Terminal Weather Service (ITWS)
    - ITWS Publication prototype service subscribed to by UPS, Harris, DoD, and FedEx; MOA signed with NWA
  - Corridor Integrated Weather System (CIWS)
    - Initial participants selected for CIWS SWIM prototype, including Delta Airlines, Raytheon Company, ARINC, Harris Corporation, Kent State University, and WSI Corporation

Why would I Want to Use ITWS SWIM-Compliant Products?

- Customers can realize significant benefits by using ITWS SWIM-compliant data products.

- Airlines can use ITWS SWIM-compliant data to better predict how long they have to keep a plane in the air, how long a plane has to stay on the runway, and whether a reroute is necessary.

- Benefits include low cost to enhance current product lines and access to the same products that are used by the FAA.

- Stakeholder benefits also include not having to re-learn technology - users can leverage the data using an industry standard format, and quickly incorporate it into their systems. This results in both increased efficiency and cost savings (e.g., less time spent on transforming the data).

ITWS Prototype

- **Initial Prototype was an evaluation of Iona (Progress) Fuse Service Container**

- **Following the service container contract award, development continued to provide ITWS services to external FAA consumers though the Federal Telecommunications Infrastructure (FTI) NAS Enterprise Security Gateways (NESG)**

- **The initial prototype provides four services:**
  - Microburst TRACON Map,
  - Gust Front TRACON Map,
  - Terminal Weather Text, and
  - Configured Alerts (text)

- **Sample client software is provided to consumers in order facilitate use of the service prior to integrating it into their own applications.**
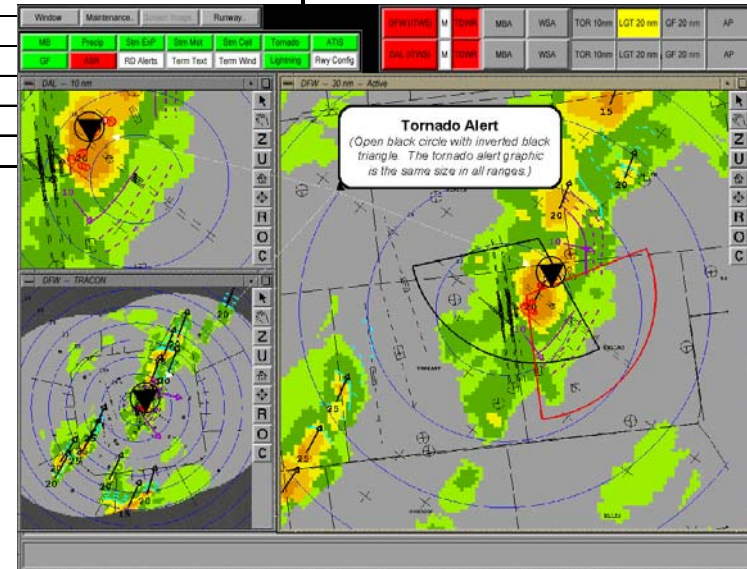
ITWS Prototype

- **On October 6, 2008 UPS started receiving digital data for the four ITWS weather products.**

- **Additional users have connected**

- **Additional product have been added to prototype**

- **For the prototype, consumers can use either a Virtual Private Network (VPN) over the internet to connect to the NESG or a VPN over a leased line to the NESG.**

- **Prototype has provided knowledge and experience with**
  - security using the Progress Fuse Service Container
  - connection to external consumers through the NESG

- **The prototype will continue to evolve with additional products until the operational system replaces it in January 2011**

What are the ITWS SWIM-Compliant Products?

ITWS SWIM-Compliant Data Products: Currently Available	
Microburst Terminal Radar Approach Control (TRACON) Map Product	Precipitation TRACON Product
Gust Front TRACON Map Product	Storm Motion (SM) Storm Extrapolated Positions (SEP) 5nm Product
Gust Front Estimated Time To Impact (ETI) Product	SM_SEP TRACON Product
Wind Profile Product	Hazard Text 5 Nautical Mile (nm) Product
Tornado Detections Product	Hazard Text TRACON Product
Tornado Alert Product	Runway Configuration Product
Configured Alerts Product	ITWS Status Information
Microburst Automatic Terminal Information Service (ATIS) Product	Forecast Image Product
Wind Shear ATIS Product	Forecast Accuracy Product
Terminal Weather Text Normal Product	Forecast Contour Product
Terminal Weather Text Special Product	Hazard Text Long Range Product
Terminal Weather Graphics Product (Availability TBD)	Precipitation Long Range Product
Airport Lightning Warning	SM_SEP Long Range Product
Anomalous Propagation (AP) Status	Storm Motion 5NM
AP Indicated Precipitation Product	Storm Motion TRACON
Precipitation 5nm Product	

For more information on the ITWS SWIM-Compliant
Prototype Service:
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Why would I Want to Use CIWS SWIM-Compliant Products?

- Customers can realize significant benefits by using CIWS SWIM-compliant data products. Publishing CIWS products through the CIWS SWIM Data Publication Service will allow the products to serve a wider range of customer needs.

- Benefits include low cost to enhance current product lines and early awareness of future CIWS products. Stakeholder benefits include not having to re-learn technology - users can leverage the data in an industry standard format, and quickly incorporate it into their systems.

- These results in both cost avoidance and cost savings measures (e.g., less time spent on transforming the data). Standards-based weather product formatting will reduce integration costs, thereby making the distribution of CIWS SWIM-compliant products more available and economical to a wider user base.

CIWS Prototype

- **Initial Prototype was an evaluation of the Mulesource Mule Service Container**

- **Development of a follow on Prototype started in January 2009 using SWIM compliant software**
  - CIWS products are available though the NESG to external consumers starting at the end of January 2010.
  - Initial prototype provides 5 services:
    - Vertically Integrated Liquid Mosaic (1 km Resolution)
    - Vertically Integrated Liquid 2-hr Forecast
    - Echo Tops Mosaic (1 KM Resolution)
    - Echo Tops 2-hr Forecast
    - Satellite Mosaic

- **One of the goals of this prototype is to provide the requirements definition for the operational system.**

- **The CIWS prototype will operate until replaced by the operational system in 2010.**

What are the CIWS SWIM-Compliant Products available in the Capability?

CIWS SWIM-Compliant Data Products: Available September 2010
Storm Info: Echo Top Tags
Storm Info: Leading Edges
Storm Info: Motion Vectors
VIL Forecast Contours (Standard Mode)
VIL Forecast Contours (Winter Mode)
Echo Tops Forecast Contours
Growth & Decay Contours
Forecast Accuracy: Echo Tops
Forecast Accuracy: Standard Precipitation
Forecast Accuracy: Winter Precipitation

For more information on the CIWS SWIM-Compliant Prototype Service:
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Digital Convergence on the Common Operating Picture

- **As more services become available, the common operating picture will improve.**

- **Increased number and quality of services will not only benefit external NAS service consumers, but internal NAS consumers.**

- **Much of the weather that is available to controllers as well as much of the state and data that is being used within the NAS will become available.**

- **The System Wide Information Management (SWIM) Program facilitates Digital Convergence on the Common Operating Picture through Web Services**

- **Additional information on Segment 1 and future Segments**
  - **www.swim.gov**