2. STRATEGIC VIEW

SESAR
DEPLOYMENT MANAGER

2. Strategic View

The *Strategic view* is the connection between the Pilot Common Project – the business view which sets the frame for this Deployment Programme – and the detailed and operational "*Project view*" presented in the following chapter.

In particular, it provides for a high-level recap of the role of the Programme within the SESAR framework, presenting its structure, outlining the main new features of DP 2016 compared to DP 2015 and introducing an executive view on the technological improvements that need to be deployed in Europe in the upcoming years.

2.1 DP 2016 new features

DP 2016 provides for an update of the work breakdown structure already presented in DP 2015, where the 6 ATM functionalities and 20 sub-functionalities contained in the Pilot Common Project have now been turned into 48[2] Families of implementation projects enabling the full PCP implementation. Such update reflects the need of better illustrating the technological elements associated to each AF and building for coherent and clearly defined Family of implementation projects.

Still fulfilling its essential objective of providing a unique and consulted ATM technological implementation programme by and for the Aviation industry, DP 2016 has been improved and enhanced, as the following paragraphs summarize.

The **Strategic view,** which keeps its role as the junction between the PCP and the detailed *Project view*, has been further developed to include relevant changes in the Programme content such as the split of specific Families, the re-assessment of Families' readiness for implementation in the light of any recent relevant development in the upstream phases (i.e. development and validation by SJU, standardization, regulation and industrialization), as well as new graphical features like the introduction of an overall Gantt of all the Families of the Programme.

Moreover, the Strategic View has been complemented with the development of three new sections:

- **2.6 "DP Implementation Status";**
- **2.7 "Approach for an effective PCP deployment"**;
- **2.8 "Global interoperability".**

"DP Implementation Status" (2.6) provides a high-level overview of the current status of PCP deployment including in particular the strategic progress of the 84 projects awarded during the 2014 CEF Call and currently monitored and synchronized by SDM. Such section has been developed building both on the inputs gathered by operational stakeholders within the dedicated Monitoring Exercise (see section 5.1) and on the main

[2] Deployment Programme 2015 included 44 Families of implementation projects. The inclusion of additional families is further explained in the following paragraphs.

findings related to the DP Execution Progress Report, whose implementation details are reported in section 5.2.

"Approach for an effective PCP deployment" (2.7) is focused on those activities deemed as most urgent and critical in order to support an effective deployment of Pilot Common Project throughout Europe. It includes:

- an **Implementation Strategy for Data Link Services (DLS)** as the necessary step towards the deployment of AF6 (2.7.1);
- an **Action Plan** organising the necessary framework for the relevant operational stakeholders to continue and amplify their activities towards definition and establishment of a **SWIM Governance** (2.7.2).
- the identification of those families which implementation could result into the **provision of a Common Service**, thus requiring a **specific approach in the planning of their deployment** and the identification of the implementation activities required (2.7.3).
- **high-level principles to guide operational stakeholders** towards submission of candidate implementation projects through the upcoming CEF Transport Calls, making best use of all information laid down in the DP and maximizing opportunities to access EU co-funding (2.7.4).

"Global interoperability" (2.8) reports on SDM-FAA cooperation on SESAR-NextGen implementation and how this makes DP stronger on global interoperability.

The **Project view** presents the same structure of DP 2015, but it has been further improved in order to include inputs concerning respectively the current progress of 2015 CEF Transport Calls for Proposals. For all the Families, a complete review process has been also undertaken by SDM in order to further detail and better explain their content, without changing the technical capabilities stemming from the agreed DP 2015. Moreover, the WBSs for each Family has been enhanced and restructured, now including three branches, providing respectively information on the 2014 CEF Call awarded projects, on the 2015 CEF Call awarded projects and on the remaining existing gaps still to be covered (also with regard to the percentage of coverage still to be addressed and the associated funding opportunities).

The **Performance View** of DP 2016 represents a significant update from the DP 2015, now featuring the presentation of the performance gains expected from the DP implementation, as well as the results of the associated Deployment Programme Cost Benefit Analysis (CBA).

The **Monitoring View**, updated in its contents and format to include all the results of the current DP implementation status in Europe, includes important changes related to the Monitoring Exercise. As a matter of fact, the analysis, building on the inputs coming from different stakeholder categories involved in the implementation of the Pilot Common Project through ad-hoc templates and surveys developed by SDM (see section 5.1), now further details the status of deployment, through dedicated tables and charts.

In particular, for the ground monitoring, the charts include specific tables organized on a geographical scope basis, illustrating the feedback coming from different stakeholder

categories involved in the implementation of each Family in a specific airport/country (e.g. ANSPs, Airport Operators, Military Authorities, MET providers, etc.), as well as the overall implementation status of the Family, identified by consolidating all stakeholders' views.

For the relevant Families, the Airspace Users monitoring section has been also enhanced and improved, including a more fleet-oriented approach, identifying the gaps' coverage percentage. In order to detect where further projects would be needed in order to deliver the PCP and to address the needs of the Airspace User community, the monitoring questionnaires developed for DP 2015 have been enhanced and fine-tuned: one on **PCP-related flight planning capabilities**, the other one on **aircraft capabilities** and airspace user's readiness to deploy the needed avionic functionalities. This network-centric approach, due to the nature of the AU stakeholders, aims at complementing the monitoring exercise of the ground stakeholders.

Both for the ground and for the Airspace Users gaps, a percentage of coverage of the gap itself is also included, taking into account the functions/enablers and milestones identified at Family level (see section 3 – Project View) and their current implementation status.

It is worth noting that SDM **monitoring exercise** represents a **living picture** of the current status of **SESAR deployment** in Europe and, as such, is to be constantly kept updated through SDM synchronization and monitoring of the Programme.

In this respect, the Monitoring View included in the DP 2016 provides for the current snapshot of the PCP implementation, starting from the input received through the monitoring exercise started on March 4th, 2016. Such view is expected to be constantly updated through future releases of the Programme.

2.2 Performance Policy

SESAR Deployment Manager (SDM), according to its regulatory framework set by Commission Implementing Regulations (EU) No 409/2013 and No 716/2014, **considers the performance driven deployment of the Pilot Common Project and any subsequent Common Project as a priority.**

SDM commitment is focused on a **constant improvement of the methodology** to assess the consistency with and level of contribution to European Union-wide performance targets[3] provided by technological investments.

Within the scope of its responsibilities, SDM's performance policy is to:

1. Guarantee **compliance to relevant regulations and adherence to the European ATM Master Plan as reference for operational changes** that are essential enablers to achieve the Single European Sky (SES) performance objectives;
2. Guarantee **full coordination with SJU, PRB, NM and EDA** on performance assessment;

[3] European Union-wide performance targets' means the targets referred to in Article 9 of Commission Implementing Regulation (EU) No 390/2013.

3. Guarantee the **consultation with the implementing partners on performance analysis** before they are published and within the consultation process defined for the Deployment Program;
4. Guarantee the **coordination of performance assessment with Military stakeholders** through EDA;
5. Provide the **assessment of implementing projects against SES performance targets** namely safety, capacity, environment and cost efficiency as part of the synchronisation effort of the Deployment Program;
6. Provide the **analysis of the costs and expected benefits of the PCP related implementation projects**;
7. Provide **the monitoring and the assessment of impact of implementing projects** on each performance target;
8. Promote the **use of good practices in the field of cost benefit analysis methodologies** and the **adoption of continuous improvement models**;
9. Guarantee that **all involved staff is aware of its role in the achievement of performance driven deployment**;
10. Develop and promote, at management and implementation levels of the SESAR Deployment Governance, a **performance driven culture**.

The "performance view" of the DP (chapter 4) further develops the above described performance policy.

2.3 Full PCP implementation

The Pilot Common Project, as laid down by Regulation (EU) 716/2014, combines coherent technological improvements aiming at enhancing the performance of the European Air Traffic Management system in the short to medium term. It focuses on those technological improvements deemed as mature enough to start and to be fully deployed in the 2014-2026 timeframe requiring a synchronized implementation among the key investors.

The Pilot Common Project also fosters the implementation of key ground-ground and air-ground infrastructural building blocks for the future Common Projects.

DP 2016 aims at providing the **project view for the full PCP implementation**: in particular, there are **48 Families of implementation projects underpinning the deployment of the 20 Sub-ATM Functionalities and therefore of the 6 ATM Functionalities in the PCP**, as illustrated in Fig. 1 included in next page.

Fig. 1 also illustrates, for each Family, the level of readiness for implementation and time wise urgency to be launched in order to pursue timely PCP implementation. Specifically, the **48** Families have been clustered into the following categories:

- **40 High Readiness Families**: ready for implementation Families, which need to be covered by projects to be submitted through 2016 Calls; these Families are mature for implementation and time wise the most urgent to be deployed in order to continue timely PCP implementation and early benefits delivery.
- **5 Medium Readiness Families**: ready for implementation Families, which could be covered by projects to be submitted through 2016 Calls; these Families are ready for implementation, although time wise they are less urgent to be deployed for PCP timely implementation.

- **3 Low Readiness Families**: not ready for implementation Families; these Families are not yet ready for implementation but will be re-considered when developing the future versions of the DP as their readiness for implementation is expected to improve in time.

The present categories have been identified in order to support the operational stakeholders in **sequencing the implementation activities towards the full PCP deployment** and the clustering has been performed **taking into account the technological maturity of the elements associated to each Family** (e.g. in terms of validation activities, availability of standards, deployment start, etc.). In detail, taking into account the aforementioned elements, the SDM experience of the current deployment initiatives throughout Europe and the comments received during the Consultation process, the level of readiness for implementation of the following Families has evolved from a "**Medium**" to a **"High**" level of readiness:

- **Family 2.1.4 Initial Airport Operations Plan (AOP)**
- **Family 2.4.1 A-SMGCS Routing and Planning Functions**
- **Family 4.1.2 STAM Phase 2**
- **Family 4.2.4 AOP/NOP Information Sharing**
- **Family 5.1.2 NewPENS: New Pan-European Network Service**
- **Family 5.2.2 Stakeholders SWIM Infrastructure Components**
- **Family 5.4.1 Upgrade / Implement Meteorological Information Exchange System / Service**

The increase of technological maturity and of readiness for implementation of the mentioned Families results in an **overall evolution of the Programme itself** vis-à-vis its 2015 edition, which featured 30 high-readiness Families, 10 medium-readiness Families and 4 low-readiness Families.

The number of Families in DP 2016 has increased to **48 Families** (starting from the 44 included in DP 2015), due to the **split of 3 of the Families included in the AF5** and to the **refinement of the AF6 structure**. Such split has been performed in order to increase the clarity of the technological elements included in the ATM Functionality, to separate technological elements ready to be implemented from still non-mature ones, and to guide the operational stakeholders in sequencing the implementation activities. More in detail, the following Families have been split:

- **Family 5.1.3 Common SWIM Infrastructure Components** has now been split in two Families, thus resulting in the addition of the new Family **5.1.4 – Common SWIM PKI and cyber security**;
- **Family 5.2.2 Stakeholders SWIM Infrastructure Components** has now been split in two Families, thus resulting in the addition of the new Family **5.2.3 – Stakeholders' SWIM PKI and cyber security**;
- **Family 5.6.1 Upgrade/Implement Flights Information Exchange System / Service** has now been split in two Families, thus resulting in Family 5.6.1 – **Upgrade / Implement Flights Information Exchange System / Service supported by Yellow Profile** and the new Family **5.6.2 - Upgrade / Implement Flights Information Exchange System / Service supported by Blue Profile**.

Furthermore, **AF6 structure** has now been **slightly re-organized**, considering the impacts of the **associated DLS implementation strategy** designed by SDM and taking into account the **outcomes stemming from the SJU/ELSA study**. In this respect, AF6 is now composed of the following 5 families:

- **Family 6.1.1 –ATN B1 based services in ATSP domain**
- **Family 6.1.2 –ATN B2 based services in ATSP domain**
- **Family 6.1.3 –A/G and G/G Multi Frequency DL Network in defined European Service Areas**
- **Family 6.1.4 – ATN B1 capability in Multi Frequency environment in aircraft domain**
- **Family 6.1.5 – Implementation of ATN B2 in Aircraft domain**

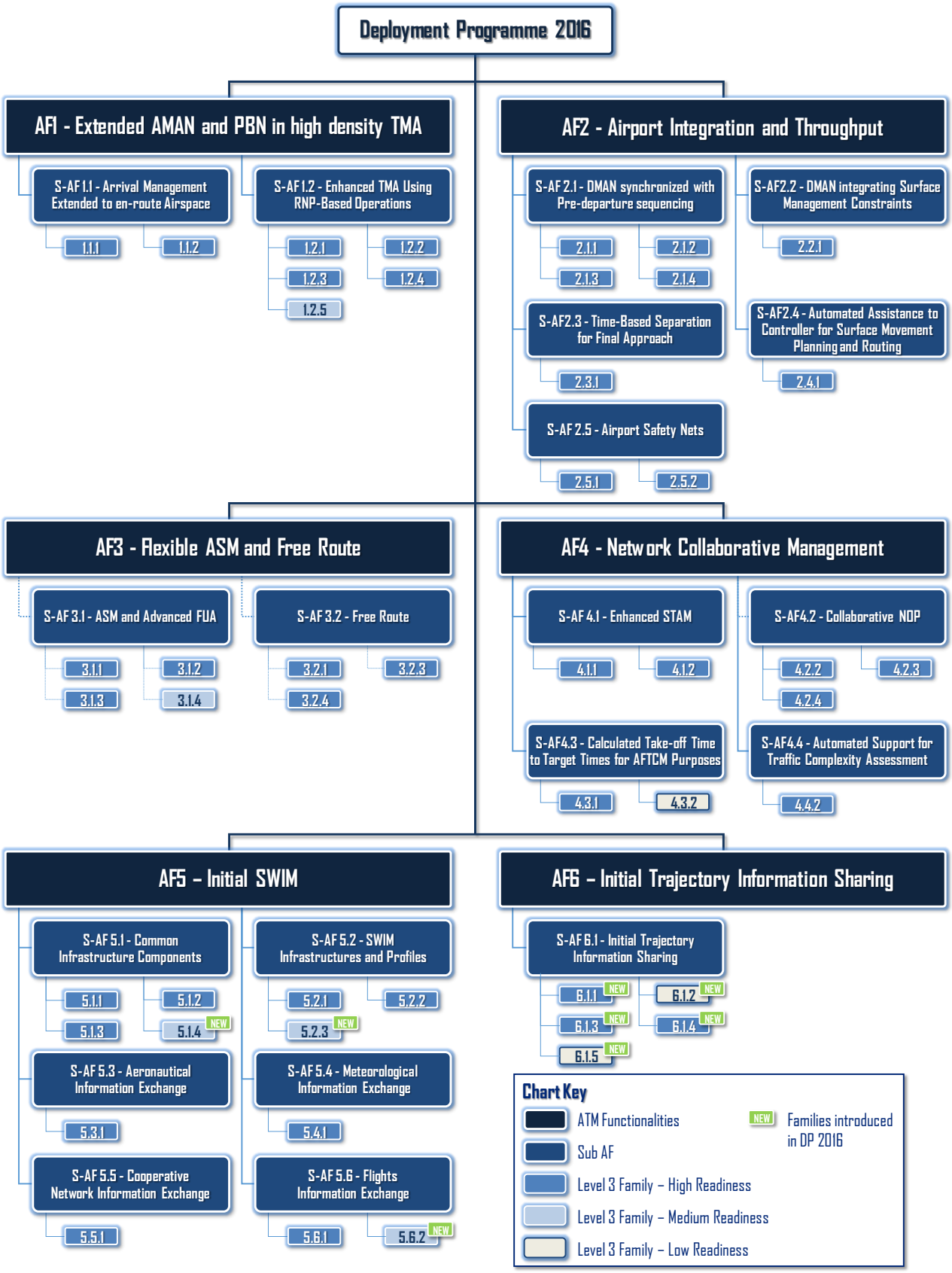


Fig. 1 – Overall Structure of the DP 2016

Here below the **full list of the 48 Families of the DP 2016** is reported.

AF1 – Extended Arrival Management and Performance Based Navigation in the High Density TMAs

- 1.1.1 Basic AMAN
- 1.1.2 AMAN Upgrade to include Extended Horizon function
- 1.2.1 RNP Approaches with vertical guidance
- 1.2.2 Geographic Database for Procedure Design
- 1.2.3 RNP 1 Operations in high density TMAs (ground capabilities)
- 1.2.4 RNP 1 Operations in high density TMAs (aircraft capabilities)
- 1.2.5 Advanced RNP routes below Flight Level 310

AF2 – Airport Integration and Throughput

- 2.1.1 Initial DMAN
- 2.1.2 Electronic Flight Strips (EFS)
- 2.1.3 Basic A-CDM
- 2.1.4 Initial Airport Operations Plan (AOP)
- 2.2.1 A-SMGCS Level 1 and 2
- 2.3.1 Time Based Separation (TBS)
- 2.4.1 A-SMGCS Routing and Planning Functions
- 2.5.1 Airport Safety Nets associated with A-SMGCS (Level 2)
- 2.5.2 Aircraft and vehicle systems contributing to Airport Safety Nets

AF3 – Flexible Airspace Management and Free Route

- 3.1.1 ASM Tool to support AFUA
- 3.1.2 ASM management of real time airspace data
- 3.1.3 Full rolling ASM/ATFCM process and ASM information sharing
- 3.1.4 Management of Dynamic Airspace configurations
- 3.2.1 Upgrade of ATM systems (NM, ANSPs, Aus) to support Direct Routings (DCTs) and Free Routing Airspace (FRA)
- 3.2.3 Implement Published Direct Routings (DCTs)
- 3.2.4 Implement Free Route Airspace

AF4 – Network Collaborative Management

- 4.1.1 STAM Phase 1
- 4.1.2 STAM Phase 2
- 4.2.2 Interactive Rolling NOP
- 4.2.3 Interface ATM systems to NM systems
- 4.2.4 AOP/NOP Information Sharing
- 4.3.1 Target times for ATFCM purposes
- 4.3.2 Reconciled Target Times for ATFCM and arrival sequencing
- 4.4.2 Traffic Complexity Tools

AF5 – Initial System Wide Information Management

- 5.1.1 PENS 1: Pan-European Network Service version 1
- 5.1.2 NewPENS: New Pan-European Network Service
- 5.1.3 Common SWIM Infrastructure Components

- 5.1.4 Common SWIM PKI and cyber security
- 5.2.1 Stakeholders Internet Protocol Compliance
- 5.2.2 Stakeholders SWIM Infrastructure Components
- 5.2.3 Stakeholders' SWIM PKI and cyber security
- 5.3.1 Upgrade/Implement Aeronautical Information Exchange System / Service
- 5.4.1 Upgrade/Implement Meteorological Information Exchange System / Service
- 5.5.1 Upgrade/Implement Cooperative Network Information Exchange System / Service
- 5.6.1 Upgrade/Implement Flight Information Exchange System / Service supported by Yellow Profile
- 5.6.2 Upgrade/Implement Flight Information Exchange System / Service supported by Blue Profile

AF6 – Initial Trajectory Information Sharing

- 6.1.1 – ATN B1 based services in ATSP domain
- 6.1.2 – ATN B2 based services in ATSP domain
- 6.1.3 – A/G and G/G Multi Frequency DL Network in defined European Service Areas
- 6.1.4 – ATN B1 capability in Multi Frequency environment in aircraft domain
- 6.1.5 – Implementation of ATN B2 in Aircraft domain

Whilst the technical content of each of the 48 aforementioned Families identifies the technological improvements that need to be deployed to fully implement the Pilot Common Project, the DP also aims at defining a common, consulted and agreed roadmap to ensure a synchronised, coordinated and timely PCP implementation. Such roadmap, which is reported in the following Gantt chart, has been defined taking into account the target dates for each ATM Functionality and Sub-ATM Functionality, as stated in the Regulation (EU) 716/2014, and identifies the expected start and end of deployment for each Family.

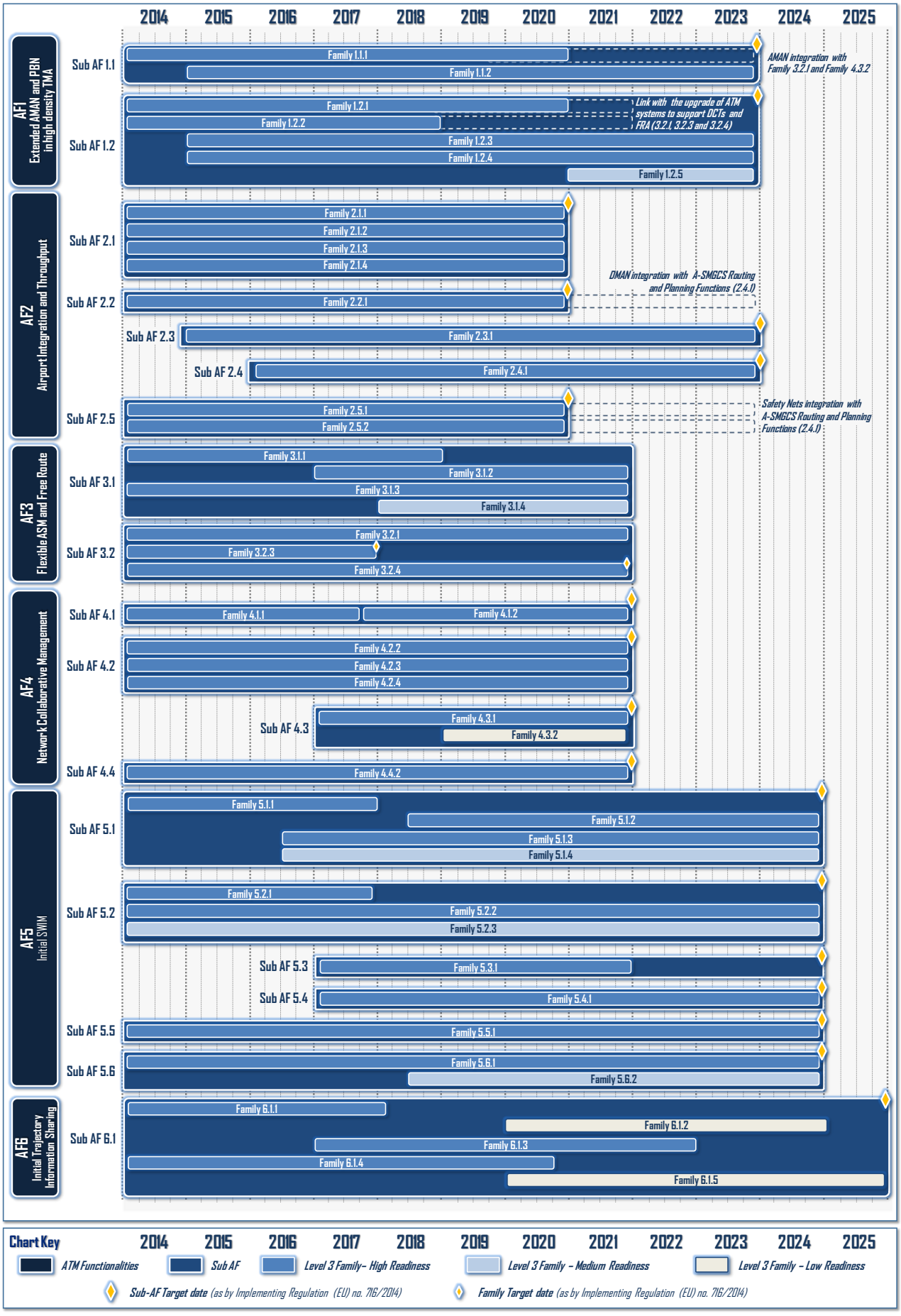


Fig. 2 – Overall Implementation Planning of DP 2016

2.4 DP and ATM Master Plan Alignment

The close cooperation between the SESAR Joint Undertaking and the SESAR Deployment Manager has resulted in a successful alignment between the PCP-related components of the 2016 Master Plan Level 2 and 3 and Deployment Programme 2016. Indeed, the alignment has been performed as far as possible considering that:

- the DP 2016 is the Project view of the PCP, itself a **subset of the most essential Operational Improvements included in the ATM Master Plan Ed. 2 (2012)**, which are required to be implemented on the basis of Regulation (EU) 716/2014;
- the DP 2016 applicability area **encompasses SES area** and reflects the commitment of SES operational stakeholders, whilst the **ATM Master Plan has an ECAC, thus broader, geographical coverage**, and reflects the plan of the ECAC Member States;

Due to the Deployment Programme's core objective to define an optimal and feasible deployment sequence of the PCP, some families have elements not explicitly mentioned in the Regulation (EU) n. 716/2014 but implicitly required as **essential to achieve the full and effective Pilot Common Project implementation** as they enable its full deployment in the context of the current ATM reality and – in some cases – are **required to access the full performance benefits associated to the PCP**. This is also the reason why in some families, alignment with the ATM Master Plan may present some slight differences.

2.5 Introduction to the Project View

Whereas section 2.3 provides an overview of the content of the Pilot Common Project and with a high-level planning for its implementation, this section focuses on **clearly explaining how each of the 48 Families is described and illustrated within the Project View** (Chapter 3) of the Programme.

The Project View is the **"technical and *operational*" view of the DP** itself and is the **core reference for proposals to be submitted under the "*Common projects*" category of the "Single European Sky – SESAR" priority in the framework of CEF Transport Calls for Proposals**. It includes all information and technical details to fulfil three key purposes:

- Provide an exhaustive and complete **view of the technical scope of each of the 48 Families of the Programme** (along with the most relevant links and references the ATM Master Plan, to Guidance material, Standards and Community Specifications, etc.); such thorough description supports the stakeholders in understanding the technological improvements required by the Pilot Common Project regulation, as well as the deployment approach to be followed;
- List all **Implementation Projects associated to the CEF Framework** (both 2014 CEF Transport Call awarded projects and 2015 CEF Transport Calls candidate projects), clustered on a Family-basis;
- Support the **identification of the existing gaps**, i.e. the **activities still deemed necessary to ensure the complete and timely implementation of the related**

Family, sub-AF, AF and then of the overall PCP. The identification of such gaps is developed thanks to a dedicated SDM Monitoring Exercise launched in March 2016 with the direct involvement of the operational stakeholders, on the basis of *ad-hoc* surveys as well as on the analysis of the planned deployment activities covered by CEF Transport Calls 2014 and 2015.

Such list of existing gaps per Family is also a tool at disposal of the operational stakeholders, with the twofold objective to:

- ease the **timely alignment of the ATM technological investment plans of the operational stakeholders with PCP implementation sequencing**;
- maximize **operational stakeholders' probability to access the available financial support through future CEF Transport Calls, especially when submitting projects targeting the full gap implementation.**

In order to summarize all abovementioned information, the **Work Breakdown Structure (WBS)** of each Family will be included in Chapter 3. A mock-up of the WBS is proposed in the figure hereafter for illustrative purposes. For the complete set of Gaps and information on the progress of implementation, stakeholders shall refer also to the Monitoring View in Chapter 5.

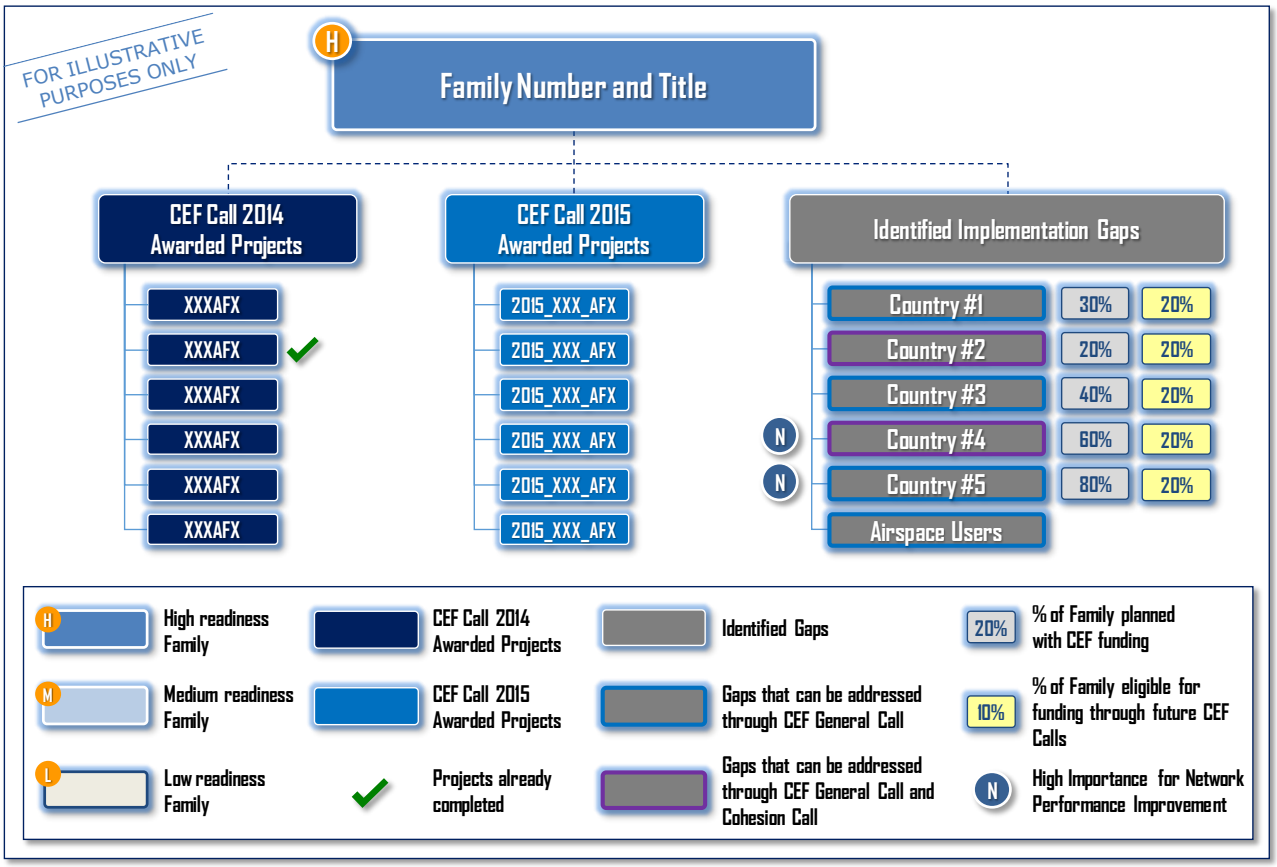
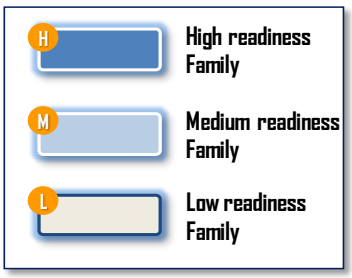


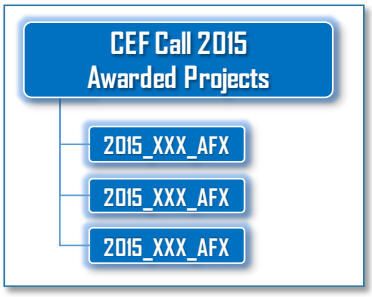
Fig. 3 – Mock-up of the Family WBS

As detailed in the legend, the Work Breakdown Structure has been developed in order to report the following information:



The **readiness for implementation of the Family** (High/Medium/Low), as previously outlined in paragraph 2.3., and further explained within the technical description of the Family itself (Chapter 3).

The **Family-related Implementation Projects** that have been **awarded through the 2014 CEF Transport Call** are identified by the standard designator. Projects submitted under the CEF framework and already completed at the present date are clearly identified through a green check mark.



The **Family related Implementation projects awarded through the 2015 CEF Transport Calls** (both General and Cohesion calls), according to the INEA awarding process as identified by the standard designator.

The **Family-related implementation gaps**, which represent the implementation initiatives still needed to fully deploy the Family itself, as well as to support the achievement of the performance expectations. Such gaps are **identified on a geographical scope-basis** (i.e. by airport for AF1 and AF2 and by country for AF3, AF4, AF5 and AF6).

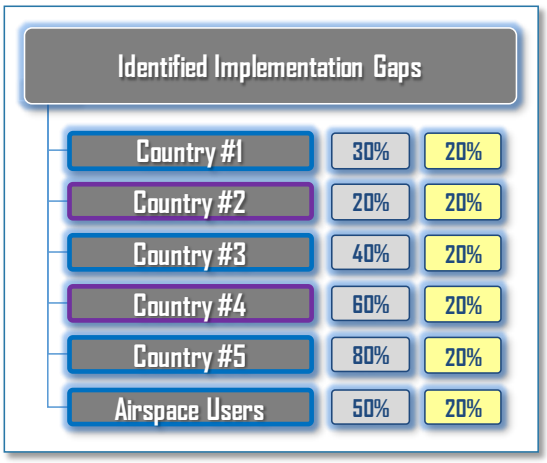


Fig. 4 – Overview of the Implementation Gaps

For specific Families, where Airspace Users are requested to invest by the PCP regulatory framework, a **dedicated "Airspace Users" gap** is also included.

In this perspective, for each identified gaps, the WBS also provides information concerning which **percentage of the gap is still expected to be covered** in order to achieve the

full Family deployment. In order to outline a **harmonized and shared view per Family**, SDM has developed a matrix per each Family, associating the percentage of coverage of the Family with tailored milestones, also indicating the stakeholders' categories involved in their achievement. Such matrices have been considered as standard inputs for the *ad-hoc* surveys distributed among operational stakeholders, gathering inputs concerning the current status of implementation and future plans. Additional information on such surveys and the elaboration of their outcomes are included in Chapter 5.1.

More specifically, two percentages will be featured for each existing gap:

- **"grey" Implementation gaps -** Percentage of the gap which is being implemented through implementation projects, although not completed yet, to which CEF funding has been awarded and under SDM coordination;

- **"yellow" Implementation gaps - Percentage of the gap which has not been implemented yet**. From a planning perspective, yellow gaps represent **the "real gap"**, i.e. the gap to be closed either taking any upcoming CEF Transport Calls as funding opportunity or through relevant stakeholders' decision to fully fund the implementation projects required to close the gap. In both cases, the "yellow" gaps set the reference.

Following this approach, the 48 Families translate into **1168 existing Implementation gaps** (still open or already closed) out of which the "yellow" percentage is the target for next CEF Transport Calls. Furthermore, the following elements will be constantly monitored by the SESAR Deployment Manager:

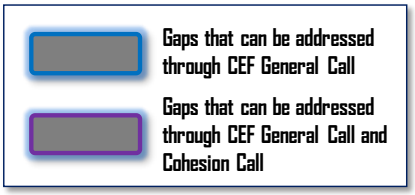
- Strategic progress of the implementation from one DP yearly edition to another;
- Percentage of coverage of the identified gaps;
- Overall level of completion of Families' deployment;
- Overall outlook on the status of the Pilot Common Project implementation.

The view presented in the Project View (Chapter 3) is complemented by the information presented in the Monitoring View (Chapter 5); in fact, whereas the "Project view" drives the **opportunities to access co-funding** narrowing down through the "yellow gaps", i.e. what remains to be submitted for co-funding after each CEF call's results, the "monitoring view" reports on the **whole PCP implementation regardless implementation activities are co-funded and under SDM coordination or not** co-funded and outside SDM coordination.

In this perspective, **any implementation project submitted but not awarded will be kept in the yellow gaps** as long as the next CEF Transport Calls could still represent a co-funding opportunity consistent with the time window required for the family to which the project contributes. On the other hand, the **information** related to implementation carried out outside SDM coordination **is collected by SDM through its stakeholders' consultation platform** and through the dedicated Monitoring exercise. This view also includes implementation projects not awarded that the implementing partners decide to execute without co-funding.

The **implementation initiatives / gaps crucial for the improvement of the current performance at network level**,

identified by the Network Manager in accordance with the European Network Operations Plan (NOP) 2016-2020 and with the European Route Network Improvement Plan (ERNIP) Database, labelled with an "N" symbol. The importance of these specific implementation gaps has been identified by applying a family-tailored approach, aiming at ascertaining which technological elements shall be deployed and where, in order to positively impact on the overall performance of the Network;



The indication whether each implementation project/initiative/gap, according to its geographical scope, could be **co-funded through CEF Transport Calls for Proposals or CEF Cohesion fund Calls for Proposals**.

2.6 DP Implementation Status

Building on inputs included within Chapter 5, this paragraph provides an executive recap of the current status of PCP deployment, as well as at reporting on the strategic progress of the 84 projects awarded during the 2014 CEF Call and currently coordinated and synchronized by SDM.

PCP implementation status across Europe – Overview

As reported in section 5.1, the implementation of the Pilot Common Project has successfully started, and is now progressively growing in its pace. Out of the overall **1165** gaps identified in the Programme, defined by matching the 48 families of the Programme and the airports / countries specified in the geographical scope of the Regulation, **143** are considered as already completely closed (around 12%).

Moreover, the implementation initiatives undertaken by Operational Stakeholders – either within or beyond the CEF framework – are currently addressing additional **270** gaps (around 23%); out of these 267 gaps, the current **IPs** that are benefitting from the public funding support are planned to fully close **62 gaps**.

It is worth noting that the deployment of PCP does not proceed at the same pace for all ATM functionalities and associated families, due to the different level of readiness for implementation of the technological elements to be deployed. More specifically, **AF1, AF2** are currently being **implemented at a faster rate than AF3, AF4, AF5 and AF6**.

More specifically, the **slower deployment of SWIM** (AF5) and of the **Initial Trajectory Information Sharing** (AF6) is highly dependent respectively from the current lack of a well-defined and **agreed SWIM Governance Framework** and from a **coordinated implementation of Data Link Services**; both streams of deployment are however expected to benefit from the key strategic tasks that the SDM is performing, on the basis of specific EC requirements (see section 2.7.1 and 2.7.2).

DP Execution Progress – Key findings

Based on the main outcomes related to the DP Execution Progress Report (see section 5.2), such section highlights the strategic implementation status of the Deployment programme, identifying the potential issues and risks for the DP future implementation.

Specifically, the analysis of such inputs shows that the **technical progress of the 84** (out of which 3 are split into two different parts due to application of different co-funding rates, making the total number of Implementation Projects rise to 87) **projects** awarded during the 2014 CEF Call, is **substantially in line with the planned progress**. Moreover, **no Implementation Project is expected to end beyond the timeframe of the related AF** as specified in the PCP, and **no implications are envisaged in terms of timely achievement of the expected operational targets** and benefits.

In a nutshell, it emerges that **13 of 87 Implementation Projects have been successfully completed** as outlined below:

- **3** Implementation Projects in **AF1**
- **8** Implementation Projects in **AF2**
- **2** Implementation Projects in **AF5**

Further details related to the operational progress of the Action are reported in section 5.2.

2.7 Approach for an effective PCP deployment

This sub-section aims at highlighting the most urgent activities undertaken by SDM, in cooperation with SJU and other SES bodies, in order to ensure an effective and synchronized deployment of PCP throughout Europe.

2.7.1 Data Link Services (DLS) Implementation Strategy towards Initial Trajectory Information Sharing

A dedicated strategy, developed by SDM following a specific EC request, aims at organizing and sequencing the deployment activities still required to implement first **Data Link Services in accordance with ELSA's recommendations** and, then, the whole AF6 throughout Europe. Following a targeted round of consultation with the most relevant operational and non-operational stakeholders, the DLS Implementation Strategy is included as an Addendum of the present Strategic View.

2.7.2 SWIM Governance Action Plan

In order to support and promote the highest level of buy-in and engagement of Operational Stakeholders for a **common and shared SWIM Governance Framework**, SDM has been tasked by European Commission to elaborate a tailored **Action Plan**, which include targeted actions to better organize and synchronize the whole AF5 implementation. The Swim Governance Action Plan is included as an Addendum of the present Strategic View.

2.7.3 Preliminary Identification of Common Services

SDM was tasked by European Commission to preliminarily identify **those families whose implementation would need or highly benefit from a specific approach in the planning of their deployment** (central, regional, multi-stakeholder), potentially resulting into the provision of a Common Service. As a result of the analysis, and especially in light of the inputs gathered through the third round of the consultation process, SDM has identified three main technological elements:

- **NewPENS** (Family 5.1.2), for which a dedicated multistakeholder implementation project has been awarded by EC in the framework of the 2015 CEF Call, engaging more than 20 operational stakeholders into the deployment of a Europe-wide IP service based Ground-Ground network. As reported in the Family description, any Operational Stakeholder is invited to join the initiative and become a NewPENS user, with the final goal of building a unique ATM network;
- A common **SWIM Governance** framework (covered in the DP through family 5.1.3 and 5.1.4) is needed to ensure a controlled evolution and a harmonized deployment of all SWIM elements. The aforementioned SWIM Governance Action Plan aims at representing a preliminary step towards the set up and operational deployment of a solid and agile SWIM Governance, able to facilitate a coordinated deployment for all AF5;
- The coordinated **deployment of Data Link Services** (a pre-requisite of the implementation of the whole AF6) is an essential enabler of a realistic path from today's state of play towards the full implementation of the Initial Trajectory Information Sharing by the deadlines set in the Pilot Common Project. The whole Strategy developed by the SDM underlines the opportunity to provide DLS as a common service, i.e. through a distributed provision of the service through a limited number of service areas under a single Governance.

2.7.4 High-level Principles towards next CEF Transport Calls

The DP 2016 has been designed by SDM with the overarching objective to provide all potential implementing partners with the best possible guide through the next CEF Transport Calls. In this direction and as explained in the previous sections, you will find here all what you need to submit PCP related implementation projects into the upcoming CEF Transport Calls.

However, past experiences have proven that:

- Some candidate implementation projects, even when obviously globally PCP related, do not go through the evaluation because their alignment with DP is not visible enough contents wise and time wise;

- Prioritization is the mean that SDM adopted to manage the significant overbooking in the 2015 CEF Transport General Call and this is only partially successful. Despite the obvious positive message that ATM industry forward with high volume of co-funding request about its willingness to deploy SESAR, too much overbooking appears detrimental to efficient PCP implementation management in so far it offers such a wide choice that final selection may not correspond to optimum implementation.

Therefore, learning from the above, the SDM recommends the potential implementing partners to define their candidate projects against all the information available in the DP, **but also**:

– **Addressing the gaps**
The Monitoring view of the DP and the list of Gaps included in the Project View provide for an exhaustive outlook of the current status of deployment of the Pilot Common Project throughout Europe, as well as the list of implementation activities still to be undertaken in order to achieve the full PCP implementation. **It is expressly**

recommended to define projects starting from gaps identified in the DP, preferably focused on closing one specific gap instead of spreading the same project over several gaps without closing any and bringing together all stakeholders required to close this gap instead of unnecessary fragmentation.

- **Focusing on the right timing**
  In order to ensure a timely and effective PCP implementation as well as the achievement of earliest performance benefits, it appears essential to submit the "right project in the right call". The notion of "readiness for implementation" as well as the Gantt charts in the strategic and project views is there to determine your best timing. I**t is recommended to focus the next investments – and the associated submissions for the upcoming CEF Transport Calls – to High Readiness Families in DP 2016 and in synchronization with the Gantt chart of these families.** The SDM will look into possibilities also to assess the readiness on the field of the local or regional stakeholders to invest in high or medium readiness families.

- **Targeting the improvement of the overall Network performance**
  By design of the PCP, all functionalities in the PCP contribute to improve the overall Network Performance, including the pure ground investment projects that enhance capacity and safety on airports. However, among all the gaps in the DP 2016, Network-critical gaps have been specifically identified in cooperation with the Network Manager and are aligned with the inputs coming from the latest version of the European Network Operations Plan (NOP) concerning the capacity constraints and from the European Route Network Improvement Plan (ERNIP) Database concerning the flight efficiency gaps. **It is recommended to focus on implementation initiatives crucial to resolve or mitigate the impacts of current performance (mainly capacity and flight efficiency) constraints and potential bottlenecks, which might hinder the overall performance at network level.**

- **De-fragmenting implementation**
  De-fragmentation of PCP implementation remains a room for improvement. Whereas the 2014 CEF Transport Call included about 10% of multi-stakeholder's projects, the 2015 CEF Transport Calls rose to 30% of multi-stakeholder's projects. In order to further progress in this direction, SDM paid special care to the identification of all stakeholders required to close every gap. **SDM recommends the systematic partnering of the stakeholders involved together in closing the same gap and SDM stands ready to act as a facilitator to ease such regrouping.** The support provided by SDM could be performed on the basis of local or regional compliance plans drafted by the implementing partners involved. These compliance plans could be used as the compass document for future monitoring, reporting and submission of projects._In this respect, when deemed beneficial for the overall objectives of the initiatives and for the achievement of the associated performance benefits, it is recommended to evaluate the opportunity of liaising between different stakeholders (both within the same stakeholder category and between different categories) in order for them to present joint proposals in the framework of upcoming Calls. The Families for which such approach is considered beneficial are clearly identified in Chapter 3 (*Recommendation for the IP proposal* field in the Family description template).

- **Fostering civil/military coordination**
  The timely involvement of military stakeholders in PCP implementation is paramount to achieving full PCP benefits. It is therefore recommended to civil and military stakeholders to improve and enhance the cooperation processes, particular when the DP 2016 identifies that military stakeholders are required to close a gap where others civil stakeholders are involved.

In the case where the volume of candidate implementation projects in the next CEF Transport Calls would require another prioritization exercise, the compliance of the candidate implementation projects with the above recommendations would be taken into consideration.

In addition to the afore-mentioned high level recommendations, dedicated recommendations based on the specific features of each Family are presented in the Project View, as a further support to stakeholders potentially interested in submitting projects in the upcoming CEF Transport Calls. Furthermore, the SESAR Deployment Manager remains fully available in providing its support to operational stakeholders for the elaboration of proposals to be submitted in the framework of future CEF Transport Calls.

2.8 Global interoperability

The analysis of the necessary harmonization of the main technological developments and evolution, as well as the necessary synchronization needs, is at the cornerstone of the SDM effort to contribute to global interoperability. Special reference was given in DP 2015 to the risk of lack of global interoperability[4], which was reported as a key concern of the airspace users in the SDM stakeholder consultation process 2015.

While many countries around the World are implementing ATM improvements, the US FAA's NextGen and EU's SESAR are the two largest ATM modernization programs currently under way. The cooperation between FAA and SDM was therefore identified as instrumental for SDMs contribution to global interoperability and to support harmonization of standards, technologies and procedures on deployment matters. The SDM commits to the need to work on a complete life cycle view (definition, development, deployment) of both NextGen and SESAR, confirming the importance of promoting SESAR as one project with definition, development and deployment fully covered. With respect to cooperation with the FAA and global harmonization the SDM works therefore closely with the SJU, ensuring a single SESAR view to the international stakeholders' community.

2.8.1 Framework and guidance from Policy Level

The international activities of SDM take place under the **oversight of the policy level led by the European Commission, which has delivered a specific mandate to SDM** to set the scope of the cooperation with the FAA.

[4] See DP 2015, final edition November 2015.

Regarding European cooperation with US/FAA, for **R&D purposes** the cooperation between SESAR JU and NextGen is taking place under the umbrella of the **MoC between the EU and US[5] with specific reference to Annex 1**. With respect to **deployment**, the SDM cooperation with the US/FAA is currently taking place under the umbrella of the **Letter of Intent (LoI), signed by FAA and EC in June 2015**.

Whilst cooperating with the FAA through 2 different frameworks, SDM and SJU are working closely together to ensure that **SESAR is perceived as a single project**.

2.8.2 Objectives

SDM activity on global interoperability and harmonization, including the cooperation with FAA, will make the **DP 2016 and upcoming editions more focused to avoid any extra burden to the (airspace) users on standards, procedures and equipment** due to non-alignment or late alignments on global interoperability.

With respect to SDMs work on global interoperability and cooperation with FAA **initial focus areas of cooperation have been identified and addressed in the 2016 work plans**, including but not limited to Data Comm, SWIM, AMAN/TBFM[6], with the aim to:

- gaining **understanding of NextGen and SDM deployment strategies**, implementation priorities, timelines and milestones associated;
- **identify potential gaps and needs**, discovered during implementation, in terms of industry standards;
- identify **risks to timely (Programme) implementation and risks on interoperability** and global harmonization, as well as sharing potential mitigation strategies[7];
- assessing the **feasibility and the need for US/EU synchronizing deployment activities** respectively synchronized risk mitigations actions;
- exchange on economic impact assessment and business cases;
- **sharing of lessons learnt and best practices**.

Furthermore, the results of the cooperation with FAA on deployment matters will also feed the SESAR input to the updates of ICAO GANP 2016 and 2019 to ensure the reflection on global perspective of the deployment aspects of ATM modernization programmes in Europe and the US. The cooperation will identify and address **topics and activities in the global** (ICAO) **context where information need to be shared** and subsequently where currently coordination is on-going or will be required. The DP 2016 contains the mapping of the DP with the ICAO GANP/ASBUs. A **mapping of ATM MP, DP, ICAO**

[5] Memorandum of Cooperation between the United States of America and the European Union, 3rd March 2011, published in the Official Journal on the European Union 5th April 2011 (MoC including Annex 1)
[6] TBFM = Time Based Flow Management and is part of NextGen Portfolio
[7] See also GAO Report (GAO-15-608) July 2015, Report to Congressional requesters, Next Generation Air Transport System. Improved Risk Analysis Could Strengthen FAA's Global Interoperability Efforts

ASBUs and NextGen is also planned and will be provided to the international stakeholder community when available.

2.8.3 Outlook to upcoming DP editions

As outlined above, it is foreseen to **incorporate outcomes from the SDM-FAA cooperation work** into each upcoming DP edition in order to complement it with a wider global perspective. With respect to ICAO SARPs and guidance material related to deployment, SDM will work closely with the relevant working groups at European level, under the guidance of EC and in close cooperation with SJU. SDM will further seek **co-operation of the manufacturing industry in this context** (especially airborne manufacturers but not limited too); this activity will take place under the framework of the Cooperative Arrangements with the manufacturing industry according to Regulation (EU) N°409/2014.

Eventually, the **international exchange on experiences on deployment execution**, lessons learnt and best practices in implementation are expected to contribute to SDMs capability to fulfill the tasks of synchronization and coordination for Common Projects implementation in accordance to Regulation (EU) N°409/2013.

2. STRATEGIC VIEW

SESAR
DEPLOYMENT MANAGER

Strategic View – Addendum 1
Data Link Services (DLS)
Implementation Strategy towards Initial Trajectory Information Sharing

1. Overall context and objective of the note

European Commission requested SDM to develop a full DLS-AF6 implementation strategy as part of DP 2016 with the objective to set a realistic path from today's state of play up to Initial Trajectory Information Sharing (AF6) implementation by the deadlines set in the PCP, i.e. 1 January 2025 for ground and 1 January 2026 for airborne segment. Whilst EC's request came soon after SDM establishment through a letter from DG MOVE to SDM dated 25 February 2015 introducing SDM as "data link deployment project manager", it is by spring 2016 that SDM has been in position to develop such strategy considering the need to build consistently on ELSA's recommendations.
Pending ELSA's recommendations, SDM's preparatory action on data-link was the inclusion of a new family "Air Ground Data-Link" (Family 6.1.2) into the DP 2015 in order to stress the importance of this prerequisite for the whole AF6 implementation and ensure access to co-funding. Now, in full knowledge and consistency with SJU's DLS related studies[8] and other relevant findings from *New European Common Service Provision for PENS2 and DLS*, SDM benefits from useful guidance and essential technical indications that enabled this proposal for a realistic, pragmatic and – most important – ready to start implementation strategy through the next 2016 CEF Transport Calls.

The proposed strategy is structured in four main sections:

- **Background**;
- **Key Principles**;
- **Action Plan**;
- **SDM added value**.

2. Background

2.1 Importance of DLS

DLS is an essential prerequisite to business trajectory (Initial Trajectory Information Sharing) which is the backbone of SESAR operational concept. Therefore, benefits from a considerable portion of SESAR solutions would be severely inhibited unless AF6 delivers.

2.2 Regulatory Framework

The strategy has been defined considering the relevant regulatory framework which is set mainly through the 3 following regulations:

[8] VDL Mode 2 Capacity and Performance Analysis – 2015
VDL Mode 2 Measurement, Analysis and Simulation Campaign by the ELSA Consortium and Programme Partnership – 2016

- DLS IR (Reg. (EU) No 2015/310 amending Regulation (EC) No 29/2009), which define new deadlines for the implementation on February 2018 for ground domain and February 2020 for airborne segment. This regulation includes a specific reference **to EASA[9]'s recommendation that "implementation of the plan of actions be preferably performed by SDM";**
- PCP IR (Reg. (EU) No 716/2014) where AF6's deadline is 1 January 2025 on ground and 1 January 2026 airborne (although limited to 20% of the fleet; 45% of the flights). **This is the only deadline that falls under direct SDM's responsibility as per regulation, reinforcing the need for SDM to be specifically involved in the implementation of AF6 and its prerequisites, DLS in particular**.
- SESAR Deployment Governance IR (Reg. (EU) No 409/2013), in particular its article 9.2 which sets the tasks of the SDM.

2.3 Implementation status

ATN Data Link systems, based on VDL Mode 2, are already implemented in some areas of SES airspace.

In order to propose a realistic strategy, it was essential for SDM to build an accurate and reliable picture of the current status of DLS in Europe. In complement to SDM's natural monitoring function of PCP implementation, SDM has launched a specific ground and airborne DLS survey, from 17 to 28 June 2016. The main findings of the survey are reported in this chapter. Some still missing data will be captured in the framework of future interactions with operational stakeholders. Further information on the different VDL operating models is provided at the end of the present Addendum.

With regard to the Airborne domain, the following chart recaps the status of implementation of the family 6.1.4, related to the *ATN B1 capability in Multi Frequency environment in aircraft domain*, on the basis of the inputs provided by the Airspace Users (headquartered in EU):

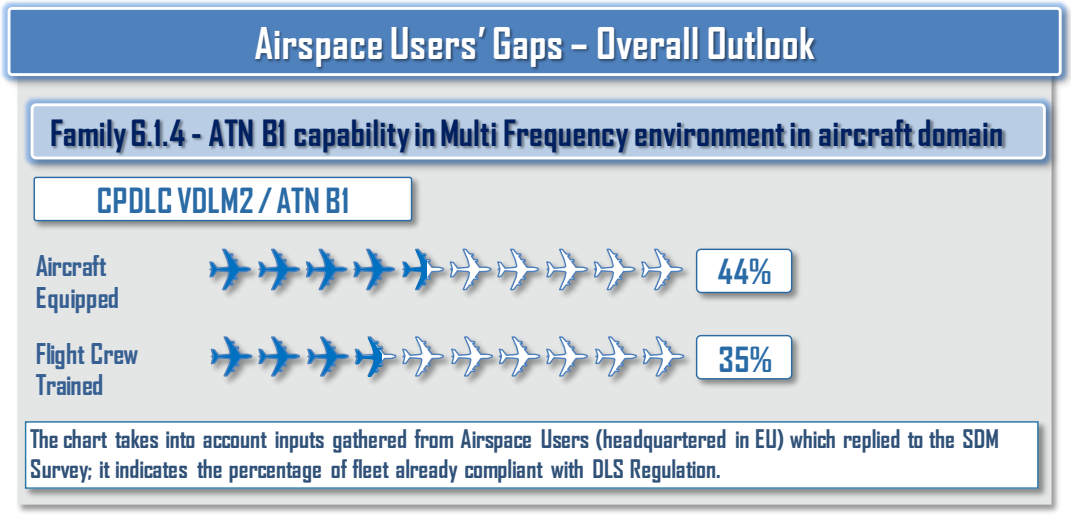


Fig. 4 – DLS Implementation Status – Airborne Capabilities

[9] EASA Report on *Technical issues in the implementation of Regulation (EC) No 29/2009 (Data Link)*

With regard to the Ground segment, the following chart recaps the current status of implementation of Data Link Services throughout Europe, on the basis of the inputs provided by the Air Navigation Service Providers through the dedicated DLS Survey:

Data Link Services Implementation Status

Due to the new structure of AF6, this picture of the current status of implementation of Data Link Services throughout Europe supports the identification of the main gaps associated to Family 6.1.1 and 6.1.3

Overall Implementation Status – June 2016

The chart reflects the inputs gathered from the responses to the dedicated DLS Survey, issued by SDM in June and distributed to all European Air Navigation Service Providers

- Data Link Services currently in operations
- Data Link Services partially implemented or not yet in operations (A/G VDLM2 Network in place)
- No A/G VDLM2 Network in place
- Not applicable

NB. The present picture and the following table have been prepared only by consolidating the information provided by the recipients of the DLS survey, without any direct cross-check of the feedback from SDM

Country	Air Navigation Service Provider	DLS in operations	ATM Systems Upgrade			At least one VDLM2 A/G comm. Network in place	Updated ATC Procedures	ATCO training completed	Starting Mode**
			Front End Processor	FDP System	HMI interface				
Austria	Austro Control		✓	✓	✓	✓	✓	✓	Mode 1 A
Bulgaria	BULATSA	By 2017	✓	✓	✓	✓	✓	✓	Mode 1 A
Croatia	Croatia Control	By 2017	✓	✓	✓				No implementation yet
Cyprus	DCAC	No date available							No implementation yet
Czech Republic	ANS CR	No date available	✓	✓	✓	✓			Mode 1 A
Denmark	Naviair		✓	✓	✓	✓	✓	✓	Mode 1 A
Estonia	EANS	By 2018	✓	✓	✓				No implementation yet
Finland	Finavia	By 2019	✓	✓	✓				No implementation yet
France	DSNA*	By 2019	✓	✓	✓	✓	✓	✓	Mode 1 A
Germany	DFS		✓	✓	✓	✓	✓	✓	Mode 1 A
Greece	HCAA	No date available							No implementation yet
Hungary	Hungaro Control		✓	✓	✓	✓	✓	✓	Mode 1 A
Ireland	IAA		✓	✓	✓	✓	✓	✓	Mode 1 A
Italy	ENAV	By 2016	✓	✓	✓	✓	✓		Mode 1 C
Latvia	LGS	By 2018		✓	✓				No implementation yet
Lithuania	Oro Navigacija	By 2018							No implementation yet
Malta	MATS	No date available							No implementation yet
MUAC Region	MUAC		✓	✓	✓	✓	✓	✓	Mode 1 A
Norway	Avinor	By 2020							No implementation yet
Poland	PAN SA	By 2018							No implementation yet
Portugal	NAV Portugal*	No date available	✓	✓	✓	✓			Mode 1 A
Romania	ROMATSA	By 2017							No implementation yet
Slovak Republic	LPS	By 2018							No implementation yet
Slovenia	Slovenia Control	By 2018							No implementation yet
Spain	ENAIRE	No date available	✓	✓	✓	✓			Mode 1 A
Sweden	LFV		✓	✓	✓	✓	✓	✓	Mode 1 A
Switzerland	skyguide		✓	✓	✓	✓	✓	✓	Mode 1 A
United Kingdom	NATS		✓	✓	✓	✓	✓	✓	Mode 1 A

*NB. According to their feedback, DSNA and Nav Portugal are currently providing only a subset of Data Link Services (respectively DLIC, AMC and ACM for France and DLIC Logon for Portugal)

**NB. Assumptions by SDM on the basis of the feedbacks provided by the ANSPs through the DLS Surveys

Fig. 5 – DLS Overall Implementation Status – Ground Network

2.4 Technical status

Considering that performance issues (provider and users aborts) have been experienced during the operational use of ATN B1 services making it difficult to continue to use them in the current configuration, EC requested:

- a technical investigation to EASA, resulting in the elaboration of a specific Report on *Technical Issues in the implementation of Regulation EC 29/2009* which identifies the causes of the current DLS issues;
- technical studies to SESAR JU:
  - *VDL Mode 2 Capacity and Performance Analysis*, which identifies the time horizon within which VDL Mode 2 is expected to reach its operational limits in Europe;
  - *VDL Mode 2 Measurement, Analysis and Simulation Campaign* elaborated by the ELSA Consortium and programme partnership in order to analyse the causes of the current DLS issues and identify solutions.

Appendix A summarizes the main findings of these activities that SDM used as a basis for the proposed strategy.

3. Key principles

3.1 Implementation focused

In accordance to the mandate received by EC the SDM has drawn its DLS implementation strategy, considering the current regulatory framework and the results and findings deriving from ELSA study.

The approach followed is **implementation focused** and builds on what ELSA's recommendations put forward as the immediately ready for deployment technology, i.e. ATN B1 Multi Frequency over VDL Mode 2 network in order to re-launch, on a sound basis, DLS implementation in Europe since the next CEF Transport Calls, presumably before end 2016. However, beyond the short term implementation of the reference technology, the proposed strategy also includes the following implementation steps with the evolution from ATN B1 to ATN B2 and possibly ATN B3 as well as some other technologies to be implemented in complement to VDL Mode 2. With such an end to end vision, SDM ambition is to demonstrate that a sound path exists from today's situation until AF6 implementation and that the short term approach proposed, in particular through the upcoming 2016 CEF Transport Calls, is **a major step in the right direction**.

In this perspective, according to ELSA study, the definition and implementation of an effective datalink end-to-end system certification process, including both ground and air components, is expected to be established by relevant Bodies/*empowered Functions*.

The proposed strategy does **not** consider:

- the development, validations and demonstrations that might still be required for the further evolutions of the *reference technology* (i.e. ATN B2 and ATN B3 which will be required at later stage, in particular to meet Initial Trajectory Information Sharing capacity needs);

- the development, validations and demonstrations still required by complementary technologies that should come along the *reference technology* at some point in time and mitigate limitations of the *reference technology*;
- the development, validations and demonstrations still required by a future generation of technologies that would take over from the *reference technology* at some point in time, addressing in particular the interoperability issue between EU and US, left pending by the *reference technology*;
- the establishment of the future DLS service provision governance;
- the activities required to elaborate standards, guidance material, regulatory documents. The responsibilities to produce such kind of documentation remain with the European Standardization and Regulatory bodies.

3.2 Distributed service provision and single governance

Despite the implementation focused nature of the proposed strategy, there is a close interrelation between how to implement DLS and how to organise the service provision.

For the time being, there is no agreement on how DLS provision will be organised. On the other hand, an implementation strategy "broad enough" to cover any service provision scenario would dilute its driving strength among an endless list of assumptions.

Considering that major studies have already highlighted that the European wide nature of **DLS makes it a perfect candidate to be provided as a common service**, i.e. distributed provision of the service through a limited number of service areas, based on common and interoperable infrastructures (e.g. PENS/NewPENS), under a single governance, SDM decided to base the proposed strategy on a distributed service provision with a single governance.

3.3 VDL Mode 2 lifespan

Any DLS CBA is closely connected with the potential lifespan of the VDL Mode 2 technology into which many stakeholders have already invested and will be required to further invest as a consequence of the proposed strategy. More lifespan means more time to accumulate benefits after the breakeven point. Also, the capacity study by the SJU[10] has demonstrated that the lifespan of the VDL Mode 2 technology is a direct function of its ability to accommodate data traffic for both AOC and ATS according to their respective required performances.

In this context, the option to complement VDL Mode 2 technology with other complementary technologies (ground or space based, airports or en route continental) when the data traffic demand of AOC and ATS together would come close to VDL Mode 2 only capacity (e.g. as a result of Initial Trajectory Information Sharing/EPP introduction by 2025) is essential[11]. In accordance with existing studies, the proposed strategy assumes that smartly and timely complemented, the VDL Mode 2 technology could last at least until 2030.

[10] VDL Mode 2 Capacity and Performance Analysis
[11] E.g. SATCOM, AeroMACS

3.4 Cost Benefit Analysis

In order to demonstrate the overall benefits to be drawn from the investments already made and those still required to ensure DLS provision based through VDL Mode 2, SDM will include a **revised DLS CBA view** in the DP2017. Starting from existing DLS CBA, it will provide an update, mainly to reflect the new costs stemming from ELSA's recommendations. As DLS is not included in the PCP, the DLS CBA is outside the PCP CBA.

With regards to additional costs and potential additional benefits stemming from the introduction of **complementary technologies**[12], their analysis and further incorporation into the overall DLS CBA will require specific studies by SDM together with the most relevant stakeholders, in particular the SESAR JU, in order to set the operational concept, the services and their associated benefits that could result from the combination of VDL Mode 2 with such complementary technologies.

4. Action Plan

The **SDM DLS Implementation Action Plan** is a **realistic recovery plan** which aims at addressing the remaining challenges on the ground and airborne sides.

In this perspective, taking into consideration:

- the technological upgrades required by the ground and airborne side in order to enable DLS provision in accordance with ELSA recommendations;
- the CEF framework and processes; and
- the current DLS implementation status;

The SDM has elaborated the "most probable and realistic scenario", having as main driver the target dates fixed by the PCP for AF6 Initial Trajectory Information Sharing. **It is worth saying that notwithstanding the compliance to the IR (EU) 310/2015 deadlines has been considered as the main driver, due to the above mentioned technological upgrades, a drifting of the deployment deadlines is highly possible**.

The proposed Action Plan bridges between current implementation status AF6 implementation, taking advantage of the specific SDM skills like:

- acknowledged centre of expertise reinforced by strong connections with all types of ATM stakeholders;
- specific relations with SESAR Joint Undertaking and Network Manager;
- planning combination with CEF framework to translate regulatory constraints into IPs co-funded by EU, coordinated and monitored by SDM.

Taking into consideration the high level principles concerning the DLS implementation outlined in the present note, as well as the outcomes of the ELSA study, the Action plan has been elaborated, with an overall deployment perspective, in order to identify the effective paths/steps needed to be undertaken in the ground and airborne domain in order to achieve, in the right sequence, a synchronized DLS deployment in Europe.

[12] E.g. SATCOM, AeroMACS

Airborne domain

The SDM strategy has duly taken in consideration also the airborne domain in order to ensure an effective and overall enhancement of the ATS VDL2 performance. According to ELSA study (see Appendix A), the availability of different avionics with related different performance levels has a strong impact on DLS operation with high level technical disconnections. Moreover, the current avionics are not compliant with the ATS performance requirements, therefore the harmonization of avionics performance is needed in order to improve the network performance.

In this perspective, one of the outcomes of ELSA study was a set of avionic configurations, the "best in class", that were tested and demonstrated as sufficient to comply with the ATN/VDL2 performance expectations in multi-frequency (MF) environment.

Moreover, ELSA identified the need to continue testing efforts beyond the lifespan of the study itself to cover both newly emerging avionic configurations as well as other existing configurations that were not covered in the ELSA study. **ELSA proposed that ultimately, an effective end to end certification process for both ground and air components should be defined and implemented.**

The SDM strategy aims at incentivizing the upgrade to the "best in class" avionics configurations which are considered as the set of airborne equipment necessary and sufficient to comply with the ATN/VDL2 performance expectations.

Ground domain

According to the results of DLS survey (Fig. 2), the European current situation can be represented by the following starting points for the transition towards the "Model D" that is considered as the target solution (See Appendix A):

- **"Model A":** a country/region with a multiple VDL M2 networks implemented in the same airspace, using a One-GSIF system on common frequencies;
- **"Model C":** a country/region with a single VDL M2 networks implemented in the same airspace, using a Two-GSIF4 system on reserved frequencies;
- **No implementation yet**: a country/region that has not implemented any ATN COM infrastructure.

The following table outlines the main technical characteristics of the DLS Models:

Model	VDL RF operating Networks	VDL RF Frequency Use	GSIF on each Frequency announced by each Network	Existing today	Note
A	MULTIPLE	COMMON	ONE	YES	Current Central EU model
B[13]	MULTIPLE	RESERVED	ONE	NO	**Target Short term evolution for central EU**
C	SINGLE	RESERVED	TWO	YES	Current model deployed in a limited area[14]
D	SINGLE	RESERVED	TWO	NO	**Target Long term model for EU VDL network evolution**

Fig. 6 – DLS Model Description

[13] To implement the Model B in a way suitable to meet the requirements, it is necessary to have at least five frequencies available in the high traffic area, considering the current situation of two operating CSPs. (Considering that only four frequencies are currently assigned to VDL Mode 2, ICAO FMG is currently working to make available also the fifth frequency. A decision on this topic is expected by 2016).

[14] Currently deployed by ENAV in Italian airspace

In the light of above, the following picture highlights the potential paths envisaged for the transition towards the target solution:

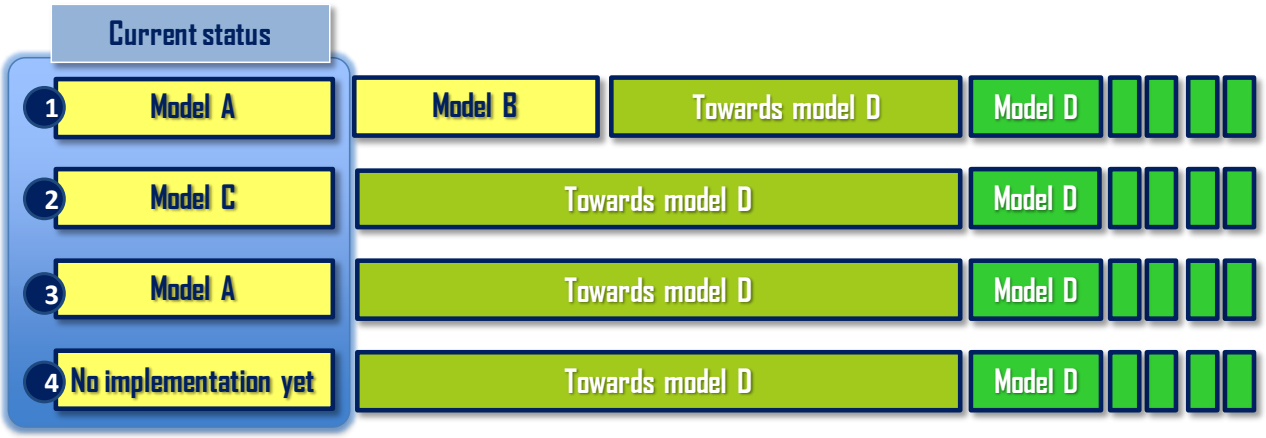


Fig. 7 –Ground Network – Potential paths towards Model D

Considering the current status of implementation in Europe, the SDM strategy aims at incentivizing each operational stakeholder into the most relevant and effective path **towards the achievement of Model D**.

Action Plan development

In the light of above, the SDM Action Plan has been developed and structured in four main streams:

- **Stream 1 – Overall Setup and Coordination,** which aims at further analysing the current status of play and possible RF network improvements, identifying the Service Areas and designing the system architecture at Service Area and European level. Stream 1 is led by SDM, in strict cooperation with Network Manager, EASA and SJU, if needed.
- **Stream 2 – Implementation of intermediate step towards Model D,** which aims at performing the detailed design and deployment of the system architecture of an intermediate step (Model B or Model C with MF) at Country / region level, towards the targeting of Model D. Stream 2 is performed by the implementing partners supported by SDM.
- **Stream 3 – Model D implementation,** which aims at designing and deploying the integrated system architecture, at Country/region, Service Area and EU level, ensuring the full achievement of the target solution. Stream 3 is performed by the implementing partners supported by SDM.
- **Stream 4 – Avionics upgrade,** which aims at upgrading Avionics, including the upgrade to "best in class" configurations according to the requirement described in ELSA. Stream 4 is performed by the implementing partners supported by SDM.

It is worth noting that, although the Action Plan outlines activities to be performed up to the full deployment of target solution by 2022, complementary technologies [15] are envisaged as from 2025, taking over part of the increased data traffic out of VDL Mode 2 and Extending VDL Mode 2 lifespan.

[15] SATCOM, AEROMACS

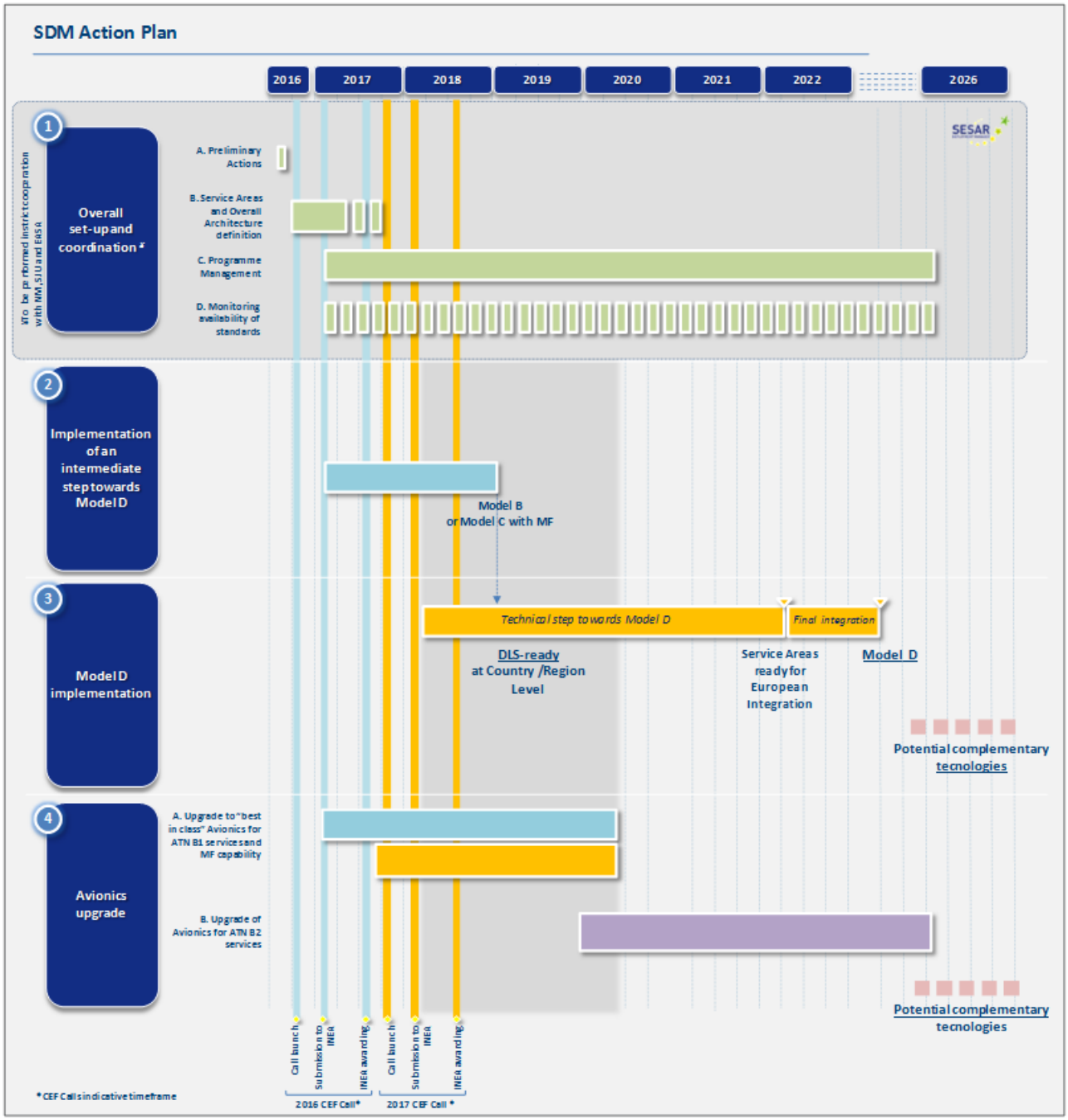


Fig. 8 – SDM Action Plan

Specifically, the phases and related steps envisaged within each stream are outlined below:

4.1. Stream 1 - Overall Setup and Coordination

Stream 1 consists in the following phases **under SDM steering and** in coordination with Network Manager, EASA and SJU, if needed:

A. Preliminary actions, including an effective and exhaustive state of play analysis on the current infrastructure/service models adopted within each State and possible RF network improvements, on the basis of the results of the DLS Survey launched by SDM towards the ANSPs on 17th June and the following consultation period. On the basis of such analysis, preliminary high level principles are elaborated to guide

the civil and military operational Stakeholders in the submission of IP proposal for the 2016 CEF Transport Calls.

B. Service Areas and overall architecture definition, including the following steps:

- **Identification of Service Areas:** on the basis of the results of the analysis performed in the previous phase and the evaluation of further criteria stemming from ELSA study, SDM identifies homogeneous Service Areas - i.e. groups of neighboring Countries/regions which are in a similar operational environment and with similar state of play - in order to achieve together a common target model.
- **Guidelines definition for system design at Service Area and European Level:** in accordance with the SDM DL Strategy and the applicable ELSA recommendations, SDM provides guidelines to design DL target architecture on a Service Area basis, with full cross-border consideration, in order to ensure the complete DLS implementation at European Level.
- **Service Area level architecture design:** such step aims at defining the technical architecture at Service Area level in terms of components, interfaces and exchanged data on the basis of the SDM DL Strategy and the ELSA study results, in full cooperation with the local involved stakeholders.
- **European level architecture design:** such step aims at defining the overall technical architecture at European Level, including the functional design of the interfaces among the identified Service Areas, in full cooperation with the local involved stakeholders.

C. Programme Management, including coordination and monitoring of DLS implementation initiatives in order to ensure their effective, timely and synchronized deployment, as well as high accuracy, compliance with applicable standards and improvement of the overall performance, targeting the final achievement of Model D (i.e. the target model).

D. **Monitoring availability of standards**, including continuous and constant monitoring of the standardization/regulatory processes and activities, performed by the relevant competent Bodies, in order to facilitate and increase the implementation of technical standards, maximizing interoperability, safety and quality.

The above mentioned activities need a close cooperation with the Network Manager in order to take in consideration all the relevant technical aspects and the performance monitoring needs.

This stream also requires close coordination between SDM and the Regulator – European Commission and EASA – in order to define and apply a process through which SDM proposals regarding the service areas, their respective technical architectures and the overall technical architecture at European level would be agreed after due stakeholders' consultation.

4.2. Stream 2 – Implementation of an intermediate step towards Model D

Stream 2 consists in the local design and deployment of an intermediate step - Model B or Model C with MF – at Country/region level, towards the achievement of the Model D. In this perspective, the Stream 2 has to be followed by the Stream 3 as a consequent step to ensure the targeting of Model D implementation.

The stream addresses the following cases:

- Countries/Regions in Model A status or want to start from Model A;
- Countries/Regions in Model C status or want to start from Model C.

For these cases, in accordance with the SDM guidelines defined in Stream 1, each respective Country/region is expected to detail, respectively:

- the **design of the system at local level** (including the G/G – A/G netw**o**rk and the interfaces with legacy systems) and, then, **deploy the Model B** (first path of Figure 3),
- or **the design of the system at local level** (including the G/G – A/G netw**o**rk and the interfaces with legacy systems) and, then, **deploy the Model C with MF** (second path of Figure 3).

With regard to both cases, such deployment is expected to be achieved within 2018, ensuring the operational transition from the current situation.

In order to facilitate the early integration among involved stakeholders, the submission of multi-stakeholder/cross country projects for the 2016 CEF Transport Calls is suggested.

The Communication Service Providers are expected to be fully involved in the preparation of project proposal, possibly as Project Contributors.

4.3. Stream 3 – Model D implementation

The stream encompasses the following activities:

A. **Intra Service Area integration design & deployment:** such phase entails the necessary steps to ensure, within each Service Area, the systems integration among Countries/regions which have implemented a "*technical step towards Model D"*, consisting in local deployment to ensure the DLS provision at Country/Region level (DLS ready at Country/region level).
   Such "technical step towards Model D" has to be considered as a first step to enable the implementation of such model within Service Area. It is worth noting that the Service Areas are identified by the SDM within Stream 1 and Countries/regions are expected to interact and cooperate, also through the submission of multi-stakeholder projects, to ensure the effective integration of the respective systems within each Service Area.
B. **Inter Service Area integration:** such phase includes the steps needed to ensure the system integration among all the identified Service areas, so as to enable the full achievement of European Model D by 2022.

It is worth noting that Stream 3 has taken into consideration the potential availability of Complementary technologies, taking over part of the increased data traffic out of VDL Mode 2 and Extending VDL Mode 2 lifespan.

4.4. Stream 4 – Avionics upgrade

The stream identifies the following phases:

A. **Upgrade to "best in class" Avionics for ATN B1 services and MF capability:** includes the upgrade of the avionics to the "best in class" versions, when available.
B. **Upgrade of Avionics for ATN B2 services:** aims at adapting aircraft systems to receive and process a ground initiated ADS-C Contract Request for EPP using either VDL2 and/or complementary technologies.

It is worth noting that Stream 4 has taken into consideration the potential availability of Complementary technologies, taking over part of the increased data traffic out of VDL Mode 2 and Extending VDL Mode 2 lifespan.

5. SDM added value

5.1. The natural role of SDM

It is SDM natural role to lead the execution of the above action plan as "DLS implementation project manager", in full cooperation with Network Manager, EASA, and SJU.

This approach is in line with:

- Regulation (EU) 409/2013, article 9;
- Regulation (EU) 2015/310, recital (4);
- DG MOVE's letter to SDM on 25 February 2015 where DG MOVE stated: "SDM can and should be tasked with a project management role in data link deployment".

SDM will act "in substitution" of a Technical Service of a potential future DLS Governance as long as not ready to take over. The following actions/tasks have been identified:

- **As architect**: overall set-up, steering and coordination:
  - Identification of homogeneous service area starting from thorough analysis of the current situation in EU States;
  - Definition of the target ground architecture per service area in cooperation with the local stakeholders;
  - Interconnection of sub-networks within each service area to achieve a European distributed network and a European common approach;
- **As facilitator:** proactive and direct engagement of all required stakeholders, in particular Communication Service Providers to ensure timely upgrade and optimisation of ground network in accordance with target architecture, promoting access to EU co-funding as leverage.
- **As precursor:** stimulate establishment of a single European DLS governance taking advantage of SDA model.

5.2. Connecting strategy with co-funding opportunities in 2016 CEF Transport Calls

It is an essential SDM added value to enable immediate connection between the above action plan and upcoming co-funding opportunities:

- **Providing strong guidance to the stakeholders required to implement regarding what to submit, with whom, to which call and with which timeline; whilst**
- **demonstrating to the European Commission that submitted projects form all together a significant step towards the agreed objective into which it is worth investing public EU money.**

With respect to the Airborne Domain, it is expected that implementation projects submitted for 2016 CEF Transport Calls will be focused on the Avionics upgrade to the "best in class" Avionics for ATN B1 Services and MF capability, including those projects related to the upgrade of Avionics for ATN B1 Services that will be included in the best class, after a successful testing certified by relevant Bodies.

The following table, focused on the implementation activities within the Stream 4 of the Action Plan, provides a recap of the expected IP proposal to be submitted for the 2016 CEF Transport Calls, with reference to the airborne domain:

Focus on IP proposal expected for the next CEF Transport Calls - Airborne domain

	What	When
IP proposals expected for 2016 CEF Transport Calls	Upgrade to ATN B1 multi frequency avionic successfully assessed "best in class" by ELSA study	By 2020
	Upgrade to ATN B1 multi frequency avionic not tested against "best in class" criteria in ELSA, subject to demonstration of equivalent minimum level of performance as part of the proposal or commitment to demonstrate equivalent minimum level of performance prior to implementation	By 2020

Fig. 9 – IP proposal expected for the next CEF Transport Calls –Airborne domain

With respect to the Ground Domain, it is expected that implementation projects submitted for 2016 CEF Transport Calls will be focused on the deployment/upgrade towards multi-frequency networks at Country/region level.

The following table is focused on the implementation activities within the Stream 2 of the Action Plan and provides a recap of the expected IP proposals for the 2016 CEF Transport Calls:

Focus on IP proposal expected for the next CEF Transport Calls - Ground domain

	Starting Current Model	What	When
IP proposals expected for 2016 CEF Transport Calls	Model A	**Model B,** as intermediate step towards Model D*	By 2018
	Model C	**Model C with MF,** as intermediate step towards Model D*	

Fig. 10 – IP proposal expected for the next CEF Transport Calls – Ground domain

Consequently, for 2016 CEF Transport Calls the **SDM strongly encourages** the submission of implementation projects **targeting:**

- **Either the transition from Model A to Model B; or**
- **The transition from Model C to Model C with MF by December 2018.**

In addition, SDM strongly recommends the preparation of the IPs on multi-stakeholder basis, i.e.:

- at Country level jointly submitted by all the involved stakeholders (i.e. ANSP and CSPs);
- at Regional level involving neighboring countries.

In the case where CSPs would access **co-funding** to facilitate and accelerate upgrade and optimisation of their networks, the SDM shall also consider how to ensure that the financial support should translate into reduced service fees paid by ANSPs to the CSPs, and consequently not double invoiced amounts through the charging fees paid by the airlines.

Data Link Services (DLS) Implementation Strategy towards Initial Trajectory Information Sharing Appendix A – Main findings from EASA and ELSA reports

This Appendix summarizes the main recommendations and conclusions by EASA and SJU from which SDM has drawn the proposed strategy. For more details, please refer directly to the relevant reports.

EASA Report

The EASA Report clearly identified some potential causes of the technical problems. Among them, in particular it was identified that:

- **the use of a single frequency (the CSC channel alone, used for AOC as well as ATS data) was one of the most important root causes of the technical problems**. So, the needs to meet the ATS performances have led the aeronautical community to consider **upgrading the current single frequency VDL M2 networks by developing and deploying multi-frequency infrastructures**, also in accordance to what requested by ICAO standards (also the SJU "VDL Mode 2 Capacity and Performance Analysis" confirmed the single frequency saturation in core Europe starting from 2015);
- **the avionics currently having a high level of disconnections and already capable of operating in multi frequency environment should be assessed in a multi-frequency environment.**

ELSA Report

In order to address such issues, the ELSA study has analysed the causes and provided recommendations regarding the Avionics and Ground Networks domains.

AVIONICS Domain

Starting from the EASA report, the following Avionics recommendations have been elaborated by ELSA:

- Harmonise avionics' performance, especially MF capability:
  - Upgrade of avionics to the "best in class" performance, showing no operational issues in the extensive validation described in Annex C of ELSA D11 Final Report, and supporting MF operations, especially FSL (Frequency Support List)-based, GRAIHO (Ground Requested Air Initiated Hand-Off) and Autotune handovers.
  - Update flight crew operational procedures which had been introduced for older avionics, to avoid unnecessary avionics resets.

With reference to the first point, ELSA Study performed interoperability testing (including MF functionality) in combination with in-service monitoring of AIRBUS, Honeywell and Rockwell configurations that have resulted in the identification of "best in class" products. These configurations passed the interoperability tests and have demonstrated a significant improvement in terms of performance during in-service monitoring (more details in ELSA D11 Final Report). In addition to these bench tests, the "best in class" performances have

been confirmed by the actual operational behaviour observed on equipped commercial flights indicated by:

1) The PA rate as monitored by EUROCONTROL (below 5 PAs per 100 flight hours being identified as an operation trigger);
2) The mean timeframe on one VGS (above 5-10 minutes in most of cases). The Mean Timeframe on One VGS is the mean time spent by each aircraft on an individual VGS.

The current airborne routers and VHF Data Radio already labelled as "best in class" in the frame of the ELSA project are listed below:

1) **Data Link Management Units** (airborne routers)

- AIRBUS FANS B+ ATSU CSB8
- HONEYWELL
  - MkII+ CMU upgrade from -501 and -521 to -522
  - EPIC CMF upgrade to Block 3.xx or later
  - B787 CMF upgrade to BPV3
  - B777 CMF upgrade to BPv17A BLE
- Rockwell Collins CMU-900 operators should upgrade to CMU Core software 815-5679-505 (refer to CMU-900 Service Information Letter 15-1) in order to fix a software bug impacting the VDL2 Multi-Frequency operations.

2) On board VDR (VHF Data Radio)

- Honeywell
  - RTA-50D PN 965-1696-0F1
  - RTA-44D PN 064-50000-2052 or with service bulletin SB23-1570 installed
  - EPIC avionics fitted with mod D or greater for the VDR element.
- Rockwell Collins
  - VHF-920: P/N 822-1250-002w/SB16 or 822-1250-020w/SB17
  - VHF-2100: P/N 822-1287-101/180w/SB7 or 822-1287-121/141

Finally, the following actions have been indicated by ELSA:

- upgrade of the avionics to the "best in class" versions, when available. This requires that "best in class" versions are being determined for all providers.
- apply the methodology used by ELSA to identify "best in class" performance as a major input to the associated Standards-01 recommendation (define and implement an effective datalink end-to-end system certification process (including both ground and air components) and reference material for the ground network infrastructure (MOPS-like)) meaning, in order to determine the "best in class" versions for all providers, the test bench has to be implemented first.

GROUND Networks

Starting from the EASA report, the following Ground Network recommendations have been elaborated by ELSA:

- improve the VHF Ground Station (VGS) network and fix the ground system issues:
  - use a dedicated channel for transmissions at the airport in regions with high traffic levels in en-route;
  - use alternative communication means for AOC in the airport domain (e.g., Wi-Fi, cellular, AeroMACS) to off-load the frequencies used for CPDLC;
  - progressively implement additional VDL2 frequencies in accordance with the traffic level;
  - optimise the en-route VGS network coverage;
  - ensure the availability of a fifth VDL2 frequency (at a minimum);
  - use the CSC as common control channel only, unless traffic level is very low;
  - implement ELSA recommended protocol optimisation: limit AVLC frame size;
  - fix the ELSA identified ground system problem;

- start implementing the transition roadmap to the MF VDL2 target technical solution: introduction of alternate channels using reserved frequencies, addition of frequencies, and transition to one managed MF VDL2 network per Service area.

With reference to the last point, ELSA Study, after a technical assessment of the various MF deployment identified options, concluded that the best model for MF deployment in Europe is a model comprising a number of Service Areas, where all VDL M2 Ground Stations (VGS) operating on VDL frequencies in a given Service Area work together under one unique frequency licensee responsible for managing the traffic on the RF network. Thus the European architecture is based on a "Service Areas" approach that, from a pure technical point of view, means an European distributed architecture.

Such model – named **Model D - represents the target high level architecture solution for the ATN COM** infrastructure outlined in the following picture:

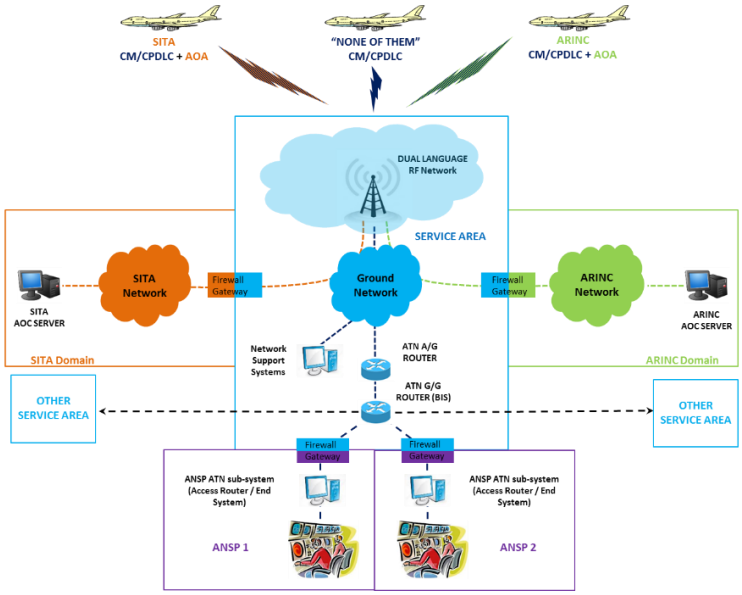


Fig. 11 - Target high level architecture solution for the ATN COM infrastructure

"Model D" description:

As outlined in the previous figure, the model D consists of a European distributed architecture based on Service Areas.

For each Service Area, the following components are included:

- RF network: MF VDL M2 VGS implementing Dual Language16 technology
- Ground network: IP network for internal and external components connections (the AOC transport is not considered in the family scope)
- ATN Ground Network: composed by ATN A/G and G/G routers in a dedicated ATN domain
- Network support systems: monitoring, recording, billing and network management systems
- Network interfaces: Firewall/Gateways for external interfaces

It is worth noting that, at European Level, Network Support Systems should be envisaged to ensure an overall monitoring supporting the Common DL Service provision.

One of the most important element of the Model D is its scalability, that means the possibility to add new frequencies, also only one, each time the available bandwidth becomes insufficient in the Service Area as well as in the Country/Region within the Service Area (the number of frequencies "linearly" grows with the traffic increase). The Model D, with the adequate capacity, shall support AF6 PCP requirements.

Regarding to the ground networking (Ground Network and ATN Ground Network), a possible common approach is to implement the G/G network ATN rationalization for DLS based on PENS use and considering also the Service Area approach as defined in the TEN-T study "New European Common Service Provision for PENS 2 and DLS".

Towards "Model D":

1) Starting point for the transition

Having defined the European target solution architecture for the ATN COM infrastructure, also the transition from the current situation to the target solution has been studied by ELSA. The European current situation can be represented by three different statuses which can be assumed as starting points for the transition:

- **"Model A":** a country/region with a multiple VDL M2 networks implemented in the same airspace, using a One-GSIF[17] system on common frequencies;
- **"Model C":** a country/region with a single VDL M2 network implemented in the same airspace, using a Two-GSIF system on reserved frequencies;
- **No implementation yet**: a country/region that has not implemented any ATN COM infrastructure.

Due to the need to consider:

- the existing infrastructure;

[17] "Single Language" means that any VGS broadcasts the ID (Identifier) of only one (Single) Digital Service Providers . "Dual Language" means that any VGS broadcasts the IDs (Identifier) of multiple (Dual) Digital Service Providers in its Ground Station Information Frames (GSIF) on the RF channel.

- the time required to move forward the technical target solution (assuming that some of the current infrastructures are in operation;)

a transition model, named "Model B", has been introduced.

2) "Model B" description:

Model B consists in a **Multiple VDL M2 networks implemented in the same airspace using a One-GSIF system on reserved frequencies with MF implementation.**

To make possible to implement the Model B in a way suitable to meet the requirements, it is necessary to have at least five frequencies available in the high traffic area, considering the current situation of two operating CSPs. (EUR ICAO FMG is currently working on this topic). **The Model B has to be considered as a temporary step to reach the Model D.**

The following table recaps the Models described above:

Model	VDL RF operating Networks	VDL RF Frequency Use	GSIF on each Frequency announced by each Network	Existing today	Note
A	MULTIPLE	COMMON	ONE	YES	Current Central EU model
B	MULTIPLE	RESERVED	ONE	NO	**Target Short term evolution for central EU**
C	SINGLE	RESERVED	TWO	YES	Current model deployed in a limited area[18]
D	SINGLE	RESERVED	TWO	NO	**Target Long term model for EU VDL network evolution**

Fig. 12 – DLS Model Description

The following picture outlines the ELSA transition roadmap, taking in consideration the models described above:

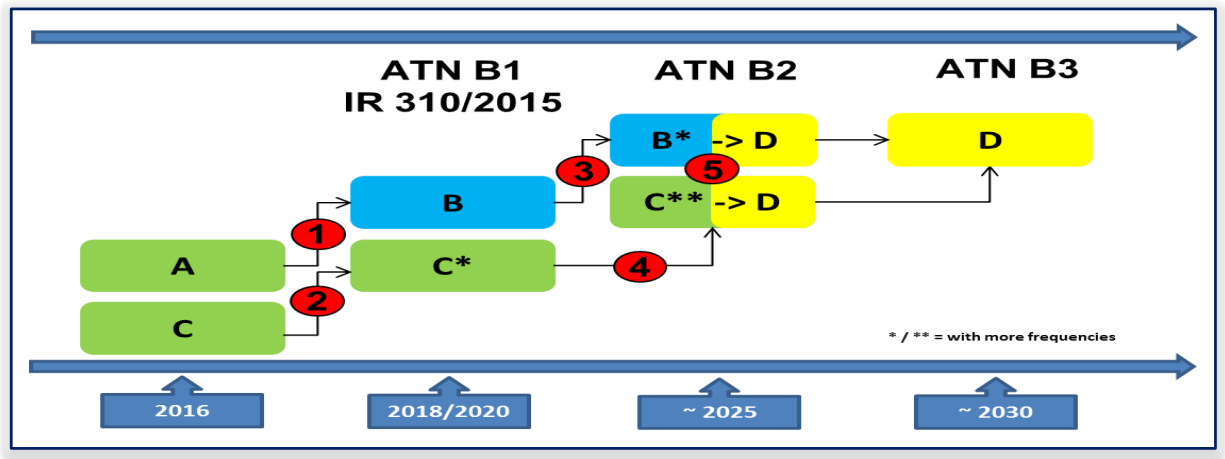


Fig. 13 – ELSA Transition Roadmap

[18] Currently deployed by ENAV in Italian airspace.

2. STRATEGIC VIEW

SESAR
DEPLOYMENT MANAGER

Strategic View – Addendum 2
SWIM Governance Action Plan

1. Overall context and objective of the note

The Commission Implementing Regulation (EU) No 716/2014 states that "*SWIM comprises standards, infrastructure and **governance** enabling the management of information and its exchange between operational stakeholders via interoperable services*".

SWIM Governance is needed to ensure a common starting point and a controlled evolution of all elements related to SWIM. SWIM Governance means all the processes that coordinate and control the SWIM foundation material, SWIM standards and guidance material, the execution of the service lifecycle, the compliance framework and the SWIM common components. It is established to enable the seamless exchange of data through standardized processes.

The European Commission has tasked the SDM to define a SWIM Governance deployment action plan as a mitigation action with regards to the high level risk N°8 – late definition/failure to establish SWIM governance – as identified in the DP 2015 and reiterated in the DP 2016.

As SWIM Governance aims at defining a common approach for SWIM deployment, the SDM has started to work with all the relevant operational stakeholders, and in particular the SJU, the NM and the project leader of the Implementation Project on SWIM Governance – *SWIM Governance Deployment*[19] – leading to the Action Plan for the implementation of a structured and appropriate governance framework for SWIM.

The main conclusions of this work in framing SDM's activity have been:

- Identifying the main principles according to which the SWIM Governance should be organized and managed on the basis of previous studies, requirements and experiences from the SESAR1 project 08.01.01, but also looking at results and role models like the NewPENS organization and existing platforms like the change control boards for the AIRM, FIXM, WXXM and AIXM (part 1);
- Defining an Action Plan for setting-up a solid and agile SWIM Governance, agreed between the concerned operational stakeholders[20] and able to facilitate the coordinated deployment of SWIM in the framework of the PCP implementation (part 2).

[19] "*SWIM Governance Deployment*" is an implementation project proposed to the 2015 CEF Transport General Call by 8 ANSPs, EUROCONTROL, Aéroport de Paris and Lufthansa. The project was presented in the framework of the CEF 2015 but was not awarded by the European Commission and will not be executed.

[20] Whenever the term "operational stakeholders" is used, it refers to civil and military organizations alike.

2. Background

2.1. Importance of SWIM Governance

The main objective of SWIM governance is to ensure a stable implementation and controlled evolution of SWIM standards, guidance material, foundation material, common components, the SWIM service lifecycle including service definitions and the compliance framework. The concept of 'System Wide Information Management' - SWIM - covers a complete change in paradigm of how information is managed and exchanged along its full lifecycle, involving stakeholders from across the whole European ATM network and beyond.

SWIM is SESAR's enabler for assuring that the right information will be available with the right quality to the right person at the right time. It covers all ATM information to be exchanged between Operational Stakeholders, including aeronautical, flight, aerodrome, meteorological, and air traffic flow information.

SWIM Governance encompasses the following aspects:

- Ensuring the development, formalization and maintenance of common SWIM policies, processes and functions to support the implementation of all aspects of SWIM;
- Expediting the SWIM standards development and evolution as well as influencing those standards in the name of the SWIM users, which SWIM Governance represents. For this reason a formalised collaboration between the independent standardisation organisations and the SWIM Governance needs to be established in a way that ensures that the will of the SWIM Users is appropriately taken into account.
- Improving interoperability with an appropriate level of security among systems by promoting a common set of semantic and structural artefacts and promulgating them through the SWIM policies and processes as well as the communities of stakeholders;
- Ensuring the provision of a collaborative platform for the communication and collaboration between all SWIM stakeholders on all matters of SWIM Governance;
- Ensuring a commonly agreed definition of the SWIM services mandated by the PCP [21] and a common set of SWIM services to be deployed, leading to the interoperability that the PCP demands[22].

In short, the establishment of SWIM Governance is an essential **facilitator for the coordinated deployment of SWIM** allowing the full achievement of the **SESAR operational/economic benefits associated with ATM Functionality N°5 (AF5) and the other ATM functionalities, for which SWIM is an enabler**. The lack of SWIM Governance will highly increase the risk on SWIM Deployment as it is intended and mandated by the PCP and will most likely compromise the required interoperability between ATM stakeholders.

[21] Note that the service provision itself is the full and sole responsibility of the provider.
[22] The concrete role of the SWIM Governance in the service definitions needs to be defined.

2.2. Deployment focus

This note is focused on deployment by defining an Action Plan to be undertaken by SDM and the relevant stakeholders leading to operationally deployed SWIM Governance[23]. The purpose of the action plan is twofold: on the one hand it aims at raising the readiness for deployment of SWIM Governance; on the other hand it is assumed to pave the floor for another SWIM Governance Deployment implementation project to be submitted to the 2016 CEF Transport Call. Subject to EC's award decision, this project could then start in time by July 2017, to set up and run the resulting SWIM Governance framework.

3. SWIM Governance Structure

As this note addresses the necessary future arrangements related to the Governance of SWIM during the PCP deployment phase, it is important to take into consideration the main results coming from previous activities on SWIM Governance, in particular the SJU work through the SESAR1 project 08.01.01–"Operational Requirements & Demands concerning organization of the ATM Information Management within the scope of the European ATM Enterprise Architecture "- on the SWIM Governance for the deployment of iSWIM. Inspiration can also be taken from other governance frameworks.

Considering the results of the above mentioned references, the necessary SWIM Governance approach to be defined, shall take in consideration the following two main aspects:

- **SWIM Elements**: All items belonging to the deployment of SWIM that are defined, controlled or at least influenced by the SWIM Governance.

- **SWIM Governance structure:** structures, bodies and roles that are needed to conduct governance processes.

3.1. What are the SWIM Elements to be governed?

SWIM Governance is required to establish the trust of the SWIM stakeholders regarding the quality of provided services. In other words, SWIM Governance aims at ensuring the interoperability and security of information exchanges via SWIM services as demanded by the PCP and the SWIM compliance of these services: *[SWIM enables] the management of information and its exchange between operational stakeholders via interoperable services.*

The main elements to be governed by SWIM Governance are defined within specific types of documents which can be grouped in the following categories:

[23] For this reason, the SESAR 2020 R&D program run by SJU is regarded as another stakeholder of SWIM Governance. It can provide inputs and change proposals to SWIM Elements.

- the **SWIM Foundation** provides a coherent set of *principles, rules and recommendations* for establishing SWIM standards related to information, information services, technical infrastructure and governance;
- a **SWIM Standard** is a specification relating to SWIM provided by SWIM stakeholders which was adopted by a recognized standardization body or community of interest for repeated or continuous application. Even if the SWIM Governance is not in charge to develop the SWIM Standards, it should encourage the SWIM Standards developments when needed, participate in the development process and thereafter expedite and promote their implementation;
- the **SWIM Guidance Material** is typically developed to accompany the SWIM Foundation and SWIM Standards in order to provide additional explanation to assist their use and to help illustrate the meaning of technical specifications and requirements. Guidance material is thus used to support the realisation of SWIM. Typically guidance material includes guidance documents, technical manuals (e.g. for tools), handbooks & tools.

Information Management (IM) Functions are fundamental elements of the SWIM Governance, needed for the operation and evolution of SWIM. The IM Functions are carried out by the SWIM Governance. This concept has been introduced by SESAR 1 project 08.01.01 in deliverable D47**Error! Reference source not found.**.

The IM functions can be grouped as follows:

- **Steering IM Functions:** functions to steer and guide the SWIM evolution, covering also the actual overall SWIM Governance process. They have a direct impact on the other two IM Functions;
- **Policy Management IM Functions:** to make policies for the areas covered by SWIM Governance (financial, compliance, etc.) in support of SWIM deployment and SWIM operation;
- **Governed IM Functions:** functions impacted or "driven" by the Steering and Policy management functions.

It is worth noting that the actual implementation of IM Functions can be tailored and refined by SWIM Governance to best meet the needs of the SWIM evolution and SWIM deployment. The level of governance for a specific IM Function will be determined in the corresponding rulebooks and guidelines, which will be derived from the policy documents.

The IM Functions will be assigned to the appropriate SWIM Governance bodies, responsible to govern and execute the IM Functions, according to their role and responsibilities defined in the agreed SWIM Governance structure.

Within the framework of the above-mentioned SWIM Elements, SWIM Governance processes define the operation of SWIM Governance, thus realizing the IM Functions.

Processes are required to carry out a number of activities – either by the SWIM Governance or by the operational stakeholders – that are essential for SWIM Governance, for example

- The change control of SWIM Elements;
- The assessment of compliance to SWIM standards;
- Etc.

The exact list of required processes needs to be identified by the SWIM Governance taking into consideration the IM Functions that need to be fulfilled. One process can contribute to several IM Functions, while in turn one IM Function might require several processes for its realization.

It is worth noting that – as in every organization - the SWIM Governance processes are at the basis of a high-performing SWIM Governance and serve as a reference for the implementing stakeholders. Complementing the above mentioned governance functions the governance covering SWIM service definitions will be tailored to its specific context. The SWIM service definition governance shall adapt to aspects like SWIM Service lifespan, business criticality, community of interest etc.

3.2. How should SWIM Governance be organized?

An effective and efficient SWIM Governance requires an appropriate organizational structure, answering on "who" are the appropriate governance bodies – organizational instances composed of people from different companies or organizations working together either temporarily or permanently – required to execute the SWIM Governance. SESAR1 project 08.01.01 has proposed an initial version of a governance structure in its deliverable D47 **Error! Reference source not found.**, which will be used as input.

SDM recommends the SWIM Governance structure to be inspired by successful role models of governance like the one for NewPENS, or the governance (through Change Control Boards) of the exchange models AIRM, AIXM, WXXM, FIXM etc. Likewise examples and inputs from other regions of the world, e.g. the US, and from ICAO should be considered.

It is fundamental to define the role of each governance body in a clear and comprehensive way, highlighting all the potential relationship among different bodies involved and avoiding multiple links and heavy processes: Fit for purpose and tailored to the needs of the operational stakeholders of SWIM

The establishment of comprehensive Terms of Reference (TORs) for the SWIM Governance Bodies will be essential to define the roles, tasks and relationship between the governance bodies as well as a description of input and outputs artefacts. The trust of the stakeholders in a robust and agile SWIM Governance is one key of the SWIM implementation success.

4. Towards a SWIM Governance – Action Plan

Taking on board the requirements and lessons learned from the SESAR1 Project 08.01.01 – "Operational Requirements & Demands concerning organisation of the ATM Information Management within the scope of the European ATM Enterprise Architecture" - by the SJU and inspired by other governance arrangements like NewPENS, and the information models' change control boards (CCB), it is now fundamental to define an Action plan, detailing the phases and actions needed for the establishment of robust and agile SWIM Governance. The action plan provides a framework on HOW to achieve the SWIM Governance; the WHAT, i.e. the concrete structures, processes etc. will have to be defined by the operational stakeholders.

In this perspective, SWIM Governance shall be set up in such a way that definitions of the SWIM services mandated by the PCP for deployment can be agreed by the applicable community of interest. Likewise a commonly agreed set of policies, functions and processes is required, leading to the interoperability that the PCP demands. Specifically, Family 5.1.3 of DP 2016, which includes SWIM Governance, is the foundation for deploying all other families in AF5 and those families in the other AFs that make use of SWIM. From this it is clear that SWIM Governance needs to be operational within a short timeframe – best before the main wave of SWIM-related deployment projects realizing the PCP start their execution or as soon as possible thereafter. This is necessary in order to enable the SWIM Governance to effectively conduct its enabling role for the deployment of SWIM.

Taking advantage of the studies mentioned in the previous sections of the document, the SDM Action plan aims at identifying the main steps needed to define and deploy a well-structured and reliable governance framework for SWIM operations.

4.1. Roadmap towards SWIM Governance implementation

SWIM Governance is a prerequisite for a coordinated deployment of SWIM and for realizing the intended interoperability. In this respect, there will be three evolutionary steps towards a full SWIM Governance:

- **Refinement of the SWIM Governance specifications** developed during SESAR 1 and anticipated in the CEF Call 2015 non-awarded IP 2015 065 AF5. This comprises the elaboration of the Terms of Reference of the relevant governance bodies, the specification of the main processes of governance, the specification of the compliance framework etc. Extensive stakeholder consultation forms an integral part of this stage. During this stakeholders can raise any concern with the proposed arrangements, suggest changes etc. The ultimate goal is to arrive at SWIM Governance arrangements that are widely accepted by the stakeholder community and are ready for deployment in the next step.
- **Initial execution of SWIM Governance**: During this step the SWIM Governance will be in operation, although not all processes and functions will be executed from the beginning. Processes and functions will be added to the operation as they mature and are required; likewise, SWIM Governance policies will be adapted.
- **Full execution of SWIM Governance**: This is the final, steady-state during which SWIM Governance will be fully operational. Final legal agreements for SWIM Governance are expected to be clarified (and in place when needed) and a mechanism for financing the SWIM Governance (if applicable) is expected to be functional.

Starting from this situation, SDM recommends the following deployment approach to avoid any delay in the necessary setting-up of SWIM Governance.

4.1.1. Stream 1 – SDM-supported preparation of SWIM Governance deployment

Considering the work already performed by the multi-stakeholder project 2015_065_AF5 "SWIM Governance Deployment", its deployment priority and roadmap aligned with the SDM need to timely deploy AF5 and the related PCP functionalities, and considering as well INEA's decision of not awarding it, **SDM will support the implementing partners towards the continuation of the activities detailed above. In particular, SDM**

recommends that the partners of the IP 2015_065_AF5 "*SWIM Governance Deployment"***:**

- **Cooperate on refining the proposed governance structure and processes;**
- **Set up the first phase of SWIM Governance operation as defined above**
- **Either directly or indirectly via their respective representing organizations involve as many stakeholders as possible and practical stemming from the following stakeholders' groups: Air Navigation Service Providers, Airspace Users, Airports, MET Service Providers, NM and Military;**
- **Stick as closely as possible to the action plan priorities and deadlines;**
- **Cooperate in preparing a new IP in the framework of CEF Calls 2016 with more Stakeholders.**

As a prerequisite to widening the stakeholder involvement in the undertaking SDM strongly recommends to launch an information initiative, which aims at bringing all stakeholders to the same level of knowledge regarding SWIM Governance. In particular the results of SESAR 1 in this area as well as the work performed by the project 2015_065_AF5 "SWIM Governance Deployment" should be made available.

SDM will support these operational stakeholders' activities in the role of a project sponsor also funding the relevant resources while at the same time monitoring the progress and the results of the actions.

4.1.2. Stream 2 – Implementation Project in CEF Call 2016 for SWIM Governance deployment

For this second stream of activity, SDM will support the operational stakeholders to submit an implementation project for SWIM Governance deployment in CEF Call 2016. This project shall have a wider stakeholder base, i.e. as far as possible incorporating further stakeholders' category representatives while at the same time keeping a manageable size.

Besides this enlargement of the number of participants, the project should follow the same model of the project proposed in CEF Call 2015, i.e. by and large adopt the same objectives and work-breakdown structure as well as the associated timeline.

SDM is convinced that the described approach is an efficient way to mitigate the risk identified in the DP 2015 and will avoid any disruption in the setting-up of the SWIM Governance necessary for the deployment of the PCP AFs to which SWIM is a prerequisite.

4.2. Required SWIM Governance Arrangements and Activities

Realizing the deployment approach laid out in the previous section the main actions to achieve an operational SWIM Governance will be:

- **Prepare SWIM Governance deployment (by a group of operational stakeholders until September 2017; supported by SDM)**
  - Refine the SWIM Governance structure and processes
  - Setup the governance organisation
  - Contribute to the SWIM standardization of SESAR's SWIM output for deployment

- Produce Compliance Assessment Guidance Material
- Specify the Lifecycle Management for Services
- Establish a wide consultation mechanism with the stakeholders' communities in order to achieve agreement on the main principles of the governance structures and functions.
- Monitor and coordinate the other relevant SESAR deployment projects related to SWIM Common Components (implementation projects in DP Families 5.1.3 and 5.1.4).

- **<u>Deploy SWIM Governance (by a group of operational stakeholders from July 2017 until December 2018; in the framework of a future implementation project to be submitted to 2016 CEF Transport Calls,)</u>**
  - Manage and execute SWIM Governance
  - Apply the consultation mechanism with the stakeholders' communities
  - Develop the relevant policies, related – amongst others – to legal and financial aspects, for the implementation to support a sustainable implementation of SWIM Governance.

These main actions are shown in the following Gantt chart before being further detailed below:

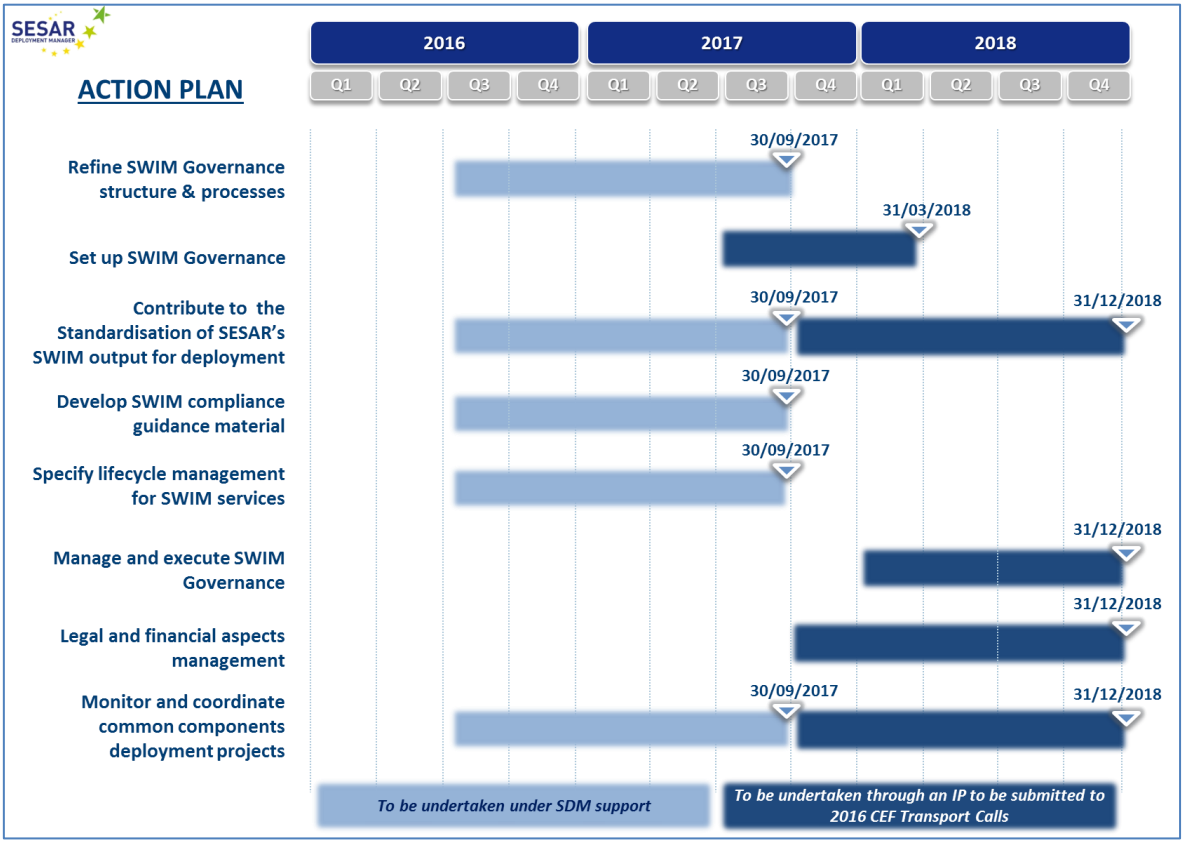


Fig. 14 – SWIM Action Plan[24]

[24] SDM acknowledges the challenge of this tight schedule, which is driven by the need to have SWIM Governance in place, when the bulk of SWIM deployment activities will be carried out. It

Actions by a group of operational stakeholders supported by SDM to prepare SWIM governance deployment	Actions by a group of operational stakeholders in the framework of a future implementation project to be submitted to 2016 CEF Transport Calls to deploy SWIM Governance
Refine SWIM Governance structure and processes On the basis of the work performed in SESAR1 Project 08.01.01 – "Operational Requirements & Demands concerning organization of the ATM Information Management within the scope of the European ATM Enterprise Architecture" the scoping of SWIM Elements to be governed needs to be refined. Naturally, this involves also the development of the first set of policies, governance processes and IM functions. Furthermore, also based on the SESAR1 work and inspired by the experience of NewPENS governance and the governance of international standards like AIXM, FIXM etc., the SWIM Governance structure must be defined in terms of roles, responsibilities and relationships among the several governance bodies involved. The entire refinement and definition shall be performed including a wide consultation and supported by the buy-in of the potential involved Stakeholders. **Contribute to the standardization of SESAR's SWIM output for deployment** In alignment with a recommendation by the European ATM standardization coordination group (EASCG) several standardization organizations have initiated the work to develop the SWIM standards that are required for deployment, for example the SWIM TI Yellow Profile specification. While the development of these standards and their maintenance is in the remits of the respective standardization organization, the SWIM Governance shall have an observer role in the EASCG and indirectly contribute to the production of the standards thus representing stakeholder interests. **Develop SWIM compliance guidance**	**Set up SWIM Governance** Once the SWIM Governance structure and the processes are defined and accepted by the involved stakeholders, the governance bodies need to be set up. **Contribute to the standardization of SESAR's SWIM output for deployment** continuation of previous action **Manage and execute SWIM Governance** Perform the management and the execution of the defined governance, such as the contribution to standards development for the implementation of SWIM, the management of the registry, the ensuring of the availability of supporting documents (e.g. templates, guidelines...). **Legal and financial aspects management** Identify legal issues related to SWIM Governance and – if applicable – define the charging and funding scheme to be applied to operate the SWIM Governance in preparation of a regular operation of SWIM Governance beyond the initial deployment. **Monitor and coordinate the other Common Components deployment projects** continuation of previous action

is up to the proposed CEF Call 2016 project to provide a deviating schedule if deemed necessary and feasible.

Actions by a group of operational stakeholders supported by SDM to prepare SWIM governance deployment	Actions by a group of operational stakeholders in the framework of a future implementation project to be submitted to 2016 CEF Transport Calls to deploy SWIM Governance
material SWIM Governance shall refine the SWIM compliance framework and develop the guidance material for assessing the SWIM compliance of implementation projects, including tools and their configuration for assessing the services, as well as the compliance process and making them available in a common way. **Specify the lifecycle management for SWIM services** SWIM Governance must identify the main aspects of the service lifecycle (states, ground rules, requirements for the Service Lifecycle Processes), taking into account that different levels of governance might be required depending on the type of service and the related community of interest and that service definitions should be produced according to the SWIM Principles and Standards. The agreed service definitions will need to be shared between the affected stakeholders. Further tasks are to define the processes for change control of services, the coordination of the registry with the service lifecycle and the coordination of compliance assessments with the service lifecycle. **Monitor and coordinate the other Common Components deployment projects** Provide coordination to the other SESAR deployment projects dealing with SWIM Common Components and monitor their progress and results in order to ensure that the objectives in the interest of the community are met.	

SWIM Governance Action Plan
Appendix B – Glossary

SWIM Element: All items belonging to the deployment of SWIM that are defined, controlled or at least influenced by the SWIM Governance. The SWIM Elements include

- SWIM Foundation, SWIM Standards and SWIM Guidance Material
- Information Management Function definitions
- SWIM Governance Process definitions
- SWIM Governance Policy definitions

To this end SWIM Element is a placeholder term used to refer, in a generic way, to SWIM-related documents, standards, technical means, etc.

SWIM Foundation: A coherent set of principles, rules and recommendations for establishing SWIM standards related to information, information service, technical infrastructure and governance.

SWIM Standard: A specification related to SWIM for repeated or continuous application. A SWIM Standard is either developed by the SWIM Governance itself or with a contribution of the SWIM Governance.

SWIM Guidance Material: Additional explanation to assist the application of the SWIM Foundation and the SWIM Standards.

Information Management Functions (IM Functions): Basic functions needed for the operation and evolution of SWIM. Thus IM Functions are the main activities to be undertaken by the governance bodies.

SWIM Governance: SWIM Governance is about establishing policies and continuous monitoring their proper implementation to ensure a stable operation and controlled evolution of SWIM. SWIM Governance means all the processes that coordinate and control all resources and actions of a pan-European SWIM implementation.

SWIM Governance Processes: Processes to be executed by the SWIM Governance bodies. SWIM Governance Processes realize one or more IM Functions. Specifically, SWIM compliance assessment and SWIM service lifecycle management are two of the most fundamental SWIM Governance processes.

SWIM Governance Policies: A SWIM Governance Policy groups a coherent set of rules and principles on certain cases of governance to steer decisions and achieve rational outcome. Thereby it makes the operation of the SWIM Governance deterministic. It sets the framework, in which the SWIM Governance Processes are defined.

NewPENS: New Pan European Network Service is an international ground/ground communications infrastructure to exchange information based on Internet Protocol, which is jointly implemented by the European air navigation service providers (ANSPs), EUROCONTROL and other involved operational stakeholders in order to meet existing and future air traffic communication requirements. It will replace PENS1 terminating in June 2018.

References

[1] DEL08.01.01-D47-SWIM IM Functions, April 2016.
[2] DEL08.01.01-D47-SWIM Governance Structure, April 2016.