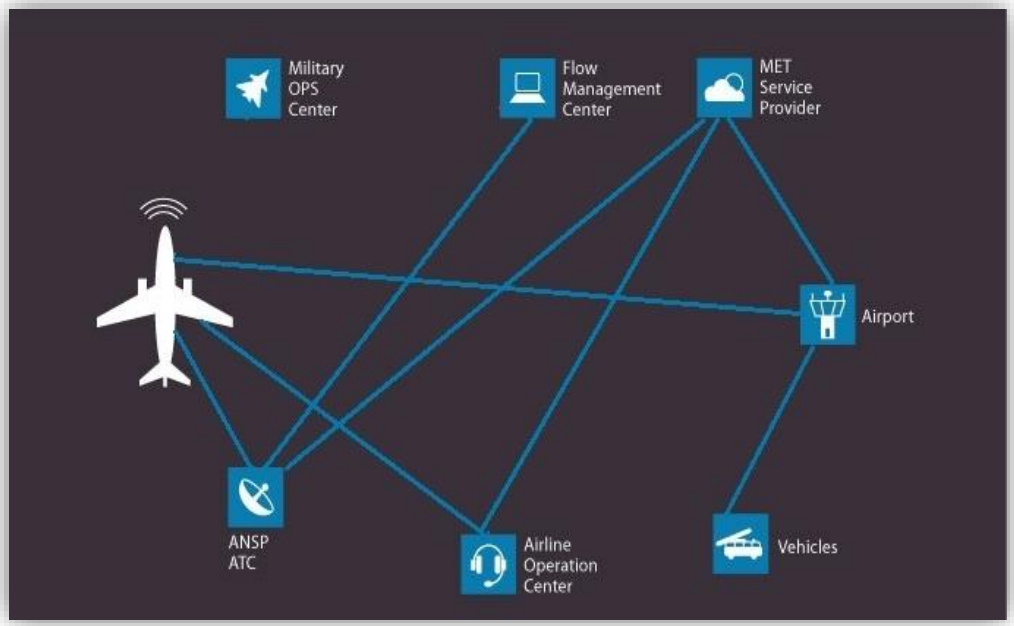

Introduction to
SWIM

Why SWIM?

The Problem:



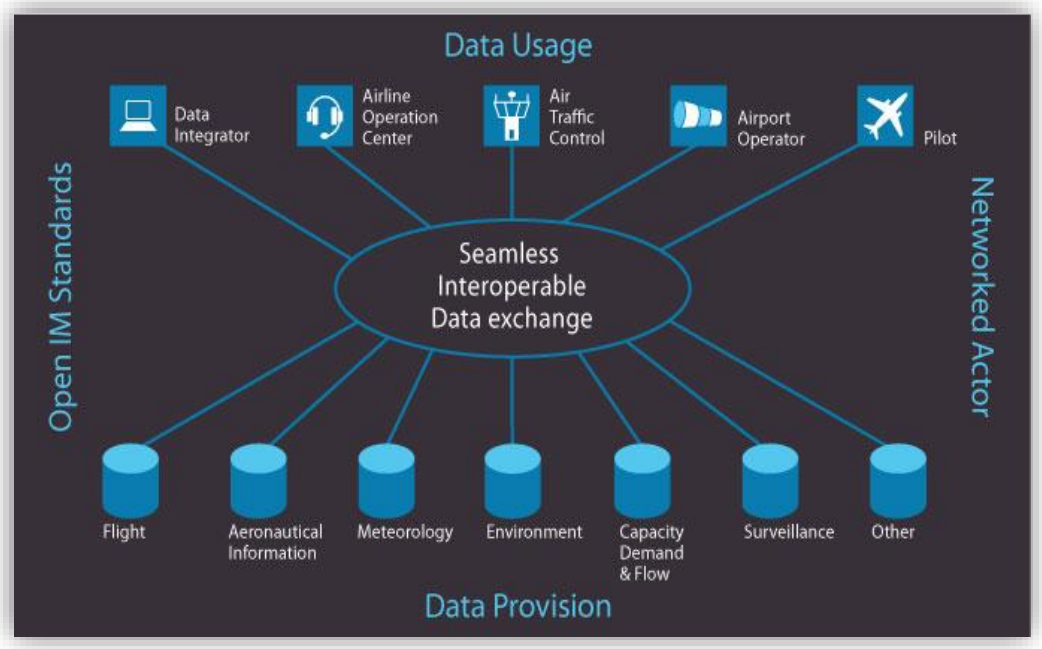
The exchange of information between Air Traffic Stakeholders is hindered because of

- different types of tight individual **peer to peer coupling** between the various stakeholders - which makes the establishing of new links complicated and time/money consuming
- diverging networks for different purposes with **different interfaces and data formats** which are **not interoperable**

With this **peer to peer** concept the support of CDM or the planning and execution of a 4D Trajectory are rather complicated. Missing interoperability hinders collaboration, which is the basis for an optimised routing.

Why SWIM? (2)

The Solution:



The exchange of Information between Air Traffic stakeholders is fostered by

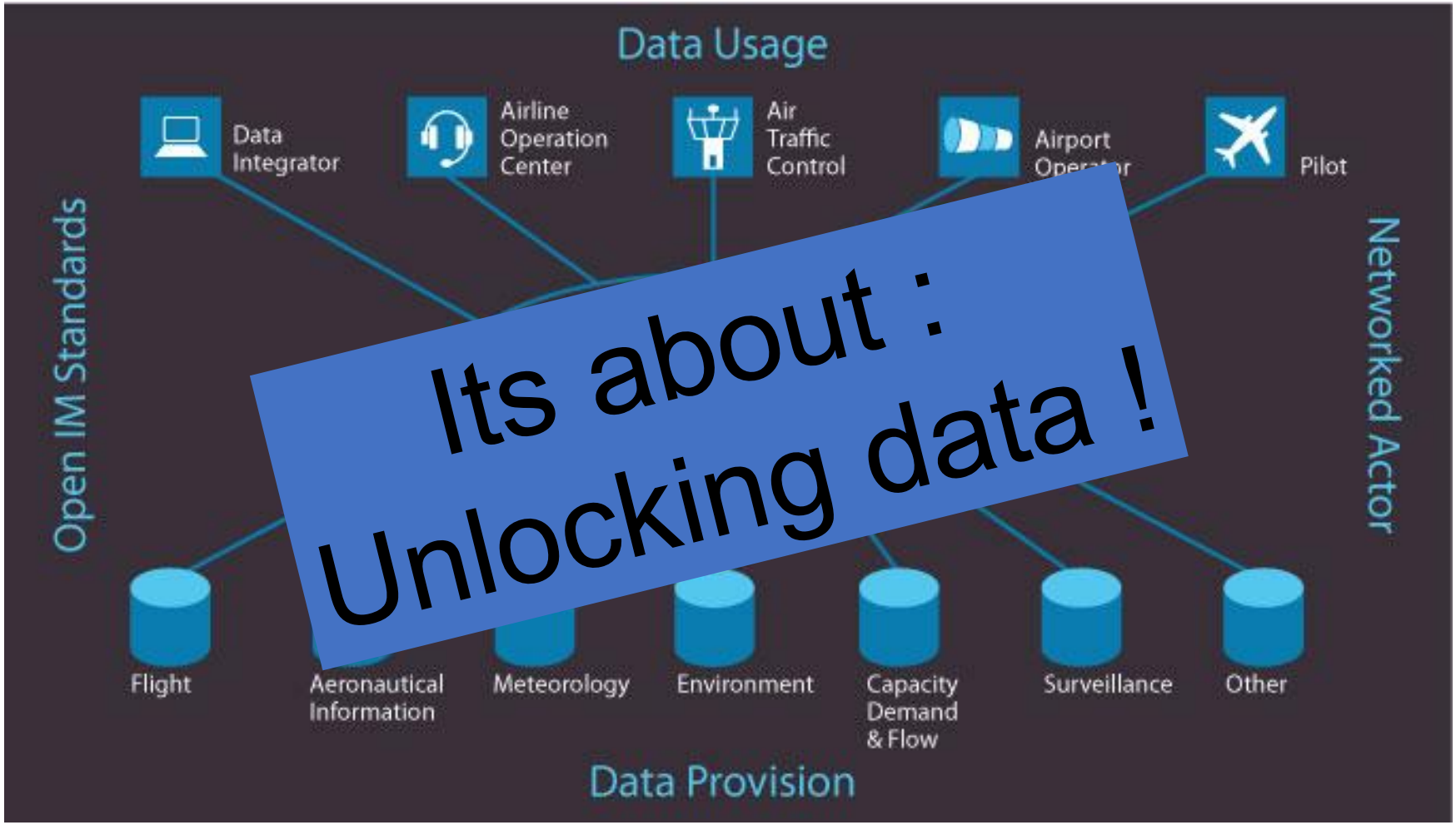
- connecting all stakeholders via a defined platform to a centric network, **the ATM Intranet**, which is continuously evolving
- enable all stakeholders to easily **consume and provide information and data**
- using a **SOA** service approach for an on-demand interchange of digital information
- Complexity hiding, compatible interfaces, open standards, **increased interoperability** between systems

The objective of SWIM is to enable a better collaboration between air traffic stakeholders by information interchange for safer, more efficient, and environmentally sound performance-based ATM operations.

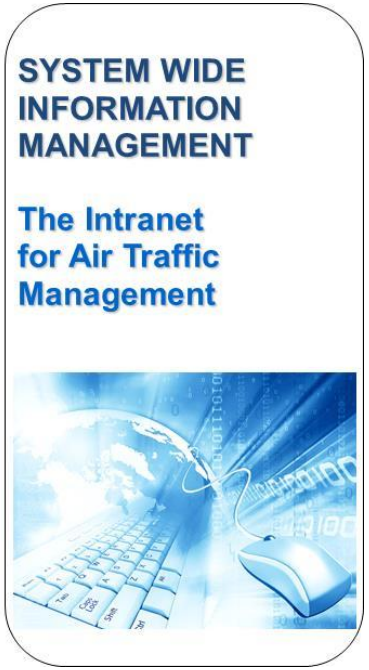
The need for SWIM

- Systems have not been designed and implemented to be globally interoperable.
- Many interfaces, designed to support point-to-point exchange have limited flexibility to accommodate new users, content or data formats.
- Message size limitations and a non-scalable approach to information exchange with the present infrastructure.
- Current infrastructure design makes it difficult and costly for one stakeholder to access, on a timely basis, information originated by another stakeholder.

Split data provision from data consumption



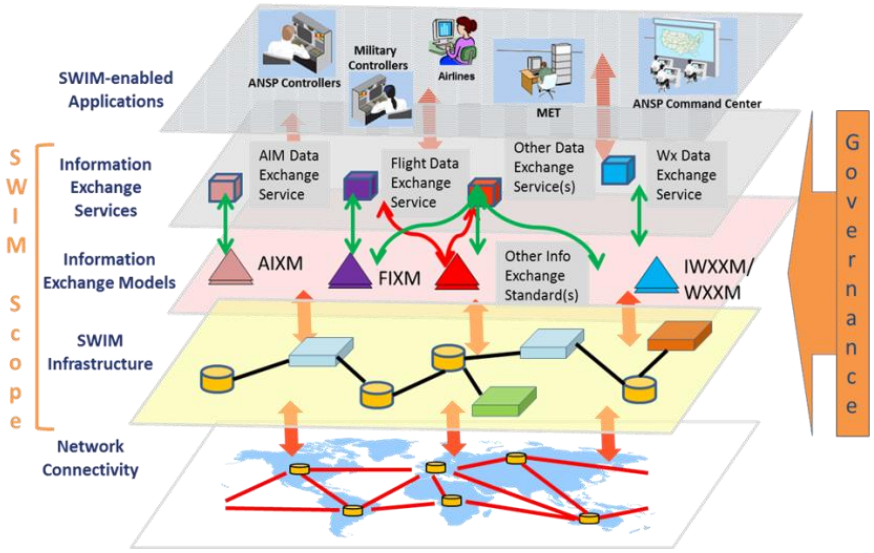
What is SWIM?

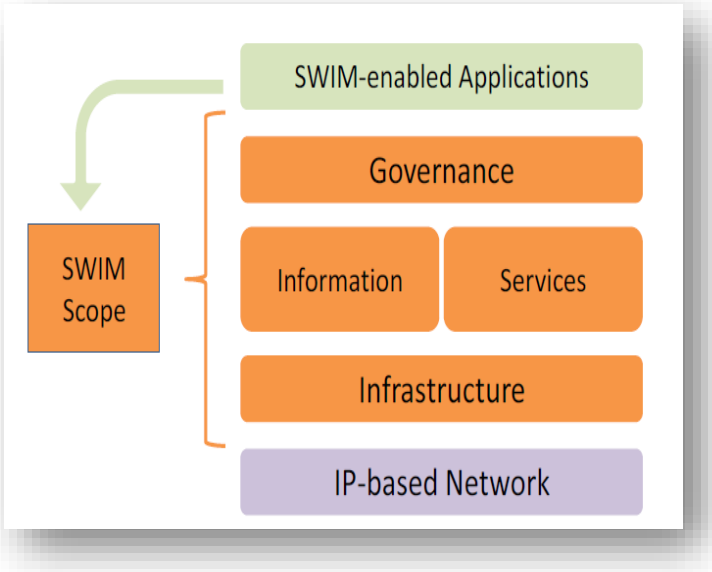


- Discussed for years, many perceptions
  - ‘Swimming in a pool of information’
  - ‘The intranet of Air Traffic Management’
- Sometimes considered to be the ‘silver (*and may be magic*)’ bullet to all information exchange needs and data quality concerns’

What is SWIM ?

SWIM consists of standards, infrastructure & governance enabling the management of ATM information and its exchange between qualified parties via interoperable services."

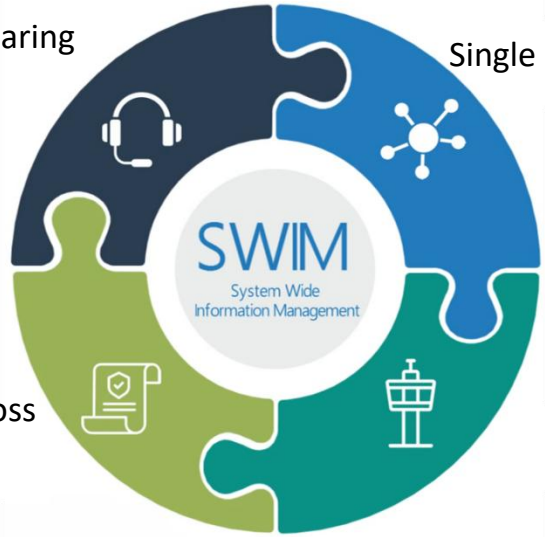




What is SWIM ?

Information sharing platform

Single point of access



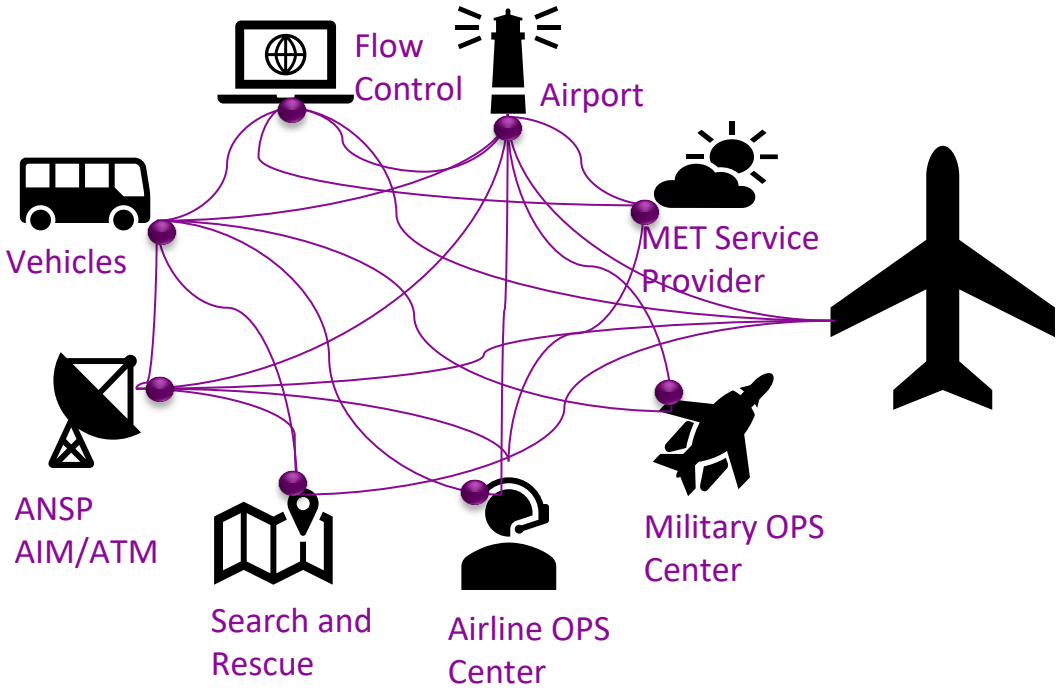
Standards and Policies to achieve interoperability across aviation systems

Real-time, relevant and reliable aviation data

SWIM is the key towards **ATM digitalisation** worldwide.

What is NOT SWIM?

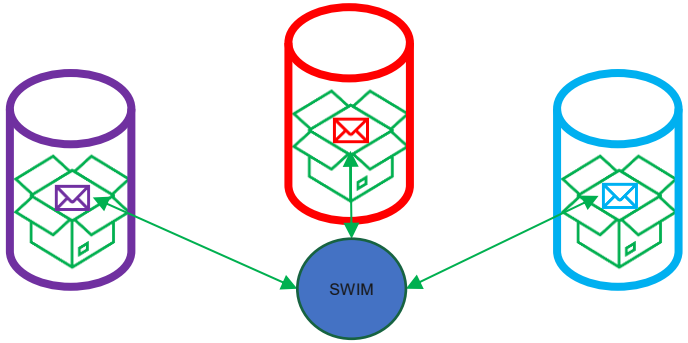
- Point to point
- Many protocols
- Custom interfaces



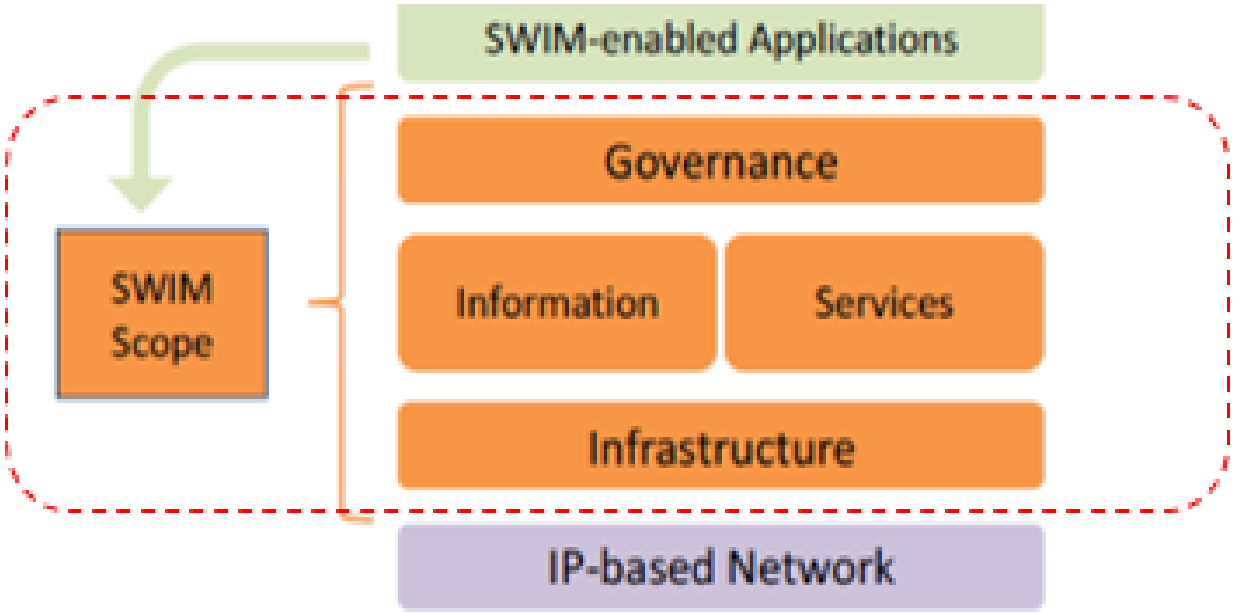
SUMMARY

SWIM provides a path for ANSPs to leverage modern ATM information exchange based on *widely-used open standards.*

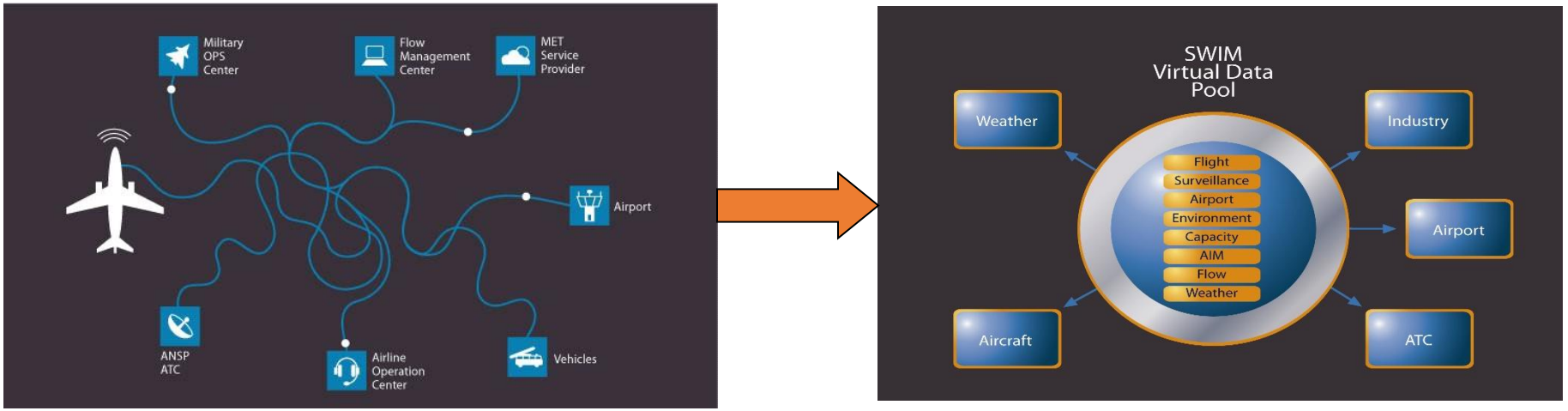
SWIM uses information services to decouple information service providers from consumers to liberate information from silos



SWIM SCOPE


SWIM-enabled Applications
Governance
SWIM Scope
Information
Services
Infrastructure
IP-based Network

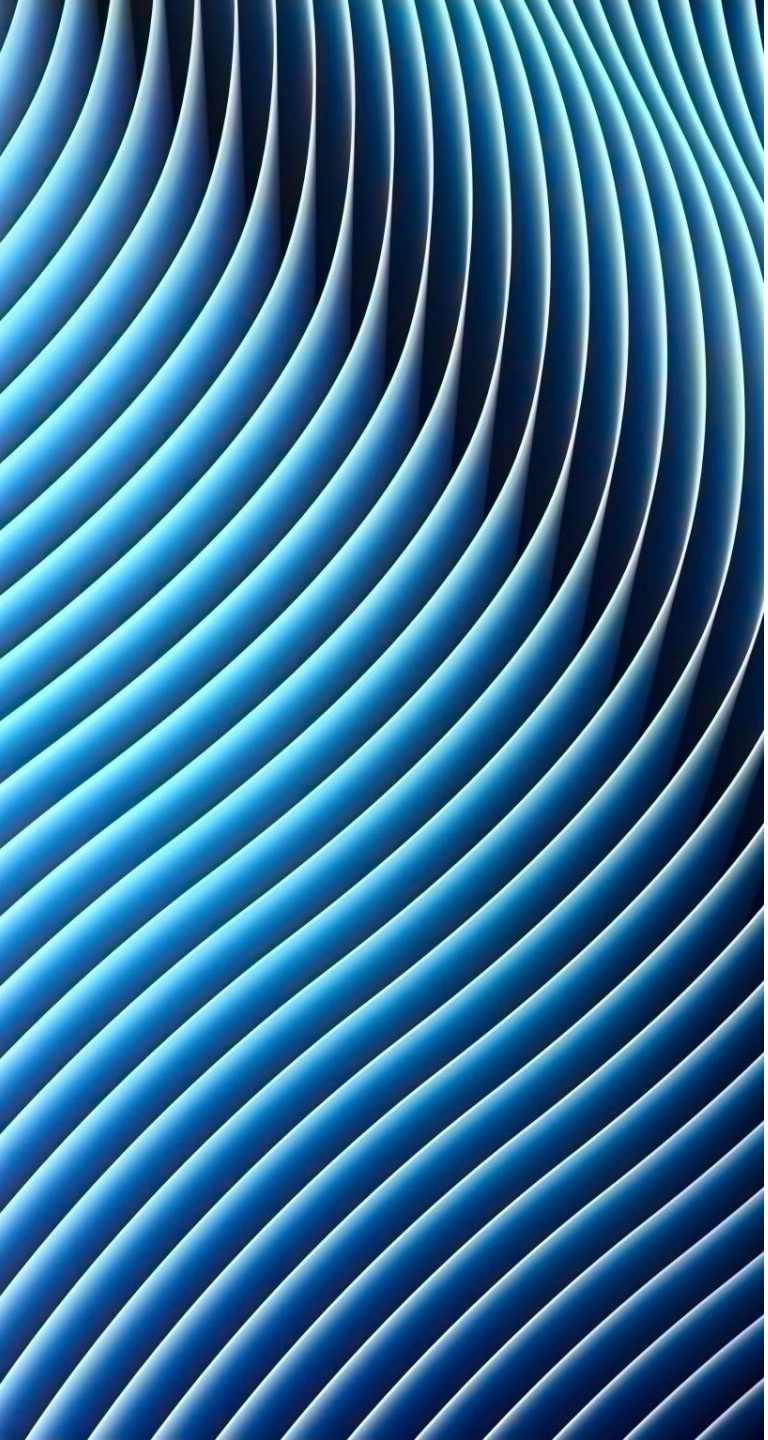
SWIM contribution to the future ATM system



- Integrating all ATM business-related data, the SWIM environment underpins the entire ATM system and is essential to its efficient operation.
- It will support **Shared Situation Awareness**, **Collaborative Decision Making** and **Trajectory Based Operations**
- Examples: A-CDM, Digital NOTAM, Trajectory-Based Operations (TBO)

SWIM Benefits

- Improve decision making during all stages of flight through:
  - ✓Improve shared situational awareness
  - ✓Improved availability of quality data and information from authoritative sources
- Increased system performance
- More flexible and cost effective communications by the application of common standards for information exchange
- Loose coupling which minimises the impact of change between information producers and consumers



SWIM Benefits (2)

Easy access to information

- Multiple ATM stakeholders
- Offer and consume ATM information from each other
- Easy to connect

Provider and consumers build on Trust

- All involved parties can be trusted (authorized entities only)
- Exchange mechanism can be trusted (secured, reliable, on-time)
- No abuse of information (adequate access control)

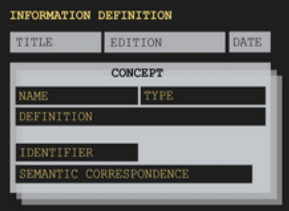
Cost reduction in ATM evolution

- Cost proportional to required performance level
- Future changes shall be faster and cheaper

SWIM Essentials

Information services

Information services are the means by which organisations make their information available. This includes capabilities to allow a service consumer to interact efficiently with a service provider.



Information

Interoperable information exchange between all ATM stakeholders is essential in the evolving ATM network.

Technical infrastructure

The SWIM technical infrastructure (TI) allows the implementation of interfaces between systems, providing technical capabilities for the secure, high-performance and reliable exchange of information.

SWIM service registry

SWIM service registries are directories of information which support the discovery of SWIM services.

Objective: seamless information access and interchange between all providers and users of ATM information and services

https://reference.swim.aero/

SWIM IN A NUTSHELL

SYSTEM WIDE INFORMATION MANAGEMENT

The Intranet for Air Traffic Management

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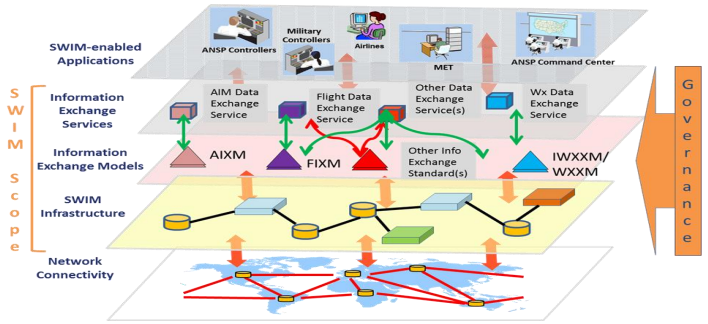
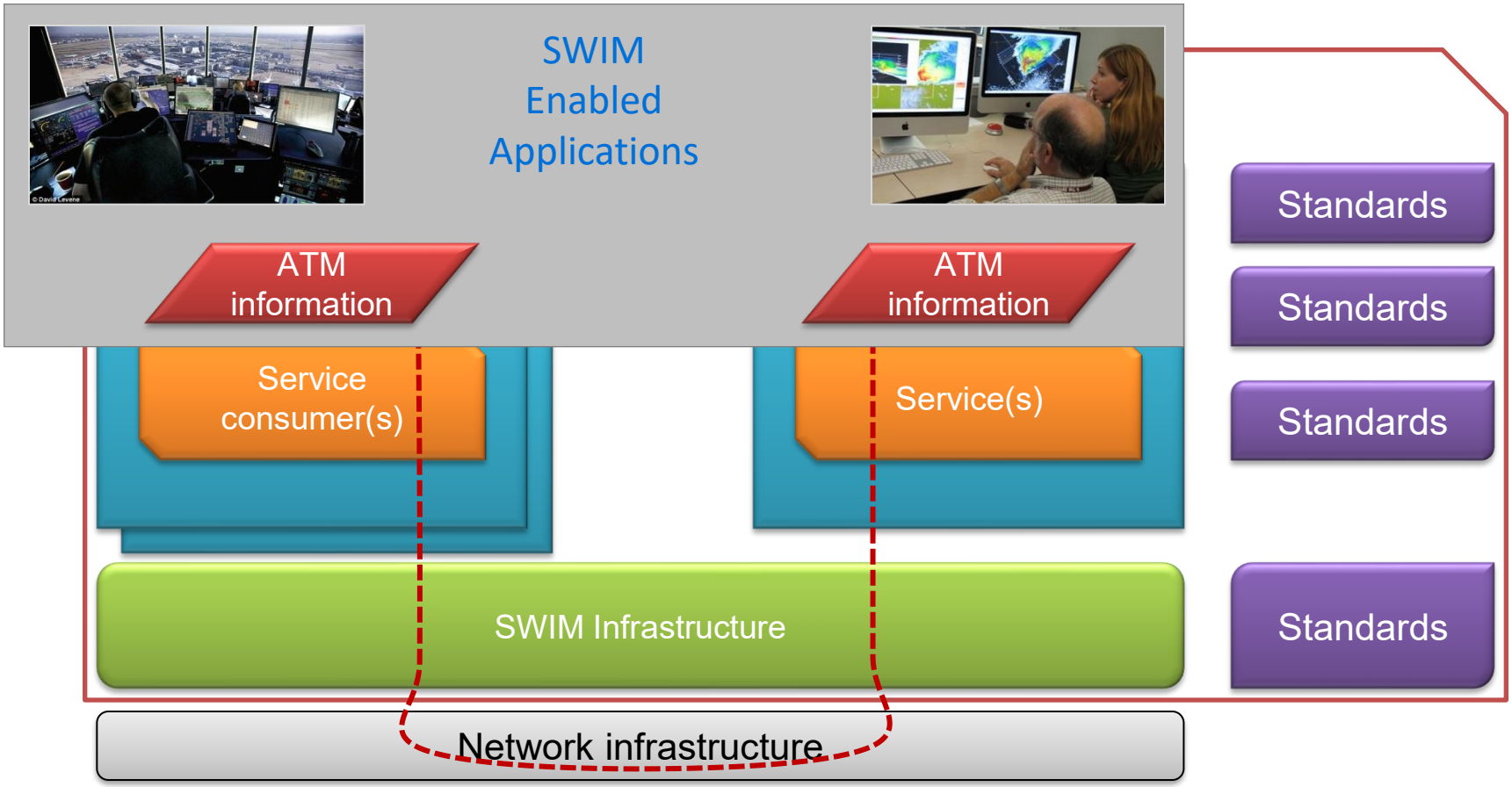


APPLYING SERVICE ORIENTATION TO ATM

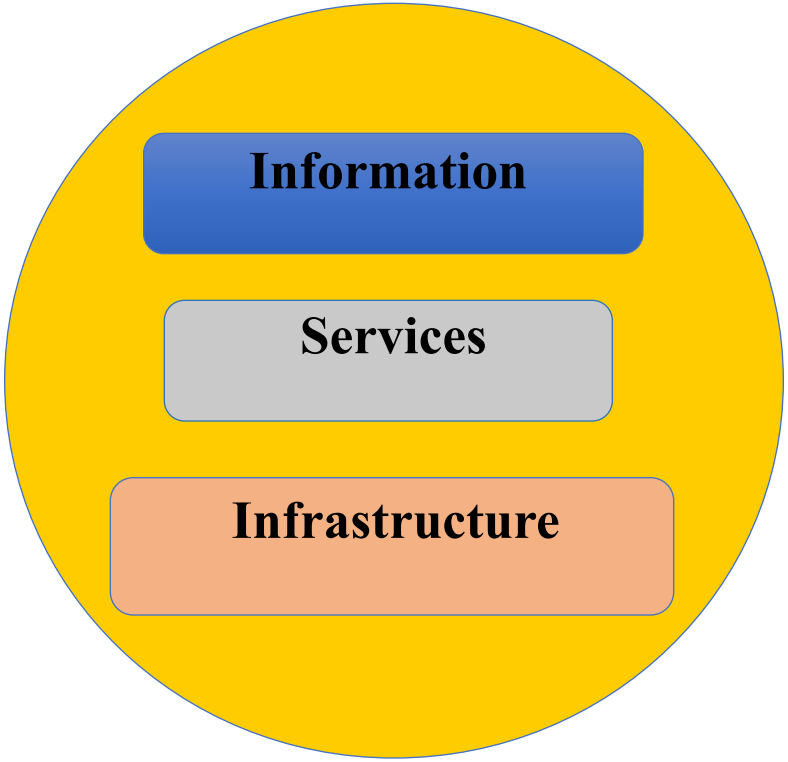
SWIM DEFINITION AND COMPONENTS

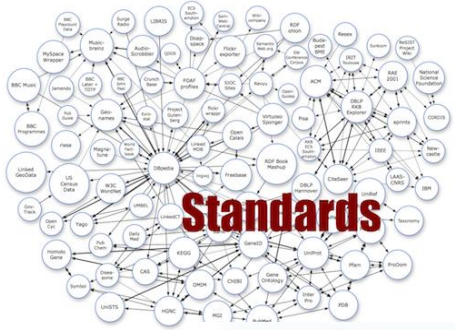
SWIM consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable information services.



SWIM in practical terms

AIXM
WXXM
FIXM





SWIM : accessing data

Unlocked data

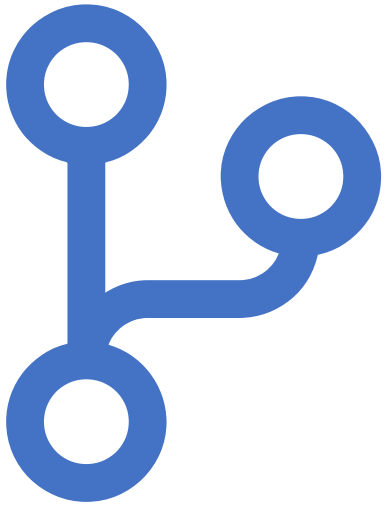
SWIM Governance

Provider

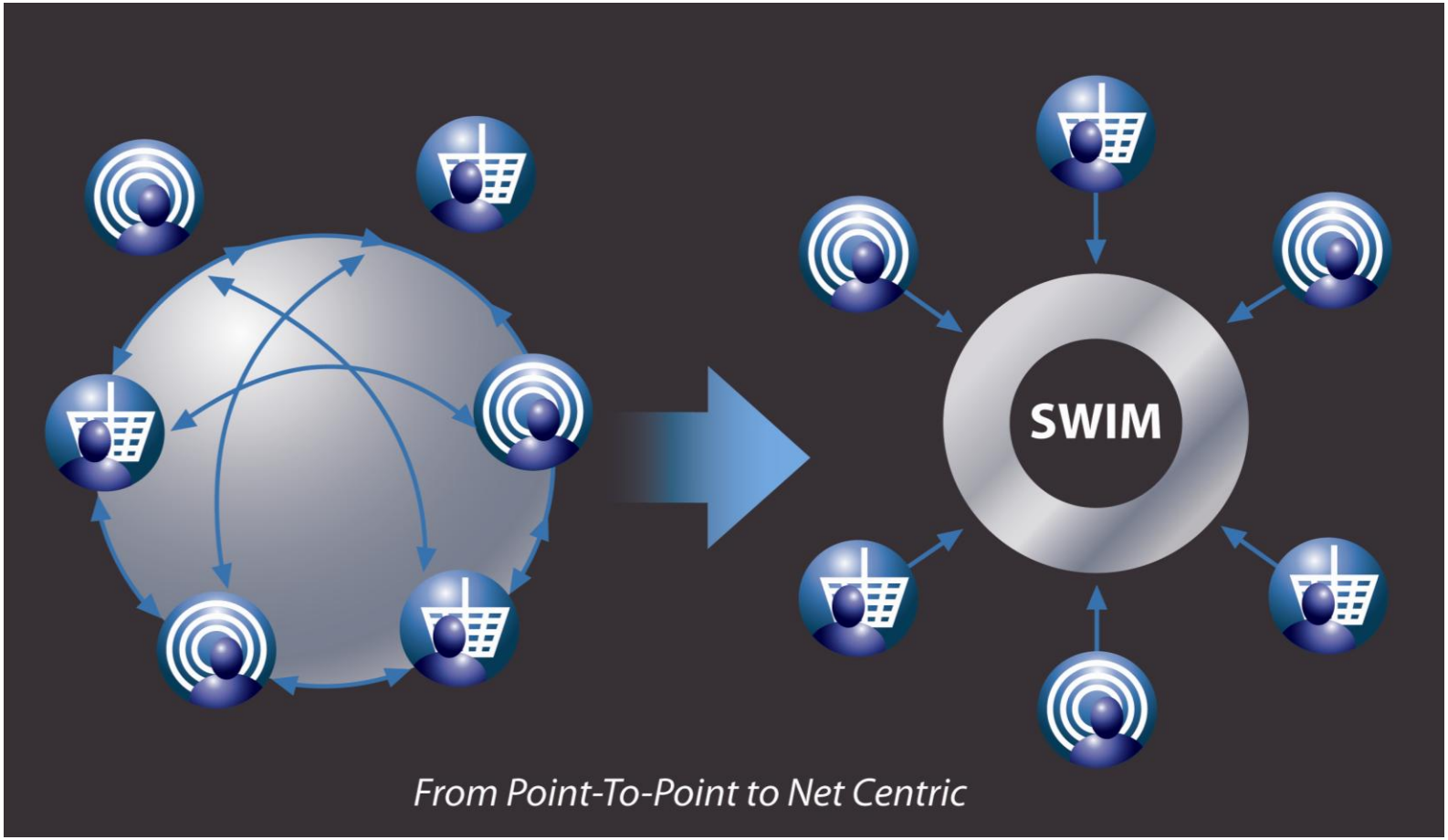
Consumer

PRINCIPLES

- **6 principles to support interoperability**
  - Use of interoperable information services
  - Separation of information provision and information consumption
  - Loose coupling
  - Discoverability
  - Use of Open Standards
  - Secure information exchanges

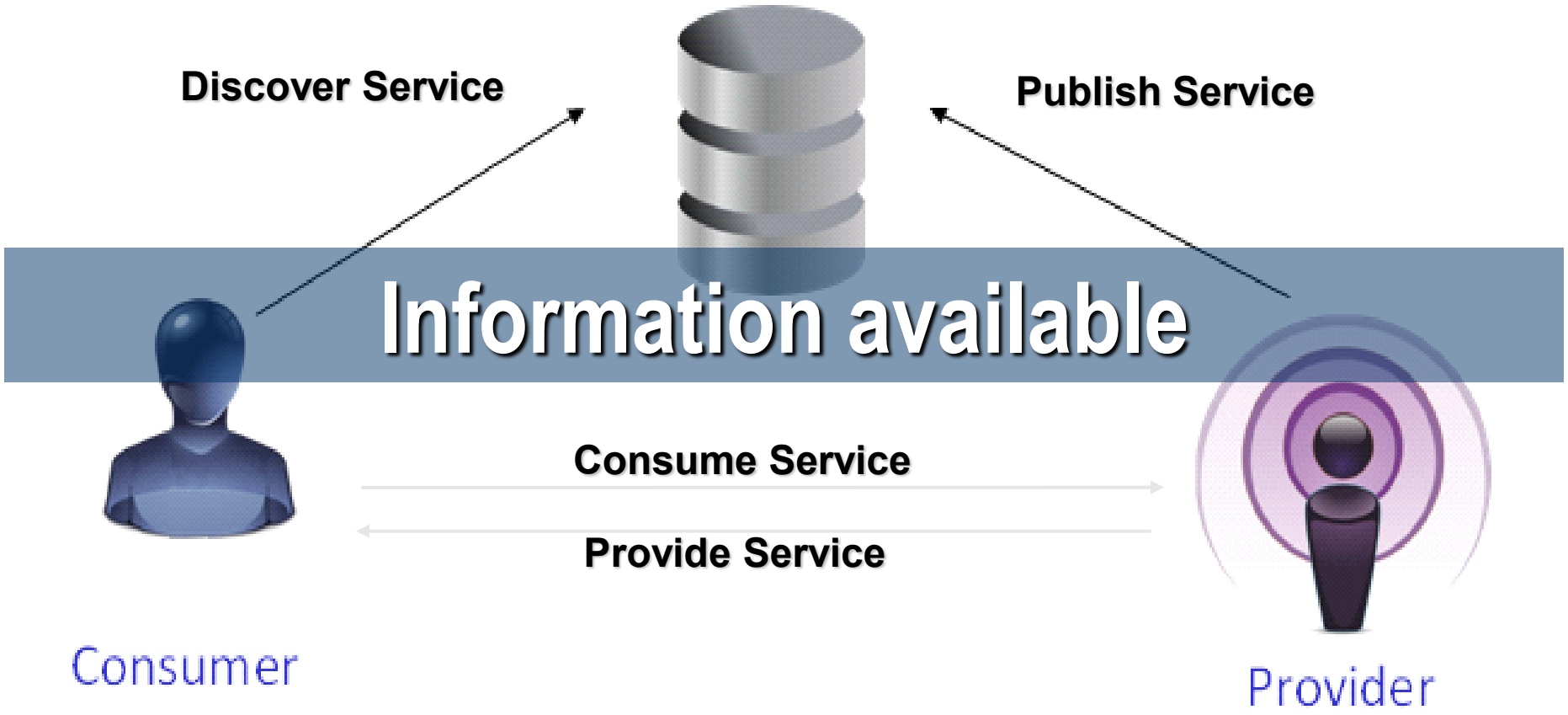


SWIM is net-centric



SWIM is Service Oriented Architecture

Sharing information via Providing / Consuming service(s)



SOA - Service Oriented Architecture

SOA is a style of software design … The basic principles are **independent of vendors, products and technologies**

It is enabled by **technologies and standards** that make it easier for components to communicate and cooperate over a network, **especially an IP network**

service-orientation promotes **loose coupling**

help businesses respond **more quickly and more cost-effectively** to changing market conditions

Business value is given more importance than technical strategy
Strategic goals is given more importance than project-specific benefits
Intrinsic inter-operability is given more importance than custom integration
Shared services is given more importance than specific-purpose implementations
Flexibility is given more importance than optimization
Evolutionary refinement is given more importance than pursuit of initial perfection

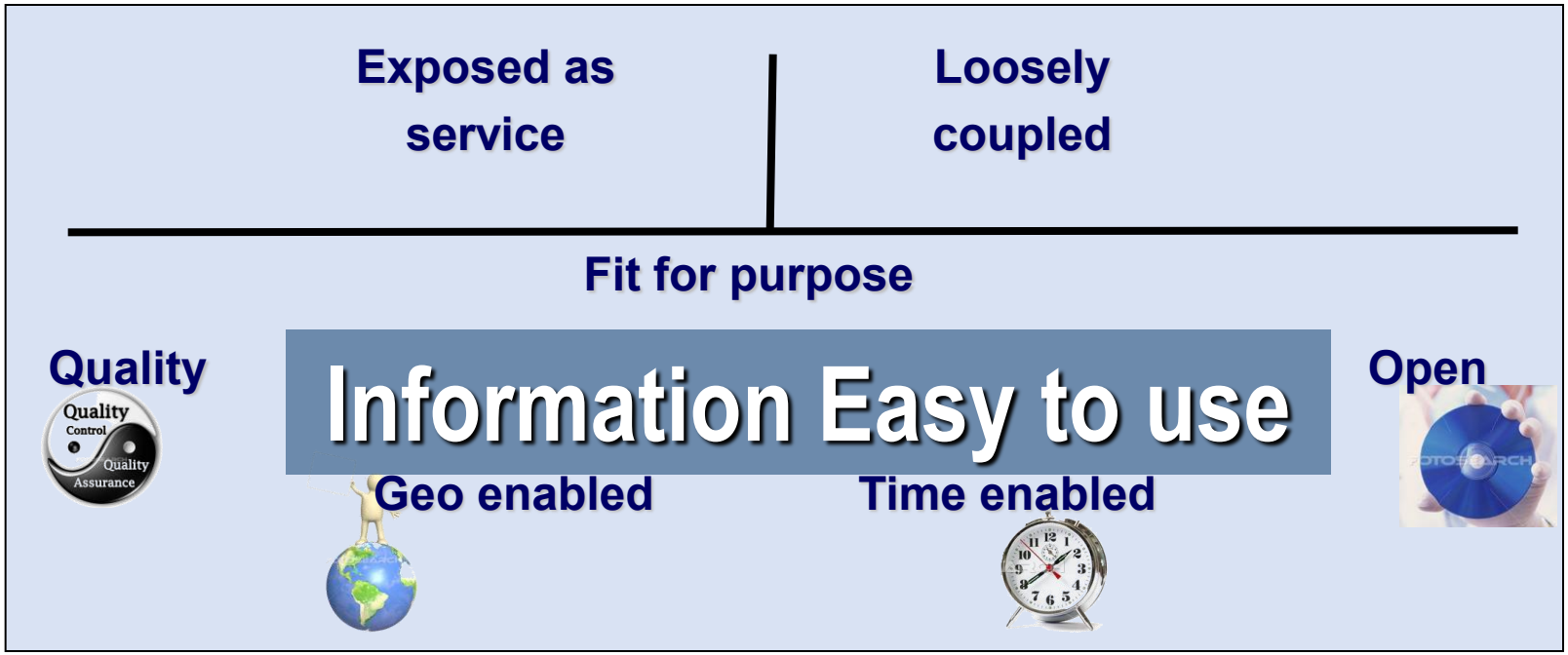
SOA in other industries

- Military – Net Centric Warfare (C4I2).

- Banking – Society for Worldwide Interbank Financial (SWIFT).

S.W.I.F.T.

SWIM is Open Standards



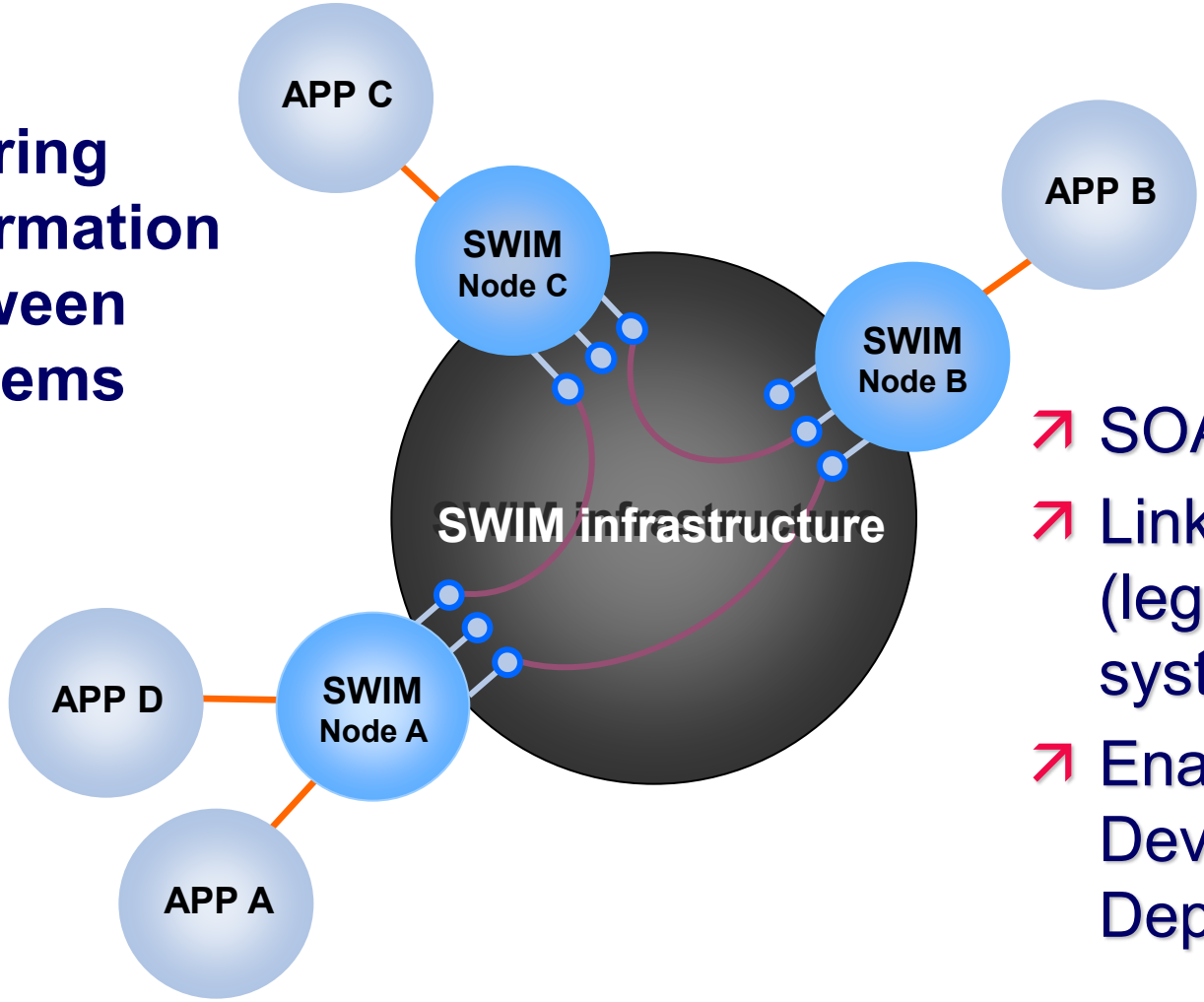
- ***Interoperability***
- ***Secured Seamless*** *access & exchange*
- *information exchange over* ***open Standards***

SWIM is Information Management

- ***Information Management Functions (Governance)***
  General Principles, ATM Information related aspects
- ***AIRM - ATM Information Reference Model***
  Information Modelling Conventions and common meaning
- ***Information Services Specifications***

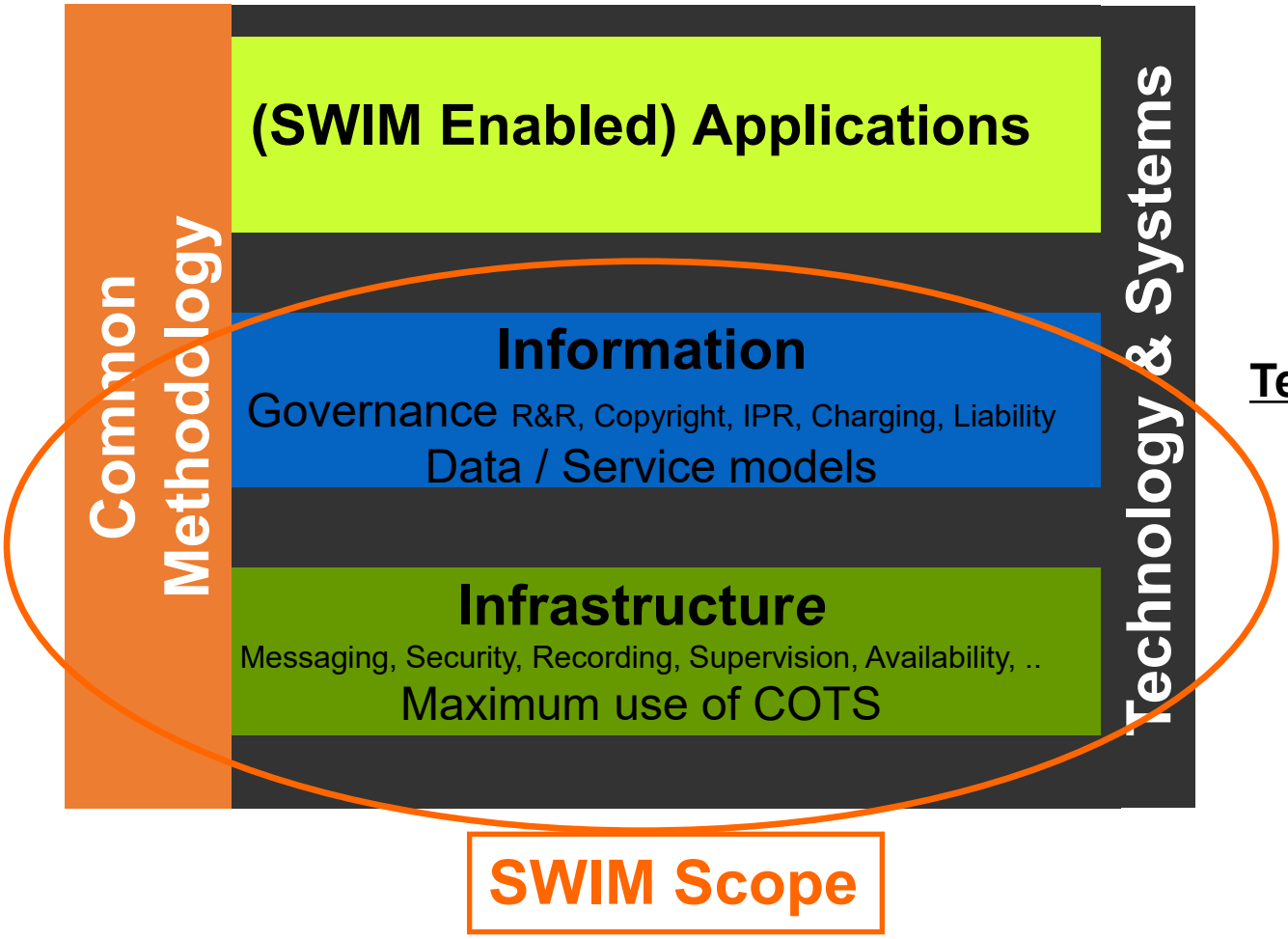
SWIM is system-to-system

Sharing information between systems



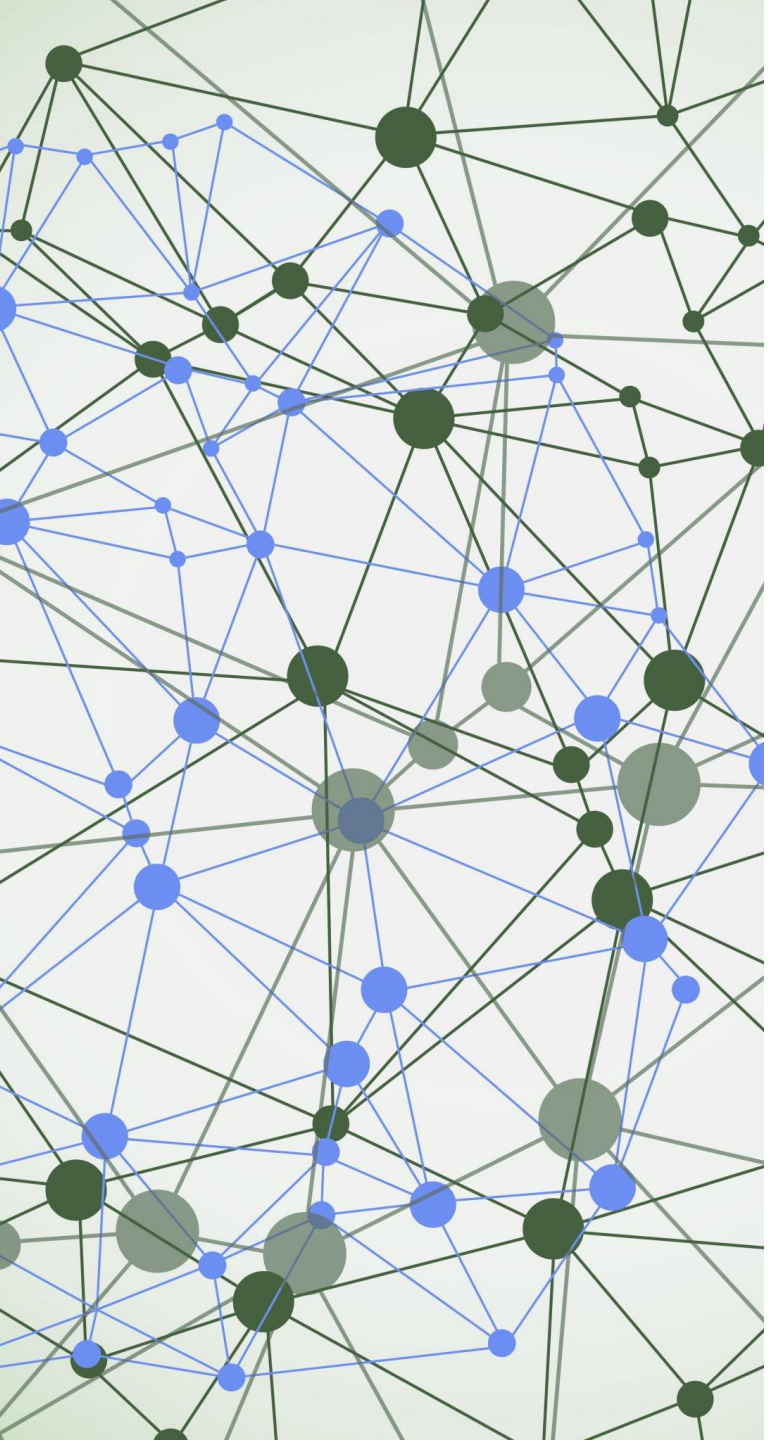
- SOA but …
- Linking existing (legacy) & new systems
- Enabling stepwise Development & Deployment

SWIM vs Technology and Contents
SWIM is net-centric



Technology agnostic

Content agnostic

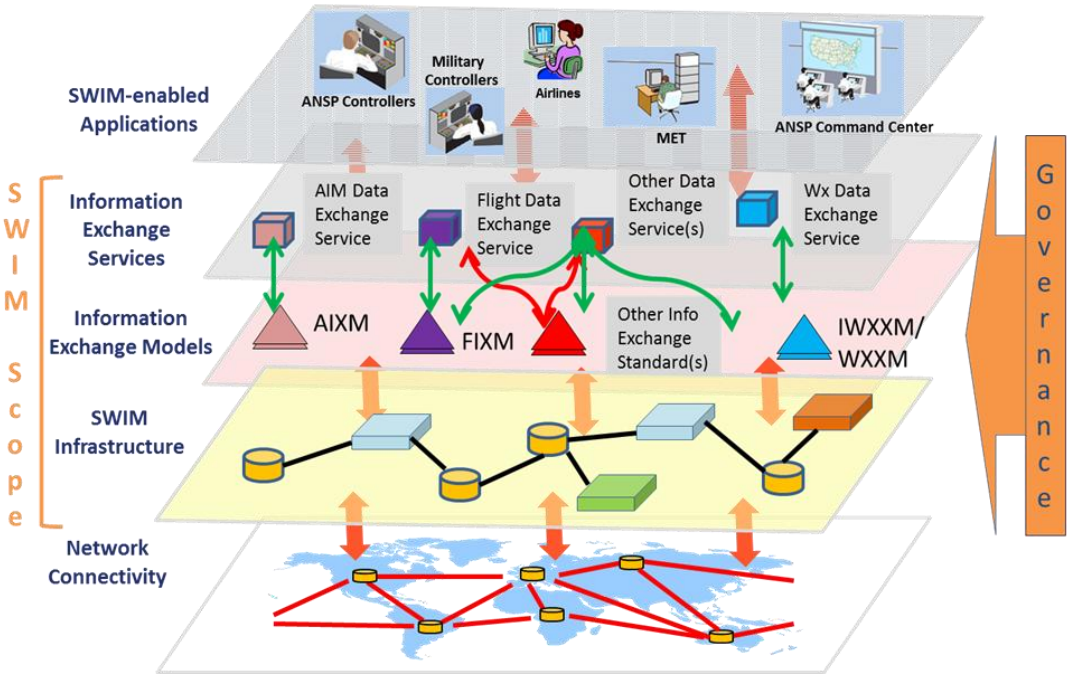


Key-points

- **Federation** - SWIM enables the stakeholders in the ATM community to collaborate in a federated manner, at the international, regional and local levels.
- **Information sharing** - Information is available to all parties, except if specific policies restrict access to it.
- **Service orientation** - SWIM uses information services as the mechanism for supporting the ATM stakeholders with a view to the sharing of information.
- **Open standards** - SWIM services are based on open and internationally agreed standards when fit for purpose.
- **Information and service life cycle governance** - SWIM information and services are governed throughout their life cycle.

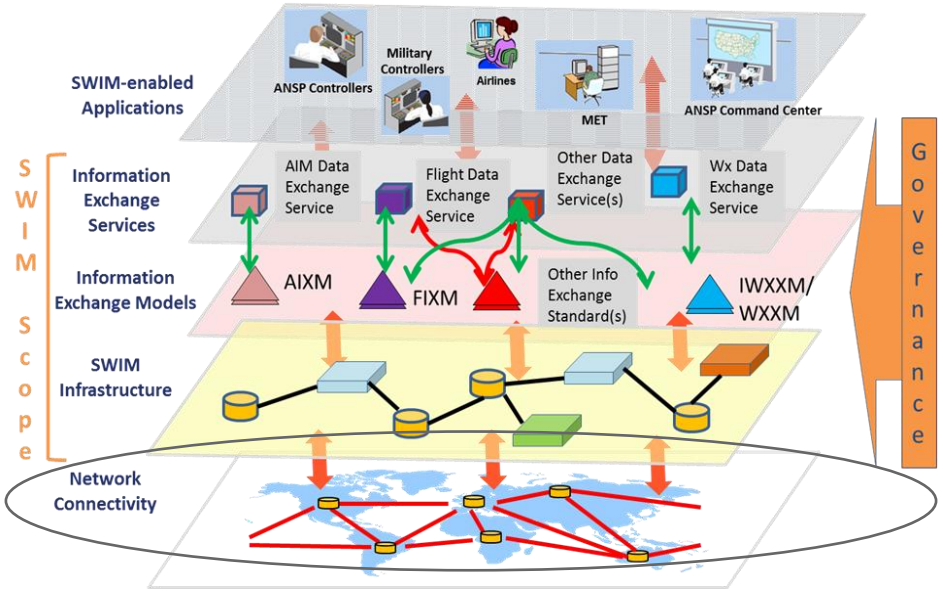
SWIM Layers

- SWIM Enabled Applications.
- Information Exchange Services.
- Information Exchange Models.
- SWIM Infrastructure.
- Network Connectivity.



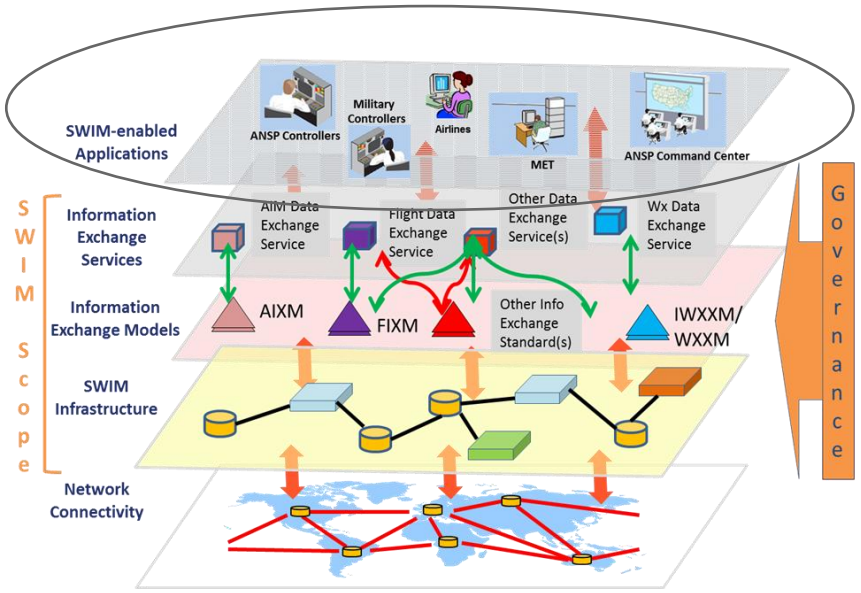
Network Connectivity

- Provides telecommunication services.
- Consist of a collection of interconnected network infrastructure of different stakeholders.
- Private or public Internet protocol (IP) networks.



SWIM enabled applications

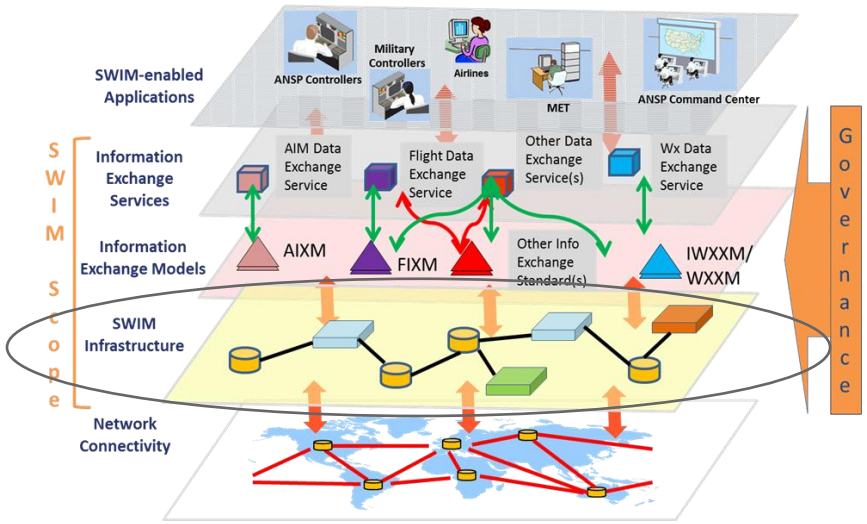
Applications that interoperate through SWIM, can be information providers and consumers from around the globe.



SWIM Infrastructure

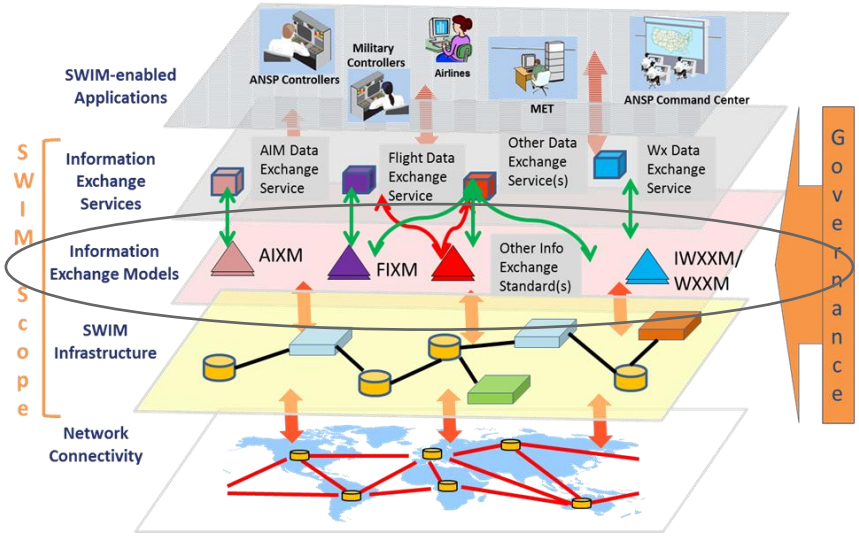
Infrastructure provides the core services, such as

- Interface management.
- Request reply and publish subscribe messaging.
- Service security.
- Enterprise management services



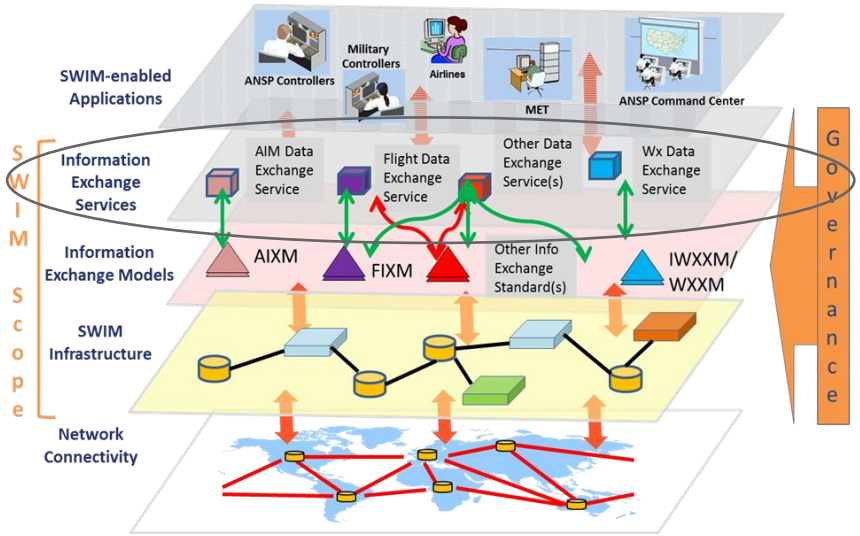
Information Exchange Models

- Using subject specific standards for sharing information for the information exchange services.
- The models define the syntax and semantics of the data exchanged by the applications.



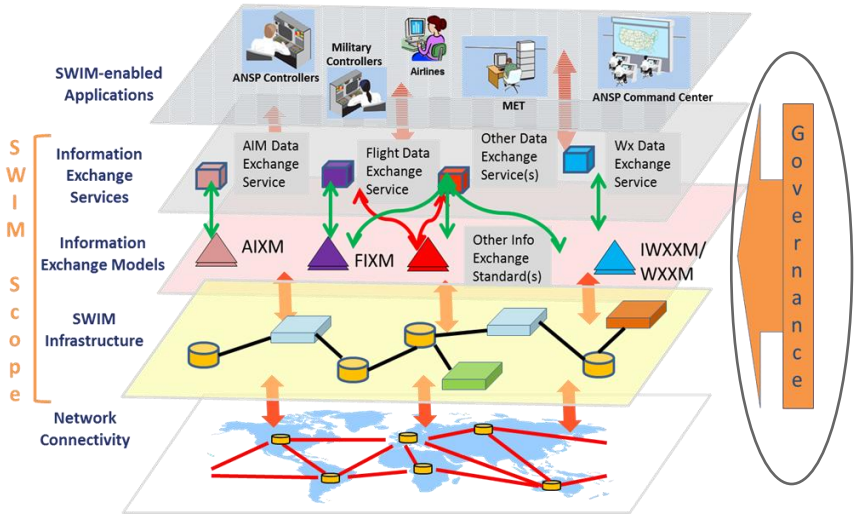
Information Services

- Are defined for each ATM information domain and for cross domain purposes.
- SWIM enabled applications use information services



SWIM Governance
SWIM Registry

- Achieving interoperability across all ATM areas requires governance.
- Registry is the key to bring SWIM related artifacts together and enable policy enforcement where required.
- It allows information providers to publish services and consumers to find appropriate services.
- Registry allows collaborative lifecycle management.



Interoperability

Logical

Technical

Organisation A

Organisation B

Real World System

Organisational Alignment

Process Alignment

Semantic Alignment

Real World System

Syntax (XML,…)

Interaction (SOAP,REST, OGC…)

Transport (HTTP, TCP/IP,…)

Information System

Information System

Regional SWIM

Regional SWIM initiatives are a catalyst for accelerating national SWIM Implementations, it

- Increases ability for stakeholders such as ANSPs to share information across a region for mutual benefit
- Brings stakeholders together to help with SWIM implementation
- Helps start, accelerate and improve State SWIM implementations
- Exposes SWIM requirements (State, region and global)
- Creates an appreciation for operational SWIM challenges and benefits

Ingredients

- Presence of ANSPs, SWIM Stakeholders, international organizations (eg CANSO, ICAO, IATA) and SWIM experts
- Exchange information is the main focus
- Agreements and policies for regional information sharing

SWIM Implementations are Gaining Momentum

ICAO PANS-IM SWIM provisions and SWIM implementation guidance

European mandates for FF-ICE/R1 and AMET information sharing over SWIM

Regional SWIM initiatives

The need to modernize ATM for better situational awareness

The need to accommodate new entrants

Benefits for ATM

- Share ATM information
  - across a wider range of ATM stakeholders and information domains internally and externally using on-premise and other platforms such as the cloud and hybrid
  - with open standard information exchange models containing standardized data elements that are fit-for-purpose in modern ATM information exchange (NOTAMs, FF-ICE, ATFM over SWIM)

- Increase collaboration
  - With ATM stakeholders and other ANSPs
  - Participate in ATM demonstrations: FF-ICE, Digital NOTAMs

- Modernize information exchange
  - Higher security, resiliency, performance
  - Agility: leverage the cloud
  - Digital Transformation