THE PROJECT VIEW OF THE PILOT COMMON PROJECT

SESAR
DEPLOYMENT MANAGER

3. The Project View of the Pilot Common Project

3.1 Translating PCP into operational reality

Whereas the Pilot Common Project – as laid down by Regulation (EU) no. 716/2014 – sets forth the ATM functionalities required to be implemented across the European Air Traffic Management infrastructure in the timeframe 2014-2026, the **SESAR Deployment Programme** aims at translating these groups of operational improvements and their sub-sets into coherent **Families of implementation projects**. A Family therefore represents a **more specific set of homogeneous technological and operational elements**, which shall be deployed within a defined geographical scope in order to **make sure that the operational scenario defined by the PCP Regulation** becomes reality and **the associated performance improvements** are delivered to the ATM Community and – in turn – to European passengers.

The **48 Families** identified in the Programme therefore regroup **all local implementation initiatives** which contribute to **pursue the deployment** of the **20 Sub-ATM Functionalities**, and – subsequently – of the **6 ATM Functionalities** currently included in the PCP. In order to better organize the PCP implementation and support stakeholders in the refinement of their investment plans, the 48 families of the Programme have been clustered into three categories:

- ***36 core* PCP families**, which regroups all operational and technological improvements that are explicitly mentioned within the text of Regulation (EU) n. 716/2014;
- ***7 facilitating* families**, which includes the implementation activities linked to PCP Sub-AFs, which can facilitate the full deployment as an intermediate step to achieve the operational concept. They are not mandatory by PCP Regulation;
- **5 *complementary* families**, which are linked to the PCP Sub-AFs and are deemed necessary to cover an existing gap not explicitly addressed in the PCP Regulation; they are not mandatory by Regulation (EU) n. 716/2014, although they can be mandatory in accordance to other EU Regulations (such as Aeronautical Data Quality Regulation and Data Link Services Regulation[4]);

After the initial iterations in 2015 and 2016, the **full list of the 48 Families –** including their clusterization into *core PCP*, *facilitating* and *complementary families* – has been finally defined and shall be considered as stable. Whilst the number and technical scope of the families will no longer be modified, their readiness for implementation is still expected to evolve, thanks to the growing **technological maturity** of the elements to be deployed and the **progresses in the industrialization phase**, with a specific focus on the availability of standards and recommended practices for the deployment.

Detailed information on the readiness for deployment of each Family, as well as on their **status of implementation throughout the PCP geographical scope**, are **included in the yearly detailed functional views that support the SESAR Deployment Programme**, namely the DP Planning View and the DP Monitoring Full PCP.

As a stable reference, the **full list of the 48 families** is **reported below**, clustered by ATM Functionality.

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

- **Family 1.1.1** Basic AMAN – *facilitating family*
- **Family 1.1.2** AMAN Upgrade to include Extended Horizon function
- **Family 1.2.1** RNP Approaches with vertical guidance
- **Family 1.2.2** Geographic Database for Procedure Design– *complementary family*
- **Family 1.2.3** RNP 1 Operations in high density TMAs - ground capabilities
- **Family 1.2.4** RNP 1 Operations - aircraft capabilities – *facilitating family*
- **Family 1.2.5** RNP routes connecting Free Route Airspace (FRA) with TMA – *complementary family*

AF2 – Airport Integration and Throughput

- **Family 2.1.1** Initial DMAN
- **Family 2.1.2** Electronic Flight Strips (EFS)
- **Family 2.1.3** Basic A-CDM

[4] Respectively, *Regulation (EU) n. 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the Single European Sky* and *Regulation (EU) 2015/310 amending Regulation (EC) n. 29/2009 laying down requirements on data link services for the single European Sky*

- **Family 2.1.4** Initial Airport Operations Plan (AOP)
- **Family 2.2.1** A-SMGCS Level 1 and 2
- **Family 2.3.1** Time Based Separation (TBS)
- **Family 2.4.1** A-SMGCS Routing and Planning Functions
- **Family 2.5.1** Airport Safety Nets associated with A-SMGCS (Level 2)
- **Family 2.5.2** Aircraft and vehicle systems contributing to Airport Safety Nets – *facilitating family*

AF3 – Flexible Airspace Management and Free Route

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

AF4 – Network Collaborative Management

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

AF5 – Initial System Wide Information Management

- **Family 5.1.1** PENS 1: Pan-European Network Service version 1
- **Family 5.1.2** NewPENS: New Pan-European Network Service
- **Family 5.1.3** Common SWIM Infrastructure Components
- **Family 5.1.4** Common SWIM PKI and cyber security
- **Family 5.2.1** Stakeholders Internet Protocol Compliance – *facilitating family*
- **Family 5.2.2** Stakeholders SWIM Infrastructure Components
- **Family 5.2.3** Stakeholders' SWIM PKI and cyber security
- **Family 5.3.1** Upgrade/Implement Aeronautical Information Exchange System / Service
- **Family 5.4.1** Upgrade/Implement Meteorological Information Exchange System / Service
- **Family 5.5.1** Upgrade/Implement Cooperative Network Information Exchange System / Service
- **Family 5.6.1** Upgrade/Implement Flight Information Exchange System / Service supported by Yellow Profile
- **Family 5.6.2** Upgrade/Implement Flight Information Exchange System / Service supported by Blue Profile

AF6 – Initial Trajectory Information Sharing

- **Family 6.1.1** ATN B1 based services in ATSP domain – *complementary family*
- **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 – *complementary family*
- **Family 6.1.4** ATN B1 capability in Multi Frequency environment in aircraft domain – *complementary family*
- **Family 6.1.5** Implementation of ATN B2 in Aircraft domain

The **Work-Breakdown Structure (WBS)** reported in the following page reflects the structure of the Pilot Common Project and its breakdown into AFs, Sub-AFs and Families. It is worth noting that the WBS includes both the **PCP families**, which are explicitly derived from the PCP Regulation text, and the **DP families**,

which have been added at the initiative of the Deployment Manager with the **full support of the operational stakeholders** in order to de-risk full PCP implementation.

Fig. 10 - The full Project View of the Pilot Common Project

In the following paragraphs, the content of the Project View will be expanded and the 6 ATM Functionalities of the PCP will be broken down, illustrating the **full structure of each ATM functionality** through a further detailing of the Work Breakdown Structure, as well as providing an overview on the **technical content of each Family**. Such overview is further detailed through a fully developed **Family description** within the yearly-updated **DP Planning View**.

AF #1 – Extended AMAN and PBN in high density TMA

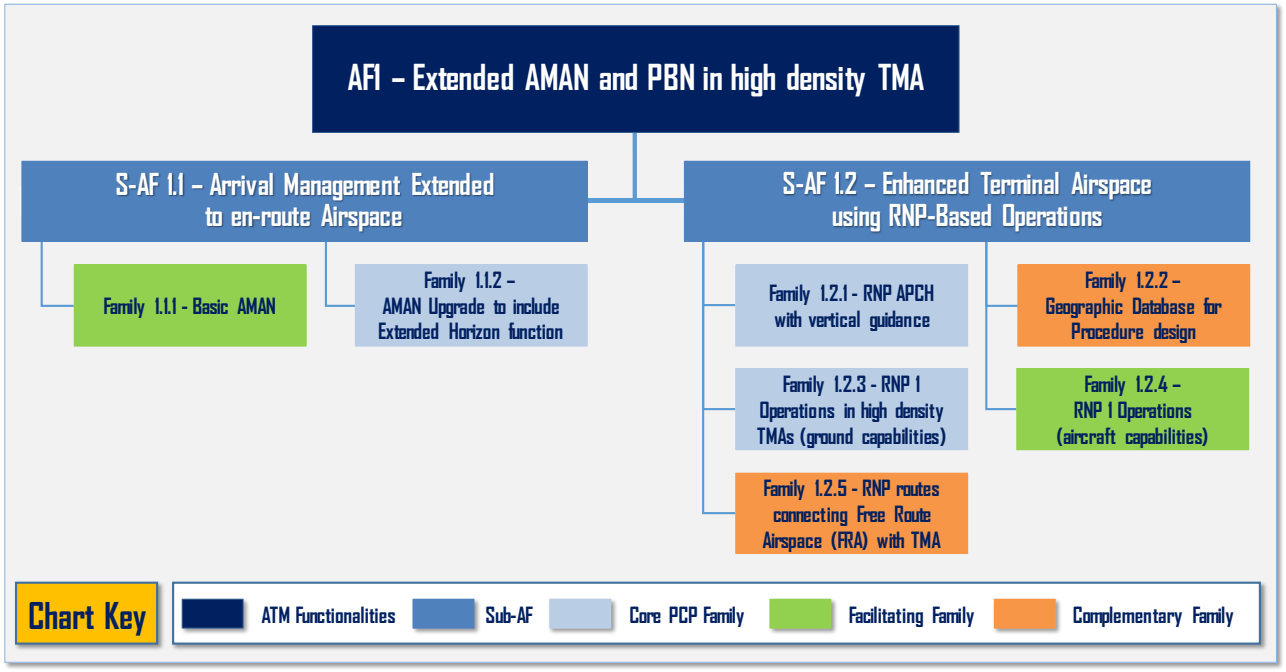


Fig. 11 - AF#1 Extended AMAN and PBN in high density - Work Breakdown Structure

The ATM Functionality #1 includes **Extended Arrival Management** and **Performance Based Navigation (PBN)** in high density Terminal Manoeuvring Areas. AF 1 will allow for more optimal route structures with closer spaced routes supporting deterministic profiles, improve the precision of the approach trajectory and facilitate air traffic sequencing at an earlier stage.

More in detail, Extended AMAN supports the **extension of the planning horizon out to a minimum of 180-200 Nautical Miles**, well beyond the Top of Descent of arrival flights. PBN in high density TMAs covers the development and **implementation of fuel efficient and/or environmentally friendly procedures for Arrival and Departure RNP1** (Required Navigation Performance 1) **Standard Instrument Departures** (RNP 1 SIDs), **Standard Arrival Routes** (STARs), and **RNP approach with vertical guidance** (RNP APCH).

Optimisation of airspace design is in most cases necessary to obtain full benefit from PBN. This includes **all phases of flight from en-route down to landing and from take-off to en-route** in support of operations like CDO and CCO etc. Consistent navigation based on RNP connecting Free Route Airspace (FRA) with TMAs is expected to be facilitated by Advanced RNP (A-RNP).

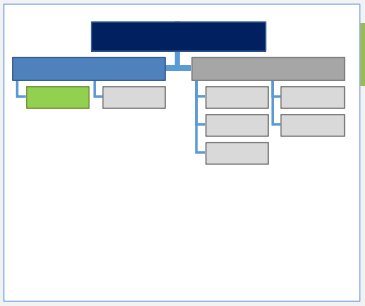
Accordingly, AF1 is structured in **two Sub-AFs**, including respectively **two and five Families**, as follows:

Sub-AF 1.1 – Arrival Management extended to en-route Airspace

- **Family 1.1.1:** Basic AMAN – *facilitating family*
- **Family 1.1.2:** AMAN upgrade to include Extended Horizon function

Sub-AF 1.2 – Enhanced Terminal Airspace using RNP-Based Operations

- **Family 1.2.1:** RNP APCH with vertical guidance
- **Family 1.2.2:** Geographic Database for procedure design – *complementary family*
- **Family 1.2.3:** RNP 1 operations in high density TMAs – ground capabilities
- **Family 1.2.4:** RNP 1 operations - aircraft capabilities – *facilitating family*
- **Family 1.2.5:** RNP routes connecting Free Route Airspace (FRA) with TMA – *complementary family*



1.1.1 – Basic AMAN

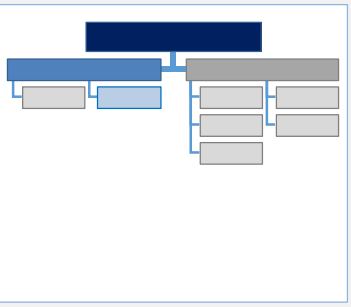
Implementation of Basic AMAN service to support synchronization of arriving traffic in high density TMAs. Basic AMAN is used as a controller support tool to smooth the flows at TMA border and ensure a stable sequence which the TMA controllers then maintain and optimize towards the runway.

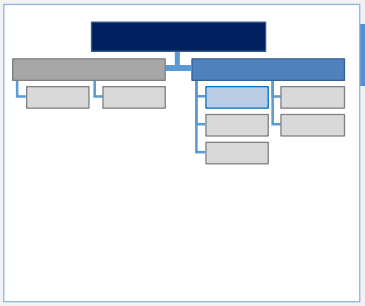
The implementation typically involves changes to ATM system configuration – hardware, software, interfaces, possibly a new controller role, new controller procedures and associated training.

1.1.2 – AMAN Upgrade to include Extended Horizon function

Implementation of Extended AMAN service to support synchronization of arriving traffic in high density TMAs. The AMAN service horizon is extended to 180-200 nautical miles, equivalent to about 35 to 40 minutes before landing, which means that adjacent En-Route sectors get involved in sequence implementation and maintenance.

The implementation typically involves ATM systems configuration, new interfaces, new controller roles, procedures and training.





Family 1.2.1 - RNP APCH with vertical guidance

Implementation of RNP APCH procedures in high density TMA's. RNP APCH is an approach specification offering performance superior to conventional non precision approach and without dependency on ground based infrastructure.

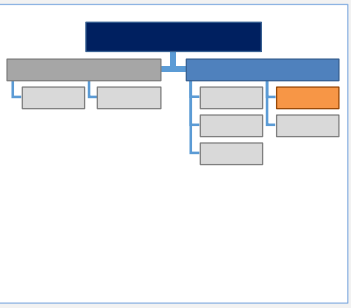
Instead, RNP APCH is dependent on onboard navigation capability.

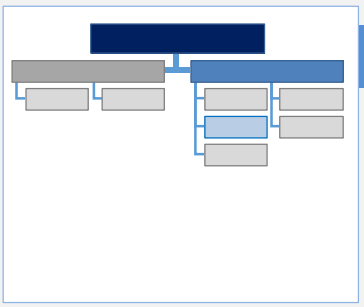
The procedure shall be implemented to two lines of minima on the approach chart; LNAV/VNAV and LPV.

Family 1.2.2 – Geographic Database for Procedure design

Provision of geographic database to support procedure design including obstacle data as part of Aeronautical Information Management.

A high integrity geographic database is a facilitator for PBN procedure construction. The implementation involves system configuration – hardware, software, interfaces, database population and staff training.



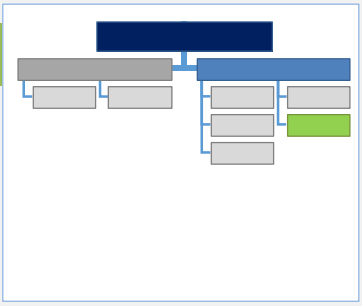


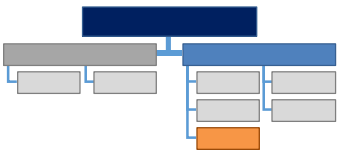
Family 1.2.3 - RNP 1 Operations in high density TMAs (ground capabilities)

Implementation of RNP 1 departure and arrival routes (SIDs and STARs) in TMA including the use of the Radius to Fix (RF) turns where benefits are enabled for noise exposure, emissions and/or flight efficiency (reducing environmental impact). A SID-STAR structure designed on the basis of a RNP 1 airspace concept allows routes spaced closer to each other, repeatable and accurate turns and deterministic routes which in turn enable greater flexibility for aircrews to plan and execute a predictable, environmentally optimized descent.

Family 1.2.4 - RNP 1 Operations (aircraft capabilities)

Implementation of aircraft RNP navigation capability that enables efficient and environmentally friendly operations (noise and GHG emissions) in departure (SID), arrival (STAR), approach (RNP APCH) and connecting airports to En-Route airspace.





Family 1.2.5 - Family 1.2.5 - RNP routes connecting Free Route Airspace (FRA) with TMA

Connectivity between Free Route Airspace and TMAs through the implementation of navigation specifications covered by Advanced RNP (A-RNP).

The intention is to provide consistent PBN navigation from departure to landing.

Advanced RNP is a recent addition to PBN and may undergo further evolution; this family will be updated accordingly once the PBN Manual Edition 5 has been published.

AF #2 – Airport Integration and Throughput

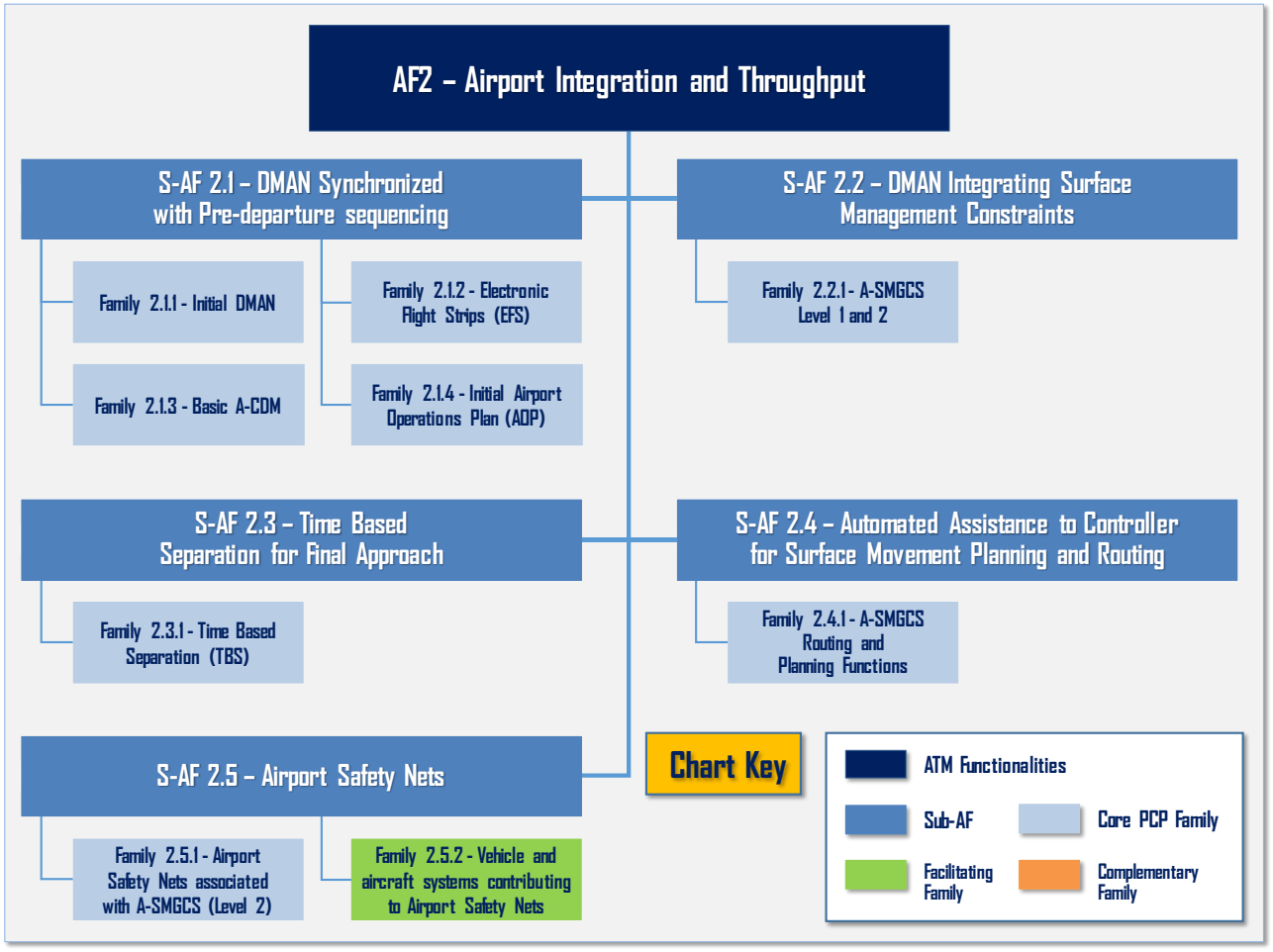


Fig. 12 - AF #2 Airport Integration and Throughput - Work Breakdown Structure

Airports are the nodes of the air-traffic network in Europe. It is therefore of great importance to achieve a **seamless integration of airports in the pan-European network management** and to ensure that airports do not become bottlenecks, limiting the capacity of the European ATM-system. The Pilot Common Project, set forth in Regulation (EU) no. 716/2014, identifies **25 airports that are critical to the network**, either because they play a significant role for the air-transport in their region or because they are located in a high-density Terminal Manoeuvring Area (TMA).

The ATM Functionality #2 was created to ensure that these airports and TMAs will be able to **manage the growing traffic demand of the future in a safe and efficient manner**, whilst taking on-board environmental aspects and guaranteeing a **maximum degree of interoperability for airspace users**.

Together with aspects from other AFs (mainly AF1– Extended AMAN and PBN in high density TMA, AF4 – Network Collaborative Management, and AF5 – Initial SWIM), the objectives of AF2 shall be achieved through the following Sub-AFs and related Families:

Sub-AF 2.1 Departure Management synchronised with Pre-Departure Sequencing

- **Family 2.1.1** – Initial DMAN
- **Family 2.1.2** – Electronic Flight Strips (EFS)
- **Family 2.1.3** – Basic A-CDM
- **Family 2.1.4** – Initial Airport Operations Plan (AOP)

Sub-AF 2.2 Departure Management integrating Surface Management Constraints

- **Family 2.2.1** – A-SMGCS Level 1 and 2

Sub-AF 2.3 Time Based Separation for Final Approach

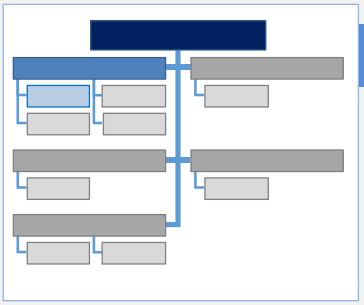
- **Family 2.3.1** – Time Based Separation (TBS)

Sub-AF 2.4 Automated Assistance to Controller for Surface Movement Planning and Routing

- **Family 2.4.1** – A-SMGCS Routing and Planning Functions

Sub-AF 2.5 Airport Safety Nets

- **Family 2.5.1** – Airport Safety Nets associated with A-SMGCS (Level 2)
- **Family 2.5.2** – Vehicle and aircraft systems contributing to Airport Safety Nets – *facilitating family*



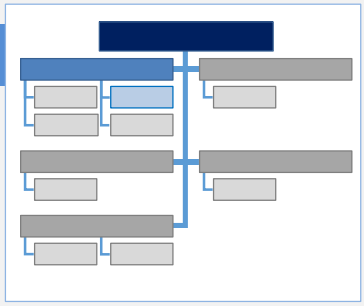
Family 2.1.1 - Initial DMAN

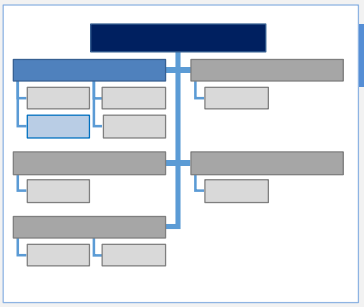
Initial Departure Manager (DMAN) is a planning tool to improve the departure flows at airports. This system elaborates a collaborative sequence and provides both Target Start Up Approval Time (TSAT) and Target Take Off Time (TTOT), taking into account agreed principles to be applied.

Family 2.1.2 – Electronic Flight Strips (EFS)

Electronic Flight Strips (EFS) is the automated assistance to air traffic controller.

EFS shall integrate the instructions given by the air traffic controller with other data such as flight plan, surveillance, routing, published rules and procedures. The system supports coordination dialogue between controllers and transfer of flights between units or different locations within one unit.





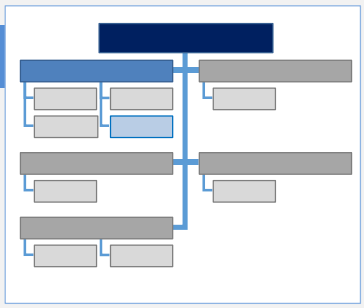
Family 2.1.3 - Basic A-CDM

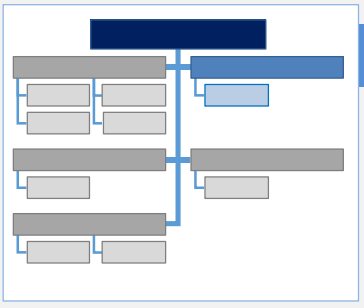
Airport Collaborative Decision Making (A-CDM) is the concept, which aims at improving operational efficiency at airports and improves their integration into the Air Traffic Flow and Capacity Management (ATFCM) by increasing information sharing and improving cooperation between all relevant stakeholders (local Air Navigation Service Providers, airport operator, aircraft operators, Network Manager, other airport service providers).

Family 2.1.4 - Initial Airport Operations Plan (AOP)

The Airport Operations Plan (AOP) is a single, common and collaboratively agreed rolling plan available to all airport stakeholders whose purpose is to provide common situational awareness.

The AOP reflects the operational status of the airport.





Family 2.2.1 - A-SMGCS Level 1 and 2

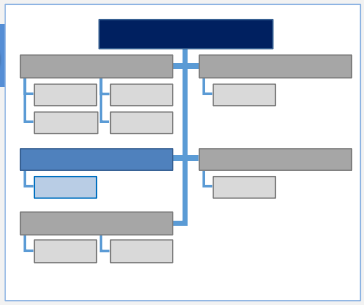
A-SMGCS level 1 provides ATC with the position and identity of all relevant aircraft within the movement area and of all relevant vehicles within the manoeuvring area.

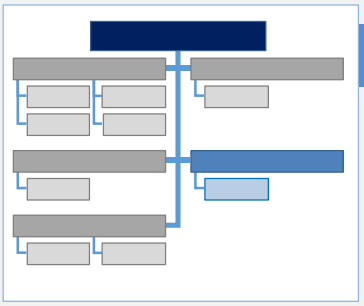
A-SMGCS level 2 is a level 1 system complemented by the A-SMGCS function to detect potential conflicts on runways, taxiways and intrusions into restricted areas and provide the controllers with appropriate alerts.

Family 2.3.1 - Time Based Separation (TBS)

Time Based Separation (TBS) consists in the separation of aircraft in sequence on the approach to a runway using time intervals instead of distances.

The objective is to recover loss in airport arrival capacity currently experienced in headwind conditions on final approach under distance-based wake turbulence radar separation rules.





Family 2.4.1 - A-SMGCS Routing and Planning Functions

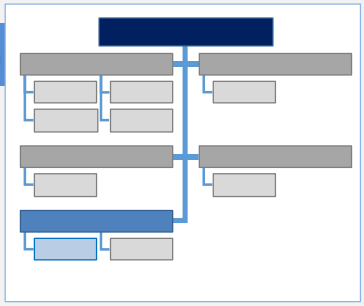
A-SMGCS Routing and Planning Functions provide ATC with:

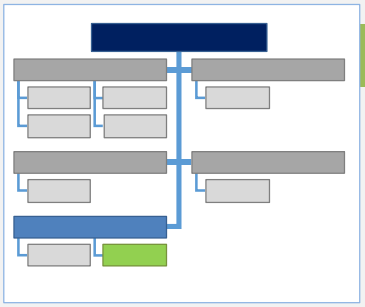
- Optimised route designation for each aircraft or vehicle within the movement area;
- The detection of all route conflicts on the movement area as well as improved routing and planning for use by controllers.

Family 2.5.1 – Airport Safety Nets associated with A-SMGCS (Level 2)

Airport safety nets consist of the detection and alerting of conflicting ATC clearances to aircraft and deviation of vehicles and aircraft from their instructions, procedures or routing which may potentially put the vehicles and aircraft at risk of a collision.

The scope of this sub-functionality includes the Runway and Airfield Surface Movement area.





Family 2.5.2 - Vehicle and aircraft systems contributing to Airport Safety Nets

The scope of this Family includes:

- aircraft technology in the scope of avionic or electronic flight bag based systems with the objective to conclude the ground based airport safety net with specific airborne systems and technology;
- on-board vehicle displays including on-board vehicle safety nets, including alerting functions, with the objective to support the ground based airport safety net with specific vehicle systems and technology;

Under Family 2.5.2, it is not foreseen to provide the complete "aircraft picture" to the "Air Traffic Controller", nor to provide the complete "Air Traffic Controller picture" to the cockpit.

AF #3 – Flexible ASM and Free Route

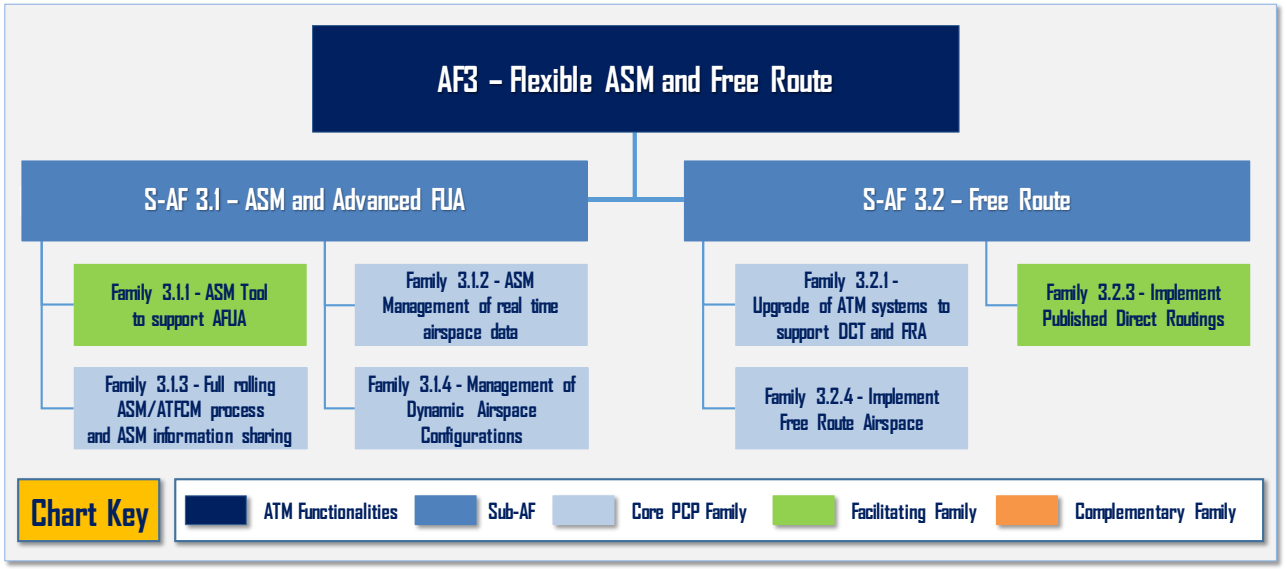


Fig. 13 - AF #3 Flexible ASM and Free Route – Work Breakdown Structure

The management of airspace in terms of **advanced flexibility and free route** is the future for its optimization. The main aims of ATM Functionality #3 are to produce **benefits to the environment**, in terms of **emissions reduction**, as well as to the Airspace Users, with respect to the desired trajectories and with due consideration of the impact on airspace capacity. These objectives may be achieved by combining the following operations:

- Implementation of **ASM management systems, tools, airspace structure, and procedure** that support an advanced **Flexible Use of Airspace**. The aim is to ease, to **facilitate segregations and reservations of portions of airspace when required for exclusive usage**, avoiding, as much as possible, to hamper the military mission effectiveness and providing, at the same time, minimum impact on other airspace users.

- Implementation of **harmonised DCTs and Free Route Airspace throughout Europe**, with necessary support by system upgrades and tools. This shall enable flights to as far as possible to fly their **preferred route without the typical constraints of fixed route network** and rigid airspace structure.

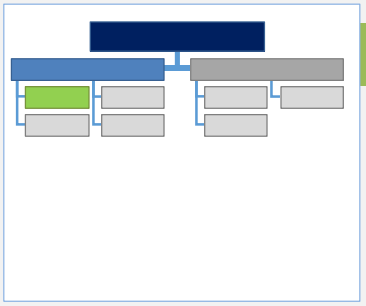
For this reason, AF3 is structured in two Sub-AFs with their related Families:

S-AF3.1 – Airspace Management and Advanced Flexible Use of Airspace. This requires close coordination and cooperative decision making among all stakeholders (civil and military), ASM tools, real time data management and exchange for **most flexible airspace use and configuration for best adaptation to users' needs**.

- **Family 3.1.1** – ASM Tool to support AFUA – *facilitating family*
- **Family 3.1.2** – ASM management of real time airspace data
- **Family 3.1.3** – Full rolling ASM/ATFCM process and ASM information sharing
- **Family 3.1.4** – Management of Dynamic Airspace Configurations

S-AF3.2 – Free Route This requires important changes in **airspace structure and significant upgrade of all stakeholders' systems** to support DCTs and Free Route implementation operations, in a synchronised European scenario, regardless of border limitations.

- **Family 3.2.1** – Upgrade of ATM Systems (NM, ANSPs, AUs) to support Direct Routings (DCTs) and Free Route Airspace (FRA)
- **Family 3.2.3** – Implement Published Direct Routings (DCTs)– *facilitating family*
- **Family 3.2.4** – Implement Free Route Airspace



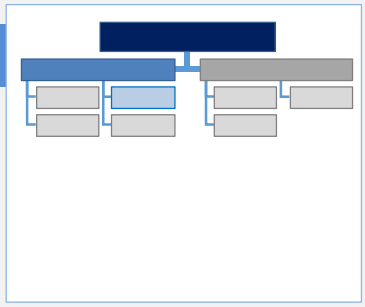
Family 3.1.1 - ASM Tool to support AFUA

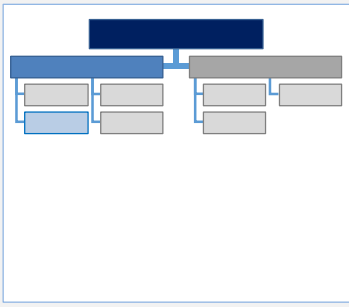
The deployment of automated AirSpace Management (ASM) Systems and their interoperability with Network Manager systems and neighbouring ASM systems to manage ARES (Airspace REServations) will lead to improved civil-military co-ordination and greater flexibility according to Airspace Users' needs.

Family 3.1.2 – ASM Management of real time airspace data

Airspace management (ASM) is enhanced by the automated exchange services of ASM data during the tactical and execution phases, continuously in real time.

ASM information (real-time ARES status) are shared between ASM systems, civil and military ATS units/systems and communicated to the Network Manager in the tactical and execution phases.





Family 3.1.3 - Full rolling ASM/ATFCM process and ASM information sharing

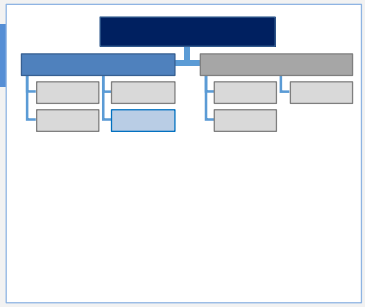
ASM information sharing addresses the required system support improvements to enable a seamless data flow and their management in the framework of the enhanced CDM (Collaborative Decision Making) process.

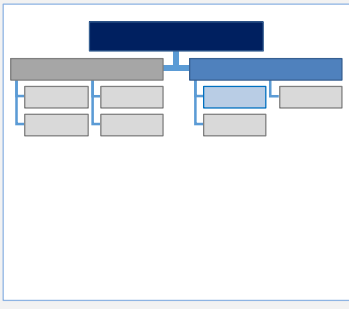
It includes requirements aiming to improve notifications to airspace users based on automation of data exchange.

Family 3.1.4 - Management of Dynamic Airspace Configurations

Airspace configurations are based on pre-defined, coordinated airspace structures and ATC dynamic sector management.

Dynamic Airspace Configuration focuses on defining the concept, including roles and responsibilities in an advanced Collaborative Decision Making process.





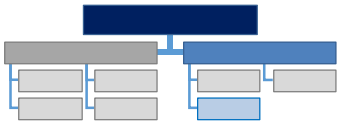
Family 3.2.1 - Upgrade of ATM systems to support DCT and FRA

The upgrades of ATM systems belonging Network Manager, Airspace Users and Air Navigation Service Providers necessary to support the implementation of Direct Routings and Free Route Airspace

Family 3.2.3 - Implement Published Direct Routings

Implementation of published Direct Routings (DCTs) may be carried out within a State or between States on a cross border basis.

The Stakeholders may choose to implement Free Route Airspace without implementing Direct Routings as an intermediate step.



Family 3.2.4 – Implement Free Route Airspace

Free Route Airspace (FRA) is a specified airspace within which users may freely plan a route between defined FRA entry points and defined FRA exit points, with the possibility to route via intermediate (published or unpublished) waypoints, without reference to the ATS route network.

AF #4 – Network Collaborative Management

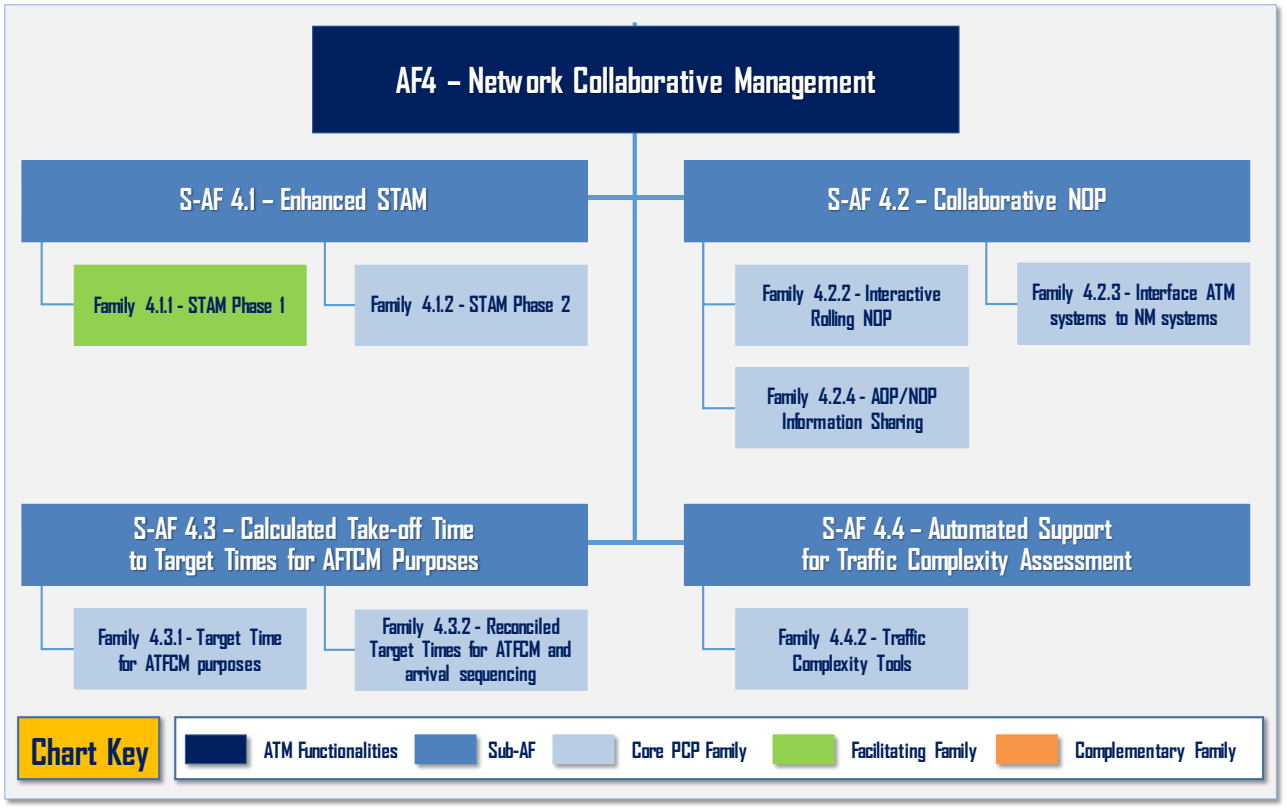


Fig. 14 - AF#4 Network Collaborative Management - Work Breakdown Structure

The ATM Functionality #4, Network Collaborative Management, has the objective of **enhancing the European ATM network performance**, notably optimized capacity and flight efficiency, through the **exchange, modification and management of aircraft trajectory information**. Flow Management shall move to a **Cooperative Traffic Management (CTM) environment**, optimizing the delivery of traffic into sectors and airports whilst acknowledging the requirement for **Air Traffic Flow and Capacity Management (ATFCM) measures**. AF4 is structured in four Sub-AFs with their related Families, as follows:

Sub-AF4.1 – Enhanced Short Term ATFCM Measures

- **Family 4.1.1** – STAM Phase 1, mainly related to what already exists – *facilitating family* **Family 4.1.2 –** STAM Phase 2, with coordination between local entities – such as ANSP, Airport and AU – and NM tools

Sub-AF4.2 – Collaborative NOP, through the exchange of information between Stakeholders via a central repository.

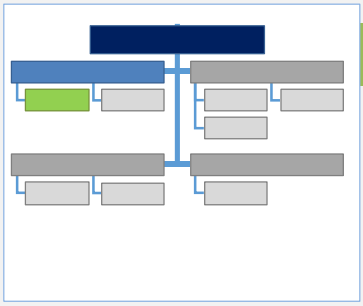
- **Family 4.2.2 –** Interactive Rolling NOP (NM platform and its usage)
- **Family 4.2.3 –** Interface ATM Systems to NM Systems (information exchange between ANSP, AU and NM)
- **Family 4.2.4 –** AOP/NOP Information Sharing (information exchange between Airports – see Family 2.1.4 for AOP – and NM)

Sub-AF4.3 – Calculated Take-off Time to Target Times for ATFCM purposes

- **Family 4.3.1 –** Target Time for ATFCM purposes (including the validated part)
- **Family 4.3.2 –** Reconciled Target Times for ATFCM and arrival sequencing (including a more ambitious yet still to be fully validated concept)

Sub-AF4.4 – Automated Support for Traffic Complexity Assessment

- **Family 4.4.2** – Traffic Complexity Tools



Family 4.1.1 – STAM Phase 1

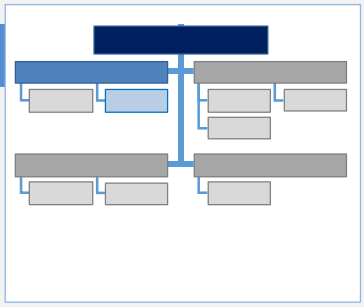
The target of the Short Term ATFCM Measures (STAM) phase 1 is to replace systematic usage of En Route CASA regulations for situations when imbalances are manageable via local operational procedure.

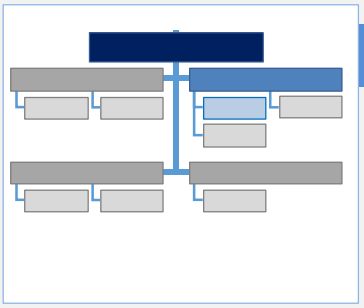
The aim is to improve the efficiency of the system using flow management techniques close to the real time operations with direct impact on tactical capacity management, occupancy counts and tactical action on traffic.

Family 4.1.2– STAM Phase 2

The second phase tactical capacity management using STAM requires the deployment of additional tool and procedures in order to ensure a close and efficient working relationship between NM, FMP and airspace users.

STAM phase 2 tool should include occupancy traffic monitoring values (OTMV), hotspot detection and coordination tool.



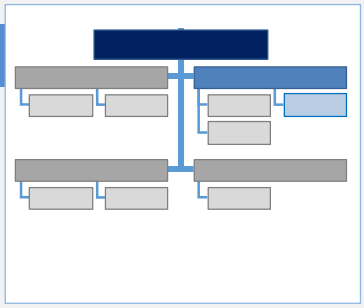


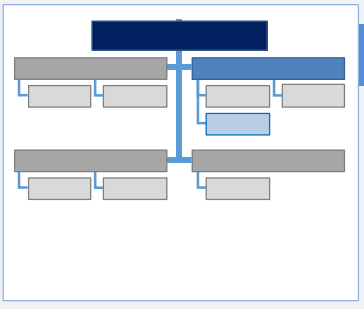
Family 4.2.2 – Interactive Rolling NOP

Network operations are driven by enhanced stakeholders' participation in a rolling cooperative process (Civil & Military airspace users, ANSPs, Airports, NM, outside EUR interfaces). This rolling view of the network situation (rolling NOP) and the support to the collaborative processes is based on an information management platform, accessible online by all stakeholders for consultation

Family 4.2.3 – Interface ATM systems to NM systems

This Family addresses the message exchange between NM systems, ANSPs ATM system and AU/FOC /WOC flight plan fling systems in respect of collaborative flight planning, improving flight plan distribution and enhanced tactical flow management. Those messages are for example AFP/ACH from ATM and Extended Flight plan from Airspace Users





Family 4.2.4 – AOP/NOP Information Sharing

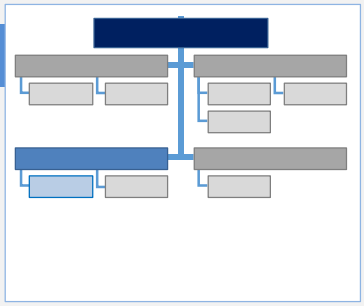
In order to improve the European ATM network performance, notably capacity and flight efficiency through exchange, modification and management of trajectory information there is a clear need for information sharing between the Airports and the Network Manager.

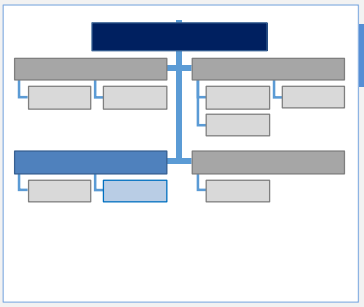
This could be done via the automatic sharing of data between AOP (Airport Operation Plan) and the NOP (Network Operation Plan). This family is limited to the PCP airport.

Family 4.3.1 – Target Time for ATFCM purposes

NM system should transmit calculated target time at the most penalising regulation reference point in addition to CTOT to all concerned users. Those users should be able to manage this new feature and potential system upgrades should be foreseen.

In case of single arrival regulation, it should be possible for the Airport/TMA to amend the TTA, leading to a recalculation of the CTOT by NM.





Family 4.3.2 – Reconciled Target Times for ATFCM and arrival sequencing

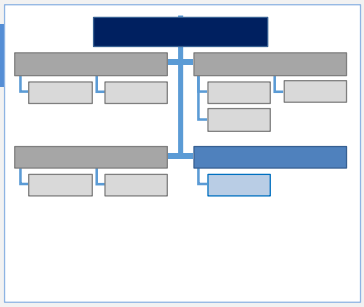
The scope of this Family contains the process, procedure and system upgrades related to the reconciliation of multiple local Target Time constraints, coming from Airport (AOP), ANSP (either AMAN/extended AMAN or en-Route) or Network DCB process.

Considering the current status of development work, the concept still needs to be validated at SJU level

Family 4.4.2 – Traffic Complexity Tools

Traffic Complexity tools continuously monitor and evaluate current and expected traffic loads and estimated controller's workload in order to optimise the use of available capacity.

Depending on the time horizon, the tools will use predefined metrics to enhance long-term ATFCM, and/or enhanced planned trajectory prediction for mid-term ATFCM and/or real time trajectory data for short term ATFCM. Traffic complexity tools also enhance the real time ATCO workload estimation.



AF #5 – Initial SWIM

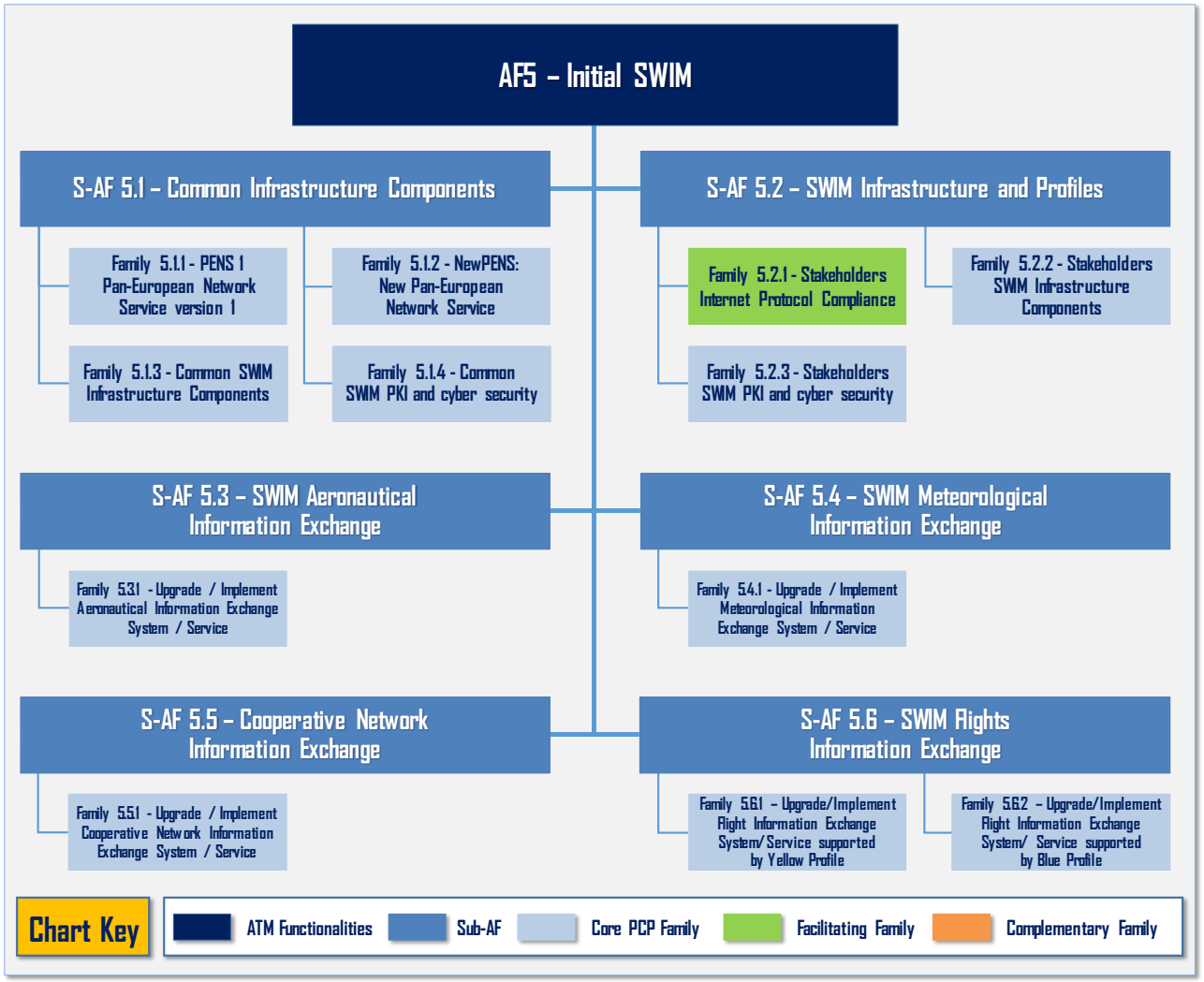
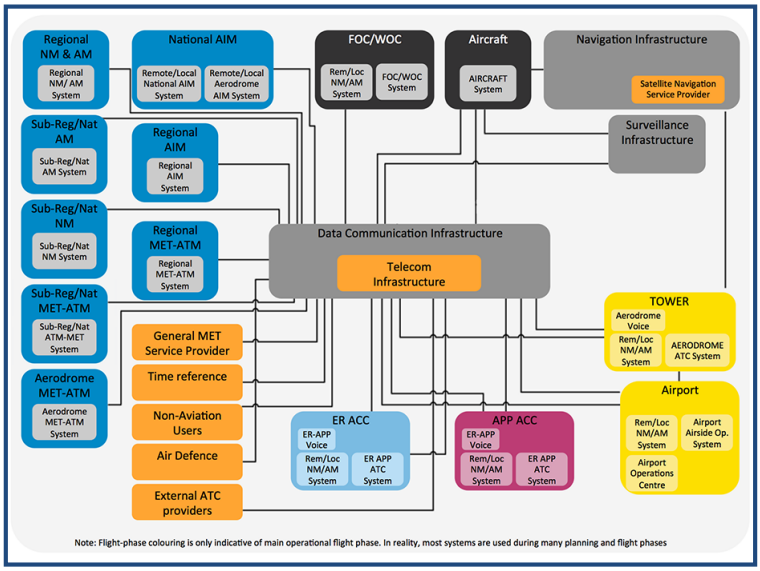


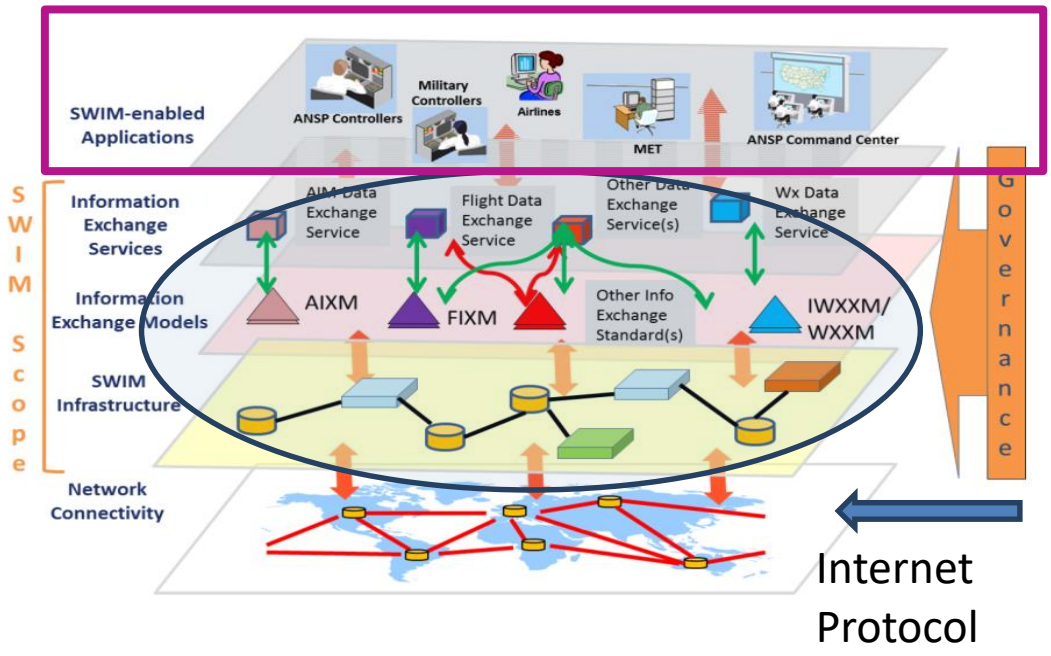
Fig. 15 - AF#5 iSWIM - Work Breakdown Structure

SWIM is part of the **Data Communication Infrastructure** as well as of the **ATM systems connected to the Data Communication Infrastructure** in the SESAR EATM Architecture.



SESAR EATM Architecture

SWIM supports the exchanges of ATM information between the Operational Stakeholders for all data domains, ground-ground and air-ground. Initial SWIM (iSWIM) as called in the PCP, is limited to some specific **Ground-Ground Aeronautical, Meteorological, Cooperative Network and Flight Data Information exchanges.**



Based on the ICAO definition of SWIM depicted above, according to which "*SWIM comprises **standards**, **infrastructure** and **governance** enabling the management of information and its exchange between operational stakeholders via **interoperable services***", the Deployment Programme contains 12 Families, as a guideline for the operational stakeholders to implement initial SWIM projects. The 12 Families fall into 3 distinct sets.

A first set is dealing with the **necessary common components and structures**. "*Common*" in this respect means that **only one common system or one common set of rules is to be deployed for the geographical scope** mandated by the Commission Implementing Regulation (EU) no. 716/2014. Thus, all operational stakeholders have to collaborate and put these in place together to facilitate the SWIM interoperability and interconnectivity:

- **Family 5.1.1** – PENS1: the first implementation of PENS ending in June 2018 with a possible extension to end 2019 due to the probable deployment delay of NewPENS;
- **Family 5.1.2** – NewPENS: the new PENS implementation, with a new stronger governance, launched very beginning 2016 replacing PENS1 after a transition period (2017-2019)
- **Family 5.1.3** – SWIM Governance and Registry implementing the necessary common structures and processes for SWIM operation and evolution
- **Family 5.1.4** – PKI and Cybersecurity developing the necessary common security requirements to guarantee a common secure SWIM implementation

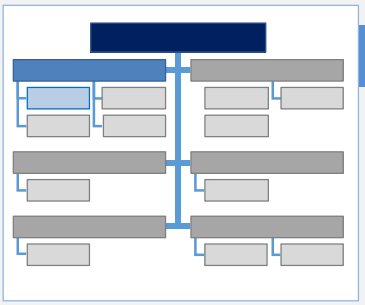
The first set is complemented by a second set that deals with the **specific infrastructure components to be implemented by each operational stakeholder** within its own area of responsibility. These stakeholder infrastructure components form the basis for information provisions and consumptions dealt with in the third set:

- **Family 5.2.1 –** dedicated Internet Protocol Network Services to support IP exchanges – *facilitating family*
- **Family 5.2.2** – dedicated SWIM infrastructure (*middleware*) realizing the SWIM Yellow and Blue Profiles
- **Family 5.2.3 –** dedicated PKI and Cybersecurity components and processes to meet local security requirements, in line with the common ones defined in Family 5.1.4

The third and last set is dealing with the **different kinds of ATM information exchanges defined in the PCP**, including the interdependencies with the other AFs:

- **Family 5.3.1** – The Aeronautical Information Exchanges
- **Family 5.4.1** – The Meteorological Information Exchanges
- **Family 5.5.1** – The Cooperative Network Information Exchanges
- **Family 5.6.1** – The Flight Information Exchanges
- **Family 5.6.2** – The Flight Object Information Exchanges

Finally, **Appendix 1** of the DP Planning View contains a **list of services**, developed in the context of SESAR 1 or services deployed or planned by NM. This list defines a **starting point for the SWIM implementation** and thus guides the Operational Stakeholders to a partial coverage of the ATM information exchanges required by the PCP. **Evolution of this starting point shall thereafter be under the responsibility of the SWIM Governance**.



Family 5.1.1 – PENS 1: Pan-European Network Service version 1

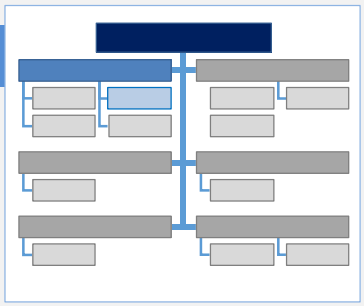
PENS 1 is a means for information exchanges between European ANSPs by providing European-wide connectivity via Internet Protocol (IP) V6.

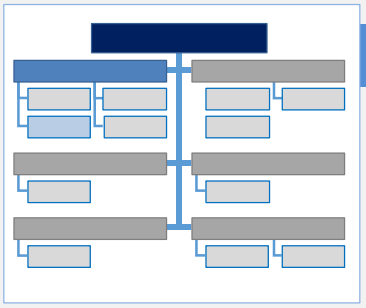
Thus it is a prerequisite for implementing SWIM, since the PCP mandates the use of an IP-based network for SWIM.

Family 5.1.2 - NewPENS: New Pan-European Network Service

NewPENS is the successor of PENS 1, replacing it after December 2019.

Like PENS 1 it offers IP V6-based connectivity, yet extending the scope of operational stakeholders beyond ANSPs to Airport Operators, Airspace Users, Network Manager, Military Authorities and MET Service Providers.





Family 5.1.3 - Common SWIM Infrastructure Components

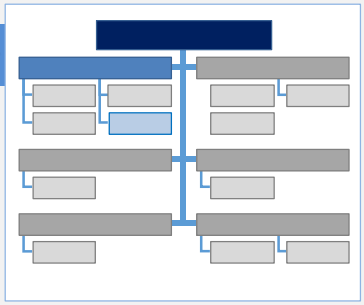
Common Infrastructure Components of SWIM are those elements of the SWIM infrastructure (systems or sets of rules) to be deployed only once for the entire geographical scope mandated by the PCP.

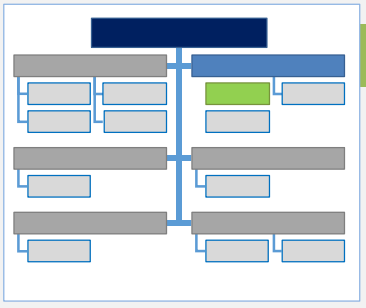
The Common Infrastructure Components consist of the SWIM Governance arrangements ensuring a common baseline and controlled evolution of SWIM and the SWIM registry as one of the Governance mechanisms, which in turn is governed itself.

Family 5.1.4 – Common SWIM PKI and cybersecurity

Common SWIM PKI and cyber security are those elements related to the security of SWIM to be addressed only once for the entire geographical scope mandated by the PCP.

This comprises the common specifications relating to PKI and its governance, e.g. processes related to certificates, common requirements, rules for delegating certificates etc.





Family 5.2.1 - Stakeholders Internet Protocol Compliance

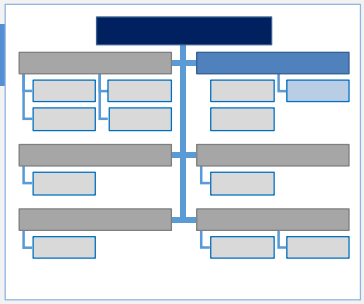
Complementing the PENS 1 and NewPENS networks on European level, each stakeholder has to have an internal Internet Protocol (IP)-based network.

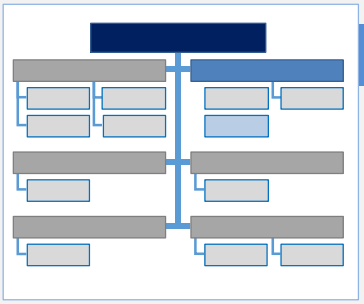
This type of network is a prerequisite for supporting SWIM information exchanges using the SWIM TI Profiles.

Family 5.2.2 - Stakeholders SWIM Infrastructure Components

The SWIM Infrastructure Components to be deployed at each operational stakeholder comprise technical parts – the SWIM TI Blue Profile and the SWIM TI Yellow Profile – as well as organizational means – like training and certification of technical personnel or other components necessary for stakeholder SWIM implementation (supervision, monitoring and control).

These components constitute the foundation for implementing SWIM information exchanges and SWIM-enabled systems.





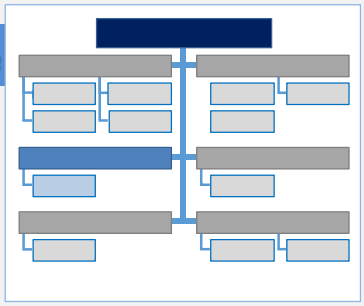
Family 5.2.3 - Stakeholders SWIM PKI and cyber security

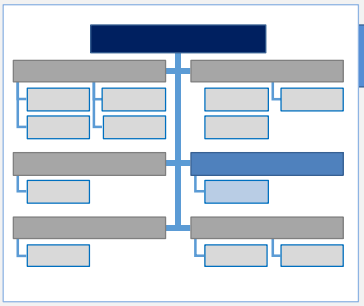
The scope of this Family aims at implementing basic public key infrastructure management at each operational stakeholder including certificate management, key lifecycle management, training and certification of technical personnel, monitoring and control, implementation of audit programmes ensuring continuous compliance with common and local policies and standards etc.

Family 5.3.1 – Upgrade/Implement Aeronautical Information Exchange System/Service

This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Aeronautical Information Exchange systems and services in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Aeronautical Information via SWIM services in the role of either service provider or service consumer.





Family 5.4.1 - Upgrade / Implement Meteorological Information Exchange System / Service

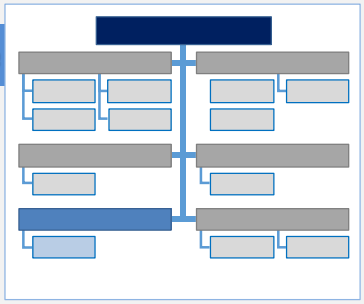
This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Meteorological Information Exchange systems and services in accordance with SWIM principles.

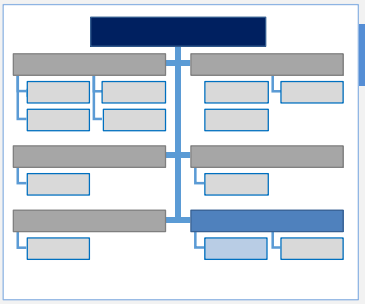
The systems shall be upgraded or implemented to support the exchange of Meteorological Information via SWIM services in the role of either service provider or service consumer.

Family 5.5.1 - Upgrade / Implement Cooperative Network Information Exchange System / Service

This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Network Information Exchange systems and services in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Network Information via SWIM services in the role of either service provider or service consumer.





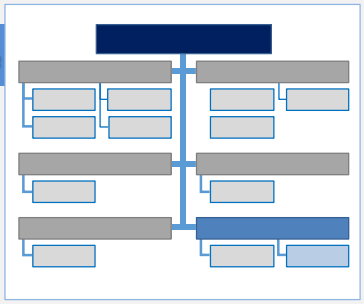
Family 5.6.1 – Upgrade/Implement Flight Information Exchange System/Service supported by Yellow Profile

This Family is part of the implementation of actual information exchanges and aims at upgrading or implementing Flight Information Exchange systems and services using the Yellow SWIM TI Profile in accordance with SWIM principles. The systems shall be upgraded or implemented to support the exchange of Flight Information via SWIM services in the role of either service provider or service consumer. This family is also intended to provide the prerequisites for trajectory management, which requires the sharing of information regarding aircraft performance and the trajectory itself.

Family 5.6.2 – Upgrade/Implement Flight Information Exchange System/ Service supported by Blue Profile

This Family is part of the implementation of actual information exchanges and aims at implementing Flight Object Information Exchange systems and services using the Blue SWIM TI Profile in accordance with SWIM principles.

The systems shall be upgraded or implemented to support the exchange of Flight Object Information via SWIM services in the role of either service provider or service consumer.



AF #6 – Initial Trajectory Information Sharing

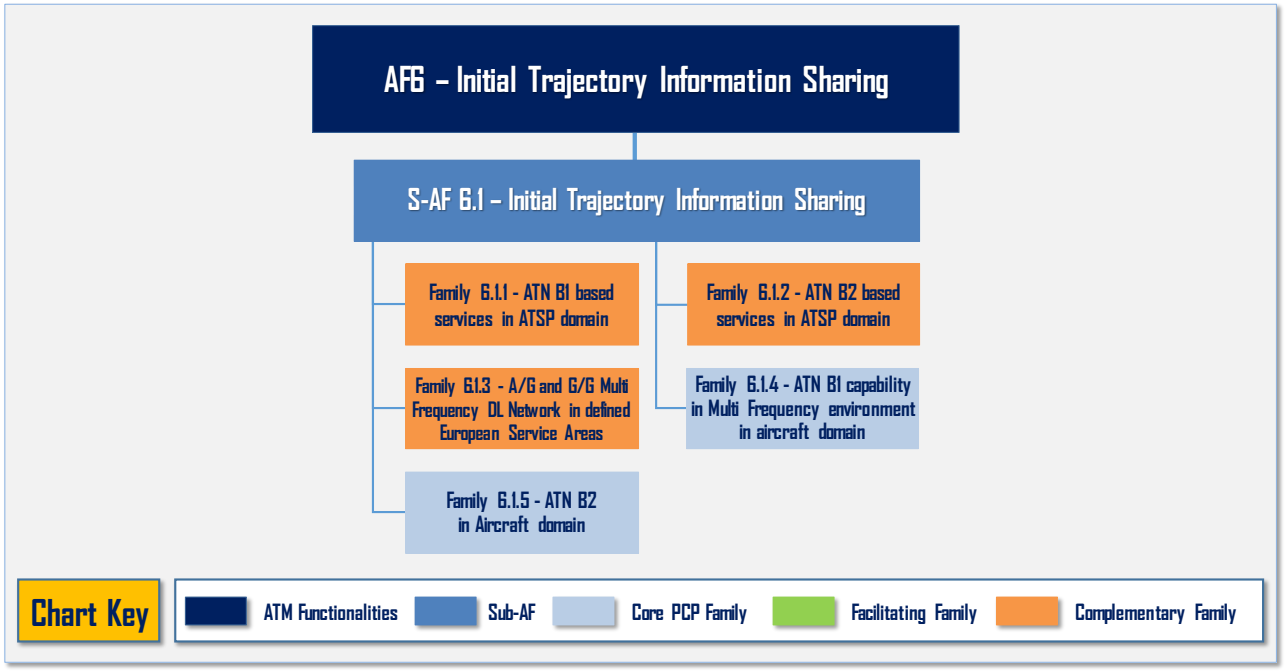


Fig. 16 - AF #6 Initial Trajectory Information Sharing

The primary objective of ATM Functionality #6, **Initial Trajectory Information Sharing**, is the **integration of aircraft predicted flight path information and other on-board parameters into the ATM systems**. To achieve this, a successful implementation of the **data link capabilities** described in (EC) No 29/2009, the Data Link Services Implementing Rule, is an essential prerequisite. In addition to these air/ground data link capabilities, an **effective ground/ground dissemination of the aircraft predicted flight path information** is needed.

After the first implementations of the DLS IR (i.e., "CPDLC"), it became apparent that the VDL Mode 2 network deployed within the scope of the DLS IR did not meet the performance requirements set by the DLS IR and the complementing standards. A detailed analysis of the network issues was conducted in the "**ELSA study**": "**VDL Mode 2 Measurement, Analysis and Simulation Campaign**". Major results and recommendations of this study have been incorporated in the family descriptions of AF6 (specifically, 6.1.3 and 6.1.4, as described below).

Based on the results of the ELSA study, SDM developed the "Data Link Services (DLS) Implementation Strategy towards Initial Trajectory Information Sharing", that was further elaborated into the "**Data Link Services (DLS) Recovery Plan**". This DLS Recovery Plan focuses on the **implementation of the ELSA recommendations that take effect in the communication domain** (family 6.1.3) **and aircraft** domain (family 6.1.4).

Based on the DLS Recovery Plan, EC mandated **SDM to act as the Data Link Services (DLS) Implementation Project Manager**. To support the implementation of the DLS Recovery plan, EC has also requested **EASA, EUROCAE and NM to act on specific gaps identified by ELSA**.

The AF6 families are grouped in the following three domains:

ATSP domain upgrades for Initial Trajectory Information Sharing

- **Family 6.1.1** – ATN B1 based services in ATSP domain – *complementary family*
- **Family 6.1.2** – ATN B2 based services in ATSP domain – *complementary family*

Communication domain upgrades for Initial Trajectory Information Sharing

- **Family 6.1.3** – A/G and G/G Multi Frequency DL Network in defined European Service Areas – *complementary family*

Aircraft domain upgrades for Initial Trajectory Information Sharing

- **Family 6.1.4** – ATN B1 capability in Multi Frequency environment in aircraft domain
- **Family 6.1.5** – ATN B2 in aircraft domain

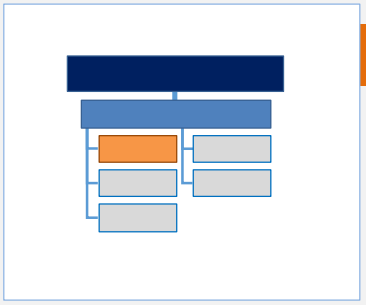
Families related to **ATN Baseline 1** (ATN B1) target the implementation of the original DLS IR on ANSP (6.1.1) and Airspace User (6.1.4) side. These families enable **CPDLC (beside other applications)**. Family 6.1.4 includes ELSA study's recommendations for the aircraft domain.

Families related to **ATN Baseline 2** (ATN B2) target the **implementation of trajectory information sharing on ANSP/NM (6.1.2) and Airspace User (6.1.5) side**. These families enable the **ADS-C EPP application**, including the ground/ground dissemination of the trajectory information through flight object exchange.

Family 6.1.3 is related to the **implementation of an air/ground and ground/ground network supporting ATN B1, ATN B2 and ACARS** and providing:

- in the short term, **coverage and performance required to satisfy the DLS IR**, and
- in the medium term, **capacity to support the increased data volume** expected with the introduction of **trajectory downlinks with ADS-C EPP**.

Operational benefits achieved by the implementation of AF6 are envisaged by the PCP in the areas of **improved de-confliction and the reduction of tactical interventions as a result of improved use of target times and trajectory information**. However, AF6 can also be regarded as an **infrastructure provision**, integrating the aircraft as a node into the ATM network.



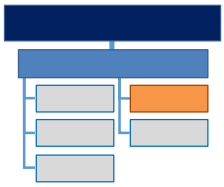
Family 6.1.1 - ATN B1 based services in ATSP domain

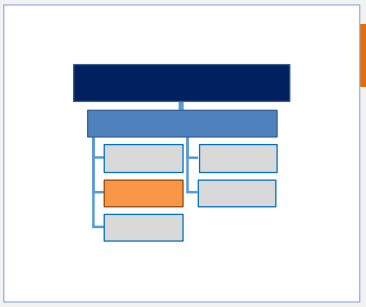
Implementation of ATN B1 capability in the ATSP domain in order to secure compliance with the original DLS mandate EC 29/2009 as amended by 2015/310 and its complement concerning ground/ground exchange of flight data, EC 30/2009. This implementation concerns ATM system configuration, new hardware, software, interfaces, contractual arrangement of access to any other ground based end system and transit routing domains, training of technical staff, development of new controller working procedures and training material and controller training.

Family 6.1.2 - ATN B2 based services in ATSP domain

Implementation of EPP capability in the ATSP domain, to enable the ATSP to establish the appropriate connection and contract with aircraft and receive and process the EPP.

This implementation concerns ATM system configuration, software, interfaces including interconnection to a central EPP management entity if appropriate, development of new controller working procedures and training material and controller training.





Family 6.1.3 - A/G and G/G Multi Frequency DL Network in defined European Service Areas

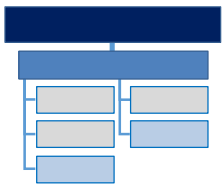
Implementation of multi-frequency DL network environment to attain the network capacity required for AF6.

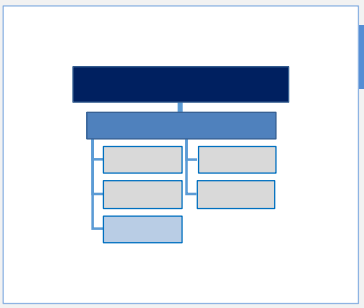
This implementation concerns primarily the G/G and A/G datalink network domains; it will concern the securing of the required radio frequencies from the appropriate authority, design, deployment and interregional integration of the G/G and A/G networks and contractual as well as physical arrangements of interconnection to any third party or transit routing domains.

Family 6.1.4 - ATN B1 capability in Multi Frequency environment in aircraft domain

Implementation of ELSA "best-in-class" capable configuration in the airborne domain in order to enable aircraft to use datalink communication in multi-frequency environment.

This implementation concerns the procurement and installation of avionic equipment in the prescribed and approved configuration, crew training and procedures.





Family 6.1.5 - ATN B2 in Aircraft domain

Implementation of ATN B2 capability in the airborne domain in order to enable aircraft to downlink EPP through ADS-C to a suitably equipped ground domain.

This implementation concerns the procurement and installation of avionic equipment in the prescribed and approved configuration.

3.2 The path towards a synchronized implementation

The overall Gantt of PCP implementation

The Annex to Regulation (EU) no. 716/2014 – describing the technical content of the ATM Functionalities to be implemented – identifies the ***deployment target dates***; as reported within Article 2 of the Regulation, as "*the date by which the deployment of the ATM functionality in question is to be completed and fully used operationally*". **Article 1.3, 2.3, 3.3, 4.3, 5.3 and 6.3 of the Annex** illustrates the **deployment target dates for each ATM Functionality**, or – when needed – for the deployment of specific sub-sets of their technological, procedural and/or operational elements.

A short recap of the deployment target dates – as laid down by the PCP Regulation – are reported in the table below.

AF #1	Extended AMAN and PBN in high density TMA	**Extended AMAN and PBN in high density TMAs** shall be operated from 1st January 2024
AF #2	Airport Integration and Throughput	**Departure Management synchronized with Pre-departure sequencing** shall be operated from 1st January 2021
		Departure Management integrating Surface Management Constraints shall be operated from 1st January 2021
		Time-Based Separation for Final Approach shall be operated from 1st January 2024
		Automated Assistance to Controller for Surface Movement Planning and Routing shall be operated from 1st January 2024
		Airport Safety Nets shall be operated from 1st January 2021
AF #3	Flexible ASM and Free Route	**Direct Routings (DCTs)** shall be operated from 1st January 2018
		Free Route Airspace (FRA) shall be operated from 1st January 2022
AF #4	Network Collaborative Management	**Network Collaborative Management** shall be operated from 1st January 2022
AF #5	Initial SWIM	**iSWIM** shall be provided and operated from 1st January 2025
AF #6	Initial Trajectory Information Sharing	**Initial Trajectory Information Sharing** shall be ensured by ATS providers and by NM from 1st January 2025
		At least 20% of the aircraft operating within the airspace of ECAC countries from the ICAO EUR Region – corresponding to at least 45% of flights – shall be equipped with the **capability to downlink aircraft trajectory using ADS-C EPP** from 1st January 2026.

Fig. 17 - Deployment Target Dates, as specified within Regulation (EU) no. 716/2014

In order to support the impacted operational stakeholders in their deployment activities and in turn to **enable the compliance with the aforementioned mandatory target dates**, the Deployment Programme defines a common and shared roadmap for the implementation of PCP-related elements.

The Programme therefore defines the **expected start and end dates** of deployment for each of the 48 identified Families, therefore **outlining the most appropriate *window*** within which the related implementation activities should be planned and subsequently carried out by the relevant stakeholders impacted by the PCP.

Such window and the associated Initial Operational Capability and Full Operational Capability dates have been identified on the basis of:

- the **readiness for implementation** of the operational improvements, in terms of **technological maturity** of the elements to be deployed and of **availability of standards, regulations and recommended practices** to support a harmonized and effective implementation;
- the **urgency for deployment**, in order to timely pursue the achievement of the associated performance benefits.

The **full picture** of the implementation windows is translated in the chart below, the **overall Gantt chart of the Pilot Common Project deployment**.

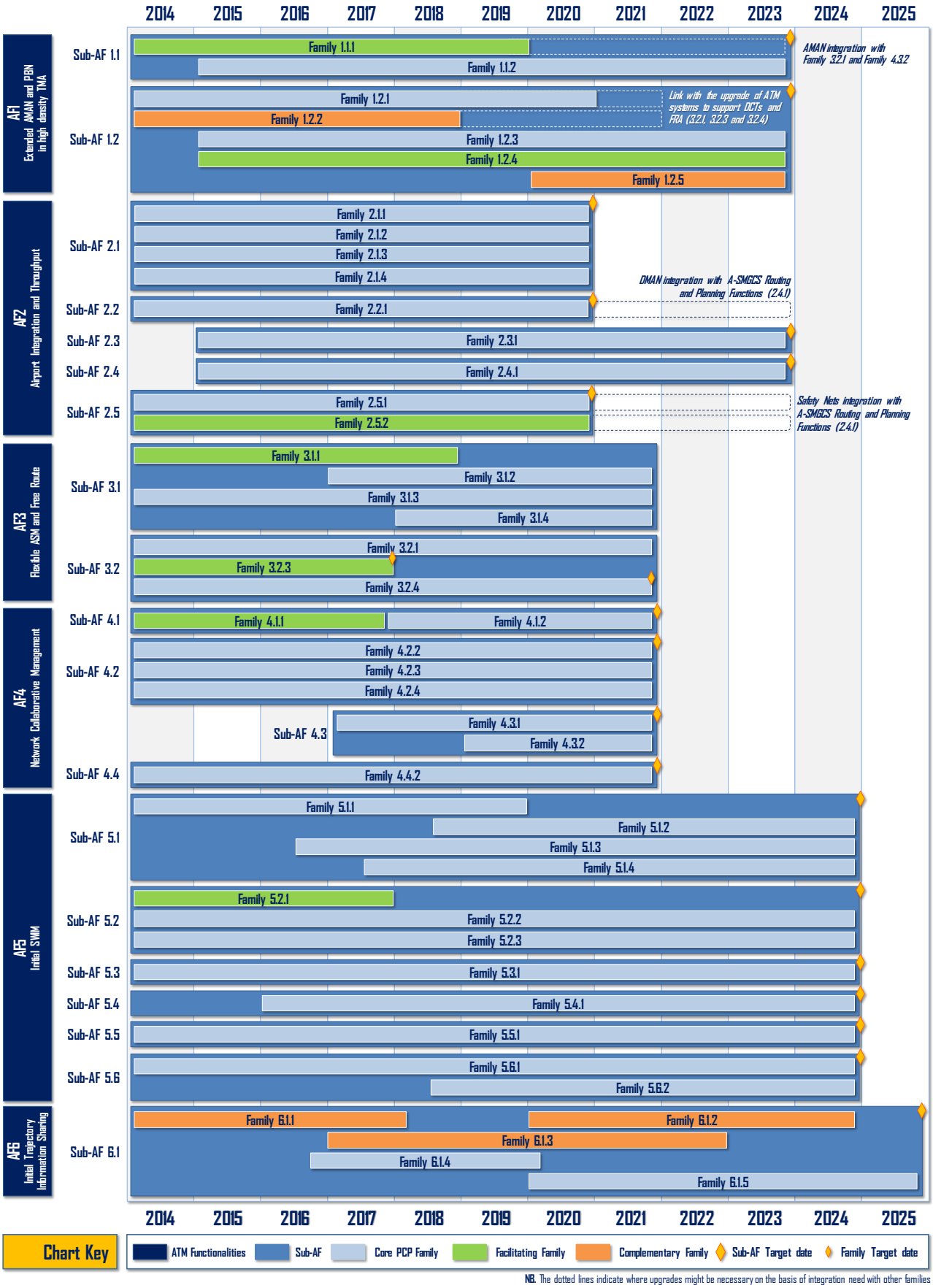


Fig. 18 - Overall Gantt of PCP Implementation

The Deployment approach for a timely PCP implementation

In order to better **streamline and harmonize the Pilot Common Project deployment** across the wide number of Stakeholders impacted by Regulation (EU) no. 716/2014, the Deployment Programme complements the Family-based Gantt with the **identification of the most effective way to complete the implementation** of an ATM Functionality and/or of a Sub-ATM Functionality.

In other words, the **deployment approach** for each AF and Sub-AF represents the **sequencing of the deployment activities** (e.g. of specific families) associated to an ATM Functionality, and corresponds to the **preferred approach to be followed by operational stakeholders impacted by the PCP Regulation** and therefore requested to invest in the implementation of new technologies and/or operational improvements.

It is worth underlining that the proposed **approach** shall be **tailored by involved stakeholders at local level**, as the Family implementation time span might differ from one geographical area / operational environment to another, depending on several elements.

This **approach** has been determined on the basis of the combination and weighting of the following **principles** and **criteria:**

- **Sequence in time**
- **Interdependencies among families**
- **Potential acceleration of performance benefits**

As some families are interdependent and some are pre-requisites to others, the proposed deployment Approaches and the associated flow diagrams must be aligned with these relationships. In particular, the optimum approaches place the Families into the most effective logical and chronological sequencing order, whilst also identifying those Families whose deployment can proceed in parallel, potentially leading to an early realization of the associated performance benefits stemming from the deployment of the technological and operational elements included in each Family.

In addition, it shall be noted that – as the technological and operational elements of the 6 ATM Functionalities are tightly intertwined between each other – the elaboration of the AF-based **deployment approaches** enabled an **overall mapping** of the deployment-related interrelations **between AFs and Sub-AFs**, providing in a unique snapshot a wide-reaching **overview of the full Pilot Common Project implementation**.

By construction, the recommended **deployment approaches per ATM Functionalities are stable in time**, and could only be changed at the occasion of an evolution of the Pilot Common Project Regulation.

Building on the stable recommended deployment approaches per AF laid down in the DP, the **Planning View** will identify by each new edition and for each AF the **next steps on the way to the recommended approach**, turning the required **short term implementation** into the recommended priorities for the next CEF Transport Call that the DP and its planning view shall specify.

At the same time, the **short-term deployment approach** will be complemented in the **Planning View** with a description of the performance contribution from each AF and Sub-AF to the main 4 KPAs that appear in the SES High-Level Goals. This performance assessment, in line with the PCP CBA, will be notwithstanding a qualitative indication to allow identify the most relevant DP Families contributing to a certain KPA. The aim is not to provide quantitative values, nor to amend or update the benefits part of the initial CBA, but to flag the performance benefits.

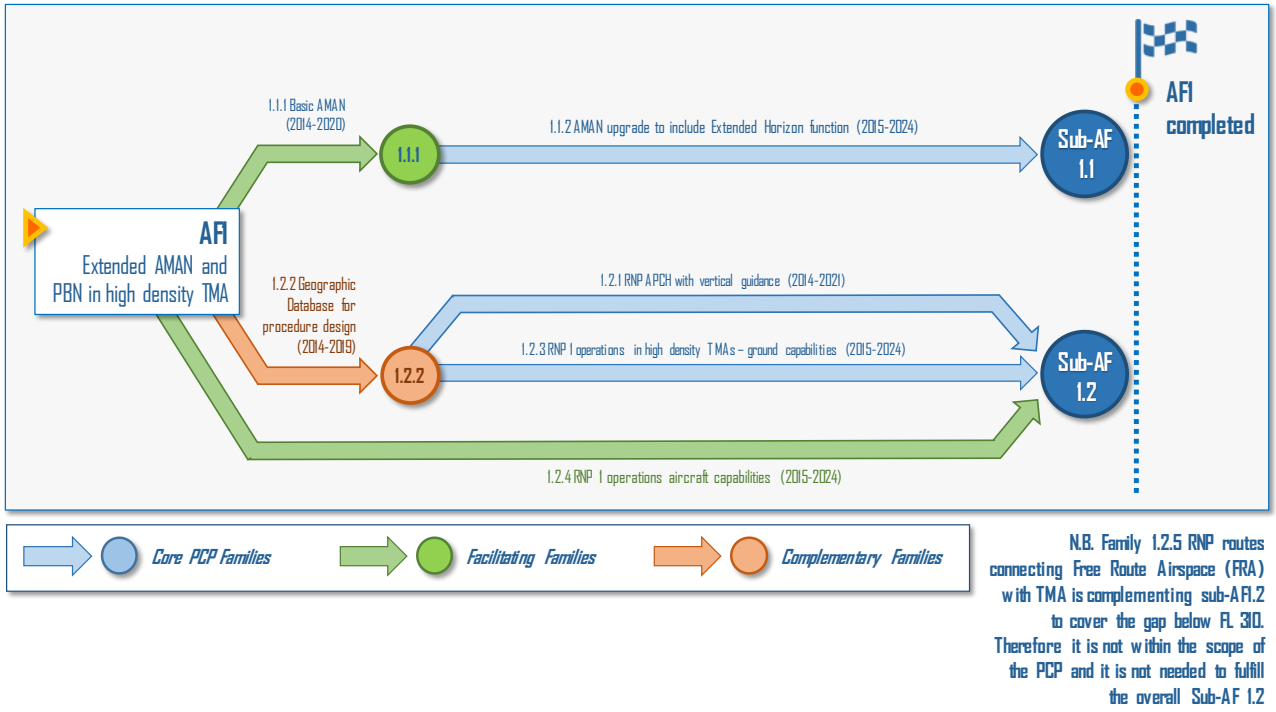
It must be noted that the **AFs and sub-AFs cannot be seen as isolated projects**. They are interconnected and there are interdependencies among them within the PCP. These interdependencies are sometimes actual pre-requisites, and sometimes mere enhancements of one functionality over another. In any case, it will be worth giving an **overview of the main linkages** to have them taken into account when describing the Approaches. The overall picture with the interdependencies among the different AFs will be explained at the end of this section, once each individual AF has been detailed. This will give a better understanding to the reader of how all the DP Families are linked.

In the next pages, each ATM Functionality will be depicted with its sub-AFs and DP Families. The diagrams will encompass the corresponding text explaining the families sequence in time and the **deployment approaches** for each Sub-AF.

In the diagrams, a **normal arrow** means that one family is a pre-requisite of the successor family, and therefore should be deployed in sequence, although sometimes part of a predecessor family can start being deployed in parallel with part of the successor family. More specifically, according to the Families clusterization proposed within section 3.1, the **light blue arrows** represent the **core PCP families**, whilst the **green and red ones** respectively indicates the **facilitating and complementary families**.

The **small bubbles** with the Family and Sub-AF numbers indicate that the given family or Sub-AF has been fully achieved, whilst the **dark blue bubbles** indicate the achievement of the Sub-AF.

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



AF1 is divided into **two sub-AFs**: Extended AMAN and PBN in high density TMAs.

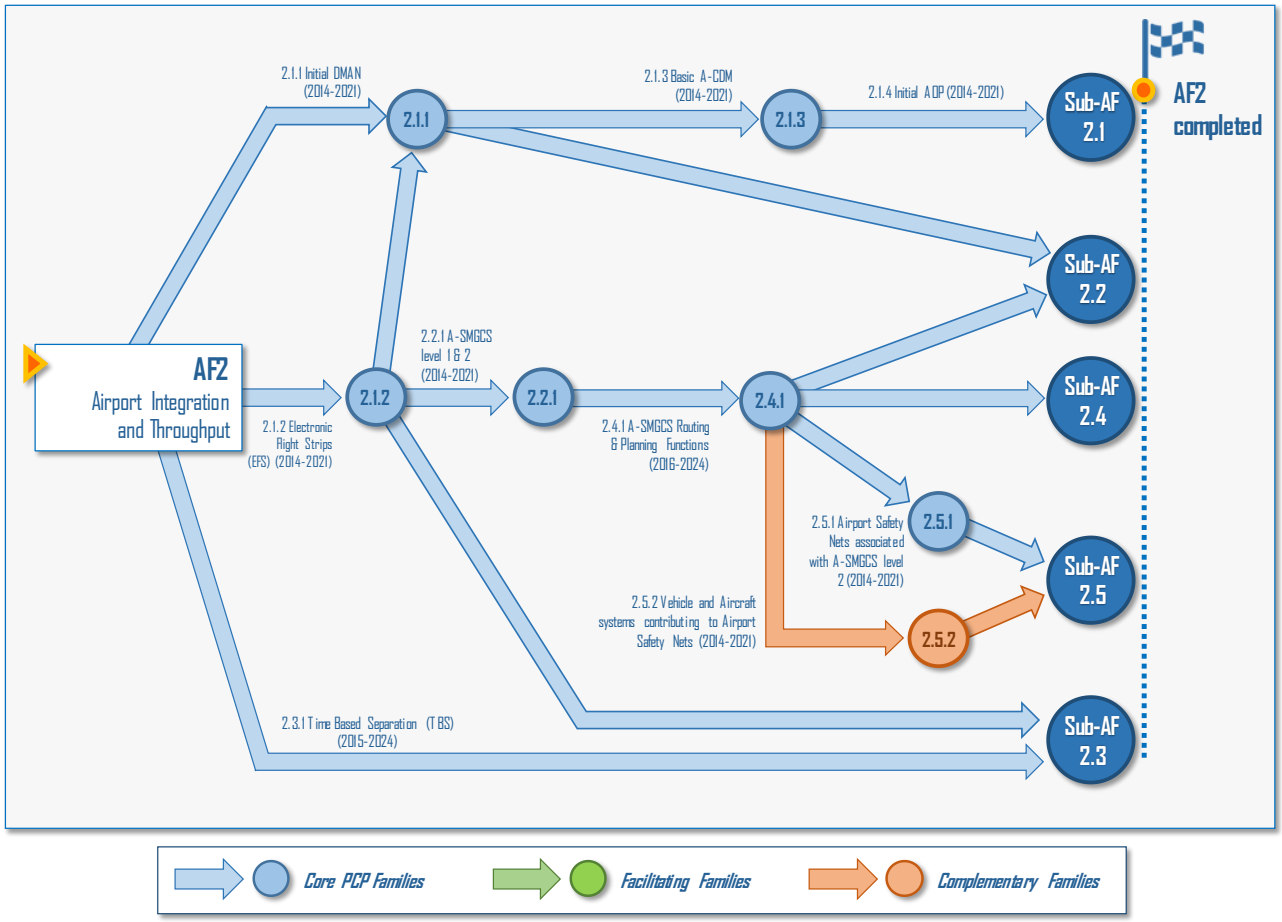
To achieve the **Extended AMAN** implementation, the DP includes *Family 1.1.2 AMAN upgrade to include Extended Horizon function*. This Family describes the core of the Extended AMAN Sub-AF, and although the Basic AMAN is also included in the DP, the full Extended AMAN functionality could be deployed directly without having previously a Basic AMAN.

The second Sub-AF, **PBN in high density TMAs**, comprises RNP-based operations. RNP procedures are based on quality assured geographical data stored in databases, thus *Geographical Database (Family 1.2.2)* has been introduced. Based on accurate geographical data the *RNP Approach* with vertical guidance *(Family 1.2.1) and RNP1 Operations in high density TMAs (ground capabilities) (Family 1.2.3)* should be implemented. Finally, *RNP routes below Free Route Airspace (Family 1.2.5*), is not strictly part of the

Regulation but is addressing a gap in PCP connecting Free Route Airspace with TMAs, delivering additional benefits in terms of cost-effectiveness, predictable profiles, and fuel saving if implemented.

It should be noted that RNP 1 is not mandatory in the PCP for the airspace users, *RNP1 operations (aircraft capabilities) (Family 1.2.4)*. However, desirable performance would only be achieved once the aircraft are equipped to be able to both use RNP 1 and RNP APCH capabilities.

AF2 – Airport Integration and Throughput



AF2 is divided into **five sub-AFs**: Departure Management Synchronised with Pre-departure sequencing, Departure Management integrating Surface Management Constraints, Time-Based Separation for Final Approach, Automated Assistance to Controller for Surface Movement Planning and Routing and Airport Safety Nets.

Sub-AF 2.1, **Departure Management Synchronised with Pre-departure sequencing** requires the integration of the Initial Departure Management and of the basic A-CDM systems, in order to support optimised pre-departure sequencing. *Family 2.1.2 Electronic Flight Strips* is also a pre-requisite for the achievement of this Sub-AF. Finally, the Initial AOP which will be fed by the Initial DMAN and A-CDM is crucial to connect the relevant stakeholders and to share the data and information related to the different status of planning phases. *Family 2.1.4 Initial AOP* is also interdependent with *Family 4.2.4 AOP/NOP Information Sharing*. All these elements contribute to achieving S-AF 2.1.

Sub-AF 2.2, **Departure Management integrating Surface Management Constraints** will require the A-SMGCS level 1 & 2 fully implemented (*Family 2.2.1*). Specially A-SMGCS is required to provide the optimised taxi-time, which would be integrated into the Initial DMAN. DMAN integrating A-SMGCS constrains using a digital system, such as Electronic Flight Strips, integrating "Airport safety Nets associated with A-SMGCS Level 2" supplemented by an advanced A-SMGCS routing function shall be integrated into flight data processing systems for departure sequencing and routing computation. Therefore, to

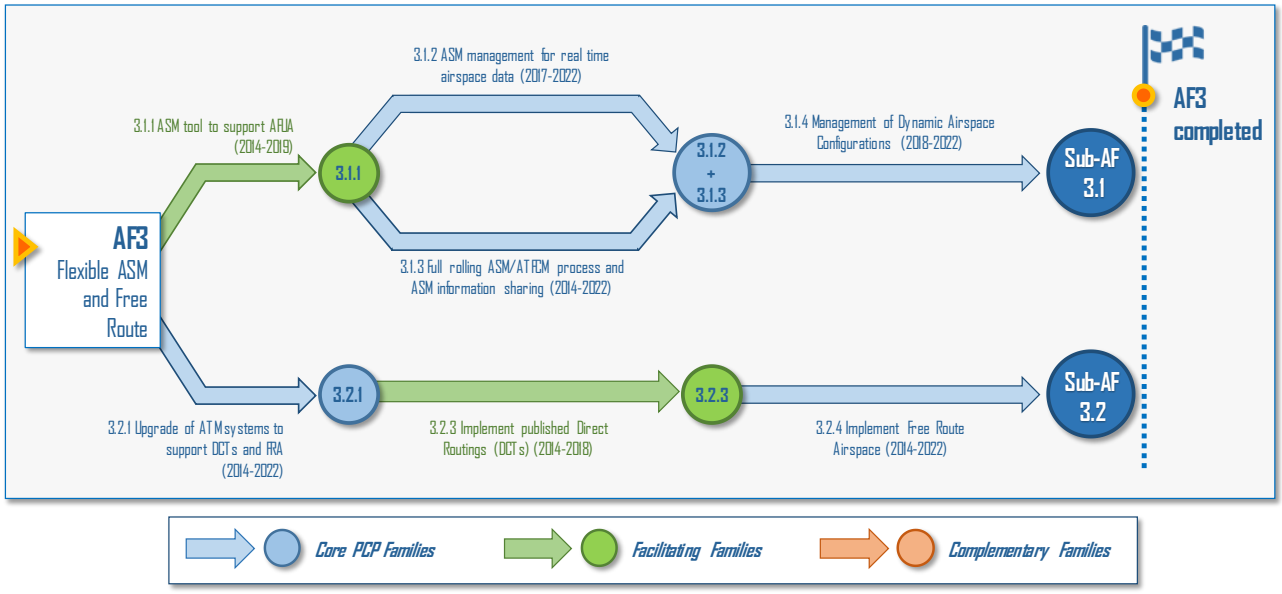
successfully achieve this Sub-AF, *Families 2.1.1, 2.1.2, 2.2.1,* and part of *2.4.1* need to be implemented to achieve S-AF 2.2.

Sub-AF 2.3, **Time-Based Separation for Final Approach** is reflected in the DP by the *Family 2.3.1* and with its implementation, the separation of aircraft in sequence on the approach using time intervals instead of distances will be enabled. The *Family 2.1.2 Electronic Flight Strips* will enhance the performance delivered by TBS. Both Families will contribute to achieving S-AF 2.3.

Sub-AF 2.4**, Automated Assistance to Controller for Surface Movement Planning and Routing** is covered by *Family 2.4.1 A-SMGCS Routing & Planning*. *Families 2.1.2, 2.2.1* are the pre-requisites to implement the routing and planning functionalities (automatic generation of taxi routes with the corresponding estimated taxi time and management of potential conflicts). All these Families contribute to achieving S-AF 2.4.

Sub-AF 2.5, **Airport Safety Nets** will be covered by *Families 2.5.1 ASN associated with A-SMGCS level 2* and *2.5.2 Vehicle and Aircraft systems contributing to airport safety nets*. It should be noted that *Family 2.4.1* FOC Date is currently 01/01/2024 while *Families 2.5.1* and *2.5.2* which both depend (partially) on *2.4.1* output have their FOCs currently set at 01/01/2021. It should be extended to 01/01/2024 to match with *2.4.1* FOC. It should also be noted that *Family 2.2.1 A-SMGCS Level 1 and 2* is a pre-requisite to *Families 2.5.1, 2.5.2* and *2.4.1*. All these Families contribute to achieving S-AF 2.5.

AF3 – Flexible Airspace Management and Free Route



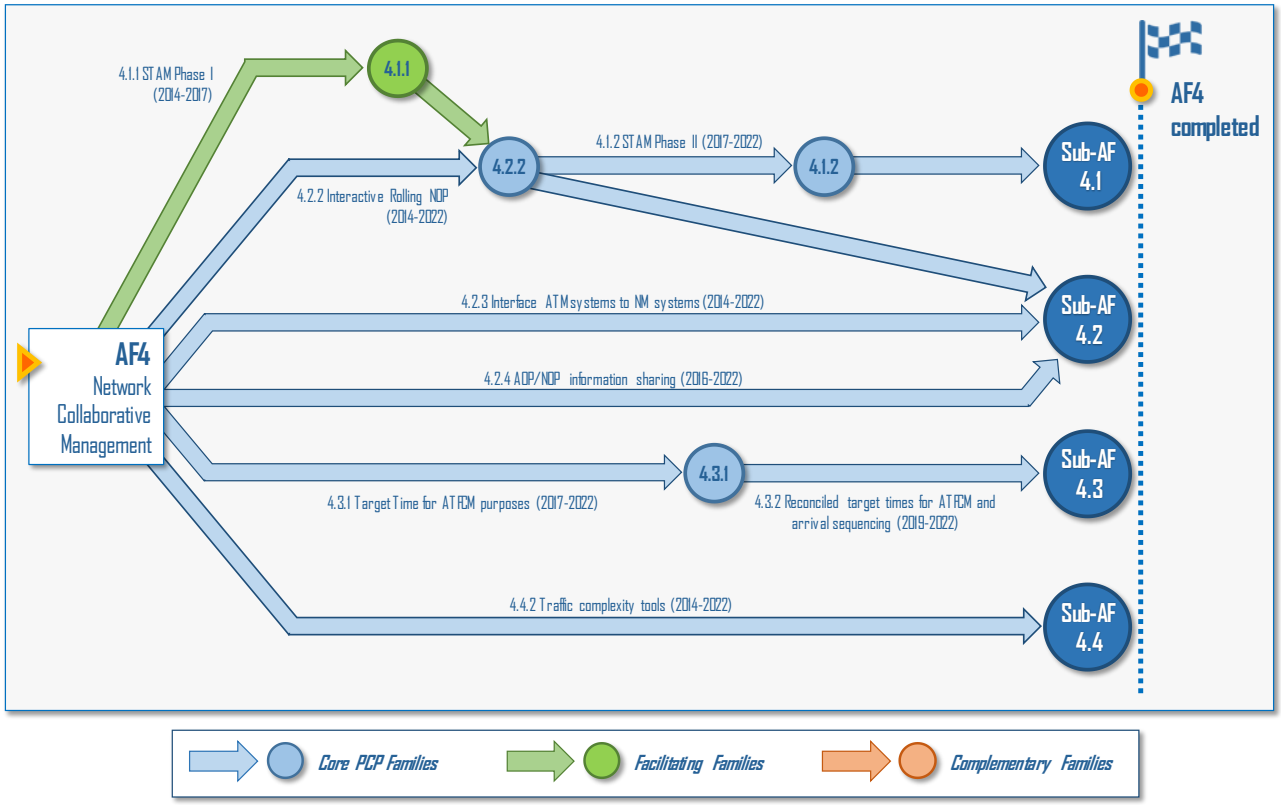
AF3 is divided into **two sub-AFs**: Flexible Airspace Management and Free Route.

Flexible Airspace Management requires airspace management tools to support AFUA and Dynamic Airspace configurations. This Sub-AF requires interaction and real time data exchange between ASM, ATFCM and ATC systems during planning and execution phases. The deployment approach goes through families *3.1.1, 3.1.2* and *3.1.3*, partially enabling the achievement of *3.1.4 Management of Dynamic Airspace configurations*, which will support the dynamic airspace configurations for DCTs and FRA. This is not a mature concept and still requires further developments and validations, therefore the deployment approach cannot yet be fully established.

With regards to **Free Route**, the approach focuses on the ATM systems upgrade (Flight data processing system, including HMI) to support the DCTs and Free Route (*Family 3.2.1*), which is a pre-requisite for FRA (*Family 3.2.4 Implement FRA*). To facilitate early implementations before the target deployment date, FRA may be implemented through intermediate steps (*Family 3.2.3 Implement published DCTs*). The

implementation of FRA is dependent on system upgrades, airspace design and airspace reservations involving civil/military coordination including OAT routes.

AF4 – Network Collaborative Management



AF4 is divided into **four sub-AFs**: Enhanced Short Term ATFCM Measures, Collaborative NOP, Calculated Take-off Time to Target Times for ATFCM purposes, and Automated Support for Traffic Complexity Assessment.

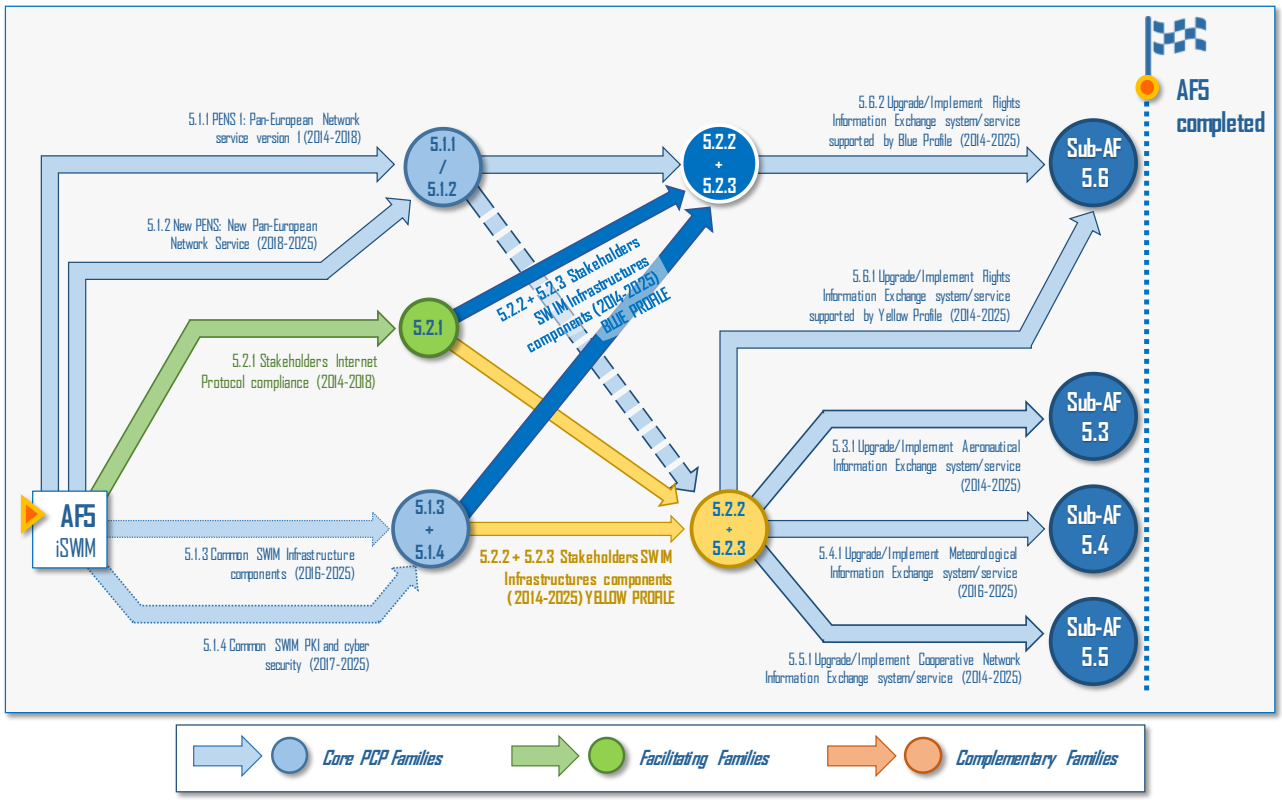
The first Sub-AF, **STAM**, comprises STAM Phase I and STAM Phase II in the DP. STAM Phase I is a predecessor of STAM Phase II, but the deployment of STAM Phase I is not a mandatory task due to the fact that STAM Phase II focuses on network workflow procedures and STAM Phase I is more locally focused. It will be with the STAM Phase II tool and procedures, once implemented, that the ATFCM planning will be managed at network level by the Network Manager ensuring an efficient relationship between NM, FMP and airspace users. STAM Phase II needs the new information management platform described in *Family 4.2.2 Interactive Rolling NOP*. This is the reason why the deployment approach for this Sub-AF goes through 4.2.2 and 4.1.2.

The **Collaborative NOP** as described in the PCP regulation needs to integrate the NOP and the AOP information. Therefore, the *AOP/NOP information sharing* (Family 4.2.4), which is the technical data layer on the collaborative NOP, is part of the deployment approach together with the *Interactive Rolling NOP* (Family 4.2.2). The *Interface ATM systems to NM systems* (Family 4.2.3), which addresses the message exchange between NM systems, ANSPs ATM systems and AU/FOC/WOC flight plan filing systems in respect of collaborative flight planning, could be deployed in parallel with 4.2.2 and 4.2.4.

The third Sub-AF, **Calculated Take-off Time to Target Times for ATFCM purposes** is still pending of full validation, and hence the deployment approach cannot be fully established yet. *Family 4.3.1* comprises the part of the Sub-AF that is ready to be implemented, consisting on the transmission of the calculated target times to allow an early partial optimisation from a local point of view. However, the reconciliation of multiple local target time constraints, coming from the airport, the ANSPs or Network DCB processes is still to be validated.

Finally, **the Automated Support for Traffic Complexity Assessment** will be achieved directly through the implementation of *Family 4.4.2 Traffic complexity* tools. This Family is enabling a better capacity management, which will enhance the ATFCM and Free route. It is therefore connected with *Family 4.1.2* STAM Phase II and *Families 3.2.1 Upgrade of ATM systems to support DCTs and FRA* and *3.2.4 Implement FRA*.

AF5 – Initial System Wide Information Management



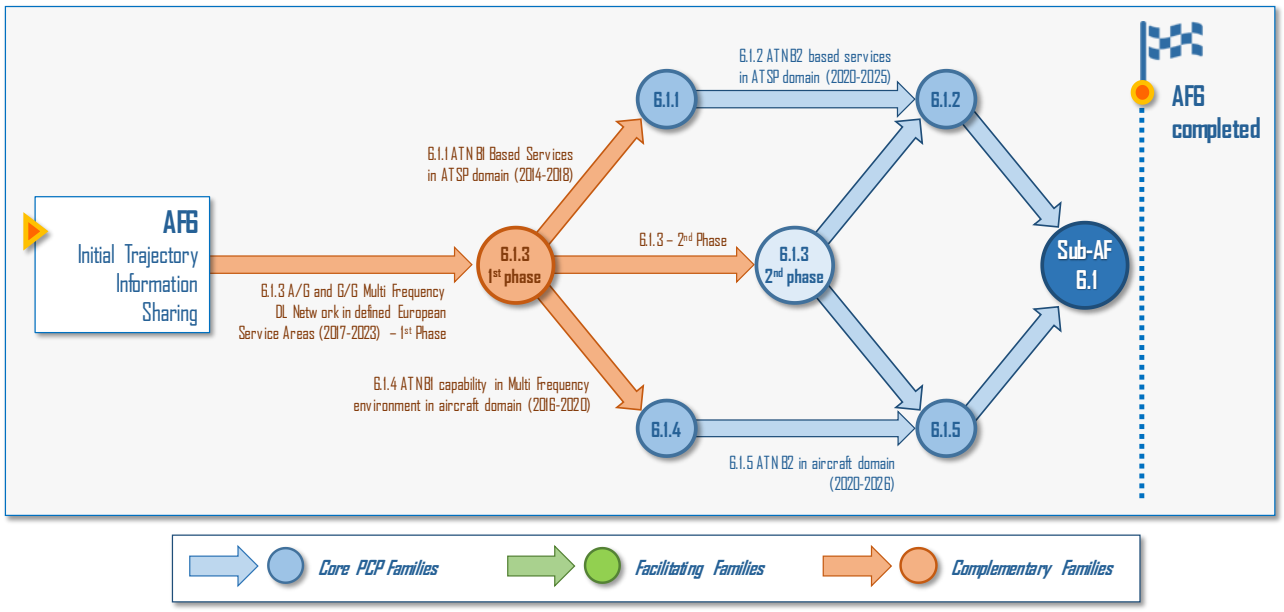
AF5 is divided into six sub-AFs: Common infrastructure components, SWIM Technical Infrastructure and Profiles, Aeronautical information exchange, Meteorological information exchange, Cooperative network information exchange and Flight information exchange.

For the first Sub-AF, **Common infrastructure components**, the DP includes a set of four Families to cover the full infrastructure components as described in the Regulation. For the successful implementation of SWIM, the proper governance and registry is paramount, but however some Stakeholders have already initiated the implementation of the SWIM infrastructure components even without the governance in place. While 5.1.3 deals with the common components governance and registry, Family 5.1.4 deals with the dedicated stakeholders' components.

SWIM Technical Infrastructure and Profiles include the Blue and Yellow SWIM profiles. In this diagram, a coloured dark blue arrow has been used to indicate the Blue Profile, and the dark yellow arrows mark the Yellow Profile. The Blue profile is to be used for exchanging flight information between ATC centres and between ATC and Network Manager, and thus it is essential to deploy Family 5.2.1 to its achievement, but also Families 5.1.4 and 5.1.3. For the Blue SWIM profile, in parallel Families 5.1.1 *PENS 1* and 5.1.2 *New PENS* (transition phase to migrate from PENS 1 to New PENS is expected from 2017 to 2018) will also be required.

Aeronautical information exchange, Meteorological information exchange and Cooperative network information exchange sub-AFs can be implemented in sequence directly once the Yellow Profile is available. However, the **Flight information exchange** Sub-AF would also require the availability of the Blue profile.

AF6 – Initial Trajectory Information Sharing



AF6 has **only one Sub-AF**, which is the Initial Trajectory Information Sharing.

The **Initial Trajectory Information Sharing** consists of the improved use of target times and trajectory information, including where available the use of on-board 4D trajectory data by the ground ATC system and Network Manager System. The approach to successfully achieve the full AF6 deployment goes through two phases based on a phased approach for the implementation of the A/G DL communication infrastructure through *Family 6.1.3* and the initial implementation of the DLS IR as prerequisite for AF6:

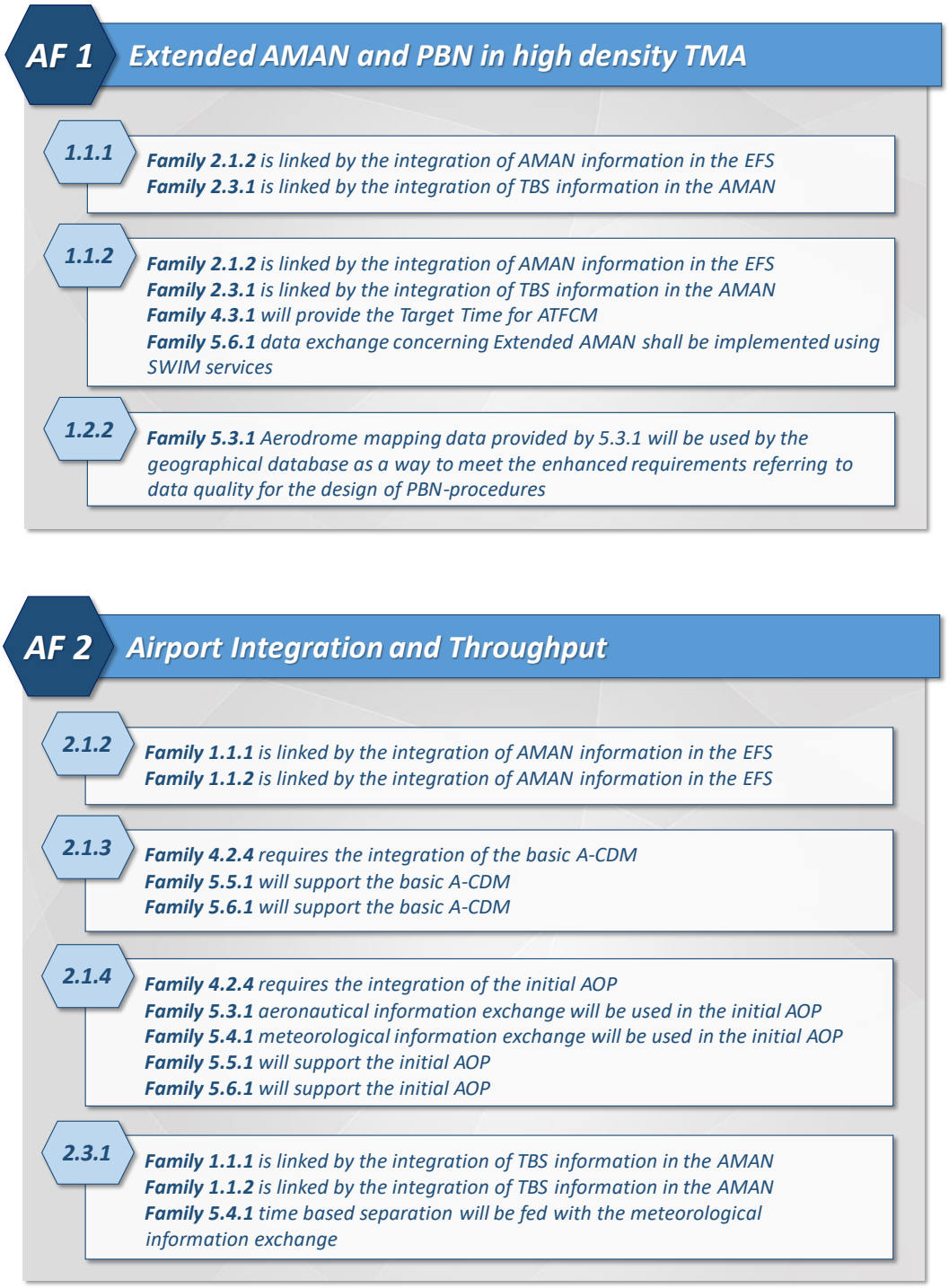
1. During the first phase, *Family 6.1.3 1st Phase* (VDL Mode 2 Multi Frequency upgrade) will provide the required VDL Mode 2 network performance to support the implementation of CPDLC as per DLS IR (EC 29/2009 and amendment). The first phase of *Family 6.1.3* is deployed in parallel with *families 6.1.1* (ground capabilities to support CPDLC) and *6.1.4* (airborne capabilities to support CPDLC).
2. During the second phase, the focus of *Family 6.1.3* implementation will be the increase of the A/G DL network capacity primarily through the deployment of "Model D" Target Solution per ELSA study results. (Note: Preparatory activities for the second phase are performed in parallel to the first phase activities for Family *6.1.3*.) This network optimisation is necessary to support the increased data volume produced by the downlink of the ADS-C EPP aircraft trajectory data that is implemented parallel to *Family 6.1.3* through families *6.1.2* (ground capabilities to support ADS-C EPP) and *6.1.5* (airborne capabilities to support ADS-C EPP)

Family 6.1.3 implementation will be completed (i.e., the required network capacity will be provided with the second phase) before *family 6.1.2* and *6.1.5* implementations will be completed.

Benefits expected from Family 6.1.2 (ADS-C EPP/ground) implementation can only be achieved after the implementation of Family 6.1.5 (ADS-C EPP/airborne). However, there is currently neither a clear mandate for airspace users to implement Family 6.1.5, nor sufficient planned (within PCP timeframe) availability (in terms of supported aircraft types) of avionic components to pursue the full implementation of Family 6.1.5.

Interdependencies among the 6 ATM Functionalities and the DP Families

As noted at the beginning of the deployment approach section, the **DP Families and each AF are not isolated projects**. There are many interdependencies among the different activities needed to successfully deploy the PCP. These interdependencies appear in all AFs, and sometimes they are due to the fact that **some elements of one AF are enablers for another AF**, or because **a given Sub-AF will be enhancing the performance and capabilities of another Sub-AF**. This section aims at explaining the main interdependencies within all the ATM Functionalities illustrating the linkages among the DP Families.



AF 3 Flexible ASM and Free Route

3.1.2
Family 4.2.2 *interactive rolling NOP will enhance the real time airspace data exchange*
Families 5.3.1, 5.5.1 and 5.6.1 *will support the information exchange systems required for the management of real time airspace data*

3.1.4
Family 4.4.2 *traffic complexity tools will enhance the dynamic airspace configurations*
Families 5.3.1, 5.5.1 and 5.6.1 *will support the information exchange systems required for the dynamic airspace configurations*

3.2.1
Family 1.1.2 *will enhance the systems upgrades supporting FRA*
Family 4.2.3 *information exchange between ATM systems and NM systems will enhance family 3.2.1*
Family 4.4.2 *traffic complexity tools will enhance family 3.2.1*
Families 5.3.1, 5.4.1, 5.5.1 and 5.6.1 & family 5.6.2 *information exchange systems will facilitate the FRA implementation*

3.2.4
Family 5.6.1 *Flight information exchange systems (yellow profile) will enhance the FRA*
Family 5.6.2 *Flight information exchange systems (blue profile) will enhance the FRA*

AF 4 Network Collaborative Management

4.1.2
Family 3.2.1 *will be supported by the STAM Phase II*
Family 5.5.1 *interfaces with all AF4 families for access to Network information*

4.2.2
Family 3.1.2 *will be enhanced by the interactive Rolling NOP*
Family 5.5.1 *interfaces with all AF4 families for access to Network information*

4.2.3
Family 3.2.1 *will be enhanced by the interface of ATM systems to NM systems*
Family 5.5.1 *interfaces with all AF4 families for access to Network information*
Family 5.6.1 *is linked with the SWIM interface*

4.3.1
Family 1.1.2 *will use the Target Time information*

4.3.2
Family 5.6.2 *blue profile may be used to exchange the reconciliation of multiple local Target Time constraints*

4.2.4
Family 2.1.3 *basic A-CDM information will be integrated in the AOP/NOP*
Family 2.1.4 *initial AOP information is a prerequisite to be integrated in the AOP/NOP*
Family 5.4.1 *will provide the meteorological information*
Family 5.5.1 *interfaces with all AF4 families for access to Network information*

4.4.2
Family 3.1.4 *will be enhanced by the traffic complexity tools*
Family 3.2.1 *will be enhanced by the traffic complexity tools*
Family 5.5.1 *interfaces with all AF4 families for access to Network information*

AF 5 Initial SWIM

5.3.1

Family 2.1.4 *iAOP will be supported by the aeronautical information exchange systems*
All families in 3.1 *will require the aeronautical information exchange systems*

5.4.1

Family 2.1.4 *initial AOP will be fed with the meteorological information exchange*
Family 2.3.1 *is linked through the provision of real time data regarding the wind speed*
Family 4.2.4 *will integrate the meteorological information provided*

5.5.1

Family 2.1.3 *will be supported by the cooperative network information exchange*
Family 2.1.4 *will be supported by the cooperative network information exchange*
Family 3.1.2 *management of real time airspace data will be supported by cooperative network information exchange*
Family 3.1.4 *will be supported by the cooperative network information exchange*
All AF4 families *interface for access to Network information*

5.6.1

Family 1.1.2 *data exchange concerning Extended AMAN shall be implemented using SWIM services*
Family 2.1.3 *will be supported by the flight information exchange (yellow profile)*
Family 2.1.4 *will be supported by the flight information exchange (yellow profile)*
Family 3.1.2 *management of real time airspace data will be supported by the flight information exchange (yellow profile)*
Family 3.1.4 *dynamic airspace configurations will be supported by the flight information exchange (yellow profile)*
Family 3.2.1 *will be enhanced by the flight information exchange*
Family 3.2.4 *will be enhanced by the flight information exchange (yellow profile)*
Family 4.2.3 *is linked with the SWIM interface*

5.6.2

All families in 3.2 *will be supported by the blue profile*
Family 4.3.2 *may use the blue profile to exchange the reconciliation of multiple local Target Time constraints*
Family 6.1.2 *will require the Flight Object (FO) to be implemented*

AF 6 Initial Trajectory Information Sharing

6.1.2

Family 5.6.2 *the Flight Object (FO) will be required by family 6.1.2*

3.3 SDM Synchronization and Monitoring Approach

One of the main SDM responsibilities concerns the **synchronization of the SESAR Deployment Programme** realization, together with its coordination and execution. In this light, efficient and effective technical monitoring of implementation activities are considered pivotal to ensuring the timely implementation of the Programme and the achievement of its expected performance benefits, both taking into account links among families and inter-dependencies between Implementation Projects.

An overview of the key features of the **synchronization and monitoring methodological approach** applied by the SESAR Deployment Manager is outlined in the following Figure and described below.

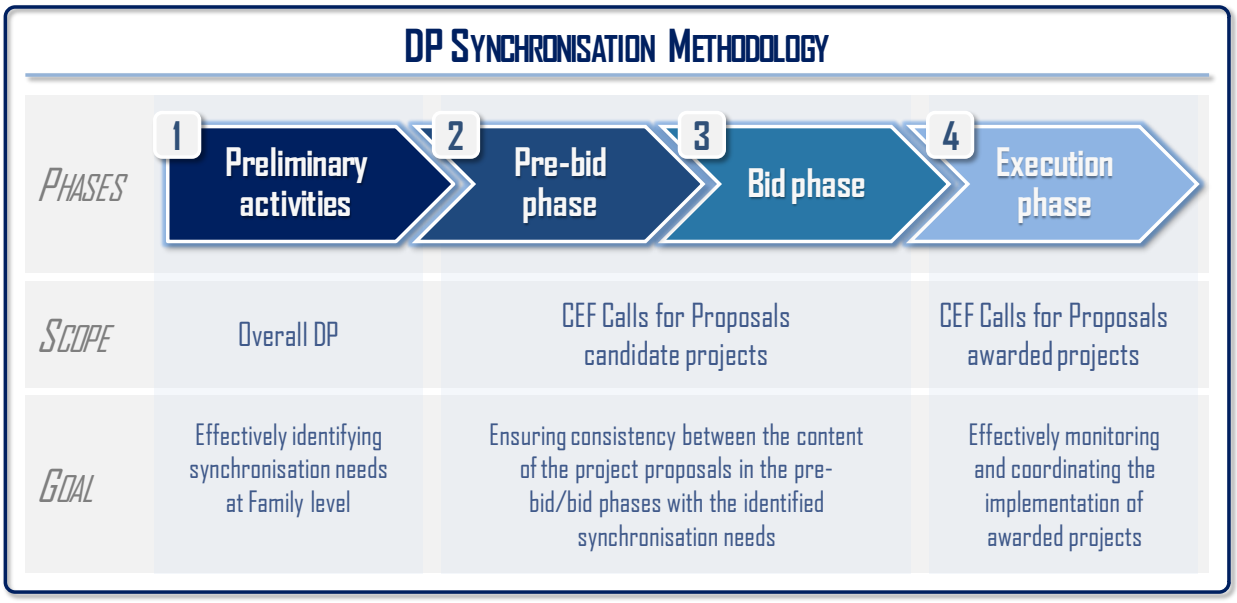


Fig. 19 - Overall SESAR Deployment Manager Synchronization Methodology

1. Preliminary activities

During the SESAR Deployment Programme elaboration, SDM identifies some **key principles** to be applied to the **overall DP**, in order to ensure its synchronized realization. In particular, SDM focused on:

- **Synchronisation needs at Family level:** the Families included in the DP have been analyzed in order to identify the synchronization needs related to the affected Stakeholders groups as well as to the sequencing of the Families themselves;
- **Milestones to be monitored to ensure a coordinated deployment of the Programme:** SDM identified a set of "common" milestones to be monitored during the execution phase; such set includes milestones to be applied to all the Implementation Projects [5] (IPs) and milestones which are specific on the basis of the Family to which each candidate IP belongs.

Such principles are reviewed before each update of the DP, in order to confirm their applicability.

2. Pre-bid phase

The "**pre-bid phase**" anticipates the elaboration of SDM-coordinated proposals in response to periodical CEF Calls for Proposals. At this stage, the operational stakeholders provide "**Indications of Interest**" (IoI) to declare their intention to participate in the Call; SDM analyses them in order to **verify that synchronization needs at "IP level" have been taken in duly account** and **interacts directly with the operational stakeholders**, providing tailored suggestions and guidance in order to support them in

[5] An Implementation project is a deployment or a development initiative established by one or more operational stakeholders under the coordination of the SESAR Deployment Manager, which aims at contributing to the implementation of one (or more) ATM functionalities in the framework of the SESAR Pilot Common Project.

the subsequent elaboration of project proposals through targeted formal feedbacks, concerning technical elements, as well as to planning/sequencing of the initiatives.

Specifically, in the pre-bid phase the SESAR Deployment Manager aims at:

- Checking projects **compliance to PCP Regulation** and the association to the **DP Planning View**, in order to ensure alignment of implementation projects with the DP and provisions for easier coordination and synchronization by SDM in the execution phase;
- **Raising quality of the future proposals** to a common high level standard, in particular through the harmonization of descriptions of the projects and continuous interactions with the operational stakeholders to provide feedback and comments, setting the way for a more efficient monitoring of the activities;
- Supporting **cooperation and dialogue among individual stakeholders** with closely related projects targeting the reduction of the PCP implementation fragmentation, as well as ensuring the adequate level of coordination with military stakeholders potentially impacted by the PCP implementation activities;
- Identifying how submitted initiatives planned to cover the **identified Family level "gaps"** identified in the DP Monitoring View with an impact on the synchronization dimension;
- **Triggering proposals** where relevant gaps identified in the Programme appeared partially uncovered, with potential consequences on other implementation initiatives.

3. Bid phase

The "**bid phase**" consists in the elaboration of the proposals coordinated by SDM to be submitted to INEA in response to the CEF Calls for Proposals.

In this phase, SDM analyses the "**IP proposals"** submitted by the operational stakeholders, containing the necessary information on the Implementation Projects to be included in the proposals, and interact with them in order to enhance the overall quality of the proposals themselves. The activities performed aim at ensuring that the adequate level of detail is provided, with specific regard to monitoring milestones and synchronization/coordination needs. It is important to stress that, as for the "pre-bid" phase, also in the bid Phase continuous interactions with the operational stakeholders take place, also to enhance the quality of the proposal.

In order both to secure the most relevant projects for a timely and effective PCP implementation and to allow for the smooth execution of monitoring synchronization activities, the candidate projects are assessed by SDM through **5 key items**:

- **Continuity of implementation** with projects already awarded through previous CEF Calls;
- Level of **readiness** and nature of the relevant Family associated to the implementation activities;
- Link to and **coverage of one (or more) of the gaps** in the DP Monitoring View;
- **Timeframe** of the implementation initiative;
- **Multi-stakeholder involvement**.

4. Execution phase

An effective and comprehensive monitoring of the Programme during the **execution phase** is necessary in order to ensure the timely and synchronized implementation. In this light, following the awarding of Implementation projects by INEA, SDM monitors the achievements of the ongoing projects and proposes, where necessary, the most convenient **mitigation actions** to ensure a synchronized implementation of the Programme. In particular, the following **high-level principles** underpin the execution phase as a whole:

- **Time**: deployment activities have to be performed within the agreed timeframe, in order to enable the timely implementation of the PCP and the effective achievement of the expected performance benefits;
- **Quality**: the expected scope of the awarded Implementation Projects should be correctly fulfilled, in order to ensure the effective deployment of the PCP;
- **Progress**: a continuous monitoring of the progress achieved is needed to ensure the timely, synchronized and coordinated implementation of the projects and, of the PCP;

- **Costs**: consistency between planned and actual costs represents an important indicator of the capacity of Implementation Projects to fulfill the envisaged deployment scope within the defined timeframe.

The monitoring and coordination activities performed by SDM leverages on data provided by the operational stakeholders:

- At specific "**monitoring gates**", i.e. three times per year, leading to the elaboration of the "**DP Monitoring and Performance View – SESAR FPA**";
- Through "**continuous interactions**" with SDM in order to provide information on completed projects/tasks/milestones/deliverables throughout the year.

In particular, the analysis of the progress achieved by the IPs is made possible through the submission of "supporting documents" and/or relevant information by the operational stakeholders, providing:

- Information on tasks, milestones and deliverables accomplished and actual costs incurred;
- Rationales for delays in tasks, milestones and deliverables.

SDM **reviews and validates** supporting documents and relevant information provided by concerning the projects' achievements; furthermore, it interacts with the operational stakeholders to investigate delays in the achievements and their impacts and to agree on appropriate mitigation actions.

It is worth noting that:

- The gathering of consistent information concerning the IPs achievements is made possible through the **active involvement of all the parties** within the Action (SDM, Implementing partners, Action leader, Activity leaders, PMO) and continuous interactions among them;
- The collection of monitoring information is performed through the **STAR tool**, which represents the main reporting and communication tool within the Actions under SDM coordination.

SDM closely monitors any misalignment ("**discrepancies**") between the planned and actual situation of projects in order to anticipate any potential negative impacts on the overall Action and synchronise and coordinate suitable actions for the effective mitigation. In compliance with the four high level principles stated above, discrepancies are identified when a project overcomes defined thresholds in relation to four main dimensions:

- **Time**: Actual/expected start date or end date of an IP, a task or a deliverable or the actual/revised delivery date of a milestone not aligned with the planned dates;
- **Quality**: "Supporting documents" submitted by the Implementing Partners (IPPs) not in line with the quality requirements set by the SDM and/or not fully covering the expected scope.
- **Progress**: Declarative progress of an IP or a task not aligned with the theoretical progress;
- **Cost**: Actual costs significantly higher (overspending) or lower (underspending) than planned costs at IP/task level;

3.4 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 to the risk of lack of global interoperability, which has been representing a key concern for airspace users in the SDM stakeholder consultation process.

While many countries around the world are implementing ATM improvements, the United States **FAA's NextGen and European Union's SESAR** are the two **largest ATM modernization programs currently under way**. The cooperation between US FAA and EU 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.

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.

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[6] 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 two different frameworks in the period 2016-2017, SDM and SJU are working closely together to ensure that **SESAR is perceived as a single project**. In case of any future development towards a revised US EU MoC, covering the full life cycle, the cooperation of SESAR and FAA will evolve the updated framework according to the same principles.

Objectives

SDM activity on global interoperability and harmonization, including the cooperation with FAA, is feeding the rolling updates of the Planning View of the Deployment Programme in the technical areas, especially with respect to data communication and SWIM. The cooperation with the deployment colleagues in the FAA continuous to make the **Deployment Programme more focused with respect to issues of global interoperability 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 work plans**, including but not limited to Data Comm, SWIM, AMAN/TBFM[7], 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 standards;
- identify **risks to timely implementation resulting from a potential lack in global interoperability;**
- **identify risks on interoperability** and global harmonization, as well as sharing mitigation strategies[8];

[6] 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)
[7] TBFM = Time Based Flow Management and is part of NextGen Portfolio
[8] 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

- assessing the **feasibility and the need for US/EU synchronizing deployment activities** and on 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 Global Air Navigation Plan (GANP) and respective process for the updates of the ASBUs to ensure the reflection on global perspective of the deployment aspects of ATM modernization programmes in Europe and the US. SDM also contributes to the Global Air Navigation Industry Symposium (GANIS) process to reflect the needs of the European deployment stakeholders accordingly. The coordination on global interoperability aims to 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 Planning View contains the mapping of the Programme with the ICAO GANP/ASBUs. A **mapping of ATM MP, DP, ICAO ASBUs and NextGen** is ongoing and will be provided to the international stakeholder community contributing to the relevant ICAO processes, with a special focus on the update of the GANP.

State of Harmonisation between SESAR and NextGen

In December 2016 the second edition of the State of Harmonisation Document on the state of US/EU Air traffic modernization and its programs SESAR and NextGen was published simultaneously by SJU/SDM and FAA[9]. The purpose of this regular publication is to provide a high-level summary of the current state of progress towards achieving the necessary level of harmonization and global interoperability between NextGen and SESAR. More broadly, the publication reflects the current and planned collaboration efforts by the United States and the European Union to harmonize and secure the modernization of air traffic management bilateral as well as globally in support of the ICAO Global Air Navigation Plan (GANP) and its Aviation System Block Upgrade (ASBU) programme.

Both NextGen and SESAR recognize the need to integrate the air and ground parts of their respective ATM systems by addressing efficiency needs of flight trajectories planning and execution and the seamless and timely sharing of accurate information. The US–EU harmonization work aims to ensure that modernization and advances in aviation and in the air navigation systems worldwide can be made in a way that supports a high-performing aviation system over time and global cooperation leading to seamless operations and safe and efficient practices for the airspace users and the travelling public.

NextGen and SESAR have together made significant progress in several critical areas since the publication of the first edition of the State of Harmonization in 2014 and the state of harmonization document includes for the first time the full life cycle of the programmes – including deployment. The European deployment stakeholders are invited to contribute their views and expectations for the future progress via the SDM Stakeholder Consultation Platform and via the consultation activities of the Cooperative Arrangements to the different key technical issues (i.e. in particular but not limited to Datalink, SWIM and AMAN).

Outlook to upcoming DP editions

As outlined above, it is foreseen to **incorporate outcomes from the SDM-FAA cooperation work** into the functional views of the SESAR Deployment Programme in order to complement it with a wider global perspective. With respect to ICAO SARPs and guidance material related to deployment, SDM will work in close cooperation with SJU, feeding and supporting the relevant working groups at European level on deployment matters, under the guidance of EC. SDM will further seek **co-operation of the manufacturing industry in this context** (especially airborne manufacturers but not limited to); this activity takes place under the framework of the Cooperative Arrangements with the manufacturing industry according to Regulation (EU) no. 409/2013.

[9] NextGen – SESAR State of Harmonization (Second Edition) – 2016, prepared by the Coordination Committee (CCOM) for the US-EU MoC Annex 1 High-Level Committee

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) no. 409/2013. The key implementation initiatives with respect to DataComm implementation and on SWIM governance will be in the focus and will benefit from the SDM FAA cooperation.