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System Wide Information Management (SWIM)

Summary - SWIM: Connecting the ATM world

The concept of SWIM – System Wide Information Management - covers a complete change in paradigm of how information is managed along its full lifecycle and across the whole European ATM system. The implementation of the SWIM concept will enable direct ATM business benefits to be generated by assuring the provision of commonly understood quality information delivered to the right people at the right time. Given the transversal nature of SWIM, which is to go across all ATM systems, data domains, and business trajectory phases (planning, execution, post-execution) and the wide range of ATM stakeholders, it is not expected that one solution and certainly not one single technology will fit all. Nevertheless it is recognised that global interoperability and standardisation are essential and SWIM is expected to be an important driver for new and updated standards.

Current situation and need for change

Today's ATM system comprises a wide variety of applications developed over time for specific purposes. It is characterised by many custom communication protocols, each with their own self-contained information systems: on board the aircraft, in the air traffic control centre, etc. Each of these interfaces is custom designed, developed, managed, and maintained individually and locally at a significant cost. Moreover the way ATM information is defined / structured, and the way it is provided and used are specific for most of the ATM systems.

The expected increase in aviation capacity demands, economic pressure and attention to the environmental impact are relying ever more on accurate and timely information. Such information must be organised and provided through flexible means that support system-wide interoperability, secured seamless information access and exchange. This system will result in a more cost and time efficient exchange of information between providers and users.
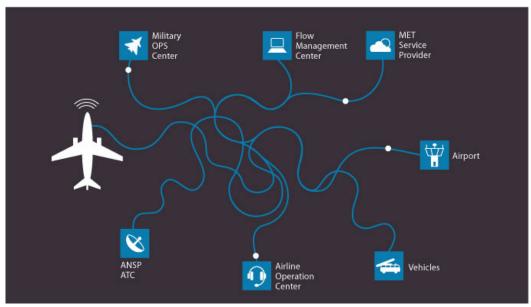
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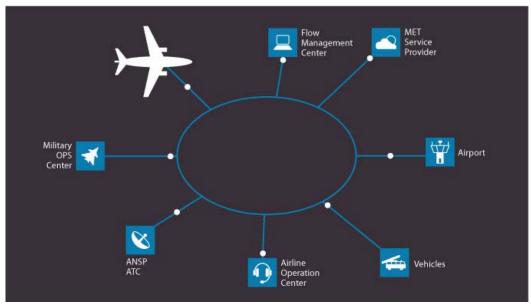
Figure 1 : Sharing information today

Figure 2 : Sharing information tomorrow

SWIM principles

Building on the best practices from different information communities, the aim of SWIM is to provide information users with relevant and commonly understandable information. This information should be of the right quality, provided at the right time and delivered to the right place, so enabling the concept of net-centric ATM operations.

In order to achieve this objective in an efficient way the following SWIM principles have been adopted:

- Separation of information provision / consumption. In the ATM network, almost every participant is a producer as well as a consumer of information. It is not ideal to decide in advance who will need what information, obtained from whom and when. The key issue is to decouple producers of information from the possible consumers in such a way that the number and nature of the consumers can evolve through time.

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- Loose system coupling. Where each of its components has, or makes use of, little or no knowledge of the definitions of other separate components. By doing this the barriers between systems and applications are removed, and interfaces are compatible.

- Using open standards. An open standard is one that is publicly available and has various rights to use associated with it. It may also have various properties of how it was designed (e.g. open process). The terms "open" and "standard" have a wide range of meanings associated with their usage.

- Using Service Oriented Architecture. Driven by analysis of business processes and needs functionality is developed, packaged and implemented as a suite of interoperable services that can be used in a flexible way within multiple separate systems from several business domains.
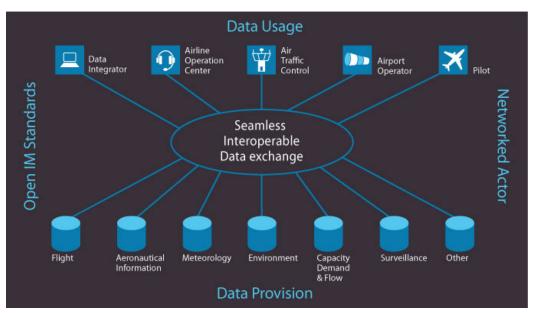

Figure 3 : Net centric information viewpoint

Building SWIM

Based on the aforementioned principles, the implementation of SWIM will put in place the following elements.

- ATM Information Reference Model - AIRM - which will provide an implementation neutral definition of all ATM information, through harmonised conceptual and logical data models. It will contain well-known elements such as Aerodrome, ATS Route, Airspace, Flight procedure and a common definition of fundamental modelling concepts including time and geometry.

- Information Service Reference Model - ISRM – which provides the logical breakdown of required information services and their behavioural patterns. Working towards service implementation specifications, it will include the details of services' payload, pattern of exchange, quality of service (QoS), and binding to the system-of-system data exchange infrastructure, also known as the SWIM infrastructure.

- Information Management Functions (including Governance) - such as user identity management, discoverability of resources, security aspects such as authentication, encryption and authorisation, notification services, registration need to be defined to support information sharing. SWIM governance affects almost all the roles and

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their interactions within the ATM system. In addition, the management of information requires that policies related to the access and uses of information are developed. Rules, roles and responsibilities need to be defined, per stakeholder, taking into account the functional criticality of the information they handle. Data ownership, data provision and data usage rules will need to be redefined and possibly harmonised. Issues such as liability, charging and copyright principles should be proactively managed. In all circumstances, there is an increasing requirement for the definition and application of Service Level Agreements (SLA) between the different parties.

- SWIM Infrastructure is the interoperable (runtime) technical infrastructure (Ground/Ground and Air/Ground) over which the data will be distributed. Its implementation may, depending on the specific needs profile, differ from one stakeholder to another, both in terms of scope and way of implementation. It will offer SWIM technical services based as much as possible on mainstream IT technologies. It will mostly be based on commercial of-the-shelf (COTS) products and services, but it is possible that in some cases specific software may need to be developed. Typically the Pan European Network System (PENS) and the Internet will provide the underlying basic Ground/Ground connectivity.

- SWIM Enabled Applications. The implementation of SWIM in the ATM system enables ATM business benefits by assuring the provision of commonly understood quality information to the right people at the right time.

Conclusion

Enabling SWIM is a challenging change for ATM. Although many building blocks are already available (and a number of existing applications could already be labelled as early SWIM adopters), full SWIM deployment will take time. Firstly to prototype and validate some of the newer SWIM concepts. And more importantly to organise the commonly shared information and develop and deploy the associated changes in the different user systems and applications. This major change requires a close collaboration between the ATM stakeholders. To accomplish this, all stakeholder groups will be involved from the start in the development of the SWIM requirements, prototypes, roadmaps and deployment plans covering all technical and governance related aspects.

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