IOP ATC System Requirements (Final IOP TS)

Document information	
Project Title	Flight Object IOP System Requirements & Validation
Project Number	10.02.05
Project Manager	Indra
Deliverable Name	IOP ATC System Requirements (Final IOP TS)
Deliverable ID	D55
Edition	00.03.00
Template Version	03.00.00
Task contributors	
Eurocontrol, DFS, DSNA, Thales, Selex, Indra	

Abstract

This technical specification contains the requirements to support Ground to Ground IOP Management.Some of these requirements are derived from TMF INTEROP D846 and others are inherited from ED-133.The amendments as well as their application (temporary or permanent) regarding ED-133 has been identified in the traceability provided in the appendix A. The partially matured topics have been moved to Appendix B and Appendix C provides guidelines for the development of the future ICD.

Disclaimer:

The document is not complete in scope (e.g. topics not yet tackled, topics for which agreement is pending – ref. to Appendix B) and requirements are "In Progress" (more work is needed to reach a fully validated set of requirements).

The content of the document is considered mature enough to continue the development work necessary to reach the full maturity of IOP solution.

Authoring & Approval

Prepared By - *Authors of the document.*		
Name & Company	Position & Title	Date
[redacted] DFS	[redacted]	28/10/2016
[redacted] EUROCONTROL		28/10/2016
[redacted] DSNA		28/10/2016
[redacted] DSNA		28/10/2016
[redacted] Thales		28/10/2016
[redacted] Thales		28/10/2016
[redacted] Thales		28/10/2016
[redacted] Selex		28/10/2016
[redacted] Selex		28/10/2016
[redacted] Indra		28/10/2016
[redacted] Indra		28/10/2016

Reviewed By - *Reviewers internal to the project.*		
Name & Company	Position & Title	Date
[redacted] DFS	[redacted]	28/10/2016
[redacted] EUROCONTROL		28/10/2016
[redacted] DSNA		28/10/2016
[redacted] DSNA		28/10/2016
[redacted] Thales		28/10/2016
[redacted] Thales		28/10/2016
[redacted] Selex		28/10/2016
[redacted] Selex		28/10/2016
[redacted] Indra		28/10/2016
[redacted] Indra		28/10/2016
[redacted] Indra		28/10/2016

Reviewed By - *Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.*		
Name & Company	Position & Title	Date
[redacted] DSNA	[redacted]	04/11/2016
[redacted] EUROCONTROL		04/11/2016
[redacted] Thales		04/11/2016
[redacted] EUROCONTROL		04/11/2016
[redacted] ENAIRE		04/11/2016
[redacted] DFS		04/11/2016
[redacted] Thales		04/11/2016
[redacted] DSNA		04/11/2016

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

[redacted] NATS	[redacted]	04/11/2016
[redacted] ENAV		04/11/2016
[redacted] ENAV		04/11/2016
[redacted] EUROCONTROL		04/11/2016
[redacted] EUROCONTROL		04/11/2016

Approved for submission to the SJU By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date
[redacted] DFS	[redacted]	07/11/2016
[redacted] EUROCONTROL		07/11/2016
[redacted] DSNA		07/11/2016
[redacted] Thales		07/11/2016
[redacted] Selex		07/11/2016
[redacted] Indra		07/11/2016

Rejected By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date
<Name / Company>	<Position / Title>	<DD/MM/YYYY>

Rational for rejection
None.

Document History

Edition	Date	Status	Author	Justification
00.01.00	28/10/2016	Final	[redacted]	New Document. There was an input/task from the IOP Task Force in order to clarify the requirements for the Interoperability. An Analysis Team is defined with the aim to support the clarification of the requirements for the Interoperability. Inside the Analysis Team several Features was defined,

				grouping the open issues regarding to the Interoperability, in order to facilitate the scope and the management of the task coming from the IOP Task Force. The output from these Features, previously defined into the Analysis Team, is a set of specific requirements for the Interoperability which are defined inside this document.
00.02.00	15/11/2016	Final	[redacted]	Implementation of comments from SJU assessment.
00.03.00	14/12/2016	Final	[redacted]	New requirements regarding to the following features: • Feature#2 (management of FO Flight Script) • Feature#9 (WIFO) • Feature#5 (Control Sequence Hadling) • Feature#8 (SSR Codes)

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

Table of Contents

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

List of tables

List of figures

Executive summary

The Interoperability (IOP) between different ATC Systems represents an important part of the SESAR fundament. This document contains the Technical Specifications for the Step-1 evolution prototypes of IOP capable ATC Systems. Most of the requirements in this TS are derived from the operational needs specified in TMF INTEROP D846 The other requirements represent a partly modified subset of the ATC Interoperability Standard requirements established by the EUROCAE Working Group 59 in 2009 – documented in the ED-133[1].in addition with some new requirements to address the open issues raised during the IOP prototype development and validation phases.

Work performed within this period can be aligned with the ENB-03.01.01 “System Interoperability with Air and Ground Data sharing.” However, the scope of this document is only the Ground-Ground Interoperability.

The predecessor of this document, worked out by the SESAR project P10.2.5 is D52- (VP841)“IOP ATC System Requirements edition 00.01.00”[4]. The counterpart within the SWIM layer/subsystem is developed by SESAR P14.01.04 (D44- 005 (BP TS))[8], which allocates other ED-133 requirements. The allocations of requirements between those two technical projects have been closely coordinated. The tracing of requirements is given with respect to originator ED-133 requirements and to the SESAR document 10.02.05 D52, to D846 edition 00.01.00 4.5/5.5.1 TMF INTEROP Technical Note for 2016[3], to SESAR Deliverable 10.01.07 D120 edition 00.01.00 Technical Architecture Description – Cycle 2015 [5].

Functionality required to achieve Ground–Ground interoperability has been divided into features. These features provide a functional decomposition that allowed the analysis team to focus in the subjects that makes the core of the IOP standard. A set of these features was considered necessary to develop the initial IOP and therefore were the ones treated in this deliverable. Those features are:

- Feature 1: Coordination & Transfer
- Feature 2: Flight Script management
- Feature 3: Informative distribution
- Feature 9: Transversal technical functionality to support data exchanges in the IOP network.

The requirements to be selected out of ED-133 (V1.0 dated June 2009) which are in scope of initial IOP and IOP V&V exercises have been elaborated in an intensive working period with several workshops by all project members, which consist of operational and technical experts from Industries and ANSPs. It was found that some of the ED-133 requirements needed to be adjusted for initial IOP and IOP V&V exercises along with some new complementary requirements. Therefore, in parallel a process of collecting concrete recommendations for ED-133 evolutions has been called into life by P10.2.5, which will involve higher level SESAR treatment. The “Rational” cells in the Requirements Definition section of this document are used to guide this process. A traceability matrix has been added to map the new requirements with the existing ED-133 requirements and D52 requirements, along with their operational need, stated in TMF/IOP Technical Note D846.

The initial parallel evolution of IOP for NM will have an impact on the current ATC IOP requirements.

This document is only aiming to tackle the requirements from the functional blocks related with IOP that define the interactions between several stakeholders. That is, any requirement that defines a local behavior of a system and its implementation, not affecting an external stakeholder will not be considered in the scope of this specification.

It must be noticed that this version of the document presents the view of the Analysis Team at the date of publication of this release and will continue evolving.

Disclaimer:

The document is not complete in scope (e.g. topics not yet tackled, topics for which agreement is pending – ref. to Appendix B) and requirements are “In Progress” (more work is needed to reach a fully validated set of requirements).

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

1 Introduction

The 'Flight Object' (FO) is a concept to support the sharing of consistent flight data between all stakeholders. Its purpose is to ensure that all systems have a consistent view of the flight, and that the data is widely and easily available, subject to appropriate access controls. It is the basis for the interoperability (IOP) mechanism defined by this document. The work performed here can be aligned with the ENB-03.01.01 "System Interoperability with Air and Ground Data sharing." However, the scope of this document is only the Ground-Ground Interoperability.

The fundamental idea is that a single logical entity, the FO is kept up to date by all parties wishing to share information about a flight. All parties use the FO as a reference and keep it updated with the latest information, thereby ensuring that all systems have the most up to date and consistent view of the flight data.

Conceptually the FO is intended to hold all flight data that needs to be shared between any interested stakeholders: Civil ATC, Military ATC, Flow Management Systems, Airport Operators, Aircraft Operators and Aircraft Systems. The FOIPS model was developed to provide a model of the FO data and services required to satisfy the needs of these stakeholders. However, the FO defined in this document is restricted to the flight data that needs to be shared between civilian ATC systems (i.e. a subset of the FOIPS model). This will form the scope of the initial implementation of the FO, however it is expected that the scope of the data held within a FO will grow in the future as more stakeholders implement the FO concept.

The FO concept has been redefined based on the operational needs. The concept and features described in 10.02.05 D52 have been evolved in this document to answer the various necessities. The structure of this document is adapted as per the new features and hence, results significant changes from D52.

1.1 Purpose of the document

This document defines the interface between different instances of civilian ATC Flight Planning Lifecycle & Distribution Systems, in support of En-route and Terminal ATC Operations. It explicitly covers the exchange of real time Flight Information, and makes a number of assumptions about the provision of other types of information. It also positions this document about the other SESAR deliverables as illustrated in the following Figure :

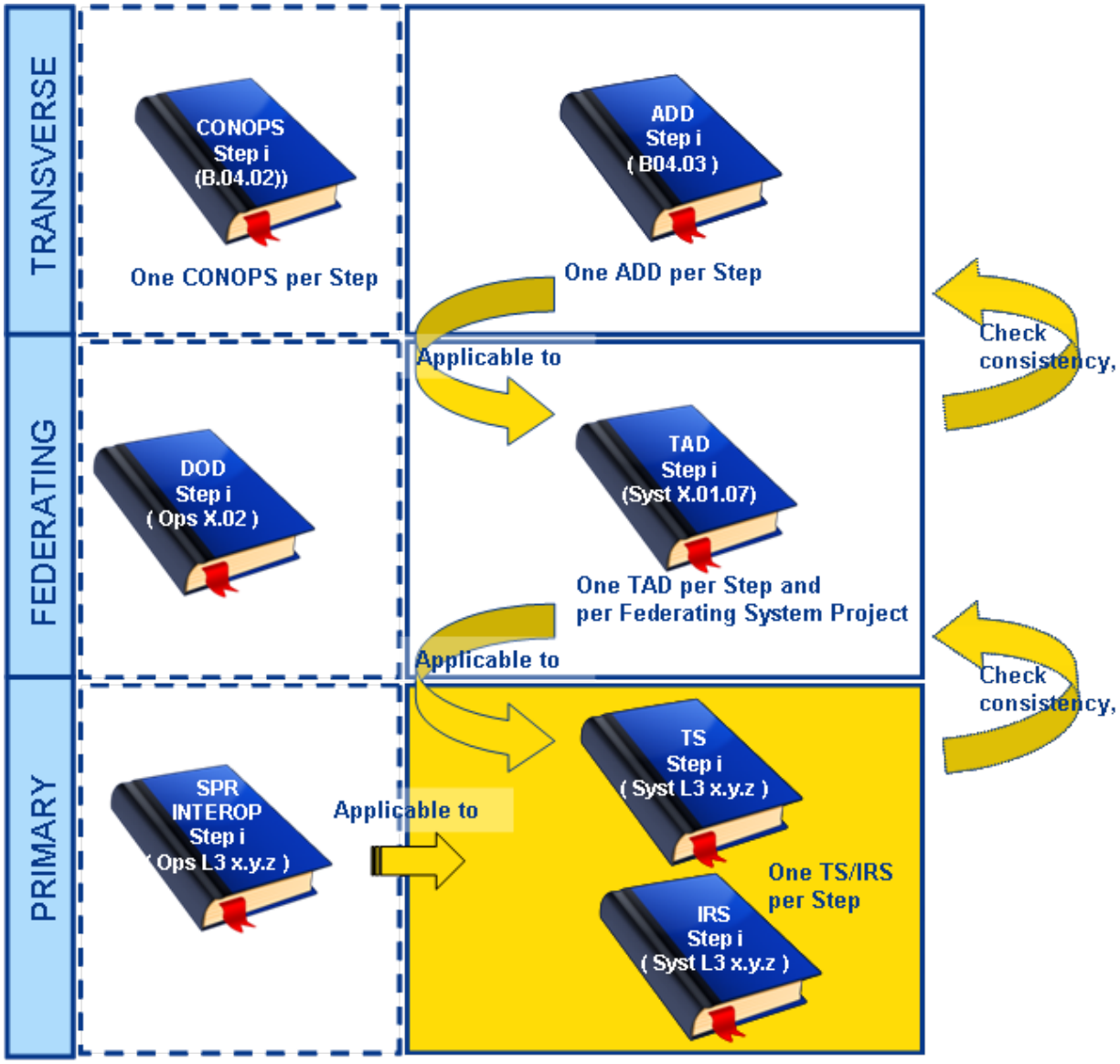


Figure 1.1: TS document with regards to the other SESAR deliverables

This document does not specifically address military to civil or military-to-military coordination, although it may be possible to reuse the mechanisms proposed within this document to also support these kinds of coordination.

This interface has been defined to ensure a consistent view of the flight data across all FDPSs. It is intended to satisfy current operational needs including the European Commission Regulation (No 1032/2006) relating to notification, coordination and transfer of flights between air traffic control units, as well as to provide the basis for future operational concepts including:

- MTCD across system boundaries.
- The distribution of time constraints from AMAN applications
- Negotiation of route amendments with downstream units.

1.2 Intended readership

The primary users to which this document is applicable are the WP 10.2.5 project members.

For information, as user of the prototypes for IOP validation, people using the ATC tools and the HMI users can refer to this document.

Outside SESAR, for standardization purposes, the EUROCAE WG59, who is in charge of maintaining the ED-133 standard, is also interested in the proposed evolutions of the standard issued by the IOP Analysis Team.

1.3 Inputs from other projects

Input material used by WP 10.02.05 is the draft specification of ED-133 published by EUROCAE WG59 in June 2009. The requirements have been outlined from the needs defined in P05.05.01. A particular coordination is set up with WP 14.02.09 “SWIM Platform development and Demonstrator delivery” in order to agree on requirement allocation between Flight Object Server (FOS) and ATC system. In addition, the SWIM services definition is the responsibility of P14.01.04.

Results of WP 10.02.05, in particular developed and verified prototypes, will be used by WP 3 for integration purpose and then by WP 4.3 for validation purposes.

It is to be highlighted that in the context of the Phase 1 and IOP V&V exercises, addressing mainly non regression, a bottom –up approach starting from ED-133 standard has been applied for both 10.2.5 and 4.3 WPs. A more standard approach (top-down) will be proposed in the context of the Phase 2.

P13.02.01 and P07.06.02 have addressed the initial steps for the specification, development of prototypes and IOP V&V exercises where NM is enabled as an IOP system, and MUAC and REIM ATCs are adapted for the inclusion of NM as a new IOP stakeholder

1.4 Structure of the document

The document is divided into six sections as follows:

- Chapter 1: Introduction- This chapter introduces the subject of this document and describes its purpose.
- Chapter 2: General Functional Block Description- This chapter provides a high level view of the scope of the prototype and the limitations within that scope for initial IOP. The general scope of the project is described using a functional block view of the broader Flight Planning Lifecycle & Distribution system in order to illustrate the scope of the requirements covered by this project.
- Chapter 3: Requirements- This chapter forms the majority of the document, and includes the available functional and non-functional requirements for the IOP. It has to be noted that this sections covers only the requirements on the selected features discussed till November in the Analysis Team framework.
- Chapter 4: References- This chapter lists the resources used throughout this document.
- Appendix A: Requirements Consolidation- This contains tracing information from the requirements to ED133, D52 as well as to the 4.5/5.5.1 TMF/IOP Technical Note D846 and the status of each requirement, whether agreed, deleted or to be tackled.
- Appendix B: Pending Topics- This appendix includes the topics which have not been tackled in SESAR 1 due to time constraints. These topics will be addressed in future.

- Appendix C: Data Model Exchange (AIRM/ISRM)- This appendix includes the available FO model and services defined for several features and are subjected to evolve with the advancement of the project.

1.5 Requirements Definitions – General Guidance

ED-133 [1], 05.05.01.D846[3] and 10.02.05.D52 – (VP-841) IOP_ATC_System_Requirements - Edition 00.01.00[4]are the main input for IOP technical specifications. Most of concepts have been described with the reference to the Flight Object specification derived from ICOG I&II work. .. Requirements have been formatted according to SJU template.

A detailed traceability of ED-133 standard toward SESAR Technical Specification is provided in the annex of this document. In addition, for each ED-133 requirement the modifications and relevant impacts on the standard have been depicted, along with the status of each requirement and its traceability with TMF Interop D846. Interoperability requirements are the minimum technical and functional requirements that provide the basis for ensuring compatibility among the various elements of the CNS/ATM system using specific technologies. There is one INTEROP per OFA, (as for the OSED and SPR). The technical, functional, and interface requirements for the defined technologies and the requirements are allocated to the different system domains. The allocation is based on the selected technologies and functions defined in the OSED. The INTEROP is coordinated with the OSA and OPA, and safety and performance requirements that are necessary for interoperability are allocated in the INTEROP. One INTEROP may apply to different domain systems and may impact one or several technical system developments (e.g. Sys Primary projects).

The IOP functional requirements have been organized by the following decomposition:

- General Mechanism
- Coordination and Transfer
- Flight Script management
- What- if Flight Object
- Trajectory management
- Informative Distribution and Data Filtering
- System Wide Information Management
- Other Requirements
- Non- Functional Requirements

1.5.1 Suggested requirements development style

The requirements developed in this TS are intended to support the IOP protocol. The sections are strongly related among them nevertheless, several partners were involved in their development. So it is necessary to establish common rules to grant a similar level of detail and coherency through the whole document. These rules are additional to the requirements development guideline provided in SESAR. The proposed rules are going to be presented in the following points:

1. Local behaviour is not included in the requirements.

The requirements should only describe the information exchanged through the FO data model and the intended use of such information whenever its use is mandatory to any IOP stakeholders. The FO contains several structures of flight related information, but if such information does not have a common and mandatory process to be followed by all the stakeholders, that information should not be

included within a requirement. Note that the available content of the FO is defined at FO model which complements the provided requirements.

Sometimes, there could be recommendations or description of logical behaviours on the processing on information received via the FO but if such processing is not mandatory (it does not directly affects to other IOP stakeholder) then it should be described within a note or paragraph outside the requirements.

Example: The reception of a notification of an error processing a service request should not establish a requirement that forces the processing of that error locally. That is, there should not be requirements stating that the error shall be logged (It does not mean anything to the other IOP stakeholders). The concrete processing is to be defined locally.

Nevertheless, when a "concrete" error is defined and such error forces the receiver to declare itself de-synchronized, then such processing should be defined in a requirement since other stakeholders should be aware of such behaviour.

2. The requirements do not determine a particular data model.

Most of the requirements in the TS are about information that is to be distributed between the IOP stakeholders. There are different reasons to distribute the information:

- FO updates protocol. Example: FO release data, FO request patterns, FO identifier, WIFO structure, SI distribution list… etc.
- Functional updates: Changes related to the flight data that needs to be distributed with a well-defined purpose in the receivers. Example, coordination related data, a route update, etc. These two examples are to be synchronized in the receivers of such information.

When describing the information that is included in the FO, the use of terms that forces a concrete data structure in the FO model should be avoided. Whenever a suggested data structure is already available to cope with the requirement, such suggestion should be included as notes or text surrounding the requirement or with a reference to the proper chapter of the appendix C in which these suggestions are hold. Otherwise, any change in the data model would imply a modification of the requirements themselves. In the short / medium term, an alignment of the FO model with AIRM evolution or FIXM is likely and such alignment should not affect the requirements in the standard.

Example of wrong wording: The FDMP shall set to true the attribute indicating that the flight is in phase….

Example of proper wording: The FDMP shall indicate in the FO that the flight is in phase…

3. The requirements are technical and cannot be used to define an operational concept.

.

TS requirements define the data (and its use) that is to be distributed between IOP stakeholders to accomplish a concrete operational functionality. These requirements are to be supported by the set of operational requirements that define its need within IOP. That is, requirements that define a system behaviour that affects the controller way of working should not be included unless they are supported by the corresponding operational requirements.

Example: A technical requirement to distribute the TFL and display it at the receiver should be based on an operational requirement that is clearly establishing this need. A requirement that establish the distribution of operational data without a complementary one that establishes the use of that data may not be complete.

1.6 Glossary of terms

Term	Definition
A	

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

Term	Definition
Actor	An actor is an implementation independent unit of responsibility that performs a certain role.
Air Traffic flow	The set of all possible flight paths that can be followed between two distant points identified as origin and destination of the flow Can be associated to an origin point (departure flow) or a destination point (arrival flow) only
ATSU	One of ACC, APP or TWR
AoR	The Area of Responsibility of an ATSU
AoI	The volumetric extension of the AoR of an ATSU that allows detecting flights of interest for this ATSU. It is typically conditioned by the need of tactical control, i.e. capability of controllers to mentally integrate the traffic and functions like MTCD. It may additionally include specific rules based on traffic flows. There are as many AoI as there are ATSUs the associated system instance of which is an IOP stakeholder.
AIM Data	Data needed by the System Instance, which are not included in the Flight Object. Some of those data are the IOP AIM object Data that are shared between the IOP stakeholders.
AIM Static data	This is any AIM information that changes at a low frequency (typically at each AIRAC cycle)
AIM Dynamic data	This is any AIM information that can change anytime according to the operational situation.
ADM	This role applies to AIM Static and Dynamic data. The responsibilities of this role are: ▪ Updates locally the value of the data, being responsible for its consistency. ▪ Provides the AIM Data it manages to the AIM Data Publisher.
ADP	This role applies to AIM Static and Dynamic data The responsibilities of this role are: Collect the AIM Data from the Managers. Publish the AIM data to the AIM Data users.
ADU	The responsibilities of this role are: Subscribes to AIM Information set or to a part of it. Receives the updates of the AIM Information set subscribed.
Application scope	The application scope of a constraint is determined by the trajectory portion located between the TSP and the TEP of the constraint. In other words, the portion of trajectory in which a constraint has to be applied.
Application point	Application point of a constraint stands for the point in which the flight starts the maneuvers in order to accomplish the constraint.
C	
Constraint	Any constraint that restricts the preferred trajectory of an aircraft over the IOP area.

Term	Definition
Controlled Time of Arrival	An ATM imposed time constraint on a defined waypoint
CPDLC	It is a data link application that allows for the direct exchange of text-based messages between a controller and a pilot
D	
DADMP	This role applies to AIM dynamic data. It is the concatenation of both ADM and ADP roles for AIM dynamic data.
DADU	The specific role of Dynamic AIM Data User
Distribution Cluster	To ease the distribution of FO data, it has been grouped into clusters of related data. Distribution cluster is the basis element of distribution of FO data.
Desynchronised	An IOP stakeholder is not synchronised for a given Flight Object
Data Centric Publish Subscribe	The first layer of OMG DDS
Data Distribution Service	Data Distribution Service as specified by OMG Also: FDP Data Distribution Service When ambiguity may arise, OMG DDS and FDD are used.
Deferred Clearances	Clearances that do not imply an immediate instruction, but they condition its application to the flight having matched a condition respect to a given position or a given time.
DDS topic	The term DDS topic refers to the concept defined in the Data Distribution Service standard. It is used in this document to differentiate from the FOIPS concept that designates a part of the Flight Object.
E	
ETA min/max	ETA min/max is the earliest/latest ETA at a waypoint, provided the aircraft flies the 4D trajectory at its max/min allowable speed, wind/temp error is also taken into account, in order to guarantee that any CTA defined within associated ETA min/max interval will be satisfied with high probability.
F	

Term	Definition
FDMP	The responsibilities of this role are to: Collect operationally agreed changes on one or more subset (Topic) of Flight Object from contributors. Update the value of the changed Topics of Flight Object, being responsible for the consistency of Flight Object Publish the Flight Object to the subscribed partners Hold the reference value of the Flight Object, and responsibility for publishing this reference value as the FO.
FDC	The responsibilities of this role are to: Locally set the value to a subset of the information constituting the Flight Object. Send the proposed update of the topic, deriving from operationally agreed changes (constraints, orders, messages) to the concerned Flight Data Manager Publisher for partial contribution.
FDU	The responsibilities of this role are to: Subscribe the FO and Receive the updates of the FO
Flight object	The system instance view of a flight. It is the flight object that is shared between the IOP stakeholders.
Flight Script	FO contained data that is composed of the flight specific data that supports trajectory prediction. The script collects: The specification of horizontal legs The specification of vertical level targets The applicable constraints
I	
IFPZ	The IFPS Zone (IFPZ) is the area in which IFPS is responsible for the distribution of flightplans and associated messages to the ATC world.
IOP stakeholder	Any entity that provides information to other entities or that consumes such information using the IOP capabilities. For example: A system instance working for a civilian ATSU (En Route, Approach, or Tower). A system instance working for a military ATSU. Or a combination of the above. A system working for an Airport Authority. A system working for an Aircraft Operator. A system working for an aircraft (FMS). A Central Flow Management Unit (CFMU). In the frame of ED-133, the IOP stakeholder is limited to a system instance working for one or more civilian ATSUs.
IOP area	The area corresponding to the union of the AOR of each IOP stakeholder. This area is unique.

Term	Definition
IOP-capable system instance	A system instance declared as able to participate in IOP. This is a static property that denotes a capability that exists but may be out of service at a given time. An IOP stakeholder has an IOP-capable system.
IOP-enabled system instance	The system instance of an IOP stakeholder for which the IOP capability is currently in operation (enabled). It is a dynamic property of the stakeholder. It is lost as soon as the IOP capability is down.
IOP-disabled system instance	A non "IOP-enabled" system instance.
IOP role	There are several roles that a given IOP stakeholder can play. The role assignment is defined for a given flight-object. The assignment of role changes during the course of the flight represented by the flight-object.
IOP holes	Holes in the IOP area can be two kinds of space volumes: Volumes that are not controlled by an IOP-capable system instance (permanent hole) Volumes that are controlled by an IOP-capable system instance but not currently IOP-enabled (temporary hole)
IOP data	The data items that are transmitted or shared between IOP stakeholders to realise IOP services with QoS
IOP infrastructure	The black box that provides the IOP services from the external actor view point (e.g. controller, ATC function like AMAN)
IOP service	One capability of the IOP infrastructure, answering one or more IOP requirements and activated in several use cases
IOP use case	The description of how IOP services are provided in an identified operational situation
Q	
Quality of Service	Refined into the characteristics extracted from the FOIPS study: Availability, Consistency, Performance (Latency, capacity), Integrity.
P	
Private Strategic Constraint	Strategic constraints known only by one SI.
Publication	The action of a publisher of sending data though the Distribution Service. It corresponds to the publish part of the publish/subscribe pattern.
R	
Relevant Constraint Point	An indicator set for the Application Point, Target Start Point and/or Target End Point of a constraint to identify whether the constraint point is the main target for the trajectory computation.
RTA	Advisory made by the AMAN to allow the good sequencing of the flight in the arrival sequence

Term	Definition
S	
Shared Strategic Constraint	Strategic constraints defined in Adaptation Data in more than one SI.
SI AoI	AoI of a system instance is the sum of the AoIs of the ATSUs deployed within that system instance
SI AoR	AoR of a system instance is the sum of the AoRs of the ATSUs deployed within that system instance
System Instance	A deployed unit that addresses one or more ATSUs
SFPL	The internal core entity which stores the flight intention in each program for developing and advanced ATC system as well as all applicable constraints during the flight lifecycle of the flight within the area of interest
Synchronised	An IOP stakeholder is synchronised for a flight Object when the local SFPL is aligned on the Flight Object.
T	
Target End Point (TEP)	The target end point of a constraint represents the trajectory point in which that constraint is required to be fulfilled.
Trajectory	Representation of the predicted 4D path of an aircraft.
Target Start Point (TSP)	The target start point of a constraint represents the trajectory point in which that constraint is expected to be already accomplished.
V	
Valid FS service request	A FO service request that has succeeded the eligibility, syntactical and semantic checks by the FDMP
W	
WIMP	The responsibilities of this role are: Creation of the WIFO to query a WIC regarding FO changes. Publishing of the WIFO to a unique contributor (WIC). Collects and updates the value of the changed Topics of WIFO, being responsible for the consistency of the WIFO. Provide the agreements regarding the WIFO to the manager of the real Flight Object.
WIC	The responsibilities of this role are: To answer to the WIMP by: - Accepting a proposed WIFO - Rejecting the proposed WIFO Provide a counter proposal to the WIMP by sending the modifications to the proposed WIFO.
What-if Flight Object (WIFO)	It is an alternative Flight Object. It is generated from a real Flight Object and contains the modifications needed to propose an alternative to the real one.

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

Term	Definition
What-if Context	The what-if context in which the Flight Object is defined: “Real world”, “simulation 1”, etc.
WIFO Commit phase	The phase of the What-If on IOP, when all involved IOP Stakeholders accepted the latest shared WIFO, and the WIMP may communicate to FDMP the changes to be applied to the related real FO.
WIFO Counter Proposal	It is a request for change by a WIC to a WIMP on negotiated items that may produce a WIFO update distribution to all WIFO WICs if retained acceptable by WIMP.
WIFO Agreement	There is an agreement between WIMP and all consulted WICs on a WIFO when the locally accepted and distributed WIFO is also accepted by all consulted WICs.
WIFO Agreement Status	The WIFO Agreement Status is the status assumed by WIFO when WIMP has received all consulted WICs acceptance on distributed WIFO
WIFO Committing Status	The WIFO Committing Status is the status assumed by WIFO when WIMP has achieved the WIFO Agreement and WIMP is going to propagate to FDMP the WIFO Changes
WIFO Rejection Status	The WIFO Rejection Status is the status assumed by WIFO when it is rejected by WIMP or by any consulted WIC

1.7 Acronyms and Terminology

Acronym	Description
ADD	Architecture Definition Document
ADR	Airspace Data Repository
AIM	Aeronautical Information Management
AIS	Aeronautical Information System
AIXM	Aeronautical Information Exchange Model
AMAN	Arrival Manager
AMQP	Advanced Message Queuing Protocol
AO	Aircraft Operator
AOI	Area of Interest
AOR	Area of Responsibility
API	Application Programming Interface
ATM	Air Traffic Management
ATT	Actual Time over at Target
APOP	AirPort OPerator
APP	Application point
ATSU	Air Traffic Service Unit
CAP	Controller Awareness Phase

Acronym	Description
CCM	Corba Component Model
CDM	Collaborative Decision Making
CDR	Conditional Route
COP	Coordination Point
CORBA	Common Object Request Broker Architecture
COTS	Commercial Off The Shelf
CPSA	Centre for Advanced Service Provisioning
CTA	Controlled Time of Arrival
DADMP	Dynamic AIM Data Manager Publisher
DADU	Dynamic AIM Data User
DARPA	Defence Advanced Research Products Agency
DB	Database
DBA	Database Administrator
DBMS	Database Management System
DCOM	Distributed Component Object Model
DCPS	Data Centric Publish Subscribe
DDS	Data Distribution Service
DII	Dynamic Invocation Interface
DISR	Defence Information System Agency
DLRL	Data Local Reconstruction Layer
DM	Data Mart
DMAN	Departure Manager
DOD	Detailed Operational Description
DSI	Dynamic Skeleton Interface
DW	Data Warehouse
EAD	European AIS Database
E-ATMS	European Air Traffic Management System
EEC	Eurocontrol Experimental Centre
EJB	Enterprise Java Beans
EMAN	En-route Manager
ESI	EAD System Interface
ETA	Expected time of arrival
ETF	Extensible Transport Framework
ETO	Expected time over a point
EPP	Extended Projected Profile
FCS	Future Combat System
FDBS	Federated Database System
FDC	Flight Data Contributor
FDMP	Flight Data Manager/Publisher
FDMS	Federated Database Management System
FDU	Flight Data User
FMS	Flight Management System

Acronym	Description
FO	Flight object
FOIPS	Flight Object Interoperability Proposed Standard
FOS	Flight object Server
FS	Flight Script
FT	Fault Tolerance
FTP	File Transfer Protocol
GIOP	General Inter-ORB Protocol
GCMS	Genesis Correspondence Management System
HERMES	A Heterogeneous Reasoning and Mediator System
HTTP	Hyper Text Transfer Protocol
ICD	Interface Control Document
IDL	Interface Description Language
IDTF	Interoperability Development Task Force
IIOP	Internet Inter-ORB Protocol
IOP	Interoperability
IP	Internet Protocol
INTEROP	Interoperability Requirements
IRD	Interface Requirements Document
IRS	Interface Requirements Specification
IS	Information System
JDBC	Java Database Connectivity
JMS	Java Messaging Service
LAN	Local area network
LHC	Large Hadron Collider
LRS	Local/Regional Servers
M-ATSU	Military ATSU
MBIS	Mediator Based Information System
MDS	Minimal DataSet
MDW	Middleware
MOM	Message Oriented Middleware
MSL	Mediator Specification Language
MSP	Multi sector planning
MTOM	Message Transmission Optimization Mechanism
NFR	Non-functional requirement
NGOSS	New Generation Operations Systems and Software
NM	Network Manager
NP	Negotiation Phase
NV	National view
OACE	Open Architecture Computing Environment
ODBC	Open Database Connectivity
OE	Operational Entity
OEM	Object exchange model

Acronym	Description
OMA	Object Management Architecture
OMG	Object Management Group
ORB	Object Request Broker
OS	Operating System
OSED	Operational Service and Environment Definition
POA	Portable Object Adapter
PKI	Public Key Infrastructure
QoS	Quality Of Service
RAID	Redundant Array of Independent Disks
RMI	Remote Method Invocation
RPC	Remote Procedure Call
RT	Real Time
RTA	Required time of arrival.
RTPS	Real Time Publish Subscribe
SAP	System Awareness Phase
SAS	Secure Attribute Service
SESAR	Single European Sky ATM Research Programme
SFPL	System Flight Plan
SI	System Instance
SIT	Slot Issued Time
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SPR	Safety and Performance Requirements
SQA	Sequenced time of arrival
SRM	Scalable Reliable Multicasting
SSL/TLS	Secure Socket Layer/Transport Layer Security
TAD	Technical Architecture Description
TCP	Transmission Control Protocol
TEP	Target End Point
TFM	Traffic Flow Management
TIM	Technical Infrastructure Monitoring
TS	Technical Specification
TSA	Temporary Segregated Area
TSIMMIS	The Stanford-IBM Manager of Multiple Information Sources
TSP	Target Start Point
TTA	Target Time of Arrival
TTO	Target Time Over
UDDI	Universal Description Discovery and Integration
UDP	User Datagram Protocol
UML	Unified Modelling Language

Acronym	Description
UR	User Requirement
VPN	Virtual Private Network
W3C	World Wide Web Consortium
WAN	Wide Area Network
WSDL	Web Service Description Language
WSF	Web Services Frameworks
WWW	World Wide Web
XML	Extensible Mark-up Language
XMPP	Extensible Messaging and Presence Protocol
W3C	World Wide Web Consortium
WAN	Wide Area network
WIC	What-if Contributor
WIFO	What-if Flight Object
WSF	Web Services Frameworks
WIMP	What-if Manager/Publisher
WSDL	Web Services Description Language

2 General Functional block Description

2.1 Context

In the SESAR EA context the future ATC System is presented as drawn in the following figure [Reference:Technical Architecture Description – Cycle 2015[5]. This identifies the allocated functional blocks as:

- The 'G/G IOP Management': It provides the management, dissemination and synchronization of flight objects with other ATSU's in the IOP area
- The Flight Planning Lifecycle Management Data Distribution: It provides the management of the system flight plans (SFPL) for IFR and VFR flights from creation until their deletion from their lifecycle perspective.
- The Trajectory Prediction & Management: It provides the planned flight trajectory according to the flight intent (planned route and tactical constraints), aircraft intent (where extracted from downlinked data) and predefined environment data and constraints.
- The Coordination and Transfer: It provides the management of coordination and transfer of flights between "internal" sectors and with external ATSUs, civil/military coordination, pre-departure clearance coordination, and the processing of oceanic clearances.
- The Air-Ground Datalink Communication (AGDC) functional block comprises the communication function (as defined in 10.07.01-D03[6]) that provides the means to exchange air-ground datalink communication and surveillance messages through standardized datalink communication protocols, relayed by external air-ground data communication networks (i.e. the ATN and/or the ACARS networks).
- The Arrival Management (AMAN) functional block is responsible for determining an optimal arrival sequence at designated aerodromes and providing associated advisories such as time to lose/gain and Controlled Time of Arrival based on downlinked ETA min/max at the metering point. The sequence and advisories are distributed to the Controller Working Positions and to external clients. The AMAN also allows the controller to manually alter the arrival sequence.

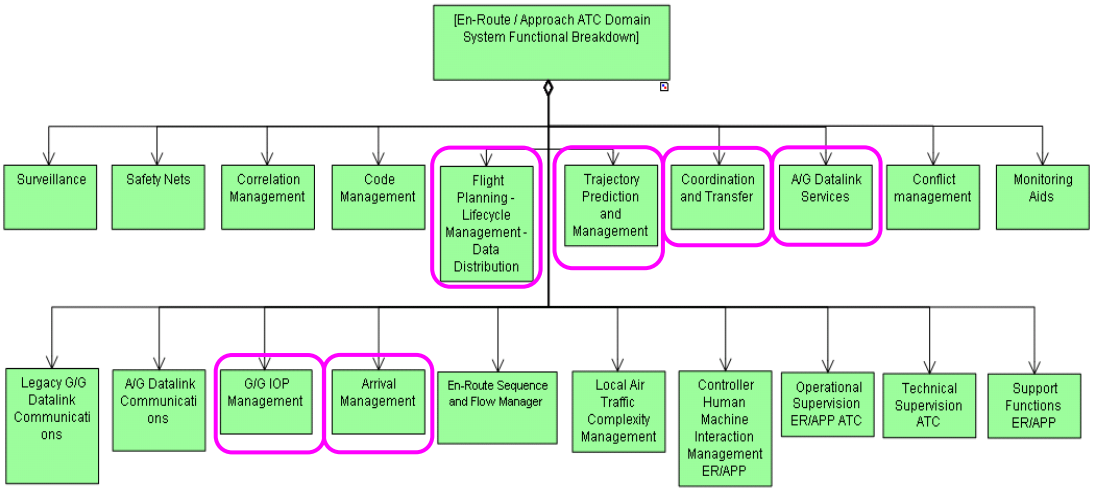


Figure 2.1: ER/APP ATC System Functional Blocks

From a bottom up approach, the project 10.2.5 has described the G-G Interoperability architecture in its D02 deliverable [2]as shown below:

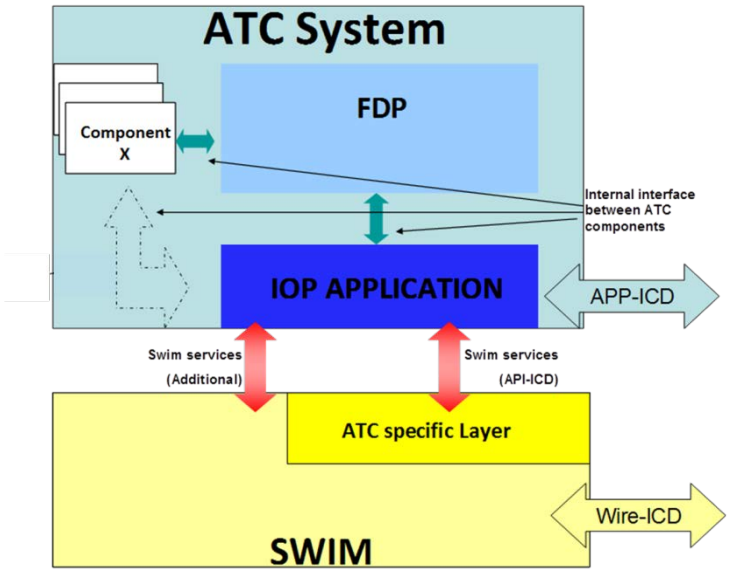


Figure 2.2: Basic IOP ATC architecture

The explanation of each item is depicted as below:

2.1.1 System Wide Information Management

The SWIM component including the ATC specific layer is entirely a WP14 responsibility. The SWIM application will be provided by P14.02.09; whereas the SWIM services definition is the responsibility of P14.01.04. The definition of the SWIM services (Additional & API ICD) was supported by P10.2.5.

The ATC-Specific Layer:

This layer of SWIM is specifically devoted to ATC. It is considered as accepted that the SWIM will have a generic profile and specific ones for the ATM domains that require it.

In this specific profile, WP14 has located IOP ATC specific things such as the FO Management at a low level (for example, DDS clusters definition for the FO distribution clusters, FO management parameters… etc.). Two arrows for SWIM services are represented in the interface, since the ATC will not only use ATC specific but also generic services. For example (Network supervision related, security, etc.).

2.1.2 ATC System

The general En-Route ATC System development is a WP10 responsibility. For evolving it towards Ground-Ground IOP capability, it is complemented by a new system component, which was named within P10.2.5 and adapted by P4.3 with “IOP Application”. Its main internal interface is with an evolved Flight Planning Lifecycle & Distribution and a number of other ATC system components. Their functional scope is briefly described in the following.

The FDP

It represents the functionality of a classic FDP (legacy or in development). In P10.02.05, such functionality will be modified in order to support the new IOP features. In phase 1 and IOP V&V exercises, the FDP functionality modification will be minimized to what is required to support agreed scenarios.

The IOP Application

It can be considered as an additional component to an ATC System. It will support anything that is specifically related with the FO handling, such as the API-ICD interface between ATC systems or the FO management handling.

This new component needs the domain information computed and provided by FDP, as well as to feed FDP with the information arrived in the FO updates. The interface between IOP Application component and the FDP is internal to each system and therefore it is out of the scope of this document.

In the scope of this document is mainly The APP ICD, which describes on a higher level the services between ATC-ATC related to Flight Objects, is not yet addressed.

Internal ATC System interfaces and other ATC System components

In the ATC system, there are a number of other components. These components may be affected depending on each specific local ATC system architecture. Those interfaces are however considered as internal and are not in scope of this document.

However, the internal interfaces defined inside each ATC system will be mostly defined between the FDP and the new IOP application.

2.2 Functional block Modes and States

N/A.

2.3 Major Functional block Capabilities

As stated in §2.1 six ATC Functional Blocks are addressed by the P10.2.5 prototype which is directly specified by functional requirements (behaviour, services etc.) and the Interfaces which are of three types:

- private – to ATC System components like FDPS and HMI, they are not scope of this document
- public – APP ICD between ATC IOP systems
- public – SWIM Application ICD

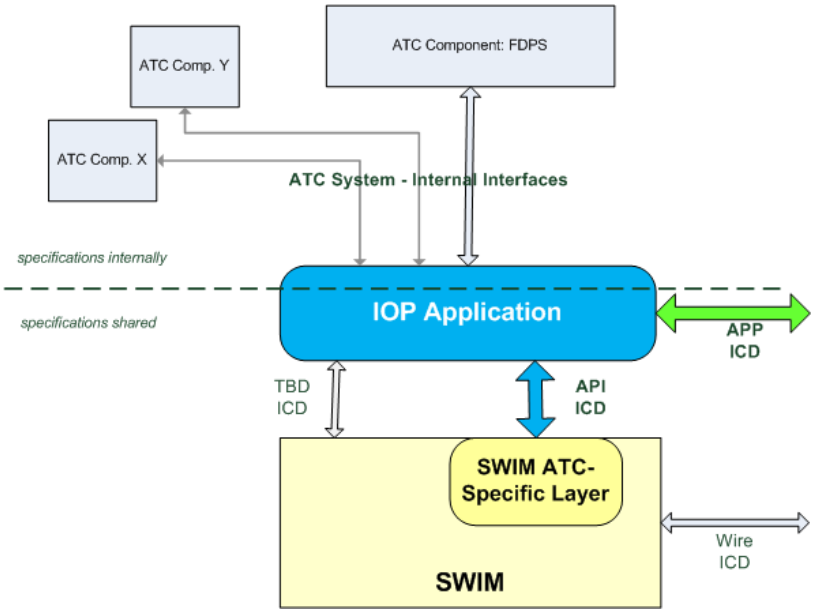


Figure 2.3: Scope of the TS

Within D52 IOP ATC System Requirements[4], the aforementioned functional blocks have been detailed in functional requirements. The Technical Specification described in §3 of this document further elaborates on these requirements which have been evolved based on operational needs and consultation with the operational community, being.

General FO Mechanisms (MECH)	This functional block deals with the different roles of IOP capable System Instances (SI) i.e. FDMP, FDC or FDU, the transition between them and the management of a Flight Object (FO) by the FDMP (Flight data Manager/Publisher). This functional block includes as well the management of the Flight Object as a whole or in parts (the clusters). It handles its creation, the relation of FO and SFPL, its content and properties. Finally this functional block deals with the validity checking that need to be included in all the stakeholders systems within the IOP domain. Validity checking ensures that services are requested, and events are published, in accordance with defined syntactic, semantic and eligibility rules.. Ref. §3.1.1
What-If FO Mechanisms (WIFO)	This functional block deals with the special needs of a parallel What-If FO handling and mechanism between the proposing and negotiating SIs with their roles and the translation of the agreed What-If FO content into its parent real FO. What-If, among others, supports electronic dialogue/negotiations. Ref. §3.1.2
Interaction with SWIM Technical Layer (SWIM)	This functional block represents the functions within the IOP Application which are needed to correctly interact with the lower level SWIM Technical Infrastructure,. Ref. §3.1.6.2

Coordination and Transfer (COTR)	This functional block comprises the management of Coordination and Transfer (C&T)of flights between the two sectors belonging to the different system instances. Ref. §3.1.2
Flight Script Management (FSMG)	This functional block deals with the Management of the Flight Script (as one of the main clusters of an FO) between the IOP stakeholders (FDMP and FDCs). The Flight Script contains the flight data required at the input to the trajectory prediction process (e.g. Expanded Route and Constraints), and when used in conjunction with other data, allows the FDPSs to create consistent, although not identical, trajectories for each flight. Ref. §3.1.4
IOP Data Filtering and IOP Data Informative Distribution (MECH,INFO)	This functional block deals with the filtering, which is a mechanism to avoid system instance overloading from too much data being distributed and to enable rational use of processing resources. FO filtering is mainly performed by the FDMP (at sending time). IOP data filtering defines not only what should not be sent but also what is to be sent and to whom. This functional block describes particularly the mechanism needed for Informative FO distribution, respectively subscription of a third IOP stakeholder (e.g. non crossed SI) to a FO service. Ref. §3.1.4
Trajectory Management (SCTJ)	This functional block deals with the management of the trajectory computed by FDMP across the whole IOP Area, its generation, update etc. The requirements define the scope (SC), the triggering conditions, and the outputs of trajectory(TJ) prediction calculations. It also addresses the calculation of crossed volumes Ref. §3.1.5

2.4 User Characteristics

N/A

2.5 Functional

2.5.1 Functional decomposition

See **§2.**3.

2.5.2 Functional analysis

See **§2.**3

2.6 Service View

This section provides detailed information regarding to Interoperability (IOP) related Services. The related IOP services are also defined into the D65 - European ATM Service Description for the ATC Flight Object Control Service [10].

2.7 Assumptions

N/A

3 Requirements

This section contains the functional and non-functional requirements.

When a requirement states “The SI shall *verb…”,* it must be understood as:

- If SI is the FDMP, it will do the *action*
- If the SI is FDC, it will request the FDMP to do the *action*.

3.1 Functional Requirements

3.1.1 General Mechanisms

This section describes the IOP roles handing, basic FO management, FDMP Role transfer, alignment of local SFPL to FO and vice versa, etc.

3.1.1.1 IOP Roles Handling

The different stakeholders interested in the FO are identified according to their responsibility regarding a given flight. Each of these stakeholders will be given a role for a flight object and this role will be modified dynamically with the progression of the flight.

The roles are applied to System Instances (SI). An SI is considered the physical system in which one or more ATSUs are deployed. It is considered that the AoR/AoI of an SI is the sum of the AoR/AoI of the ATSUs deployed within that SI.NM is considered as an SI for the sake of this specification. Although NM is not considered in initial IOP its integration is foreseen in a deployable IOP phase.

The following section determines the rules used to identify the roles applied to each SI concerned for a given FO as well as their generic responsibilities regarding the FO update.

3.1.1.1.1 Flight Data Manager Publisher (FDMP)

This section describes how the FDMP role for a given flight is successively taken by different IOP stakeholders.

It covers the IOP stakeholders:

- in charge of civilian ATSUs
- in charge of the Network Manager (NM)
- who join the IOP community (AO, APOP, M-ATSU)

Some of the requirements defined below may need to be extended to include these stakeholders.

Definition:

A System Instance is at a given time FDMP-eligible (a dynamic property) for a given FO if all the below conditions are true:

- The SI is IOP-capable: a static property of the SI,
- The SI is currently IOP-enabled: a dynamic property of the SI,
- The SIcan identify a valid SFPL for the FO: a dynamic property for the considered Flight Object

In all other cases the SI is not FDMP eligible for this flight object.

3.1.1.1.1.1 FDMP role initialisation

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0001
Requirement	A SI shall create a Flight Object for a flight if and only if: - it predicts the flight traverses the IOP area, and - it assesses to be its FDMP, and - the Flight Object does not yet exist, and - the SI is the first FDMP-eligible SI.
Title	FDMP role initialization at FO creation
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to identify which SI will create a FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Notes:

- *If a flight is currently not planned to enter the IOP area it will not be published as a Flight-Object. Such flights will remain as today known only to the SIs that were informed of it by a non IOP mean (AFTN, OLDI, etc.)*
- *If a flight not traversing the IOP area is later diverted into the IOP area, the SI that first gets aware (through AFTN, OLDI, verbally) of that and that assesses to be the FDMP will create the associated flight object.*
- *The SI evaluates if the flight traverses or not the IOP area using its local view.*

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0002
Requirement	The SI that creates a Flight Object shall declare itself the FDMP of it.
Title	FDMP role declaration at FO creation
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to identify who is the very first holder of the FDMP role on a FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Note: The requirement above covers the creation of a flight object by NM (in Europe, this should be the main case); it covers also the creation by an ATC of a flight that does not yet exist in the IOP.

3.1.1.1.1.2 FDMP role assessment

There are two kinds of stakeholders that can take the FDMP role:

- the Network Manager (NM) and
- the ATCs.

Note: The FDMP at creation remains FDMP until another system instance claims the role. This is the consequence of the basic principle driving the FDMP role transfer, i.e. the role is taken by another SI and not given to that SI.

3.1.1.1.1.2.1 Assessment of the FDMP role for a NM stakeholder

The IFPS specification 1.1[9] says at chapter 10.3 “Distribution to ATS unit in the IFPZ”: NM schedules the distribution to ATC a SP time before the calculated arrival of the flight in the AOR of that ATC. The SP is specified by each ATC and is held in the NM Environment database.

The above condition on time to distribute to ATC indicates that negotiations conducted by NM far before take-off are conducted outside IOP mechanisms, and IOP is used by NM to inform ATCs of an already consolidated release of the flight (although not final).

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0003
Requirement	A NM SI shall assess it is the FDMP of a flight if: - It is currently FDMP-eligible for this flight, and - No ATC SI has declared itself FDMP yet.
Title	FDMP role for NM
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to identify when NM SI can be holder of the FDMP role on a FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

3.1.1.1.1.2.2 Assessment by a NM stakeholder that the flight is ready for switching to ATC FDMP

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0004
Requirement	A NM SI shall indicate at SIT 2 in the Flight Object of a flight departing from the IFPZ, if it is its FDMP so that ATC SI can take the FDMP role when they need.
Title	FDMP role readiness for NM to ATC transfer
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to identify when ATC can take FDMP role according to NM view. It is not constraining for ATC SIs
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Notes:

- *For flights departing within the IFPZ, this time is SIT 2 (Slot Issue Time 2), so a certain parameter before the CTOT, when the possible improvement to the initial slot have been done by CASA.*
- *For flights that depart outside IFPZ, there will be no equivalent indication.*
- *The information that NM provides regarding the status "ready for ATC" is informative:*
- *While the NM is IOP-disable, it is not able to indicate to ATC that they can take the FDMP role.*
- *An ATC stakeholder can take the FDMP role when it needs. The working procedures of ATCOs will ensure that the switch of FDMP role between NM and ATC occurs at an appropriate time.*

3.1.1.1.1.2.3 FDMP role transfer between NM and ATC system instance

The ATC that will first give instruction to the flight will take the FDMP role at itsconvenience. At latest, this will occur at time of assumption (cf. MECH-0008).

The NM indication that the flight is "ready for ATC" is only informative.

The back-up mechanisms defined under § 3.1.1.1.1.3.1.2.1 and § 3.1.1.1.1.3.1.2.2 are applicable while NM is FDMP. It means that some ATC SI can take over the role of FDMP if NM becomes IOP-disable.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0006
Requirement	When an ATC SI has taken the FDMP role from NM, the NM shall become a FDC of the Flight Object.
Title	FDC role for NM
Status	<In Progress>

Maturity Level	TRL2
Rationale	This requirement is needed to identify that NM is always at least FDC for a flight object, so able to share changes on the flight. It means also that NM is continulously fed with the updated FO content.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Note: This ensures that NM remains able to make inputs to the flight, in particular further changes to the CTOT.

In case NM becomes IOP-disabled, an ATC takes the FDMP role indicating that it is the FDMP, but not controlling the flight.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0007
Requirement	When the NM SI becomes “IOP-enabled” again, it shall take back the FDMP role if: - It is not yet time (SIT 2), and - No ATC has yet indicated it is controlling the flight.
Title	FDMP role take back by NM
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to identify when NM can take back a FDMP role following some loss of IOP capability.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

3.1.1.1.1.2.4 Assessment of the FDMP role for an ATC stakeholder

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0008
Requirement	The FDMP-eligible SI that has assumed the flight shall declare itself the FDMP of the corresponding flight object.
Title	FDMP role for controlling SI
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to identify the main reason for become FDP: assuming the flight.

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

This is the nominal case. The controlling SI will be the SI currently in communication with the flight.

A SI has only one role at a given time. Whenever several conditions are fulfilled, the following order of priority is applied: FDMP then FDC and then, FDU. That is, a SI in charge of two SIs, one that is currently controlling the flight and another one that is expected to control the flight at a later stage will declare itself FDMP for the flight.

3.1.1.1.1.3 FDMP role transfer

3.1.1.1.1.3.1 IOP ATC to IOP ATC

3.1.1.1.1.3.1.1 Nominal FDMP role transfer

The regular FDMP role transfer is managed by the requirement REQ-10.02.05-TS-MECH.0008.

In the requirements about FDMP role, there is no indication whether the flight is operating under IFR/VFR or GAT/OAT. It has to be noted that this requirement does not make the assumption that the flight traverses the AOR of the controlling SI. Military SIs might also take the FDMP role, if FDMP-eligible.

Note: Upon transfer of flight between two SIs managed by the same System Instance, there is no change of FDMP.
Note: upon transfer of flight between two ATCOs working for the same SI, there is no change of FDMP.

3.1.1.1.1.3.1.2 Other cases of FDMP role transfer

The purpose of this section is to make robust the IOP mechanisms by ensuring that there is always a System Instance taking the FDMP role so that the continuous sharing of information of a flight object can continue.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0010
Requirement	Each FDMP-eligible SI that is aware of a FO shall assess its FDMP role over this FO when: - It is notified that the IOP-enabled status of the FDMP of this FO changes to IOP-disabled, or - It is notified that it recovers its IOP-enabled status, or - It is notified that the FDMP lost its local view, or

	- It recovers access to its local view, or - The controlling SI indicated that a change of frequency to another IOP-capable SI is instructed, or - The controlling SI indicated that a change of frequency to another non IOP-capable SI is effective (MAS received or equivalent verbal exchange).
Title	Trigger to assess one's FDMP role on a flight object
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to provide backup mechanism in case of current FDMP failure. It contributes to the availability of the sharing of data through IOP.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Note: The SI evaluates its role either immediately after one of the above events occurred or up to the time limit specified in each detailed case below.

3.1.1.1.1.3.1.2.1 FDMP backup by a SI of a non-controlling crossed SI

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0012
Requirement	The first FDMP-eligible SI with FDC role shall declare itself the FDMP for that FO, if the controlling SI is not FDMP eligible.
Title	Backup the FDMP role on downstream traversed system instances
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to provide backup mechanism in case of current FDMP failure. It contributes to the availability of the sharing of data through IOP.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

3.1.1.1.1.3.1.2.2 FDMP backup by SI in charge of an non AOR-traversed SI

Giving the possibility to be FDMP when only one's AOI is traversed provides following interests:

- The benefit of data sharing through IOP is extended to flights traversing only the AOI of the IOP stakeholders (so flights operating on the "vicinity" of the IOP area).

- The FDMP role remains available also when none of the AOR-traversed SI is IOP-enabled.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0013
Requirement	Any FDMP-eligible FDU shall declare itself the FDMP for that FO if: - The controlling SI has not declared itself FDMP, and - No FDC has declared itself FDMP within max SP-IOP-Max_Manager_Change_Waiting_Time, and - No other FDU has yet declared itself FDMP.
Title	Backup the FDMP role on downstream traversed system instances
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to provide backup mechanism in case of current FDMP failure. It contributes to the availability of the sharing of data through IOP.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Note: there is no transfer of FDMP role when a FDU took it. Unless this former FDU becomes IOP-disable, it will remain FDMP until a SI with an AOR traversal returns IOP-enabled.

3.1.1.1.1.3.1.3 FDMP role transfer during traversal of a non-IOP area

The requirement below states the conditions when a non IOP-enabled system instance takes the communication of a flight from an IOP-enabled SI.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0014
Requirement	When the flight has been successfully transferred to anon IOP-capable SI, the FDMP shall indicate in the FO that it is no longer the controlling SI.
Title	Flight transferred to a non-IOP SI
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to define FDMP role change in case of traversal of a non – IOP area.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

When a flight traverses an IOP hole, the FO no longer contains the information of which SI/SI is currently controlling the flight. Several OLDI SIs may take control of the flight during the traversal of the hole and this information is not available to the IOP stakeholders.

Contrary to what ED 133 ed. 2009 states, the behaviour will be to publish a FO without indication of a controlling SI as the IOP stakeholders are not able to maintain this information during the traversal of the IOP hole.

The actual time when the downstream IOP takes the FDMP role is fixed by its internal logic. It could be the reception of an ACT message, or some parameter before boundary or the correlation, etc.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0022
Requirement	The IOP SI downstream to an IOP hole shall take the FDMP role after the IOP SI upstream to that hole has indicated it is no longer controlling the flight, and at latest when it assumes the flight.
Title	Flight coming back from a non-IOP SI
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to define FDMP role change in case of traversal of a non – IOP area.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

During the traversal of the hole, all IOP SIs can continue to share information in the FO using the services of the FDMP which can either be the SI upstream or the downstream to the hole.

3.1.1.1.1.3.1.4 Change of route during the traversal of an IOP hole

If a flight traversing an IOP hole gets rerouted, while under control of a non IOP SI of the hole, so that it will never re-enter the IOP area (for example the flight is diverted to an airport located within the IOP hole), the IOP downstream SIs should be made aware of that.

As the traversal of some downstream IOP SIs was planned, at least one of these SIs will receive the corresponding CHG (or any message) message from the originator (a non IOP SI) or from IFPS. It will update the FO accordingly as FDMP or FDC.

The NM never takes back the FDMP role, even during the traversal of IOP holes. If NM receives during the traversal of the IOP hole some updated information of the flight, NM can share it with the

other IOP stakeholders as FDC of the flight. So NM could provide to the FDMP the new route to the diversion airport.

When the FDMP has published a FO with an empty controlling SI, it means that the flight is managed by a non-IOP SI. During this time, any IOP stakeholder that receives updated information about the aircraft behaviour can re-assess its role on this flight and potentially take the FDMP role. This will address the case of a reroute granted during the IOP hole traversal. The flight will re-enter the IOP area through the AOR of a different stakeholder that the one planned when entering the IOP hole.

3.1.1.1.1.3.2 Analysis of specific cases

Because of inconsistent offline configuration, or because each SI assesses it FDMP role using its own view of the flight (own local processing of the flight script in particular), it may happen that:

- More than one SI assesses it is the FDMP of the flight at the same time
- No SI assesses it is the FDMP of the flight currently

3.1.1.1.1.3.2.1 FDMP role dispute resolution

The dispute on the FDMP role corresponds to the situation where:

- The release N of the FO indicates that the SI A is the FDMP
- The SI A receives a further update of the FO indicating a new FDMP. When assessing again its role for this FO (as per § 3.1.1.1.1.3.1.2 and following), the SI A finds out that it should be the FDMP.

This change of FDMP is deemed not legitimate by SI A. To avoid loops, in such a situation, there is no automatic take-back of the FDMP role by SI A.

At the next assume within the IOP stakeholders, the SI of the controlling SI will take the role of FDMP role and the “dispute” will be resolved.

3.1.1.1.1.3.2.2 Case where the FDMP SI has no more local view available for a FO

In case the FDMP of the FO loses access to its local view (cause can be various: local FDP is shut down for any reason, or software bug like a loop on this SFPL, or SFPL deleted locally), it is no more in position to hold is role of FDMP. It has to inform its partners.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0017
Requirement	When the FDMP has been deprived of the SFPL that corresponds to the flight-object for longer than the value of the SP-IOP-Max SFPL Deprived Time, it shall indicate in the flight object that it is not FDMP-eligible for this flight.
Title	Reporting the loss of local view for a FO
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to trigger the FDMP backup meachanisms.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

3.1.1.1.1.4 VFR / OAT parts of a flight

The TECH and OPS group proposes to extend the IOP support to the VFR and OAT segments of a flight where the SI can produce a trajectory. The ability to produce a trajectory for a given segment conducted under VFR may depend on the SI: some may be able, some not.
In some cases, there may be in the part of the flight conducted under VFR / OAT not enough information for the system to produce a trajectory. On the portions of VFR / OAT route where no trajectory can be produced, some SI may provide some level of ATC service.

When the flight enters a portion of “unknown route” while under VFR or OAT, the controlling SI, will remain FDMP of the flight.

Notes:

1) *In the FO, the traversed SI will contain the sequence of traversed SI that can be produced using the known portions of the route only.*

2) *If a flight is fully conducted under VFR and its route is fully made of unknown items, the system is not at all able to predict the list of traversed SI. Such a flight is not published to IOP. There would be no way to predict that it is the FDC of this flight. There is no need for a specific requirement to obtain that behaviour. It results from the cardinality of the traversed SI list in the ICD. It cannot be empty.*

3.1.1.1.2 Flight Data Contributor (FDC)

Definition:

The FDC is a SI that is responsible for one or more ATSUs that are expected to control the flight.

Unlike the FDMP identification and role transference rules, the FDC identification is only performed by the latest FDMP (with some inputs from the downstream SIs). The rules and requirements followed by the FDMP to identify the SIs with FDC role will be found in the later sections: **Erreur ! Source du renvoi introuvable.**

In general a SI with FDC role will be allowed to make requests to the FDMP for modifying any flight specific data that is under the responsibility of the SI that is going to control the flight. The actual limits (whenever they exist) to those requests will be specified in the service definition of the ICD.

3.1.1.1.3 Flight Data User (FDU)

Definition:

The FDU is a SI that is only responsible for SIs that are interested / concerned for the flight but that are not going to control it.

The SIs may be concerned because of different reasons:

- The flight crosses its Area of Interest (AoI)
- The FO is pointed to that SI.
- General Information distributions
- Maintained Duplication.
- Manual Subscriptions

Unlike the FDMP identification and role transference rules, the FDU identification is only performed by the latest FDMP (with some inputs from the downstream SIs). The rules and requirements followed by the FDMP to identify the SIs with FDU role will be found in the later sections.

In general a SI with FDU role will be allowed to provide requests that do not modify flight specific information, that is, technical requests related to the FO management protocol. For example, it can provide requests with FO data reception acknowledgements, etc. As in the case of the FDC, the actual limits to the FDU requests will be specified in the services definition of the ICD.

3.1.1.2 Flight Object Management

3.1.1.2.1 Flight Object Identification

This section addresses the requirements related to the identification of flight objects that are needed to support the IOP mechanism.

3.1.1.2.1.1 Unique identification of the flight object (FO_ID)

The IOP wide unique identification for a flight object (FO_ID) is automatically assigned by the first FDMP and used by SWIM. Two Flight Objects should never have the same FO_ID.

There exist other kind of identifiers such as the IFPL_ID and the GUFI, those identifiers, when available will be also stored in the FO. Nevertheless, the FO_ID provided by the FDMP at creation time is the one that is actually used as unique FO identifier in the IOP network.

Note: The usage of the GUFI will be determined at the regional level, and it may be the case this element is not exchanged globally.

- *This could be an identifier generated by an Air Navigation Service Provider (ANSP). In the United States, this will be the ERAM GUFI – an identifier unique for the flight in the National Airspace Service (NAS).*
- *This could be an identifier generated and used by the aircraft operator.*

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0201
Requirement	The IOP SIs shall use the FO_ID assigned at the FO creation to uniquely identify a FO.
Title	FO unique identification
Status	<In Progress>
Maturity Level	TRL2
Rationale	A flight object is uniquely identified through the IOP area. Rational for modification Only the FO_ID is considered as the unique identifier of the FO. IFPL_ID, GUFI, and any available identifier are considered additional information that can be used in search criteria.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0202
Requirement	The SI shall ensure the uniqueness of the FO_ID through the IOP area.
Title	Uniqueness of the local identifier
Status	<In Progress>
Maturity Level	TRL2
Rationale	A flight object is uniquely identified through the IOP area.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0203
Requirement	When requesting the SWIM Technical Infrastructure to create the FO in the IOP network, the FDMP shall provide the FO_ID.
Title	Provision of the FO_ID identifier to SWIM
Status	<In Progress>
Maturity Level	TRL2
Rationale	A flight object is uniquely identified through the IOP area. Rational for modification; Filling the IFPL_ID is removed from the requirement. It is not mandatory. It was removed for the sake of coherency, this requirement would need another requirement for each data in the FO that "will" be included if available.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

At SWIM Technical Infrastructure, the IOP wide unique identifier of a real flight object is made of a unique universal identifier for the flight object and an empty What-If Context Identifier. For a What-If flight object, the IOP wide unique identifier is made of the unique universal identifier for the real flight object and a unique What-If Context Identifier.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0010
Requirement	Upon creation of a real flight object, the FDMP shall provide to the SWIM Technical Infrastructure an IOP wide unique identifier for the real flight object made of a unique universal identifier for the flight object and an empty What-If Context Identifier.
Title	Unique identification of the real flight object
Status	<In Progress>
Maturity Level	TRL2
Rationale	A flight object is uniquely identified through the IOP area.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-F010-0080	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

Obtaining the FO_ID

This section addresses how the FDMP succeeds in setting the FO_ID of a flight-object.

Note: The uniqueness of the FO_ID in the IOP area is ensured by composing the FO_ID with the identifier of the SI creating the FO and a locally defined identifier that is built according to local SI rules. The SI will be responsible for using a local identifier that is unique within its own system.

Note: Valid IOP System identifiers will be shared in adaptation.

The FO_ID will be defined as an alphanumeric string of a size capable of storing the SI identifier and the locally defined identifier. An example of FO_ID may be “KUAC101R2016”. The size and any possible limitation/pattern to this string will be defined in the FO model amendment.

Note: The IFPL_ID and the GUFI will be filled in the FO if they are available, but they are not required for FO identification.

3.1.1.2.1.2 Operational Key

In addition to the FO_ID, there is the need for a more operational key to identify, query and retrieve flight objects the operational one that is composed of six attributes CALLSIGN, ADEP, ADES, EOBT, EOBD and the context name. The context name is only an identifier that is filled when the FO is not real but a WIFO. They are required to prevent the creation of several FOs for the same flight.

Note: The context value for a real flight has been dealt in Annex C. The context of the flight will be used to identify WIFOs from the real FOs.

It has been considered that all the items of the operational key are required to identify a flight, but the fact is that it is not necessary to have the five items to create a SFPL, sometimes the flight plans are manually created with fewer items. For example, AFIL flight plans or even flight plans creations triggered by the reception of a coordination message from a non-IOP stakeholder.

As a consequence, it is possible to create FOs that does not have a complete set of items in the operational key. This raises the problems to solve in the case of the existence of several FO's with the same subset of keys. It is explained below.

When the flights become of interest for the local system without having the whole operational key, the FDMP has to search for the existence of its associated FO by these operational keys. If does not exist any FO, then the FDMP will create flight-object corresponding to that SFPL.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0205
Requirement	The SI shall create a flight-object only if there is no flight object already existing that matches the operational key.
Title	FO creation
Status	<In Progress>
Maturity Level	TRL2
Rationale	Requirement needed to grant that there is no FO already created for a flight. Rational for modification due to the search by FO_ID has been eliminated. The FO ID has nothing to do with the search. The FO is created with its FO-ID… that is, before that, there was no identification for a FO, so It should not use FO_ID in the search for matching FOs when creating a SFPL
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note: The operational key will match in different cases, when a SFPL is created it needs to be linked with a FO, any of the following options will not allow the linkage with an existing FO:

- *The SFPL is being created with the five items and there is no FO with the same five items but there is more than one FO with four (or less items) that matches a subset of the SFPL.*
- *The SFPL is created with less than five items and there are other FOs with the same items or there are other FOs for which our SFPL provides only a subset of those items.*

The IOP SI should provide a mechanism to retrieve a list of candidates that are to be reported to an operator to allow the manual linkage of the SFPL and the FO

When there are several flight objects matching a SI's SFPL's operational key, the SI will provide the list of candidate FOs to a human operator for manual linkage or correction.

In addition, it is also possible to modify (for any reason) these items after the SFPL (and therefore the FO) has been created. For example: a rerouting to other ADES, in case of storm, runway blocking, etc. It means change the operational key dynamically.

Moreover, it is possible for defined working positions to manually modify a flight plan, i.e. the fields changed by reception of a message may also be changed directly by manual input; the operational key could also be changed

Therefore the operational key in the FO cannot be considered static.

The Operational key of a flight may be changed dynamically by the FDMP, but it has to be granted the uniqueness of the FO, which means that the operational key could be changed in a FO as long as it does not coincides with other FO with the same six values of the operational key

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0207
Requirement	A SI shall be prohibited from modifying any attribute of the operational key in a FO when as a consequence of that update the modified FO contains the five attributes of the operational key (callsign, ADEP, ADES, EOBT, EOBD) and there exist another FO that already has the same five attributes of the operational key.
Title	Updating Operational Keys
Status	<In Progress>
Maturity Level	TRL2
Rationale	New Logical limit to Operational key update
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

It is up to each local system to determine how to solve this issue.

3.1.1.2.1.3 FO creation

The first IOP System Instance controlling a flight at a given time is the one responsible for creating the it will be Contributor for this Flight Object.

In the case that it will be:

- the FDMP: It creates the Flight Object and publishes it.
- a FDC: It does not create the Flight Object but waits for reception of the Flight Object. If after an SP-IOP-Waiting_time_before_FO_creation time it does not receive the corresponding Flight Object, it will create the Flight Object, declare itself as FDMP and publish the Flight Object

The SI uses the search mechanism described in§3.1.1.2.3to be sure that does not exits a flight objects matching some operational key, before creating a new one.

- If the SI is FDMP, when the flight becomes of its interest, it will create a flight-object corresponding to that SFPL as has been stated in the section 3.1.1.2.1.2 (Operational Key). Moreover it is the responsible to grant the uniqueness of the FO_ID. See section 3.1.1.2.1.1 (Unique identification of the flight object (FO_ID))

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0332
Requirement	When the flight becomes of interest to an SI which assess not to be the FDMP and if there is no existing flight object matching the operational key of the SFPL,it shall wait a SP-IOP-Waiting_time_before_FO_creation time for the creation of the flight-object corresponding to that SFPL.
Title	SFPL Activation
Status	<In Progress>
Maturity Level	TRL2
Rationale	The search for an existing FO is to be done using the operational key Rational for modification: The old requirement had two shall. It has been reworded to avoid it. In addition the FO_ID key is removed from the search criteria. The search for an existing FO is to be done using the operational key of the flight since a new FO_ID can only be assigned upon confirmation that there was no FO already created for the local SFPL
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.1.2.2 Flight Object deletion from the Network

The FO is an agreed set of data shared between all the IOP stakeholders. When a FO deletion takes place, it is important to distinguish if this take place in the network or it is a local FO (only the local image of the FO in a system instance has been deleted).

The deletion from the network can only be done by the FDMP, the FDC only can execute a local FO deletion. This section mainly talks about the FO deletion from the network since local FO deletion is subject to local decision and therefore out of IOP scope.

A FO deletion can happen in the following situations:

- **Automatic Deletion of the FO**: When an existing flight has landed or has exited from the AoI of the last IOP SI, after a certain time, the FDMP deletes the FO and request to the SWIM the deletion of the FO from the network.
- **Flight Cancellation** If the flight is cancelled for whatever reason The SI that becomes aware of the cancellation must notify it to the interested stakeholders.
- **SFPL Deletion**: This situation handles the deletion of a local SFPL that is currently linked to a FO.
- **FO manual deletion**: It describes the situation in which a FO is removed from a technical position and the consequence of those deletions depending on the flight status.

3.1.1.2.2.1 Automatic FO Deletion

This situation takes place when an existing flight has landed or has exited from the AoI of the last IOP SI. This last SI will be the FDMP who will be capable of removing a FO from the network.

Moreover, FO removal from the network should not be triggered by SWIM itself but requested from the application layer to the SWIM, so to delete the FO from the network means that the FDMP request to SWIM the deletion of the FO after SP-IOP-waiting-time-before-FO deletion time parameter.

The SP-IOP-waiting-time-before-FO-deletion time parameter is defined as the waiting time after the last estimated exit of the IOP area (if landing in the IOP area then it is the time after the actual landing or ETA if it the landing notification has not been received by the last FDMP) that the last FDMP must wait before requesting the FO deletion to SWIM.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0208
Requirement	When a flight has landed or has exited from the AoI of the last IOP SI, the FDMP shall request to the SWIM TECHNICAL INFRASTRUCTURE to delete the FO from the network after a SP-IOP-waiting-time-before-FO-deletion time.
Title	FO Deletion after landing
Status	<In Progress>
Maturity Level	TRL2
Rationale	New No requirement defining the FO removal by the FDMP from the IOP network was defined.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When the rest of the stakeholders FDCs and FDUs receive the FO deletion information, they would initiate the removal (if they had not done yet) of the local image of the FO. The impact of removing the local image of the FO to the SFPL will be determined by its local requirements; but this is outside the scope of this specification.

3.1.1.2.2.2 Flight cancellation

If the flight cancellation (e.g. a cancellation message (either FO distribution or CNL) is received from the NM, etc.) the SI that becomes aware of this must share the knowledge with other IOP stakeholders.

Taking into account the system role, two situations arises:

- If the system instance which receives the flight cancellation is the FDMP of the FO, it has to delete the FO from the network and share this information with the rest of the stakeholders.
    - If the FDC receives a flight cancellation. It should inform the FDMP about this cancellation so the FDMP can process the FO deletion from the network.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0209
Requirement	When the FDMP becomes aware of the flight cancellation, it shall delete the FO from the IOP network.

Title	FO deletion due to a flight cancellation
Status	<In Progress>
Maturity Level	TRL2
Rationale	New Removing a flight that is being cancelled
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0210
Requirement	If the SI that received the flight cancellation is a FDC it shall inform the FDMP about this cancellation.
Title	The SI of the cancelled Flight is no the last in the crossed SI list.
Status	<In Progress>
Maturity Level	TRL2
Rationale	New Removing a flight that is being cancelled when the SI that received the notification does not have the FDMP role.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note:The local processing of a flight cancellation received from another SI is a local topic and therefore out of scope of this specification.

3.1.1.2.2.3 Technical deletion of the SFPL

This situation arises when an input is made locally at an SI to delete an SFPL which is causing a problem inside the system. This situation may happen in SIs with any role (FDMP, FDC, FDU), nevertheless it is only relevant to the common IOP standard when this situation is not solved locally and it affects other SIs (Only when the SFPL needs to be removed in the FDMP).

In IOP it is required a SI capable of performing the FDMP role for a given FO. Removing the SFPL in the SI with FDMP role may imply that such SI becomes unable to fulfil this responsibility for a time period.

3.1.1.2.2.4 FO manual deletion

It is necessary to provide the capability to manually removing an FO. It can be used for example to resolve FO duplication for FO, to remove a corrupted FO that bothers the IOP operations, to remove a flight that has been left in the FO database by mistake, etc. Nevertheless, this functionality is considered local business and therefore it is not stated as a common requirement in this specification.

3.1.1.2.3 Search for Flight Objects in the Network

It is very important that a given flight is represented by a unique flight-object, so that all stakeholders can share the information on it. The capability to search for the existence of a flight-object based on some criteria contributes to the uniqueness of the flight-object.

It is proposed that, in addition to the distribution of the full flight-objects to the interested IOP stakeholders, a summary of each flight-object is also distributed to all IOP stakeholders. This summary contains the FO_ID and the operational key for the flight-object as well as the name of the current Manager/Publisher that publishes the Flight Object. Note that this summary is published each time that any of this information changes. For example, each time that a new Manager / Publisher assumes the management.

Since each IOP stakeholder stores the summary for all the FOs that exists in the IOP area, it is aware of which flight-objects exist in the IOP area and where to request for them if needed.

FO Summary handling is done at SWIM TECHNICAL INFRASTRUCTURE level. The SWIM TECHNICAL INFRASTRUCTURE is in charge of updating and publishing the summaries related to the FO managed by its system instance. It is also in charge of processing the FO summaries received from other IOP system instances. Note that the SWIM TECHNICAL INFRASTRUCTURE identifies the role of its own system instance because only one role is allowed per SWIM TECHNICAL INFRASTRUCTURE – i.e. if an IOP stakeholder in a system instance publishes a FO, the SWIM TECHNICAL INFRASTRUCTURE will automatically identify its system instance as the FDMP for that FO.

As it has been described in the Operational Key section, the operational key may not be completed and therefore, if a search is executed with only subset of the five attributes of the operational key a list of candidates to match that search is possible.

The SI should be able to request from the SWIM TECHNICAL INFRASTRUCTURE all the flight-object(s) matching a given subset of the operational key.

It is up to each local SI to determine how to handle the list of the received candidates according to the reason that triggered the search process.

3.1.1.2.4 Introduction to the FO update mechanism

3.1.1.2.4.1 Context

The FO as an agreed set of data shared between all the IOP stakeholders needs to be revised and updated by each one of the stakeholders. For that, there is the need to specify the different mechanisms that will allow the FO modification by the concerned SIs.

3.1.1.2.4.2 FO update process

The main objective is to maintain a consistent view of the flight data, and to allow them to coordinate changes to that flight data even between systems that are not yet operationally controlling the flight.

FO Modification Process is a process where the FDMP is the only SI allowed to modify and distribute the FO, but a SI with the FDC role is able to request the FDMP to update the FO on its behalf.

The FO modification process starts when a SI needs to align the FO with its local SFPL. The local SFPL could have been updated because of a local action from the controller or other local event.

When the alignment is triggered by the FDMP it updates and distributes the FO to any interested/subscribed SI. If the alignment is triggered by the FDC, then the FDC has to request the FDMP to update the FO on its behalf.

FDMP updates are fulfilling the Publish/Subscribe pattern whereas FDC request will follow the Request / Reply pattern

- Request / Reply pattern: This pattern is a mechanism allowing the request of a service from a SI to another SI. It includes the acceptance/rejection from the requested system instance. This pattern starts with the service request from the SI, then the distribution of the request through the IOP network; the service request validations at the destination SI and finally the distribution of the reply to the requesting system instance (This reply is about service acceptance or rejection and it does not include the service processing result).
- Publish/Subscribe pattern: This pattern consists of a publishing event from the FDMP and then its distribution through the IOP network.

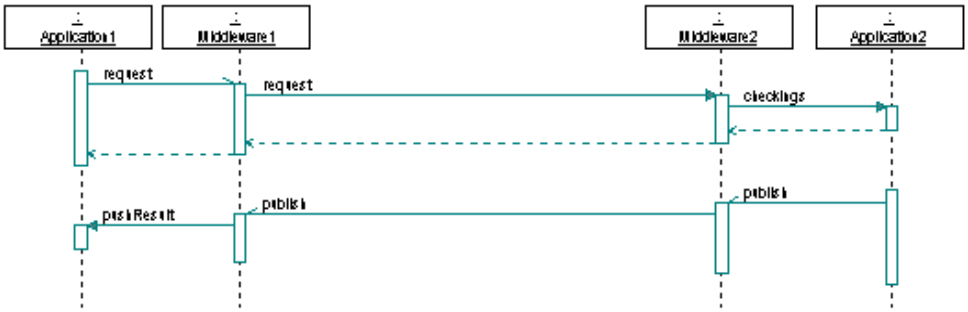


Figure 3.1: Example of IOP Patterns

The above figure depicts both IOP patterns; in fact, a FO update performed by the FDC requires the two patterns. A synchronous request (request / reply) pattern is provided to the FDMP and later on an asynchronous publication of the FDMP in which the request is actually implemented.

In the first part of the example (a Request / Reply pattern), the SI (FDC) requests a service to the FDMP. After service validation at the destination, the requested SI (FDMP) replies either by accepting or rejecting the service.

In the second part of the example (a distribution pattern) a publishing event occurs at the sending SI (FO publication from the FDMP). Notice that this event may be the result of processing the service initially requested in the first example, or it may be as the result of an internal trigger in the FDMP.

3.1.1.2.4.2.1 Publish FO Event (FO Publication)

The FDMP uses events to send the information to the stakeholders using the SWIM network. These "events" are published by the FDMP any time the data in the FO is updated. Each time the FO is updated, a new Release of the FO will be distributed. The FO is composed by a number of clusters that gathers together the related information, each of this clusters is given a release number. The release version of the FO is composed by the aggregation of the release number of each cluster.

With each release of FO, some clusters are updated and others not. Only the updated clusters are distributed to the interested stakeholders. Every time that a cluster is updated its release number is incremented

This is an asynchronous message and therefore the FDMP does not wait for any answer to this publication.

3.1.1.2.4.2.2 Request FO Service (FO update service request)

3.1.1.2.4.2.2.1 FDC triggers a FO update:

If a FDC detects a change in its SFPL it will have to align its local information with the one in the FO. It will be able to perform the alignment by requesting the FDMP to implement the appropriate changes in the FO. These changes will be requested through a set of FO services.

The FO services will be defined with a specific purpose and designed to be atomic by themselves. That is, the parameters of each service will comprise any possible data that may be affected by the modification of the main information that is going to be changed. For example, an STAR modification may also imply changes in the route or the constraints therefore a service defined to modify the STAR will not only provide parameters to provide the name of the new assigned STAR but it will also provide parameters to update the route or list of applicable constraints.

Each Request Message is applicable to one FO Release, to have a common understanding about the data that the FDC wants to change. When the Request Message is built, it is sent to the FDMP using the SWIM network.

Once the Request Message is sent, the FDC will track from the FDMP, both the request acceptance (synchronous pattern) and the result of its implementation (asynchronous pattern).

3.1.1.2.4.2.2.2 Request processing by the FDMP

When the FDMP system receives a Request message, it will be analyzed and processed in two steps:

1) **Request assessment (synchronous reaction)**

The request is assessed by performing a set of verifications (Eligibility, Syntax and Semantic) at FDMP side.

The FDMP will answer to the requester (FDC) with the result of that assessment.

The actual verifications applicable to each service will be defined in the detailed definition of those services in the ICD and through local processing.

2) **Request implementation (asynchronous reaction)**

The services that passed the assessment will be processed by the FDMP to be implemented in the local SFPL and in the FO. The local implementation of the required services is still constrained to local requirements and therefore it may still fail.

Once the request has been processed, the FDMP will publish the result of the implementation process. This publication in the FO will contain the requested changes in the FO (if succeeded).

Notice that a FO publication represents an alignment of the local SFPL with the FO, therefore a FO may be published with the result of the requested services by the FDC and any other data updates that were produced due to other local events and were not already published in the FO.

3.1.1.2.4.2.2.3 FDC receives the answer to its Request.

Reception of the request assessment (synchronous reaction)

The FDC will receive a synchronous answer from the FDMP with the acceptance or rejection (with the reason for rejection) to the requested service.

When the service is accepted, the FDC will track the received FOs waiting for the implementation of that service. This tracking will be performed for SP-IOP-Max_Contrib_Consequences_Waiting_Time duration.

When the service is rejected, depending on the service and the reason for the rejection, the FDC will determine the procedure to follow. These FDC actions may range from triggering a desynchronization process to repeat the request (the cases that create a desynchronization should be explicitly defined in the requirements describing the related functionality). Note that sometimes the actions will be common/standard to all the IOP stakeholders, determined by the IOP requirements whereas sometimes it will be determined by local requirements.

Reception of the request implementation (asynchronous reaction)

The FDC will receive a FO update containing the result of implementing the service

Whenever the requested service was successfully implemented, the FDC SFPL and the FO are successfully aligned again. Nevertheless, when the service was not properly processed a misalignment between the FO and the local SFPL in the FDC is detected. As in the initial assessment, the FDC reaction may vary from trying again the alignment (retry the request) or start a process of desynchronization with the FO.

Note that there cannot be a complete freedom in the FDC to perform retries indefinitely, since this would lead to infinite loops that would degrade the network. A mechanism to prevent this problem will be described in the Publish – Request Management chapter3.1.1.2.7.

3.1.1.2.5 Verification rules applicable to both publications and FO requests.

In general, the reception of FO updates from an IOP stakeholder triggers three levels of checks;

- Eligibility
- Syntactic
- Semantic

Eligibility checks

They will determine when a source of a FO publication or FO update request has the right to perform such action. The concept of eligibility must be consistently applied among all IOP stakeholders and therefore the different system instances must agree the same interpretations.

When the system instance is processing a request or receiving IOP data, these rules are again checked to prevent any non-authorized operation from being executed. When met, the normal flow

continues. If not, and there is rejection of another stakeholder request, the requesting stakeholder should be informed. This should be a rare case, because every stakeholder should use the same set of access control rules, and such a rejection indicates inconsistencies between both IOP users' rules. Only the rejection case is considered to need a direct notification to the SI that published the FO or the request that was rejected. The local presentation of that notification is local business. For acceptance no notification will be sent.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0302
Requirement	A SI without FDMP role for a given FO shall reject any request regarding that FO
Title	Rejection of change requests received by an stakeholder without FDMP role
Status	<In Progress>
Maturity Level	TRL2
Rationale	Rejection of change requests received by an stakeholder without FDMP role
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The requirement below describes the general eligibility principles to be fulfilled for all services requests and FO distributions within the IOP network. The requirement uses the term message that refers to any kind of message received by an IOP stakeholder, that is, a service request when it is FDMP or a FO publication when it is FDC or FDU. In addition, specific eligibility checks will be provided for each specific service.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0305
Requirement	When a message is rejected because of eligibility checks, the SI that has received the message shall reject it and return a message to the originator, including the reason for the rejection
Title	Message rejection: sender eligibility check
Status	<In Progress>
Maturity Level	TRL2
Rationale	Rules for SI that have received a message rejection Rational for the modification: Original requirement has been modified to refer to any SI role instead of having independent requirements according to the role.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Syntactic checks

Before proceeding to process a given message, such as a service request or an event notification, the receiving system instance shall ensure that it has no syntactical errors. Otherwise, the system instance could fail to correctly interpret the message. This, in turn, could lead to unwanted operational behaviour within the IOP domain. Hence, it is essential to detect these types of errors as early as possible, i.e. on reception of the message.

The syntax specified for the IOP interface defines the formats to be used for service and event exchanges; the data items that each specific message contains and, for each data item, the range of values that are considered valid

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0303
Requirement	When a message is considered syntactically invalid, the SI shall reject it and return a message to the originator, including the reason for the rejection
Title	Message rejection: syntactical check
Status	<In Progress>
Maturity Level	TRL2
Rationale	Rules for SI that have received a message rejection
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note that the basic syntactic checks will be ones derived from the ICD. Any particular / additional check (if any) could be defined per service

Semantic checks

An SI may receive a message that it is syntactically correct, but is still invalid at a semantic level. For instance, an FDC may be requested for a counter-proposal from its adjacent SI even before the coordination process has been initiated (e.g. due to some technical malfunction in the adjacent centre), or the FDMP may distribute a FO update that includes a constraint requested by a given FDC, but the SI has not made such a request. In both cases, the receiving system instance shall detect the semantic error and react will accordingly, returning a notification message to the originator and, possibly, warning an operator in order to handle the problem. Note that the requirements cover the need for the checking and the distribution of the failure reason in case of detecting a problem. The actual common checks depend on the concrete data structures and therefore it is to be defined in the ICD.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0304
Requirement	When a message is considered semantically invalid, the SI shall reject it and return a message to the originator, including the reason for the rejection.
Title	Message rejection: semantic check
Status	<In Progress>
Maturity Level	TRL2

Rationale	Rules for SI that have received a message rejection
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.1.2.6 FO publication process

The FO can only be published by the SI that has the FDMP role at a given time, and therefore it is responsible for granting the coherence of the FO. The first FDMP of a FO will be the responsible for creating and publishing the FO.

Downstream SIs with FDC role are able to use FDMP flight object services to request the FO update but they are not allowed to update/publish the FO directly.

What the FDMP should publish in the FO has to be defined in the ICD. The main set of data that would be advisable to consider inside the flight object will be:

- FO protocol data (Identification, FO distribution related data, etc.)
- Flight trajectory information (route and constraints applied to the flight across the IOP area, computed trajectory from the FDMP, etc.)
- Flight coordination information between different SIs
- Arrival and departure information
- Aircraft related data
- Original flight plan information.

3.1.1.2.6.1 FO structure

Conceptually the FO is a single consistent / coherent representation of a single flight. In practice the FO has been detached into a number of clusters. For the time being, the following clusters are defined:

- Flight Identification Cluster
- Operational Key Cluster
- SIs Distribution List Cluster
- Flight Plan Data Cluster
- IOP Information Cluster
- Arrival Cluster
- Departure Clearance Cluster
- SSR Cluster

- Departure Cluster
- Script Cluster
- Trajectory Cluster
- Coordination Cluster
- Aircraft Cluster

The clustering allows publishing only the clusters that has been modified at a given time. The Flight identification Cluster is always published together with any other updated cluster. Within this cluster, the latest applicable release identification of each cluster is published. That is, this cluster is used to grant the coherency of the whole FO.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0330
Requirement	The FDMP shall manage unique release identification for each cluster of data within the flight-object
Title	Unique cluster identification
Status	<In Progress>
Maturity Level	TRL2
Rationale	Unique release identification for each cluster of data within the flight-object
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The IOP application is responsible for versioning the FO. The FO version is composed by the version of each cluster that defines the FO. Each time a cluster is updated, the Application Layer has to increase its version before publishing the FO update. The SI checks the FO version ensuring its validity. See section 3.1.1.2.5 (Verification rules applicable to both publications and FO requests).

The ID of the FO is included in one of these clusters. Any time that the FDMP is publishing the changes in a FO, it publishes the set of related clusters all together. To allow the receivers to identify the clusters being sent, the FDMP needs to include the cluster containing the ID of the FO being modified along with the latest version of all the FO clusters.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0331
Requirement	Every time that the FDMP publishes a set of modified FO clusters it will also include in that publication the cluster containing the FO identification.
Title	FO identification distribution
Status	<In Progress>
Maturity Level	TRL2
Rationale	Integrity of a flight object
Category	<Functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.1.2.6.2 FO update

This section describes the general activities performed by the FDMP in order to update the Flight Object.

3.1.1.2.6.2.1 SFPL – FO alignment by the FDMP

This section describes the general activities performed by the FDMP for synchronizing the local SFPL with the Flight Object.

The alignment of the FO with the local SFPL being FDMP occurs whenever there's a local update. And the distribution of the FO only occurs when there are some relevant updates for distribution (see section 3.1.1.2.4.2"FO distribution").

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0360
Requirement	When the FDMP detects an update of its local SFPL impacting the Flight Object, the FDMP shall update the flight-object.
Title	Local SFPL alignment to the FO (FDMP)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed in order to get synchronized the FO with the local SFPL of the FDMP. This requirement has been updated in order to generalize the update of any FO cluster and not only in the flight script update
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

If the alignment is triggered by the FDC, it has to request the FDMP to update the FO on its behalf. See section 3.1.1.2.7.3 (FO Request preparation and delivery to the FDMP).

3.1.1.2.6.2.2 FDC process upon reception of a FO publication

This section describes the general activities performed by the FDC / FDU at reception of a FO publication from the FDMP (protocol handling procedures). It does not describe the application data usage or understanding which is to be explained under the sections covering any specific functionality (coordination, flight script alignment, etc.)

When the FDC or FDU receives a FO publication it performs an initial assessment of the information received. The eligibility, syntactic and semantic verification is performed as described in the verification rules section.

Note that at reception of a publication, it must be checked that the received FO clusters are coherent, that is, there is no obsolete cluster and all of then corresponds to the latest available version. This verification is not described here since it is performed at SWIM layer.

When the FDCs and FDUs receive the FO publication, they should retrieve a local SFPL that corresponds to the flight-object matching the same five items of the operational key or a subset of them. The way to search for a local SFPL under a FO reception will be determined by its own local requirements. It is out of scope of IOP

If the FDC or FDU does not find a local SFPL corresponding to a flight-object, it will need to create a local SFPL. The creation of local SFPL will be based on the information held by the flight-object.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0336
Requirement	An FDC or FDU shall be able to create a local SFPL based on a received flight-object when no local SFPL currently exists in the SI.
Title	SFPL creation on FO reception
Status	<In Progress>
Maturity Level	TRL2
Rationale	The creation of local SFPL will be based on the information held by the flight-object
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Once the received FO update has been verified, the FDC or FDU will initiate the correct actions to implement these changes into the local SFPL. That is either:

- Verify that the SFPL is aligned with the FO (when the received FO implements a previous request), or
- Modify the SFPL to align with the FO

When the FDC/FDU receives a flight-object update, it analyses it and updates its local SFPL to maintain its alignment with the flight-object.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0306
Requirement	The FDC or FDU shall incorporate in its SFPL the changes coming from the Flight-Object published by the FDMP as long as these changes are compatible with the local set of data in the SFPL.

Title	Local SFPL alignment to the FO (FDC & FDU)
Status	<In Progress>
Maturity Level	TRL2
Rationale	When the FDC/FDU receives a flight-object update, it analyses it and updates its local SFPL to maintain its alignment with the flight-object. Rational for the modification: Two requirements REQ.10.02.05-TS-FSMA.0039 and REQ.10.02.05-TS-FSMA.0040 have been integrated and generalized to cover any FO publication (not only the flight script related ones)
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

As the result of this SFPL alignment we can identify three different situations:

- The SFPL and FO are aligned.
- As a result of the SFPL modification in the FDC, new changes are internally triggered in the FDC and therefore it needs to perform an additional request to the FDMP system. This is the general case described in §3.1.1.2.7.3 FO Request preparation and delivery.
- The SFPL alignment fails in the FDC, then, the SFPL and FO have lost their synchronization (partially) for the information that has been tried to be implemented. The FDC that gets into this case will notify the FDMP about this situation.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0307
Requirement	Upon reception of an FO update by an FDC, if the SFPL cannot be aligned with the information received in the FO, the FDC shall notify the FDMP of a local misalignment with the type of data that generated the issue.
Title	Warning the FDMP of a problem aligning the SFPL information.
Status	<In Progress>
Maturity Level	TRL2
Rationale	Misalignment mechanism is required to prevent infinite loops to update the FO according to the local SFPL data The requirement has been modified to: - Avoid defining the local treatment (local operator warning) - Allow that any alignment issue of the SFPL and the FO becomes visible for the rest of the stakeholders.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The misalignment is to be considered specifically for the piece of data that has not been properly processed. Different options to categorize the misalignment data will be given in the FO. The FDC will determine the relevant one according to its own local treatment. Examples of misalignment categories to be included in the ICD are route, applicable constraints, SIs control list, coordination, etc. The realignment strategy in the FDC is to be defined locally and it may depend on the category of the information that is generating the problem. For example, it can be defined an automatic retry to implement that information after a time period or it can be displayed for human operator treatment.

Sometimes, the received FO was triggered by a request previously delivered to the FDMP. In those cases, the FDC should check if its request was successfully implemented or not. Note that the FDMP was expected to implement all the services requested by the FDC. The failure in the implementation of the request by the FDMP leads to a misalignment between the SFPL and the FO in that FDC. The FDC that notifies a misalignment according to its local criteria is also responsible of notifying the end of the misalignment.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0308
Requirement	Upon reception by the FDC of a notification from the FDMP indicating that the service previously requested was not successfully implemented, the FDC shall, if locally relevant data are impacted, notify the FDMP of a misalignment with the type of data that generated the issue.
Title	Warning the FDMP about a problem aligning the SFPL
Status	<In Progress>
Maturity Level	TRL2
Rationale	Misalignment mechanism is required to prevent infinite loops to update the FO according to the local SFPL data
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

These misalignments update in the FDCs that are notified to the FDMP are included in the FO so they can be locally considered by other IOP stakeholders.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0310
Requirement	The FDMP shall include in the FO any misalignment notification provided by a FDC.
Title	FDC misalignment status updates notification to IOP stakeholders
Status	<In Progress>
Maturity Level	TRL2
Rationale	A misalignment in a FDC may be used by other IOP stakeholders (i.e downstream SI) as an indication of the reliability of the FO information they

	are receiving. It can be used to assume local decisions on the functionality that can be feed with the FO data.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0322
Requirement	The FDC shall inform the FDMP when a misalignment does no longer exist.
Title	FDC misalignment status termination
Status	<In Progress>
Maturity Level	TRL2
Rationale	A misalignment in a FDC may be used by other IOP stakeholders (i.e downstream SI) as an indication of the reliability of the FO information they are receiving. It can be used to assume local decisions on the functionality that can be feed with the FO data.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.1.2.7 FO Request update process

As has been stated in §3.1.1.2.4.2.2.1 (FDC triggers a FO update), if a FDC detects a change in its SFPL it will have to make the local information and the FO consistent. This will be done by requesting the FDMP to implement the appropriate changes in the FO.

These changes will be requested through a set of FO services.

3.1.1.2.7.1 FO Request structure

A FO request is a message sent by an FDC or FDU to the FDMP. This request is synchronous, that is, the FDC waits for an answer before further processing. In IOP this answer implies only an acceptance of the request but it is not its implementation which will come later with a FO publication.

The request is composed of the following information:

- A request identifier that will be used by the FDC to identify the FO release in which its request was tackled.

- An atomic service that contains the concrete changes that are requested to the FDMP.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0316
Requirement	An FDC shall add a unique request identifier in each request sent to the FDMP
Title	FDC request identifier
Status	<In Progress>
Maturity Level	TRL2
Rationale	To allow that each FDC link the update of a FO received from the FDMP with the last request it has sent
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Each service may be given several parameters (some mandatory, some optional). The services will be defined to be atomic, that is, any parameter that is provided within the service is expected to be used by the FDMP when implementing the service or not at all. For example, a SET_STAR service may be given the identifier of the new STAR procedure as well as the new route applicable. The FDMP cannot modify the STAR and discard the route since they may be linked at the requester. The required parameters, as well as the expected verifications, for each service are to be defined in the ICD.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0309
Requirement	If the FDMP is not able to use every parameter provided in an FO service, it shall reject the service including a reason for rejection.
Title	FO services atomicity.
Status	<In Progress>
Maturity Level	TRL2
Rationale	To allow identifying the updates that are to be implemented in a transaction.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.1.2.7.2 SFPL – FO alignment for FDC

This section describes the general activities performed by the FDC for synchronizing the local SFPL with the Flight Object.

The alignment of the FO with the local SFPL being FDC occurs whenever there's a local update. And if there are some relevant update that needs to be synchronized with the global FO, a request will be done to the FDMP in order to get the update.

3.1.1.2.7.3 FO Request preparation and delivery to the FDMP

When an FDC needs to align the FO with its SFPL information that has been modified internally, it will do it through a FO request sent to the FDMP. These changes will be requested through a set of FO services. See explanation in the section 3.1.1.2.4.2.2.1 FDC triggers a FO update.

Each Request Message is applicable to one FO Release. When the Request Message is built, it is sent to the FDMP using the SWIM TECHNICAL INFRASTRUCTURE.

Once the Request Message is sent, the FDC will track from the FDMP, both the request acceptance (synchronous pattern) and the result of its implementation (asynchronous pattern).

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0321
Requirement	When the FDC needs to align the FO with its SFPL it shall request the FDMP to update the FO.
Title	FO request sent to the FDMP
Status	<In Progress>
Maturity Level	TRL2
Rationale	When an FDC needs to align the FO with its SFPL information that has been modified internally, it will do it through a FO request sent to the FDMP Rational for the modification: The REQ.10.02.05-TS-FSMA.0030 and REQ.10.02.05-TS-FSMA.0031 requirements have been generalized in this requirement to cover any FO related alignment and not only the flight script related ones.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

An FDC that is requesting the alignment of the FO with its SFPL should prevent the automatic repetition of a request that was previously requested but not implemented by the FDMP. The repetition of these requests would trigger an endless loop that would be consuming the network resources until that FDC becomes FDMP. The mechanisms to prevent this request as well as their identification are considered a local issue and they not in the scope of this specification.

The FDC should not make further requests until the service included in the previous request have been tackled. (The result of their implementation (success or failure) has been notified by the FDMP).

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0315
Requirement	The FDC shall not make any request for the same FO until the result of its previous request has been completely processed by the FDMP.
Title	Number of requests active at a given time
Status	<In Progress>

Maturity Level	TRL2
Rationale	New. Only one request per FO should be activesince each request is linked to a concrete FO distribution. The publication a FO containing the result of a previous request would invalidate any pending request on that FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.1.2.7.4 FDMP process upon reception of a FO Request

The FDMP tackles the requests received from a FDC in two steps, an initial one that is synchronous in which an initial assessment of each of the services included in the request is performed.

The services that fail any of the three level checks (Eligibility, syntactic and semantic) are rejected as it is being described in the section 3.1.1.2.5 (Verification rules applicable to both publications and FO requests*)*. The services that passed these initial checks are processed by the FDMP that will distribute the result, asynchronously in a FO distribution.

The initial assessment of the service corresponds to the FDMP verifications that are performed before trying to implement the request. When the FDMP receives a service request, it first needs to accept it or reject it. There can be several reasons to reject a service before even trying to implement it, like eligibility, semantic etc. More verification will be defined in the FO ICD.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0318
Requirement	The FDMP shall synchronously answer to a FO request with the result of the initial assessment of the service included in that request and if it were rejected it will also include the reason for the rejection
Title	FDMP initial assessment of all the services included within the FO Request
Status	<In Progress>
Maturity Level	TRL2
Rationale	FDMP initial assessment of all the services included within the FO Request This behaviour was implicitly implemented and derived from the overall concept but it was never stated as a requirement.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The FDMP will then implement the changes required by the FDC and align the local SFPL with that information.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0319
Requirement	The FDMP shall align its local SFPL upon a request from eligible FDCs, as long as it is able to implement the changes.
Title	Alignment of the local SFPL in the FDMP due to FO updates from FDC
Status	<In Progress>
Maturity Level	TRL2
Rationale	Alignment of the local SFPL in the FDMP due to FO updates from FDC The new wording generalizes the application of the requirement to any kind of FO update. It is not related only to flight script updates.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The above requirement caters for the need to align the SFPL in the FDMP with the FDC requests. Nevertheless, the changes may be “not compatible” with local requirements (not shared in IOP) that prevents the SFPL update. Therefore request may also fail at implementation time.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0320
Requirement	The FDMP shall asynchronously notify the request implementation result to the requester, including the identifier of the FO in which the request was implemented (if succeeded) or the reason for the implementation failure.(if the FDMP failed in the implementation)
Title	FDC request identifier management by FDMP
Status	<In Progress>
Maturity Level	TRL2
Rationale	FDC request identifier management by FDMP The implementation status of the service included in the request is no longer provided within a general FO distribution. A dedicated notification to the requester instead.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.2 What-if Flight Object (WIFO) Management

In the following paragraphs, the technical analysis of What-if context Flight Object has been performed. What-if Flight Object is created in order to support “What-if dialogues” for negotiation. These dialogues are transactions between System Instances.

3.1.2.1 WIFO Information Logical Categorization

During the WIFO lifecycle, WIFO shall be created as an identical copy of the related FO. Then it will be modified according to a set of information that may have different flavours from a logical point of view:

- **Negotiated Data**, that are those information being negotiated among different System Instances, e.g. during a Coordination and Transfer What-if Dialogue.
- **Consequences of Data being Negotiated**, for instance elements of the Script Cluster impacted by the realization of Negotiated Data in the Coordination and Transfer Cluster.

This categorization aims to identify what data might need to be notified to update the related real FO on WIFO acceptance. At least “Negotiated Data” need to be distributed to involved System Instances.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0001
Requirement	SI shall allow the creation of a WIFO to support electronic dialogue on a flight with another IOP Stakeholder.
Title	WIFO Support to Electronic Dialogue (Basic IOP)
Status	<In Progress>
Maturity Level	TRL2
Rationale	What-if FO Mechanism has been defined in order to evaluate possible FO changes during a negotiation
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0045
Requirement	SI shall allow existence of multiple WIFOs for same Real FO
Title	Multiple WIFOs for same Real FO
Status	<In Progress>
Maturity Level	TRL1
Rationale	Multiple electronic negotiations can be defined on the same Real FO by different stakeholders
Category	<Functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0034	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0002
Requirement	The proposing IOP Stakeholder System instance involved in the negotiation shall tag in the WIFO which data are being negotiated with that WIFO
Title	WIFO Negotiation Data Identifying
Status	<In Progress>
Maturity Level	TRL1
Rationale	In order to easily identify proposed changes inside the WIFO
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note

1) *The WIMP or the WIC that is making a negotiation data proposal has to be able to tag such data into the WIFO to clearly identify changes applied to related Real-FO*

3.1.2.2 WIFO Roles

The System Instance that initiates the What-If Dialogue has the What-if Manager/Publisher (WIMP) role.

Any System Instance that is involved in the What-if dialogue by the WIMP has the What-if Contributor (WIC) role.

The FDMP or any FDC System Instance included in the Distribution List of the real FO can create a WIFO for establishing a What-if dialogue with at least another System Instance.

FDU being delegated for the FO becomes FDC, so only FDMP and FDC can create a What-If on IOP, but WIMP can decide to include also a third party ATSU (not in the control sequence) between consulted WICs.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0004
Requirement	The FDMP and the FDCs SIs identified in the distribution list of a FO shall be allowed to create a WIFO for that FO.
Title	WIFO Roles for Creation

Status	<In Progress>
Maturity Level	TRL1
Rationale	The WIMP has to be able to provide directly or by requestFOService the proposed FO changes to the FDMP.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0014	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0087	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0094	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.2.2.1 WIMP Role

The WIMP is the System Instance that initiates a What-if negotiation dialogue.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0006
Requirement	The System Instance that creates a WIFO shall identify itself as the WIMP
Title	What-if Manager/Publisher
Status	<In Progress>
Maturity Level	TRL2
Rationale	Only one SI can manage a WIFO lifecycle
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.00XX	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The What-If Manager / Publisher (WIMP) is a SI responsible for:

- Creating the WIFO as a copy of the real FO
- Identifying the systems that are involved in the What-if on IOP dialogue (WICs)
- Updating the WIFO with a change proposal
- Aligning the WIFO with Real-FO updates
- Publishing the WIFO to WICs
- Collecting the feedbacks from WICs applying them to the WIFO and redistributing them for approval.
- Providing all the negotiation data included in the WIFO to the FDMP, once the WIFO is accepted.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0008
Requirement	The WIMP shall identify the WICs among the SIs in the distribution list of the real FO and the FDMP (whenever the WIMP is not the FDMP)
Title	WIFO WICs Identification
Status	<In Progress>
Maturity Level	TRL1
Rationale	It's required to involve only SIs which have interest on FO evolution.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0088	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0095	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0005	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0009
Requirement	The WIMP shall include in the WIFO Distribution List all and only the identified WICs
Title	WIFO Distribution List Content
Status	<In Progress>
Maturity Level	TRL2
Rationale	Only consulted WICs have to be notified for distributed WIFO
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.00XX	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note

1) *The WIMP has to identify the WICs as the System Instances being involved in a negotiation supported by the WIFO mechanism.*

These responsibilities are detailed in the WIFO Lifecycle section §3.1.2.4.

3.1.2.2.2 WIC Role

The What-If Contributor (WIC) is any System Instance involved in a What-if Dialogue, except WIMP.

WIC provides feedbacks to the proposals made by the WIMP such as:

- Providing a Counter Proposal to the WIMP
- Rejecting the proposed WIFO
- Accepting a proposed WIFO

These responsibilities are detailed in the WIFO Lifecycle section §3.1.2.4.

3.1.2.3 WIFO State Diagrams

In order to approach the WIFO states study and evolution for WIMP and WIC roles, two state diagrams have been realized, and here reported with clarification on possible states and transitions, defining Automatic (A), Human (H) or Locally implementation dependent (L) Interactions

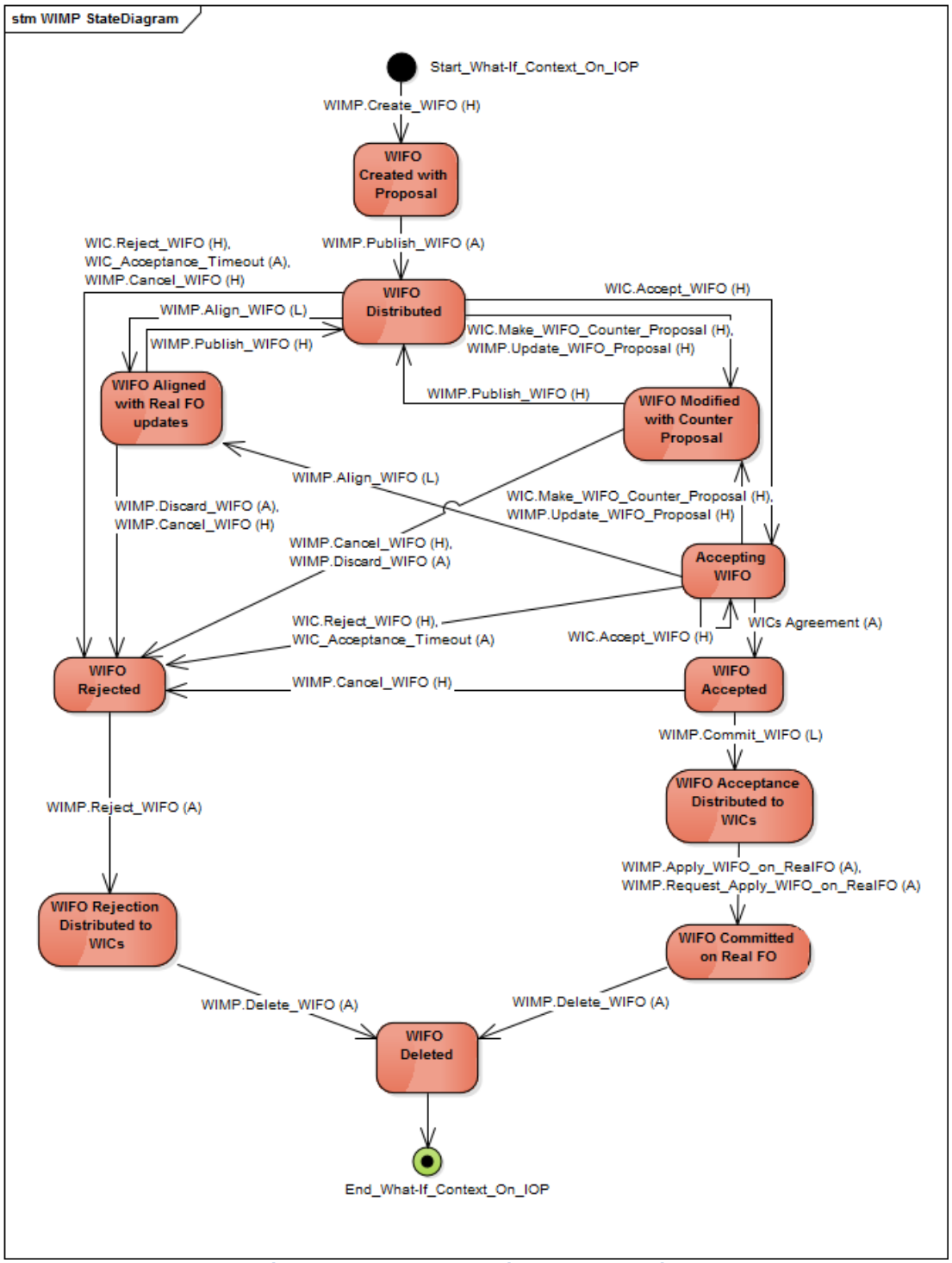


Figure 3-2: WIFO State Diagram, WIMP view

- **WIFO Created with Proposal**: WIFO created as a copy of related Real FO, including the tagged negotiation data proposed by WIMP

- **WIFO Distributed**: current WIFO has been published to all consulted WICs using the SWIM-TI
- **WIFO Modified with Counter Proposal**: current WIFO has been updated with new negotiated data proposed by WIMP or by WIC
- **WIFO Aligned with Real FO Updates**: current WIFO has been aligned to Real FO received updates.
- **Accepting WIFO**: WIMP has received at least one WIC Acceptance for distributed WIFO
- **WIFO Accepted**: WIMP has achieved the WICs Agreement on distributed WIFO obtaining all the Distribution List WICs Acceptances
- **WIFO Acceptance Distributed to WICs**: WIFO Committing Status has been communicated to all consulted WICs
- **WIFO Committed on Real FO**: WIFO negotiated data has been communicated to related Real FO FDMP for its update
- **Rejected WIFO**: the current WIFO has been rejected or cancelled by one of involved actors
- **WIFO Rejection Distributed to WICs**: WIFO Rejected Status has been communicated to all consulted WICs
- **WIFO Deleted**: WIFO has been deleted by WIMP and all consulted WICs have been notified.

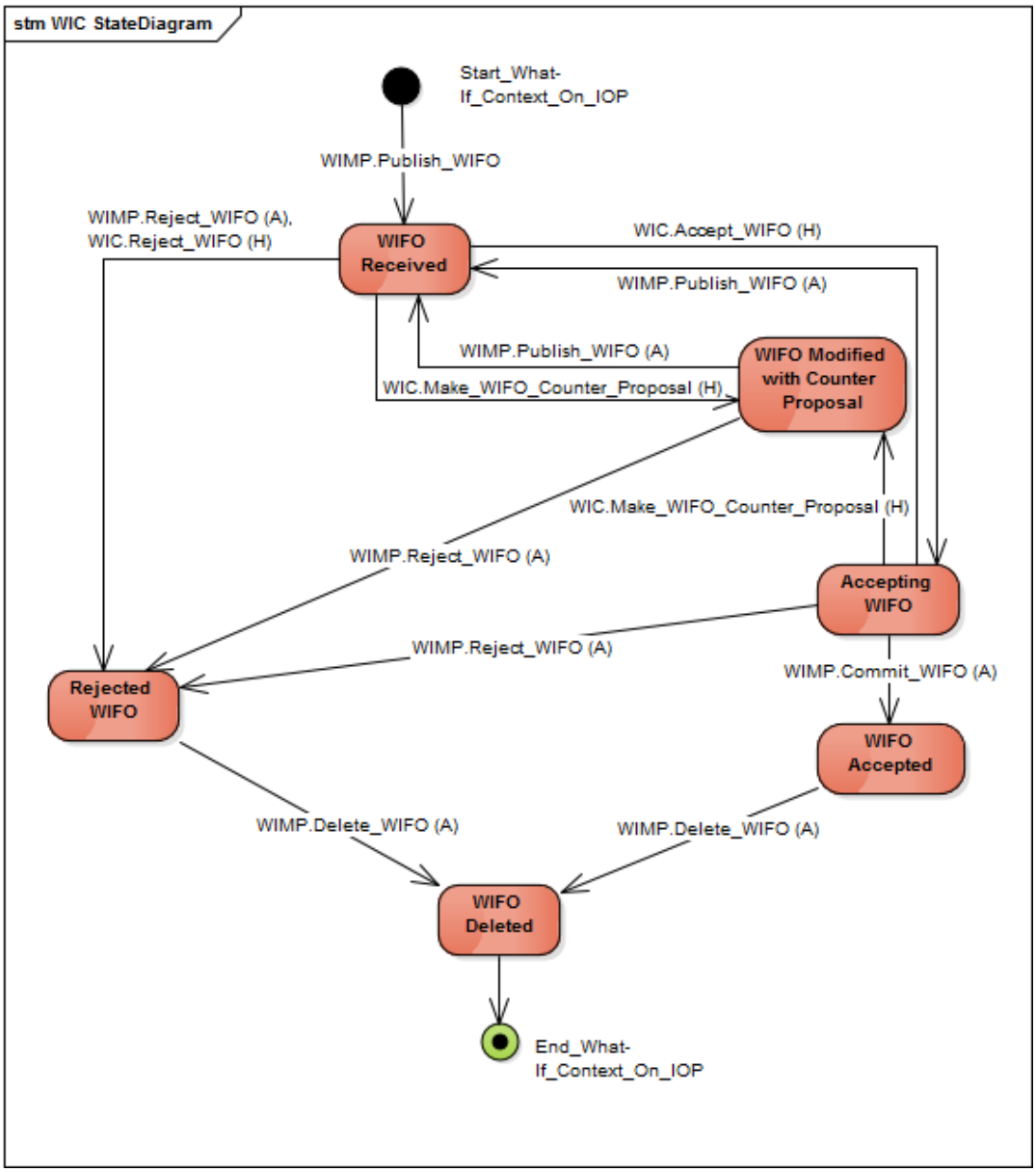


Figure 3-3: WIFO State Diagram, WIC view

- **WIFO Received:** the WIC has received a WIFO or a WIFO update published by a WIMP
- **WIFO Modified with Counter Proposal:** received WIFO has been updated with new negotiated data proposed by local WIC
- **Accepting WIFO:** the WIC considers the received WIFO acceptable
- **WIFO Accepted:** the WIC has received the WIFO Committing status by WIMP
- **Rejected WIFO:** the WIFO has been rejected by local WIC or a WIFO Rejection status has been received

- **WIFO Deleted:** WIC has received WIFO delete notification by WIMP

3.1.2.4 WIFO Lifecycle

Based on identified states, it's possible to define six phases to be analysed in WIFO lifecycle management performed by WIMP:

- **WIFO Proposal Phase**: it's the phase of WIFO lifecycle when, starting from a Real FO, the WIMP decides to define and distribute a WIFO for non-standard coordination to one or more WICs to be consulted for negotiation-data proposal evaluation. This phase involves following WIFO states:
    a. **WIFO Created** with WIMP proposed negotiation data and related consequences
    b. **WIFO Distributed** with WIMP current proposal

- **WIFO Counter-Proposal Phase**: it's the phase of WIFO lifecycle when, starting from a distributed/received WIFO, any of involved stakeholders make a change proposal on proposed data, which result in a new WIFO distribution for evaluation. This phase involves following WIFO states:
    a. **WIFO Modified** with a WIC counter-proposal data or WIMP update on not still accepted proposal
    b. **WIFO Distributed** by WIMP for updated data evaluation
    c. **WIFO Accepting if one or more consulted WICs accept the new proposed data**
    d. **WIFO Rejected** if WIMP or any WIC rejects new proposed data. Such status needs to be distributed to all consulted WICs.

- **WIFO and Real-FO Alignment Phase**: it's the phase of WIFO lifecycle when, starting from a distributed WIFO, an update on related Real-FO is received and it's required to align WIFO with received updates, evaluating if aligned WIFO negotiation data is still valid for new Flight Object information or it has to be considerate obsolete and to be discarded. This phase involves following WIFO states:
    a. **WIFO Aligned** with Real-FO updates
    b. **WIFO Distributed** by WIMP for Real-FO aligned negotiation-data evaluation
    c. **WIFO Rejected** if aligned WIFO is considered not valid or negotiation data obsolete by WIMP and it has to distribute such status to all involved WICs.

- **WIFO Acceptance Phase**: it's the phase of WIFO lifecycle when, starting from a distributed WIFO, involved WICs can inform WIMP of proposed negotiation-data acceptance or rejection within a defined timeout. If all consulted WICs accept the received WIFO, there is an agreement to proceed with such negotiation data commit on Real-FO. This phase involves following WIFO states:
    a. **WIFO Accepting** if WIMP has distributed a locally accepted WIFO and it's receiving WIFO Acceptances by consulted WICs.

b. **WIFO Accepted** by WIMP and all consulted WICs when WIMP has received all their acceptances within the specified timeout.

c. **WIFO Rejected** if WIMP doesn't receive all consulted WICs acceptances within the specified timeout or any consulted WIC rejects the Accepting WIFO.

- **WIFO Commit Phase**: it's the phase of WIFO lifecycle when, starting from an accepted WIFO by all consulted WICs, finally agreed by WIMP, negotiation-data is implemented on Real-FO and related WIFO deleted. This phase involves following WIFO states:

  a. **WIFO Accepted** when WIMP has received all WICs acceptances within the specified timeout

  b. WIFO Acceptance Distributed by WIMP to all consulted WICs in order to notify them about WIFO accepted status

  c. **WIFO Committed on Real FO** by WIMP, performing a direct update on Real FO if WIMP is also FDMP for flight, otherwise requesting such update to related Real FO FDMP.

  d. WIFO Deleted by WIMP and status notified to WICs as it has been committed on Real FO by WIMP.

- **WIFO Rejection Phase**: it's the phase of WIFO lifecycle when, starting from a Rejecting WIFO due to any WIMP alignment discard or any negotiation-data proposal/counter-proposal distribution reject, WIFO Rejection is distributed to all consulted WICs and related WIFO deleted. This phase involves following WIFO states:

  a. WIFO Rejection Distributed by WIMP to all consulted WICs in order to notify them about WIFO rejected status

  b. WIFO Deleted by WIMP and status notified to WICs, as it has been rejected

In the next paragraphs, an analysis of WIFO lifecycle phases technical requirements is provided.

3.1.2.4.1 WIFO Proposal

The What-if Flight Object (WIFO) is an alternative Flight Object. It is generated from a real Flight Object and allows negotiating a set of changes for the real FO before applying them once agreed.

When a System Instance needs to start a negotiation with other System Instances, it creates or updates an existing alternative FO (WIFO) and distributes it to the consulted System Instances (WICs), defining a What-If context for related Real FO.

In the next paragraph the What-if context and What-If Flight Object content on creation have been analysed.

3.1.2.4.1.1 What-if Context

The What-If context is the context in which a What-If Flight Object is defined. Any WIFO is univocally identified by the real FO identifier plus a What-if context identifier. The uniqueness of the real FO identifier will be guaranteed with solution provided under SWIM-TI section.

The uniqueness of WIFO identifier will be guaranteed by the uniqueness of the real FO identifier, plus the uniqueness of the What-If Context identifier.

The uniqueness of the What-If Context identifier needs a unique identifier for each What-If instantiated in any SI, so the identifier of the SI has to be included in the What-If Context ID.

Several WIFOs, within different What-if Identifier, can be created for the same real FO. A System Instance may define as many WIFOs as it needs for each FO. There is no logical restriction on the number of WIFOs created for the same FO.

It will be possible to have several WIFOs in parallel for different FOs. The following scenarios are allowed:

- Any SI may manage more WIFOs for the same FO, usually involving different WICs, but there will be a different What-if Context for each WIFO related to the same real FO.
- Any SI may manage or be involved in several WIFOs in parallel for different FO, within the same or different What-If Contexts.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0012
Requirement	Upon creation of a What-If flight object, the WIMP shall provide to the SWIM Technical Infrastructure an IOP wide unique identifier for the what-if flight object made of the unique universal identifier for the associated real flight object and a unique What-If Context Identifier.
Title	Unique identification of the What-If flight object
Status	<In Progress>
Maturity Level	TRL2
Rationale	Two What-if for the same real FO will have different What-If context identifiers.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.00XX	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note: Several WIFOs linked to the same real FO can exist at the same time and will have different What-If contexts Identifiers.

3.1.2.4.1.2 What-if FO Content

WIFO reflects the same content of the related FO, except the proposed negotiation data and its consequences.

WIFO requires that

- the what-if context is defined,
- the System Instance that is proposing the What-if FO will be the Manager Publisher for that (WIMP),

- the content of the Distribution List will be changed including only consulted System Instances (WICs)

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0044
Requirement	If the WIFO status is not yet accepted or rejected, the WIMP shall be able update a WIFO proposal
Title	WIMP Proposal Update
Status	<In Progress>
Maturity Level	TRL1
Rationale	WIMP proposal can be updated
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0021	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.2.4.2 WIFO Counter-Proposal

On reception of a WIFO, the involved WICs System Instances may provide counter-proposals to the WIMP.

Counter Proposal is a request for change by a WIC to a WIMP on negotiated items that will produce a WIFO update to all WICs, waiting for their final “acceptance/reject”.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0016
Requirement	When the WIMP receives a Counter-Proposal from WIC that the WIMP evaluates as locally acceptable, the WIMP shall distribute an updated WIFO including both that Counter-Proposal and the proposing WIC identifier.
Title	WIMP Receiving a Counter-Proposal (Basic IOP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	Negotiated data have to be agreed among WIMP and consulted WICs, clarifying always who is the latest changes proposer.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0030	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Notes

1) *WIC counter-proposals will be understood by the WIMP as applying the proposed negotiated changes to the latest real FO*
2) *The Counter-Proposal received by WIMP, retained acceptable, will be distributed for acceptance to the involved WIC.*

Concurrent Counter-Proposals shall not bring to any WIFO abrogation as all Counter-Proposals based on an obsolete version of the WIFO (the first Counter-Proposal is already taken into account by WIMP) will be ignored.
The WIC will be able sending to the WIMP some contributions that are not negotiated items but only consequences of the negotiation in the same What-if context, also if due to combination of real FO updates on a WIC.

3.1.2.4.3 WIFO Rejection

The WIFO provided by WIMP might be rejected by involved WIC system(s).

The WIMP can decide to manually terminate a WIFO due to negotiated data obsolescence or not valid conditions, which has the same effect as a Rejection.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0015
Requirement	The WIC shall be able to request the WIFO Reject to the WIMP for received WIFOs
Title	WIC Reject
Status	<In Progress>
Maturity Level	TRL2
Rationale	Any consulted WIC can reject whenever required a WIFO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0007	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0039	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0018
Requirement	When a WIC receives the Rejection Status for a WIFO, it shall consider the negotiation completed
Title	WIFO Rejection Phase: WIFO delete by WIC on WIFO Rejection
Status	<In Progress>
Maturity Level	TRL2
Rationale	Distributed WIFO Rejection requires the local WIFO delete

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0090	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0008	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0040	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0022
Requirement	The WIMP shall be able to Reject a WIFO
Title	Manual termination of a WIFO
Status	<In Progress>
Maturity Level	TRL1
Rationale	It's required to avoid negotiation data obsolescence and to allow manual WIFO termination.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.2.4.4 WIFO Acceptance

The WIFO distributed by WIMP will be notified to consult WICs which can accept proposed changes.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0019
Requirement	The WIC shall be able to inform the WIMP of the acceptance of the WIFO content.
Title	WIFO Acceptance
Status	<In Progress>
Maturity Level	TRL1
Rationale	Any distributed WIFO proposal needs to be agreed among all involved SIs. If any SI doesn't accept within a timeout, it has to be considered a not valid answer and consecutively as a reject.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0007	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0050
Requirement	The WIMP shall consider the WIFO as rejected if it receives no acceptance within WIFO_acceptance_Time.
Title	WIFO Acceptance Timeout Reject
Status	<In Progress>
Maturity Level	TRL1
Rationale	Any distributed WIFO proposal needs to be agreed among all involved SIs. If consulted SI doesn't accept within a timeout, it has to be considered a not valid answer and consecutively as a reject.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0007	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0020
Requirement	The WIMP shall consider the WIFO as accepted and start the commit phase when it received the single WIC acceptance within the WIFO_Agreement_Time
Title	WIFO Agreement (Basic IOP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	Any distributed WIFO proposal needs to be agreed among all involved SIs. Once the full acceptance has been achieved, the WIFO changes commit on FO has to be triggered.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0030	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0031	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

3.1.2.4.5 WIFO Commit

There is no impact on the real FO when linked WIFO is created, updated or deleted.

The only phase in which the real FO is updated is the “WIFO commit”: with such term it’s defined “The phase of the What-If on IOP, when all involved IOP Stakeholders accepted the latest shared WIFO, and the WIMP may communicate to FDMP the changes to be applied to the related real FO”.

Only during the WIFO Commit phase there may have an impact on the related real FO according to WIFO negotiated data. The impact of negotiated data included in the WIFO will be applied to the real FO, according to local system policies. This means that a human might be able to impede the application of negotiated data to the real FO, if no longer deemed compatible or necessary, but it depends on local system behaviour.

The automatic update of the real FO with accepted proposed or counter-proposed negotiated changes is deemed not a valid general solution. It will be a local system choice to decide if those changes should be again approved by a human at WIMP before providing the updates to the real FO, or sent without any further human check

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0024
Requirement	During the WIFO Commit phase, when the WIMP achieves the WIFO Agreement, it shall Request FDMP of the related real FO to set in FO the accepted changes and then delete the WIFO, distributing the Committing information and reasons
Title	WIFO Commit Phase
Status	<In Progress>
Maturity Level	TRL1
Rationale	Once agreed the WIFO proposal, the tagged changes have to be reported in the FO by FDMP.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0008	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0010	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0026
Requirement	When a WIC receives the Committing Status for a WIFO, WIC shall consider the negotiation completed
Title	WIFO Commit Phase: WIC negotiation completed on WIFO Commit
Status	<In Progress>

Maturity Level	TRL2
Rationale	WIMP has already provided the negotiated data to FDMP, so WIFO can be deleted.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0098	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.2.4.6 WIFO and Real FO Alignment

It has been highlighted the need that a System Instance involved in a WIFO shall not freeze the implementation of changes in its SFPL until an agreement is reached in a WIFO. The alignment of the WIFO with the updates to the real FO allows identifying if WIFO negotiations are based on obsolete data.

While a WIFO is used, the FDMP role of the related FO can go from one SI to another. This does not impact the assignment of the WIMP and WICs role.

Since WIFOs existence is linked to the real FO existence, if the real FO is deleted, the WIFO will also be deleted as soon as the WIMP detects that the real FO no longer exists.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0027
Requirement	The WIMP shall maintain the WIFO aligned to the updates of its related real FO
Title	WIFO Alignment With Real FO
Status	<In Progress>
Maturity Level	TRL2
Rationale	It's required in order to avoid obsolescence of referred Real FO information on which the negotiation is based.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0041	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Notes

1) *The alignment allows identifying if WIFO negotiations are based on obsolete data.*
2) *If an associated real FO is deleted, all related WIFOs will be discarded and deleted by the WIMP and WICs.*

3.1.3 Coordination and Transfer

The granularity of the information shared in the Flight Object, for what pertains to Coordination & Transfer is, unless explicitly stated, the System Instance (SI).

The coordination data, states and crossing described in this section are related to the last ATSU of upstream system and first ATSU of downstream system instance. The crossing between two sectors of different ATSUs belonging to the same system is out of the scope of IOP.

3.1.3.1 Phases at SI boundaries

In order to use the IOP mechanisms in an efficient way, the operational experts explained the operational need of coordination and transfer functionality. The concept of distinguishing the coordination phase from transfer phase has been eliminated as it is considered that the flight will already be coordinated when a system receives a Flight Object. This coordination information keeps on updating as per the coordination data changes in the Flight Object.

The new concept on the Coordination and transfer introduces three phases depending on the position of a flight between different systems. These phases are:

- System Awareness Phase (SAP)
- Controller Awareness Phase (CAP)
- Negotiation Phase (NP)

For more details on the concept, please refer to “TMF INTEROP D846” document.

The requirements related to coordination and transfer in this document is applicable to all the phases, unless explicitly stated. Also, the SI boundaries should be understood as the boundary between the last concerned ATSU of the upstream system and the first concerned ATSU of the downstream system.

3.1.3.1.1 System Awareness Phase

The System Awareness Phase (SAP) is the phase specific to each IOP stakeholder, when this stakeholder decides to locally create an SFPL that corresponds to the FO. The IOP Stakeholder will then be able to feed its local constraints into the FO and to maintain a local view (SFPL) aligned with the changes requested by the other IOP stakeholders.

The SAP is defined for a flight and is related to the whole system instance.

There can be two cases:

- FO exists before the creation of the local SFPL of the IOP stakeholder A

  This is the situation when the IOP stakeholder A is made aware of the existence of the flight when it receives the FO created by another IOP stakeholder. IOP stakeholder A decides to create a local SFPL and enters (locally) in the SAP for this flight.
- The local SFPL of the IOP stakeholder A exists before the FO

This is the situation when IOP stakeholder A is aware of the flight before receiving the corresponding Flight Object. The flight was locally created through an HMI action, or through the reception of an IFPL/FPL message.
If IOP stakeholder A assesses that it is the FDMP for the flight, it creates the FO and distribute it to the list of FDCs/FDUs it has determined.
If IOP stakeholder A assesses that it is not the FDMP for the flight, it waits for another System Instance to create it.

The information that a SI traversed by the flight has reached the SAP is important to the other IOP stakeholders and will be shared in the FO (see Appendix C - §C.1); it means that this SI can update the FO with the information it has on this flight.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0029
Requirement	When an FDMP or an FDC enters the SAP for a Flight Object, it shall include this information in the FO.
Title	Inform FDMP of the SAP start
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to share the SAP start. It provides an idea of the level of confidence in the content of the FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0001	<Full>

Note: The SIs that are only FDUs may also create a local SFPL, and hence, by definition, may enter into SAP. The FDUs will not inform the FDMP of this, because no one else than themselves is interested in that information.

3.1.3.1.2 Controller Awareness Phase

The Controller Awareness Phase (CAP) is the time where the flight should be displayed on at least a CWP of the system instances downstream to a boundary. The CAP exists only for the SIs that are predicted to be FDCs for the flight.
The decision to enter the Controller Awareness Phase for a given SI boundary can be triggered

- According to a System Parameter (SP) time/distance/level before the boundary defined in the applicable bilateral agreement.
- Manually through a specific ATCO action (force-CAP)
- As consequence of another action (e.g. Point functionality, involvement of a SI in a negotiation, skip proposal)
- By other events (locally defined in each SI)

The transition to the CAP for a SI boundary crossing is marked by setting the CAP information related to that crossing within the FO.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0001
Requirement	When the trigger defined for CAP start of a given SI crossing in the LoA occurs, the upstream SI shall set in the FO the state of the exit crossing to CAP immediately
Title	CAP trigger from LoA (upstream)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to inform other Sis of the CAP start.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0007	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0002
Requirement	When the trigger defined for CAP start of a given crossing in the LoA occurs, the downstream SI shall set in the FO, the state of the entry crossing to CAP after a SP_time_threshold_for_CAP, if the CAP is still not set.
Title	CAP trigger from LoA (downstream)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to inform other Sis of the CAP start.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0007	<Full>

Note: The purpose of the SP_time_threshold_for_CAP is to ensure that in most cases, the upstream SI will have time to set the CAP information before the downstream SI and to avoid that both upstream and downstream setting the CAP together in the FO.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0003
Requirement	When an SI detects that the CAP is started for any of its boundaries by the other SI, it shall start the CAP locally.

Title	react to CAP started by another SI
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to ensure that SI at each side of a SI boundary is in CAP. □
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0007	<Full>

The above requirement ensures that the upstream and downstream ATCOs are aware of the flight during the CAP phase, so that efficient negotiation (with system support or verbal) can be undertaken. This processing of making the ATCO aware of the start of the CAP is locally defined (out of IOP but will be visible at CWP level.
In case an ATCO anticipates that he will have to contact the other ATCO about a given flight, he can provoke the start of the CAP (regardless if this ATCO belongs upstream or downstream to the boundary):

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0004
Requirement	An SI shall have the means to manually trigger the Controller Awareness Phase at any of its SI boundary for an FO.
Title	CAP manual trigger- Local system capability
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow manual trigger of CAP. □
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0013	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0014	<Full>

The above requirement states nothing about the state of the upstream crossings that may not yet be in CAP while some downstream crossing gets triggered into the CAP. It will be a local implementation issue, if a given SI wants to anticipate, in such a case, the start of the CAP to its entry crossings.
The system may also anticipate the CAP as consequence of some ATCO actions (The CAP is meaningful only for ATCOs (Executive and Planning), not for FMPs who need a wider time horizon. The requirements below capture this

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0005
Requirement	The SI that starts a negotiation with another system shall set the CAP information for this boundary in the FO, if it has not yet been set.
Title	CAP trigger to support WIFO
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed for negotiation to be a trigger of the CAP
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0005	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0006
Requirement	The SI that triggers a point between the last sector of the upstream SI and the first sector of the downstream SI for a given SI boundary shall trigger the CAP in that boundary, if the CAP was not yet started.
Title	CAP trigger through POINT
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed for point to be a trigger of the CAP
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0084	<Full>

Note: If the pointed SI is a third party (outside the control sequence list), it will not enter the CAP.

When the CAP starts for an SI boundary, the involved SIs have to inform their respective ATCOs if the crossing conditions are non-standard for at least one of them. The way to inform is a local choice hence, out of the scope of IOP. It has to be noted that the assessment of the crossing conditions should be the same for upstream and downstream in most cases. But in some cases like error of LoA modelling, or difference in trajectories, this can be different. No explicit proposal/acceptance of the crossing conditions, even if non-standard, is expected from the partners of the boundary.

3.1.3.1.3 Negotiation Phase

The Negotiation Phase (NP) is the phase when it is bilaterally agreed (LoA) that any change to the flight must be negotiated and agreed between the giving and the receiving controller. The LoA defines the start of the NP. The NP exists only for the Sis that are traversed or predicted to be traversed by the flight.

The transition to the NP for an ATSU boundary is marked by setting this information in the FO related to that crossing

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0008
Requirement	When the trigger defined for NP start of a given SI crossing in the LoA occurs, the upstream SI shall set in the FO the state of the exit crossing to NP immediately
Title	Trigger Negotiation Phase from upstream
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to inform other Sis of the NP start.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0017	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0009
Requirement	When the trigger defined for NP start of a given crossing in the LoA occurs, the downstream SI shall set in the FO, the state of the entry crossing to NP after a SP time threshold for NP, if the NP is still not set.
Title	Trigger Negotiation Phase from downstream
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to inform other Sis of the NP start.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0017	<Full>

Note: It has to be noted that the purpose of the SP_time_threshold_for_NP is to ensure that in most cases, the upstream SI will have time to set the NP information in the FO before the downstream and to avoid that both upstream and downstream set this information in the FO at the same time.

In case an ATCO wants to indicate to the other ATCO that the crossing conditions should now be manually negotiated between them, he can anticipate the start of the negotiation phase, regardless of the crossing conditions (standard or non-standard). Once the negotiation phase is started (automatically or manually), the ATCOs at that crossing should be aware of this

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0010
Requirement	The SI shall have the means to manually trigger the Negotiation Phase at any of its SI boundary for an FO.
Title	Trigger Negotiation Phase manually- Local system capability
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow manual trigger of NP. □
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0021	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0022	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0011
Requirement	The request on frequency of a flight by the downstream SI shall start the Negotiation Phase for its upstream boundary.
Title	Trigger Negotiation Phase by issuing a Request On Frequency (ROF)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to ensure that SI at each side of a SI boundary is in NP.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0043	<Full>

3.1.3.2 Behaviour during SAP

During the SAP for a given system instance, the IOP exchanges occur between the FDMP and FDCs silently. The FDCs request, the FDMP accepts or rejects the requests, but ATCO is not informed explicitly of any changes. On the other side, the other human operators can have full access, display and feedback on a flight in this phase.

3.1.3.3 Behaviour during CAP

While in the Controller Awareness Phase, an ATCO can modify the flight unilaterally. He can also consult an ATCO of another SI before making a change using WIFO mechanism (system electronic dialogue) or using verbal/telephonic coordination (no system support).The way the ATCO is informed of the changes is a pure local implementation issue.

A negotiation can either be triggered to perform direct changes on some of the data, or can be triggered to modify other items (like the 2D route or some cruise level or RFL) that may also affect the transfer conditions at a boundary.

When the crossing conditions between two Sis are non-standard according to the applicable LoA, both System Instances (upstream and downstream) in CAP shall inform their concerned ATCOs. The standard/non-standard condition is informative only. It does not block the application of the modification. The other ATCO is made aware of it and will have enough time to react to the changes, in case he disagrees with them.

3.1.3.3.1 Regression of CAP for a crossing

The regression of CAP for a system instance occurs when a flight is significantly delayed to enter in that SI (delay at departure or later).In this case, the start of the CAP will be cancelled by the system and will be set to SAP..
This return to SAP will occur even if at some crossing the CAP had been forced. It has to be noted that this regression is evaluated by the downstream system instance.

The decision to consult an ATCO to regress the on- going CAP should be local process

Note: All the data in the FO for a given crossing is removed when its crossing disappears from the FO. The SIs that are no longer traversed receive a last distribution with reason “end of service”. These SIs remain in the distribution list until they acknowledge this “end of service” and ready for no reception of the FO.

3.1.3.4 Behaviour during NP

3.1.3.4.1 ATCO inputs

During the Negotiation phase, the ATCO is supposed to negotiate any change before applying it.

As the negotiation can be done either with system support (WIFO) or without (verbally), the system cannot verify in all the cases that a negotiation has occurred.

It is a local implementation issue to define the system behaviour at this point. Some possible (non-limitative) behaviour are listed below:

- Force the use of system support (WIFO)

- Force to confirm that a verbal coordination occurred
- Trust the ATCO's input (no system verification)

Consequently, for IOP, there is no limitation regarding the changes that can be requested to FDMP or applied by the FDMP if they are manual inputs (originating from ATCO's):

The service to make a negotiation will contain the information that the change is already agreed or not. Depending on the local policy of each SI, a SI submitting a change may, for example, set the "already agreed" information:

- without requesting the involved human, or
- based on information from the involved human

3.1.3.4.2 Behaviour for system initiated changes during Negotiation

The system changes are not applied directly on the flight. They must be confirmed and agreed by the involved ATCOs. Depending on local implementation, ATCOs can be involved:

- by electronic support,
- Or verbally.

3.1.3.5 Standard/Non-standard crossing condition

Two SIs assess independently the crossing conditions as per the LoA defined between them generally, its upstream who first assesses the crossing conditions as standard or non-standard and later, it is the downstream. But, if for some reasons, the downstream assesses the crossing conditions to be non-standard while upstream as standard, the resulting condition will be non-standard.
Whatever the actual order of the assessment is, as soon as one of the crossing condition is non-standard for one of the system instance (either upstream or downstream), the result is non-standard.
The table below summarizes different possibilities.

1st Assessment by Upstream SI	2nd Assessment by Downstream SI	Resulting value in FO
Standard => update in FO	Standard => no need to update FO	Standard
Standard => update in FO	Non-standard => update FO	Non-standard
Non-standard => update FO	Standard => no need to update FO	Non-standard
Non-standard => update FO	Non-standard => no need to update FO	Non-standard

3.1.3.6 Transfer of the flight responsibility

Although there is a predicted list of SIs that are expected to take in sequence, the control of the flight. the ATCO scan modifies this sequence to match their needs. There is not necessarily strict link between the geographical progress of the flight and the actual sequence of control.

3.1.3.6.1 Nominal case

Although IOP granularity is the SI, the transfer at an SI boundary is managed at the granularity of the sector!; Due to this during the transfer of a flight, the receiving SI's, sector and frequency and the transferring SI's, sector and frequency are shared in the FO.

Note: An ATCO can set and modify the information about sector and frequency as per his needs and not necessarily at the request of frequency.

3.1.3.6.1.1 Instructing the frequency change to another unit (Send input)

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0028
Requirement	On frequency transfer input, the FDMP shall indicate in the FO that the frequency transfer has been instructed.
Title	COF manual input
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow a frequency change.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0032	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0044	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0121
Requirement	On frequency transfer input, following a reclaim, the FDMP shall indicate in the FO that the frequency transfer has been instructed.
Title	COF manual input in a reclaim context
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow a frequency change
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0049	<Full>

Note: in the data for a given crossing, the downstream SI will set the frequency on which the flight must be instructed to contact the first ATCO of the SI (receiving frequency).

Note: in the data for a given crossing, the upstream SI will set the frequency on which the flight will be with the last ATCO of the SI (transferring frequency). Confirming contact with pilot (assuming a flight)

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0037
Requirement	Upon assumption of a flight, the SI shall: • indicate that the flight has been assumed, and • indicate that no Negotiation Phase is ongoing and • indicate the previous controlling SI, and • indicate the new controlling SI
Title	Assumption of a flight in a SI
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the assumption
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0020	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0034	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0054	<Full>

If the new controlling ATCO assumed the flight before the aircraft actually left the AOR of the previous SI, this create a situation where a controller is controlling the flight while it is in the AOR of another one. Operationally the flight behaviour should remain as the one at time of assume until the flight enters the new SI. Nonetheless, the controller of the previous SI can authorize some evolutions for the flight.

3.1.3.6.1.2 Requesting the frequency change to the controlling unit

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0038
Requirement	Upon request on frequency by an FDC to its upstream SI, the FDMP shall indicate the request in the Frequency-transfer information of the related SI crossing and update the following information in the FO: - receiving SI - receiving sector - receiving frequency.
Title	Request on Frequency by a SI
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the request on frequency
Category	<Functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0040	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0122
Requirement	The request on frequency functionality shall be available for an SI if and only if its entry boundary is in CAP or/and in NP.
Title	Availability conditions for ROF input
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to define when request on frequency is possible
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0042	<Full>

3.1.3.6.1.3 Undo Frequency Change (undo-send)

In some cases, the ATCO that enters the input for the change of frequency in his system must take back the flight on frequency before the next SI confirms the contact, i.e., before it assumes the flight. This can happen in some of the following cases:

- The pilot was not yet instructed to contact downstream (he did the input in his system and changes his mind before contacting the pilot),
- The pilot has been instructed to contact downstream but controller called him back before the pilot performed the change of frequency, so the pilot is still reachable on the frequency of the current controller),
- Following a phone call from upstream controller to downstream, the pilot has been instructed to contact upstream again,
- The pilot contacted again the upstream controller because of some problems in contacting downstream (wrong frequency, …)

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0040
Requirement	Upon undo of an instructed frequency change, the FDMP shall indicate that the transfer has been cancelled provided the next SI has not yet assumed the

	flight.
Title	Undo-frequency change processing
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the undo of an instructed frequency change
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0036	<Full>

3.1.3.6.1.4 Requesting back the frequency change to the former controlling unit (Reclaim)

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0041
Requirement	When an SI requests back a flight, the FDMP shall set the reclaim information in the FO for its entry crossing.
Title	Reclaim processing
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the reclaim of a flight
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0045	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0042
Requirement	The FDMP shall only grant access to the Reclaim of a flight to the transferring sector of the immediately previous controlling SI.
Title	Reclaim eligibility
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to define which sector may do the reclaim of a flight
Category	<Functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-COTR.0045	<Full>

3.1.3.6.1.5 Undo Assume

There can be situations when an ATCO either assumes a wrong flight or assumes it too early. In those cases, he can have option to undo the assume action he has performed on the flight.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0043
Requirement	The SI that has assumed the flight shall provide the capability of UNDO the assumption of that flight.
Title	Undo Assume Input
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the undo of assumption of a flight
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0038	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0044
Requirement	The SI that is processing an Undo Assume shall: • Indicate that its entry crossing is no longer assumed, and • Re-assess if the Negotiation Phase should be started, and • Indicate that the frequency-transfer has been instructed*, and* • Set the name of the controlling SI to the one before this assume.
Title	Undo Assume Processing
Status	<In Progress>
Maturity Level	TRL2

Rationale	This requirement is needed to define the FO changes linked to undo of the assumption
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0039	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0050	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0058	<Full>

Note: Undo assume can be performed manually only. There is no LoA corresponding to this. Once the undo assume has been performed, both ATCOs must be aware of this action. The mechanism to do this is local and out of scope of IOP.

3.1.3.6.1.6 Force-Assume of a flight

In case an ATCO is contacted by a pilot and the ATCO feels the call to be genuine, he can assume the flight despite it was not proposed to him by the currently controlling ATCO. This kind of assumption is termed as force assumption and any SI (whether traversed or not) can provide this capability to its ATCO.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0046
Requirement	The SI shall provide the capability of force the assumption of any flight.
Title	Force Assume Input
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the force assumption of a flight
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0051	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0055	<Full>

3.1.3.6.1.7 Undo Force-Assume

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0049
Requirement	The controlling SI, when a flight is stolen, shall have the means to undo its force-assume.
Title	Undo Force Assume input

Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the undo of a force assumption of a flight
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0057	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0120
Requirement	Upon undo of the force-assume, the SI that regains control of the flight shall reassess the information of its exit crossing State.
Title	Undo Force Assume processing
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to define what changes in the FO upon undo of a force assumption of a flight
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0059	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0117
Requirement	An SI shall abrogate an existing crossing by including the crossing information in the abrogated crossing list.
Title	Management of crossings no longer applicable
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the abrogation of an existing coordination between SIs
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0118
Requirement	An SI shall consider that its entry crossing is abrogated when it receives a FO in which its entry crossing data is in the abrogated crossing list.
Title	Management of crossings no longer applicable
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the abrogation of an existing coordination between SIs
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0119
Requirement	The SI the entry crossing of which is abrogated shall notify the FDMP of the reception of such abrogation.
Title	Acknowledgement of the abrogation of a crossing
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow the abrogation of an existing coordination between SIs
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

3.1.4 Flight Script Management

3.1.4.1 Flight Script Definition

The Flight Script (FS) is the main piece of information shared by the FDMP to the IOP Stakeholder to help them to compute the aircraft trajectory. The Flight Script contains the following data blocks:

- The “Initial Conditions” data block is set by the FDMP to inform all IOP Stakeholders about the aircraft position information used by its TP to generate the IOP Trajectory;
- The “Current Assigned Data” data block reflects the current set of tactical instructions/constraints,
- The “Expanded Route” data block describes the lateral path of the aircraft as computed by the FDMP after application of all accepted constraints,
- The “List of Constraints” data block contains all the vertical, lateral and longitudinal constraints requested by the FDMP and the FDCs impacted by the flight. Each constraint is either accepted by the FDMP (and therefore used in the computation of the IOP Trajectory) or rejected by the FDMP (and stored for information or later use).

3.1.4.1.1 FS Scope

The FS scope considered by the FDMP to compute the IOP Trajectory encompasses at least the IOP area whereas the scope for the FDCs can be limited to a portion of it.

If some information outside the IOP area is available, the FDMP keeps it in the Flight Object for information purpose. For example, if the route field provided by the NM at the creation of the flight extends outside the IOP area, this raw information is preserved in the FO Flight Script. These information, as for instance beacons, may be used to correctly determine the entry/exit of the IOP area.

Whereas the FDMP must provide information in the FO Flight Script and the FO Trajectory for the whole IOP area, the FDCs can either consider that information for the whole IOP area or only for the part related to their AOI.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0001
Requirement	The FDMP shall consider the IOP area as the minimum scope to use the FO Flight Script stored information for processing the planned trajectory within the IOP area.
Title	FO Flight Script Scope (FDMP)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement defines the scope of the processing needed to build the flight-object which is shared between the IOP stakeholders and is able to enrich their local SFPL. It applies to the FDMP only, the FDC might consider a smaller scope.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.1.2 FS Initial Conditions

The FS Initial Conditions specifies the initial reference used by the FDMP to calculate the trajectory of a given flight.

This reference contains the 4D position, the ground speed and track or heading of the aircraft.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0002
Requirement	The FDMP shall include in the FO Flight Script Initial Conditions : • the updated aircraft 4D position that can be either: - the last overflown point, obtained by projecting the last track position on the Trajectory, with Actual Time Over (ATO) and level, or - when the flight has not yet entered the IOP area, a point in the trajectory before or at the entry of the IOP area, with Estimated Time Over (ETO) and level. • the speed and track/heading related to the reported point, when available.
Title	Updating the Aircraft Position in the FO Flight Script
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to share in the Flight Script the aircraft initial position used to compute the IOP Trajectory and specifies what this position is depending on whether the aircraft is inside or outside the IOP area.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.1.3 FS Current Assigned Data

The FS Current Assigned Data reflect any of the current assigned level, heading, speed, rate of climb/descent values. These values are stored in the FS in executive constraints.

The Current Assigned Data (especially in case they have been assigned by the upstream controller) are useful information for the next controller.

To compute these data the FDMP could use the executive constraints for which the Application Point is overflown and the Target End Point is not yet overflown.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0003
Requirement	The FDMP shall maintain in the FS Current Assigned Data the current applicable clearances, when available, for: – Cleared Flight Level, – Cleared Speed, – Cleared Heading, – Cleared Direct, – Cleared Holding, – Cleared VRCD, – Cleared Offset (direction, distance), and – Weather avoidance (indication, entry point).
Title	Updating the Current Assigned Data in the FO Flight Script
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to share in a specific data block of the Flight Script the current cleared instructions followed by the flight crew.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0027	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0032	<<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0034	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0035	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0036	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.1.4 FS Expanded Route

The FO Flight Script Expanded Route reflects the 2D dimension of the trajectory. It is the expansion of the ICAO field 15c plus additional points. The expanded route fully defines the 2D intent of the flight. It contains the departure and destination aerodrome identifiers (if applicable), a set of route points that can be Published Significant Points (named points) or Geographical Points (points defined by lat/long information):

- from the ICAO F15c route on creation and update of the SFPL,
- from the expansion of airways portions and of Standard Procedures like SID, STAR, Approach Procedure and Missed Approach Procedure, as intermediate point among procedure legs;
- from any accepted route change specified by a set of Published Significant Points and/or Geographical Points,
- from specific points modifying the original 2D path, e.g. the immediate Application Point of an open heading (or a go-offset), and the related re-join starting position as shown in Figure 3-2.

The initial Expanded Route might include some items unknown in the FDMP adaptation data but will be published as such in the Expanded Route. These unknown items can be ADEP, SID, airway or fix name, STAR, IAP, ADES. Any IOP Stakeholder having those items defined in its adaptation data will send to the FDMP a FO service request to substitute them with known elements (e.g. by a sequence of one or more significant points).

The Expanded Route points will also provide, when applicable, Flight Type switches indication (GAT/OAT), Flight Rule switches indication (IFR/VFR), Speed/Level switches indication, geographical position, published name, expanded route point identifier, origin of the point (airway, significant point, SID, STAR, ADEP, ADES). They also include an indication whether they have been identified as 'protected point' through a route amendment constraint.

In order to allow a non-ambiguous identification of the points, each route point is given a unique identifier based on the SI identifier as follows:

- upon create/modification SFPL/FO, the FDMP assigned a unique route ID based on the FDMP identifier,
- upon acceptation of a route modification requested by an FDC or the FDMP, the FDMP assigns a unique route point ID based on the FDC or FDMP identifier.

This identification scheme allows at any time to relate any point in the Expanded Route to the SI.

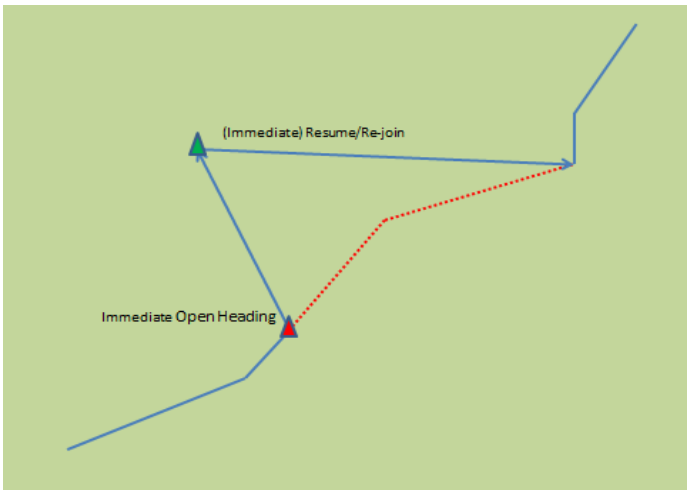


Figure 3-4: Expanded Route in case of route change

On any route change from local stimulus or acceptance of a FDC route change request, the FDMP will update in the FO Flight Script the horizontal path of the trajectory using a set of expanded route points.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0004
Requirement	On any accepted route change, the FDMP shall update the Expanded Route of the FO Flight Script to reflect those changes.
Title	Updating the Horizontal Path of Trajectory in the FO Flight Script
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect in the Expanded Route data block of the Flight Script any applicable route change.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0008	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0061
Requirement	When creating or updating the route, the FDMP shall insert in the Expanded Route field of the FO Flight Script, one or more of the following items: – Departure and Destination Aerodrome Points, – Published Significant Points and Geographical Points from the F15c route, including expanded airway portions, having optional attributes stating that a Flight Type (OAT/GAT) or a Flight Rule (VFR/IFR) switch is associated to those points. – Published Significant Points from the expansion of Standard Procedures (SID, STAR, Approach Procedure and Missed Approach Procedure), – Geographical Points used to modify the original 2D path, – Points resulting from the projection of points in case of route amendment (Published Significant Points or Geographical Points), – Points describing the surface movements. – Unknown items from the flight plan route.
Title	FDMP updating the Expanded Route
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement identifies all the route elements that the FDMP must include in the Expanded Route data block when the route is created from the filed flight plan and then modified.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0007	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0008	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0009	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0025	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0026	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0089	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0062
Requirement	When receiving a FO, all IOP Stakeholder identifying in the FS Expanded Route an Expanded Route item for which they know the corresponding set of one or more route points shall request the FDMP to substitute in the FS Expanded Route the item by the a sequence of known route points.
Title	FS Expanded Route Refinement
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs all SIs receiving a Flight Object to substitute as much as they can the unknown element items present in the Expanded Route by the sequence of known route points. Editor's note. This requirement might be later on substituted by more precise requirements upon clarification on the route expansion procedures.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.1.5 FS Constraints

The FO Flight Script contains an ordered list of constraints that characterize the vertical, lateral (e.g. heading) and longitudinal information used to calculate the trajectory (levels, speed or time at a given location).

Rules are defined to allow the IOP Stakeholders understanding the same way the constraints shared in the FO Flight Script. However, as the IOP stakeholders use those constraints through different Trajectory Prediction (TP) engines and performance data bases, the resulting trajectories computed by the IOP Stakeholders might be slightly different.

Constraints are defined by:

- "non-variable attributes" specified at the creation of the constraint by an FDC or the FDMP: Type, Category, Target Value, Owner Identifier, Origin;
- "variable attributes" that can be modified by the FDMP or FDC during the lifetime of the constraint: Eligible Stakeholder(s), Input Application Point (AP) Value, Input Target Start Point (TSP) Value, Input Target End Point (TEP) Value, Computed Application Point, Computed Target Start Point, Computed Target End Point, Constraint Handling and Activity Status, Constraint Relevant Points Identification.

The constraints attributes are described in section 3.1.4.2.

The IOP stakeholders must never modify the following constraint attributes when provided at the creation of the constraint by any FDC or the FDMP: the constraint owner, the constraint type and category and the constraint identifier. If needed, a new constraint needs to be creating to replace the current one.

The constraint owner is never changed.

The constraint ownership of the flight plan category constraints is assumed in turn by each SI becoming the FDMP of the flight (the constraint identifier will reflect this FDMP ownership, referring a wildcard SI ID). FDMPs will be eligible in turn to modify/delete a constraint.

The identification of the constraint Relevant Point(s)[1] can be modified by an eligible SI (by default by its owning SI).

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0006
Requirement	Upon receipt of a request from an FDC to modify an existing constraint identified by its constraint identifier, the FDMP shall reject that request if it modifies one of the following constraint attributes: – the constraint type and category, – the constraint target value, – the constraint owner.
Title	Not modifiable constraint attributes (1)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirements requires the FDMP to perform additional checks when receiving a request to modify an existing constraint to ensure that the issuer does not attempt to modify non-variable attributes
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0061	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[1] "Relevant points" are defined in section 2.2.1.2.4.

3.1.4.2 Constraint Attributes Definition

3.1.4.2.1 Constraint Type

The constraints defined in IOP are specified in Table 1. The constraint dimension, i.e. the unit of the Target Value, is provided for each constraint. IOP Stakeholders can support a locally-defined subset of this list.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0076
Requirement	When it needs to share a constraint and it supports this constraint type, the IOP Stakeholder shall create or request to create in the FO Flight Script the associated constraint as defined in Table 1.
Title	Available Constraint Types
Status	<In Progress>
Maturity Level	TRL2
Rationale	This generic requirement is created to identify all the constraints that are made available in the Flight Script. It clearly makes optional the support and the use of these constraints by each IOP Stakeholder. This requirement is associated with the definition of the list of constraints in the ICD model.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0046	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0047	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0055	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0074	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0092	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0094	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

	Constraint Type	Description	Dimension
Level Constraints	CFL	Cleared Flight Level (Clear, Climb, Descent) Flight Level or Flight Level Band at or to which an aircraft is authorised to proceed under conditions specified by an ATC Unit.	Level
	ECL	En-route Cruising Level Constraint The level that the flight has to maintain for a significant part of the flight after reaching TOC and prior to TOD. *Note. The ECL constraint is also used in the FO Flight Script to reflect Requested Flight Level(s) (RFL) defined in the Flight Plan and in the Flight Plan route as Speed/Level Groups.*	
	TFL	Transfer Flight Level Constraint Flight level or Flight Level Band at which a flight is planned to be cleared on transfer from the current responsibility to the next responsibility. From the upstream SI, the TFL is an Exit Flight Level (XFL). From the downstream SI, the TFL is an Entry Flight Level (EFL). The TFL can be complemented with a Supplementary Flight Level (SFL).	
	Strategic Level	Level constraint resulting from off-line defined restrictions and default level coordination constraints.	
	Planning Level	Level constraint resulting from level ATC planning constraints (FMP, EAP, etc.).	
	Tactical Level	Level constraint derived from ATCO input. An altitude constraint is a tactical input which requires the pilot to be within a level window over a point.	
Speed Constraints	ECS	En-route Cruise Speed constraint, from flight plan route (Speed/Level group) or flight plan data.	Speed
	Strategic Speed	Speed constraint resulting from off-line defined restrictions, e.g. ATC speed constraints or default speed constraints from SIDs/STARs.	
	Planning Speed	Speed constraint resulting from planning restrictions (Integrated Network management and ATC Planner (INAP), AMAN, etc.).	
	Tactical Speed	Speed constraint derived from an ATCO input e.g. assigned speed, the current speed clearance which has been passed and acknowledged by the pilot, the speed restriction coordinated among adjacent SIs.	
VRCD Constraints	Strategic VRCD	Vertical Rate Of Climb/Descent constraint resulting from off-line defined restrictions, e.g. ATC vertical rate constraints, default vertical rate constraints from SIDs/STARs, default vertical rate constraints e.g. LoAs .	Rate of Climb/ Descent
	Planning VRCD	Vertical Rate Of Climb/Descent constraint resulting from planning restrictions (Integrated Network management and ATC Planner (INAP), AMAN…).	
	Tactical VRCD	Vertical Rate Of Climb/Descent tactical constraint derived from ATCO input, e.g. assigned vertical rate, the current vertical rate instruction which has been passed and acknowledged by the	

	Constraint Type	Description	Dimension
		pilot, or the VRCD coordinated among adjacent SIs.	
Time Constraint	Planning Time	Time constraint resulting from planning restrictions (FMP, Integrated Network management and ATC Planner (INAP), AMAN, Network Manager Calculated Take Off Time, and/or target times …)	Time
	Tactical Time	Time constraint (typically "cross position P at time T") derived from ATCO input (Controlled Time of Arrival/Controlled Time Over).	
Route Constraints	Route Amendment	– Insert Point: an expanded point being inserted in between two points of the expanded route. – Proceed to point : Go-Direct – Route Amendment applied to the Expanded Route from given AP up to a Re-join Point,	Route
	Diversion	Route amendment including an ADES change.	
	Offset	Constraint that does not impact the Expanded Route when handling is OPEN. It is given as a lateral offset from the Expanded Route, starting from the given AP. It can be also coordinated among adjacent SIs.	
Heading Constraint	Planning Heading	Heading tactical constraint resulting from planning restrictions	Heading
	Tactical Heading	Heading tactical constraint derived from ATCO input, also coordinated among adjacent SIs.	
Holding STACK & AMA (Aerial Manoeuvring Area) Constraints	Planning Holding	Complex holding constraint, including a Time constraint, and possibly a space and level discontinuity resulting from planning restrictions.	Time
	Tactical Holding	Complex holding constraint, including a Time constraint, and possibly a space and level discontinuity derived from ATCO input.	
STAY	STAY	Stay constraint that induces a time delay on a point. From ADEXP format: '-' "STAY" stayident time ((adid adid) | (ptid ptid) (adid | ptid) | (ptid adid)) [ptspeed] [ptrfl] e.g. - FURTHRTE BABIT DIMLO STAY1 GRZ ERKIR KOGOL KPT - STAY - STAYIDENT STAY1 - TIME 0025 - PTID DIMLO - PTID GRZ - ADES LSZH	Duration
	Planning STAY	Stay constraint that induces a time delay on a point constraint resulting from planning restrictions.	
	Tactical STAY	Stay constraint that induces a time delay on a point derived from ATCO input.	

Table 1 – Constraint Types

At a given time, it is assumed that all SIs of the IOP area will support the same set of constraint types. As a consequence, there is no requirement on FDMP nor FDCs dealing with situations where a requested constraint is not supported by another SI.

3.1.4.2.2 Constraint Category

For each type of constraint, the Constraint Category provides information about the conditions that led to the creation of the constraint. It may be used together with the Constraint Type to identify the exact source of the constraint (e.g. a 'flight plan' ECL is a RFL).

The constraints included in the FO Flight Script can be of one of the following categories:

- **Flight Plan**: These constraints are derived from the original flight plan information (e.g. flight plan RFL).
- Flight Plan constraints are create on the filed Flight Plan and any changes made to the flight plan before the activation of the flight. Note that the FO Flight Plan Cluster is also aligned and is then never modified. Once the flight is activated, new constraints can be accepted and invalidate the flight Plan constraints.
- **Executive**: These constraints reflect controller's orders or clearances given to the flight crew (e.g. CFL).

  Executive constraints are always indicated to the flight crew through the use of clearances (voice or data link). Clearances can be either 'immediate' (e.g. CLIMB now) or 'deferred' (e.g. AT time/position/level CLIMB). Immediate clearances start at the actual position of the aircraft, whereas deferred clearances start at the point associated with the AT condition.
- **Planning**: These constraints reflect planner's controller input, e.g. ECL or TFLs.

  Planning constraints are not exchanged/cleared with the pilots but they are negotiated amongst inter- or intra-SI ATCOs and inserted in the local system.
- **Strategic**: These constraints applicable on a flight are selected based on crossed geographical element (aerodrome, published point or geographical area) with further criteria based on flight plan data.

The Strategic Constraints may be used:

- to reflect operational procedures to manage the flow of traffic within an SI or between SIs,
- to reflect airspace use restrictions, such as noise reduction procedures,
- to reflect default coordination constraints as stated in operational Letter Of Agreements (LOAs) between SIs or responsibilities.

Strategic constraints can be defined also on initial climb and final approach portions of route.

Only some of the strategic constraints are shared between System Instances through the Adaptation Data. When not shared (private), those constraints are not defined in the Adaptation Data of different SIs, they are locally managed by the SI as they usually represent ATC restrictions (level, speed, etc.) inside its AoR. Strategic constraints whose definition is shared by different SIs are mainly those contemporary impacting the AOR of more than a unique SI, e.g. those derived by LoAs. Both shared and private strategic constraints are published in the FO Flight Script.

The SIs sharing strategic constraints must have a common understanding on when and how to activate and process these constraints. The applicability rules, the constraint parameters, as well as the off-line defined environment data are maintained for those constraints locally in the System Instances in the 'Adaptation Data' database.

The IOP stakeholder creating a constraint will assign to it the category as per Table 2.

Constraint Category	Constraint Type													
	CFL	ECL	TFL	Level	Cruise Speed	Speed	VRCD	Time	Route Amendment	Diversion	Offset	Heading	Holding	STAY
Executive	✓	-	-	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planning	-	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strategic	-	✓	✓	✓	-	✓	✓	-	✓	✓	✓	-	-	-
Flight Plan	-	✓	-	-	✓	-	-	-	-	-	-	-	-	✓

Table 2 – Possible Category per constraint type

It is not allowed to modify the category of an existing constraint. When a constraint needs to be replaced by another one with a different category, the previous one must be removed and a new one added.

3.1.4.2.3 Constraint Target Values

At creation time, each constraint is assigned one or more target values:

- The **Main Target Value** (mandatory) provides a quantitative value of the constraint. This value is typically a level, a speed, a vertical rate of climb/descent, a time, a duration, etc. 8according to the constraint type. The target value can represent a discrete value ([at]) or a band ([at or above]/[at or below]/[band]).
- **Additional target values** (optional) can be complementary to the main target value. For instance, an XFL constraint can be associated with a Supplementary Flight Level (SFL) constraint.
- **Additional conditions** describing when the target values need to be achieved, e.g. time conditions can be [at or before time], [at or after time] and position conditions can be [at position], [at or before position], [at or after position].

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0009
Requirement	An IOP stakeholder creating a constraint shall provide target values as per Table 3.
Title	Constraint Target Values Setting
Status	<In Progress>
Maturity Level	TRL2
Rationale	This generic requirement is created to specify the data that need to be provided by an IOP Stakeholder when creating a constraint. This requirement is associated with the definition of each constraint in the ICD model.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0017	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0019	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0021	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0037	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0041	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0042	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0048	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0049	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0050	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0051	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0053	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0086	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0087	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0088	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0091	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Constraint Category	Constraint Type													
	CFL	ECL	TFL	Level	Cruise Speed	Speed	VRCD / Gradient	Time	Route Amendment	Diversion	Offset	Heading	Holding	STAY
Relevant Constraint Points														
Application Point (AP)		C_1		C_1		✓			✓		✓	✓		
Target Start Point (TSP)		C_1		C_1		✓	✓	✓					✓	✓
Target End Point (TEP)				O		O	O		✓		O	C_2	O	O
Main Target Value														
Level	O	✓	✓	C_1										
Level Band	O		✓	C_1										
Level qualifier (at, at or below, at or above)	✓	✓	✓	✓										
Type of Transition (wall, up/down)			✓											
Speed					✓	O								
Speed Band						O								
Speed Qualifier (at, at or less, at or greater, at the lowest, at the highest)					✓	✓								
VCRD (value, highest possible) + VCDR Qualifier (at, at or less, at or greater)							C_1							
Gradient + Gradient Qualifier (at or less, at or greater)							C_1							
Time Type (CTOT, CTA, CTO, TTA, TTO)								✓						
Time								C_1						
Time Band								C_1						✓
Time Qualifier (at, at or later, at or before, between)								✓						
Heading or Track												✓		
Vectoring qualifier (heading or track)												✓		
Point of Resume												O		
Stay Identification														✓
Entry Point													✓	✓
Holding Level													O	
Exit Point													O	✓
Exit Level													O	
Time to Spend													O	
Exit time													O	
2D path [0 to n expanded route points]									✓	✓				
ADES										✓				
Offset side (left, right)											✓			
Lateral Offset											✓			
Additional Target Value														
SFL			✓											
Optional Additional Conditions														

Time	✓			✓		✓								
Position	✓			✓		✓								

Table 3 – Target Values defined per constraint Type

O: *Optional*
C_1 *Only one.*
C_2 *Mandatory for closed heading constraint*

Route Amendment Constraint

The target value of a route amendment constraint identifies the route segment that the aircraft has now to fly. Some point(s) (or segment(s)) of the route can be identified as 'protected', that is the constraint owner requires that the IOP stakeholders be all aware that these route point(s) / route segment(s) have been defined to cope with a constraint and must as much as possible not be modified. When the constraint is accepted, the 'protected' tag is reflected in the Expanded route.

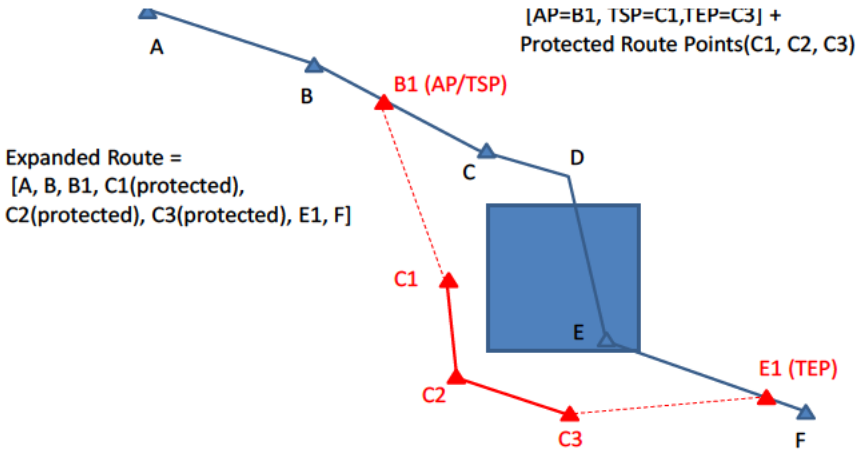


Figure 3-5: Route Amendment Constraint

Go-Direct Constraint

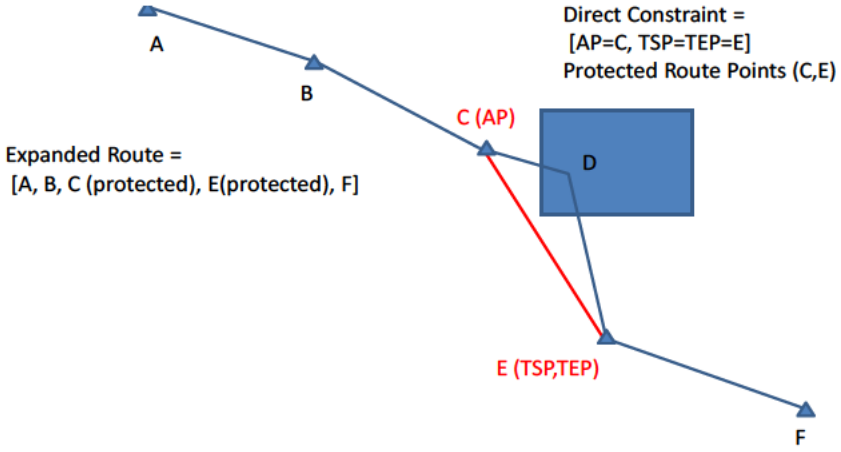


Figure 3-6: Go-Direct Constraint

Offset Constraint

In case of an aircraft being cleared to offset, the FS Expanded Route contains the initial cleared route (the blue route) whereas the constraint specifies the offset (offset distance and offset direction (left/right)).

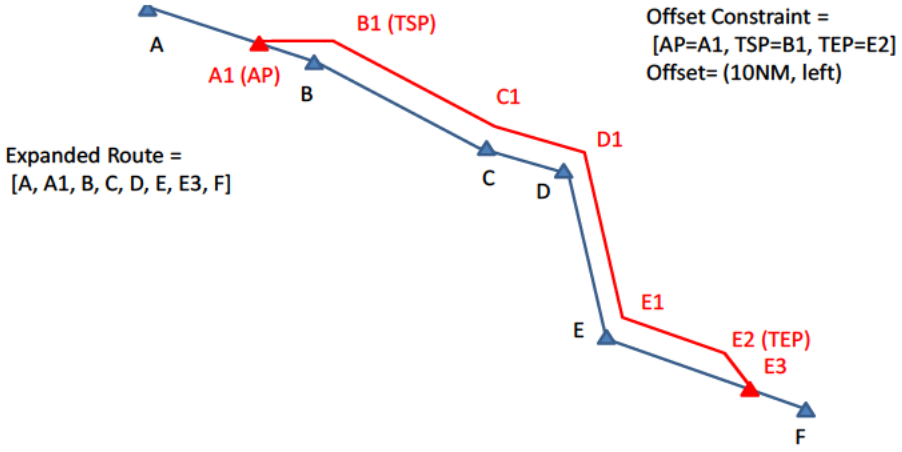


Figure 3-7: Offset Constraint

Diversion Constraint

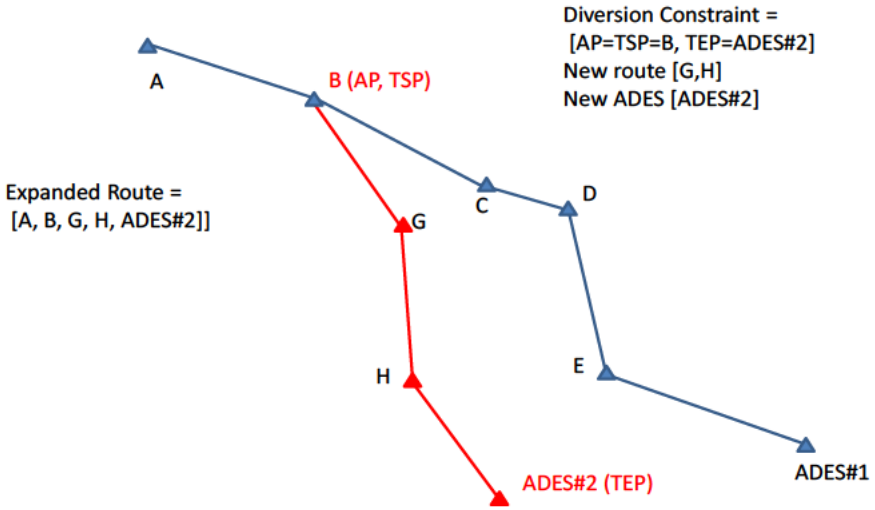


Figure 3-8: Diversion Constraint

3.1.4.2.4 Constraint Input, Relevant and Computed Points

The segment of the route on which the constraint applies is determined by three main points:

- The “Application Point” (AP) is the point at which the flight is requested to start the maneuvers in order to accomplish the constraint.

- The “Target Start Point” (TSP) is the point at which the constraint is required to be fulfilled.
- The “Target End Point” (TEP) is the point at which the constraint is not applicable any more.

These three points are specified more in detail by the following definitions:

- The “Relevant Application Point” is a flag indicating whether the application point of the constraint is a main target for the trajectory computation.
- The “Relevant Target Start Point” is a flag indicating whether the target start point of the constraint is a main target for the trajectory computation.
- The “Relevant Target End Point” is a flag indicating whether the target end point of the constraint is a main target for the trajectory computation.
- The “Input Application Point” is the value defining the position of the application point of the constraint as computed by the system creating the constraint.
- The “Input Target Start Point” is the value defining the position of the target start point of the constraint as computed by the system creating the constraint.
- The “Input Target End Point” is the value defining the position of the target end point of the constraint as computed by the system creating the constraint.
- The “Computed Application Point” is the value defining the position of the application point of the constraint as computed by the FDMP.
- The “Computed Target Start Point” is the value defining the position of the target start point of the constraint as computed by the FDMP.
- The “Computed Target End Point” is the value defining the position of the target end point of the constraint as computed by the FDMP.

When creating a constraint, the System Instance:

1. provides input constraint points for the AP, TSP and TEP when applicable,
2. identifies which are the relevant constraint point(s).

It is not allowed to modify the identification of the relevant constraint points in the FO Flight Script. When this is needed, the current constraint must be removed and a new one added to the FO Flight Script with new relevant points.

Once the IOP trajectory is computed using the constraint input points, the FDMP specifies in the FS the “computed” AP, TSP and TEP.

The IOP stakeholder creating a constraint identifies which of the constraint points must be respected when computing the trajectory, amongst the application point, the target start point and the target end point, following the rules specified in Table 3.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0010
Requirement	The IOP stakeholder creating a constraint shall indicate in the constraint the existing relevant constraint point(s) amongst the application point, the target start point and the target end point.
Title	Constraint Relevant Point Identification by Constraint Owner
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the IOP Stakeholder creating a constraint to explicitly describe how it expects the other IOP Stakeholder to implement the constraint. This requirement specifically addresses the overall IOP objective to

	allow all IOP Stakeholders to locally create a trajectory that would take into account as much as possible the constraints as experienced by other IOP Stakeholders. *Note 1. These points are identified as the 'relevant' constraint points.* *Note 2: Relevant Constraint Point(s) are indicators that will be set in the constraint on creation, together with all the available Input Constraint Points (position values), computed by the IOP stakeholder that creates it.*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0060	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0011
Requirement	For each constraint, the FDMP shall include in the FO Flight Script: - the indication of which constraint point(s) is a relevant point as indicated at the creation of the constraint, when any, - the input points as indicated at the creation of the constraint, when any, - the FDMP computed constraint points.
Title	Constraint Points in the FO Flight Script
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect in the Flight Script the description of the constraint as expressed by the IOP Stakeholder having created the constraint (see REQ-10.02.05-TS-FSMG.0010) and include in the Flight Script the way it has actually implemented it.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.2.5 Constraint Origin

The constraint Origin provides information about the way the constraint has been set:

- '**manual'** when the constraint is triggered following a Controller / Operator input;
- '**automatic'** when the constraint is triggered based on an off-line defined configuration;
- '**filed'** origin when the constraint is derived by an AFTN or OLDI message.

Table 4 lists all possible origins for each constraint type.

Constraint Origin	Constraint Type																	
	CFL	ECL	TFL	Strategic level	Planning/Tactical Level	Cruise Speed	Strategic Speed	Planning / Tactical speed	strategic VRCD	Planning/Tactical VRCD	Time	Route Amendment	Diversion	Strategic Offset	Planning / Tactical Offset	Heading	Holding	STAY
Manual	✓	✓	✓	-	✓	-	-	✓	-	✓	✓	✓	✓	-	✓	✓	✓	✓
Automatic	-	✓	✓	✓	-	-	✓	-	✓	-	-	✓	✓	✓	✓	-	✓	-
Filed	-	✓	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	✓

Table 4 – Possible Constraint Origin per constraint type

✓: *Can be the origin of that constraint.*
- *Cannot be the origin of that constraint*

3.1.4.2.6 Constraint Owner

The owner of the constraint is allowed to define dynamically which IOP Stakeholders are allowed to modify and remove the constraint. These identified IOP Stakeholders are the Constraint Eligible Stakeholders.

The ownership of a constraint is usually granted as indicated in Table 5. The ownership could be assigned;

- to the requester of the constraint (default case),
- to one of the impacted SIs as defined by bilateral agreement in the LoAs in case of shared strategic constraints,
- to the systems having the FDMP role for constraints derived from initial flight plan data and initial flight route. For those kind of constraints the current FDMP will be a Constraint Eligible Stakeholder.

It may happen that an SFPL can be created contemporary in all SIs affected by the same flight, due for instance to IFPL/FPL/ICHG/CHG messages received. To avoid the risk of sharing duplicate sets of En-route Cruise Level and Cruise Speed constraints, with Flight Plan category, thoseconstraint will have no specific operational ownership, and for technical convenience the ownership of those constraints will be assigned by default to the first SI publishing the related FO.

The initial constraint in the flight plan (ECL, cruise speed, etc…) cannot have a designated owner since they are applicable in a time and airspace greater than a given SI. As a consequence, the ownership is given along the flight in turn to each current FDMP.

Constraint Owner	Constraint Type																	
	CFL	ECL	TFL	Strategic level	Planning / Tactical Level	Cruise Speed	Strategic Speed	Planning / Tactical Speed	strategic VRCD	Planning / tactical VRCD	Time	Strategic Route Amendment	Planning / Tactical Route Amendment	Diversion	Offset	Heading	Holding	STAY	Planning / Tactical STAY
The SI that trigger the constraint	✓	✓	✓		✓			✓	C_1	✓	✓		✓	✓	✓	✓	✓		✓
Defined in Adaptation Data		✓		✓			✓		C_1			✓		✓	✓				
FDMP Ownership: eligibility dynamically taken by the current FDMP		✓				✓												✓	

Table 5 – Constraint Owner defined per constraint type

C_1 *Only one.*

The owner of the constraint is assigned at creation of the constraint.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0080
Requirement	The requester of a constraint shall assign an owner to the constraint.
Title	Initial Constraint Owner Assignment
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement ensures that the constraint is associated to the right owner in case the constraint requester is not the initial owner.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0098	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.2.7 Constraint Eligible Stakeholders

The 'Constraint Eligible Stakeholder' is a specific IOP Stakeholder designated by the constraint owner and authorized to perform specific operations on the constraint.

By default,

- the SI identified as the owner of the constraint is considered as a constraint Eligible Stakeholder for all operations,
- the SI controlling the flight is considered as a Constraint Eligible Stakeholder for the modification operation on all upstream constraints.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0081
Requirement	The owner of a constraint shall designate which IOP Stakeholder(s) are allowed to perform operations on the constraint ("Constraint Eligible Stakeholder(s)").
Title	Constraint Eligible IOP Stakeholder Assignment
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement requires the Constraint Owner to explicitly define which actor is allowed to act on the constraint. By default, the SI owner of the constraint is a Constraint Eligible IOP Stakeholder, and the SI controlling the flight is a Constraint Eligible IOP Stakeholder for all the upstream constraints.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0099	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.2.8 Constraint Identifier

Constraints are identified by a Constraint Identifier constructed as follows:

- For all constraints excluding shared strategic constraints, the Constraint Identifier identifies the SI that owns the constraint and includes a dynamically assigned number unique to that SI.
- For shared strategic constraints, the Constraint Identifier identifies the SI that owns the constraint and a number unique to that SI. Both the owning SI identifier and the unique number are off-line defined and shared in the adaptation data. In addition, a Strategic Constraint Common Identifier can be used to describe in plain text the shared constraint.

3.1.4.2.9 Constraint Handling

The Constraint Handling attribute is set at the creation of the constraint and can be modified later on by the Constraint Eligible Stakeholders. This attribute has the following meaning:

- Constraints are '**closed'** when they have an impact on the trajectory and should be used by the FDMP for the IOP trajectory computation.

- Constraints are '**open'** when they have no impact on the trajectory and should not be used by the FDMP for the IOP trajectory computation.

For instance, a heading constraint or an offset constraint with no clear instruction on how to re-join the agreed trajectory cannot be used for trajectory computation and is included in the FS as an open constraint. Target time constraints are always open constraint. For other time constraint, they are open until they are transmitted to the aircrew and acknowledged.

Time constraints may be used for other needs, often with closed handling.

Both closed and open constraints are included in the constraint list.

Open constraints have the following properties:

a) An 'open' constraint may deactivate another 'closed' constraint, so it may have an indirect impact on trajectory computation (e.g. an 'open' climb CFL may set INACTIVE a 'closed' Level Strategic constraint in the overall Climb phase of flight).

b) 'Open' constraints may contain information useful during the transfer phase (e.g. an upstream open heading).

c) 'Open' constraints may be managed as 'closed' constraints by a downstream system (e.g. an open heading that would need to be closed by a downstream system).

Table 6 specifies whether each constraint type can be considered 'open', 'closed' or both.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0016
Requirement	Upon receipt of a request from an FDC to create a constraint, the FDMP shall reject that request if its constraint handling is not consistent with the rules specified in Table 6.
Title	Constraint Handling Attribute Setting
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to check that the IOP Stakeholder creating a constraint has correctly set the 'constraint handling' parameters. Indeed, some constraint types are per nature exclusively closed or open, the other value making no sense. No check is required for constraint types that can be set open or closed at the discretion of the constraint owner / eligible stakeholder.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0023	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0061	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Constraint Handling	Constraint Type																		
	CFL	ECL	TFL	Strategic level	Planning Level	Tactical Level	Cruise Speed	Strategic Speed	Planning speed	Tactical speed	Strategic VRCD	Tactical / Planning VRCD	Time	Route Amendment	Diversion	Offset	Heading	Holding	STAY
Open	C_1	-	C_1	-	-	-	-	-	-	C_1	-	C_1	C_1	-	-	C_1	C_1	C_1	-
Closed	C_1	✓	C_1	✓	✓	✓	✓	✓	✓	C_1	✓	C_1	C_1	✓	✓	C_1	C_1	C_1	✓

Table 6 – Possible Constraint Handling attribute per constraint type

✓: *Only valid value for that type of constraint.*
C_1: *Open or Closed as stated by the constraint owner / eligible stakeholder.*
- : *Invalid value for that type of constraint.*

3.1.4.2.10 Strategic Constraints Status

The strategic constraints may be characterized with an additional status attribute, set to 'active' or 'inactive':

- '**active**' strategic constraints are taken into account by the TP and therefore used to compute the flight profile,
- '**inactive**' strategic constraints included in the FO Flight Script are not used by the TP to compute the flight profile.

Inactive constraints are constraints that are theoretically impacting the flight but are temporarily not applicable for whatever reason (e.g. a non-active military zone).

The SI owner of a strategic constraint, on any context change, local or by IOP, will re-assess if the flight is still impacted by the constraint. When the flight is considered as definitively outside the scope of the constraint, the SI modifies, or requests the FDMP to modify, the Strategic Constraint Status to INACTIVE in the FO Flight Script.

3.1.4.2.11 Relationship between Constraints and Expanded Route

Any constraint must be associated with points of the Expanded Route of the FO Flight Script.

When the constraint does not modify the route, the input AP, TSP and TEP and output AP, TSP and TEP, when provided, must be defined by referring to existing points of the Expanded Route plus optionally a positive distance.

When the constraint points cannot be positioned on the existing Expanded Route (e.g. see Figure 3-3) because the Expanded Route is amended, the constraint points are added as new points in the Expanded Route.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0018
Requirement	The FDMP shall associate the input AP, TSP and TEP and output AP, TSP and TEP of a constraint, when provided, with the Expanded Route by : - associating them with existing Expanded Route points plus an optional

	positive distance, when the constraint does not modify the route, - adding them as new points in the Expanded Route otherwise.
Title	Constraint Points / Expanded Route Linkage
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to associate any constraint with an existing or a new point in the Expanded Route. A constraint with no link to the Expanded Route would not be understood by the other IOP Stakeholders.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.2.12 Constraint Acceptance

Once a constraint is inserted or changed locally in the FDMP, inserted or changed by an FDC constraint FO service request accepted by the FDMP, the FDMP includes the constraint in the FS as an 'accepted' or a 'rejected status as follows:

- '**accepted'** means the constraint has been used by the FDMP for the trajectory processing. Optionally an acceptance qualifier is also provided:
  - No qualifier means the constraint has been fully applied by the FDMP (see REQ-10.02.05-TS-FSMG.0028);
  - The qualifier value 'accepted-not-implemented–as-requested' means the constraint has only partially been applied by the FDMP, i.e. the computed trajectory does not match exactly the requested target values of that constraint or the way to implement it was not exactly satisfied (see REQ-10.02.05-TS-FSMG.0030);
  - The qualifier value 'to-be-re-assessed' is used when the constraint has been maintained by the FDMP after a route change and need to be re-assessed by the constraint owner (see REQ REQ-10.02.05-TS-FSMG.0068).
- '**rejected'** is used by the FDMP to indicate in the FS that the constraint has not been used for the trajectory production. It is also used locally by the FDC when it cannot implement the constraint in its SFPL. The reason for rejection is also provided:
  - The reject reason 'Out-of-Route' is used by the FDMP to indicate it was not able to maintain the constraint after a route change (REQ-10.02.05-TS-FSMG.0069/ REQ-10.02.05-TS-FSMG.0057);

    The reject reason 'not-to-be-maintained'; is used by the FDMP to indicate that the constraint maintenance policy do not request the constraint to be maintained after a route change (REQ-10.02.05-TS-FSMG.0056).

3.1.4.3 General Operations on the FO Flight Script

The FDMP is responsible for updating the FO Flight Script when alignment with its trajectory local view is needed or upon request of a FDC.

3.1.4.3.1 FO Creation

At FO creation, all the applicable constraints known by the FDMP must be integrated in the FO Flight Script as an Expanded route point and/or as a constraint. Those constraints may come from the filed flight plan (Cruise Speed, Cruise Level, Speed/Level switches, ..) and from the local system.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0072
Requirement	When creating a FO, the FDMP shall include in the Flight Script the constraints coming: - the filed flight plan when still applicable, and - the local constraints used to compute the IOP Trajectory
Title	FO Creation (FDMP)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP at the creation of the FO to initiate the list of constraints with the constraints issued from the filed flight plan and optionally the local constraints of interest for the other IOP Stakeholder.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0009	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0085	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.3.2 FO Modification triggered by FDMP

FDMP local stimulus

The FDMP is responsible for keeping aligned its flight internal representation (SFPL) and the trajectory specified in the FO. When an internal stimulus creates or modifies the SFPL and this change and its consequences needs to be reflected in the FO, the FDMP updates the FO Flight Script Expanded Route and/or Constraints List, and publish it to interested IOP stakeholders.

Stimulus can be for instance local controller input, modification of local conditions to activate local constraints, estimated time or level associated with a deferred clearance (e.g. AT time/level CLIMB TO level) does not correspond to the intended time or level), etc.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0022
Requirement	When detecting that a stimulus has created a change in its local view of the flight that impacts the Expanded Route and/or the Constraint List in the FO Flight Script, the FDMP shall reflect the change in the associated FO Flight Script and publish that FO.
Title	FDMP local stimulus changing the FS
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect any significant changes of the local SFPL into the Flight Script to allow other IOP Stakeholder to take this change into account.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0001	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0010	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0012	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0027	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0028	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0031	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0034	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0035	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0036	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0085	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Surveillance data stimulus

Surveillance information is a special case of internal stimulus. This information does not always lead to a change in the predicted trajectory. It reflects the real position of the aircraft which does not need to be systematically updated in the FO Flight Script. The FO Flight Script is only updated when there is a significant discrepancy between the predicted position and the measured position.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0023
Requirement	When the aircraft position changes and there is no other reason to publish an update of the FO, the FDMP shall publish a new Flight Object updating the FO FS Initial Conditions only if the exit conditions of the first crossing with a downstream SI change with respect to the previously published FO: - regarding vertical dimension by more than SP-VERT-UPDT-THRESHOLD (in FL), or - regarding time dimension by more than SP-TIME-UPDT-THRESHOLD (in seconds).
Title	Thresholds for FO initial conditions republish
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect in the Flight Script the significant changes of the current position of the aircraft into the Flight Script to allow other IOP Stakeholder to take this change into account. By significant change, it is meant change modifying the coordination data with a downstream SI.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Although a surveillance position update is itself not a change trigger, it is important to highlight that any FO that is published needs to be fully aligned with the SFPL of the FDMP. This implies that the FDMP will update the last measured position of the aircraft each time it publishes the FO Flight Script, regardless the reason for publishing (i.e. triggered by an internal event or by an external request from another contributor).

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0024
Requirement	The FDMP shall update the FO FS Initial Conditions with the current position of the aircraft within the FO Flight Script for each Flight Object publication.
Title	Update of the FO Flight Script Current Position
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to update the current position of the aircraft whenever it publishes the FDMP.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.3.3 FO Modification triggered by FDC

FDC local stimulus impacting the Flight Script

When the FDC SFPL is updated, the FDC can request the FDMP to align the FO accordingly.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0025
Requirement	When detecting that a stimulus has created a change in its local view of the flight that impacts the Flight Script of the associated Flight Object, the FDC shall request the FDMP to update the flight script to reflect the local change.
Title	Local stimulus modifying the FO Flight Script from FDC side
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDC to request the FDMP to reflect any significant changes of the FDC's local SFPL into the Flight Script to allow other IOP Stakeholder to take this change into account.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0001	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0010	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0012	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0027	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0034	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0035	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0036	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0085	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

FDMP Processing of the FS change request (positive)

A valid FS service request from an FDC is FO service request that has succeeded the eligibility, syntactical and semantical checks by the FDMP.

When a request to add or modify a constraint is received from a FDC, the FDMP checks the validity of the requested change and tries to integrate it in its SFPL. If this succeeds, the constraint is included in the FS with an indication it has been accepted. The FO aligned with the FDMP internal view is published along with the IOP Trajectory.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0028
Requirement	Upon receipt of a valid FS service request from an FDC to insert, update or remove constraints in the FO Flight Script and if the FDMP can align its local flight (SFPL) with the requested change, the FDMP shall include the proposed change in the FO Flight Script in an accepted constraint.
Title	Acceptable FO Flight Script update request processing
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to apply locally a received FDC's request to add, modify or remove a constraint before accepting it and including it in the Flight Script as accepted.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

FDMP Processing of the FS change request (constraints. negative case)

When a request to change the route or a constraint is received from a FDC, the FDMP performs first 'eligibility', 'syntactical' and 'semantic' checks.

Semantic checks include:

- Consistency between the request parameters,
- Consistency of the request parameters with the existing FO,
- A route change request is received without the projection of existing flight plan points,
- No concurrent FO service requests (just one FO service request will be accepted for each FO version (will be processed).

When a request to change the route or a constraint is received from a FDC, the FDMP checks the validity of the requested change and tries to integrate it in its SFPL. If this integration does not succeed, the constraint is included in the FS as a 'rejected' constraint. The FO aligned with the FDMP internal view is published.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0029
Requirement	Upon receipt of a valid FS service request from an FDC to insert or update a constraint in the FO Flight Script and the FDMP cannot apply in its local flight (SFPL) the requested change, the FDMP shall include the proposed change in the FO Flight Script in a rejected constraint with the reason for the rejection.
Title	Non Acceptable FO Flight Script update request processing (constraints)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to include any received FDC's request to insert or update a constraint in the Flight Script as a rejected constraint when it cannot apply it locally. This allows IOP Stakeholder to detect that the constraint request has been processed by the FDMP and later on to next FDMPs to re-evaluate it. Reject Reasons are defined in section 3.1.4.2.12.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0063	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When the FDMP modifies its SFPL when processing a FDC change request, the FDMP can have to incorporate additional constraints in the SFPL. These new constraints must in turn be published in the Flight Object.

FDMP Processing of the FS change request (partial application)

It is possible that a valid constraint requested by a FDC cannot be fully achieved by the FDMP, i.e. the computed trajectory does not match exactly the requested target values of that constraint.

This situation may be caused by the use of different TP algorithms.

Examples of Requested Target Value that cannot be totally achieved are:

- an Exit FL that on the input Target Start Point is below or above the Target Value of the constraint, or
- the Target Value of a Time constraint, that cannot be fully satisfied at its input Target Start Point because, starting from the input Application Point, the needed speed change to satisfy that constraint cannot be provided by the aircraft in the specific context of Level, wind, temperature, etc.

In this case, the FDMP indicates in the FO Flight Script that its trajectory calculation did not fully achieve what was required by the constraint, although it tried to fulfil it.

The qualifier value 'accepted-not-implemented–as-requested' means the constraint has only partially been applied by the FDMP, i.e. the computed trajectory does not match exactly the requested target values of that constraint or the way to implement it was not exactly satisfied. This value also applies when the FDMP has not used in the IOP Trajectory computation a constraint the same way is was intended, as described in Table 7.

Requested Constraint Handling Used by FDMP in its IOP trajectory computation as…	Open	Closed
Open	Open (nominal): constraint is accepted and not used in trajectory computation	Open constraint is accepted with reason ''accepted-not-implemented–as-requested' but not used in trajectory computation.
Closed	Closed constraint is accepted with reason ''accepted-not-implemented–as-requested' but is used in trajectory computation.	Closed (nominal): constraint is accepted and used in trajectory computation

Table 7 – Constraint Handling Usage by FDMP

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0030
Requirement	If a constraint proposed by a FDC is accepted but the requested target value or the way to implement it is not as expected (e.g. relevant point or constraint handling), the FDMP shall include that constraint in the FO Flight Script as accepted with the acceptance qualifier set to 'accepted-not-implemented–as-requested'.
Title	Constraint partially reached
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement allow the FDMP to partially implement a requested constraint but instructs the FDMP to clearly indicate it in the Flight Script.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0063	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

FDC Processing of the FS change request processed by FDMP (negative)

When the FDMP includes a constraint requested by an FDC tagged as 'rejected', the requesting FDC may retain the proposed constraint in its local image when according to its own algorithms it is acceptable. .

It is the responsibility of the FDC to remove the constraints that FDMP rejected (flagged 'ignored', 'not-applied' or 'rejected'), that it owns and which are considered as not valid any longer.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0032
Requirement	The FDC shall request the FDMP to remove the rejected constraints that it owns from the FO Flight Script when it considers according to its own logic that they are not valid and removed from its SFPL.
Title	Removal of rejected constraints
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirements instructs the FDC to remove from the Flight Script any constraint it previously set but now considers as obsolete for the flight. *Editor's note. This requirement might be extended to cover the case of 'old' constraints.*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0064	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When an FDC has sent a constraint request service to the FDMP, if it receives a service request acceptance but then receives a FO whose Flight Script does not reflect that request, it can optionally repeat the request. The number of retries (0 or more) is limited to avoid endless loops.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0033
Requirement	When an FDC has sent a add, modify or remove constraint service request to the FDMP and received a service acceptance from the FDMP, if it then receives a FO in which that constraint has not been added, modified or removed, the FDC shall repeat the request up to a maximum number of times locally defined.
Title	Optional Retry by FDC for an accepted constraint service request not reflected in the FS
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDC to verify that the constraint request it sent was processed by the FDMP and to reiterate its request if not. The requirement prevents the retry mechanism to enter an endless loop.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When an FDC has performed a constraint request to the FDMP, and received a request rejection, when it will receive a FO whose Flight Script does not include that constraint request, it will not repeat the request, as the FDC must not retry sending an invalid request. The way to recover this error by an FDC is a local system behaviour.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0065
Requirement	When an FDC has sent a constraint service request to the FDMP, and received a service rejection from the FDMP (due to eligibility or syntactical or semantic checks failure), the FDC shall not repeat the same request.
Title	No retry by FDC for a rejected constraint service request not reflected in the FS
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDC to not repeat the same request when this request was properly rejected by the FDMP. By same request it is meant a request containing the same parameters.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.3.4 FO Reception

Change detection

When the FDC receives a Flight Object update (which might be the result of a Flight Object change from the FDMP or from another FDC), it analyses the received FO Flight Script, identifies the differences with its local view and assess whether those differences are locally acceptable.

Alignment of the FDC SFPL (constraints)

Upon receipt of an FO from FDMP, the FDC will reflect in its SFPL the added, modified and/or removed constraints and any Expanded Route change provided in the FO Flight Script, as long as these changes are compatible with the local rules for constraint and route management and have an acceptable impact on trajectory.

The FDC will incorporate in its SFPL the changes to the Constraint List and the Expanded Route of the FO Flight Script published by the FDMP, when these changes are compatible with the local rules for constraint and route management and have an acceptable impact on trajectory.

For the updates that are not deemed acceptable, the FDC will not apply the changes to the SFPL.

The FDC does not need to keep the changes sent by the FDMP in the FO FS when they are evaluated incompatible with the local rules and data. Indeed, when that FDC will take over the FDMP role, it will publish an FO FS not including the incompatible changes. In this case, the owner of those changes (constraint) will request to integrate them back in the FO FS. They will be added as rejected constraints.

When a constraint owned by an FDC is re-evaluated by the FDMP following a route change, the FDMP it distributes the FO with the constraint accepted and requests the FDC to re-evaluate the constraint. The FDC processes again the projection of the input constraint point(s) and request the FDMP to modify the constraint or remove it. In case of a modification request, the FDMP will remove the indication for the FDC to re-assess the constraint.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0068
Requirement	Upon receipt of a FO from the FDMP, if any constraint included in the FO FS owned by the FDC is accepted by the FDMP but requested to be re-assessed, the FDC shall process again the projection of the original input constraint point(s) on the modified expanded route, and: - if the constraint is still applicable, request the FDMP to update the constraint with the new input constraint point(s) processed, - otherwise request the FDMP to remove that constraint.
Title	Local SFPL alignment to the FO Flight Script (FDC) – to be re-assessed constraint
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement supports on the FDC side the mechanism of constraint re-assessment, used for instance in case of re-route when the FDMP succeeds to

	project an existing constraint on the new route and requests confirmation from the constraint owner.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When the FDMP does not succeed to properly project a constraint in case of route modification, it distributes the FO with the constraint rejected and requests the FDC to perform the projection and re-evaluate the constraint (out-of-route). The FDC processes the projection of the input constraint point(s) and request the FDMP to modify the constraint or remove it. In case of a modification request, the FDMP will remove the indication for the FDC to evaluate the constraint (out-of-route).

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0069
Requirement	Upon receipt of a FO from the FDMP, if any constraint included in the FO FS owned by the FDC is rejected by the FDMP with the reason 'out-of-route', the FDC shall process the projection of the original input constraint point(s) on the modified expanded route, and: - if the constraint is applicable, request the FDMP to update the constraint with the new input constraint point(s) processed, - otherwise request the FDMP to remove that constraint.
Title	Local SFPL alignment to the FO Flight Script – rejected 'Out-of-Route'
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement supports on the FDC side the mechanism of constraint re-assessment, used for instance in case of re-route when the FDMP does not manage to project an existing constraint on the new route and requests the constraint owner to perform it itself and remove the constraint if needed..
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.4 Specific Operations on Constraints and Expanded Route

3.1.4.4.1 FDMP Operations

The FDMP is granted all rights to create, modify and remove constraint in the Flight Script.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0038
Requirement	The FDMP shall be able to insert, modify or remove any constraint in the Flight Script, according to its local input and rules, or due to requests coming from the FDCs.
Title	FDMP operations on constraints in the Flight Script
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement specifies the rights of the FDMP in terms of constraint management. Ultimately, it is always the FDMP's choice to execute the add, modify or remove constraints action in the Flight Script.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

On any change from local stimulus or FDC request, the FDMP will update in the FO Flight Script the vertical, longitudinal and lateral intent of a flight using a set of constraints.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0005
Requirement	On any change from local stimulus or acceptance of a FDC request impacting the vertical, lateral or longitudinal dimension, the FDMP shall update the Constraint List of the FO Flight Script to reflect those changes.
Title	Updating the Vertical, Lateral and Longitudinal Profiles in the FO Flight Script
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect in the Flight Script any significant vertical, lateral and longitude change.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

FDMP Constraints Ordering

The constraints in the Flight Script are ordered by the FDMP. As they are linked to the expanded route points, the input application point of constraints position in the expanded route is the main ordering criteria.

The input Application Point, when it is computed by the owner of the constraint, for instance when the relevant constraint point given in input is the input Target Start Point, is provided by its owner.

That owner-computed input AP will be kept unchanged. Whichever role having the owner, that input AP shall be stored it in the FO Flight Script.

The FDMP is allowed to modify that input AP only in case of its 'projection', after any route change, and the owner may provide a re-assessed input Application Point.

Using the input APs also allows ordering the 'rejected' constraints (which do not have any computed AP).

The same rules described above for the input AP are applied also to the input TSP and input TEP.

In case a constraint has not an input Application Point provided by the originator of the constraint, the input Target Start Point or input Target End Point, with decreasing usage priority for ordering, will be used instead. Note that that also constraint with 'open' handling, or strategic constraint status 'INACTIVE', can have input Constraint Point(s) (AP/TSP/TEP).

The constraint creation timestamp will be distributed within each constraint in the Flight Script.

The constraint creation timestamp can be used by systems to handle duplicate constraints (i.e. constraints of the same type, having also same input constraint point(s). For instance in case of two consequent time constraints having the same Target Start Point, only the latest time constraint will be applied.

FDMP modification of an FDC requested constraint

The FDCs are allowed to request Flight Script changes that affect the upstream Systems Instances, including the one that is currently controlling the flight. The FDMP should try to apply the constraint as requested by the FDC.

Nevertheless, the FDMP should be protected against downstream changes that lead to a local inconsistency in its own AoR. In order to avoid this inconsistency, the FDMP is authorized to apply the constraint at a different position. This allows the FDMP to confirm the use of the FDC constraint but it does not guarantee that the profile computed by the FDMP actually fulfils the constraint as intended by the FDC.

The same logic applies between two FDCs, when the second FDC requests to apply a constraint that starts in its upstream (the first FDC). As a consequence, upstream/downstream should be understood in the requirement as 'FDMP-FDC' or 'FDC-FDC'.

It has to be noted that the constraints 'input' and 'relevant' AP/TSP/TEP will be never modified (the relevant constraint point(s) are flags set at constraint create time, according to local rules). So, the FDMP system will be only allowed to modify the computed AP/TSP/TEP, to avoid any impact on its own constraints by a downstream one.

The adaptation of the computed constraint points to the need of the upstream system will avoid the need to set 'rejected' the downstream constraint.

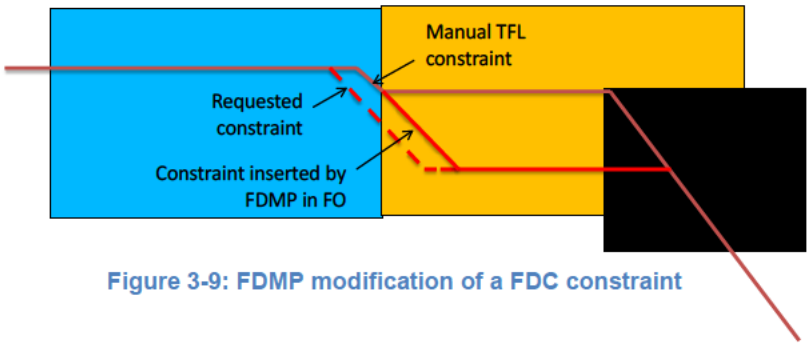


Figure 3-9: FDMP modification of a FDC constraint

3.1.4.4.2 FDC Operations

The FDC is granted all rights to create, modify and remove constraint in the Flight Script when it is owner of the constraint.

FDC Constraint Retrieval

IOP stakeholders use different TPs and implement heterogeneous local system requirements. It is likely that the FDMP will tag 'rejected' or will not apply in the IOP Trajectory constraints exactly as requested by the FDC.

The FDC may later be unable to recognize its own constraint and request again the insertion of the same constraint. In order to avoid multiple requests from the FDC concerning the same constraint, the criteria defined to retrieve a constraint is based on static attributes rather than on computed values.

Non variable constraint attributes are identified in § 0.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0047
Requirement	When receiving a Flight Script update, the owner of a constraint shall verify if it has been included in the flight script by using the Constraint Identifier.
Title	Identifying constraints
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement specifies the means by which a IOP Stakeholder can retrieve a specific constraint by using the Constraint Identifier.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

For shared strategic constraint, a common additional identifier off-line defined is used, the Strategic Constraint Common identifier. This identifier allows the IOP stakeholders impacted by the constraint to easily assess if the strategic constraint has been already included by the FDMP, optionally upon request of another FDC.

3.1.4.4.3 Constraint Propagation Rules

An IOP stakeholder receiving the Flight Script will translate the Flight Script content into a format that can be used by its native system. To avoid ambiguous translations, some basic information need to be inserted for all constraints of the flight script.

The application of a constraint depends on the operational concept, internal requirements and internal data bases (e.g. aircraft performance data base) operated by each system. In order to ensure that all IOP Stakeholders apply a constraint the way the constraint owner has applied it, the values which determine the profile of a constraint are included in the constraint.

The information provided for each constraint in the Flight Script will have two different sources, depending on the specific request:

- extracted without further processing from the command given by the controller or a flight restriction,
- the result of the trajectory calculation process that was generated in each system.

The retention of a constraint depends on the other downstream constraints. Several scenarios are identified:

1) There is no downstream constraint,
2) The next downstream constraint of the same dimension has an AP relevant point,
3) The next downstream constraint of the same dimension has a TSP relevant point,
4) The next downstream constraint of the same dimension becomes not applicable,
5) A relevant Target End Point is specified.

The applicable segment of a constraint can be dynamically modified based on tactical clearances entered by the ATCO (e.g. a RESUME NORMAL SPEED clearance can affect the TSP of an existing speed constraint).

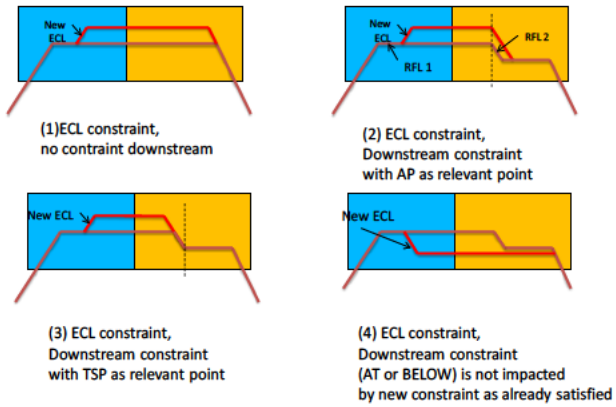


Figure 3-10: Examples of Constraint Propagation

3.1.4.4.4 Constraint and Expanded Route Management in case of re-route

Any route amendment is reflected in both a route amendment constraint and the Expanded Route.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0075
Requirement	For any accepted route modification from local stimulus or from FDC request, the FDMP shall: - insert in the FO Flight Script the associated lateral constraints (route amendment, diversion), and - update the Expanded Route accordingly with the modification
Title	FDMP Processing of a route modification
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect twice any accepted route modification, first as a new constraint and second in the Expanded Route.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

In case of route change, if any of the following Expanded Route points are impacted:

- point derived from the Flight Plan data,
- point bearing a Flight Type or Flight Rule switch,
- point set “protected” in a route amendment.

the FDC (or the FDMP when the FDC does not perform it) must compute the projection of those points on the updated Expanded Route and include them in the updated Expanded Route if the projection is successfully achieved.

In case of re-route is proposed, there are constraints impacted by the route modification and the flight is still in the constraint applicability zone:

a) The FDC requesting the route modification can optionally propose at the same time the modification of those constraint(s) that it owns. For that purpose, the FDC may extrapolate the constraint input relevant points by applying a constraint input relevant points projection or positioning them in the new route according to distance proportionality maintenance. This step allows the owner of the impacted constraint to modify accurately the constraint avoiding the FDMP to do it with its own rules.

The projection of its own input constraint points no more on the route due to a route change, will be achieved only if the constraint Maintenance Policy specified in Table 8, and also its local maintenance policies for that specific constraint type requests to maintain it.
It the projection is allowed and succeeds, then the FDC will send to the FDMP the route change constraint and the constraint modification request, otherwise the FDC will send to the

FDMP the route change constraint, with a request to remove that constraint no more on the modified route.

b) Upon receipt of the route modification constraint, if the FDC has not sent the modified impacted constraint, the FDMP will extrapolate the constraints input relevant points itself.

As the FDMP is not aware of any specific 'projection' implementation needed by the owner of the constraint.

So, only a generic 'projection' is performed, independently from the specific constraint type and category (e.g. any XFL in a downstream SI, being at the boundary between sectors known only by the owning SI, will be 'projected' by FDMP, then usually positioned again at the boundary among those sectors, if still applicable).

The FDC owning the impacted constraint must re-assess that 'projected' constraint and modify, remove or re-insert it (if it was removed by the FDMP as it was not able to achieve any kind of 'projection') in case of significant discrepancy detected or maintenance policy disregarded respectively (see REQ-10.02.05-TS-FSMG.0068).

The 'projection' processing mentioned is still a quite generic processing, and might be an orthogonal projection, or a positioning according to proportional distances along the 2D path in the previous and modified route portion.

The constraint owner will be able to apply a much more precise constraint points 'projection' of its own constraint points, according to local adaptation data and local rules.

The FDMP and the FDC must remove the constraint in case its constraint maintenance policy does not allow it (e.g. the maintenance of time, heading, holding constraints does not make sense and no constraint projection must be performed).

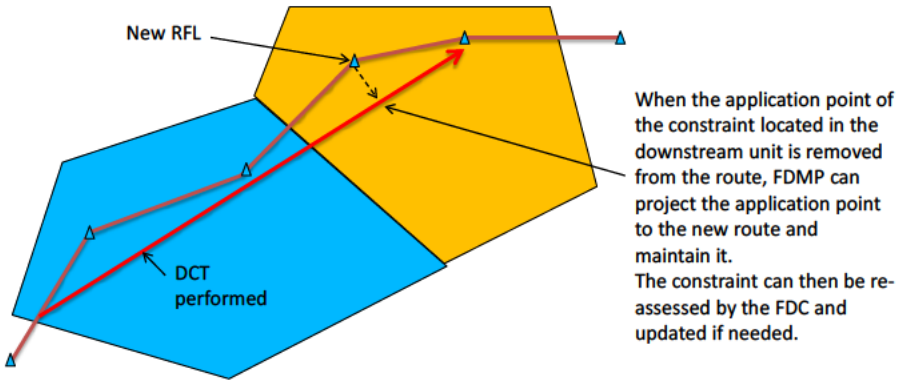


Figure 3-11: Constraint Maintenance in case of re-route

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0071
Requirement	When the FDC requests a route change and a constraint it owns is modified by the route modification, the FDC shall: – if both the Maintenance Policy specified in Table 8 and its local maintenance policies for that specific constraint request to maintain it, o project new input constraint points on the modified route, o if the projection succeeds, ▪ update the input constraint points with the projected points, ▪ send to the FDMP the route change constraint and the constraint modification request – if the maintenance policies for the specific constraint type do not request to maintain it or the projection does not succeed: o send to the FDMP the route change constraint, with a request to remove that constraint.
Title	Projected constraints in case of re-route (FDC)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDC when requesting a route modification to consider the global and the local maintenance policies to decide whether a constraint must be preserved and projected on the new route or not.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0066	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When the FDMP needs to reposition input constraint points no more on the route due to a route change, it will process new input constraint points on the new route, if allowed by its local policies for the specific constraint type, and using its local rules for projection. In case projected input constraint points will be provided, the FDMP will tag the constraint so that the input constraint points will be re-assessed by the constraint owner.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0056
Requirement	When the FDMP applies a route change and removes from the expanded route the input constraint points of a constraint belonging to a downstream SI, the FDMP shall: – if both the Maintenance Policy specified in Table 8 and its local maintenance policies for that specific constraint type request to maintain it: o compute in the expanded route the projection of those input constraint points according to its own rules only, and o if that computation is correctly achieved: ▪ update the input constraint points with the projected points, ▪ set the constraint as accepted, and ▪ include a request to the constraint owner to re-assess it, o otherwise: ▪ set the constraint as rejected, ▪ provide a request to the constraint owner to assess it as it is out-of-route. – if the maintenance policies for that specific constraint type does not request to maintain it: o add the constraint in the FS as a rejected constraint with reason for rejection 'not-to-be-maintained'.
Title	Projected constraints in case of re-route (FDMP)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP when applying a route modification to consider the global and the local maintenance policies to decide whether a constraint must be preserved and projected on the new route or not, on behalf of the FDC. In case of projection, the FDMP is instructed to notify the FDC f the result to trigger a confirmation or a new projection by the constraint owner. Note. It is up to the owner to re-assess the validity of the constraint on the projected points (as per REQ-10.02.05-TS-0068).
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0066	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Constraint maintenance	Constraint Type													
	CFL	ECL	TFL	Level	Cruise Speed	Speed	VRCD	Time	Route Amendment	Diversion	Offset	Heading	Holding	STAY
To be kept (relevant and protected point(s) projected in case of any route change)	✓	✓	✓(1)	✓	✓	✓	✓	-	✓	-	-			
Not Maintained	-	-	-	-	-	-	-	✓	-	-	✓	✓	✓	✓

Table 8 – Constraint Maintenance Policy per constraint type

✓: *Applicable.*
\- *Not Applicable*
(1) *Needs to be re-assessed among sectors / SIs of owning SI*

It may happen that a constraint becomes no longer applicable because the flight has changed its route. In that case, the FDMP will reject that constraint that no longer apply so that the FDC responsible may request a complete removal for them, or possibly revert its status back to applied, re-computing the projected input constraint point(s).

When the FDMP needs to reposition input constraint points no more on the route due to a route change, it will process new input constraint points on the new route, if allowed by its local policies, and using its local rules for projection. In case projected input constraint points will not be provided, the FDMP shall tag the constraint so that the input constraint points projection will be put in charge of the constraint owner.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0077
Requirement	When the FDMP applies a route change and removes from the expanded route the input constraint points of a constraint belonging to itself, the FDMP shall: – if the Maintenance Policy specified in Table 8 and its local maintenance policies for that specific constraint type request to maintain it: o compute in the expanded route the projection of those input constraint points according to its own rules o if the computation is correctly achieved: ▪ update the input constraint points with the projected points, – if the maintenance policies for that specific constraint type do not request to maintain it or the computation failed: o remove its constraint from the Flight Script.
Title	Projected constraints in case of re-route (FDMP managing its own constraints)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP when applying a route modification to consider the global and the local maintenance policies to decide whether a constraint belonging to itself must be preserved and projected on the new route or not
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0066	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.4.5 Strategic Constraint Management

A shared strategic constraint is a strategic constraint known by more than one SI and having:

- a common identifier,
- a commonly agreed impact on the FO Flight script and, as a consequence, a similar impact on trajectory processing,
- a commonly agreed responsible SI (owner),
- a shared application rule.

The owner of a shared strategic constraint is off-line defined and included in the adaptation data.

By definition of shared applicability rules, for strategic constraints, all IOP Stakeholders will process the same result in terms of applicable strategic constraint in the FO Flight Script.

Setting Strategic Constraints

All existing strategic constraints defined in the IOP area cannot be shared between all IOP stakeholders. Nevertheless, the standard crossing conditions between different SIs are normally agreed in Letters of Agreements (LoAs). They are usually modelled in the form of strategic constraints.

The strategic constraints that are used to model the LoAs are usually known by the affected SIs and shared as common adaptation data (off-line defined environmental data, also including the definition of mandatory and optional parameters for both shared and local strategic constraints and their applicability rules) between both SIs. When the FDMP (or any FDC) determines that a strategic constraint is applicable to a given flight, it can create this constraint, even in the case the constraint is owned by another IOP Stakeholder.

“Applicable” means that the evaluation of the shared applicability rules for that strategic constraint provide that the constraint must exist in the FO FS Constraint List.

Shared strategic constraints must have the same definition in the adaptation data and associated to the same applicability rules. Those rules must be processed in the same manner in every system sharing those constraints.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0051
Requirement	An IOP Stakeholder shall include, or request to include, in the FO Flight Script any strategic activated constraint evaluated applicable, using its applicability rules, not yet existing in the FO Flight Script, being off-line shared and existing in its adaptation data, even if owned by another IOP SI.
Title	Creation of shared strategic constraint (FDMP or FDCs)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs any IOP Stakeholder aware of an active shared strategic constraint not already included the Flight Script to request its insertion in the Flight Script.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0011	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Strategic Constraint Re-assessment by FDMP and Constraint Owner

A strategic constraint is applied upon a number of conditions that need to be re-evaluated when the FO changes.

Upon any FO update, the FDMP re-evaluates if the strategic constraints in the Flight Script are still applicable. Following this assessment, the FDMP can decide to reject the strategic constraint.

When the FDMP is the owner of the strategic constraint, it is able alone to properly re-asses the applicability rules of the constraint.

For the strategic constraint owned by a downstream system, even if the FDMP shares its applicability rules, it has not always all the information to precisely determine if the constraint is still applicable or not. The FDMP can only make a general assessment. This is then up to the IOP Stakeholder owner of

the constraint to locally confirm if the strategic constraint is still applicable or not. In case the FDMP has re-evaluated the strategic constraint as not applicable while the owner still evaluates it as applicable, the FDMP will tag that constraint as rejected, while the owner will set it as applied in its SFPL.

In case the strategic constraint which has been included by the FDMP or a FDC is actually not currently applicable for the flight, according to owner local additional rules not shared with other IOP stakeholders or local conditions, the owner of the strategic constraint can request its status to be set INACTIVE. This INACTIVE status allows all IOP Stakeholder to be aware that the constraint has been taken into account, is considered not active by its owner and therefore there is no need to ask again to apply it. The strategy to keep inactive constraints that cannot be removed according to shared applicability rules will avoid possible loops due to requests by other SIs to reinsert a shared strategic constraint. The Strategic Constraint Status (active/inactive) is updated only by the constraint owner,

An INACTIVE Strategic Constraint may revert back to the ACTIVE status again, according to a local change of conditions that are relevant to local rules. The same processing of local rules shall allow toggling the strategic constraint status from INACTIVE to ACTIVE and vice-versa. Strategic Constraints are the only constraint that may be set INACTIVE and then ACTIVE again.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0017
Requirement	Upon reception of a FO update or on any change of local conditions to a SI being owner of a strategic constraint, applicable for a given flight according to shared applicability rules evaluation, that SI shall: – Re-assess any additional local rule to evaluate the strategic constraint ACTIVE/INACTIVE state, – change, or request the FDMP to change that state, if needed, according to the result.
Title	ACTIVE/INACTIVE status management (Strategic Constraint Owner)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the owner of a strategic constraint to periodically re-assess the validity of the constraint and manage accordingly the ‘active’/’inactive” status of that constraint.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0070	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0071	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Strategic Constraint Removal

When the SI owner of a strategic constraint not shared with other SIs in the adaptation data is aware that the constraint it previously set is not able to impact the flight any longer, then it can request the FDMP to remove it.

A strategic constraint not owned by the FDMP may be requested to be removed only by its owner when, according to the shared definition of the constraint in the adaptation data, including applicability

rules, the strategic constraint is not applicable anymore because of rerouting, or other flight attributes changed.

As each IOP stakeholder is responsible for keeping its own constraints up-to-date, it has to include in the FO any modification needed to align its internal view of the flight and to remove any constraint that it does not use anymore.

Only private strategic constraints can be removed by its owner. Shared strategic constraints are never removed; instead they are set inactive when they are temporarily or permanently not applicable. This prevents loops when an SI inserts again a shared strategic constraint previously added by another SI.

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0050
Requirement	The IOP Stakeholder owner of a private strategic constraint shall remove (or request the removal of) the constraint from the FO Flight Script when the flight does no more satisfy the strategic constraint applicability rules.
Title	Condition for removal a strategic constraint (Strategic Constraint Owner)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the owner of a private strategic constraint to remove it from the flight script when it becomes obsolete.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.4.4.6 Coordination Data relationship with Constraints and Expanded Route

Editor's note: section to be provided (see Appendix B.2.1).

3.1.4.5 Supporting Flight Script Requirements on Adaptation Data

Identifier	REQ-10.02.05-TS-FSMG.0064
Requirement	The shared strategic constraints shall be defined offline in the adaptation data and agreed amongst the IOP stakeholders that manage them.
Title	Defining Shared Strategic Constraints offline
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement requests the IOP Stakeholder sharing strategic constraint to consistently define the contents and the management of these constraints in local data bases.
Category	<Non Functional>
Validation Method	
Verification Method	<Analysis>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.5 Trajectory Management

This section describes the Trajectory Management in terms of the behaviour according to the IOP roles (FDMP, FDC) already defined in the previous sections.

Editor's note: this section will be handled by Feature #10.

The main sub-features are:

- Perform Trajectory calculation for the Flight Object,
- Check Trajectory consistency.

3.1.5.1 Perform Trajectory calculation for the Flight Object

The Trajectory Prediction of all the SIs sharing a flight plan (FDMP and FDCs) will process the planned trajectories, starting from the identified reference point (usually the last point reported, having assigned an Actual Time Over/ATO and/or an Actual Level Over/ALO, applying all the constraints following that start processing reference point, using the relevant constraint points provided by the owner of each constraint, i.e. the application point, target start point, target end point, or a combination of them (e.g. when application point and target start point are both relevant constraint points) to compute the effect on the trajectory, if not incompatible with the local context . As what described above cannot be stated in a functional testable requirement, a non-functional requirement has been provided instead: REQ-10.02.05-TS-FSMG.0013.

3.1.5.2 Check Trajectory Consistency

The Expanded Route of a FO Flight Script published by FDMP is “aligned” with the local system SFPL when the local system always succeeded applying all received Expanded Route changes, or if in case it was not possible, the systems being requester of the route change and the one not able to apply that route change share an alternative route change that satisfies the needs of both systems (via voice or automatic route amendment negotiation).

[REQ]

Identifier	REQ-10.02.05-TS-SCTJ.0003
Requirement	Each time the IOP trajectory changed from its previous release, the FDC shall use local thresholds and rules for detecting horizontal, vertical and time divergences when comparing the FO planned trajectory published by FDMP with the local planned trajectory.
Title	Local Threshold Definition for Trajectory Comparison
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement requests the IOP Stakeholder to apply local defined threshold to perform the comparison of the local trajectory and the FO trajectory.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0075	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SCTJ.0004
Requirement	In the case of a significant trajectory divergences detected among the FO planned trajectory published by FDMP with the local planned trajectory, any downstream FDC crossed by the flight shall Inform the FDMP about the trajectories inconsistency providing the start point of the discrepancy and if available the end point.
Title	Action in case of Trajectory discrepancies (FDC)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDCs identifying significant divergence between its local trajectory and the FO trajectory to warn the FDMP and provide information about the discrepancy.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0078	<Full>

<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0080	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0081	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SCTJ.0005
Requirement	When the FDMP is notified by any FDC of a significant trajectory discrepancy detected among the published FO trajectory and the FDC local planned trajectory, it shall publish a new FO, indicating the specific FDC is de-synchronized with the start point and optionally the end point of the de-synchronization.
Title	Action in case of Trajectory discrepancies (FDMP)
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect in the Flight Object the indication received from an FDC that it has detected a significant discrepancy between its local trajectory and the FO trajectory.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0080	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SCTJ.0006
Requirement	When the FDMP is notified by any FDC that a significant trajectory discrepancy detected among the published FO planned trajectory and the FDC local planned trajectory doesn't exist anymore, it shall publish a new FO indicating that the specific FDC is synchronized.
Title	FDMP action in case of Trajectory discrepancy reset by an FDC
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement instructs the FDMP to reflect in the Flight Object the indication received from an FDC that its local trajectory and the FO trajectory are now synchronised again.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0082	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

There is no way to compute any residual portion of trajectory still being 'de-synchronized'. Anyway, as soon as the FO planned trajectory 'de-synchronized' indicator will be published, any FDC detecting

any existing discrepancy shall send again the notification to the FDMP, that will be able to identify again the trajectory 'de-synchronised' portion.

3.1.6 IOP Data Filtering and IOP Data Distribution - Informative Distribution

3.1.6.1 FO distribution

The FDMP is responsible for identifying the list of stakeholders interested in flight (either for control or for information). This identification is initially determined using geographical criteria (crossing with the AoR / AoI) of downstream SIs. The initial criterion, based on the identified crossings of the trajectory computed by the FDMP, is also used to assign each SI a concrete role (FDC / FDU).

The FDCs identified by the FDMP will be able to request the FDMP to correct the geographic criterion used to identify the SIs concern over the flight and the corresponding role. Example, SKIP or Delegation functionality described in

Coordination and Transfer chapter will modify the expected SI responsibility in the flight and therefore their role.

Three different lists are identified by the FDMP to identify the SIs that should receive any FO update and their role.

Note that the following definitions are conceptual, that is, there is no physical model presumed. The actual data structures fulfilling these definitions and the requirements will be defined in the FO model.

3.1.6.1.1 Distribution list

It contains the list of IOP SIs that are interested in the flight for any reason. Each SI is included in this list together with all the reasons for which the SI has been identified as concerned. The following reasons are identified:

1) Control: SIs that are going to control the flight. The initial criteria is that the FDMP computes a trajectory that crosses its AoR, nevertheless, this criteria may be corrected later on by local FDMP rules or by downstream FDCs (skips, delegation, etc.)
2) Vicinity: The trajectory computed by the FDMP crosses the SI AoI and they were not identified as concerned for control. Note: Control and Vicinity reasons are mutually exclusive.
3) Pointed: SIs that were pointed from another SI. This reason for distribution may be additional to Control or Vicinity.
4) Subscribed: An ATCO has requested a manual subscription to a specific flight.
5) Maintained duplication: allows the distribution of FOs, distributed for control to one sector and duplicated to another sector, where it will be served for information.
6) Regional General information distribution:
7) End of Distribution requested: SIs that are no longer concerned in this FO. This reason is used by the current FDMP whenever it is the last SI interested in that flight and there is no other reason for distribution. This reason is mutually exclusive with all the previous distribution reasons.

The following requirements identify the SIs that have to be included in the distribution list as well as the reason when there is confirmed reason. Notice that the reasons control and vicinity are mutually exclusive and the SIs may be moved from one to the other along their FO lifetime. The basic rules to handle those reasons will be explained with the requirements ruling the identification of the SIs in the control list.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0312
Requirement	The FDMP shall include any SI whose AoI is crossed by the flight in the Distribution List
Title	Identification SIs interested because of geographical crossings
Status	<In Progress>
Maturity Level	TRL2
Rationale	Modified from ED-133 and D52 Rational for the change: Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - Control SIs List - Distribution List - Delegation - Skip - SIs vs SI
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0006	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0011	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0014	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0337
Requirement	The FDMP shall include any SI to which a flight has been pointed in the Distribution List adding Pointed to the reasons for its inclusion
Title	Identification of the SIs interested in the FO because of Point reception
Status	<In Progress>
Maturity Level	TRL2
Rationale	Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - Concerned SIs' List - Control SIs List - Distribution List - Delegation - Skip -

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0077	<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0078	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0348
Requirement	The FDMP shall include any SI that has been requested to receive the FO for general Information in the Distribution List adding General Information to the reasons for its inclusion.
Title	Identification of the SIs interested in the FO because of General Information request
Status	<In Progress>
Maturity Level	TRL2
Rationale	Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - - Control SIs List - Distribution List - Delegation - Skip -
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0007	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0349
Requirement	The FDMP shall include any SI that has been requested to receive the FO for maintained duplication in the Distribution List adding Maintained Duplication to the reasons for its inclusion.
Title	Identification of the SIs interested in the FO because of Maintained Duplication request
Status	<In Progress>
Maturity Level	TRL2
Rationale	Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - - Control SIs List

	- Distribution List - Delegation - Skip -
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0008	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0350
Requirement	The FDMP shall include any SI that has requested a subscription to the FO in the Distribution List adding Subscribed to the reasons for its inclusion.
Title	Identification of the SIs interested in the FO because of Subscription request
Status	<In Progress>
Maturity Level	TRL2
Rationale	Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - - Control SIs List - Distribution List - Delegation - Skip -
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0009	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

When a flight does no longer cross the AoI of a SIand there is no other reason for distributing the FO to that SI, the FDMP should request the end of FO distribution. The SI that is going to be taken out from the distribution should acknowledge this request before the FDMP actually remove it.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0339
Requirement	The FDMP shall set the reason for distribution to a SI to End_of_distribution_requested in the Distribution List when:

	• The flight has exited from the AoI of this SI, and • There is no other reason for distribution to that SI
Title	Requesting removal of SIs from the Distribution List.
Status	<In Progress>
Maturity Level	TRL2
Rationale	Requesting removal of SIs from the Distribution List.Rational for the change: This requirement does not modify the principles in the original definition. Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - Control SIs List - Distribution List - Delegation - Skip - SIs vs SI
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0006	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0340
Requirement	The SI that receives the End_of_distribution_requested shall acknowledge this reception to the FDMP.
Title	Confirming removal of a SI from the Distribution List
Status	<In Progress>
Maturity Level	TRL2
Rationale	Rational: Confirming removal of a SI from the Distribution List This requirement does not modify the principles in the original definition. This functionality was already defined and implemented in the ICD but it was not supported by the requirements.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0006	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0341
Requirement	The FDMP shall only remove a SI from the Distribution list upon reception of

	the acknowledgment of End of distribution requested
Title	Executing the removal of an SI from the Concerned SIs List
Status	<In Progress>
Maturity Level	TRL2
Rationale	Rational: Executing the removal of an SI from the Concerned SIs List This requirement does not modify the principles in the original definition. This functionality was already defined and implemented in the ICD but it was not supported by the requirements.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

In the nominal case, the NM is the first FDMP but at a certain point in time the FDMP role is handed over to ATC. See Flight Data Manager Publisher (FDMP) section for further information. When an ATC SI plays the FDMP role, it will also include the NM as contributor in the distribution list. Concrete NM rights to request flight data changes to the FDMP will be determined in the FO services definition.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0346
Requirement	An ATC SI that is behaving as FDMP shall always add the NM to the Distribution list as FDC
Title	NM inclusion in the Distribution list
Status	<In Progress>
Maturity Level	TRL2
Rationale	Rational: Requirement needed to support the inclusion of the NM as a permanent receiver of the FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0344
Requirement	The FDMP shall set the reason for distribution to Control in the Distribution list to any SI included in the SIs control list.
Title	Identifying the controlling SIs within the Distribution List.

Status	<In Progress>
Maturity Level	TRL2
Rationale	Overall update of the requirements affecting the FO filtering and distribution SIs that are concerned in the flight because of geographical reasons may be controlling or vicinity (mutually exclusive). The crossing of AoR or AoI is no longer enough to differentiate them.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0345
Requirement	The FDMP shall set the reason for distribution to Vicinity to any SI in the Distribution list whose AoI is crossed and it is not included in the SIs control list.
Title	Identifying the SIs interested in the FO because of geographical reasons that are not going to control the flight
Status	<In Progress>
Maturity Level	TRL2
Rationale	Overall update of the requirements affecting the FO filtering and distribution SIs that are concerned in the flight because of geographical reasons may be controlling or vicinity (mutually exclusive). The crossing of AoR or AoI is no longer enough to differentiate them.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0006	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Any SI that has been included in the distribution list for control is considered FDC whereas any other SI that is in the Distribution list for any other reason than control is considered FDU.

3.1.6.1.2 Publishing the FO

Once the FO has been locally updated by the FDMP and the distribution list has been calculated, the FDMP should publish the modified clusters to the SI in the distribution list.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0347

Requirement	When a new release of the flight-object is available, the FDMP shall distribute it to all the systems identified in the Distribution List.
Title	Distribution of the FO upon new release available
Status	<In Progress>
Maturity Level	TRL2
Rationale	Distribution of the FO upon new release available Rational of the change: There is no more reference to static and dynamic distribution rules. Instead, an explicit process to fill the Distribution list has been provided.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The System instance manages the following types of informative distributions:

- Vicinity distribution
- General information distribution
- Point distribution
- Maintained duplication
- Subscription

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0026
Requirement	The FDMP shall accept a complementary distribution request for an FO coming from any IOP stakeholder and add the corresponding new SI in the distribution list
Title	Eligibility for complementary distribution
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanisms
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0020
Requirement	Upon reception of an FO with a new informative distribution of type: “pointed”, the pointed SI shall acknowledge to the FDMP.
Title	Acknowledgement of the complementary distribution
Status	<In Progress>
Maturity Level	TRL2

Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0075	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0076	<Full>

The FDMP that made a complementary distribution of a flight-object (triggered itself, or by a contributor), shall perform a retry if no report indicating the success of the distribution is received within a parameter time (SP-IOP-Max_Comp_Dist_Report_Time). The number of retries shall be limited to a maximum value (SP-IOP-Max_Comp_Dist_Requests).

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0021
Requirement	The FDMP shall perform up to SP-IOP-Max_Comp_Dist_Requests retry of a new complementary distribution if no report indicating the success of the distribution is received from the pointed SI of that distribution within SP-IOP-Max_Comp_Dist_Report_Time
Title	Retry complementary distribution if not acknowledged
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0075	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0076	<Full>

Retry = **The retry consists in re-publishing the FO with its distribution list.**

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0022
Requirement	The FDMP SI shall, after SP-IOP-Max Comp Dist Requests number of requests have been made without receiving a positive report of the first distribution and notify the failure to the SI that triggered the complementary distribution.

Title	Report Failure of a complementary distribution to its initiator
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0003	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0075	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0076	<Full>

3.1.6.2 Support for distribution for General Information of a flight object

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0018
Requirement	The SI shall update the distribution list of a Flight-Object when its locally built list of recipients for general information has changed.
Title	Forward to FDMP the list of SI to be distributed for general information
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type GENERAL INFORMATION
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0002	<Full>

3.1.6.3 Point of a flight

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0006
Requirement	The SI shall be able to point a flight to designated sector at another SI.
Title	Availability of the POINT manual input
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED. This mechanism will be available between neighbouring Sis only for deployable IOP, and to any SI for full IOP.
Category	<Functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0075	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0076	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0085	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0086	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0007
Requirement	The system shall be able to acknowledge the point it received.
Title	Acknowledgement of a POINT
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0004
Requirement	Any SI shall be able to point a physical sector of another SI indicating as originator its own SI and one of its physical sectors.
Title	Capability to point a flight to another System Instance
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0077	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0078	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0027
Requirement	When creating a point session, the FDMP shall add the new session to the

	entry in the distribution list corresponding to the distributed SI or create a new entry for this SI if it does not yet exist.
Title	Capability to point a flight to another System Instance
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0077	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0078	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0008
Requirement	An SI involved in a POINT session shall be able to terminate it.
Title	Point termination
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type POINTED
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0081	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0082	<Full>

3.1.6.4 Subscribe to a flight

An ATCO can subscribe to a flight if he needs it. Before the subscription, the SI is not served with this flight, but it has the summary of all flights. So the ATCO must provide the details to identify the flight he wants to get.

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0013
Requirement	An SI shall have the mean to subscribe to any flight
Title	Capability to subscribe to a given flight
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to allow complementary distribution mechanism of type SUBSCRIBE

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0004	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0016
Requirement	An SI shall have the mean to unsubscribe to any flight

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0004	<Full>

3.1.6.5 Modification of the predicted control sequence

When the flight route is modified, this possibly impacts the predicted sequence of SIs that are involved in this flight; some SIs may be added to the sequence whereas some others may be removed or appear somewhere else in the sequence.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0095
Requirement	When the FDMP applies a change to the FO that results in a modification of the predicted SI control sequence, it shall publish in the FO the new control sequence, maintaining the available data for the crossings that are not modified
Title	Maintenance of the crossed SI sequence in the FO
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement is needed to ensure that the up to date predicted SI sequence is always in the FO.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

3.1.7 SWIM

3.1.7.1 Asynchronous notification of request completion/failure

A request for an FO service from FDC to an FDMP is assessed in a synchronous manner, i.e.it will be assessed by the FDMP in a synchronous manner, i.e. the FDC will wait for the assessment to complete and get a report from the FDMP as an answer to the service request.

As the implementation of the FO service request will be performed later, the FDMP will need include in its assessment report to the FDC enough information to correlate the request with a possible notification following the failure of the implementation of the service request.

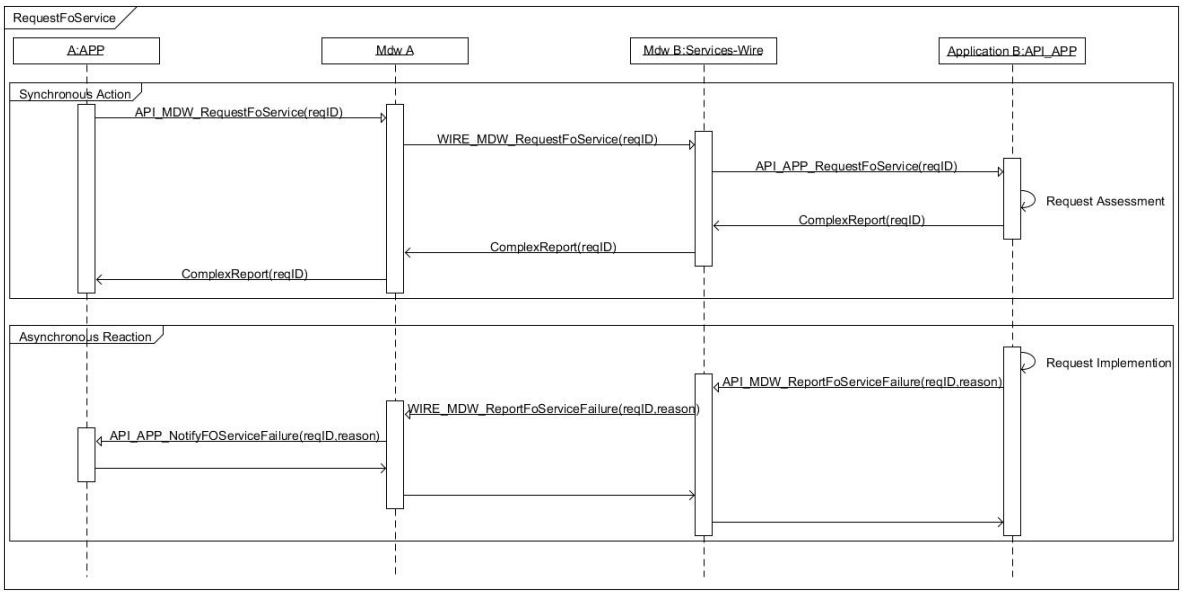


Figure 3-12: Asynchronous notification of request completion

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0020
Requirement	The FDC shall generate a unique service request identifier for each request to the FDMP for an FO service.
Title	FDC to generate unique service request identification.
Status	<In Progress>
Maturity Level	TRL2
Rationale	The unique service request identification is per FDC request and will be used by the FDMP to report failure of the service request implementation to the FDC. The FDMP will need to store the service request identifier and the requester id (FDC) for later usage.
Category	<functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0022
Requirement	Upon failure of implementation of an FO service, the FDMP shall report to the calling FDC the failure providing it with the unique service request identifier received from the FDC, and the reason for the failure.
Title	FDMP to report failure of service request implementation to FDC.
Status	<In Progress>
Maturity Level	TRL2
Rationale	If a service request implementation has failed, the FDMP will report the failure to FDC through the SWIM Technical Layer.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.7.2 Collisions or Concurrent updates of FO releases

As there is no explicit negotiation between stakeholders to elect an FDMP for a flight object, two or more SIs may update the flight object concurrently and the updates may conflict with each other.

When a flight object is updated independently at multiple locations, the FO release information may not follow the correct ordering that allows the receiving FDCs to order the updates and discard old FO releases. This conflicting situation is referred to as a collision of FO updates.

The SWIM Technical Layer may detect such collisions based on the FO release information published in the FO Summary.

For a formal definition of FO releases collision refer to SWIM TS.

3.1.7.2.1 Understanding Ordering of FO releases

An FO release is a version of a Flight Object and is a sequence of all the releases of the clusters of the flight object.

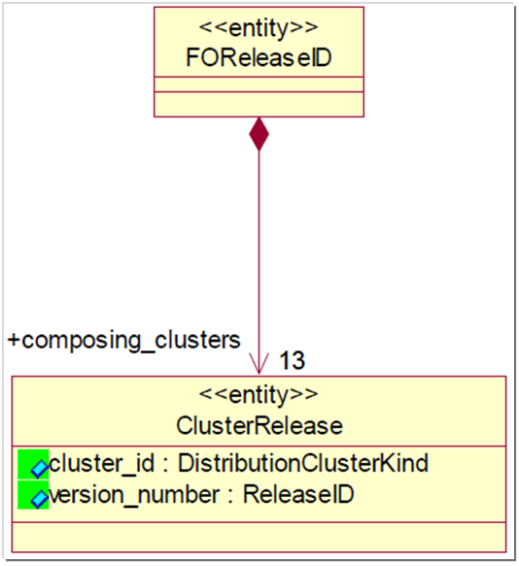


Figure 3-13: FO Release

This is basically a version vector[2] for tracking changes to the clusters of a flight object.

At flight object creation, all the clusters releases are equal to zero.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0024
Requirement	At flight object creation, the FDMP shall set all clusters release numbers to zero value.
Title	FDMP sets clusters' releases to zero at FO creation.
Status	<In Progress>
Maturity Level	TRL2
Rationale	In order to avoid potential FO release collision at FO creation, there is a need to enforce a common initial value.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

Each time a flight object is updated, the releases of the updated cluster are incremented and the FDMP publishes the Summary containing the FO release.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0026
Requirement	Each time a flight object is updated, the FDMP shall increase the value of the release number of the updated clusters.
Title	FDMP increase FO release on update.

[2] https://en.wikipedia.org/wiki/Version_vector

Status	<In Progress>
Maturity Level	TRL2
Rationale	Each time a flight object is updated, the releases of the updated cluster are incremented and the FDMP publishes the Summary containing the FO release.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0028
Requirement	FDCs and FDUs shall raise a warning when the SWIM Technical Layer detects that the locally stored Flight Object release is posterior to the release identification sent by the FDMP.
Title	Detection of old FO release
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement triggers the automatic Tier re-allocation when the FDMP role is legitimately taken by a new IOP Stakeholder. It covers the initial FDMP case.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.7.2.2 Resolving Collisions / Concurrent Updates

Once a collision is detected, the SWIM Technical Layer will notify the application layer providing the FO release and reason (collision). The SWIM Technical Layer will not update its locally stored clusters.

At application level, the FDC is not expected to react since the FDMP will have to republish FO update.

The FDMP will republish FO with ‘corrected/adapted’ FO release to make sure all FDC/FDU SI converge to the same FO release (as they may have received updates in different order).

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0030
Requirement	Upon FO collision detection, the SWIM Technical Layer shall notify the application layer providing the FO release and the reason (fo_version_collision).
Title	FO version collision notification
Status	<In Progress>
Maturity Level	TRL2
Rationale	The application layer will only receive the cluster release numbers and not the content of the clusters.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0032
Requirement	Upon FO collision notification from the SWIM Technical Layer, the FDMP shall increase the release numbers for the conflicting clusters beyond the received release numbers, increase the release numbers for all the other clusters, and republish the complete FO.
Title	FDMP handling of FO version collision
Status	<In Progress>
Maturity Level	TRL2
Rationale	Republishing the complete FO ensures all stakeholders receive the complete FDMP view of the FO and update their own local copies.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

During a handover and to decrease likelihood of residual updates that may come from previous FDMP incrementing a cluster release by 1, the new FDMP may choose to increase all the FO clusters by a '*fixed step*' and publish the complete FO.

3.1.7.3 Distribution Failure

There are multiple reasons that may make the distribution fail. We will go through the following:

- Failure to distribute because of problem in local Messaging infrastructure.

- Loss of connectivity to WAN and isolation from IOP network.
- A problem in the cluster payload (due to version mismatch/problem for example).

SWIM node isolation/loss of connectivity to WAN can be detected locally, while a distribution failure due to a problem within the payload (excluding checks that may be detected locally via XML schema validation) requires notifications from other System Instances (SI).

3.1.7.3.1 Problem in local Messaging infrastructure

Upon a problem in the local messaging infrastructure, the SWIM Technical Layer detects the problem and notifies the IOP application. The notification can be done the following way:

- **Synchronous notification**: If the failure happens while the SWIM Technical Layer is processing a (synchronous) request from the application, it will respond with a Report with appropriate *ExceptionKind* in the *report_value*(isolated_stakeholder, timeout, middleware_failure, critical_errors).
- **Asynchronous notification**: If the failure did not happen while the SWIM Technical Layer is processing a (synchronous) request from the application, the SWIM Technical Layer may report the problem to the application via one of the existing mechanisms: *NotifyException* with an appropriate value in reason (*isolated_stakeholder*, *middleware_failure*, *critical_errors*), or via *API_APP_MiddlewareStatus(IopStatus:not_enable)*.
- **Abort/Restart IOP-MDW**: For safety reasons (and depending on the problem in the messaging infrastructure), it is mandatory to abort/stop and restart the SWIM TI software and/or hardware. This may be required when communication between SWIM Technical Layer and application is no more possible.

Depending on the how critical the problem is, the SWIM-TI will be able to trigger IOP-disabled (mdw_status: false). In case of IOP-MDW abort, the IOP application and remote SIs will detect a middleware failure and hence an IOP disabled state.

3.1.7.3.2 Isolation / Loss of WAN connectivity

In case of isolation for the SWIM network (WAN), the SWIM-TI will not receive the IOP_STATUS publications from the other SIs and will inform the application via *API_APP_IopAreaStatus*.

If all SIs are *not_enabled*[3] then the IOP Application will trigger IOP-disabled (app_status:false).

3.1.7.3.3 Problem in payload (version mismatch)

In case of an incompatibility of versions in the FO cluster content, the FDC/WIC will notify the FDMP/WIMP via a call to ***API_MDW_RejectFo***. This will generate a call to ***WIRE_MDW_RejectFo***at the SWIM Technical Layer level to request the rejection of the flight object, giving the reason for the rejection to the current FDMP together with the FO release. At FDMP side, the SWIM Technical Layer will call ***API_APP_RejectFo*** to notify application of the FO rejection (the SWIM Technical Layer forwards the call to the IOP application).

When there are at least 2 FDC/WIC in the distribution list and all the IOP stakeholders reject the [WI]FO then the FDMP/WIMP may consider this a distribution failure for the [WI]FO and report this to the operator.

[3] Special attention is given to the first IOP-capable SI as it will not receive IOP_STATUS publications.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0034
Requirement	When there are at least 2 FDCs in the distribution list and all the IOP stakeholders reject the FO then the FDMP system instance shall consider this a distribution failure for the FO.
Title	FDMP report FO distribution failure
Status	<In Progress>
Maturity Level	TRL2
Rationale	When there are at least 2 FDC/WIC in the distribution list and all the IOP stakeholders reject the [WI]FO then the FDMP/WIMP may consider this a distribution failure for the [WI]FO and report this to the operator
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

At FDC/WIC/FDU side, the [WI]FO is desynchronised and this is reported to the operator.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0036
Requirement	When an FDC system instance cannot process an FO update because of an ICD version incompatibility, the FDC system instance shall reject the FO, inform the FDMP.
Title	FDC to report ICD version mismatch.
Status	<In Progress>
Maturity Level	TRL2
Rationale	At FDC/WIC/FDU side, the [WI]FO is desynchronised and this is reported to the operator.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.7.4 IOP Recovery

The IOP Recovery process is based on “Recovery Tiers” (i.e. Recovery Tier 1, Recovery Tier 2 up to Recovery Tier n). Each SWIM Node in the Distribution List of a Flight Object is associated with a Tier.

This tiered approach allows to:

- perform the recovery process in sequential steps in order to prevent storm of updates on the recovering SWIM Node side,
- ensure that the most critical Flight Objects are recovered first.

Each Flight Object has an enriched Distribution List in which every stakeholder is assigned with a Tier according to its priority in the recovery process.

An example of assignment logic for the Tiers is provided below for a given Flight Object:

- Tier 0 is associated to the SWIM Node whose ATSU holds responsibility of the Flight.
- Tier 1 is associated to the SWIM Nodes whose ATSU are crossed next downstream.
- Tier 2 is associated to all the other SWIM Nodes in the Distribution List.

The following assumptions are made:

- Recovery is either triggered automatically by configuration (if certain criteria are met), or are completely driven by IOP application,
- Automatic Recovery is a special case (optimization) where under some conditions the SWIM-TI will take in charge recovery on behalf of the application.
- IOP-Status (Enabled/Disabled) is independent from Recovery status.
    - SWIM node may be able to provide shared object services even when some shared objects are not recovered. (System-level decision; manual recovery of shared objects … etc.)
- When the recovery process fails it is the responsibility of the IOP Application to decide whether the system is IOP-disabled or not.
- Which Tier to recover first (ordering of Tiers during recovery) is driven by the IOP Application (no objective reason why Tier 0 should be recovered before Tier 1 for all the stakeholders)
- Periodic publications of Recovery Status should not induce unnecessary republications of FOs.
    - Adding SWIM-level recovery context / cookie
- Recovery of a SWIM node does not impact operation of other SWIM nodes.
    - Failure to publish (timely) requested FOs should not impact the publishing SWIM node.

To support the IOP Recovery process, the application and the SWIM-TI share the following responsibilities:

- IOP Application is responsible for:
    - Allocate Tier to SIs associated with each FO
    - Triggering/initiating recovery
    - Selecting which tier to recover (ordering)
    - Retrying recovery if not completed (on time)
    - Terminating recovery / Changing IOP status
- SWIM is responsible for:
    - Generate a recovery context id on each recovery request.
    - Periodic publications will contain the same recovery context / cookie.
    - Detect periodic publications of IOP Status to avoid unnecessary republications of FOs.
    - Receiving new context id value from a stakeholder will consider previous recovery from that stakeholder as completed or aborted.

3.1.7.4.1 Nominal Recovery Scenario

STEP.0: The recovery process is initiated either triggered by the IOP Application(application driven mode), or automatically under certain conditions by the SWIM TI.

STEP.1: The recovering SWIM Node sets its IOP Recovery Status to “TRUE” and the recovering Tier(s) according as requested by the IOP Application (application driven mode)or specified in the local automatic recovery policy (automatic mode), and publishes periodically a RECOVERY_STATUS information on the Network.

STEP.2: Every SWIM Node on the Network checks the Tier(s) associated to the recovering SWIM Node for each Flight Object it acts as FDMP and publishes the FO for which the recovering SWIM Node appears in the Distribution List with requested Tier (s).

STEP.3: The recovering SWIM Node receives all the Flight Objects for which it appeared as “Tier T(s)” in the Distribution List. If some Flight Objects are not received after some predefined time duration, the application may use a Request/Response mechanism to recover explicitly the missing Flight Object(s).

STEP.4: Upon completion of the “Tier T(s)” recovery, the recovering SWIM Node updates the published RECOVERY_STATUS information with the next Tier(s) to recover

STEP.5: The process continues iteratively until the recovery is completed. The recovering SWIM Node will then change its IOP Recovery Status to “FALSE” and will terminate the periodic publications of RECOVERY_STATUS information.

3.1.7.4.2 Tier Allocation Management

The FDMP must associate for each managed FO a Tier to the list of ATSUs following the “IOP Tier Management Policy”.

Identifier	REQ-10.02.05-TS-SWIM.0040
Requirement	The IOP Tier Management Policy shall be defined off-line and agreed between the IOP stakeholders.
Title	Defining IOP Tier Management Policy offline
Status	<In Progress>
Maturity Level	TRL2
Rationale	The IOP Tier Management Policy needs to be agreed.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The “IOP Tier Management Policy” assigns a recovery priority to the ATSU associated with an FO, for instance the following policy will allow an IOP stakeholder to recover first the FOs for which it was FDMP, then the FOs for which it was FDC and finally all the other FOs:

- Tier #1 assigned to the SI that manages the controlling ATSU,
- Tier #2 assigned to the SIs associated with the traversed ATSUs,
- Tier #3 to the Sis associated with the other ATSUs (“pointed”, “vicinity”).

FO creation and FDMP Role change:

- If the SI takes legitimately the FDMP role, then the Tiers must be re-allocated to the SIs by application of the “IOP Tier Management Policy”.
- If the SI takes the FDMP role to replace a failing SI, then the Tier allocation in the FO is not modified.
- When a new SI is added in the FS Distribution List, a Tier must be allocated to it by the FDMP.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0042
Requirement	When an IOP Stakeholder takes legitimately the FDMP role, it shall: - Re-assess the Tier allocation in compliance with the IOP Tier Management Policy, - Update in the FO Distribution List the Tier allocation of the identified SIs.
Title	Tier re-allocation in case of legitimate FDMP role transfer
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement triggers the automatic Tier re-allocation when the FDMP role is legitimately taken by a new IOP Stakeholder. It covers the initial FDMP case.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0044
Requirement	When the IOP Stakeholder takes the FDMP role on behalf of another SI, it shall keep unchanged in the FO the Tier allocation of the identified SIs in the FO Distribution List.
Title	Tier allocation freezing in case of replaced FDMP
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement covers the case of an SI taking the role of FDMP in place of a failing FDMP. All involved SIs keep their allocated Tier. The Tier 1 SI identified the failed FDMP.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0046
Requirement	When the FDMP insert a new SI in the distribution list, it must allocate a Tier to the added SI in compliance with the IOP Tier Management Policy.
Title	Tier re-allocation in case of distribution list modification
Status	<In Progress>
Maturity Level	TRL2
Rationale	This requirement triggers the automatic Tier re-allocation when the FDMP modify the distribution list.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.7.4.3 Recovery Process Initiation

The recovery process is initiated either:

- triggered by the IOP Application (application driven mode), or
- automatically by the SWIM Node when certain conditions are met, e.g. reconnection after an isolation from the IOP network (automatic mode). In this mode the rules to operate the recovery are described in the 'automatic recovery policy'.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0048
Requirement	When the IOP Stakeholder triggers an FO recovery step, it shall: - Request the SWIM Technical Layer: o to initiate the IOP Recovery Procedure by specifying one or several recovery levels (Tier(s)) according to the Local Recovery Policy, o to advertise the other IOP Node that it in a recovering status, - Assign a Recovery Context for that step. - Monitor that this recovering step is performed within a limited time.
Title	Recovery Process Initiation (Recovering Node)
Status	<In Progress>
Maturity Level	TRL2
Rationale	The IOP stakeholder may require IOP recovery when it becomes “IOP-enabled” again after isolation for example. The decision to recover one Tier at a time or several Tiers is a local decision and is described in the Local Recovery Policy. The Recovery Context is used to avoid unnecessary re-publications of FOs.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Once a recovery step is completed, the IOP Application chooses to continue with the next step or to stop the whole recovery process.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0050
Requirement	When the recovering IOP Application has triggered a recovery step for a given Tier(s) and all the FOs have been received in time, it shall decide to either: - trigger another Tier recovery step for another Tier(s), or - end the recovery .
Title	Recovery Steps iterations (Recovering Node)
Status	<In Progress>
Maturity Level	TRL2
Rationale	The recovery steps are driven by the IOP Application. It is up to the IOP Application to decide when the recovery is over(see REQ-10.02.05-TS-SWIM.0007) or should continue (see REQ-10.02.05-TS-SWIM.0001).
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.7.4.4 IOP Application Driven Recovery Requests

Optionally, the IOP Application can request an explicit FO recovery (Request FO Recovery) from a specific SWIM Node.

[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0052
Requirement	When the recovering IOP Application - has triggered a recovery step for a given Tier(s) and not all the FOs have been received in time, and - the missing FOs still need to be recovered by another way, it shall request the SWIM Technical Layer to request the FDMPs of the missing FOs to publish these FO and monitor the reception of these FO.
Title	Optional Recovery Alternative (Direct Request from FDMPs)
Status	<In Progress>
Maturity Level	TRL2
Rationale	When the automatic recovery performed by the SWIM-TI has not been completed in time, the IOP Application can decide to retrieve directly some FOs from their FDMP. This is an optional step. The monitoring of the reception of the FOs will allow the IOP Application to request again several times the publication from the FDMPs. The allowed time and number of retries is a local matter.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.7.4.5 Recovery Process Termination

The process continues iteratively until the IOP Application (application driven mode) considers the recovery process completed. This can be either because all missing Flight Objects have been recovered or the still missing Flight Objects are considered not in interest.[REQ]

Identifier	REQ-10.02.05-TS-SWIM.0054
Requirement	When the recovering IOP Application decides to end the recovery process, it shall request the SWIM Technical Layer to stop recovery operations and advertise the IOP Nodes that it is not in a recovering status any longer.
Title	Recovery Process Termination (Recovering Node)
Status	<In Progress>
Maturity Level	TRL2
Rationale	The IOP application can decide to stop the recovery process either when all FOs have been correctly retrieved, or when only a part of them have been retrieved (e.g. from Tier 1 and 2 only).
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3.1.8 Other Requirements

N/A

3.2 Non Functional Requirements

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0018
Requirement	The list of the IOP-capable system instance shall be defined offline and shared between the IOP stakeholders.
Title	Defining IOP-capable System Instance offline
Status	<In Progress>
Maturity Level	TRL2
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0002
Requirement	The volumetric definition of the AOI of the SIs managed by each IOP capable system instance shall be shared amongst the IOP stakeholders.
Title	Shared definition of a AOI of a system instance
Status	<In Progress>
	TRL2
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0001	<Full>

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0001	<Full>

In order to avoid possible capacity issues, it's important to define requirements to limit the number of managed WIFOs per System Instance.

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0030
Requirement	The System Instance shall support up to SP-IOP_Max_WIFO_Stored WIFOs managed at the same time, regardless the what-if IOP role (WIMP or WIC).
Title	WIFO Storage per System Instance
Status	<In Progress>
Maturity Level	TRL2
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0001	<Full>

4 References

4.1 Reference Documents

The following documents were used to provide input or guidance

[1] EUROCAE Working Group 59, Flight Object Interoperability Specification **ED-133** V1.0, June 2009

[2] SESAR Deliverable **P10.02.05-D02** - IOP ATC System Requirements Baseline- Phase 1

[3] SESAR Deliverable **P05.05.01-D846** - TMF INTEROP for Step 1 - Final Release

[4] SESAR Deliverable **P10.02.05-D52** - (VP841) IOP ATC System Requirements (IOP TS)

[5] SESAR Deliverable **P10.01.07-D120** edition 00.01.00 Technical Architecture Description – Cycle 2015

[6] SESAR Deliverable **P10.07.01-D03** AGDL System Architecture Design- Phase 1.

[7] SESAR Deliverable **P10.02.05-D34** edition 00.01.00 (VP-714)“IOP ATC System Requirements

[8] SESAR Deliverable **P14.01.04-D44-005** SWIM-TI Blue Profile Technical Specification

[9] EUROCONTROL Specification of the Initial Flight Plan; Edition 1.1; 14/6/2013

[10]08.03.10 - D65 - European ATM Service Description for the ATCFlightObjectControl Service, Edition 00.02.01, 20/07/2016

4.2 Applicable Documents

This Technical Specification complies with the requirements set out in the following documents:

[1]

[2]

[3]

[4]

[5]

[6]

[7]

[8]

[9]

[10]

[11] Template Toolbox 03.00.00
https://extranet.sesarju.eu/Programme%20Library/SESAR%20Template%20Toolbox.dot

[12] Requirements and V&V Guidelines 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Requirements%20and%20VV%20Guidelines.doc

[13] Templates and Toolbox User Manual 03.00.00
https://extranet.sesarju.eu/Programme%20Library/Templates%20and%20Toolbox%20User%20Manual.doc

[14] EUROCONTROL ATM Lexicon
https://extranet.eurocontrol.int/http://atmlexicon.eurocontrol.int/en/index.php/SESAR

4.3 Use of copyright / patent material /classified material

N/A

4.3.1 Classified Material

N/A

Appendix A

A Requirements Consolidation

This section provides detailed information regarding to each specific requirement. The following detailed information is provided for each requirement

- Requirement Identification
- Requirement description
- Traceability to Flight Object Interoperability Specification **ED-133** [1],
- Traceability **P05.05.01-D846** - TMF INTEROP for Step 1 [3]

  Requirement status to indicate if the specific requirement is agreed between all the 10.02.05 members.

SESAR-IOP
TS-Requirements trac

Appendix B

B Pending Subjects

This section provides detailed information regarding to each specific requirement. The following detailed information is provided for each requirement

- Requirement Identification
- Requirement description
- Traceability to Flight Object Interoperability Specification **ED-133** [1],
- Traceability **P05.05.01-D846** - TMF INTEROP for Step 1 [3]

Requirement status to indicate if the specific requirement is agreed between all the 10.02.05 members.

B.1 Coordination and Transfer

B.1.1 Coordination Data

The FDMP with the contributions of the FDCs already in their respective SAP phase populates the crossing data. The FDCs reach the SAP phase independently.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0034
Requirement	A FDC or FDMP shall from the start of the SAP onward start maintaining up-to-date the following set of information related to its crossings. • Transferring Sector, Transferring frequency and (if relevant) skipped sector (only for its exit crossings) • Receiving Sector, Receiving frequency and (if relevant) skipped sector (only for its entry crossings) • Requested SSR Code (only for its entry crossings) • Request on Frequency (with initiator's sector identity & frequency) • Transfer FL (/SFL) • Coordinated Direct (specific point on the route to be given as a direct after any deviation) • Coordinated Heading • Coordinated Speed • Coordinated Rate of climb / descent • Release (for turn, climb/descent, speed, rate, related aircraft) and

	kind of release (upstream, downstream) • The standard/non-standard evaluation of the crossing
Title	Maintenance of crossing data from SAP onward
Status	<In Progress>
Maturity Level	TRL1
Rationale	: extension to a wider set of data.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0027	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0096	<Full>

REQ]

Identifier	REQ-10.02.05-TS-COTR.0107
Requirement	The system shall accept inputs to modify the following subset of the coordination data relative to its exit boundary: ECL, Coordinated heading, speed or rate, transferring sector id, transferring frequency.
Title	Maintenance of coordination data from SAP onward
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0030	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0108
Requirement	The system shall accept inputs to modify the following subset of the coordination data relative to its entry boundary: ECL, Coordinated heading, speed or rate, receiving sector id, receiving frequency.
Title	Maintenance of coordination data from SAP onward

Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0031	<Full>

B.1.2 CAP phase

In this section are collected the requirements that need further discussions or that are pending OPS requirements finalization.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0113
Requirement	The SI that is being proposed a SKIP shall trigger its CAP phase if it is not yet started.
Title	CAP trigger through SKIP proposal
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0506	<Full>

Note: A System Instance will make visible to its involved ATCOs that the Controller Awareness Phase of an SI boundary is set.

Regression from CAP to SAP

B.1.3 Stolen

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0047
Requirement	The SI that force-assumes a flight shall

	• indicate in FO for its entry and exit crossing the flight is STOLEN, mark this assuming SI as the new controlling SI and • mark in the FO for its entry and exit crossing? that it was stolen to the previous controlling SI • indicate that the negotiation phase and the frequency transfer related to the exit crossing out of the previous controlling SI are completed.
Title	Force Assume Processing
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0052	<Full>

The SI of the SI that lost the responsibility on a flight following a force-assume will make aware its ATCO that the flight was stolen and by whom.

The SI of the SI that gains the responsibility on a flight following a force-assume will make aware its ATCO that the flight was stolen and from whom.

For Full IOP, when the flight is force-assumed by a further downstream SI, the stolen information will be provided to all his upstream SIs not skipped up to (and including) the former controlling SI.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0111
Requirement	The SI of the SI that lost the responsibility on a flight following a force-assume shall be able to declare it agrees with the loss of responsibility and reset the stolen information in the FO for its exit crossing?.
Title	Force Assume Feedback
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0053	<Full>

Typical UC for the force Assume (UC#6 from OPS team)

	OPS view					TECH view									
IOP Stakeholder -->	Roles	Control-ling SI	A to B	B to C	Attri	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	Stolen	Stolen To
Concept -->			Phase	Phase	applicable to -->			A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C		
step x: first FO distribution at creation	FDMP A	A	SAP	SAP		FDMP A	A	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF	
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	CAP	SAP		FDMP A	A	CAP	OFF		Not-started	INITIAL	OFF		Not-started	OFF	
step x: NP triggered (LoA, RoF) to B	FDMP A	A	NP	SAP		FDMP A	A	CAP	ON		Not-started	INITIAL	OFF		Not-started	OFF	
step x: Frequency change to B	FDMP A	A	Freq Chg	SAP		FDMP A	A	CAP	ON		Instructed	INITIAL	OFF		Not-started	OFF	
step 0: Assume by B	FDMP B	B	Assumed	SAP		FDMP B	B	Terminated	OFF		Done	INITIAL	OFF		Not-started	OFF	
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	Freq Chg	SAP		FDMP B	B	Terminated	OFF		Done	CAP	OFF		Not-started	OFF	
step 2: Force Assume by C	FDMP C	C	Terminated	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	ON	B
step 3: ATCO B acknowleges the Stolen status	FDMP C	C	Terminated	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	ON	B

The next steps can be:

- If the previous controlling SI does not agree with that, it will reclaim the flight[4] (see §3.1.3.6.1.4) and the controlling SI will then undo its force-assume (see § 3.1.3.6.1.7). If the previous controlling SI agrees, the situation remains as it is.
- Or the controlling SI gets aware that it assumed the wrong flight and makes the undo force assume (see § 3.1.3.6.1.7) without being requested to do so.
- Or the previous controlling SI force-assumes the flight again.

B.1.4 Trigger

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0016
Requirement	If the triggering of CAP is no more applicable as per the LoA, the system shall be able to revert back the coordination information of its entry crossing to SAP providedits downstream system is in SAP
Title	Regression from CAP to SAP upon important delay at entry in a SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

[4] Cf. MUAC meeting slide 16 answer to question 47

<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0023	<Full>

B.1.5 Consequences

This phase transition will be identified by the SIs where it occurs so that they can make aware their ATCOs.Any data created because of the CAP will be erased (refer to ICD for full list).

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0032
Requirement	Upon regression of the CAP start for a crossing, the SI shall reset: • Delegation data and, if any, related release • Skip data and, if any, related release • Negotiation flag of that crossing (set to OFF) • Crossing state of that crossing (reset to SAP). Skip and delegation data are reset only if they are not derived from an offline rule.
Title	CAP data reset upon regression of CAP
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0023	<Full>

B.1.6 Release

B.1.6.1 Release management

In any situation where a controller (acting controller) is actually controlling a flight while it is traversing the AOR of another controller (delegating controller), the delegating controller can define the level of freedom he grants to the acting controller.
This covers the cases:

- The downstream ATCO assumes the flight before it crosses the entry boundary to its AOR.
- The upstream ATCO keeps the responsibility of the flight AFTER the flight crosses the boundary to the downstream SI

- SKIP-SI
- DELEGATION

B.1.6.2 Setting the release information

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0086
Requirement	A system instance shall enable the delegating ATCO to set and revise the release information applicable to a flight.
Title	Input to set the release information
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0060	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0061	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0514	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0515	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0087
Requirement	A system instance shall be able to set in the FO the release information applicable to a flight regarding the remainder of its AOR traversal using one or more of the following values: • Full, • No Release • Climb limitation with optional max flight level, • Descent limitation with optional min flight level, • Turns limitation with optional Right/Left limitation or other flight id, and optionally a specific max turn angle in degree referring to position and track of aircraft when release is given • Speed limitation with optional min or max limit (expressed in knots or Mach), • Rate of vertical evolution limitation with optional limit (min or max) expressed in feet per minute.

	• A flight the release is subject to (expressed as a callsign)
Title	Possible items making the release information
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0066	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0067	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0068	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0069	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0070	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0099	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0071	<Full>

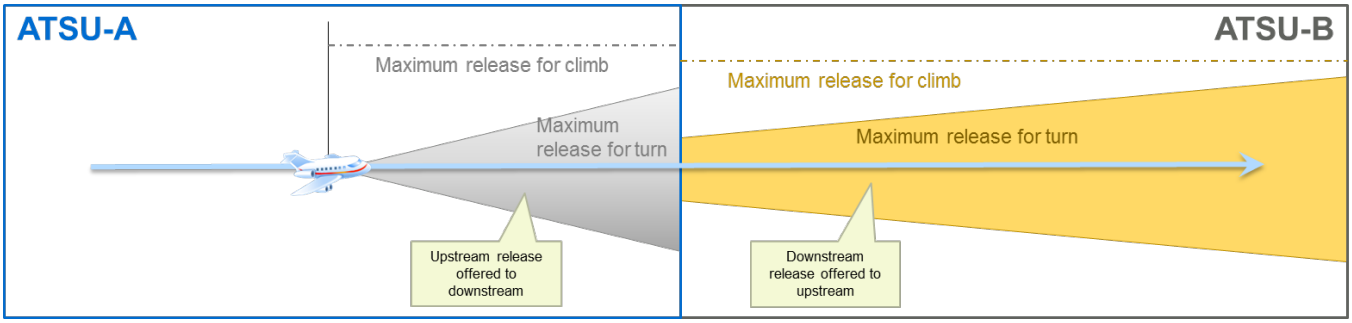
Operationally there is need for a given SI crossing to identify the AOR where the release information applies.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0088
Requirement	A system instance shall tag in the release information in the FO the AOR on which the release information is applicable using values: • Downstream AOR • Upstream AOR • Skipped-SI AOR
Title	Identification of AOR related to the release information
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0060	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0061	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0514	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0515	<Full>

The picture below clarifies the meaning of the tags “Upstream AOR” and “Downstream AOR”



Note: in case of upstream release, the ATCO of the upstream release defines the limitations he set to the changes that the downstream controller can do before the flight enters the downstream AOR. The applicable AOR will be tag "Upstream AOR" on the crossing that separates this upstream and downstream SIs.

Note: in case of downstream release, the ATCO of the downstream release defines the limitations he set to the changes that the upstream controller can do while the flight is already inside the downstream AOR. The applicable AOR will be tag "Downstream AOR" on the crossing that separates this upstream and downstream SIs.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0089
Requirement	The SI shall keep the release information applicable to the traversal of the AOR of a skipped SI with the crossing to enter that skipped SI, and tag this release information as "SKIPPED-SI".
Title	release information for the skip-SI situation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0514	<Full>

Note: when no release is given, the system shall consider that no change to current behaviour is authorized.

B.1.6.3 Negotiating the release information

B.1.6.3.1 Release negotiation without system support

The acting controller can give any clearance that match the applicable release given. If the clearance is outside the applicable release, this ATCO will coordinate the clearance verbally with the delegating

SI before giving the clearance or through WIFO mechanism. The WIFO is not used to negotiate the release information.
The delegating ATCO may authorize punctually this clearance or modify (widen) the release also.

B.1.6.3.2 Release negotiation with system support

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0090
Requirement	The system instance shall be able to request a specified new value for the release information to the delegatee SI.
Title	Input to request a change to the applicable release
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0073	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0092	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0093	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0074	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0091
Requirement	The system instance shall be able to inform its ATCO of a request to modify the release information.
Title	Feedback to ATCO the request to change to the applicable release
Status	<In Progress>
Maturity Level	TRL1
Rationale	Stream 2
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0073	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0074	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0092	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0093	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0092
Requirement	The system instance shall be able to make applicable (accept) or reject a request to modify the release information.
Title	Acceptance and Rejection of the request to change to the applicable release
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0073	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0074	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0098	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0092	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0093	<Full>

Depending on local processing, some SI may implement the full release by default when performing a frequency change.

B.1.6.4 Behaviour while a release is applicable

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0093
Requirement	The SI upstream to the skipped SI shall make aware its ATCO of the release applicable over the AOR of the skipped SI.
Title	Visibility to upstream ATCOs of the applicable release
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0514	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0094
Requirement	The SI downstream to the skipped SI shall make aware its ATCO of the release applicable over the AOR of the skipped SI.
Title	Visibility to downstream ATCOs of the applicable release

Status	<In Progress>
Maturity Level	TRL1
Rationale	Stream 2
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0514	<Full>

B.1.6.5 Conformance to applicable release

When a SI gives a clearance to a flight that is subject to a release, a local processing may verify that this clearance is compatible with the applicable release.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0115
Requirement	A SI skipped for a FO shall verify that the changes affecting this FO are compliant with the release and if not informs the skipped sector.
Title	Visibility to downstream ATCOs of the applicable release
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0517	<Full>

The ATCO may also assess the compatibility of the intended clearance with the release.
If the clearance complies with the release, the SI issuing the clearance will apply it to the FO. The FO updates reaches the SI downstream and the skipped SI and their ATCOs are informed.
If the ATCO assesses that the clearance he wants to give exceeds the release, the initiating ATCO can set up a negotiation involving the skipped SI (seeB.1.10). The result of the negotiation is either the acceptance of the new clearance by the skipped SI, the extension of the release or a decision by the skipped SI to request the termination of the skip.
If the clearance was applied without negotiation with the skipped SI, the ATCO at the skipped SI may assess the situation and decide to request the termination of the skip.

B.1.7 Reclaim

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0109
Requirement	The SI shall indicate in the FO for its entry crossing that from now on a reclaim is no longer possible when the flight is no longer under the responsibility of the first controller of the SI.
Title	No Reclaim eligibility after transfer to second controller in downstream SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0047	<Full>

Reclaim is just a request to get back the flight. The next step would be that the controlling SI instructs the pilot to contact the previous SI and then this SI confirms the contact back with the pilot (see § 0) by an assume action.

IOP Stakeholder -->	Roles	Control-ing SI	A to B	B to C	Attri	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	Stolen
Concept -->			Phase	Phase	applicable to -->			A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C	
step x: first FO distribution at creation	FDMP A	A	SAP	SAP		FDMP A	A	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	CAP	SAP		FDMP A	A	CAP	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step x: NP triggered (LoA RoF) to B	FDMP A	A	NP	SAP		FDMP A	A	CAP	ON		Not-started	INITIAL	OFF		Not-started	OFF
step x: CAP triggered (LoA, RoF) to C	FDMP A	A	NP	CAP		FDMP A	A	CAP	ON		Not-started	CAP	OFF		Not-started	OFF
step x: Freq. Change	FDMP A	A	Freq Chg	CAP		FDMP A	A	CAP	ON		instructed	CAP	OFF		Not-started	OFF
step 0: Assume by B	FDMP B	B	Assumed	CAP		FDMP B	B	Terminated	OFF		Done	CAP	OFF		Not-started	OFF
step 1: Reclaim by A	FDMP B	B	Assumed	CAP		FDMP B	B	Terminated	OFF		Reclaim	CAP	OFF		Not-started	OFF
step x: B instructs pilot to contact A	FDMP B	B	??	CAP		FDMP B	B	Terminated	OFF		Reclaim	CAP	OFF		Not-started	OFF
step x: A assumes again the flight	FDMP A	A	??	CAP		FDMP A	A	CAP	ON		Not started	CAP	OFF		Not-started	OFF

B.1.8 Undo Force Assume

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0050
Requirement	Upon undo of the force-assume, the FDMP shall reset the controlling SI to the value it had before the force Assume and indicate the flight is not stolen.
Title	Undo Force Assume processing
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0059	<Full>

Note: this will trigger in the SI of the new controlling SI (the one before the force assume that was just un-done) an assessment of the role on this FO. The SI should decide to take over the FDMP role on this FO.

Typical UC for Undo Force Assume (UC #7 from OPS team) following a reclaim by the stolen SI:

	OPS view						TECH view								
IOP Stakeholder -->	Roles	Control-ing SI	A to B	B to C	Attri	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	Stolen	Stolen To
Concept -->			Phase	Phase	applicable to -->			A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C		
step x: first FO distribution at creation	FDMP A	A	SAP	SAP		FDMP A	A	NITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF	
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	CAP	SAP		FDMP A	A	CAP	OFF		Not-started	INITIAL	OFF		Not-started	OFF	
step x: NP triggered (LoA, RoF) to B	FDMP A	A	NP	SAP		FDMP A	A	CAP	ON		Not-started	INITIAL	OFF		Not-started	OFF	
step x: Frequency change to B	FDMP A	A	Freq Chg	SAP		FDMP A	A	CAP	ON		Instructed	INITIAL	OFF		Not-started	OFF	
step 0: Assume by B	FDMP B	B	Assumed	SAP		FDMP B	B	Terminated	OFF		Done	INITIAL	OFF		Not-started	OFF	
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	Assumed	CAP		FDMP B	B	Terminated	OFF		Done	CAP	OFF		Not-started	OFF	
step 2: Force Assume by C	FDMP C	C	Terminated	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	ON	B
step 3: ATCO B acknowleges the Stolen status	FDMP C	C	Terminated	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	ON	B
step 4: ATCO B reclaims the flight	FDMP C	C	??	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Reclaim	ON	B
step x: ATCO at C undo the force assumption	FDMP B	B	Assumed	CAP		FDMP C	B	Terminated	OFF		Done	CAP	ON		Not started	OFF	
step x: the SI of B takes the FDMP role						FDMP B	B	Terminated	OFF		Done	CAP	ON		Not-started	OFF	

Typical UC for Undo Force Assume (UC #7 from OPS team) without a reclaim by the stolen SI:

	OPS view						TECH view								
IOP Stakeholder -->	Roles	Control-ling SI	A to B	B to C	Attri	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	Stolen	Stolen To
Concept -->			Phase	Phase	applicable to -->			A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C		
step x: first FO distribution at creation	FDMP A	A	SAP	SAP		FDMP A	A	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF	
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	CAP	SAP		FDMP A	A	CAP	OFF		Not-started	INITIAL	OFF		Not-started	OFF	
step x: NP triggered (LoA, RoF) to B	FDMP A	A	NP	SAP		FDMP A	A	CAP	ON		Not-started	INITIAL	OFF		Not-started	OFF	
step x: Frequency change to B	FDMP A	A	Freq Chg	SAP		FDMP A	A	CAP	ON		Instructed	INITIAL	OFF		Not-started	OFF	
step 0: Assume by B	FDMP B	B	Assumed	SAP		FDMP B	B	Terminated	OFF		Done	INITIAL	OFF		Not-started	OFF	
step x: CAP triggered (LoA, Point, Nego)	FDMP A	A	Assumed	CAP		FDMP B	B	Terminated	OFF		Done	CAP	OFF		Not-started	OFF	
step 2: Force Assume by C	FDMP C	C	Terminated	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	ON	B
step 3: ATCO B acknowleges the Stolen status	FDMP C	C	Terminated	Assumed		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	ON	B
step x: ATCO at C undo the force assumption	FDMP B	B	Assumed	CAP		FDMP C	B	Terminated	OFF		Done	CAP	ON		Not started	OFF	
step x: the SI of B takes the FDMP role						FDMP B	B	Terminated	OFF		Done	CAP	ON		Not-started	OFF	

B.1.9 Setting the frequency to be used for transfer

The frequency of a given sector is defined offline. An SI is thus aware of all the frequencies of its neighbouring sectors at the different neighbour SIs. Nonetheless, the ATCO has the possibility to overwrite his frequency to another value.

In complement to the punctual manual action, there is the same possibility for the system itself. It will cover the case of a failure of a frequency for which the system (no manual ATCO action) will designate a new frequency to be used for all flights awaited on the failed frequency.

Note: it allows managing the case

- *where in an SI several ATCO share the same airspace (frequency cannot be determined from the sector information)*
- *where a frequency is shared by several sectors*
- *where a dedicated frequency is used in some circumstances (emergency)*

B.1.10 Skip-SI

In the IOP context, the Skip-SI is a situation where anSIhas given to another adjacent traversedSI the control of a flight a priori for the whole traversal of its AOR.
There are operationally two cases for the skip-SI:
We consider a flight traversing SIs A then B then C

- Skip to upstream

  The flight will be controlled by A while it traverses the AOR of B. It is as if the control sequence was A → C; the boundary between A and C is the boundary between B and C.
- Skip to downstream

  The flight will be controlled by C while it traverses the AOR of B. It is as if the control sequence was A → C; the boundary between A and C is the boundary between A and B.

The skip situation is the result of an agreement between 2 SIs.
One SI will request to the other to establish a skip for a given flight, and the other will have to accept or reject it. The request can come from the SI that will be skipped (SKIP “ME”) or from the SI that will extend its control on the flight (BYPASS ‘YOU”)

*Note: While in a skip situation, the skipped SI may authorize some evolutions to the flight. This will done by the release mechanism (see §C.1.*1.3*).*

Note for upstream skip-sector: it is a local processing of the upstream SI to anticipate the trigger of the NP phase toward the downstream SI in case a downstream skip-sector is in place. The other SI is not at all aware of the internal sector limits within other Sis. The other SI will trigger the NP phase based on its knowledge of the SI/SI boundaries.

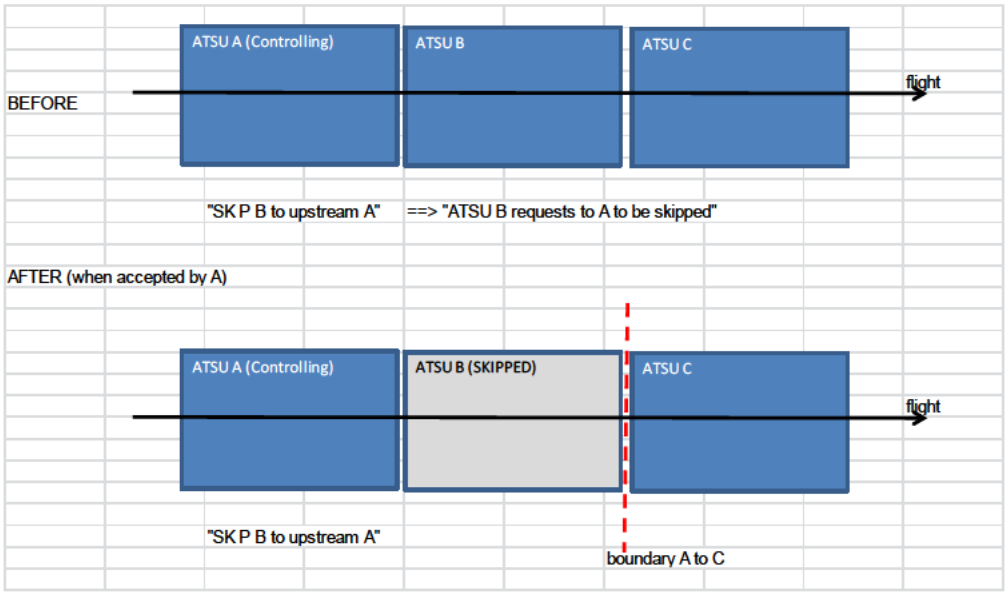
Note for downstream skip-sector: it is a local processing of the downstream SI to delay the trigger of the NP phase for its entry crossing in case an upstream skip-sector is in place. The other SI is not at all aware of the internal sector limits within other Sis. The other SI will trigger the NP phase based on its knowledge of the SI/SI boundaries.

B.1.10.1 Initiation of the Skip-SI

The granularity of the skip-SI managed in IOP is the SI.

B.1.10.1.1 To upstream (UC #9.1)

There are different situations to consider:
Situation 1:



This situation is addressed by the requirements:
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0060
Requirement	The SI of an SI traversed by the flight shall have the means to request to be skipped to the SI of its upstream SI (SKIP TO UPSTREAM).
Title	Skip (me) To Upstream Input
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0501	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0502	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0505	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>

[REQ]

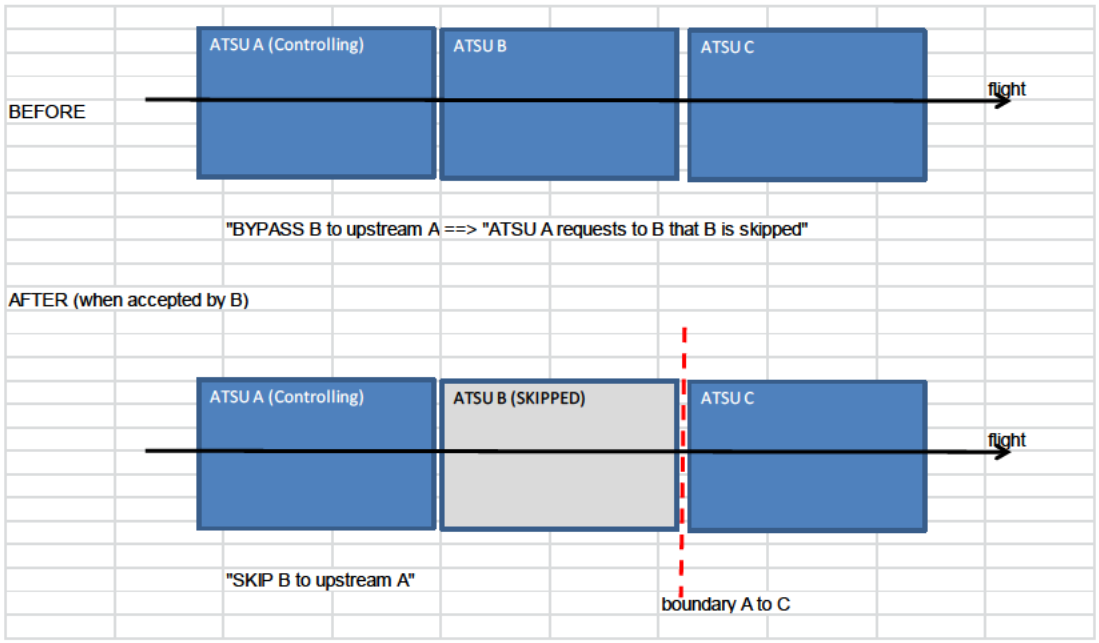
Identifier	REQ-10.02.05-TS-COTR.0061
Requirement	The SI requesting a SKIP TO UPSTREAM shall indicate the skip request for its entry crossing, identify as requester of the skip its name and as skip direction ”upstream”.
Title	Skip (me) To Upstream Processing
Status	<In Progress>
Maturity Level	TRL1

Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

Situation 2:



This situation is addressed by the requirements:

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0062
Requirement	The SI of an SI traversed by the flight shall have the means to request to its downstreamSI to skip it (BYPASS TO UPSTREAM).
Title	Skip (you) To Upstream Input
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A

<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0063
Requirement	The SI requesting a BYPASS TO UPSTREAM shall indicate the skip request for of its exit crossing, indicate as requester of the skip its name and as skip direction ”upstream”
Title	Skip (you) To Upstream Processing
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

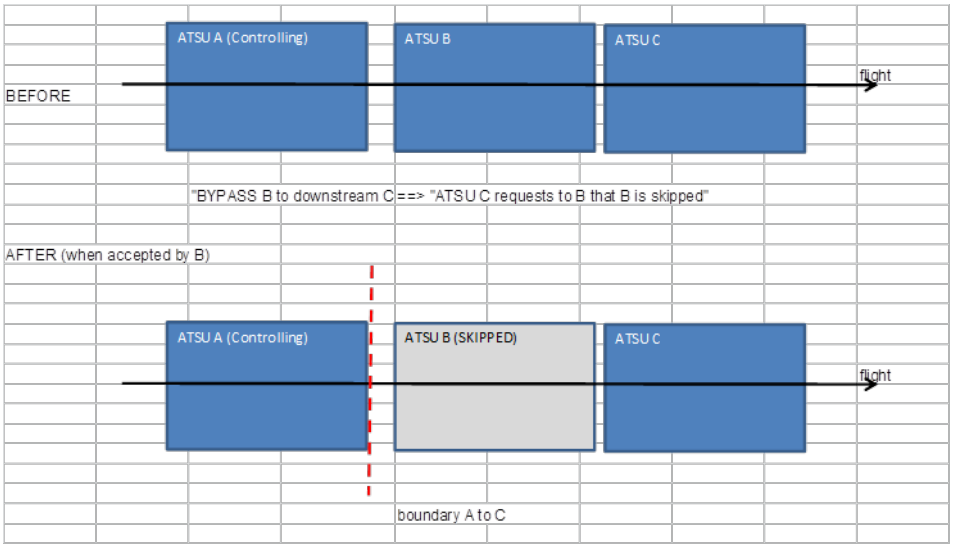
[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

The SKIP B TO UPSTREAM A and BYPASS B TO UPSTREAM A leads if accepted to the same situation. SIA will manage the flight while it traverses B airspace and will manage the transfer to C when flight arrives at boundary B to C.

B.1.10.1.2 To downstream (UC #9.2)

There are different situations to consider:
Situation 1:



This situation is addressed by requirement:
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0064
Requirement	The SI of an SI traversed by the flight shall have the mean to request to its upstream SI to skip it (BYPASS TO DOWNSTREAM).
Title	Skip (you) To Downstream Input
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0501	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

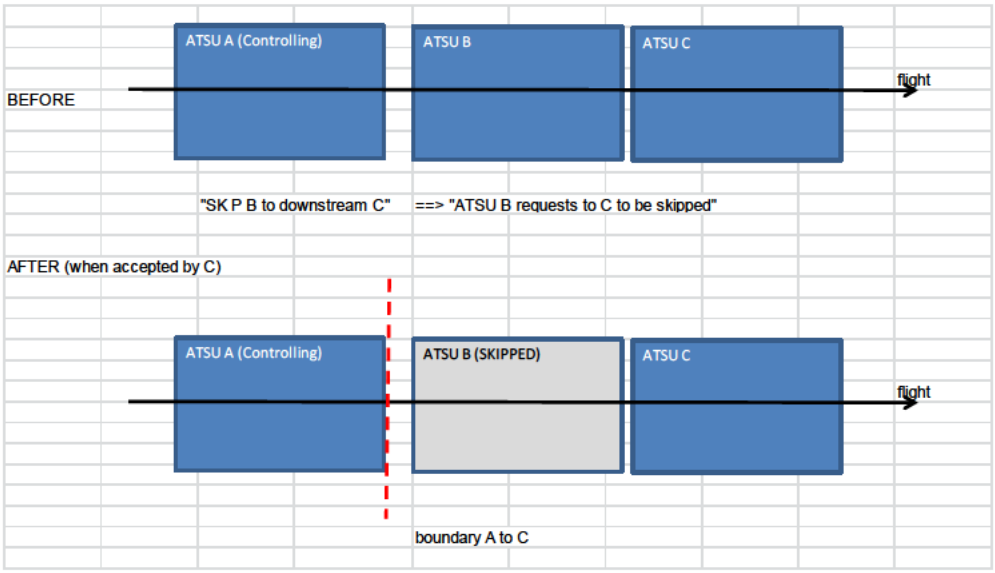
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0065
Requirement	The SI requesting a BYPASS TO DOWNSTREAM shall indicate the skip request for the entry crossing into the SI to be skipped.indicate as requester of the skip its name and as skip direction ”Downstream”.
Title	Skip (you) To Downstream Processing
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0505	<Full>

Situation 2:



This situation is addressed by requirement:
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0066
Requirement	The SI of an SIB traversed by the flight shall have the means to request to be skipped to its downstream SI (SKIP TO DOWNSTREAM).
Title	Skip (me) To Downstream Input
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0067
Requirement	The SI requesting a SKIP TO DOWNSTREAM shall indicate the skip request of its exit crossing, indicate as requester of the skip its name and as skip direction to ”Downstream”.
Title	Skip (me) To Downstream Processing
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0503	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

The SKIP B TO DOWNSTREAM C and BYPASS B TO DOWNSTREAM C lead if accepted to the same situation. C will manage the flight while it traverses B airspace and A will manage the transfer to C when flight arrives at boundary A to B.

Note: the skip can be negotiated and established even before any of the two negotiating SI has the control on the flight. It can be planned "in advance".
It is a local processing to implement local rules to trigger automatically skip proposal, acceptance or rejection (so outside IOP specification) in complement to the manual trigger.

B.1.10.2 Undo of the Skip-SI Proposal

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0114
Requirement	The SI of the SI proposing a SKIP shall have the means to undo this proposal, if the frequency change from its upstream has not yet occurred.
Title	undo of the skip proposal
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0511	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0513	<Full>

B.1.10.3 Acceptance / Rejection of the Skip-SI Proposal

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0068
Requirement	The SI of the SI to which a skip is proposed or requested shall have the means to accept it or to reject it.
Title	acceptance or rejection of the skip proposal/request
Status	<In Progress>
Maturity Level	TRL1

Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0069
Requirement	The SI that rejects a skip proposal or request shall indicate the attempted rejection for the related crossing
Title	Processing of a rejection of the skip proposal/request
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0070
Requirement	The SI of the SI initiating the Skip proposal/request shall consider the skip proposal/request as rejected if no acceptance is received within a SP time and reset the skip information of the related crossing.
Title	Automatic rejection of the skip proposal/request
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01	N/A

<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0071
Requirement	The SI that accepts a skip proposal or request shall indicate that the skip for the related crossing is in place.
Title	Acceptance of the skip proposal/request
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0504	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0072
Requirement	The SI of the ATSI initiating the Skip shall consider the skip proposal as rejected if it receives a Frequency Change from the SI of the SI whom the skip is proposed and reset the skip information.
Title	Rejection of the skip proposal/request upon Frequency change
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0502	<Full>

B.1.10.4 Termination of the Skip-SI

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0073
Requirement	The skipped controller (at the skipped SI) shall have the mean to request (ROF input) to the delegatee SI to terminate the skip and get back the flight under his control.

Title	Input to terminate the skip
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0512	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0074
Requirement	When informed by the SI of the skipped SI of the termination request for a skip, the FDMP shall indicate the request for termination if the delegatee of the skip is the controlling SI and indicate the termination is effective if not.
Title	Processing to terminate the skip
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0502	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0512	<Full>

There are two main UCs regarding the termination of a skip:
SKIP-1: the delegate has not yet taken the responsibility on the flight: the skip pattern is in place, but not yet operationally used.
SKIP-2: the delegate has already taken the responsibility of the flight
Case SKIP-1

UC skip termination before downstream assumption												
IOP Stakeholder -->	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Skip status	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Skip status	Frequency-Transfer
Concept -->			A to B	A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C	B to C
step 0: first FO distribution at creation	FDMP A	A	INITIAL	OFF		N/A	Not-star ed	INITIAL	OFF		N/A	Not-started
step 0: CAP triggered (LoA, Point, Nego) for B	FDMP A	A	CAP	OFF		N/A	Not-star ed	INITIAL	OFF		N/A	Not-started
step 0: CAP triggered (LoA, Point, Nego) for C	FDMP A	A	CAP	OFF		N/A	Not-star ed	CAP	OFF		N/A	Not-started
step 1: B decides to skip itself toward downstream C	FDMP A	A	CAP	OFF		Requested	Not-star ed	CAP	OFF		N/A	Not-started
step 1: C accepts the skip proposal made by B	FDMP A	A	CAP	OFF		In Pace	Not-star ed	CAP	OFF		N/A	Not-started
step 2: B terminates the skip	FDMP A	A	CAP	OFF		N/A	Not-star ed	CAP	OFF		N/A	Not-started

After setting in place the skip of B in favour of the delegatee C, an ATCO at B changes its mind. The flight is not yet on frequency with an ATCO of C. The ATCO at B enters the termination request of the skip. The skip is automatically terminated without involvement of the ATCO at C who needs only be made aware of the decision of B.

Case SKIP-2

UC skip termination after downstream assumption												
IOP Stakeholder -->	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Skip status	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Skip status	Frequency-Transfer
Concept -->			A to B	A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C	B to C
step 0: first FO distribution at creation	FDMP A	A	INITIAL	OFF		N/A	Not-star ed	INITIAL	OFF		N/A	Not-started
step 0: CAP triggered (LoA, Point, Nego) for B	FDMP A	A	CAP	OFF		N/A	Not-star ed	INITIAL	OFF		N/A	Not-started
step 0: CAP triggered (LoA, Point, Nego) for C	FDMP A	A	CAP	OFF		N/A	Not-star ed	CAP	OFF		N/A	Not-started
step 1: B decides to skip itself toward downstream C	FDMP A	A	CAP	OFF		Requested	Not-star ed	CAP	OFF		N/A	Not-started
step 1: C accepts the skip proposal made by B	FDMP A	A	CAP	OFF		In Place	Not-star ed	CAP	OFF		N/A	Not-started
step 2: A instructs the frequency transfer	FDMP A	A	CAP	OFF		In-Pace	nstructed	CAP	OFF		N/A	Not-started
step 2: C assumes the flight	FDMP C	C	erminated	OFF		In-Pace	Done	CAP	OFF		N/A	Not-started
step 2: B requests to terminate the skip	FDMP C	C	Terminated	OFF		ermination reques	Done	CAP	OFF		N/A	Not-started
step 2: C instructs aircraft to contact B	FDMP C	C	Terminated	OFF		Terminat on-request	Done	CAP	OFF		N/A	Not-started
step 2: B assumes the flight	FDMP B	B	Terminated	OFF		N/A	Done	CAP	OFF		N/A	Not-started

After setting in place the skip of B in favour of the delegatee C, the flight is now on frequency with an ATCO of C. The ATCO of B changes its mind and enters the termination request of the skip. There is a need for an explicit action at C so that the flight gets back to the frequency of B. C when aware of the termination request instructs the aircraft to contact B. And the skip is really terminated after B re-assumes the flight.

B.1.10.5 Skip-Sector

There exists also a facility to skip the first or last sector at a SI boundary.
The sequence of the traversed SI remains unchanged, but the identity of the first or last involved sectors upstream/downstream to the crossing is changed.

B.1.10.5.1 Upstream Skip-Sector

The upstream SI publishes in the FO the identity of the sector that will actually control the flight when it exits the AOR of the SI as well as the identity of the last sector in the SI (they may differ in the last sector was skipped by some sector upstream to it).
At IOP level the negotiation of changes still occurs between the two SIs (A WIC is at SI granularity, not sectors). If two controllers need to be involved in the upstream SI, it is a local processing of that SI and at IOP level a “consolidated” position of the upstream SI with respect to the negotiation is expected by the WIMP

B.1.10.5.2 Downstream Skip-Sector

The downstream SI publishes in the FO the identity of the sector that will actually control the flight when it enters the AOR of the SI as well as the identity of the first sector in the SI (they may differ in the first sector was skipped by some sector downstream to it).
At IOP level the negotiation of changes still occurs between the two SIs (A WIC is at SI granularity, not sectors). If two controllers need to be involved in the downstream SI, it is a local processing of that SI and at IOP level a “consolidated” position of the downstream SI with respect to the negotiation is expected by the WIMP

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0083
Requirement	The System Instance shall allow proposing to the downstream SI the downstream skip-sector of the last sector of the upstream SI toward the first sector of the downstream SI.
Title	Input to propose a “skip my last sector to the downstream SI”
Status	<In Progress>

Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0084
Requirement	The System Instance shall allow an ATCO to accept or reject a downstream skip-sector proposal.
Title	Input to accept/reject a “skip my last sector to the downstream SI”
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0085
Requirement	The system instance the last sector of which is skipped shall publish in the FO as new transferring sector the identity of the sector that will actually last control the flight before it gets transferred to the responsibility of the next SI, as well as its frequency.
Title	Update the transferring sector/frequency in case of “skip my last sector to the downstream SI”
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

At IOP level the negotiation of changes still occurs between the two SIs (A WIC is at SI granularity, not sectors). If two controllers need to be involved in the upstream SI because of the downstream skip-sector, it is a local processing of that SI and at IOP level a “consolidated” position of the upstream SI with respect to the negotiation is expected by the WIMP.

B.1.10.6 Side Effects of skip actions local to a SI

Some skip actions internal to a SI needs be partially visible in the FO when they affect the identity of the controller involved in transferring a flight between two SIs.

B.1.11 Delegation

The delegation of a flight between two ATCOs at different Sis can be requested before the delegating ATCO (delegator) controls the flight or while it controls the flight[5].
Consequently, the two Sis involved in a delegation can be different from the SI with the FDMP role on the FO.The ATCO intending to put in place a delegation for a given flight must be aware of the frequency of the delegated sector (the delegatee, the recipient of the delegation).
The delegation can be requested either by the SI (the delegator) that should take the control of the flight (or even the one that currently is controlling the flight), or by the one (delegate) that will be the controlling SI if the delegation is put in place.
It is not permitted to delegate a flight to more than one SI at a given time.
The delegating SI (delegator) may authorize some evolutions of flight. This can be done by the release mechanism (see §C.1.1.30).
The data to manage the delegation is described at § C.1.1.4.

At this stage, we assume that the recipient of the delegation is aware of the flight because it is distributed for some reason: vicinity in the main case, and by a manual point for the other cases. There is consequently no specific reason for distribution linked to the delegation mechanism.

B.1.11.1 Proposing a delegation

This is the case where it is the traversed SI that wants to delegate the control of the flight to another one for a portion of its AOR traversal. It can correspond to an overload situation for example or to the case when this is done in anticipation for a rerouting.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0051
Requirement	The SI of an SI predicted to take control of the flight or currently controlling the flight shall be able to propose a delegation for a flight to the SI of an SI different from its predicted next SI.
Title	Proposal of a delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	

[5] Cf. MUAC meeting slide 10 answer to first question TQ

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0052
Requirement	When informed by the SI proposing the delegation, the FDMP SI shall indicate the request in the delegation information and fill the “delegatee” with the SI whom the delegation is proposed.
Title	Sharing the Proposal of a delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0053
Requirement	When informed by the delegate SI, the FDMP shall indicate the delegation isaccepted or rejected
Title	Acceptance and Rejection of a Delegation Proposal
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

B.1.11.2 Requesting a delegation

This is the case where it is the non-traversed SI that wants to be delegated the control of the flight. It can correspond to the case where the requested aircraft is conflicting with others in the area of the requesting unit.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0054
Requirement	An SI not currently planned to take control of the flight can request to an SI planned to take control of the flight or currently controlling the flight to be delegated a flight. The FDMP SI shall indicate that request in the delegation information and identifying the delegatee as the SI requesting the delegation.
Title	Requesting a Delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

B.1.11.3 Accepting and rejecting a delegation

The SI that will gain the control of the flight has to explicitly accept it. It can also reject it.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0055
Requirement	The SI (delegatee) being proposed the delegation shall have the means to accept or reject it.
Title	Input to accept or reject a delegation proposal
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Similarly the SI that will lose the control of the flight has to explicitly accept it. It can also reject it.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0056
Requirement	The SI being requested the delegation (delegator) shall have the means to accept or to reject it.
Title	Input to accept or reject a delegation request
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0057
Requirement	The FDMP shall indicate the acceptance or the rejection in the delegation information upon acceptance or rejection of a delegation proposal or request.
Title	Processing at acceptance of a delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

B.1.11.4 Terminating a delegation

At any time, the delegatee SI (recipient of the delegation) can instruct the pilot to contact the delegating SI (delegator), which when the delegating SI (delegator) will have assumed back the flight will terminate the delegation.[6]

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0058
Requirement	The delegatee SI shall have the mean to request to the delegating SI (delegator) to take back the flight.

[6] Cf. MUAC meting slide 23

Title	Input to terminate a delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0059
Requirement	When informed by the delegate SI of the delegation termination request, the FDMP shall indicate the termination request of the delegation and indicate the frequency transfer has been instructed.
Title	Processing to terminate a delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

Possible next step is that

- The delegating SI (delegator) re-assumes the flight
- Or the delegate keeps the flight and performs the transfer to its downstream unit.

B.1.12 Free Text Messages

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0096
Requirement	The SI shall support the entry of free text message for a given sector at another SI.
Title	Input of free-text messages between SIs
Status	<In Progress>
Maturity Level	TRL1

Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0097
Requirement	The SI shall make aware to the ATCO the free text messages received from the other Sis that are targeted for this ATCO.
Title	Feedback to ATCOS the free-text messages between SIs
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0098
Requirement	The emitter and receiver SI shall have the means to delete a given free-message.
Title	Input to delete a free-text messages between SIs
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0099
Requirement	The SI shall manage and make available up to SP characters in a free-text message in the FO.
Title	Maximum length of a free-text messages between SIs
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A

To avoid growing the size of the FO with free-text messages that twill be rarely used, the TECH team will investigate to store them apart of the FO.
A possible structure could be:

- Emitter
- Receiver
- Free-text (string of 144 = a *tweet* ?)
- Related FO (optional) = the local-id of the FO (will be set by the SI without explicit typing of the ATCO)

The exchange of these messages can be through service call between the two involved SIs (no need to broadcast to all or manage summaries for them).

B.1.13 Coordinated clearances

These are some clearances that will be given to aircraft and that relate to the considered crossing. The two controllers (upstream and downstream) agree that when the flight will be instructed to change frequency, these clearances will have been issued to the flight.
[REQ]

Identifier	REQ-10.02.05-TS-COTR.0102
Requirement	The SI involved in a crossing (upstream or downstream) shall manage the following data relative to this crossing: Coordinated direct, Coordinated heading, Coordinated speed, Coordinated rate of climb, rate of descent, Coordinated Offset with start and end points,
Title	Support of coordinated clearances
Status	<In Progress>

Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0027	<Full>

Note: when given to aircraft, these constraints will be put also in the flight script, but they remain here to ease the link between a given crossing and this set of related constraints[7]

B.1.14 Request a SSR to another SI

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0103
Requirement	The SI downstream to a crossing shall be able to request a SSR code to the upstream SI.
Title	Support of request of a SSR code to another SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0027	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0104
Requirement	The SI requesting a SSR code to another SI shall set which SI it is requested to and who is requesting it in the FO.
Title	Support of request of a SSR code to another SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>

[7] Cf. MUAC meting, slide 11, answer to question 41.

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0027	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0110
Requirement	The SI providing a requested SSR code shall set SSR code made available in the FO.
Title	Support of request of a SSR code to another SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0027	<Full>

B.1.15 Limitations for Initial IOP

In this section the uncertain part is what is behind 4D route or 4D trajectory. Pending OPS definition.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0105
Requirement	The system shall accept inputs to modify the following subset of the coordination information relative to its exit boundary: TFL, SFL, 4D Route.
Title	Maintenance of coordination data from SAP onward
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A

<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0028	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0106
Requirement	The system shall accept inputs to modify the following subset of the coordination data relative to its entry boundary: TFL, SFL, 4D Route, next SSR code.
Title	Maintenance of coordination data from SAP onward
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0029	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0035
Requirement	The System Instance shall support negotiations between Sis using electronic support to set the TFL, PFL/ECL and the 4D trajectory.
Title	Data that can be negotiated over IOP with system support
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0091	<Full>

B.2 Flight Script Management

B.2.1 FS Management topics under discussion (V4)

1. **Relevant Points:** the way 'relevant' point are described and reflected in technical requirements need additional activity

   – REQ.10.02.05-TS-FSMG.0013

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0013
Requirement	When applying a constraint accepted by the FDMP impacting the trajectory processing, the 95-percentile of the difference between the relevant input and computed constraint points shall not exceed IOP_MAX_RELEVANT_CONSTRAINT_POINT_TOLERANCE threshold.
Title	Constraint Relevant Points Processing
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement instructs all the IOP Stakeholders implementing a constraint when constructing the trajectory to take into account as much as possible the implementation guidelines that have optionally been specified by the constraint owner. This requirement specifically addresses the overall IOP objective to allow all IOP Stakeholders to locally create a trajectory that would take into account as much as possible the constraints as experienced by other IOP Stakeholders. *Justification for TRL1: the way 'relevant' point are described and reflected in technical requirements need additional activity.*
Category	<non-functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

2. **Constraint Ordering:** the need for ordering is agreed but the technical ordering algorithm still needs to be found.

   – REQ.10.02.05-TS-FSMG.0046

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0046
Requirement	The FDMP shall order all the constraints in the Flight Script based on: - the input Application Point of the constraint when available, - otherwise the input Target Start Point if available, - otherwise the input Target End Point.
Title	Constraints ordering in the FO Flight Script (FDMP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement instructs the FDMP to logically order the constraints in the Flight Script to ease processing of the list by all IOP Stakeholders. *Note. Using the input APs (or input TSP/TEP) allows to keep the order unchanged from one FDMP to the next one and to order the 'rejected' constraint as well.* *Justification for TRL1: the need for ordering is agreed but the technical ordering algorithm still needs to be found.*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

3. **Interference of a constraint on other SI and constraints:** The modification and the propagation of a new constraint impacting other SI and constraints needs further analysis

   – REQ.10.02.05-TS-FSMG.0049

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0049
Requirement	When a constraint owned and requested by a downstream SI has its input Application Point in the AoR of its upstream SI and according to its internal criteria the upstream SI is not able to use that input Application Point, then the upstream SI shall: – evaluate the computed Application Point as moved up to the entry of the downstream SI if required to solve the inconsistency, and – if needed, update the computed application scope of that constraint accordingly.

Title	FDPM evaluation of an FDC requested constraint
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement allows an upstream SI to modify a constraint set by a downstream SI under certain conditions. Note. 'upstream/downstream' should be understood as 'FDMP-FDC' or 'FDC-FDC. *Justification for TRL1: The modification and the propagation of a new constraint impacting several SIs needs further analysis.*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

– REQ.10.02.05-TS-FSMG.0054

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0054
Requirement	When applying a constraint that conflicts with an existing downstream active constraint with the same dimension, the IOP Stakeholder shall use as target end point of the constraint the first relevant point of that downstream constraint.
Title	Constraint propagation stop condition
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement propose a mechanism for restricting the application of a new constraint when a conflicting downstream constraint is already set. Note. Target Value dimensions are defined for all constraints in Table 1. Justification for *TRL1:.Requirement need to be expanded to cover the case the added constraint has an impact on upstream constraints (not only on downstream ones).*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0065	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

4. **Projection of route points (and flight rule switches)**: the OPS requirement related to the projection of the original route points on the modified route is going to be modified to propose projection methods for each type of point. The TECH requirements will have to be modified accordingly.

   - REQ.10.02.05-TS-FSMG.0073
   - REQ.10.02.05-TS-FSMG.0074

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0073
Requirement	When the FDC requests a route change and one of the following points: - points set “to be transferred” on the amended route, - points bearing a Flight Type or Flight Rule switch, - points set “protected” in a route amendment, is impacted by the route modification, the FDC shall compute the projection of those points on the updated Expanded Route and when the computation succeeds include those projected points, with the attributes of the original point and a reference to the original point identifier, in the route amendment constraint sent to the FDMP.
Title	Projected Expanded Route Points in case of re-route (FDC)
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement instructs the FDC in case of re-route to include in the proposed new route the points resulting from the projection of specific points of the original route that are of interest for the other IOP Stakeholders, such as IFR/VFR switch or ‘protected’ points. *Justification for TRL1: The OPS requirement related to the projection of the original route points on the modified route is going to be modified to propose projection methods for each type of point. The TECH requirements will have to be modified accordingly.*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0066	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0067	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0074
Requirement	When the FDMP requests a route change and one of the following points: - points set “to be transferred” on the amended route, - points bearing a Flight Type or Flight Rule switch, - points set “protected” in a route amendment, is impacted by the route modification, the FDMP shall compute the projection of those points on the updated Expanded Route and include those projected points, with the attributes of the original point and a reference to the original point identifier, in the route amendment constraint and in the Expanded Route.
Title	Projected Expanded Route Points in case of re-route (FDMP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement instructs the FDMP in case of re-route to include in the new route the points resulting from the projection of specific points of the original route that are of interest for the other IOP Stakeholders, such as IFR/VFR switch or ‘protected’ points., *Justification for TRL1: The OPS requirement related to the projection of the original route points on the modified route is going to be modified to propose projection methods for each type of point. The TECH requirements will have to be modified accordingly.*
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0066	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0067	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

5. **Association Coordination Data and Constraints**: new TECH requirement are proposed to reflect the coordination data identified by F#1 into constraints.

   - REQ.10.02.05-TS-FSMG.0084
   - REQ.10.02.05-TS-FSMG.0085
   - REQ.10.02.05-TS-FSMG.0086

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0084
Requirement	For any of the following coordinated data between adjacent SIs, manually input or automatically assigned by LOA: - Transfer flight level, with optional Supplementary flight level - Speed restriction - Rate of Climb/Descent - Direct To - Heading - Offset if they are expected to be reflected into constraints with closed handling, the FDMP shall include an associated constraint in the constraint list of the FO Flight Script, keeping also aligned the expanded route if needed (Direct To, Heading and Offset when closed).
Title	Coordination Data with potential impact on trajectory impact the Flight Script
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement provides a relationship among Coordination Data and constraints and/or the expanded route, if any impact on trajectory is foreseen by Coordinated Data.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0055	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0085
Requirement	The FDMP shall assign a default application point or target start point at the boundary among the coordinating SIs to any constraint associated to a Coordinated Data that has a potential impact on trajectory, unless already manually or automatically assigned.
Title	Default AP or TSP for constraints derived by Coordinated Data
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement provides the AP and TSP default position to be assigned to constraints derived by Coordinated Data.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0056	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0086
Requirement	The FDMP shall keep aligned the Coordinated Data impacting the trajectory processing and the derived constraints and Expanded Route of the FO Flight Script.
Title	FDMP responsibility to keep aligned FO Flight Script and Coordinated Data.
Status	<In Progress>
Maturity Level	TRL1
Rationale	Any constraint or expanded route portion impacted by relevant Coordinated Data will be kept dynamically aligned by the FDMP.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0055	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

6. **Constraint Eligible Stakeholder:**

Default Constraint Eligible Stakeholders

It might be useful to define the concept of “default” constraint eligible stakeholders that would implicitly inherit the eligibility rights, e.g. the coordinating SIs would be by default eligible stakeholders for transfer constraints, or all the SIs between the AP and the TEP could be by default constraint eligible stakeholders.

However, this concept of default eligible stakeholders is not addressed by the OPS INTEROP.

Multiple Constraint Eligible Stakeholders

The consequences of defining several constraint eligible stakeholders need to be assessed.

B.2.2 Not addressed FS Management Topics

1. **“Garbage collector”**: New TECH requirements could be added to address the dynamic cleaning of “old” constraints (e.g. overflown/terminated constraints).

2. **Constraint ID uniqueness**: Missing TECH requirement guarantying unique constraint identifiers.

B.2.3 Alignment with OPS requirements

3. **Ownership vs. Eligibility**: OPS requirements are modified to extend constraint operations right from the constraint owner to other SIs.

   - REQ.10.02.05-TS-FSMG.0082
   - REQ.10.02.05-TS-FSMG.0083
   - REQ.10.02.05-TS-FSMG.0087

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0083
Requirement	The FDMP shall not process a request to modify/remove a constraint received from another IOP Stakeholder – not being the owner of the constraint, – not set as a Constraint Eligible Stakeholder by the owner of the constraint.
Title	Constraint Eligibility check on requesting IOP Stakeholder
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement identifies the cases of “Constraint Eligible Stakeholder”, allowed to modify/delete a constraint: 1. the SI owning the constraint, 2. the SI set Eligible by the SI owning the constraint
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0098	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0099	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0087
Requirement	The FDMP shall be eligible to modify/remove: – an initial flight plan/route derived constraint, – an upstream constraint when it is also the controlling SI,
Title	Constraint Eligibility for FDMP
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement identifies the cases of “Constraint Eligible Stakeholder”, allowed to modify/delete a constraint: 1. the FDMP with controlling role, Eligible for all the upstream constraints, 2. the FDMP for all initial flight plan/route constraints.
Category	<functional>

Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0100	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-FSMG.0082
Requirement	The FDMP shall reject the request received from a Constraint Eligible Stakeholder if the requested operation is not one of the following operations: – modify the constraint relevant points, – switch the constraint handling attribute (open/close), – remove the constraint.
Title	Eligibility rights check on constraint operations
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement identifies the operations on the constraint that are allowed only when requested by a “Constraint Eligible Stakeholders” for that constraint, that is one of the SIs identified in REQ-10.02.05-TS-FSMG.0083.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0028	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0062	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0064	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0090	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-FSMG.0100	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

4. **FO Stability**: new OPS requirement to prevent operational use of the FO before it becomes stable enough.

B.3 Informative Distribution

B.3.1 Maintained Duplication of a flow

Maintained duplication differs from the POINT because it is not highlighted to the ATCO.
It is not one shot, it is not for an individual flight (rather to a flow) and it is not triggered by a manual input. It is automatically triggered as long as some rules are satisfied.

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0011
Requirement	An SIA shall be able to distribute a flight object to another SIB when the flight

	matches some defined conditions defined at A, specifying the reason “maintained” and a destination SI / logical sector.
Title	Capability for maintained duplication
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0003	<Full>

The rules to trigger maintained duplication are defined only at the SI that evaluates them, the one at the origin of the duplication. No need to share them among all IOP stakeholders.

[REQ]

Identifier	REQ-10.02.05-TS-INFO.0012
Requirement	A system instance A shall be able to request to the FDMP to end the maintained duplication of a flight when the rules that trigger that duplication are no longer satisfied.
Title	Capability to stop a maintained duplication
Status	<In Progress>
Maturity Level	TRL1
Rationale	
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-INFO.0003	<Full>

When the SI that identifies the need for maintained duplication is a FDMP, it does it directly. When it is a FDC for the flight, it does it through a request to the FDMP of the flight.

B.4 FO Mechanism

B.4.1 Automatic retry rejection

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0311

Requirement	The FDC shall prevent automatic retries of requests that were previously rejected by the FDMP
Title	Preventing automatic retries of failed requests.
Status	<In Progress>
Maturity Level	TRL1
Rationale	. It is needed to avoid automatic updates that create infinite loops.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0317
Requirement	In case of rejection due to wrong FO release, the FDC shall re-submit a request that refers to the latest release of the FO, if the initial request is still meaningful in the new context of the flight
Title	Reaction of FDC to a request rejection due to a wrong FO release
Status	<In Progress>
Maturity Level	TRL1
Rationale	Reaction of FDC to a request rejection due to a wrong FO release
Category	<Functional>
Validation Method	
Verification Method	<Test>

[
[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.5 SI Control Sequence

B.5.1 Control SIs list:

It contains the ordered sequence of IOP SIs that are going to control the flight. Each SI may appear as many times as it is expected to assume the control of the flight. This list may be dynamically corrected by either FDMP or FDCs.

Initially the only criterion available to the FDMP for identifying the list of controlling SIs is the calculated crossings of the fight with the AoR of the downstream SIs. As the flight progresses, this list may be modified by downstream systems as long as the FDCs modify its downstream partner in the

coordination. The changes may be triggered by any kind of local agreements at the downstream SIs, for example, SKIPs (automatic or manual), delegations, etc.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0342
Requirement	Each time that the FDMP detects an entry crossing to the AoR of a SI that is neither skipped or delegating its AoR, it shall include that SI in the Controlling SIs list.
Title	Default list of controlling SIs calculation
Status	<In Progress>
Maturity Level	TRL1
Rationale	The list of controlling SIs is computed by default using the computed crossings with the AoR of the SIs, nevertheless, changes to this default list provided by eligible SIs are to be maintained. Overall update of the requirements affecting the FO filtering and distribution aiming at improving the original description and supporting and/or clarifying the concepts of: - Control SIs List - Distribution List - Delegation - Skip -
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0001	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Crossed downstream SIs that were initially identified in the SIs control list may be skipped for control. The SKIP request may be triggered by both the SI being skipped and the upstream in that coordination The SKIP procedure may be automatically performed (example a LoA between the involved SIs allows to determine the upstream that the crossing is short enough to skip the downstream) or a consequence of different types of skip negotiations (as they are operationally described in the coordination & transfer feature)

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0338
Requirement	The FDMP shall remove from the SIs control list any instance of an SI that has been requested to be skipped.
Title	Updating the SIs control list because of SI SKIP functionality.
Status	<In Progress>
Maturity Level	TRL1
Rationale	The list of controlling SIs is computed by default using the computed crossings with the AoR of the SIs, nevertheless, changes to this default list provided by eligible SIs are to be maintained. This requirement is needed to support the SKIP functionality. Overall update of the requirements affecting the FO filtering and distribution

Category	<Functional>
Validation Method	
Verification Method	<Test>

REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Other concerned SIs that were not initially identified for control, their AoR is not crossed, may be added to the SIs control list if the AoR of another SI is delegated to them. A delegation request should come from the SI delegating its AoR. Operational procedures to perform the delegation are described in the coordination & transfer feature.

[REQ]

Identifier	REQ-10.02.05-TS-MECH.0343
Requirement	When a SI in the SIs control list delegates its AoR to another SI in the list of distribution SIs the FDMP shall replace the delegating SI by the new SI in the SIs control list.
Title	Updating the SIs control list because of SI Delegation functionality.
Status	<In Progress>
Maturity Level	TRL1
Rationale	The list of controlling SIs is computed by default using the computed crossings with the AoR of the SIs, nevertheless, changes to this default list provided by eligible SIs are to be maintained. This requirement is needed to support the Delegation functionality. Overall update of the requirements affecting the FO filtering and distribution
Category	<Functional>
Validation Method	
Verification Method	<Test>

REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0004	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

As the Control SIs list is updated the reasons for distribution (control or vicinity) in the distributed SIs list needs to be updated as well.

B.5.2 SI control sequence list- full

SI control and crossed sequence management is one of the essential features of the IOP concept. There is a need to determine, correct and fix the SI sequence list. This need can be arisen due to following situations:

a) Limited amount of shared LoAs

b) Including an SI not foreseen to control (Delegation)

c) Discarding an SI foreseen to control due to short-cross rules or re-entrances(SKIP)

d) Route change

e) Wrong calculation of IOP trajectory by FDMP

f) Implementation of new constraints

g) Sequence correction by FDC

The short cross rules are applicable for the systems whose sectors are determined from a control volume that is crossed for a short time or distance.

SI Crossed Volume

This describes the list of volumes of system instances to be physically crossed by a flight. A flight can either cross the area of interest of a system instance (SI AoI) or its area of responsibility (SI AoR). These volumes can be put in lists. So it is recommended to have two types of crossed volumes list:

1) SI AoR Crossed Volume List

2) SI AoI Crossed Volume List

Two different lists can ease the processing and provide more flexibility to the system. SI AoI crossed list can ease the calculation of distribution list for the reason vicinity, while SI AoR, for the control sequence.

SI AoR Crossed Volume List

Having the SI AoR crossed volume list increases the accuracy of the SI control sequence list. A control sequence list is generated using the SI AoR crossed volume list. In case of discrepancy between trajectories and SI control sequence list, the SI AoR crossed volume list can be used for further reference. The AoR crossed volume list also helps in determining the proper entry or exit of a boundary, the IOP area or the holes. For *basic* IOP, the holes have not been taken into consideration.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0001
Requirement	The FDMP shall calculate and publish in the FO the SI AoR crossed volume list from offline defined volumes and based on the calculated IOP trajectory for the flight.
Title	FDMP calculates and publishes the SI AoR Crossed Volume list
Status	<In Progress>
Maturity Level	TRL1
Rationale	The calculation of this list will be based on trajectory locally computed by the system
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A

<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Crossed volume list modification triggered by FDMP

If there is a route change or trajectory modification, the FDMP updates the AoR crossed SI list.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0002
Requirement	The FDMP shall update the SI AoR crossed volume list with each change in the IOP trajectory for the flight and publish it in the FO.
Title	FDMP publishes the SI AoR Crossed Volume list with each update in IOP trajectory
Status	<In Progress>
Maturity Level	TRL1
Rationale	The calculation of this list will be based on trajectory locally computed by the system
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

SI AoI Crossed Volume List

An AoI Crossed Volume List contains the SIs which are crossed by a flight only in their Area of Interest. These SIs are known as Flight Data Users. This list can also be defined locally by each system. There are the possibilities that FDMP does not know all the volumes of the space and hence, might not add all the FDUs in the AoI crossed list.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0004
Requirement	The FDMP shall calculate the SI AoI crossed volume list from offline defined volumes list based on the calculated IOP trajectory for the flight and publish it in the FO.
Title	FDMP calculates and publishes the SI AoI Crossed Volume list
Status	<In Progress>
Maturity Level	TRL1
Rationale	The calculation of this list will be based on trajectory locally computed by the system
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

AoI Crossed Volume list modification triggered by FDMP

If there is a route change or trajectory modification, the FDMP updates the AoI crossed volume list.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0005
Requirement	The FDMP shall update the SI AoI crossed volume list with each change in the IOP trajectory for the flight and publish it in the FO.
Title	FDMP publishes the SI AoI Crossed Volume list with each update in IOP trajectory
Status	<In Progress>
Maturity Level	TRL1
Rationale	The calculation of this list will be based on trajectory locally computed by the system
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

SI Control Sequence List

The SI control sequence list ensures having the correct and updated list of the concerned SIs who are going to take the control of the flight as well as correct upto date information on coordination between them. The control sequence list also contains the list of previous FDCs (SIs already traversed) unless requested for end of service by them.

FDCs and FDMP may have a different view of the control sequence. This section explains, first, the possible divergences and then, how to converge on a stable view of the control sequence.

Skip

If an SI decides not to control a flight, even if the flight crosses its AoR, it can be discarded or skipped in the control sequence list. This SI is called “skippee”. The same concept can be applied if another system instance decides to bypass this SI. The SI who bypasses another SI is called “skipper” and the bypassed SI will be “skippee”. For simplicity, these two terms will be used throughout the document.

There are two types of Skip which should not be affected by any IOP mechanism. They are:

- Manual Skip- a mutual agreement between two SIs, i.e. agreed in an electronic or telephonic coordination,
- Automatic Skip- a bilateral agreement states this rule between that boundary in case of short-cross or re-entrances).

It has to be noted that skip doesn’t mean the complete disappearance of skippee from the control sequence list. This SI should be kept and tagged with a reason. This is useful in case skippee wants to unskip.

Considering there are three SIs in the control sequence list. A, B, C

The skip action can be performed in four ways:

1) SI B requests the upstream SI A to skip B
2) SI B requests the downstream SI C to skip B
3) SI A proposes to skip SI B
4) SI C proposes to skip SI B

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0016
Requirement	An SI traversed by the flight (skipee) shall be able to propose its upstream or downstream (skipper) to skip itself (skipee) from the SI control sequence list during SAP, CAP or NP.
Title	Skip me request to Upstream or downstream SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	A skippee requests to be skipped., Skippee and skipper information have to be kept in FO
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0001	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0018	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0021	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0044	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0021
Requirement	An SI traversed by the flight shall be able to propose a skip to its upstream or downstream SI during SAP, CAP or NP, indicating the reason.
Title	Bypass by upstream or downstream.
Status	<In Progress>
Maturity Level	TRL1
Rationale	These SIs are called skippers. The reason for the skip can be manual or by LoA.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0018	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0021	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0044	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0017
Requirement	A skipper or a skippee shall be able to accept or reject a skip proposal from a skipee or skipper respectively.
Title	Accept or reject a skip me or bypass request
Status	<In Progress>
Maturity Level	TRL1
Rationale	If a skippee requests to be skipped from a skipper, the skipper can accept or reject this request. Similarly, if a skipper wants to bypass a skippee, the skippee can accept or rejct this request.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A

<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0021	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0044	<Full>

Initial determination of control sequence

FDMP publishes the sequence list

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0011
Requirement	The FDMP shall determine the list of SIs which are expected to take the control of the flight, using the SI AoR crossed volume list and publish it in the FO.
Title	Initial control sequence list published by FDMP
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement ensures the publication and updating of control sequence list with each change
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0014.	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0040.	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

In case of discrepancy in SI control sequence list, the decision of an SI to desynchronize and resynchronize itself should be local.

Each SI in the control sequence list should receive up to date information of the flight.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0012
Requirement	If an SI belongs to the SI distribution list, it shall receive the flight object.
Title	General requirement
Status	<In Progress>
Maturity Level	TRL1
Rationale	Distribution list contains all the SIs who are concerned with the flight.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.001.	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0014.	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Control Sequence Modification triggered by FDC

An FDC can request FDMP to change the control sequence list as per its position in the SI AoR crossed list.

This example is based on the assumption that a mechanism of delayed FDC requests (based on FDC rank in the list) is put in place to avoid having too many requests (most of the time identical) at the same time (FO publication). It will also prevent loop in the adjustment of control sequence.

Eg- A (FDMP) B(FDC), C(FDC), F(FDC), G(FDC) I(FDC)

Sequence calculation by A- ABCFGI

Sequence calculation by B- ABC(skip)F(del)GI

Sequence calculation by C- ABC(skip)FGI

Sequence calculation by F- ABC(skip)FGI

Sequence calculation by G- ABCGI

No sequence calculation by H as it is not in the initial list determined by A (H has no information about the flight)

Sequence calculation by I- ABCGH(del)I

As B knows the LoA between C & F, it will ask A to skip C.

A accepts this request and publishes the new list as ABC(skip)FGI

As F is already in the list, B will not ask the FDMP to tag F as delegated. This can arise due to a difference in crossed volume calculated by A and that by B. but has no impact as the resulting SI control sequence is the same on both sides

In case of G, G has to align its view with that published in the FO by tagging C as skip. As F doesn't appear in G's calculation, G will ask A to skip F.

A accepts this requests knowing that this request is either because of an LoA or because of manual and the sequence published will be ABC(skip)F(skip)GI.

If F disagrees with the skip, it will ask FDMP to "unskip" itself (F). As F is the one concerned by skip, the unskip will be accepted and considered as the final decision. The new publication will be ABC(skip)F(unskip)GI

It has to be noted that the necessity to keep the unskip status rather than publishing F as "normal" is to avoid other FDCs to request the skip of F again (and again)

As I considers that H should be inserted before it (I), it asks FDMP to delegate the flight to H after G. A accepts the request and publishes the control sequence as ABC(skip)F(unskip)GH(del)I

Note: H is now aware of the flight as being FDC

However, as G considers that H is not it's downstream (according to its view of crossed AORs and LOAs), it asks FDMP to un- delegate H. As G is the SI upstream to the delegated SI, G is the one who will have the final decision and FDMP will accept it. The final control sequence will be ABC(skip)F(unskip)GH(undel)I

The un- delegate information is kept to avoid loops

Note all these examples correspond to automatic application of LOAs or resolution of inconsistencies in crossed AORs lists; it does not preclude manual modifications which always have highest priority.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0006
Requirement	Following detection of differences in crossed AoRs or in application of LoAs, an FDC shall be able to automatically request the FDMP to skip or delegate SI(s) in the SI control sequence list and coordination data, except for the SIs which are already indicated as skipped/unskipped or delegated/undelegate,
Title	FDC request to change the SI control sequence list
Status	<In Progress>
Maturity Level	TRL1
Rationale	An FDC can change its upstream or downstream Sis. A. delay is added to avoid all SIs requesting at the same time. This requirement covers the general case (first request), the cases where there is a disagreement (unskip, undelegated) are managed in SEQM.0019 and 0008, 0022
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0001	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0030	<<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0041	<<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0014
Requirement	Following a manual local input to modify the control sequence (skip, unskip, delegate, un-delegate), the FDC shall be able to request the FDMP to update the SI control sequence list accordingly
Title	Skip/unskip/delegate/undelegate manual input either by ATCO or FMP/EAP/..
Status	<In Progress>
Maturity Level	TRL1
Rationale	Manual modifications are considered as of highest priority and not inducing loop, therefore no eligibility check is made at IOP level
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-SEQM.0019	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0019
Requirement	A skippee or a skipper shall always be able to request the FDMP to unskip the skippee.
Title	Cancel skip request- Unskip
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement states that an SI can request the FDMP to change the “skip” tag to ‘unskip’ because either skippee wants control the flight or skipper no longer wants to control the flight in the AoR of skippee.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0002	<Full>

FDMP Updates the Control Sequence list as per the request of FDC

The FDMP should accept the requests from all the downstream FDCs to change the control sequence list if they are not identified as “skipped/unskipped/delegated or undelegated.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0008
Requirement	The FDMP shall accept a request from a downstream FDC to unskip or undelegate an SI from/in the control sequence list if this SI(s) is already indicated as skipped or delegated.
Title	FDMP accepts a request to change the SI control sequence list
Status	<In Progress>
Maturity Level	TRL1
Rationale	FDMP accepts an FDC’s request to skip or delegate an SI in the control sequence list. This requirement covers the general case (first request), the cases where there is a disagreement (unskip, undelegated) are managed in SEQM.0022
Category	<functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0035	<<Partial>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0041	<<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0022
Requirement	The FDMP shall reject a request from a downstream FDC to skip or delegate an SI in the control sequence list, if this SI is indicated as unskipped, or undelegated.
Title	FDMP rejects an FDC's request to change the SI control sequence list
Status	<In Progress>
Maturity Level	TRL1
Rationale	FDMP rejects a request to skip or delegate an SI which is already tagged as unskipped or undelegated, to avoid loops..
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0002	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0035	<<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0020
Requirement	The FDMP shall always accept a request of unskip from the skippee or the skipper.
Title	Unskip request from concerned SIs
Status	<In Progress>
Maturity Level	TRL1
Rationale	If a skipped SI or the SI which is controlling the skippee's AoR requests FDMP to unskip it, the FDMP should accept this and update information for their boundary (coord data shall be provided in the input)
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0002	<Full>
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0035	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0018
Requirement	The FDMP shall accept a request from a downstream FDC to skip/unskip or delegate/undelegate an SI from the control sequence list if the request is tagged as a manual one.
Title	Assumption cancels the skip
Status	<In Progress>
Maturity Level	TRL1
Rationale	Manual modifications are considered as of highest priority and not inducing loop, therefore no eligibility check is made at IOP level
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-SEQM.0019	<Partial>

Update of control sequence following another FO update or FDMP change

This section deals with the way to maintain as much as possible the control sequence after a modification of another change which results in an FO update.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0026
Requirement	On any change potentially impacting control sequence, the FDMP shall recalculate a control sequence list and - re-apply the skip to the SIs previously indicated as skipped, in case of no change in their adjacent SIs, or - re-apply the delegate to the SIs previously indicated as delegated, in case of no change in their adjacent SIs, or - re-apply the unskip to the SIs previously indicated as unskipped, in case of no change in their adjacent SIs, or - re-apply the un-delegate to the SIs previously indicated as undelegated, in case of no change in their adjacent SIs
Title	Re-calculation of control sequence in case of a change, but keeping the tags as they were
Status	<In Progress>
Maturity Level	TRL1
Rationale	Update doesn't mean the history will be lost. This is atleast needed in case of skip and delegate. The issue is to avoid a batch of updates each time the FO is published to reach again the consensus on control sequence It is based on the optimistic assumption that previous skip/delegate/unskip… are still applicable, if not the relevant SI will request for a (single) change It shall be noted that, e.g. a skipped SI is no more traversed (according to FDMP view), it won't be skipped again as the relevant sequence (upstream, skippee downstream) will not appear anymore in the control sequence and the change will be ignored (same occurs for delegation, unskip and undelegation) This behaviour is applicable as well in case of FDMP change.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note: If this re-application/re-calculation is not the right one, FDC will correct through requests. The purpose of such a re-application is to cover most of the cases (where there is no change in trajectory) avoiding useless requests, publications of FOs and associated oscillations.

It has to be noted that any FDC can update the coordination data and provide it to the FDMP, but if the responsible SI for each boundary asks the FDMP to change an attribute in the coordination data or skip and delegate information, its decision will be the final. This also applies in case of skip, unskip, delegate and un-delegate and the responsible SI is the one that will control the flight at the boundary.

Skip specificities

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0031
Requirement	If a change of frequency is instructed to skippee, the skip shall be cancelled

	following an update of the control sequence accordingly.
Title	Rejection of the skip proposal/request upon Frequency change
Status	<In Progress>
Maturity Level	TRL1
Rationale	If an upstream does a frequency change towards the skipped SI, the skip actions automatically gets cancelled. The tag will be removed.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-SEQM.0017	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0032
Requirement	The FDMP shall reject a skippee's request to have a flight on frequency until it is unskipped.
Title	Unskip following a ROF
Status	<In Progress>
Maturity Level	TRL1
Rationale	At IOP level, ROF does not automatically cancel the skip. If a skippee wants to have a flight on frequency, it should unskip itself first and then ask a ROF. Note: Such a treatment can be considered to be a local processing if needed.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-SEQM.0512	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0033
Requirement	If a flight is assumed by a skipped SI, the skip shall be cancelled updating the control sequence accordingly.
Title	Assumption cancels the skip
Status	<In Progress>
Maturity Level	TRL1
Rationale	Assumption cancels the skip

Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-SEQM.0045	<Full>

Non- functional requirements

Identifier	REQ-10.02.05-TS-SEQM.0100
Requirement	All the IOP stakeholders shall know the AoR of other IOP stakeholders.
Title	Offline defined shared crossed volume
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement is a pre requisite for control sequence determination All above processing has been built on this assumption.
Category	<Non Functional>
Validation Method	
Verification Method	<Analysis>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Identifier	REQ-10.02.05-TS-SEQM.0101
Requirement	All the IOP stakeholders shall know the AoI of other IOP stakeholders.
Title	Offline defined shared crossed volume
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement requests the IOP Stakeholders to share the list of interest volume to be crossed by a particular flight in their airspace.
Category	<Non Functional>
Validation Method	
Verification Method	<Analysis>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0012	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Difference in both SI crossed volume and SI control sequence list

If there is a difference in either the SI crossed volume list or the SI control sequence list, the alignment can be done.

This problem should never arise at the same time. For consistency, the system has to make sure that atleast one of the list is coherent. If not, the system should report this to FDMP and later to human operator. The decision of desynchronization will be local.

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0034
Requirement	The system shall inform the FDMP if there exist an incoherency between the local view and FO view of its SI crossed volume list and its SI control sequence list concerning the next SI(s).
Title	
Status	<In Progress>
Maturity Level	TRL1
Rationale	To inform FDMP that there is something wrong. So FDMP can solve if it wants. Otherwise notification to human operator or desynchronization
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0011	<Partial>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

It is upto the FDMP to take an action on this issue or not. To be further discussed

Including an SI foreseen to control the flight*- Delegation

This arises when a flight is controlled by a system whose AoR is not physically crossed by the flight. This can be caused due to various reasons such as bilateral agreement between the two boundaries, traffic load, closure of a sector in an airspace etc; In this case, a system assigns its AoR (complete or partially) to be controlled by other system which is not in the SI control sequence list. The system which receives this charge is known as “delegatee” while the system which authorizes this is called “delegator”

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0035
Requirement	A delegator shall be able to accept or reject a request from a delegatee to assign the control of a flight to delegatee.
Title	bypass
Status	<In Progress>
Maturity Level	TRL1
Rationale	Other SIs decide to skip an SI.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0030	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0041
Requirement	If an SI non traversed by the flight requests to have the control of a flight to its upstream SI, it shall manage the flight for the portion release is assigned to it by the upstream SI.
Title	Delegatee manages the flight in AoR of upstream SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	Release managed by the delegatee
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0036	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0038	<Full>

founding members
Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0042
Requirement	If an SI non traversed by the flight requests to have the control of a flight to its downstream SI, it shall manage the flight for the portion release is assigned to it by the downstream SI.
Title	Delegatee manages the flight in AoR of downstream SI
Status	<In Progress>
Maturity Level	TRL1
Rationale	Upstream skip request. HMI req
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0036	<Full>
<SATISFIES>	< ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0038	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0043
Requirement	The FDMP shall always accept a request of delegator to end the delegation of a flight and update the sequence information and coordination data for its boundaries in the FO.
Title	Cancel the delegation by delegator
Status	<In Progress>
Maturity Level	TRL2
Rationale	Coordination data between delegator and delegatee exists
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirements>	REQ-05.05.01-INTEROP-SEQM.0030	<Partial>

REQ]

Identifier	REQ-10.02.05-TS-SEQM.0044
Requirement	The system shall continuously update the control sequence information and coordination data in the FO between the delegator and the delegatee.
Title	Updating coordination data in case of delegation
Status	<In Progress>
Maturity Level	TRL1
Rationale	This requirement states one of the conditions when a coordination data is to be updated.
Category	<functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-SEQM.0034	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-SEQM.0045
Requirement	The delegator shall consider that the assignment of its AoR to the delegatee has been cancelled if it receives a Frequency Change from the delegatee.
Title	End of delegation due to upon Frequency change
Status	<In Progress>
Maturity Level	TRL1
Rationale	Transfer of a flight cancels the skip request
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB-03.01.01 TMF	N/A
<SATISFIES>	<D846>	REQ-05.05.01-INTEROP-SEQM.0031	<Full>

B.6 WIFO

B.6.1 Technical Requirements

In this paragraph they have been reported all WIFO requirements which discussion is still ongoing.

B.6.1.1 WIFO Information Logical Categorization

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0047
Requirement	SI shall allow the creation of a WIFO to support electronic dialogues on a flight with other identified IOP Stakeholders
Title	WIFO Support to Electronic Dialogue (Full IOP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	What-if FO Mechanism has been defined in order to evaluate possible FO changes during a negotiation
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0001	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0087	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0042
Requirement	The System Instance involved in the negotiation shall allow to tag in the WIFO the following negotiation data: • TFL • SFL • Sector entry/exit levels , En-Route cruise levels, • Route • DCT, Off-set route, • SID/STAR , • Take-Off Time Constraints/Targets, Flight Time Constraints/Targets, • Cruise Speed, speed constraint • Co-ordinated tactical ATC conditions prior to transfer: transfer flight level , heading, speed , rate of climb/descent, • Communications Management (transfer , skip, delegation), • Release.
Title	WIFO Negotiation Data
Status	<In Progress>
Maturity Level	TRL1
Rationale	In order to easily identify proposed changes inside the WIFO
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A

<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0004	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0003
Requirement	The proposing IOP Stakeholder System instance involved in the negotiation shall tag in the WIFO the consequences on related Real FO due to proposed negotiated data
Title	WIFO Negotiation Consequences Data Identifying
Status	<In Progress>
Maturity Level	TRL1
Rationale	In order to easily identify proposed changes inside the WIFO
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0001	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0024	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note

- *The WIMP or the WIC that is making a negotiation data proposal has to be able to tag such consequences data into the WIFO to clearly identify changes applied to related Real-FO*

B.6.1.2 WIFO Roles

B.6.1.2.1 WIC Role

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0010
Requirement	Any SI that is consulted by WIMP in a What-if dialogue shall have the WIC role.
Title	What-if Contributor
Status	<In Progress>
Maturity Level	TRL1
Rationale	The What-If Contributor participates to the what-if dialogue, both requesting WIFO changes to the WIMP or accepting/rejecting WIMP proposed and distributed changes.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.00XX	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.6.1.3 WIFO Lifecycle

B.6.1.3.1 WIFO Proposal

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0013
Requirement	The WIMP shall distribute the created, modified or aligned WIFO to the identified WICs in the WIFO Distribution List
Title	WIFO Distribution
Status	<In Progress>
Maturity Level	TRL1
Rationale	Negotiated data have to be agreed among WIMP and consulted WICs.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0005	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0008	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0042	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.6.1.3.2 WIFO Counter-Proposal

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0014
Requirement	When WIC receives a WIFO by WIMP, the WIC shall be able to request a WIFO Change to the WIMP providing updated negotiation data and consequences
Title	WIC Counter Proposal
Status	<In Progress>
Maturity Level	TRL1
Rationale	Negotiated data have to be agreed among WIMP and consulted WICs.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A

<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0006	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0007	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0021	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0024	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0030	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0046
Requirement	The WIMP shall manage any WIC proposed change on WIFO contained constraints as FDMP does for FDC on Real FO.
Title	WIC Constraints counter-proposal
Status	<In Progress>
Maturity Level	TRL1
Rationale	Constraints management is the same for Real FO and related WIFOs
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0035	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0036	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0038	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0043
Requirement	The WIMP shall allow WIFO Counter-Proposals on the following negotiation data: • TFL • SFL • Sector entry/exit levels , En-Route cruise levels, • Route • DCT, Off-set route, • SID/STAR , • Take-Off Time Constraints/Targets, Flight Time Constraints/Targets, • Cruise Speed, speed constraint • Co-ordinated tactical ATC conditions prior to transfer: transfer flight level , heading, speed , rate of climb/descent, • Communications Management (transfer , skip, delegation), • Release .
Title	WIFO Counter-Proposal Negotiation Data
Status	<In Progress>
Maturity Level	TRL1
Rationale	WIFO Counter-Proposal Negotiation Data has to be clarified in order to properly define required services
Category	<Functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0004	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0030	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0048
Requirement	When the WIMP receives a Counter-Proposal from any WIC that the WIMP evaluates as locally acceptable, the WIMP shall distribute an updated WIFO including both that Counter-Proposal and the proposing WIC identifier.
Title	WIMP Receiving a Counter-Proposal (Full IOP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	Negotiated data have to be agreed among WIMP and consulted WICs, clarifying always who is the latest changes proposer.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0030	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Notes

1) *Any WIC counter-proposal will be understood by the WIMP as applying the proposed negotiated changes to the latest real FO*
2) *The Counter-Proposal received by WIMP, retained acceptable, will be distributed for acceptance to all involved WICs.*

B.6.1.3.3 WIFO Rejection

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0017
Requirement	When the WIMP receives a WIFO Rejection, it shall delete the WIFO, distributing the rejection information and reasons
Title	WIMP processing WIC Reject
Status	<In Progress>
Maturity Level	TRL1
Rationale	The WIMP has to always inform about WIFO Rejection Status to allow its notification WIC side.
Category	<Functional>
Validation Method	

Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0090	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0008	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0040	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0049
Requirement	When the WIMP is performing a WIFO Rejection, it shall delete the WIFO, distributing the rejection information and reasons
Title	WIMP performing WIFO Reject
Status	<In Progress>
Maturity Level	TRL1
Rationale	The WIMP has to always inform about WIFO Rejection Status to allow its notification WIC side.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0089	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0090	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0008	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0040	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.6.1.3.4 WIFO Acceptance

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0051
Requirement	The WIMP shall consider the WIFO as accepted and start the commit phase when it received all the WICs acceptances within the WIFO_Agreement_Time
Title	WIFO Agreement (Full IOP)
Status	<In Progress>
Maturity Level	TRL1
Rationale	Any distributed WIFO proposal needs to be agreed among all involved SIs. Once the full acceptance has been achieved, the WIFO changes commit on FO has to be triggered.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0022	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0030	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0031	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.6.1.3.5 WIFO and Real FO Alignment

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0028
Requirement	When WIMP is performing WIFO alignment with the related real FO updates, if such updates prevent the application of the negotiated data in the WIFO, WIMP shall start Rejection Phase for that WIFO as deemed obsolete.
Title	WIFO obsolescence
Status	<In Progress>
Maturity Level	TRL1
Rationale	The update of the current aircraft position may impact any relevant constraint point, setting it overflown, and so no more applicable to the real FO/SFPL, or a route change application point, being negotiated in the WIFO. An update of the expanded route from the real FO to the WIFO may have the same impact, e.g. no more crossing part of the SIs being negotiating through a WIFO. In this cases the WIFO shall become obsolete, and there are possible safety issues in case the obsolete WIFO would be applied to the real FO/SFPL. Many other alignments from the real FO to the WIFO may imply the WIFO becoming obsolete. The Reject implementation is described in the WIFO Rejection section.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0041	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Notes:

1) *The WIFO roles will not be impacted when the FDMP, FDC or FDU role of the associated real FO is re-assigned, but that can have an impact on WIMP/WIC eligibility to participate to the WIFO, causing WIFO cancellation*

[REQ]

Identifier	REQ-10.02.05-TS-WIFO.0040
Requirement	When WIMP is processing Real FO alignment, if Real FO has been changed causing either

	- involved WIMP or WICs are not anymore interested to coordinate each other - WIMP has not anymore FDMP or FDC role WIMP shall terminate/reject the WIFO
Title	Unchangeable WIFO Roles
Status	<In Progress>
Maturity Level	TRL2
Rationale	The WIMP defines a WIFO to negotiate changes on FO within consulted WICs. If a role change is required by an involved SI, it can reject the current WIFO and defines new one with new consulted SIs.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE09.0041	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.6.1.4 WIFO in Coordination and Transfer

B.6.1.4.1 Behaviour during CAP

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0014
Requirement	While in CAP for a crossing, the SI (upstream or downstream) shall have the capability to consult the partner at the other side of the SI boundary about an intended modification of the transfer conditions of the flight, using WIFO-supported electronic dialogue, independently of the fact whether the resulting crossing conditions are standard or non-standard.
Title	Availability of WIFO to negotiate when in CAP
Status	<In Progress>
Maturity Level	TRL1
Rationale	modified for rew phases& independence of standard/non-standard.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0032	<Full>

B.6.1.4.2 Behaviour during NP

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0019
Requirement	The System Instance shall use the WIFO to conduct a negotiation with another system instance, if system support is requested by the ATCO/FMP/EAP.
Title	Non-standard does not block possibility to change FO
Status	<In Progress>
Maturity Level	TRL1
Rationale	Extend to FDMP role.
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0017	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0032	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

B.6.1.4.3 Support of negotiations in a skipped context

In complement to the SI that is actually asked to approve or reject a negotiated change, the skip situation will add a third partner in the negotiation (cf. UC 10.2 of OPS group):

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0036
Requirement	When a skip of a SI is in-place, the WIMP shall add the skipped SI inside the list of WIC if the negotiated change modifies the behaviour of the flight over the AOR of the skipped SI.
Title	Skipped SI as WIC of a WIFO
Status	<In Progress>
Maturity Level	TRL1
Rationale	Clarification on consulted WIC identification
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0048	<Full>
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-COTR.0056	<Full>

<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

Note: if the WIC was not traversed in the real FO, the boundary between WIMP and WIC that existed for the WIFO (and that was in CAP) will disappear in case the WIFO is abandoned and not applied onto the real flight.

The WIMP can be the SI upstream to the skipped SI or the downstream SI. The requirement applies in both cases.

[REQ]

Identifier	REQ-10.02.05-TS-COTR.0116
Requirement	A SI shall have the means to initiate a negotiation about a FO for which it is currently skipped.
Title	Skipped SI as WIMP of a WIFO
Status	<In Progress>
Maturity Level	TRL1
Rationale	Clarification on WIFO creation condition
Category	<Functional>
Validation Method	
Verification Method	<Test>

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<ALLOCATED_TO>	<Functional block>	G/G IOP Management	N/A
<APPLIES_TO>	<Operational Focus Area>	ENB03.01.01 TMF	N/A
<SATISFIES>	<ATMS Requirement>	REQ-05.05.01-INTEROP-GENE.0001	<Full>
<SATISFIES>	<Enabler>	ER APP ATC 160	<Full>

The acceptance of a WIFO by the skipped SI may be automatic if the change complies with the applicable release, or an ATCO can be involved (local implementation).

B.6.2 ICD Open Points

In this paragraph they have been reported all WIFO technical discussions that have to be still performed.

WIFO Negotiated Data Tagging: it shall be defined the best solution for implementing the WIFO changes tagging within the model (e.g. WIFO Cluster, WIFO flags, …)

WIFO Manager Publisher: it shall be defined the best solution to maintain negotiation manager publisher information within the WIFO and without impact on Real FO manager publisher information.

WIFO Distribution List: it shall be defined the best solution to use or extend the Distribution List data to avoid information loose on WIFO (e.g. updating the Real-FO Distribution List within WICs might cause loss of information when also Distribution List has been impacted by negotiated changes)

WIFO Counter-Proposal Services: it shall be defined the best solution to perform Counter-Proposal requests, through WIMP services (to be identified/defined in case) or other mechanisms.

WIFO Status: it shall be defined the best solution to represent and distribute the WIFO Status (Rejected, Committing, Deleted) within the WIFO.

WIFO Proposals History and Requesters: it shall be defined the best way to trace within the latest shared WIFO the proposals/counter-proposals history and requesters

B.7 SSR Code Management

B.7.1 SSR Data Distribution

This is the main technical requirements in IOP that regards FO data distribution. It contains all the data relative to a shared flight plan and in particular the data that this feature take into account:

- SSR mode and SSR code (current and next)
- Indication to request an SSR code and the requested code itself

The **current** SSR code is the SSR Code assigned to a flight plan; it could be:

Current/Assigned SSR Code

Emergency SSR Code

[REQ]

Identifier	REQ-TECH-**MFOB**.0001
Requirement	The FDMP shall publish the following set of data inside the flight object: • The unique FO_ID • Operational key (including the context name • The lists of ATSU for distribution • Identification of the FDMP • Aircraft type and wake turbulence • Other basic ICAO information (F8 through F19) • **SSR mode and SSR code (ASSR, CSSR, NSSR)** • The airborne status • The flight script throughout the IOP area • The 2D route throughout the IOP area • The applicable strategic and tactical constraints (open and closed) • The current state vector (including mass, speed, rocd, position) • The planned trajectory throughout the IOP area • The inter-ATSU coordination data throughout the IOP area (For ATSU that are in the different system instance the coordination information is a list with as many elements as pairs of adjacent ATSUs) • Identification of the upstream and downstream ATSU, (including delegated ATSUs if any and release), • Current state of progress of the coordination (inter-ATSU) • Agreed set of crossing conditions (inter-ATSU) • Proposed (under negotiation) set of crossing conditions (inter-ATSU) • **Indication to request an SSR code and the requested code itself.** • The next inter-ATSU transfer data throughout the IOP area Current Transition Identifying the • Receiving ATSU • Current state of progress of the next transfer (inter-ATSU) • List of Point sessions (including the OE of the initiator and target(s) and reason) • List of maintained duplication (including the Operational Entity's destination and Operational Entity initiator and reason) • Indication of the responsible ATSU identity currently in communication with the flight • Set of the RTAs proposed by the AMAN • Ordered list of traversed AOR for crossed ATSUs • List of synchronized / de-synchronized ATSU
Title	SSR Data Distribution
Maturity Level	TRL2
Rationale	This requirement state that the FDMP must publish the SSR Code together with other data. IOP Traceability: • ED-133 derived requirement
Category	<functional>
Verification Method	Realtime Simulation/Technical Verification

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0001, REQ-OPS-FEATURE8.0002, REQ-OPS-FEATURE8.0003, REQ-OPS-FEATURE8.0006, FEATURE8.0007	<Full>
<ALLOCATED TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.2 SSR data publishing

This requirement highlight that the FDMP process to update an ASSR when CSSR is changed.
[REQ]

Identifier	REQ-TECH-**MFOB**.0002
Requirement	The FDMP shall inform FDC/FDU IOP stakeholders of any expected SSR code change in the following way: • First, Publishing the FO including the NSSR Code data • Second: Upon reception of the track with the new SSR Code and once it is linked with the flight plan, it publishes a new FO update including the new CSSR Code, new ASSR and removing NSSR Code data
Title	SSR Data publishing
Maturity Level	TRL2
Rationale	This requirement specifies process to update NSSR, CSSR and ASSR receiving a new SSR code. IOP Traceability: • D36 derived requirement
Category	<functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0009	<Full>
<ALLOCATED TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

4.3.2 ASSR Code Management in FDMP

This requirement highlight that the FDMP is the only authorized to modify the Assigned SSR Data.
[REQ]

Identifier	REQ-TECH-**MFOB**.0003
Requirement	The System with FDMP role shall be the unique System Instance allowed to modify the ASSR code and mode data in the FO
Title	Assigned SSR Management in FDMP
Maturity Level	TRL2
Rationale	This requirement is needed to prevent that every System Instance can change ASSR Code value in IOP environment. IOP Traceability: • D36 derived requirement
Category	<non-functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0001	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.3 NSSR Code Management in FDMP

This requirement highlight that the FDMP is the only authorized to modify the Next SSR Data.
[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0004
Requirement	The ATSU controlling the flight and with FDMP role shall be the unique ATSU allowed to modify the NSSR code and mode data in the FO
Title	Next SSR Management in FDMP
Maturity Level	TRL2
Rationale	This requirement is needed to prevent that every ATSU can change SSR Code value in IOP environment. IOP Traceability: • D36 derived requirement
Category	<non-functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0002, REQ-OPS-FEATURE8.0007	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.4 CSSR Code Modification

This requirement highlight that the FDMP is the only authorized to modify the Current SSR Data.
[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0005
Requirement	The FDMP shall modify the CSSR only in case of: • Request by the controlling SI • First correlation by the FDMP Detection of CSSR change by the FDMP
Title	Current SSR Modification from the controlling ATSU
Maturity Level	TRL2
Rationale	This requirement is needed to state the process to change CSSR Code value in IOP environment. IOP Traceability: • Original requirement
Category	<non-functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance

<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.5 CSSR Code Management in FDMP

This requirement highlight that the FDMP is the only authorized to modify the Current SSR Data.

[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0006
Requirement	The System with FDMP role shall be the unique ATSU allowed to modify the CSSR code and mode data in the FO
Title	Current SSR Management in FDMP
Maturity Level	TRL2
Rationale	This requirement is needed to prevent that every ATSU can change CSSR Code value in IOP environment. IOP Traceability: • Original requirement
Category	<non-functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0003	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.6 DSSR Code Management

[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0007
Requirement	Each System is the unique responsible of updating its own DSSR information
Title	Downstream SSR Management
Maturity Level	TRL1
Rationale	This requirement is needed to prevent that every ATSU can change DSSR Code value. IOP Traceability: • Original requirement
Category	<functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0004	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.7 DSSR Code Sharing

[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0008
Requirement	Each System shall share its own DSSR information through coordination cluster
Title	Downstream SSR Sharing
Maturity Level	TRL1
Rationale	This requirement state that the DSSR information must be shared thorugh IOP. IOP Traceability: • Original requirement
Category	<functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0004	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.8 DSSR Code assignment

[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0009
Requirement	The FDCs shall be able to indicate if they require FDMP to assign their Downstream SSR (DSSR)
Title	Downstream SSR assignment
Maturity Level	TRL1
Rationale	The DSSR in this case is intended to be instructed to the aircraft to squawk before exiting FDMP airspace; normally on request of a downstream partner to enable early correlation. IOP Traceability: • Original requirement
Category	<functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0005	<Full>
<ALLOCATED_TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

B.7.9 Mode S Flight ID Sharing

This requirement highlight that the FDMP allows eligible FDC to modify the Next SSR Data through a defined service.

[REQ]

Identifier	REQ-10.02.05-TS-**MFOB**.0011
Requirement	The FDMP shall be able to share the Mode S Flight ID

Title	Mode S Flight ID Sharing
Maturity Level	TRL2
Rationale	This requirement is needed to fully implement Mode S capabilities and share the aircraft call-sign derived from radar tracks. IOP Traceability: • Original requirement
Category	<functional>
Verification Method	Real-time Simulation

[REQ Trace]

Relationship	Linked Element Type	Identifier	Compliance
<SATISFIES>	<ATMS Requirement>	REQ-OPS-FEATURE8.0006, REQ-OPS-FEATURE8.0007	<Full>
<ALLOCATED TO>	<Functional block>	Functional block Identifier	N/A
<SATISFIES>	<Enabler>	Enabler code	<Full>

Appendix C

C (AIRM/ISRM) Data Model Exchange

This section provides detailed information as an input to define the Interface Data Model (ICD) for the Interoperability.

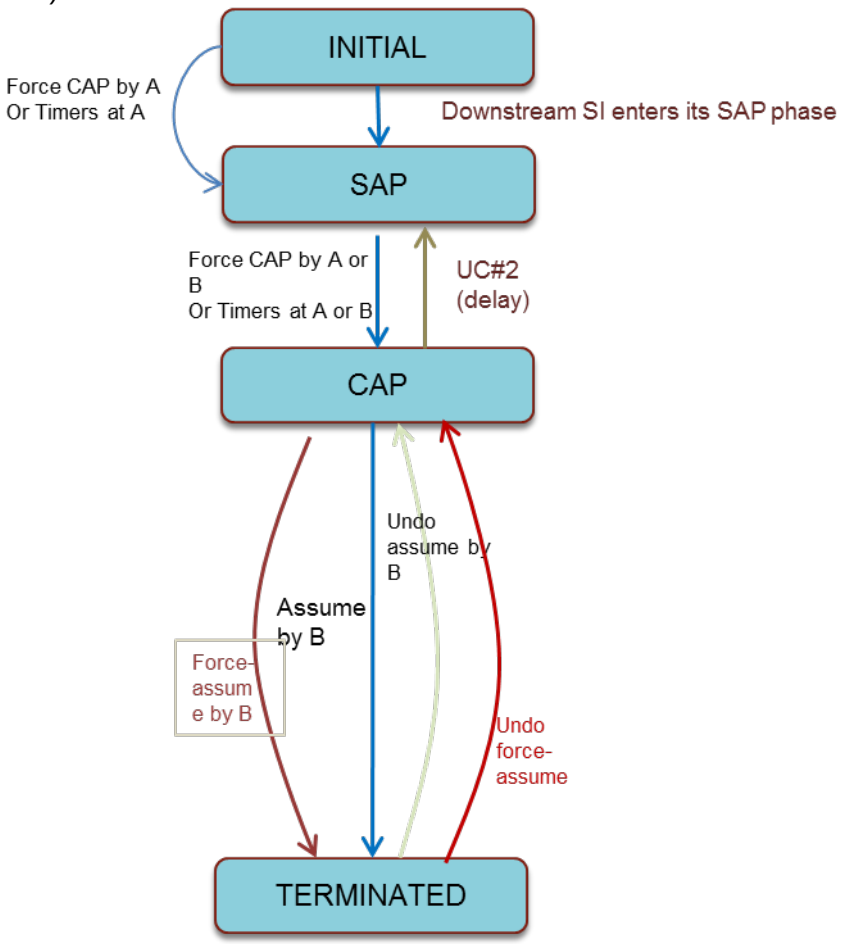
C.1 Coordination and Transfer

C.1.1 Data modelling for an SI boundary crossing

The crossings relevant to the FO are the SI crossing corresponding to boundaries of Sis only.
For a given crossing of a SI, there is an entry boundary and an exit boundary. Their respective states evolve separately.

C.1.1.1 States of a crossing between two Sis

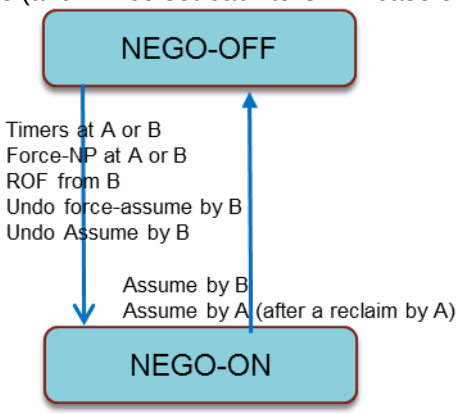
The following values will represent the state of a given crossing between 2 Sis (A upstream, B downstream):



INITIAL: this is the state of the crossing when the FO gets created by the FDMP.
SAP: this is the state of the crossing when the SI downstream to the crossing has reached the SAP phase (has created a local view for this FO). As it is the whole SI that reaches the SAP phase, in case of re-entrance in the SI, all its crossings will move to SAP at the same time.
CAP: this is the state when the downstream of the two SI managing this boundary decided to highlight the flight to its controllers (manual ATCO action, timer, some system decisions). The upstream must also high-light to its own controllers.
TERMINATED: this is the state when the responsibility of the flight is "downstream" to the SI upstream to that boundary.

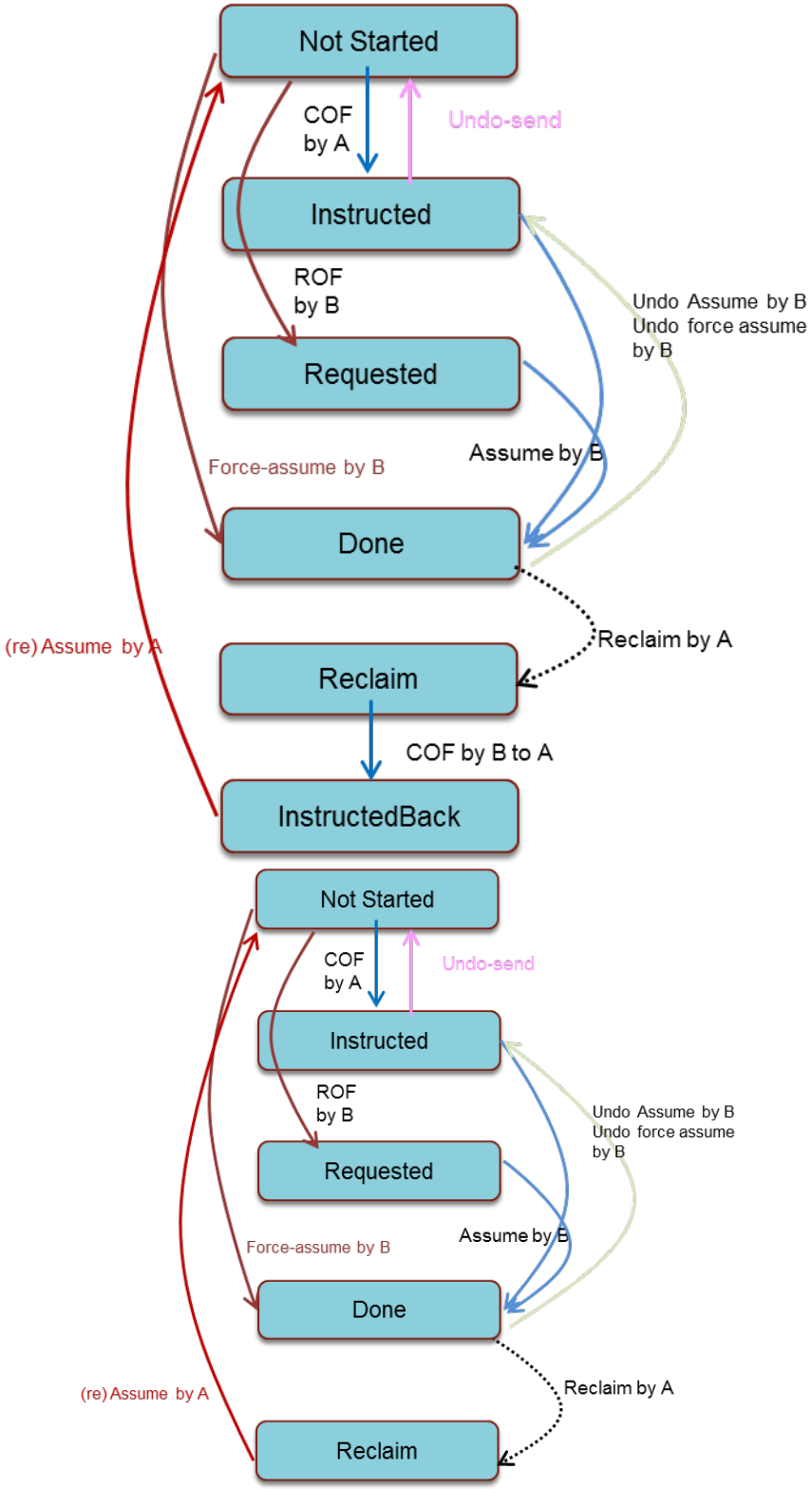
C.1.1.2 Additional flags related to a crossing between two Sis

NegotiationPhase: this flag (*ON/OFF*) is set when one of the two Sis managing this boundary decides that it is now mandatory to coordinated any change to the flight. Beware: it is not indicating that a negotiation is currently in progress. The Negotiation flag can be reset to OFF when the frequency-transfer reaches the done status (and will be set back to ON in case of reclaim)



STANDARD_CROSSING (True/False) is set when at least one of the two SIs managing the boundary evaluates the crossing as non-standard according to its local definition of the LoA.
Frequency_Transfer[8] (*not_started, requested, instructed, done, reclaim*) is a status to monitor the frequency transfer between the last sector of the giving SI and the first sector of the receiving SI:

[8] This state could be the solution to MUAC meeting slide 9, question 29.



- *Not_started* is the initial value

- *Requested* is used if the receiving SI requests the flight to the giving SI (ROF or shoot-request)

- *Instructed* is used when the giving SI has instructed the aircraft to contact the entry sector of the receiving SI. *Instructed* can come after *Not_started* (case of a COF), or after *Requested* (case of ROF first, then instruction to aircraft).

- *Done* is used to mark that the aircraft contacted the receiving SI (it is the final value for the crossing)

- *Reclaim*: following a successful transfer (state done reached), the previous SI needs back the flight on frequency. It can reclaim the flight. The next steps are "instructedBack" when the controlling SI has instructed pilot to call back the previous unit, and then "NotStarted" when the previous unit confirms that it has now again the flight on frequency.

- *InstructedBack*: this state is used when the downstream unit instructs back a flight as answer to a reclaim from upstream.

ReclaimNoMorePossible (True, False): this flag is set by the SI that assumed the flight when the first controller has given the flight responsibility to another controller in the SI. It signals to the upstream SI that the Reclaim is no longer possible.
These flags are quite independent.

Note: The request for transfer can occur when the crossing state is CAP with NP flag set or reset[9]. The transition to the next crossing state (Terminated) occurs when the receiving controller confirms that he is now responsible for the flight (he assumed the flight).

C.1.1.3 Release information related to a crossing between two Sis

The upstream SI can set some level of freedom to the receiving the flight for the remaining part of the flight that is conducted within the giving SI AOR but already under the responsibility of the receiving sector.

C.1.1.3.1 Release data

There can be two behaviours: either the ATCO will populate in details the level of freedom that he grants on each dimension, or he will just indicate that there is a verbal agreement with the other ATCO without providing into the system the details of that agreement.
To support the"full details" option:

- Release_for_climb : the controlling SI is free to make aircraft climb while flight is inside the AOR of the ATCO that defined the release.
    - (optional) limitation "up to FL" max value of level that aircraft may be cleared to
    - (optional) limitation "after crossing aircraft" call-sign of aircraft after which the controlling ATCO will be free to clear any climb
- Release_for_descent : the controlling SI is free to make aircraft while flight is inside the AOR of the ATCO that defined the release
    - (optional) limitation "down to FL" min value of level that aircraft may be cleared to

[9] Cf. MUAC meeting slide 9 question 30.

- (optional) limitation “after crossing aircraft” call-sign of aircraft after which the controlling ATCO will be free to clear any descent

- Release_for_turns: the controlling SI is free to make aircraft turn while flight is inside the AOR of the ATCO that defined the release.
  - (optional) limitation “max on left” max value of turn to left that aircraft may be cleared to (with respect to heading when assume was done)
  - (optional) limitation “max on right” max value of turn to right that aircraft may be cleared to (with respect to heading when assume was done)
  - (optional) limitation “after crossing aircraft” call-sign of aircraft after which the controlling ATCO will be free to clear any turn.
- Release_for_speed: the controlling SI is free to make aircraft change speed while flight is inside the AOR of the ATCO that defined the release.
  - (optional) limitation “up to speed” max value of speed that aircraft may be cleared to
  - (optional) limitation “down to speed” min value of speed that aircraft may be cleared to
  - (optional) limitation “after crossing aircraft” callsign of aircraft after which the controlling ATCO will be free to clear any speed.
- Release_for_rate: the controlling SI is free to make aircraft change vertical rate while flight is inside the AOR of the ATCO that defined the release.
  - (Optional) limitation “up to rate” max value of vertical rate that aircraft may be cleared to
  - (Optional) limitation “down to rate” min value of rate that aircraft may be cleared to
  - (Optional) limitation “after crossing aircraft” callsign of aircraft after which the controlling ATCO will be free to clear any vertical rate.
- Full: the controlling SI is free to execute any change before flight enters its AOR

Note: in case a release for an exact value is provided for a release parameter, then the corresponding min and max will be set to this value.

C.1.1.3.2 Operational usage of the release

The release is used

1) When an ATCO takes the control of a flight while the aircraft has not yet entered its AOR, it indicates the conditions the previous controlling ATCO set to the new controlling ATCO for the aircraft that he will manage over the airspace of the previous ATCO

2) When an ATCO takes the control of a flight while the aircraft has not yet entered its AOR as result of a skip, it indicates the conditions the skipped ATCO set to the downstream ATCO for the aircraft that he will manage over the airspace of the skipped ATCO.

3) When a delegation is put in place for a given flight. In this case, it indicated to the delegate (recipient of the delegation) the conditions set by the delegator to delegate the responsibility of the flight.

Because these operational circumstances may occur not only in sequence, the FO ICD has to foresee to hold one set of release data for each of them:

Release data for transfer, release data for skip and release data for delegation.

The system does not perform any verification regarding the compliance of the further ATCO inputs with the granted release. This information is considered as free-text to remind the controlling ATCO of the limitations set by the other controller.

C.1.1.4 Data to support coordinated clearances

For each crossing the FO will keep:

- (optional) coordinated_direct, with as parameter the name of a beacon/lat-long to which DCT will be cleared.
- (optional) coordinated_heading, with as parameter a kind (absolute/left/right) and a degree value (0..359)
- (optional) coordinated_speed, with as parameter a speed unit and a speed value
- (optional) coordinated ROC, with as parameter a rate of climb value in feet/second
- (optional) coordinated ROD, with as parameter a rate of descent value in feet/second
- (optional) coordinated_offset, with as parameter a offset (side: left/right, distance in NM) and a start point and an end point.

C.1.1.5 Data to support delegation

There is the need for each planed crossing to have[10]

A state of delegation:

N/A: the delegation is not started, was rejected or is ended

Requested: the establishment of a delegation is in progress, but not yet in place.

In-place: the delegation is effective. If the control sequence is A, B (delegation to D in place), C, then the navigation in the control sequence should be A, D, C whereas the sequence of AOR traversal is A, B, C..

Termination_requested: when the delegate SI (recipient of the delegation) instructs the pilot to contact back the delegating SI.

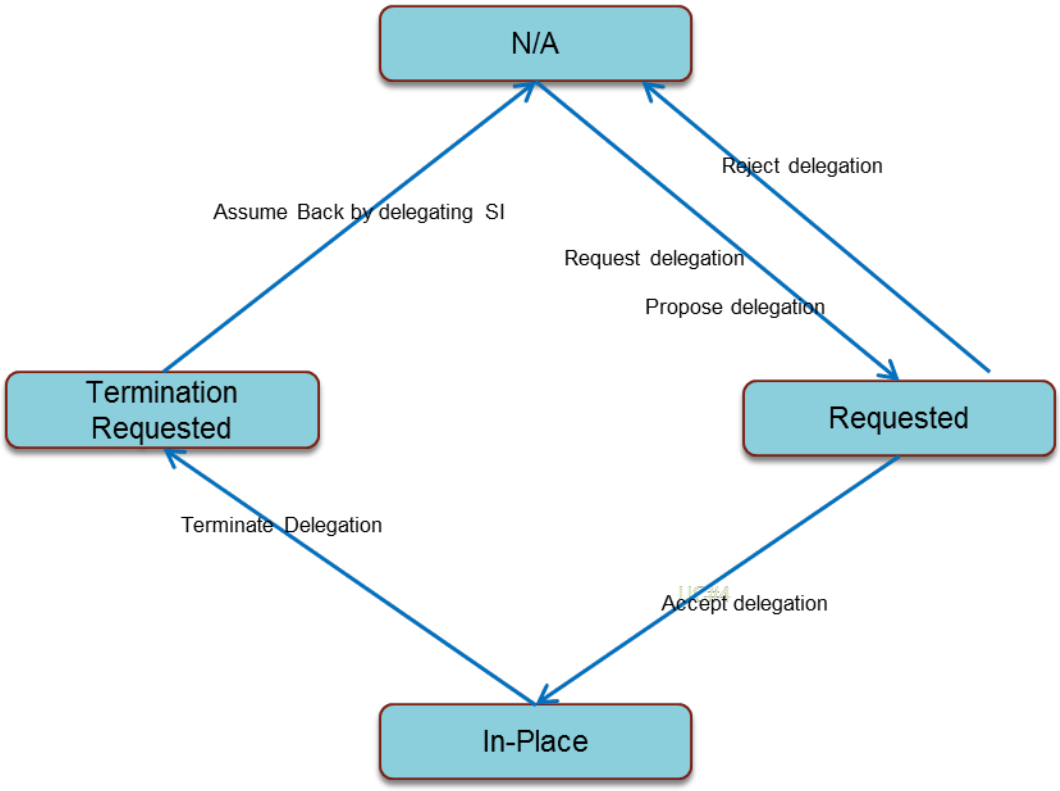
The identification of who initiates the delegation, the delegatee (granularity = sector)

The identification of

- who will receive (or has currently) the delegation (granularity = sector), when it is *in –place*
- The frequency to be used for the transfer.

Beware that the establishment of a delegation (in-place) has no effect on who is the responsible SI. Only the ASSUME manual input by an ATCO at the delegate SI changes the responsible SI.

[10] Cf. MUAC meeting slide 11 question TQ (last)



C.1.1.6 Data to support skip

There is the need for each planed crossing to have:

A state of skip:

- N/A: the skip is not started, was rejected or is terminated
- Requested: the establishment of a skip is in progress, but not yet in place.
- In-place: the skip is effective. If the control sequence is A, B (skip to A or C), C, then the navigation in the sequence should be A, C.
- Termination_requested : when the skipSIrequests to the controlling SIto get back the flight.

SkipRequester: the identification of the SI that is requesting to setup a skip with another SI

While the skip is in preparation (it is being requested), this information allows the 2 Sis around the crossing to determine their respective role: the SI requesting the skip, the SI that has to answer to that request.

The identity of the skipped sector (if any):

if the skip was done at SI level, this attribute is empty.

If the skip was done at sector level, it contains the name of the first sector of the downstream SI (case of upstream skip) or the name of the last sector of the upstream SI (case of downstream skip).

C.1.1.7 Data to support negotiations

As a negotiation between two SIs can occur independently of the steps that move the responsibility from one SI to the next one, there is no “negotiation in progress flag” associated to a crossing.

The negotiating SIs (the WIMP and the WIC Sis) will make aware their respective ATCOs by identifying that there is a WIFO related to a given FO.

It is important not to confuse the Negotiation Phase and a session to negotiate some change to the FO between two controllers.

C.1.1.8 Data to support transfer

C.1.1.8.1 Crossing related data

As the crossings are at SI level, there is the need to store also[11]:

- Transferring Sector and frequency: the sector responsible for the flight and that is organising the transfer to the next ATCO (receiving sector)
- Transferring skipped sector (in case the upstream delegates its last sector to the downstream SI)
- Receiving sector and frequency,
- Receiving skipped sector (in case the downstream delegates its first sector to the upstream SI)

The values there are consistent with the data and the associated flags of the corresponding crossing:

- Nominal case: the sector at the first sector of the receiving unit and the last sector of transferring unit
- Delegation:
  - the first sector of the delegatee SI (recipient of the delegation) as receiving sector, if the delegator is downstream to the crossing where the transfer occurs
  - the last sector of the the delegatee SI (recipient of the delegation) as transferring sector, if the delegator is upstream to the crossing where the transfer occurs
- Delegation upstream to crossing: the sector of the delegate SI as receiving sector

C.1.1.8.2 Non Crossing related data

There is an attribute “previous responsible SI”. It is needed for the undo assume” to give back the flight to the right SI.

C.1.1.9 Requested SSR code

The FO contains a field to indicate that a SSR code is being requested along with the name of the involved Sis (sender of the request, destination of the request), it contains also the value of SSR code that is made available to the requesting SI.

SSR request

- in progress (Boolean)
- RequestedBy (name of SI)
- RequestedTo (name of SI)
- CodeMadeAvailable (SSR code)

[11] Cf. MUAC meeting slide 11 (questions 36 through 38)

C.1.1.10 Other coordination data

N/A

C.1.1.11 Lost Radio Contact indicator

The controlling ATCO shall have the mean to share to the IOP stakeholders the information that he has lost the contact with the aircraft (set lost radio contact indicator).
Any SI assuming a flight with the “Lost Radio Contact” indicator set shall have the means to share to the IOP stakeholders the information that it regained the contact with the aircraft (reset of the indicator)
Note: this information is outside the coordination cluster. He doesn’t relate to a specific crossing.

C.1.1.12 STOLEN indicator

This indicator is kept apart from the crossings.
STOLEN: this flag (ON/OFF) is set when an SI took control of a flight without being proposed by the controlling SI (frequency-transfer not at *Instructed*)STOLEN TO: the name of the SI whom the flight was stolen.

C.1.2 Service Modelling

Tbd.

C.1.2.1 Relation from OPS concepts to TECH attributes

UC#1 of OPS group: nominal coordination process

	OPS view							TECH view											
IOP Stakeholder -->	Roles	Control-ling SI	A to B	B to C	C to D	Attri	Roles	Control-ling SI	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	cross state	Negotiation Flag	Standard cross	Frequency-Transfer	Stolen
Concept -->			Phase	Phase	Phase	applicable to -->			A to B	A to B	A to B	A to B	B to C	B to C	B to C	B to C	C to D	C to D	C to D	C to D	
step 0: first FO distribution at creation	FDMP A	A	SAP	SAP	SAP		FDMP A	A	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step 1: CAP triggered (LoA, Point, Nego)	FDMP A	A	CAP	SAP	SAP		FDMP A	A	CAP	OFF		Not-started	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step 2: NP triggered (LoA, RoF)	FDMP A	A	NP	SAP	SAP		FDMP A	A	CAP	ON		Not-started	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step 3: Freq. Change	FDMP A	A	Freq Chg	SAP	SAP		FDMP A	A	CAP	ON		instructed	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step 4: Assume by B	FDMP B	B	Assumed	SAP	SAP		FDMP B	B	Terminated	OFF		Done	INITIAL	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step 5: CAP triggered for C	FDMP B	B	Assumed	CAP	SAP		FDMP B	B	Terminated	OFF		Done	CAP	OFF		Not-started	INITIAL	OFF		Not-started	OFF
step 6: CAP triggered for D	FDMP B	B	Assumed	CAP	CAP		FDMP B	B	Terminated	OFF		Done	CAP	OFF		Not-started	CAP	OFF		Not-started	OFF
step 7: NP triggered (LoA, ROF)	FDMP B	B	Assumed	NP	CAP		FDMP B	B	Terminated	OFF		Done	CAP	ON		Not-started	CAP	OFF		Not-started	OFF
step 8: Freq change to C	FDMP B	B	Assumed	Freq Chg	CAP		FDMP B	B	Terminated	OFF		Done	CAP	ON		Instructed	CAP	OFF		Not-started	OFF
step 9: NP to D	FDMP B	B	Assumed	Freq Chg	NP		FDMP B	B	Terminated	OFF		Done	CAP	ON		Instructed	CAP	ON		Not-started	OFF
step 10: Assume by C	FDMP C	C	Assumed/ Terminated ?	Assumed	NP		FDMP C	C	Terminated	OFF		Done	Terminated	OFF		Done	CAP	ON		Not-started	OFF

C.2 Constraint Management

C.2.1 Data Modelling

This section identifies some of the changes required in the IOP model to support the Feature #2 technical requirements. This material is not exhaustive and is provided for information only, not for formal review.

1. *Expanded Route*

   The definition of the FS Expanded Route must be modified to allow the specification of route identifiers (from F15c). The Expanded Route Points must:

   - allow the specification of a lat/long (opt) to solve the issue of duplicate points (in different data bases),
   - allow geographical point or published points,
   - contain a 'protected' flag must be added to indicate the point or the route segment is the result of a route change and must not be modified as much as possible,
   - contains the IOP Stakeholder ID associated with the point.
   - "to be transferred" on the amended route flag
   - allow including information for Flight Type and Flight Rule switch related to a specific point

2. *List(s) of constraints*

   In ED-133, the constraints are included in the Flight Script in a single list of constraints, each constraint being tagged with a status indicating whether the constraint has been applied or not by the FDMP.

   In D-52, the Flight Script contains two separate lists, one with the applied constraints and the other with the rejected ones.

   It must be decided if technically it is better to have two separate lists or only a single one.

3. *High-level structure for constraints*

   In ED-133, the constraint is defined as a tactical constraint or a strategic constraint. The tactical constraints contains the basic constraint attributes. The strategic constraint only contains an identifier (no attribute).

   In ICD12, there is only one generic type associated with all constraints, including both strategic and non-strategic constraint. The constraint attributes are defined for all constraint types, 2 specific attributes are defined optionally for the strategic constraints.

   It must be confirmed that the ICD12 structure is more technically appropriate. Then each constraint type as identified in Table 2 must be defined separatly.

4. *Constraint Category*

   The constraint category must be revisited to only include executive, planning, executive, strategic and flight plan. The ICD12 'cruise' is removed.

5. *Constraint Policy*

   The constraint policy must be modified to allow the level band and time band.

6. *Constraint Status*

   The ED-133 and ICD12 values for the constraint status differ, see below. Accepted/Rejected status values are not necessarily needed since there are now 2 lists of constraints managed (see point #1). New D55 values such as 'need-to-be-re-assessed', 'accepted-partially-reached' etc. must be added.

7. *Constraint Timestamp*

   A timestamp field must be added in the constraint structure to indicate the time of creation. This field is used to handle duplicate constraints.

8. *Constraints & Clearances*

   When a constraint is created following the sending of a clerance to the aircrew (immediate or deferred), the constraint structure includes a flag 'is_a_clearance' that need to be added.

9. *Constraint Attributes: AP, TSP, TEP, Relevant points, Application Distance*

   In ED-133 and ICD12, only the computed AP, TSP and TEP values are provided in the FO. The input AP, TSP and TEP values must be added as well as the indication of the relevant points.

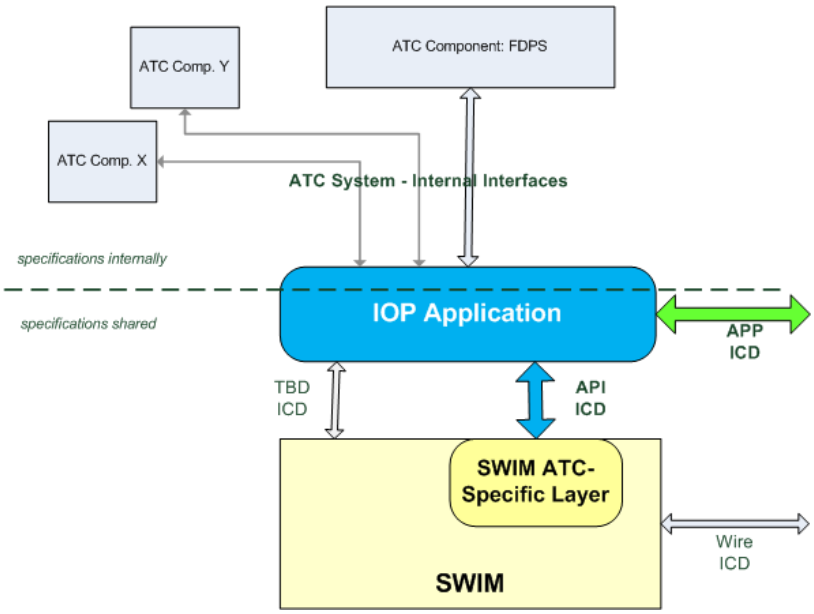
   In ICD12, the TSP and TEP are mandatory attributes (as computed values). For the input values, only the value of the relevant points are provided.

   The AP can identify a route point plus a distance (positive or negative).

C.2.2 Service Modelling

The SWIM Application ICD is the interface between the IOP Application and the SWIM-TI. It is defined in ED-133 Appendix D.3.2: API ICDs.

This section identifies some of the changes required in the IOP-MDW interface to support the Feature #2 technical requirements



1. *Since the route update is now made possible through the constraint mechanism (Route constraint, Diversion, Offset), the SERVICE modify_route() does not need to be implemented.*

C.3 Informative Distribution and Control List

C.3.1 ICD 12 defects

C.3.1.1 Attribute crossed_SIs_list

The Distribution Cluster contains a CrossedSI list where the crossed SIs are identified by an IOPstakeholderID. This is ambiguous. We must be clear where the name of the ATSU is used (ICAO name) and where the IOP stakeholder name of a System Instance is used.

C.3.1.2 Attribute distribution_list

The items in this list are system instances. A SI can manage more than one ATSU and so the reason for distribution can be different for the ATSUs managed by this SI.
So ICD 12 must be extended to cater for this.

C.3.1.3 Attribute InformedStakeholderData

The ICD 12 supports the Informed Stakeholder for the point sessions through the attribute “PointSessionsList” that contains a sequence of “sessions”.
ED-133 mentions in complement to the manual point sessions other use of the complementary distribution: maintained duplication, general information.
ICD 12 must be extended to support all cases of complementary distribution.

C.3.1.4 Attribute Is_synchronised

ICD12 does not provide a service to set/reset this information. To be corrected.

C.3.1.5 Attribute detached

It exists in ICD 12, but it is set/reset nowhere. It could be removed.

C.3.1.6 Attribute is_synchronized

The ED-133 definition is OK (see below), but not the one in ICD 12.

> **is_synchronized [0..1] :Boolean**
>
> A boolean indicating if a traversed SI is aligned or not with the Flight Object.

To be noted that in ICD 12, this Boolean is mandatory (min Occurs = 1), although the information is valid only for traversed SIs => to be corrected.
When a SI decides to de-synchronise its local SFPL and the FO, the consequence is that this SI does no longer contribute to the FO and that this SI does not update its local SFPL with the FO content any more. This SI informs the FDMP of its decision. The FDMP reflects this decision through the “is-synchronized” attribute associated to this SI.
What event is causing a SI to desynchronize its local SFPL?
ED-133 says nothing on when it shall occurs. The resolution is done by feature 9.

C.4 FO Mechanism

C.4.1 Data Modelling

- Define a stand-alone type for ATSU name and another one for System Instance name, even if they have the same implementation (String of 4, fixed length, no blanks).
- Rename the attribute “responsible_ATSU” into “controlling_ATSU”
- Allow (for management of VFR) the crossed ATSU list to be empty.

Add changes identified in SWIM TN section 3.21.1 (identifiers)

C.4.2 Service Modelling

C.4.2.1 ExceptionKind

The following sections details per service return values for the acceptance or the rejection of the requests. Added return values are presented in **bold** characters.
Column named ‘Comments’ presents reasons that may cause the rejection of the request. The reasons are from experience in SESAR prototyping and the list is not exhaustive.

C.4.2.2 IOP API_MDW Interface

API_MDW_CreateFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	duplicated_fo	The fo exists in the middleware and cannot be created again.
FALSE	syntax_error	Malformed stakeholder in distribution list.
FALSE	semantic_error	Missing distribution list. Unknown stakeholder in distribution list. Missing cluster id. No Cluster provided.
FALSE	middleware_failure	Internal middleware error

API_MDW_PublishFo

return_code	return_value	Comments
TRUE		
FALSE	fo_not_found	The flight object is not known (does not exist).
FALSE	syntax_error	
FALSE	semantic_error	Incorrect stakeholder in distribution list. Name or release id cluster is different with summary information.

		Invalid range for Release (cluster release id is out of range). Unknown Cluster (Known clusters are set at FO creation) Input clusters list should not be null.
FALSE	middleware_failure	Internal middleware error
FALSE	**old_fo_version**	Release id is older than locally stored one.
FALSE	**application_failure**	Unknown FO Cluster
FALSE	**duplicated_fo**	FlightKey with all the fields present already exists and already used for another FO.

API_MDW_RequestFoService

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	fo_not_found	The flight object is not known (does not exist).
FALSE	syntax_error	
FALSE	semantic_error	Clusters names or releasesare different between request and summary information. Cluster not found.
FALSE	not_eligible	The requester id is already the manager (FDMP) of the flight.
FALSE	old_fo_version	Release id is different between publish and summary version. Cluster release id is out of range.
FALSE	timeout	The requester wait for a reply an amount of time and close the connection when this timer ends No response from stakeholder (fdmp) within the predefined time duration
FALSE	middleware_failure	Internal middleware error (at FDC or at FDMP). Unknown Stakeholder (fdmp).
FALSE	**isolated_stakeholder**	Stakeholder (fdmp) is not IOP Enabled. Local middleware is not IOP Enabled.
FALSE	**communication_failure**	Communication with FDMP is lost while a request is in progress, after the request was sent by FDC but before the reply from FDMP has been returned to application.

API_MDW_SearchFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	**fo_not_found**	The flight object is not known (does not exist).
FALSE	**syntax_error**	
FALSE	**middleware_failure**	Internal middleware error

API_MDW_RestoreFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	fo_not_found	The flight object is not known (does not exist).
FALSE	middleware_failure	Internal middleware error Unknown Stakeholder (fdmp)
FALSE	**not_eligible**	The requester is the manager!
FALSE	**isolated_stakeholder**	Stakeholder (fdmp) is not IOP Enabled.
FALSE	**communication_failure**	Communication with FDMP is lost while a request is in progress, after the request was sent by FDC but before the reply from FDMP has been returned to application.
FALSE	**timeout**	No response from stakeholder (fdmp) within the predefined time duration

API_MDW_ApplicationStatus

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	middleware_failure	

API_MDW_DeleteFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	fo_not_found	The flight object is not known (does not exist).
FALSE	middleware_failure	Internal middleware error.
FALSE	**not_eligible**	The delete operation is not invoked from the Flight Object manager. Only locally managed FOs can be deleted.

API_MDW_RejectFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		

FALSE	fo_not_found	The flight object is not known (does not exist).
FALSE	middleware_failure	Internal middleware error Unknown Stakeholder (fdmp)
FALSE	**not_eligible**	The requester is already the manager of the FO (cannot call oneself).
FALSE	**semantic_error**	Rejecting FO fails, FO is a locally managed (local SI is FDMP) Wrong/Unknown requester_id
FALSE	**isolated_stakeholder**	Stakeholder (fdmp) is not IOP Enabled. Local middleware is not IOP Enabled.
FALSE	**communication_failure**	Communication with FDMP is lost while a request is in progress, after the request was sent by FDC but before the reply from FDMP has been returned to application.
FALSE	**timeout**	No response from stakeholder (fdmp) within the predefined time duration

C.4.2.3 IOP API_APP Interface

API_APP_NotifyFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	syntax_error	Application returns
FALSE	semantic_error	Application returns
FALSE	not_eligible	

API_APP_RequestFoService

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	fo_not_found	
FALSE	syntax_error	
FALSE	semantic_error	
FALSE	not_eligible	
FALSE	old_fo_version	

API_APP_MiddlewareStatus

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	application_failure	

API_APP_NotifyException

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	application_failure	

API_APP_IopAreaStatus

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	application_failure	

API_APP_RejectFo

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE	fo_not_found	
FALSE	syntax_error	
FALSE	semantic_error	

API_APP_NotifyFoServiceFailure

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE		

API_APP_NotifyFoCollision

Report: Return value for the acceptance or the rejection of the request.

return_code	return_value	Comments
TRUE		
FALSE		

C.4.2.4 FOIdentifier

Only one single FO Identifier is used within the middleware and for middleware and application exchanges.

```
struct FOIdentifier {
     string uuid;
     string context_id;
};
```

The ***uuid*** field is used to **unambiguously identify the flight** to which the FO refers to.

WIFOs for the same FO share with the FO ARCID, ADEP, ADES, EOBT, EOBD, and differ only in the *'context_id*'. Multiple WIFOs and an FO will refer to the same flight; so should use the same uuid. The ***context_id*** field from the operational key (FlightKey) will be used in the FO Identifier to distinguish between FO and WIFOs related to the same flight.

NOTE

The WIMP will be using the *uuid* value generated by the FDMP instead of its own generated *uuid* (WIMP may choose to use LOCAL_ID internally and keep association with {uuid;context_id}).

For a real FO the *context_id* should be an empty string.

As in current specification, the application is responsible for providing a unique *uuid*.

The IOP application can choose to use LOCAL_ID or GUFI with no impact on the SWIM Technical Layer.

Add changes identified in SWIM TN section 3.21.2 (API ICD)

END OF DOCUMENT-