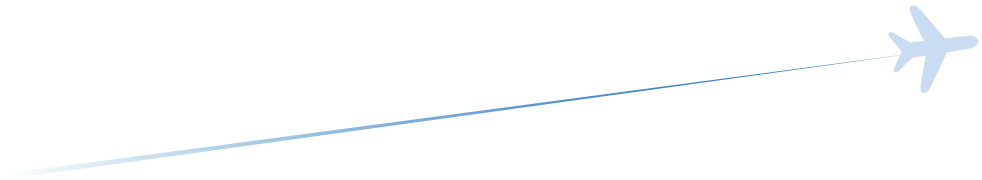

Business Model for the PJ15-01 Sub-Regional DCB Common Service TRL6

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Copyright Statement

COSER

COMMON SERVICES

This Business Model is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 734160 under European Union's Horizon 2020 research and innovation programme.

Abstract

A fundamental aim of the SES programme is the overall reduction of cost through service harmonisation. A Common Service is provision of a service to consumers that provides a capability in the same form that they would otherwise provide themselves. The advent of service orientation and the use of open standards create opportunities for identifying such common capabilities amongst certain stakeholder groups and encourage their use in the de-fragmentation of ATM.

The purpose of the Sub-regional Demand Capacity Balancing (DCB) Service (Supporting the DCB capability within the ICAO Global Concept [8]) is to facilitate an improved usage of the airspace at Sub-regional level, through enhanced planning and consequently more appropriate tactical intervention in support of Airspace User (AU) and Airport Operator (AO) operations. Consequently, the intent of the Sub-regional DCB common service is to enable the Europe-wide benefits of an integrated Sub-regional operation through reduced cost of service provision.

It is expected that Sub-regional DCB can be applied within a multi-ACC or multi-ANSP environment and facilitate an improved usage of the airspace at Sub-regional level and facilitate tactical interventions when necessary, ensuring that any potential disruptions could be correctly managed. It is not envisaged that a Sub-region is limited by geographic boundary other than the need to ensure a detailed knowledge of the airspace (generally limited to adjacent airspace).

The service is active during the whole Planning Phase, from up to 5 years before the time of operation to just before the Execution Phase within the Sub-regional airspace (generally 2 hours before the time of active operation). The primary focus is the window encompassing the pre-tactical timeframe through to just prior to activation of a given flight.

As well as with all common services, it is expected that provision of Sub-regional services will be staged in a market place that is open to competition. Therefore, it is expected that collaboration and partnerships between Air Navigation Service Providers (ANSPs) and other stakeholders is necessary to facilitate activities.

OI Steps:

Number	Title	Step
SDM-0401	SDM-0401 — Sub-Regional DCB Common Service (Business Improvement)	

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1 Introduction

1.1 Purpose of the document

The document provides a description of the Business model for the provision of common Sub-regional DCB services to ANSPs and the associated services to their customers. Based upon the Business Model Canvas, the model describes the value to the consumer and related stakeholders, market context within which the Common Service is provided, the targeted segment of ANSPs, the relationship between the consumer and the provider, the channels for delivery and the capability of the provider. The model describes the likely funding mechanism for the provision of the service. Further, the benefits to European ATM are explored and proposals are made for the level of European adoption necessary for optimal benefits of Sub-regional deployment.

The concepts for the Sub-regional operation were touched upon in SESAR 1 and included in EATMA 10. However, within SESAR 1, the Sub-regional operation was highly integrated with Regional and local operations necessitating a common services activity to extract the service from existing documentation and EATMA 10. This document develops the strategy for isolation of the Sub-regional service in EATMA.

The common services process followed within this document is driven from the Common Services Foundation Method [2].

1.2 Intended readership

The intended audience for this document is the SESAR Joint Undertaking, the partners in the SESAR programme, the ATM stakeholders (e.g. airspace users, ANSPs, airports, airspace industry) with those third parties directly affected by its findings and the contributors involved with the project such as PJ09.

Other architectural projects, such as PJ19, and tasks within the SESAR programme may also have an interest. The document also provides guidance for future work in SESAR for service identification work and to all stakeholders for deployment.

1.3 Inputs from other projects

The essence of the Sub-regional concept was partially described in SESAR 1 documentation (Primarily B4.2 – Operational Concept and WP7/13 – Network Operations). The fundamentals of the service (described as Sub-regional operation to close to operational service delivery subsequently expressed as the activity of the Flow Manager), are described in the SESAR 2020 transition ConOps **Error! Reference source not found.** (PJ19.2). Elements of the Network Management concept are further developed in SESAR 2020 PJ8 and 9. Consequently, although the foundations of Sub-regional DCB will be extracted from SESAR 1, interaction with PJ8, 9 and 19.02 are expected in relation to the evolving concept. Interaction with PJ19.03 is expected in relation to integration of associated EATMA models. Input from PJ19.04 is expected in relation to devolved SESAR performance ambitions.

1.4 Glossary of Basic Concepts

Term	Definition	Source
ACC Tactical Demand	Demand generated close to the time of operation.	EATMA
Business case	A tool to provide decision makers with the information they need to make a fully informed decision on whether funding should be provided and/or whether an investment should proceed	SESAR P16.06.06
Business model	A framework for creating economic, social, and/or other forms of value. The term' business model' is thus used for a broad range of informal and formal descriptions to represent core aspects of a business, including purpose, offerings, strategies, infrastructure, organizational structures, trading practices, and operational processes and policies.	EUROCONTROL ATM Lexicon
Capability	The ability of one or more of the enterprise's resources to deliver a specified type of effect or a specified course of action to the enterprise stakeholders.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10.0
Centralised (service) - a particular type of Common Service	A Centralised Service is an ANS support service exercised at pan-European and central network level for harmonisation and cost-efficiency purpose avoiding multiplication of investments, leading to reduced infrastructure costs, supporting the ANSPs and the Member States of the EU to come closer or actually achieving the EU cost efficiency performance targets.	EUROCONTROL
Common Service	A service providing a capability in the same form to consumers that might otherwise have been undertaken by themselves'	SESAR B04.05 D02
Consumer	A user of a service	SESAR B04.05 D02
Customer	A consumer of a service under a specific contract.	SESAR B04.05 D02
Deployment Package	Deployment Packages comprise Operational Improvement Steps and Enablers selected to satisfy Performance Needs of Operating Environments in the European ATM System by providing performance benefits confirmed by validation results.	SESAR WP C, though un-reviewed
Flow Manager	The Flow Manager is a role performed at Sub-regional level which contributes to the Network Management function."	EATMA
Node	A logical entity that performs activities. Note: nodes are specified independently of any physical realisation.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10.0
Security and safety in the context of a Common Service	Non-Functional Requirements (NFR) and Quality of service (QoS) requirements can be specified at various levels of maturity and from different viewpoints such as from the collaborative enterprise, the logical level, technology and engineering perspectives. Conceptually, NFR and QoS are not	ISRM – Modelling guidelines

Term	Definition	Source
	always distinguishable. Common Services will focus at the first two viewpoints	
Service	The contractual provision of something (a non-physical object), by one, for the use of one or more others. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or through voice communication or written processes and procedures.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10.0
Service contract (SLA)	A service contract represents an agreement between the stakeholders involved for how a service is to be provided and consumed. A service contract is specified through the service interface, the QoS and Service policies.	SESAR B.04.03 – Working method on service
Service instance	Service which has been implemented in accordance with its specification in the service catalogue (during the SESAR Development Phase, the service definitions are available in the ISRM) by a service provider (by itself or contracted to a third party).	SESAR B.04.03 – Working method on service
Short-Term ATFCM Measures	Dynamic DCB / Short-Term ATFCM Measures constitute a step forward to close the gap between ATFCM and ATC. The objective is to anticipate and manage traffic peaks and complexity, to smooth ATC workload through the application of fine-tuned measures e.g. Short-term ATFCM Measures (STAM) close to the real time operations, providing significant improvements in overall Network capacity and efficiency, with minimum curtailing for the Airspace Users	EATMA
Provider	An organisation supplying services to one or more internal or external consumers.	SESAR B.04.05 – D02
Service taxonomy	The service taxonomy describes the categorisation of services provided between ATM stakeholders. It is used to organise the responsibilities of the service design as well as to provide a means of identifying services in the run-time environment.	SESAR B.04.03 – Working method on service
Stakeholder	A stakeholder is an individual, team, or organization (or classes thereof) with interest in, or concerns relative to, an enterprise (e.g. the European ATM). Concerns are those interests, which pertain to the enterprise's development, its operation or any other aspect that is critical or otherwise important to one or more stakeholders.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10.0

Table 1: Glossary of Basic Concepts

1.5 Acronyms and Terminology

Term	Definition
ACC	Area Control Centre
AFUA	Advanced Flexible Use of Airspace
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
AO	Airport Operator
AOP	Airport Operations Portal
API	Arrival Planning Information
ASM	Airspace Management
ATCO	Air Traffic Control Officer
ATFCM	Air Traffic Flow and Capacity Management
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMSD	Air Traffic Management Service Design
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
AU	Airspace User
AUO	Airspace User Operations
AUP	Airspace Use Plan
CBA	Cost Benefit Analysis
CDM	Collaborative Decision Making
CM	Conflict Management
COATS	Combined Operations and ATS
CTA	Calculated Time of Arrival
CTO	Calculated Time Over
DCB	Demand Capacity Balancing
dDCB	Dynamic Demand Capacity Balancing
DDR	Demand Data Repository
DPI	Departure Planning Information
EATMA	European ATM Architecture
ECAC	European Civil Aviation Conference

Term	Definition
ESRA	Eurocontrol Statistical Reference Area
FAB	Functional Airspace Block
FCA	Flow Constrained Area
FCM	Flow Capacity Measures
FDP	Flight Data Processing
FOC	Flight Operation Centre
FUA	Flexible Use of Airspace
GA	General Aviation
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IM	Information Management
INAP	Integrated Network and ATC Planning
IOC	Integrated Operation Centre
IP1/DB	Implementation Package 1 / Deployment Baseline
KPA	Key Performance Area
KPI	Key Performance Indicator
LTM	Local Traffic Manager
MAWP	Multi-Annual Work Programme
MIL	Military
N/A	Not Applicable
NM	Network Manager
NMD	Network Management Directorate
NMF	Network Management Function
NOP	Network Operations Portal
OFA	Operational Focus Area
OSED	Operational Service Environment Description
OI	Operational Improvements
PAR	Performance Assessment Report
PCP	Pilot Common Project
QoS	Quality of Service
RBT	Reference Business / Mission Trajectory

Term	Definition
RPAS	Remotely Piloted Aircraft System
SDM	Service Delivery Management
SES	Single European Skies
SESAR	Single European Sky ATM Research Programme
SID	Standard Instrument Departure
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
STAM	Short-term ATFCM Measures
STAR	Standard Arrival Route
SUA	Special Use Area
SWIM	System Wide Information management
TMA	Terminal Manoeuvring Area
TS	Traffic Synchronisation
TSAT	Target Start-Up Approval Time
TTA	Target Time of Arrival
TTO	Target Time Over
TWR	Tower
UDPP	User Driven Prioritisation Process
UUP	Updated Airspace Use Plan

Table 2: Acronyms

2 Scope of the Business Model

The increasing delay to air traffic in the latter part of the 20th century lead to the creation of the European Central Flow Management Unit (CFMU) in 1995 which resulted in a significant reduction in delay within the context of an ever-increasing air traffic demand. To date, the Regional Network Manager (evolution of the original CFMU function) has successfully supported local actors in Europe to manage the increasing demand, initially through regulations applied close to the time of operation. The SES initiative has resulted in significant enhancement of the Network Management toolset to manage air traffic by improvements in planning ATFCM measures, flexible use of airspace and latterly being specific in delay avoidance measures. Over time, these measures have resulted in an increased need for Collaborative Decision Making and information sharing. The European Network has reached a stage whereby the operational architecture is required to evolve in support of further performance gain.

To date, much of European Network Management has been achieved through interaction between the Regional Network Manager and local actors (e.g. ACC, Airports). The volume and complexity of the interaction needed for future performance improvement necessitates utilisation of a Sub-region interacting with the Network Manager on behalf of the local actors (see **Error! Reference source not found.** relating to Flow Manager).

The Sub-regional DCB service supports the DCB capability within the ICAO Operational Capability model [8]. The operational Sub-regional DCB service uses existing operational processes and services, reorganising them to provide efficiencies. For example, the provision of a focal point for a number of ACC's resulting in the number of point-to-point connections. The Sub-regional service activities commence during the early planning phases, considering demand and working with regional and local actors to plan airspace capacity in support of the impending demand. As the time of operation approaches, the Sub-region, in the form of the Flow Manager, performs the co-ordination necessary to maintain developed plans, where possible. Where maintenance of plans is not possible, the key benefit of the Sub-region is the ability to optimise the plan close to the time of operation based on a detailed knowledge of the prevailing operational situation. This requirement for a detailed understanding necessarily limits the geographical dimensions of a Sub-region. The need for a detailed understanding of the airspace infers service provision by an organisation with an ANSP component, particularly at the point of service delivery.

Subsequently, the Sub-regional actor is involved in post-operational analysis to identify future performance improvements. The post operational phase is described in the SESAR 1 7.2 DOD (Step 2) [45].

Below is a table of use cases identified from SESAR 1 7.2 DOD [45].

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
	Planning the Flexible Use of Airspace;	Consideration needs to be given to the Sub-regional consumer and its willingness to contract out FUA activities. The Sub-regional manager would need to understand the capacity of the airspace being managed at a minimum so that demand vs capacity activities can be undertaken. The outflow of the FUA process must be available to the Sub-regional provider at a minimum.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer. Regional NM. ACC (Local). Military User (MIL).	Planning the Flexible Use of Airspace: The Rolling Process is based on refinement of the Airspace Users demand and Airspace Configurations that by their nature are a significant enhancement of the AUP/UUP principle. In addition to the optimum solution for the civil/military airspace sharing, Airspace Configurations contain any element/parameter that may affect the optimum performance at the local, Sub-regional and the network level. The most prominent of those elements is the dynamic and proactive ATC Sectorisation management.

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
	Planning the Airspace Configurations.	The Sub-regional plan will include planned airspace configurations for the day of operation. The Sub-regional provider will work with actors within the Sub-region to develop opening schemes and understand staff availability (as a function of capacity and the ability to open specific sectors). This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer. Regional NM. ACC (Local).	A successful M-T and S-T planning requires a collaborative approach in which the Network Manager is iteratively assessing the evolution in the traffic demand and capacity situation, on a rolling pattern with smooth transition between the successive phases. The Network Manager develops Airspace Configurations (former ASM/ATFCM/ATS scenarios) for anticipated imbalances in cooperation with local and Sub-regional joint civil-military function (Flow Managers, Local Traffic Managers, Airspace Managers) and Airspace Users. [UC-NP-19 Identify the Optimum Airspace Configuration]. The Network Manager records the agreed Airspace Configurations (ASM/ATFCM/ATS scenarios) in the System as a contribution to the NOP. [UC-NP-18 Capture and Analyse Airspace Organisation Data], [UC-NP-25 Publish and Update Airspace Configuration. Airspace Configurations are predefined and coordinated organisation of routes and their associated airspace structures including temporary airspace reservations/restrictions ARES and ATC Sectorisation. In difference to airspace scenarios, which by their nature are fixed and static solutions, Airspace Configurations enable flexible solutions as a function of changes that have occurred or are anticipated to occur.

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
N/A	Publishing and Updating the DCB plans	Generate a Sub-regional plan that consists of demand and capacity elements and refine the plan to day of operation. The Sub-regional plan will be prepared over the short/medium/long timeframes and will be distributed to the Sub-regional consumer. This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local) Airport (Local)	All stakeholders' plans are published via the NOP. The System always makes available the updated Network Operations Plan to all interested actors. Resolving identified capacity/demand imbalances is iterative throughout the Planning phase, and uses the information included in the iSBT/iSMT. The Network Manager proposes modified routes to the Airspace User based on the Airspace Users published alternative routes. The Airspace User updates its trajectory accordingly. Closer to the day of operations, more accurate information become available: The local joint civil-military function (Flow Managers, Local Traffic Managers, Airspace Managers) provides information on ACC capacity capabilities to the System which updates the NOP (see Balance Demand with Resources & Capabilities). The joint civil-military function provides detailed airspace use plans which are validated through collaborative planning and fine-tuned via CDM process. The Tower Supervisor in a CDM process with the Airport Operator provides information on Airport capacity capabilities to the AOP/NOP System which updates the NOP. Improved weather forecasts allow anticipating likely trans-Atlantic and trans-continental flow orientations, as well as weather phenomena such as low visibility or strong winds and convective activity. Runway in use and expected departure and arrival routings may be included in the trajectory. The Network Manager identifies appropriate flow management measures, including re-routing scenarios with Airspace User/Local Traffic Manager (traffic flows) in a refinement process that considers all available trajectories.

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
· **UC-NP-12**	Publish / Share Demand Forecast – publish plans based on DCB plan (contained within), leads to publish of DCB plan	Generate a Sub-regional plan that consists of demand and capacity elements and refine the plan to day of operation. The Sub-regional plan will be prepared over the short/medium/long timeframes and will be distributed to the Sub-regional consumer. The Sub-regional plan will contain a set of prepared DCB/dDCB measures for implementation. This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local) Airport (Local)	The use case describes how the Network Manager establishes a common reference for the forecast traffic and airspace, runway, SIDS demand and how it is shared (through NOP access layers) to support an efficient collaborative planning process by the ANSPs.
· **UC-NP-15**	Capture and Maintain Capacity Data	Capacity data and maintenance of capacity data be used in the Sub-region to help drive understanding of available capacity within the Sub-region and support situational awareness in the short/tactical timeframes.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM	The use case describes how the Network Manager captures and integrates incoming capacity data and develops a rolling picture of network capacities over time horizon. The Network Manager captures, maintains, and makes accessible on a need to know basis, the published sector capacities needed to build the Network Operations Plan in a CDM approach.

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
· UC-NP-16	Identify the Optimum Sector Configuration	The Sub-regional plan will include planned airspace configurations for the day of operation. The proposed sector configurations will optimise capacity based on the needs of the Sub-regional consumer. The Sub-regional provider will work with actors within the Sub-region to develop opening schemes and understand staff availability (as a function of capacity and the ability to open specific sectors). This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local)	The use case describes how Local Traffic Manager, in coordination with the Network Manager and the Flow Manager, identifies the optimum sector configuration based on the available staff, traffic pattern and airspace demand.
· UC-NP-17	Monitor Declared Capacity Values	The Sub-regional plan will include planned airspace configurations for the day of operation. The Sub-regional provider will work with actors within the Sub-region to develop opening schemes and understand staff availability (as a function of capacity and the ability to open specific sectors). This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM	The use case describes how the Local Traffic Manager, Flow Manager and Network Manager monitor the actual traffic flow and complexity values against the declared capacity values.

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
· UC-NP-19	Identify the Optimum Airspace Configuration – could include FUA or any restrictions (could include DAC)	Consideration needs to be given to the Sub-regional consumer and its willingness to contract out FUA activities. The Sub-regional manager would need to have an understanding of the capacity of the airspace being managed at a minimum so that demand vs capacity activities can be undertaken. The outflow of the FUA process must be available to the Sub-regional provider at a minimum.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local) Military User (MIL)	The use case describes how the Airspace Manager, Flow and Network Manager use support functions to identify the optimum Airspace organisation based on traffic and airspace reservation demand.
· UC-NP-21	Collaboratively Agree and Implement Airspace Configuration	The Sub-regional plan will include planned airspace configurations for the day of operation. The Sub-regional provider will collaboratively work with actors within the Sub-region to develop opening schemes and understand staff availability (as a function of capacity and the ability to open specific sectors). These opening schemes will be implemented by the Sub-regional consumer in the tactical phase, although the Sub-regional provider will continue to monitor the demand vs capacity identifying variance in to plan and resolving imbalances as necessary. This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local)	The use case describes how the ASM/DCB-ATFCM/ATS actors agree, implement and update airspace configurations collaboratively at regular intervals (as soon as an airspace change has happened or is anticipated to happen) up to a defined time before the Execution Phase.

7.2 DOD Use Case Number	Use Case	15-01 Perspective	Stakeholders (from BM)	Description (from 7.2 DOD)
· **UC-NP-22**	Analyse and Prepare DCB/dDCB Measures	Generate a Sub-regional plan that consists of demand and capacity elements and refine the plan to day of operation. The Sub-regional plan will be prepared over the short/medium/long timeframes and will be distributed to the Sub-regional consumer. The Sub-regional plan will contain a set of prepared DCB/dDCB measures for implementation. This includes Coordination of measures with other stakeholders. This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local) Airport (Local)	The use case describes how both DCB and dDCB (STAM) solutions are prepared sufficiently in advance involving the Network Manager, Flow Managers, Local Traffic Managers and Airline Operations and Control Centres.
· UC-NP-25	Publish and Update Airspace Configuration	The Sub-regional plan will include planned airspace configurations for the day of operation. The proposed sector configurations will optimise capacity based on the needs of the Sub-regional consumer. The Sub-regional provider will work with actors within the Sub-region to develop opening schemes and understand staff availability (as a function of capacity and the ability to open specific sectors). This is an iterative process taking new data as and when it arrives.	Sub-Regional Common Service Provider. Sub-Regional Common Service Consumer Regional NM ACC (Local)	The use case describes how the agreed airspace configurations is published and updated in the Network Operation Plan (NOP).

Table 3 : Use Cases as developed in 7.2 DoD SESAR 1

In summary, the scope of this Business Model encompasses the Sub-regional actor, from long-term planning (limited by SESAR 1 concepts) to execution and applicable to a continuous geographic area, manageable by a Flow Manager in the close to time of operation time frame. The service provider is required to be an organisation with ANSP background and systems provision elements. The consumers will be ANSP, ACC, Airport and other airspace related service provisions for a geographically adjacent location to the provider and accountable for increasingly busy and complex airspace. In the wider European ATM context, Sub-regional coverage is required in order to support the regional performance ambitions. The minimal necessary coverage will be investigated as part of SESAR 2020 PJ15-01 but it is proposed that the initial working assumption is complete coverage of European airspace.

2.1 Current Technical DCB landscape

The current service provision is a direct 1:1 information flow between individual ACC/Airports and the Network Manager. Each local ACC and Airport has its own individual requirements for handling and processing DCB data, meaning there is little/no standardised method for DCB information or data flows. This results in several different and isolated options for providing a DCB solution with individual member states and local ACC/Airport actors across Europe. Additionally, as each individual local actor processes their information and makes assessments to address DCB issues, there is presently little/no communication with neighbouring local actors to fully assess the overall impact of any decisions made. Where communication does exist, this is primarily limited to telephone conversations. As Network Manager (NM) data is provided from a centralised source to be then potentially processed differently across each local ACC or Airport, this can result in actions being taken which have a cumulative negative effect on the network. Alternatively, when a requirement needs to be resolved between actors, this often involves a need to provide clarification between them. These conversations necessitate several resource-demanding conversation touch points to resolve.

All of this can be improved upon and increased efficiencies can be made through the introduction of a coordination function, which will group related local actors together and offer decision-making capabilities that assess the overall impact to all associated local actors. This function is supported by the development and introduction of technological tools that are able to receive, interpret, manipulate and communicate data provided in the form of a common service.

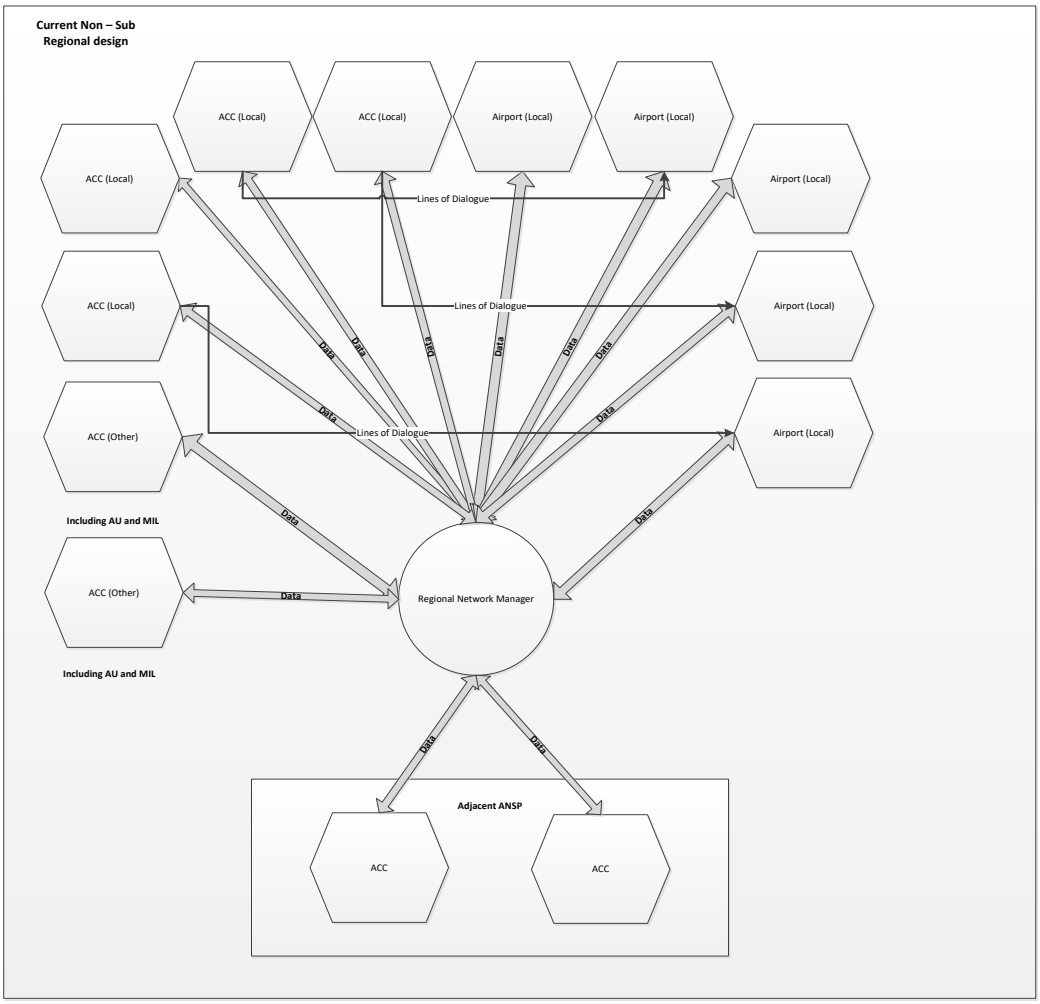

Figure 1 : Current Technical DCB Architecture

2.2 Sub-regional DCB Common Service

2.2.1 Description

The purpose of the Common Service provision is to provide greater collaboration, enhanced DCB decision-making capabilities and provide an overall EU-wide ATM cost reduction. Over the lifetime of the service, in the case where there is an existing and available Sub-regional service or a new DCB capability is being created, the cost of consuming this from the provision of a common service is required to be less than the cost of provisioning an independent solution. The fundamental elements of the Sub-regional common service were described in the SESAR 2020 MAWP [9] which is reflected or referenced in the following sections for compliance.

The operational Sub-regional service is intended to enable achievement of customer (AU and AO) operational ambition within the envelope of local and regional performance targets whilst simplifying the interaction between stakeholders. Sub-regional activity takes management responsibility for the airspace of several geographically adjacent ACCs whilst presenting a single operational interface to the regional actor; representing the local actors, including Airports, within this airspace. Whilst involvement throughout the planning phase promotes predictability in operation, one of the key benefits of the Sub-regional capability is the

additional flexibility provided closer to time of execution, as desired by customers. Such flexibility results from a detailed understanding of the airspace, the implications of the evolving demand and the ultimate impact on workload at local level. Another benefit is the ability to know, with a greater clarity than would be available at the Regional level, the actual configurations and running of the individual operations on a day-to-day basis. This local expertise allows the Sub-regional to operate with a high-level of clarity of the issues and options to resolve those issues, largely without the resource-cumbersome constraints historically utilised. Within ACCs, during execution, the Sub-regional actors (Flow Manager) interact significantly with other relevant actors involved in the Integrated Network and ATC Planning (INAP) process, optimising intervention for the benefit of the collective group of actors.

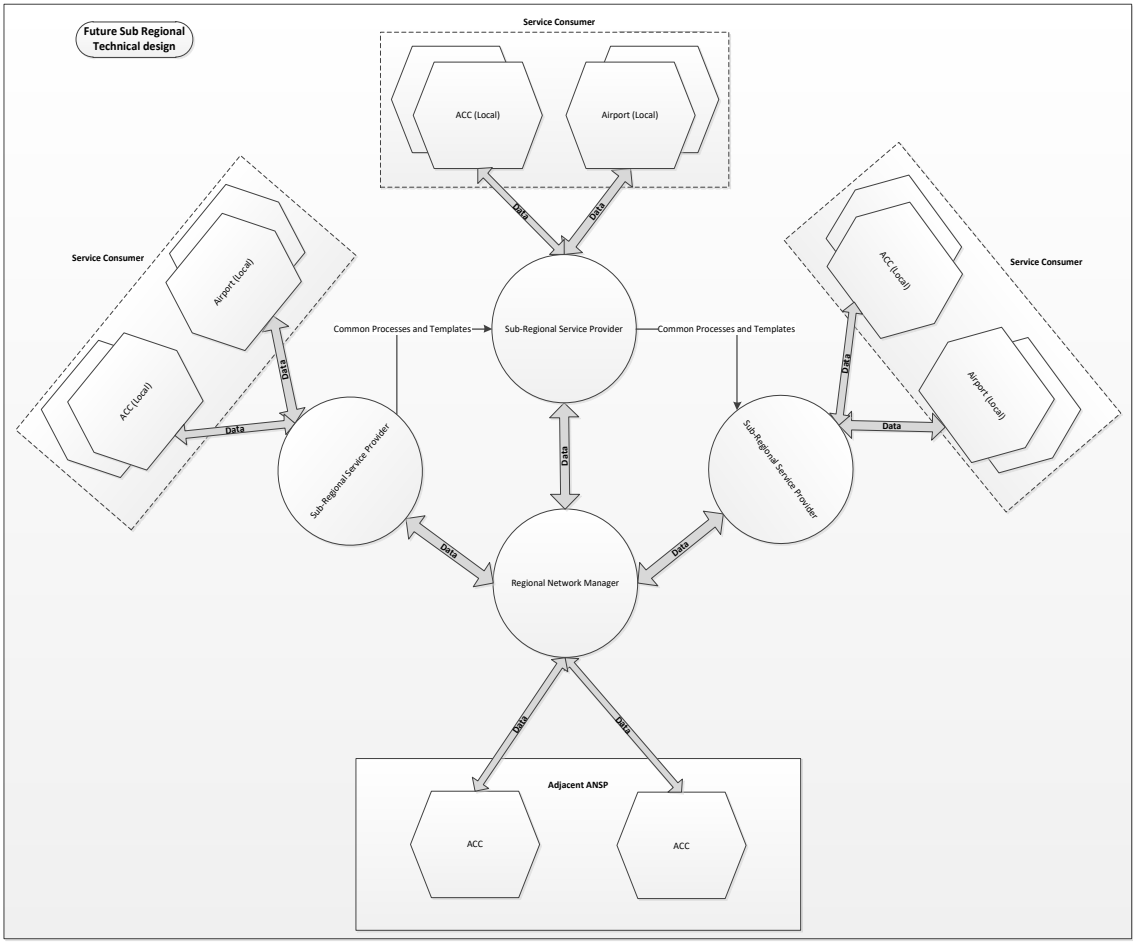

Figure 2 : Sub-regional Service Provision (Technical Level)

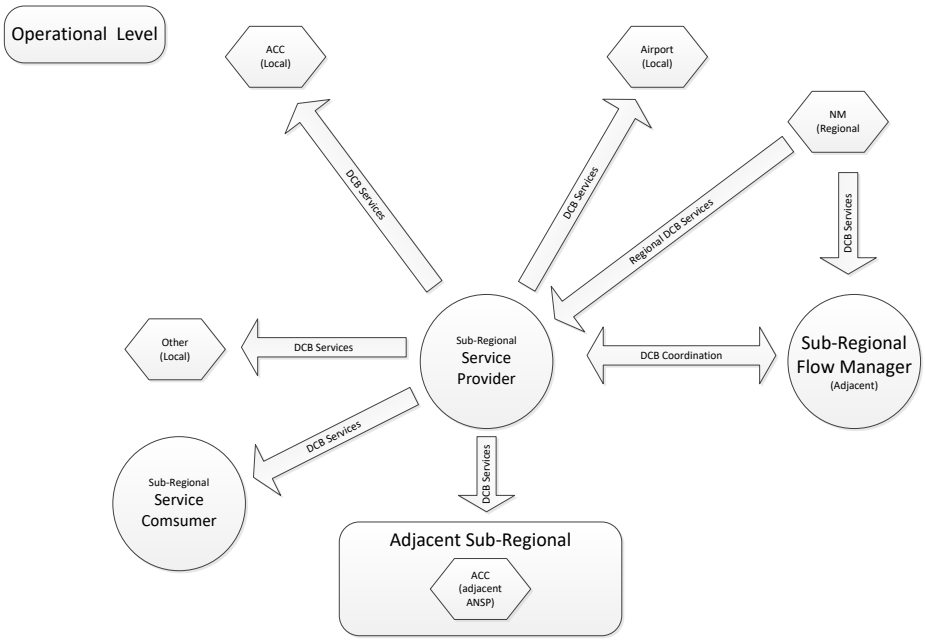

Figure 3: Sub-regional Service Provision (Operational Level)

The objective of developing Sub-Regional DCB as a common service is to provide an optimised operation within a highly integrated part of the network. Working in the context of a collaborative network, especially with the Network Management function and local DCB capabilities at the units, this Common Service is intended to offer a DCB capability in an open and standard manner to several ANSPs and airports. The DCB service would thus work to optimise the operation by working closely with the units to balance demand against the available capacity of the different stakeholders.

Several potential benefits can be highlighted such as cost reductions by optimizing the operational use of local Air Traffic Services Units (ATSUs), increased capacity of airspace and reduced flight delays due to more accurate planning, which also leads to less fuel consumption.

It is expected that Sub-regional DCB can be applied within a multi-ACC or multi-ANSP environment to facilitate an improved usage of the airspace at Sub-regional level and facilitate interventions close to the time of operation when necessary, ensuring that any potential disruptions can be correctly managed. It is expected that several larger ANSPs perform some level of Sub-regional activities through implementation of Sub-regional type scenarios in the short-term and close to time of operation timeframes, although these may not be formally organised in the form of a full Sub-region. The Sub-region plans the optimal use of operational ACC resources and demand management measures to facilitate AU (civil and military) desires, based on the regional plan and within the prevailing business performance framework, for the rolling day of operation. The plan also includes measures for managing uncertainty (including weather). Sub-regional has a need to see an integrated AOP/NOP with the aim of providing a capability to manage competing interactions between multiple airports and the Sub-regional network within the Sub-regional AoR to enable Sub-regional to optimise that part of the network.

The service supports the Local Traffic Manager (LTM) in the long, medium and short-term timeframes by developing plans to manage demand versus capacity within the scope of the Sub-region.

The service supports the Local Traffic Manager in the close to time of operation timeframe in managing unforeseen events by:

- adapting plans and developing further options as uncertainties develop
- interacting with peers, AUs and the regional Network Management Function (NMF) service to develop / implement measures to achieve effective demand/capacity balancing

The service is active during the whole Planning Phase, from up to 5 years before the time of operation (generally 1 year before the time of active operation) to just before the Execution Phase within the Sub-regional airspace (generally 2 hours before the time of active operation). The primary focus is the window encompassing pre-tactical to just prior to activation of a given flight.

The purpose of the Sub-regional Demand Capacity Balancing (DCB) Service is to facilitate an improved usage of the airspace at Sub-regional level and facilitate interventions close to the time of operation when necessary, ensuring that any potential disruptions could be correctly managed. Sub-regional DCB also promotes implementation of harmonised solutions within the scope of the Sub-region, ensuring that the actions of one actor does not destabilise the operation of other actors in the Sub-region.

Different input information from different ATM stakeholders are collected, as long-term demand information from regional DCB, capacity information from ANSPs and Airports, demand information from AUs and Military or weather forecasts from MET info providers. As an output, the Service produces optimal capacity balancing for Sub-regional airspace, encompassing the time window from the short-term timeframe phase (generally 2 hours before the time of operation) until the moment prior to the execution phase.

The provision of a Sub-regional DCB common service is made available to allow optimisation of the resources within the Sub-region. A Sub-regional provider can manage DCB services for a region where it is not economically viable to run such a service in isolation or support operational resilience by providing a contingency capability.

It is expected that provision of Sub-regional services will be staged in a market place that is open to competition, therefore it is expected that collaboration and partnerships between ANSP's and other stakeholders is necessary to facilitate activities. It is expected that a Sub-regional Provider needs to have a Sub-regional common service offering, with costs, etc. The Sub-regional provision can then be offered to other ANSP's, ACC, Airport and other airspace related service provisions in the form of a Common service, accepting associated geographical limitations (see PJ15-01 CBA [46]).

Safety considerations: See section 2.2.4 (Quality of Service).

Security considerations: Secure services and physical protection of assets supporting the associated operational capabilities.

Regulatory impact: Currently no regulatory impact, however, the business case for Sub-regional DCB is dependent on pan-European deployment for which future regulation may be required.

2.2.2 Positive & Negative potential aspects regarding Sub-regional Demand Capacity Balancing (DCB)

Positive arguments supporting the initiative:

- Reduction in number of individual stakeholders that the Network Manager (NM) would need to manage and interact with. This may contribute to a reduction of workload allowing NM to concentrate on resolving important Network issues.
- Potential to reduce data handoffs and minimize the potential for error.
- Harmonisation of data requirements at the Sub-regional level across member states and data provided in the form of template requests. Specific requirements managed at Sub-Regional level and passed upwards to NM.
- Automated data flows from NM to the Sub-regional DCBs and beyond to the end users.
- Efficiencies of scale for the NM, i.e. potential headcount reduction as a result of a lower number of requests being made to them.
- Overall reduction in the number of individual DCB solutions. Facilitating interoperability between member states, reducing technical complexity and lower overhead costs for e.g. maintenance and support
- Pan-European common operational DCB processes.
- Potentially quicker deployment of DCB concepts using a common service.

Negative arguments against the initiative:

- Potential resistance from certain airports under data rationalisation
- Layers of governance and structure to be created, and their potential cost implications
- Significant initial development and implementation costs, due to the need to develop the common service and client software.
- A Sub-regional system will have to meet the requirements of all stakeholders using it, therefore the system may become less focused to individual local needs.

2.2.3 Area of Coverage

The service relates to the area covered by a collection of (at least 2) ACCs. CDM activity relating to the service occurs across Europe. Information relating to the service is required to be available world-wide.

2.2.4 Quality of Service

Service Availability

- Major loss of service to customers shall not occur more than once in 5 years and shall not last more than an hour (information integrity maintained)
- A minimal Sub-regional service shall always be maintained (the service may be provided using supervisory operational staff if necessary).

- Information provided by the Sub-regional function shall be validated as being sufficiently accurate for its intended purpose.

Priority is given to the information closest to time of operation which would cause the greatest short-term impact. Short-term measures impacting controller workload may be safety related depending on prevailing operational conditions.

Accuracy, timeliness and assurance of information improve as appropriate as the time of operation approaches. It must be noted that the accuracy of predictions are based upon the accuracy of the base data used to make the prediction.

Note: As a part of the TRL-4 and TRL-6 validations, Service Availability, Message Integrity, Data Integrity and Time of Response quality of service metrics were measured.

2.2.5 Service Pattern

The Sub-regional service, within the scope described in Scope of the Business Model covering the Planning phase to Execution, is outsourced. The outsourcing is organised as a common service or set of common services that can be offered to an ANSP in order to manage Sub-regional activities.

2.2.6 Timeframe of Opportunity

The service is expected to exist for the foreseeable future, most likely in support of traffic levels over the next 30 years.

2.2.7 Expected Benefits

The SESAR 2020 MAWP [9] lists the expected benefits as:

Enhanced predictability of the Sub-regional operation will lead to:

- Improved Cost Efficiency

The benefits of deploying the Sub-regional service itself will lead to the cost reduction benefits described. The deployment of the Common Service itself will mainly benefit the ANSP related cost optimisation aspects. Consequently, the business benefits assessed within this model are solely related to ANSP cost effectiveness.

KPA (KPI)	Performance Benefits Expectation local to Direct Consumer	Performance Benefits Expectations at Network Level (ECAC Wide)[1]

[1] Negative impacts are indicated in red.

[2] Performance expectations are mostly considered at ECAC level according to PJ19-04 guidelines. Given that the PJ15-01 TRL6 CBA considers the ECAC scope, we recommend considering the Network Level rather than the Direct Consumer.

KPA (KPI)		Performance Benefits Expectation local to Direct Consumer	Performance Benefits Expectations at Network Level (ECAC Wide)[1]
Environment / Fuel Efficiency (Fuel Burn per Flight)		0.0%	0.0%
Airspace Capacity (Throughput / Airspace Volume & Time)		0.0%	0.0%
Airport Capacity (Runway Throughput Flights/Hour)		0.0%	0.0%
Predictability (Flight Duration Variability, against RBT)		0.0%	0.0%
Safety	**Mitigation of safety risk**	0.0%	0.0%
Cost Effectiveness	**Cost of operation**	0.0%	0.0%
Cost Effectiveness	**ATCO Productivity**	0.0%	0.0%
	Technology Cost	See ECAC-wide level[2]	0.02%

Table 4: Expected Benefits

2.2.8 Candidate Deployment for Sub-region

The maximum benefits of the Sub-region will be achieved when all local actors in Europe are represented by a Sub-region. However, the primary candidates are those with current or expected increases in traffic demand and / or complexity.

Target Regions for Sub-regional DCB are identified in the table below.

Class	Description	Full Service	Partial Service
1. New Sub-regional DCB Service	An ANSP that does not provide or participate in a Sub-region may wish to do so as a consequence of increasing / complex traffic demand in a multi-ACC environment or wishing to participate in a multi ACC environment (e.g. FAB).	√	√
2. Refreshment of Legacy Sub-regional DCB Service	An ANSP with a legacy Sub-regional operation wishing to transition to a lower cost, SESAR compliant operation due to operational or business pressure	√	√

Table 5: Classes for Category

The preceding Sub-regional classes are identified based on their significance to the European network and to their impact on network performance.

The table identifies the likely service use of the Common Service for each Sub-regional class against the following levels:

- A full Sub-regional service constitutes all the aspects defined within the common service and is most appropriate for strategic integration of busy / complex airspace.
- A partial Sub-regional service constitutes a combination of the services described in this document as appropriate for local need. However, in all cases, complete interaction with the regional Network Manager is mandatory for the overall benefit of European ATM.

2.2.9 Consumer / Customer Segments

Consumers of the service are expected to be:

- ANSPs (Flow Managers, Local Traffic Managers, ACC)
- Military
- Airports
- Airlines
- NMD
- Other Sub-Regions

Information generated by this service is likely to be useful to the End Customer (travelling public)

2.2.9.1 Key Activities

2.2.9.1.1 Long-term Planning (5 years to 6 months before Day of Operation)

- Provision of long-term demand information from the Regional service (Collation of information from AU, Airports, Military, ANSP).
- CDM processes relating to planning for the day of operation, with a continuously improving level of planning information accuracy over the long-term planning timeframe. Major event planning (e.g. Olympics) is undertaken in this timeframe. Use of historic data, schedule data and local intelligence are used to develop early demand pictures. An early picture of capacity plans including potential sector configuration and required staffing can be developed in this time frame. Potential early picture of FCA demand and required staffing can be developed.
- KPI's (performance information and targets) based on business and/or regulatory drivers can be set within this time frame.
- Proposed flight schedules will become available and a resultant demand picture will be calculated.

2.2.9.1.2 Medium/Short-term Planning (6 months before Day of Operation)

- Provision of medium/short-term demand information from the Regional service (Collation of information from AU, Airports, Military, MET, ANSP).
- CDM processes relating to planning for the day of operation, with a continuously improving level of planning information accuracy over the medium/short-term planning timeframe. Early long-term planning is refined within the Medium/Short timeframe. Capacity plans including Sector configurations will be refined within this phase. Key milestones are the finalisation of operations room staffing /configuration (3 to 1.5 months before day of operation) and the day before operation when the daily plans are finalised with accurate met information.
- KPIs (performance information and targets) based on business and/or regulatory drivers can be set within this time frame.
- It must be noted that weather data will only be available in the short-term planning horizon and this is likely to be close to the day of operation.
- Local demand pictures will be generated using available data sources. The accuracy of data will determine the use of this data.
- Imbalances and hotspots will be identified and highlighted within this phase, but not necessarily acted upon.
- ATFCM Measures including Regulation and other measures will be further planned in this phase although not necessarily implemented within this phase.
- Potential capacity measures may be planned within this phase.
- Potential runway configurations including SID/STAR configuration will be planned within this phase.
- The Airport strategic plan will be developed.

2.2.9.1.3 Day of Operation

- Implementation of the plans created in the Long/Medium/Short-term time frames.
- KPI's (performance information and targets) can be measured against the planned business and/or regulatory targets within this time frame.
- Runway configurations will be implemented within this time frame.
- Close to time of operation CDM on the day of operation in relation to Local issues.
- Imbalances and hotspots will be identified and highlighted within this phase, which may or be acted upon through capacity or demand measures depending on traffic evolution throughout the day of operation.
- Local demand pictures will be refined with additional data sources within this phase.
- Capacity plans and measures including sector configurations will be implemented within this phase.
- Demand measures such as Regulation and STAM may be implemented within this phase.

2.2.9.1.4 Key Resources

- Regional, Sub-regional and local Network Management information infrastructure,
- Regional / Sub-regional / Local applications,
- User (Civil and Military) provision of demand planning information,
- ANSP / Airport provision capacity planning information,
- Met forecasts (provided by regional weather providers),
- Appropriate AU and NMF related users for CDM purposes.

2.2.9.2 Key Information Flows

2.2.9.2.1 Sub-Regional Flow Manager (FM) & Adjacent Area Control Centre (ACC)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Adjacent Area Control Centre (ACC)**
	Short-Term ATFCM Measures	<>	
	ACC Tactical Demand	<	
	Sector Configuration Plans	<>	
	Sector Capacity	<	
	Hotspot	<>	
	Airspace Model	<	
	Capacity Plan	>	
	ATFCM Measures	<>	
	Performance Information/Targets	<	
	Post-Ops Data	<>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

2.2.9.2.2 Sub-Regional Flow Manager (FM) & Regional Network Manager (NM)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Regional Network Manager (NM)**
	Short-Term ATFCM Measures	<>	
	Sub-Regional ATFCM Measures	>	
	Sub-Regional Hotspots	>	
	Airspace Configuration (ACC operating configuration, Airport operating configuration)	>	
	Capacity	>	
	AFUA	>	
	Surveillance	>	

	Regional Demand	<	
	Proposed Flight Schedules (forecast data)	<	
	Regional Performance	<	
	Regional MET	<	
	Crisis	<>	
	Regional ATFCM Measures	<	
	Regional Hotspots	<	
	Network Management Operations Plan	<	
	Post Ops Analysis data	<	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

2.2.9.2.3 Sub-Regional Flow Manager (FM) & Local Area Control Centre (ACC)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Local Area Control Centre (ACC)**
	Short-Term ATFCM Measures	<>	
	ACC Tactical Demand	<	
	Sector Configuration Plans	<>	
	Sector Capacity	<	
	Hotspot	<>	
	Airspace Model	<	
	Capacity Plan	<>	
	ATFCM Measures	<>	
	SIDS & STARS	<	
	Performance Information/Targets	<	
	Post Ops Analysis data	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

2.2.9.2.4 Sub-Regional Flow Manager (FM) & Local or Adjacent Area Control Centre (ACC)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Local or Adjacent Area Control Centre (ACC)**
	Short-Term ATFCM Measures	<>	
	ACC Tactical Demand	<	
	Sector Configuration Plans	<>	
	Sector Capacity	<	
	Hotspot	<>	
	Airspace Model	<	
	Capacity Plan	<>	
	ATFCM Measures	<>	
	Performance Information/Targets	<	
	Post Ops Analysis data	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

2.2.9.2.5 Sub-Regional Flow Manager (FM) & Local Airport

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Local Airport**
	Short-Term ATFCM Measures	<>	
	Airport Capacity Capabilities	<	
	Runway Configuration	<	
	SIDS & STARS	<	
	ATFCM Measures	<	
	Departure Manager	<	
	Local Demand Picture (generated from Local data sources e.g. FDP)	<	
	ATFCM Measures	>	
	Actual Landing Rates	<>	

	Airport Strategic Plan (incl. Performance Information/Targets)	<	
	Post Ops Analysis data	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

Note: Departure Manager data relates to Arrival Planning Information (API), Departure Planning Information Planning (DPI) and Target Start-up Approval Time (TSAT) information.

2.2.9.2.6 Sub-Regional Flow Manager (FM) & Airspace User (AU)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Airspace User (AU)**
	Short-Term ATFCM Measures	<>	
	Proposed Flight Schedule	<	
	Trajectory Information	<	
	Operational Priorities	<	
	ATFCM Measures	>	
	Proposed Trajectory Improvements	>	

2.2.9.2.7 Sub-Regional Flow Manager (FM) & Military User (MIL)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Military User (MIL)**
	Short-Term ATFCM Measures	<	
	MIL Airspace Availability	>	
	MIL Airspace Usage	<	
	Civil Demand	>	

2.2.10 Source / Reference

Significant input from SESAR 1 and SESAR 2020 as follows:

- SESAR 1: WP 7/13 and OFA05.03.07 for network Management concepts
- SESAR 2020 PJ19.02, SESAR 2020 Transition CONOPS for direction of the Sub-regional concept in SESAR 2020.
- SESAR 2020 Project 09 for additional evolution of the Sub-regional concept.
- SESAR 2020 Project 24 for additional demonstration of the Sub-regional concept.

Safety considerations:

In terms of concept, PJ15-01 is aligned with SESAR 1 7.2/13.2.3 and with SESAR 2020 PJ09 and as a result a full safety assessment will not be carried out against implementation of a Sub-regional DCB common service. It is expected that there will be some architectural differences between a standard implementation (defined in SESAR 1 13.2.3 SPR documentation [37][38]) and through introduction of a Sub-regional DCB common service and therefore a safety assessment will be performed against these expected architectural differences.

An assessment of applicable PJ9 safety documentation has been conducted and any relevant safety requirements will be incorporated into the PJ15.01 Validation Report (TVALR).

Security considerations:

The SECRAM process has been applied to Sub-regional DCB Common Service for TRL-4 and can be found at the Security Assessment Reports (Low Risk, Medium Risk and High) [39][40][41].

Regulatory impact:

Any potential regulatory impact will be developed in a later version of this document.

2.3 Detailed Description and Issues of the OI Steps

OI Steps:

Number	Title	Step
SDM-0401	Sub-Regional DCB Common Service (Business Improvement).	

Table 6: OI Steps

2.4 List of Enablers

Enabler:

Number	Title	Step
SVC-005	Provision of cost-efficient Sub-Regional DCB capabilities using a Common Service.	

Table 7: Enablers

3 Business Model

3.1 Business Model Approach

To consider the business aspects of the Sub-regional DCB Common Service the Business Model Canvas [7] is used as a starting point. The Canvas defines a business model as describing "the rationale of how an organisation creates, delivers and captures value." It suggests that a business model can be described through nine basic building blocks that show the logic of how a company intends to make money. The nine blocks cover the four main areas of a business: customers, offer, infrastructure and financial viability. The business model is like a blueprint for a strategy to be implemented through organisational structures, processes and systems. The basic canvas is illustrated in Figure 3.

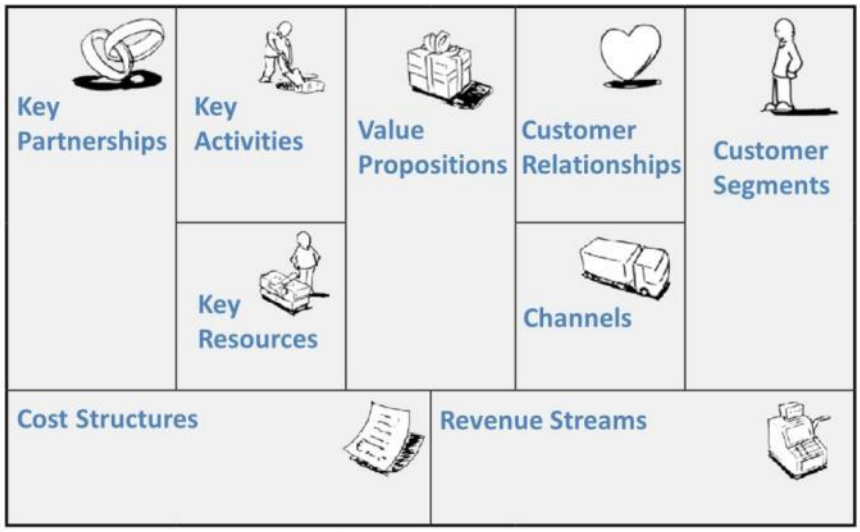

Figure 3: Business Model Canvas

The Business Model Canvas is widely used, and many written examples are available on the internet. It thus provides a relatively robust approach to examine and describe the main building blocks for a Common Service. More detail is provided in D02 Options for Common Services, the foundation document produced by Project B04.05 [2] and the Reference Material, Business Model Generation.

The building blocks within the canvas are as follows:

1. Customer Segments: what is the market the Sub-regional DCB Common Service Provider operates in and how does it differentiate its customer segments?
2. Value Propositions: what is the value that the Common Services offers to its environment?
3. Channels: how does the provider of the Common Service interact with its customers and consumers?
4. Customer Relationships: what is the provider's relationship with its customers and consumers?

5. Revenue Streams: what is the pricing mechanism and where is the revenue derived from?
6. Key resources: what resources does the Common Service Provider require?
7. Key Activities: what are the activities and processes that are undertaken on behalf of others, the capability offered as the Common Service?
8. Key Partnerships: what capabilities does the provider need from others to enable it to operate?
9. Cost Structure: what costs are incurred by the Common Service Provider; how do they relate to each other and the value proposition?

The first step in modelling a Common Services is to clearly identify the business functions being considered and to separate them from other functions that may exist in the same organisation or environment, such as an aerodrome. The separated business function(s) becomes the focus of the Common Service's business model and a guide to the type of business being considered: customer relationship, innovation or infrastructure. Each of type of business has different economic, cultural and competitive drivers and the manner for how the business function is separated provides a pattern for delivery. To assist, subject matter experts describe a set of user stories for the business being considered. These are then reviewed by others involved or interested stakeholders. The stories provide a narrative of how the Common Service is seen from different customer perspectives; in this case the provision of Sub-regional DCB. These perspectives provide an insight into the customer's perceived value of the service and the relationship that they have with the provider. From this overall understanding, the business model can then be described.

Each of the stories in Section 4 is then described in the form of the Business Model Canvas. Inevitably, value needs to be perceived from different contexts as each party in the value chain makes their own contribution to the final outcome. The stories are thus described as a set of linked canvases where one describes the business model for the consumer of the common service, recognising the common service provider as a key partner in their operation.

Figure 4 below is a conceptual model illustrating the principle of scalable response introduced in the ICAO Service Delivery Management (ATM SDM) [43]. The diagram shows how an ATM concept for a specific environment can be achieved by an appropriate balance of seven concept components. The components being, Airspace Organisation and Management (AOM), Airspace User Operations (AUO), Airport Operations (AO), Conflict Management (CM), Demand Capacity Balancing (DCB), Traffic Synchronisation (TS) and ATM Service Design (ATMSD). These seven are supported in an information rich environment provided by Information Management (IM). Whilst intended to be used on a regional basis, the principle is equally applicable to the context of an aerodrome as all the components need to be provided to a greater or lesser degree.

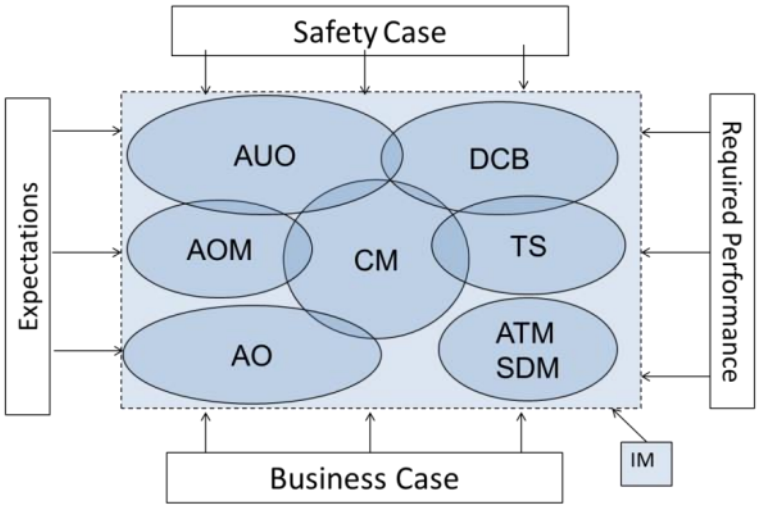

Figure 4: ICAO Global Operating Concept Scalable Response

The overall ATM performance achieved for an environment is the outcome of the capabilities supporting each of the components. In EATMA, the taxonomy for the capabilities is based upon these components. The model thus provides, in the context of the user stories for the Sub-regional DCB Common Service, a means to describe what capabilities are provided by the Service Provider and in what pattern.

3.1.1 Unbundling the Sub-regional DCB Common Service Business

Table 8 describes for each component which in the context of Sub-region is responsible for the undertaking a specific capability and under what pattern. Those items in **Bold** are the primary scope of the Sub-regional DCB Common Service Provider.

Component	ANSP Sub-Region	Sub-regional Common Service Provider	Provision Pattern
Airspace Organisation and Management	No Change		
Airspace User Operations	No Change		
Airport Operations	No Change		
Conflict Management	No Change		
Demand Capacity Balancing: Long-term	**Long-term Capacity Planning**	**Sub-regional DCB**	**Outsourced**
Demand Capacity Balancing: Medium term	**Medium Term DCB**	**Sub-regional DCB**	**Outsourced**
Demand Capacity Balancing: Short-term / Execution	**Short-term / Execution DCB**	**Sub-regional DCB**	**Outsourced**
Traffic Synchronisation	No Change		

Component	ANSP Sub-Region	Sub-regional Common Service Provider	Provision Pattern
ATM Service Design	No Change		
Information Management		**Sub-regional Planning and co-ordination information**	**Outsourced**

Table 8: -Summary of Roles and Provision Patterns

3.2 Sub-regional Context

Figure 5 below depicts a complete Sub-regional context, at the OPERATIONAL level, with all the expected service interactions. The diagram depicts the DCB service provided to the local actors, by the Sub-region, supported by the regional actor. For the avoidance of doubt, the Sub-regional and regional DCB functions exist purely in service of the local actors (ACC, AO, AU, Mil) in achieving local, Sub-regional and regional performance expectation. These performance expectations are achieved through extensive planning activities leading to predictable outcomes during operation. The key benefit of the Sub-region is the understanding of local performance aspirations, planned ATFCM measures, possible contingency measures, airspace and the prevailing operational situation to provide the operational flexibility to optimise the various operations.

The Sub-regional common service is defined by assessment of each of the interface relationships identified in Fig 4 below whereby a commercial entity (an ANSP or an entity in conjunction with an existing ANSP) can provide those services to an adjacent ANSP and / or the associated local actors.

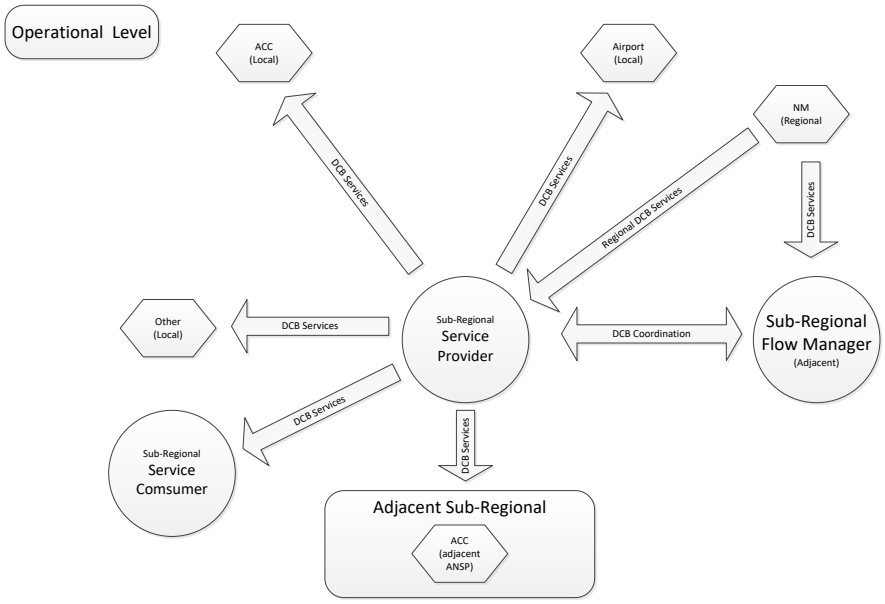

Figure 5: Sub-region Stakeholder Interaction (Operational Level)

In support of the operational context, there are several essential information flows. These generally run counter to the operational service provision and, for clarity, these technical level flows are depicted in section 4.2.3.1.2 (Data Provision).

3.3 Business Case

Table 9 shows the performance assessments results for the Sub-regional DCB Service. The validation targets and resultant benefits expectations are managed via PJ19-04. An assessment result of N/A, for not applicable, indicates that PJ15-01 is not expected to impact the KPA. An assessment result of 0% means that the PJ15-01 is expected to (possibly) impact the KPA but have been assessed not to do so.

KPA (KPI)		Validation Targets – Network Level (ECAC Wide)	Performance Benefits Expectations at Network Level (ECAC Wide)[2]	Confidence in Results[3]
Environment / Fuel Efficiency (Fuel Burn per Flight)		0%	0%	N/A
Airspace Capacity (Throughput / Airspace Volume & Time)		0%	0%	N/A
Airport Capacity (Runway Throughput Flights/Hour)		0%	0%	N/A
Predictability (Flight Duration Variability, against RBT)		0%	0%	N/A
Cost Effectiveness	**ATCO Productivity**	0%	0%	N/A

KPA (KPI)		Validation Targets – Network Level (ECAC Wide)	Performance Benefits Expectations at Network Level (ECAC Wide)[2]	Confidence in Results[3]
	Technology Cost	0.073% as per D4.8 Validation Targets (2019) of 23/01/2019.	0.02%	Medium to High

Table 9: Assessment Results Summary

3.4 Projected European Air Traffic

The case for Sub-regional service deployment needs to be considered within the context of expected traffic growth as identified in EUROCONTROL Challenges of Growth and Forecast of annual numbers of IFR flights [17]. A summary of these assessments is presented here.

From a methodological point of view, it is important to clarify that the two reports consider slightly different scopes (IFR 2023 and IFR 2035). A change in the geographical area considered was introduced in EUROCONTROL STATFOR studies in September 2015. For the purposes of this document, the impact of the slightly different areas studied can be considered negligible. As a summary:

- IFR traffic projections up to 2023 consider the ECAC area.
- IFR traffic projections up to 2035 consider the ESRA08[4] area.

Traffic growth is expected to be fastest in Eastern Europe due to economic Gross Domestic Product (GDP) growth and increasing traffic from the Asia/Pacific and Middle Eastern regions[5].

To 2035 the ESRA Eastern region is projected to grow at an average of 2.2% per year (for intra-European traffic) and 3.2% per year (for arrival/departure traffic) in comparison to ESRA North-West region is projected to grow at an average of 0.5% per year (for intra-European traffic) and 2.1% per year (for arrival/departure traffic) based on what is assumed to be the most likely 'C: Regulated Growth' scenario.

The ESRA North-West region states UK, France and Germany are projected to maintain the highest total number of flights, Germany managing approx. 3500 more flights per day compared with 2012 and UK and France between 2000 and 3000 more flights per day [1]. UK,

[4] The EUROCONTROL Statistical Reference Area (ESRA) is designed to include as much as possible of the ECAC area for which data are available from a range of sources within the Agency. ESRA08 was introduced in 2009 reports. It was used as a basis for comparison at European level in the forecasts up to September 2015.

[5] EUROCONTROL Challenges to Growth 2013 Task 4: European Air Traffic in 2035

France and Germany are projected to have the greatest increase in the number of departing flights in Europe between 500 and 1000 per day [1], apart from Turkey at over 2500 per day. The highest growth in ESRA region to region traffic flows are expected between ESRA East and ESRA North-West at 2.6% per year [1] or at 4.0% per year [2]

The ESRA Mediterranean region is projected to increase at 2.6% (for arrival/departure traffic).

Turkey is projected to handle the greatest increase in the number of flights handled of 5000 more per day in 2035 than in 2012 and the greatest increase in arrivals/departures of 2600 more per day than in 2012.

Figure 6 represents the expected annual average traffic growth rate for ESRA08 with higher expected average annual growth. The intensity of the colours summarises visually the clear differences between ESRA North-West, Mediterranean and East.

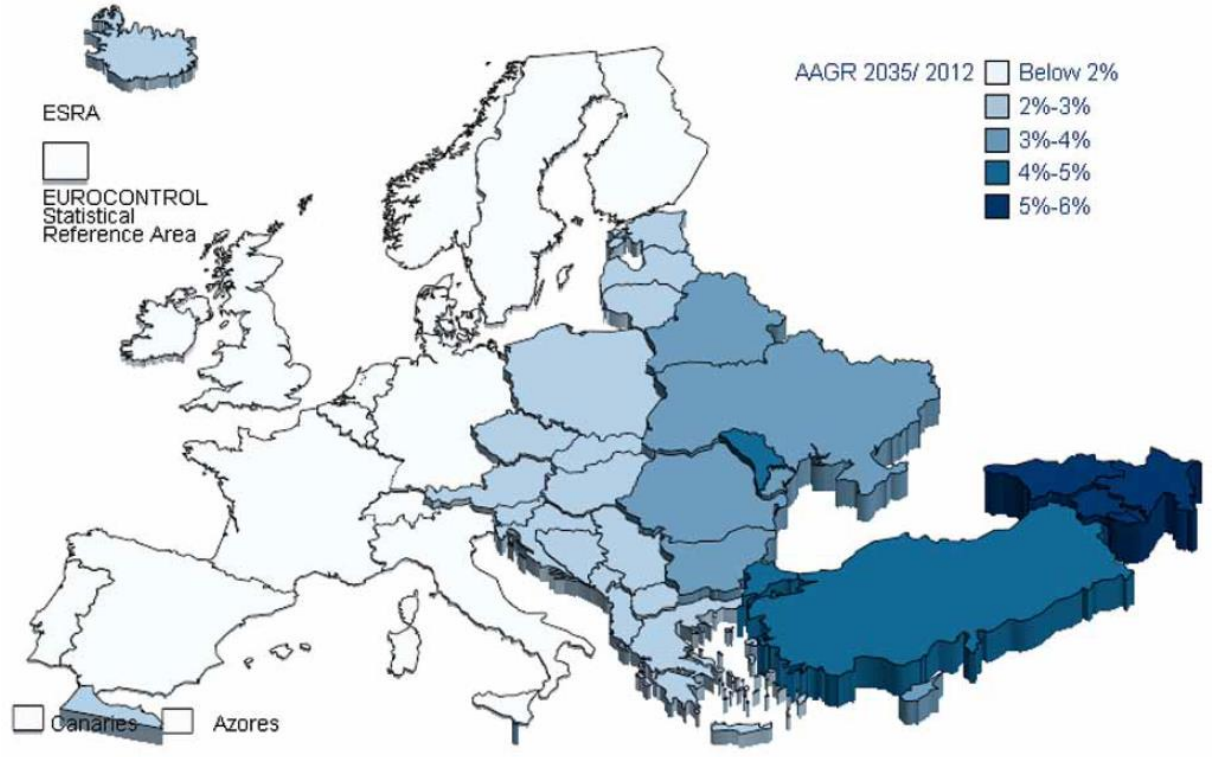

Figure 6: Average annual growth 2012-2035 in ESRA08 region

The impact of adverse conditions due to terrorism, airspace blockages (e.g. Eastern Ukraine, Syria and Libya) and flight ban on flights between Russia and Turkey have affected traffic growth projections[6] for example;

State	Region	AAGR 2035/2012[1]	AAGR 2022/2015[2]	AAGR 2022/2016[7]
Armenia	ESRA Eastern	5.1%	4.2%	2.8%
Azerbaijan	ESRA Eastern	5.4%	5.0%	3.8%
Georgia	ESRA Eastern	5.4%	4.3%	4.1%
Hungary	ESRA Eastern	3.0%	3.6%	2.8%
Romania	ESRA Eastern	3.5%	3.0%	3.2%
Ukraine	ESRA Eastern	3.9%	3.5%	4.8%
Cyprus	ESRA Mediterranean	3.6%	4.3%	4.4%
Turkey	ESRA Mediterranean	4.4%	3.6%	3.8%
Bulgaria		4.5%		

Note: AAGR – Annual Average Growth Rate

Table 10: STATFOR Projected European Traffic

The traffic growth picture does not seem different by Area Control Centre. Although long-term projections are not available per ACC, 35 out of 63 ACCs in EUROCONTROL area reported their highest traffic levels on record for the year 2016. It is remarkable that the previous record dated back before the start of the economic crisis in 2008. Figure 7 shows the growth versions previous year per ACC [31].

[6] EUROCONTROL Seven-Year Forecast September 2016 Flight Movements and Service Units 2016 -2022

[7] EUROCONTROL Seven-Year Forecast. Flight Movements and Service Units 2016-2023. Edition February 2017

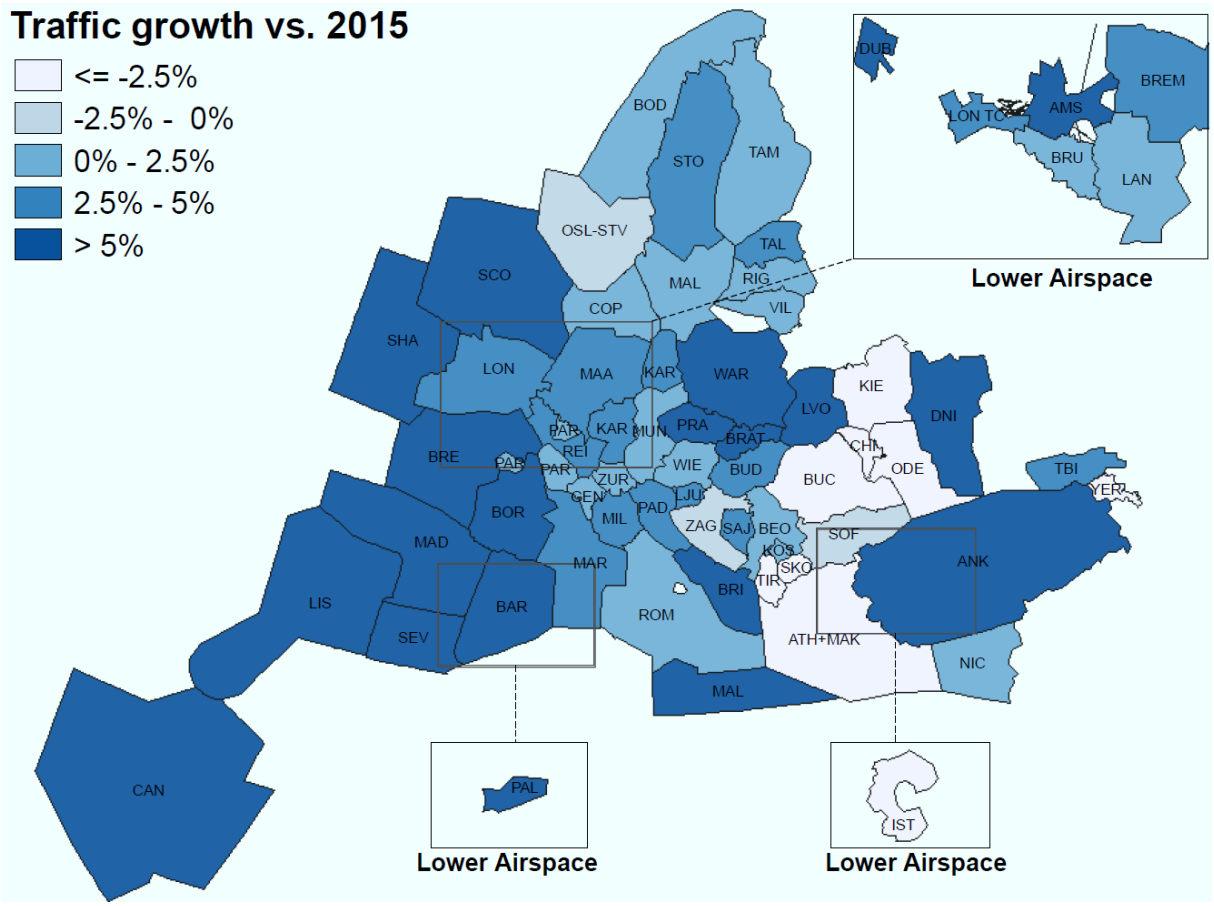

Figure 7: Annual growth 2015-2016 in EUROCONTROL area per ACC

In general ATM capabilities for states within the ESRA Eastern region are not as developed as those within the ESRA North-West region, so a faster increase in traffic will place greater strain on infrastructure with associated negative effects on other European ATM providers.

From the above analysis, the implication is that all the northern states and all of the high growth eastern and Mediterranean states will benefit by participation in a Sub-region. Note that optimal benefit to European ATM is enabled by having complete Sub-regional cover throughout the continent.

4 User Stories

The primary customer view point for the use of the Sub-regional DCB Common Service is taken from Table 5 in Paragraph 2.2.8. This table identifies the classes of potential Sub-regional provision and their likely uses of the service. The main customer segment being:

> 1 European ANSP without a specific Sub-regional operation faced with increasing traffic demand / complexity with investment restrictions.
>
> 2 European ANSP with a legacy Sub-regional operation (or element thereof) faced with increasing operating cost, the need to comply with European legislation, manage increasing demand whilst reducing lifecycle cost.

In reading the user stories below, it should be noted that the MAWP [9] states:

- GA/ Rotorcraft: the project will consider GA and Rotorcraft to be AUs, investigating operational requirements specific to these users. Specific technological requirements shall be coordinated with PJ.13.
- Civil RPAS: It is intended that Civil RPAS will integrate safely and transparently in non-segregated airspace, in a multi-aircraft and manned flight environment, guaranteeing the interoperability with the ATM system. Operational considerations specific to RPAS will be identified and technological needs, if any, coordinated with PJ.13.

In relation to PJ.15-01, the fundamental premise of DCB is the availability of trajectories within a known airspace. Consequently, in order to operate within an airspace volume subject to DCB, GA/Rotorcraft and RPAS are required to provide the same Business or Mission Trajectory information as any other aircraft. Therefore, no special provision is considered necessary for this class of vehicle.

4.1 New Sub-regional DCB Service

An ANSP that does not provide or participate in a Sub-region may wish to do so because of increasing / complex traffic demand in a multi-ACC environment or wishing to participate in a multi ACC environment (e.g. FAB).

4.2 User Stories

4.2.1 Sub-regional Flow Manager (ANSP)

The key benefit from the provision of a new Sub-regional common service is that the ANSP consumer avoids the full cost of providing this operational service for themselves, maintaining – possibly – the residual information communications function. The canvas below describes the relationship between the provider and the consumer.

Increasing traffic density and complexity leads to the need for the creation of a Sub-region to support the DCB activities for a set of local actors. The local actors can be (for example) the ACCs and Airports contained within the airspace under consideration (subsequently referred to as **The Airspace**). We could also consider that several ACCs, belonging to one single ANSP or to several ANSPs, decide to implement one common flow manager, which becomes the consumer of the service available from a Sub-Regional DCB Provider for The Airspace.

The ANSP (henceforth referred to as **ANSP 1**) is responsible for The Airspace and needs to develop the Sub-region to meet the evolving operational need. **ANSP1 is the operational delivery interface for the Sub-regional capability**.

ANSP1 could go to the extensive cost of developing the complete capability. Alternatively, ANSP1 could chose to **CONSUME** a Sub-regional **COMMON SERVICE** provided by another entity.

A commercial entity (Sub-regional DCB Common Service **PROVIDER**) offers an operational common service required by ANSP1. ANSP1 choses to **enable** its Sub-regional capabilities by CONSUMING the service offered by the PROVIDER. In doing so, ANSP1 avoids the cost of setting up operational and technical capabilities but remains the delivery point of the operational service to the local actors within the Sub-region.

Sub-Regional FM DCB Service Providers (ANSP1) must consume DCB co-ordination services from adjacent Sub-Regional FM DCB Service **PROVIDERs** which have responsibility for the airspace of the adjacent Sub-Region.

An ANSP which intends to provide a DCB Service for a Sub-region by acting as a Sub-Regional FM, based on a COMMON SERVICE offering, can consume the DCB Services provided by other Sub-Regional FM based on their COMMON SERVICE offerings.

4.2.1.1 Sub-Regional Flow Manager (FM) & Adjacent Flow Manager (FM)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**ACC (Adjacent)**
	Hotspot	<>	
	ATFCM Measures	<>	

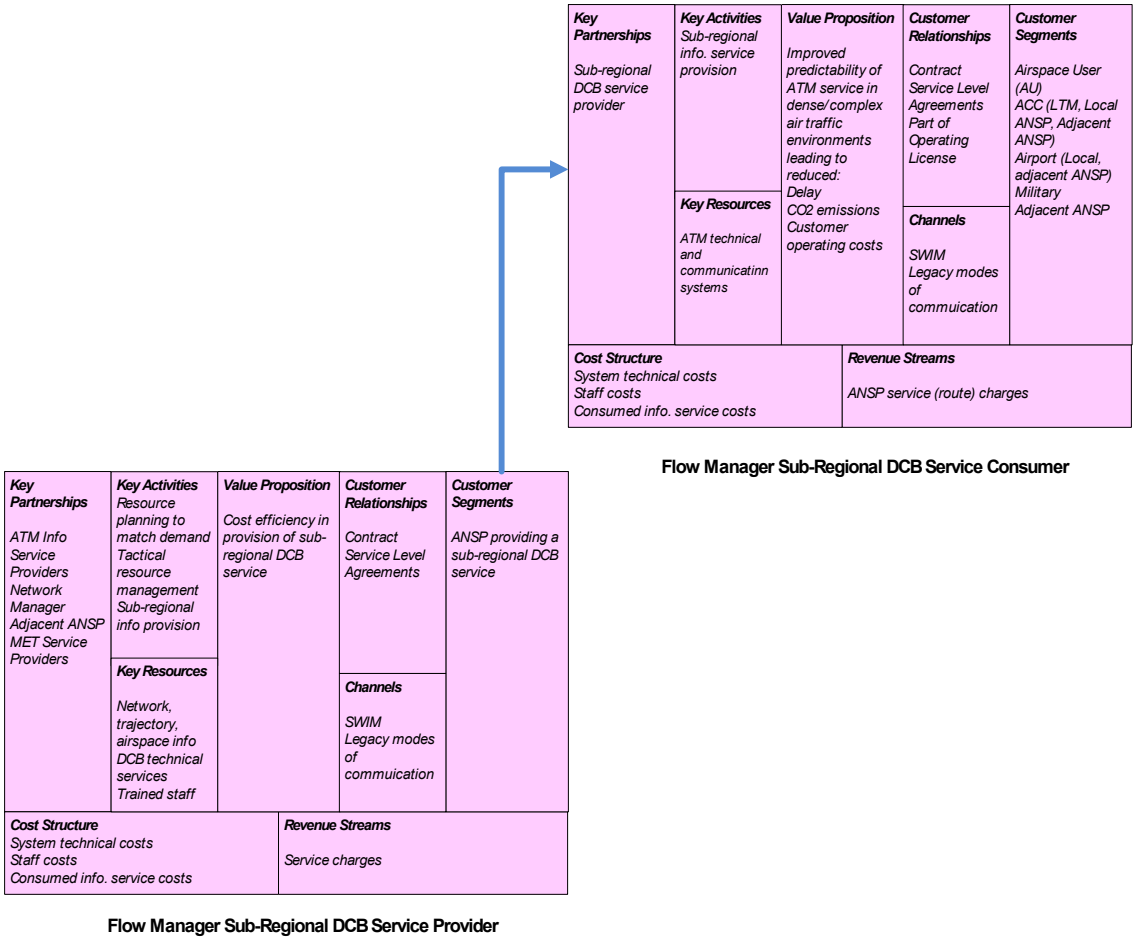

Figure 8: Sub-regional Provider Canvas

4.2.2 Sub-regional Common Service Provider

This user story is written from the perspective of the Sub-regional Common Service Provider and discusses Operational service provision within the context of a Sub-Regional DCB service being provided to new consumer. It is assumed from a service perspective that the Sub-regional Common Service provider will provide an operational service to the Sub-regional service consumer and this provision will be via Common Service.

4.2.2.1 Sub-regional Common Service Provider (Operational)

The provision of a Sub-regional operation at many of the smaller ANSP's in Europe with limited movements or with seasonal variations in demand can be costly. Accessing a Sub-regional service by contracting a suitable common service provider offers the opportunity to gain access to affordable services that can be tailored to the level of service required. Being no longer dependent on local resources, the ANSP can quickly respond to increasing demand by drawing on Sub-regional services from the common service provider.

The Sub-regional Common Service makes this possible by defining the service on an open basis, employing standards wherever possible. The Sub-regional Common Service is provided remotely to the Sub-Regional Common Service consumer through communications channels and through a common picture of demand and capacity between provider and consumer. An

understanding of consumer business objectives and KPIs is essential for the provider to provide the correct level of service.

A small ANSP could put in place staff, training, procedures, systems and communication channels to implement a Sub-Regional Flow Manager service; however, the cost of this would be prohibitively expensive for an ANSP with limited movements or with seasonal variations. The ANSP's management could tackle this problem by considering partnerships with neighbouring ANSPs or consuming COMMON services from an adjacent Sub-Regional Common Service Provider rather than directly employing controllers and developing systems to support the DCB process.

The Common Service concept is based upon the ANSP having access to the common DCB picture described earlier. Systems to support the DCB process could be either purchased or leased from the Sub-regional provider, or from suitable manufacturers that are able to build these to the appropriate standards and with appropriate safety assurance. Exchange of the technical services is commonly done using SWIM in many locations and entirely feasible for an ANSP due to the availability of excellent wide band internet communications.

Once the Flow Manager scope (i.e. The Airspace) is determined, the next task is to select the Sub-regional Common Service provider. This is done again in open competition attracting prospective providers. The Sub-regional provider could have an established Sub-Regional capability and extend that capability to the Sub-regional Consumer. It can also be the case that a Sub-regional provider could be created to support a newly created Flow Manager. However, it must be noted that the creation of a new Sub-regional provider would require a level of system and process development. All of the providers are also certified to provide Sub-regional services.

One important area is integration of the Sub-region into the overall ATM system. Integration into NM, aerodromes, Airspace Users and Adjacent ANSPs or Sub-regional providers requires consideration. The Sub-Regional provider must understand how the Sub-regional consumers' airspace is integrated into a wider European airspace network. The Sub-regional provider must also understand how the actors within the new Sub-region interact with the aim of ensuring that the Sub-region operates in the most efficient and safe manor. The Sub-Regional Consumer retains overall responsibility and safety accountability for the movement of flights in the tactical phase.

The scope of the Sub-region must be defined. Settling on the scope of the Sub-region, the management selects a provider and agrees a contract over a defined period (e.g. 5 years) with clear levels of service, defined areas of liability and appropriate dispute mechanisms. Options are included to both extend and increase the level of service as required. The scope of the Sub-region from an operational scenario perspective must also be considered. The activities for Sub-region are the specific tasks that require coordination, for example a set of complex TMAs with interacting traffic that requires collaboration would be a candidate for Sub-regional activities, whereas upper airspace with limited interactions or need for coordination would not be a scenario managed by the Sub-region and would be managed locally.

In order to provide the Operational Service, the Sub-regional provider must enable **COMMON SERVICE** through provision of technical services (see Sub-regional consumer user story). The services are defined in the TRL-4 Service Description documentation [35][36][42].

Good relations are maintained by regular management review meetings between the providers of the Sub-regional services and the local ACC management based upon the data

available from many of the automated systems used. Sharing of data on an open basis helps prevent unnecessary discussion and argument on fault and in many cases leads to joint preventive measures being put in place to avoid losses of service.

4.2.2.1.1 Service Provision

Services provided are to be developed as the 15-01 Solution develops. Services for TRL-6 are defined in the solution Service Design Documents (SDD) [35][36][42]. At TRL-6 services offered to support technical validations are:

- Sub-regionalDCBCOSER
- PostOperationsIndicators
- HotspotDefinitionAndProposedSolution

It could be envisaged that a full Sub-regional DCB common service could provide a set of services aligned with:

- Airspace Configuration
- rolling ASM/ATFCM plan
- DCB/dDCB process:
    - Flow Regulations (ATFM Delays), including UDPP (Prioritisation).
    - Scenario Management (Flow Restrictions)
    - Cherry Picking (STAM)

    + Horizontal and/or vertical planning constraints on trajectories (Level Capping, Rerouting);

    + Metering (Ground, En-Route, arrival Advancing/slowing flights);

    + RBT constraints swapping or booking (for example TTA/TTOs, CTA/CTOs);
- Crisis Management

4.2.2.1.2 Data Provision

The following diagram describes the interactions between Sub-regional Provider and Sub-regional consumer and its stakeholders at a technical level.

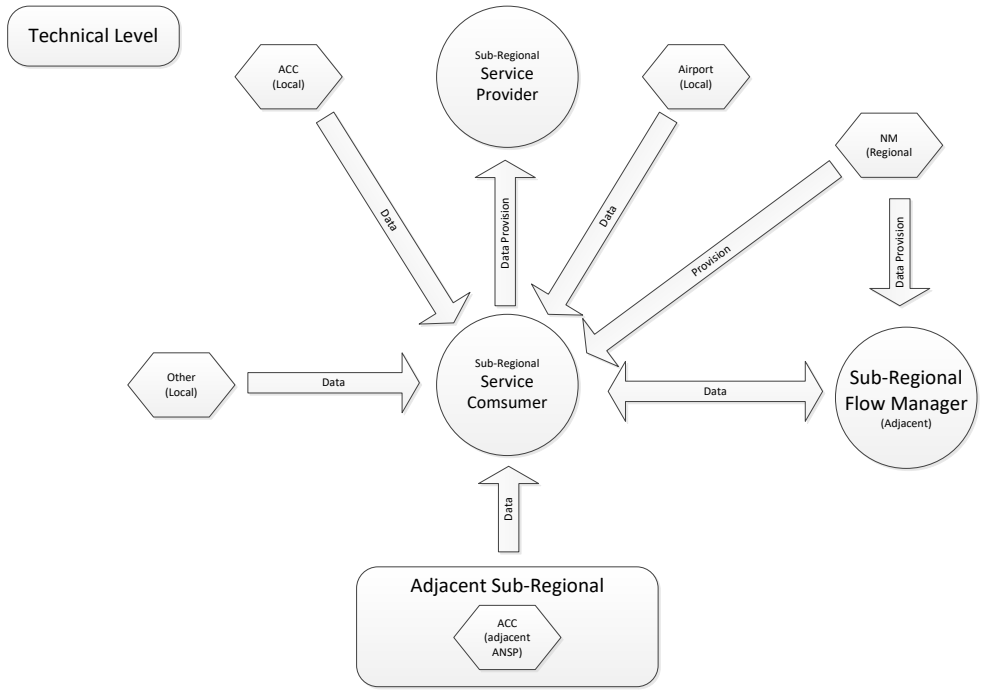

Figure 9: Sub-regional Service Provision (Technical Level)

At an operational level the Sub-regional Service Provider could provide the following information to the Sub-regional consumer:

- Long-term, Medium term and Close to time of Operation:
  - Demand vs Capacity analysis (Capacity / Entry Rates / Workload / Environment)
  - DCB set against KPIs (Business and Regulatory targets)
  - Hotspots information
  - Demand and Capacity solutions to manage hotspots
- Post-Ops Analysis
- Enabler for CDM environment

4.2.2.1.3 Timeframes

As stated before, the time frames where Sub-regional provider would provide a Sub-regional common service are:

- 6 Months to D-1 day
- D-1 to T-6 Hours
- T-6 hours to time of operation
- Post-Ops

Note: Execution itself has been omitted as a timeframe for Sub-regional common service consumption as safety accountability remains with the consumer within this time frame.

4.2.2.1.4 Scope of the Service

See Scope of the Service in the DCB Service Consumer section.

4.2.2.1.5 Sub-regional Scenarios

The scenarios where a Sub-regional common service can be provided need to be developed. The common set of scenarios that require solutions to be applied and de-conflicted with other stakeholder measures ensuring consistency of solution throughout the Sub-region. Some examples of scenarios are Coordination of Airport measures interacting with LTM measures, LTM measures interacting with adjacent LTM measures and Compatibility of Sub-regional solutions with adjacent Sub-regional solutions.

4.2.2.2 Model Canvas for Sub-regional Provider (Operational)

<table>
<tr>
<td rowspan="2">Key Partnerships

ATM info. service providers
Network Manager
Adjacent ANSP
MET service provider</td>
<td>Key Activities

Resource planning against demand
Tactical resource management
Sub-regional info. provision</td>
<td rowspan="2">Value Proposition

Cost efficient provision of Sub-regional DCB service</td>
<td>Customer Relationships

Operational Service contracts</td>
<td rowspan="2">Customer Segments

ANSP providing Sub-regional DCB services</td>
</tr>
<tr>
<td>Key Resources

Network info.
Trajectory info.(plan and tactical)
Airspace info.
DCB technical services
Expert staff</td>
<td>Channels

SWIM
Legacy comm. Channels</td>
</tr>
<tr>
<td colspan="3">Cost Structure
ATM System technical costs
Staff costs
Operational management</td>
<td colspan="2">Revenue Streams

Service charges</td>
</tr>
</table>

Figure 10: Sub-regional Provider - Consumer Canvas

4.2.3 Sub-regional Common Service Consumer

This user story is written from the perspective of the Sub-regional Common Service Consumer and discusses Technical service provision within the context of a Sub-Regional DCB service being provided to a new consumer. It is assumed from an operational service provision perspective that the Sub-regional Common Service Consumer will only consume the service and this consumption is described within the other user stories contained within this business model.

4.2.3.1 Sub-regional Common Service Consumer (Technical)

In order to avoid the cost of implementing Sub-regional service provision, an ANSP decides to consume a Sub-regional service from an appropriate Sub-regional provider. In this user story the example is an ANSP with no Sub-regional capability who wishes to transition to a SESAR compliant operation due to operational or business pressure and would consume a Sub-regional common service from an existing Sub-regional provider (operational). This will result in a cost reduction through the reduction of necessary resources to implement and operate a Sub-region, which would have to be provided multiple times in a distributed scenario.

When thinking about the Sub-regional Service Consumer technical provision we need to think about what the Sub-regional Service Provider needs from the consumer in order to provide the operational service. This User Story talks about the aspects that the Service Consumer must provide in order to enable the Service provider in providing a Sub-regional Common Service.

It is expected that the common service consumer will have to enable operational provision of the Sub-region in long, medium and short time frames and through to execution, plus post ops.

4.2.3.1.1 Service Provision

Services provided are to be developed as the 15-01 Solution develops. Services for TRL-6 are defined in the solution Service Design Documents (SDD) [35][36][42]. At TRL-6 services offered to support technical validations are:

- Sub-regionalDCBCOSER
- PostOperationsIndicators
- HotspotDefinitionAndProposedSolution

It could be envisaged that a full Sub-regional DCB common service could provide a set of services aligned with:

- Airspace Configuration
- rolling ASM/ATFCM plan
- DCB/dDCB process:
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    - Scenario Management (Flow Restrictions)
    - Cherry Picking (STAM)

    + Horizontal and/or vertical planning constraints on trajectories (Level Capping, Rerouting);

    + Metering (Ground, En-Route, arrival Advancing/slowing flights);

    + RBT constraints swapping or booking (for example TTA/TTOs, CTA/CTOs);
- Crisis Management

4.2.3.1.2 Data Provision

The following diagram describes the interactions between Sub-regional Provider and Sub-regional consumer and its stakeholders.

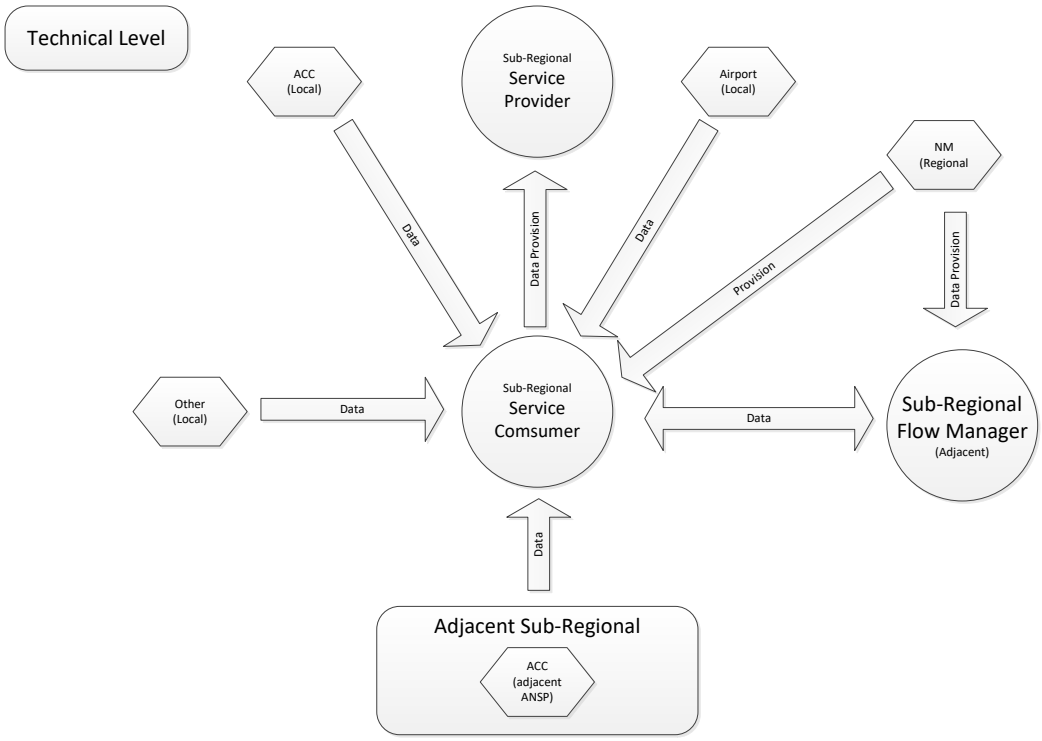

Figure 11: Sub-regional Service Provision (Technical Level)

The Sub-regional Service consumes the following information at a technical level as an enabler for Sub-regional common service provision at an operational level:

- Demand Data
- Sector configuration options (Short and Medium time frames)
- Airspace Configurations (available Sectorisation configurations)
- Airspace Definitions
- SUA Availability (as a feed into understanding capacity)
- Weather Information
- Monitor Values (including sustained and peak values)
- Stakeholder Information
- Method of Operations (appropriate to Sub-regional activities)

It may be appropriate to have a sub-set of the above elements to implement a Sub-region, the data required would be a dependent upon the scope of Sub-region.

Demand Data – Allows the Sub-Regional Manager to have situational awareness throughout the Sub-region through monitoring of demand data through the long, medium and short time

frames through to execution. Data would typically include FDP data, DDR data and ETFMS Data.

Sector configuration options (driven by e.g. ATCO validations and availability at unit level) – As a part of understanding capacity, the Sub-regional manager would need to understand the level of staffing available and therefore the sectors configurations that are available.

Airspace Configurations – As a part of understanding capacity, the Sub-regional manager would need to understand the common airspace configurations that the Sub-regional consumer would be expected to operate.

Airspace Definitions – As a part of understanding capacity, the Sub-regional manager would need to understand the common airspace configurations that the Sub-regional consumer would be expected to operate.

SUA Availability – As a part of understanding capacity, the Sub-regional manager would need to understand Special Use Area availability. It is expected that this information would only be available in the short-term or close to time of execution time frame.

Weather Information – As a part of understanding capacity, the Sub-regional manager would need to understand the weather situation and the implications for capacity. It is expected that this information would only be available with high accuracy in the short-term or close to time of execution time frame.

Monitor Values – As a part of understanding capacity, the Sub-regional manager would need to understand the operating capacities of the elemental sectors and any common sector combinations. Monitor values would typically include sustained and peak values.

Stakeholder Information – As a part of understanding communication channels, the Sub-regional manager would need to have points of contact information for stakeholders within the Sub-region. This would typically include, AO's, AU's, ACC's, etc.

Method of Operations – As a part of understanding the working practices of the Sub-regional consumer the Sub-regional manager would need access to the Method of operations of the ACC.

4.2.3.1.3 Timeframes

When thinking about the Sub-regional Service Consumer, it is important to consider the time frames that the service consumer will interact with the service provider. The time frames where Sub-regional consumer would consume a Sub-regional common service are:

- 6 Months to D-1 day
- D-1 to T-6 Hours
- T-6 hours to time of operation
- Post-Ops

  Note: Execution itself has been omitted as a timeframe for Sub-regional common service consumption as safety accountability remains with the consumer within this time frame.

4.2.3.1.4 Scope of the Service

The scope of the service should be focused around the following areas:

- Common DCB picture required – Common datasets, presented in a similar (or same) picture would allow effective communication of DCB issues.
- Common picture of DCB what if modelling – Common modelling, presented in a similar (or same) picture would allow effective communication and of DCB issues.
- Common terminology – Common terminology between Consumer and Provider will allow effective communication.
- Common definitions of capacity – Capacity factors should be understood and where possible common.
- Common definition demand – Demand factors should be understood and where possible common.
- Common timeframes – working time frames and the outputs or each time frame should be well understood and where possible common.
- Common definition of measures, the detail of the measures which can be used to resolve DCB issues and the circumstances in which they may be applied.
- Concept concept/behaviours for application of measures – an understanding of how and when the consumer would like measures applied would allow the Sub-regional provider to maximise capacity while ensuring that the operating envelope of the consumer is maintained.
- Commonly understood safety accountability – It is essential that both consumer and provider have a common understanding of the safety accountabilities
- Supply of trajectory data by the consumer to the provider such that the provider can then provide a DCB service back to the consumer and other stakeholders.

4.2.3.1.5 Sub-regional Scenarios

The scenarios where a Sub-regional common service can be consumed need to be developed. The common set of scenarios that require solutions to be applied and de-conflicted with other stakeholder measures ensuring consistency of solution throughout the Sub-region. Some examples of scenarios are Coordination of Airport measures interacting with LTM measures, LTM measures interacting with adjacent LTM measures and Compatibility of Sub-regional solutions with adjacent Sub-regional solutions.

4.2.3.2 Model Canvas for Sub-regional Consumer (Technical)

Key Partnerships *ACC (Local)* *ACC (Other)* *Airport (Local)* *Adjacent ANSP* *Adjacent Sub-Regional Flow Manager* *Regional Network Manager*	***Key Activities*** *Sub-Regional information sharing* ***Key Resources*** *SWIM compliant Technical systems*	***Value Proposition*** *Reduced cost of operating Sub-Region*	***Customer Relationships*** *Contract Service Level Agreements* ***Channels*** *SWIM*	***Customer Segments*** *Sub-Regional Service Provider* *Adjacent Sub-Regional Flow Manager*
Cost Structure ***System technical costs*** ***Staff costs***			***Revenue Streams*** ***None***	

Figure 12: Sub-regional Consumer Canvas

4.2.4 Sub-regional Flow Manager (Adjacent ACC)

Sub-regional Flow Manager X is situated adjacent from the Sub-region with a common DCB service. The Sub-regional Flow Manager established a new relationship with the new Sub-regional DCB service. This new relationship improves the efficiency of Sub-regional Flow Manager X as it limits the number of actors that need to be contacted to solve DCB issues. In the past he had to contact each ACC and airport impacted by the measure, now a single coordination with the Sub-regional Flow Manager can solve the issue.

In order to keep its development and cost at a minimum Sub-regional X could prefer:

- That the new Sub-regional common service uses legacy system (telephone) to provide and receive the information.
- That the new Sub-regional common service complies to the standardized interface defined in the context of SESAR.

Sub-regional Flow Manager X receives and provides the DCB information.

4.2.4.1.1 Sub-Regional Flow Manager (FM) & Adjacent Area Control Centre (ACC)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**ACC (Adjacent)**
	Short-Term ATFCM Measures	<>	
	ACC Tactical Demand	<	
	Sector Configuration Plans	<>	

	Sector Capacity	<	
	Hotspot	<>	
	Airspace Model	<	
	Capacity Plan	>	
	ATFCM Measures	<>	
	Performance Information/Targets	<	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

<table>
<tr><td rowspan="2">Key Partnerships

Adjacent Sub-Regional Flow Manager
ACC</td><td>Key Activities

Sub-Regional information sharing</td><td rowspan="2">Value Proposition

Reduced cost of operating Sub-Region</td><td>Customer Relationships

Contract Service Level Agreements</td><td rowspan="2">Customer Segments

Sub-Regional Service Provider
Adjacent Sub-Regional Service Provider</td></tr>
<tr><td>Key Resources

SWIM compliant Technical systems</td><td>Channels

SWIM</td></tr>
<tr><td colspan="3">Cost Structure

System technical costs
Staff costs</td><td colspan="2">Revenue Streams

None</td></tr>
</table>

Figure 13: Sub-regional Flow Management (Adjacent) (only in the context of Sub-regional coordination)

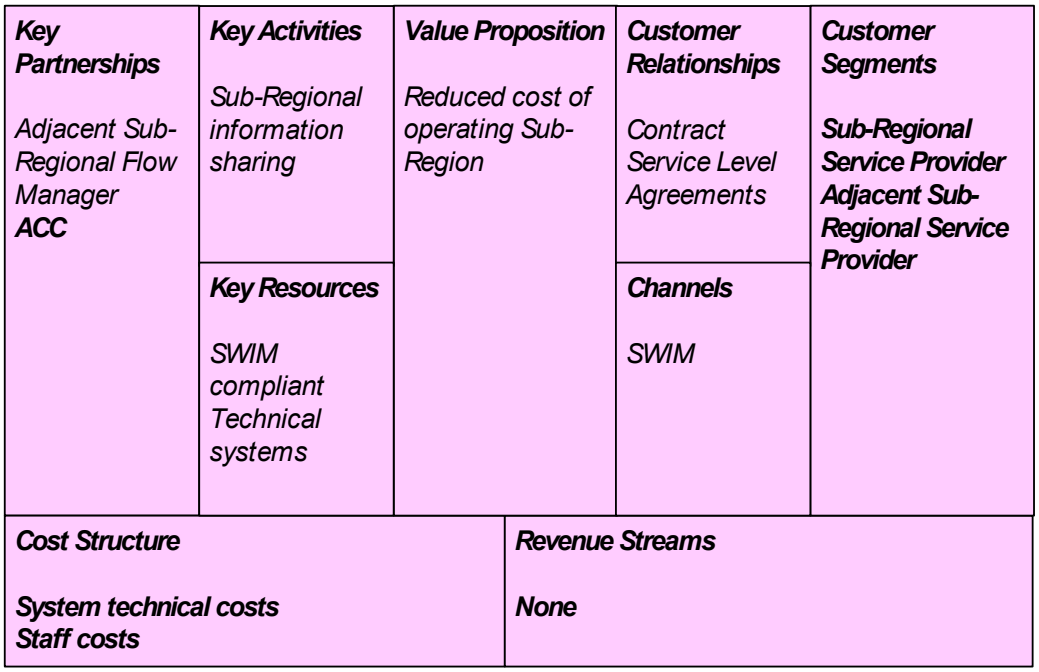

Figure 14: Sub-regional Flow Management Service Provider (For costumer adjacent SFM only)

4.2.5 Regional Network Manager

The Regional Network Manager (NM) is mandated to provide a DCB regional capability across European airspace. The NM acts as catalyst and facilitator for an efficient overall network management by all ATM stakeholders. The NM role will be enabling, facilitating and promoting the Network Operations Plan, providing a framework to allow Local and Sub-regional Managers and Airspace Users to share information (Network View), to coordinate (CDM) and to prepare scenarios to be used at network level when necessary. Further, NM supports its customers in management of major unplanned events where there is impact on its neighbouring airspace. This is achieved through provision of technical and operational services which allow customers to manage demand on restricted airspace demand in both the long to short-term planning environment (includes information support for the tactical operation).

In circumstances where traffic and complexity are increasing, creation of a new Sub-region allows the Regional NM to maintain focus on management of the Regional DCB capability, avoiding unnecessary workload.

4.2.5.1.1 Sub-Regional Flow Manager (FM) & Regional Network Manager (NM)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**NM (Regional)**
	Short-Term ATFCM Measures	<>	
	Sub-Regional ATFCM Measures	>	
	Sub-Regional Hotspots	>	
	Airspace Configuration (ACC, Airport)	>	
	Capacity	>	
	AFUA	>	
	Surveillance	>	
	Regional Demand	<	
	Proposed Flight Schedules	<	
	Regional Performance	<	
	Regional MET	<	
	Crisis	<	
	Regional ATFCM Measures	<	
	Regional Hotspots	<	
	Network Management Operations Plan	<	
	Post Ops Analysis data	<	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

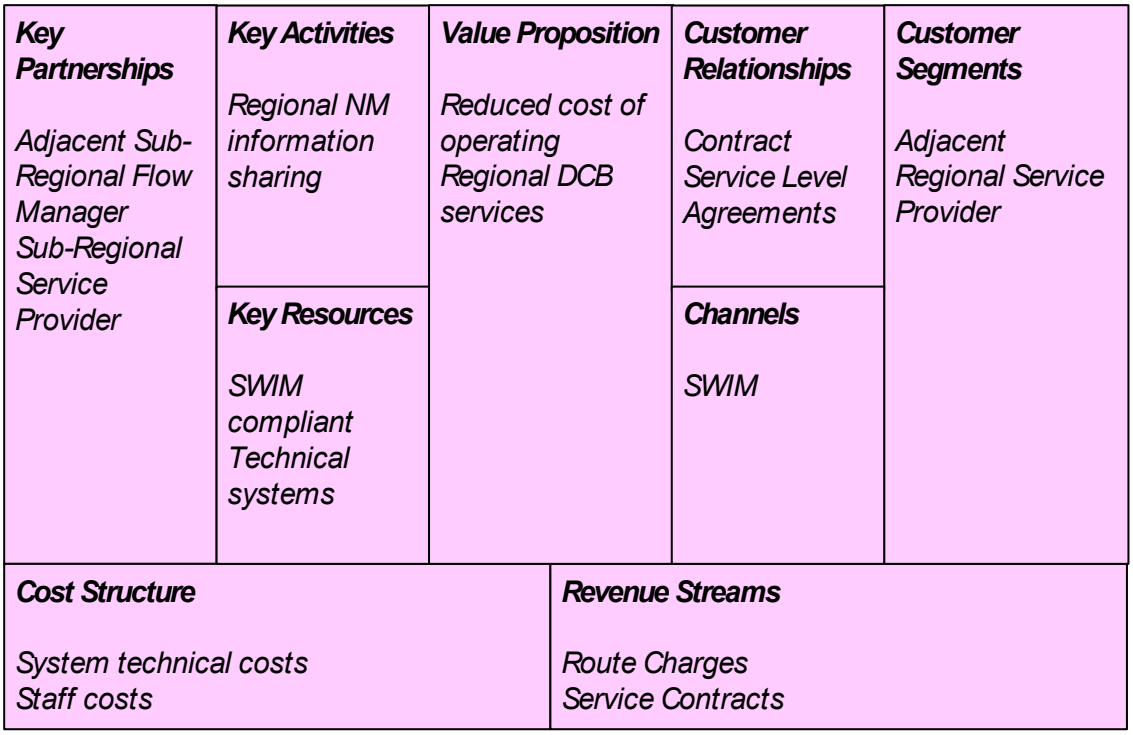

Figure 15: Regional Network Manager Canvas

4.2.6 ACC (Local)

If an ANSP decides to use the Sub-regional service to improve its performance, it is expected that the ANSP will also improve the ACC interfaces with the Sub-regional Flow Manager as a mean to reduce workload and improve communication.

Having the Sub-regional Flow Manager lowers the bunching of traffic received in the ACC, distributing the workload along a time period and/or among sectors. The number of regulations that need to be issued are lower as other options are available and coordinated among the Sub-regional actors.

The ACC local flow manager will receive the information about the DCB measures that need to be in place and provide local requests.

4.2.6.1.1 Sub-Regional Flow Manager (FM) & Local Area Control Centre (ACC)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**ACC (Adjacent)**
	Short-Term ATFCM Measures	<>	
	ACC Tactical Demand	<	
	Sector Configuration Plans	<>	
	Sector Capacity	<	
	Hotspot	<>	
	Airspace Model	<	
	Capacity Plan	<>	
	ATFCM Measures	<>	
	Performance Information/Targets	<	
	Post Ops Analysis data	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

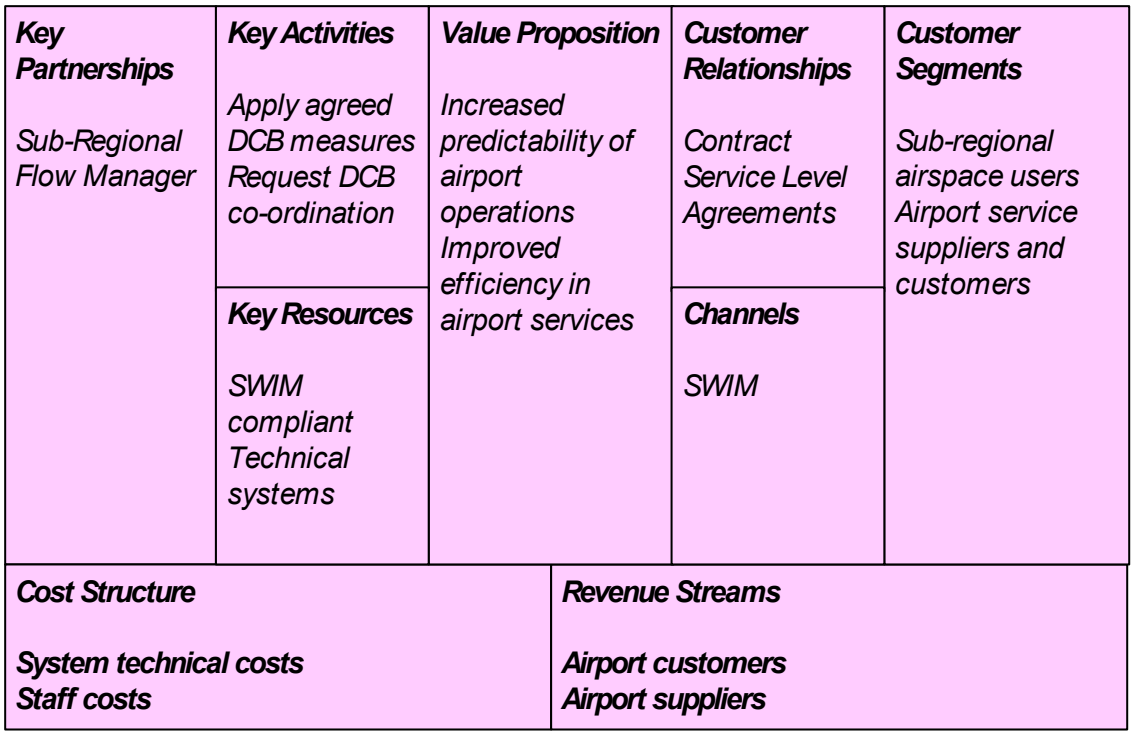

Figure 16: ACC (Local) (only in the context of Sub-regional DCB measures)

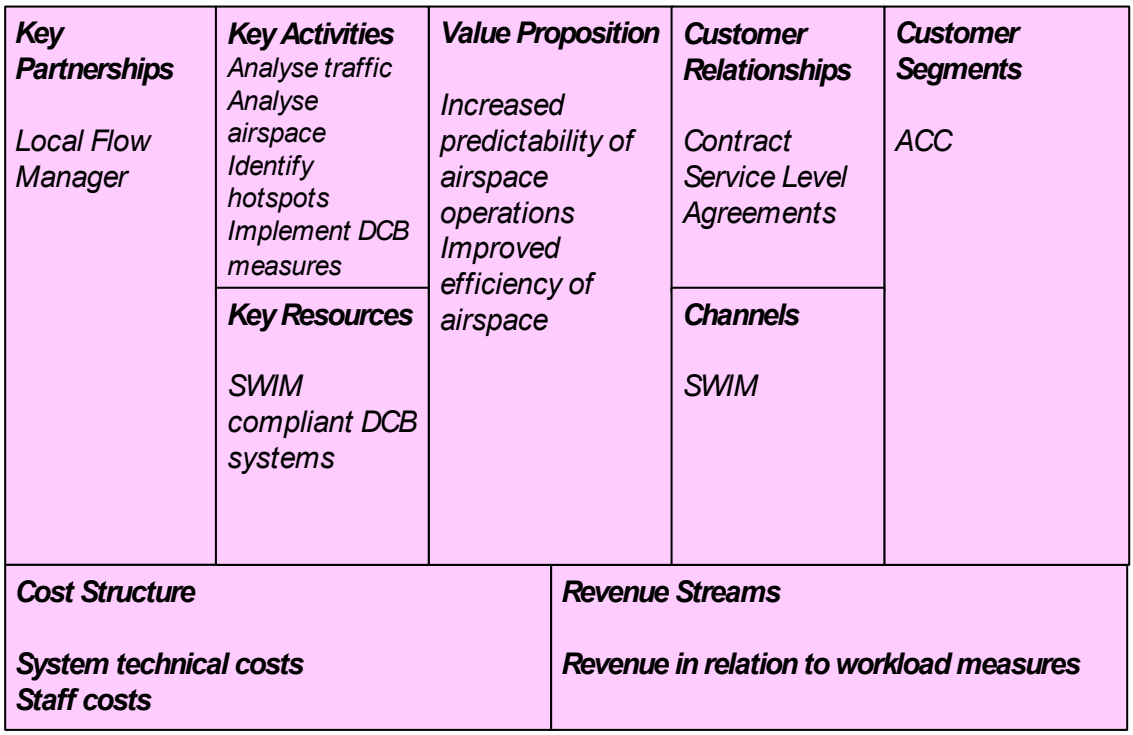

Figure 17: Sub-regional Flow Manager service provider

4.2.7 ACC (Adjacent ANSP within Sub-region)

The ACC X of an Adjacent ANSP that coordinates now with the new Sub-regional Flow Manager Service, will improve its coordination as a unique point of contact will be able to deal with the DCB measures. This service will lower the workload of the local flow manager and improve the predictability as the impact of a DCB measure proposed by them will be accessed and communicated to all the possible impacted actors in the Sub-region. On the other hand, when a DCB measure impacts the ACC X, the negotiation will be easier as all the actors will.

The ACC X local flow manager will receive the information about the DCB measures that need to be in place and provide the local requests.

The adjacent ANSP could be of two different types:

- Has already modernised its infrastructures to be aligned with SESAR and can consume services information through SWIM.
- Has not updated its infrastructures and has a legacy system.

4.2.7.1.1 Sub-Regional Flow Manager (FM) & Local Area Control Centre (ACC)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**ACC (Adjacent)**
	Tactical Change	<>	
	ACC Tactical Demand	<	
	Sector Configuration Plans	<>	
	Sector Capacity	<	
	Hotspot	<>	
	Airspace Model	<	
	Capacity Plan	<>	
	ATFCM Measures	<>	
	Performance Information/Targets	<	
	Post Ops Analysis data	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

4.2.8 Airport (Local)

The Airport within the Sub-Region is situated in the vicinity of one or more FIR (Flight Information Region) boundaries. Therefore, different FIRs generate the arrival flows. Furthermore, departures are fed into the different FIRs. Instead of coordinating with each single FIR partner the airport wishes to coordinate with only one partner which will be the Sub-regional Flow Manager. This means a more integrated planning, while not only an adjacent (upstream) ACC but also other impacting ACC (adjacent FIR as well as adjacent ANSP) are considered. This leads to better consistent arrival and departure flows. The available capacity can be used in an optimized manner. Integration of the Airport into the Sub-region promotes implementation of harmonised solutions within the scope of the Sub-region, ensuring that the actions of one actor does not destabilise the operation of other actors in the Sub-region.

4.2.8.1 Key Information Activities

4.2.8.1.1 Long-term Planning (5 years to 6 months)

- Provision of airport capacity capabilities to the Sub-regional service.
- Planning information related to planning for the day of operation within CDM processes, with a continuously improving level of planning information accuracy over the long-term planning timeframe. Major event planning (e.g. Olympics) is undertaken in this timeframe. Use of historic data, schedule data and local intelligence are used to develop early demand pictures.
- KPI's based on business and/or regulatory drivers can be set within this time frame.

4.2.8.1.2 Medium/Short-term Planning

- Provision of changed airport capacity capabilities to the Sub-regional service. This information may include staff and equipment evaluation that may affect airport capacity.
- Planning information related to planning for the day of operation within CDM processes, with a continuously improving level of planning information accuracy over the medium/short-term planning timeframe. Long-term planning that was conducted earlier is refined within the Medium/Short-term timeframe.
- KPI's based on business and/or regulatory drivers can be set or refined within this time frame.

4.2.8.1.3 Execution (Day of Operation)

- Information related to CDM processes on the day of operation in relation to local issues.
- KPI's can be measured against the planned business and/or regulatory targets within this time frame.

4.2.8.1.4 Sub-Regional Flow Manager (FM) & Local Airport

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Airport (Local)**
	Short-Term ATFCM Measures	<>	
	Airport Capacity Capabilities	<	
	Runway Configuration	<	
	SIDS & STARS	<	
	ATFCM Measures	<	
	Departure Manager	<	
	Local Demand Picture	>	
	ATFCM Measures	<>	
	Actual Landing Rates	<>	
	Airport Strategic Plan (incl. Performance Information/Targets)	<	
	Post Ops Analysis data	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

Note: Departure Manager data relates to API, DPI and TSAT information.

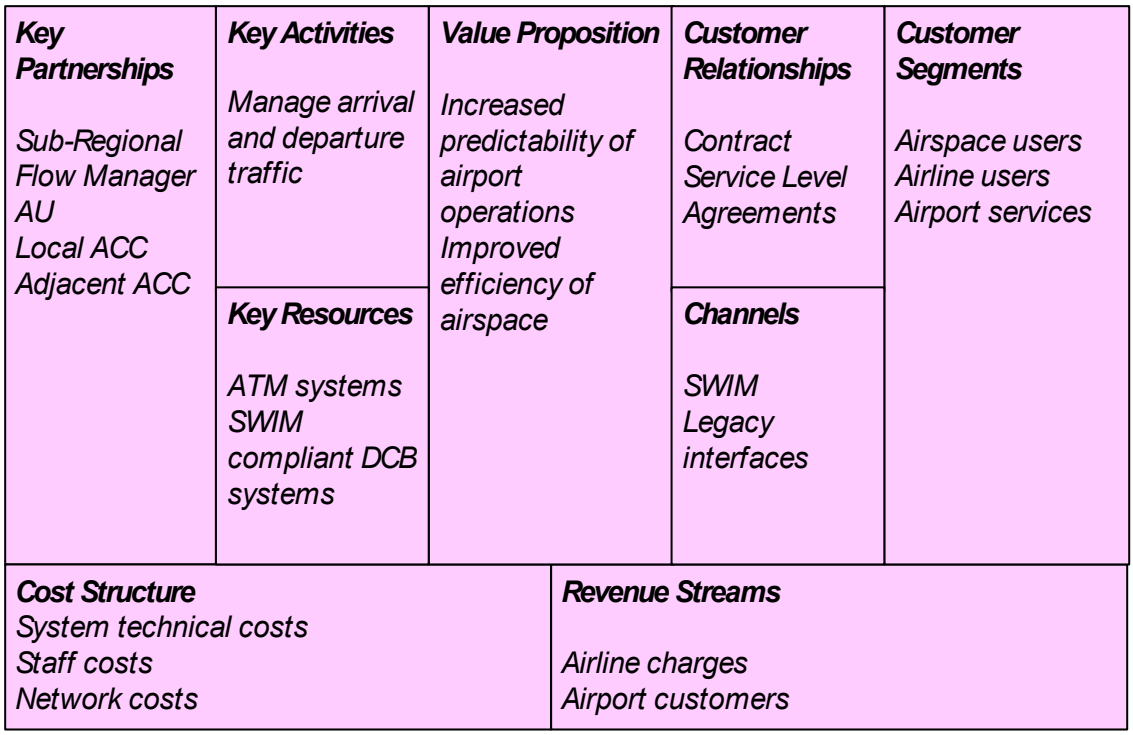

Figure 18: Airport Consumer Canvas

4.2.9 Airspace User (AU)

Airspace users within Sub-Region will continue to provide trajectory information in the planning phases as before. However, as the Sub-regional demand picture builds up there may be CDM with the Sub-regional DCB function in relation to evolving constrictions or weather issues. The key interaction will be on the day of operation where weather or other operational issues contrive to impact the original plan. Under these circumstances, the Sub-regional flow manager will endeavour to perform the co-ordination in support of the AUs prevailing operational priorities (provided by the AU). This includes any interaction with local ACCs, airports or Network Manager.

The primary benefit to the AU is the enhanced resilience of schedule to perturbations.

4.2.9.1.1 Sub-Regional Flow Manager (FM) & Airspace User (AU)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			Airspace User (AU)
	Short-Term ATFCM Measures	<>	
	Proposed Flight Schedule	<	
	Trajectory Information	<	

	Operational Priorities	<	
	ATFCM Measures	>	
	Proposed Trajectory Improvements	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

<table>
<tr>
<td rowspan="2">Key Partnerships

ANSP
suppliers
Airlines
Governmental organisations</td>
<td>Key Activities

Schedule planning
Schedule delivery
Airline operations</td>
<td rowspan="2">Value Proposition

Increased predictability of schedules
Improved efficiency of airspace
reducing costs</td>
<td>Customer Relationships

Contract
Service Level Agreements</td>
<td rowspan="2">Customer Segments

Airline users</td>
</tr>
<tr>
<td>Key Resources

Airline resources</td>
<td>Channels

Customer facing systems</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Airline technical costs
Staff costs
Network costs</td>
<td colspan="2">Revenue Streams

Airline ticketing</td>
</tr>
</table>

Figure 19: Airspace User Canvas

4.2.10 Military User (MIL)

The Sub-region interaction is with military actors utilising national airspace both for training and tactical operational purposes. Principally, this tends to be the state air force as well as the specialist branches of other forces (including remote vehicle and weapons related activity).

Creation of a Sub-region allows the military to plan events and training within the state via a single entity. However, a significant benefit is to the civil ATM operation where airspace capacity – primarily utilised by the military – can be made available to satisfy for civil demand through a defined negotiation process (Flexible Use of Airspace or FUA).

In the close to time of operation timeframe, the Sub-region co-ordinates priority military activity in order to minimise impact on planned civil operations.

4.2.10.1.1 Sub-Regional Flow Manager (FM) & Military User (MIL)

PARTICIPANT	INFORMATION	INFORMATION DIRECTION	PARTICIPANT
Sub-Regional FM			**Military User (MIL)**
	Short-Term ATFCM Measures	<	
	MIL Airspace Availability	>	
	MIL Airspace Usage	<	
	Civil Demand	>	

Note: CDM is the underpinning process that supports the exchange of data. It is assumed that CDM occurs throughout the short, medium and long-time frames and information flows as a result.

Key Partnerships	***Key Activities***	***Value Proposition***	***Customer Relationships***	***Customer Segments***
ANSP *Governmental organisations* *Adjacent MIL* *Local MIL*	*Training* *Civil co-ordination*	*Improved efficiency of MIL co-ordination for airspace*	*Governmental organisations* *International organisations*	*National governments* *International organisations*
	Key Resources *MIL resources* *Supplier resources*		***Channels*** *Government to MIL co-ordination*	
Cost Structure *MIL costs* *Supplier costs*			***Revenue Streams*** *n/a*	

Figure 20: Business Canvas for Military

4.2.11 Business Case for New Services for a Sub-region

The business case for New services for a Sub-region relies mainly on the cost savings due to the reduction of staff for the system management of the Sub-regional DCB tools and the reduction in costs of implementation of new Sub-regional DCB tools.

KPA (KPI)	New Services	
	Improvement	Description
Environment **Fuel Efficiency (Fuel Burn per Flight)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Airspace Capacity **(Throughput / Airspace Volume & Time)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Airport Capacity **(Runway Throughput Flights/Hour)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Predictability **(Flight Duration Variability, against RBT)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Cost Effectiveness	0.02%	Reduction due to reduced technology costs and reduction in staff training.
Customer / Community	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Total	0.02%	

Table 11: Comparative Benefits for the provision of New Services

4.3 Update of Legacy Sub-Regional DCB service

An ANSP that has a well-established or participate in a Sub-region may wish to transition from its legacy Sub-regional service to a Sub-regional common service from another provider.

4.4 User Stories

4.4.1 Sub-regional Flow Manager (ANSP)

The key benefit from the provision of a Sub-regional common service to an ANSP with a legacy Sub-regional operation is that the ANSP consumer avoids the full cost of updating the legacy Sub-regional service with new tools and operational procedures themselves. The canvas in Figure 21 describes the relationship between the provider and the consumer.

It may be the case that the legacy Sub-regional area is subsumed into a larger Sub-region that is managed by the Sub-regional service through provision of a common service. DCB activities across the Sub-region are provided for a set of local actors across the Sub-region. Local actors include (for example) the ACCs and Airports contained within the airspace under consideration (subsequently referred to as **The Airspace**).

The ANSP (henceforth referred to as **ANSP 1**) is responsible for The Airspace currently has a well-established Sub-regional capability but uses legacy tools and procedures to deliver the Sub-regional capability. **ANSP1 is the operational delivery interface for the Sub-regional capability**.

ANSP1 could go to the extensive cost of refreshing the existing Sub-regional capability with updated tools support and operational procedures. Alternatively, ANSP1 could chose to **CONSUME** a Sub-regional COMMON SERVICE provided by another entity.

A commercial entity (Sub-regional DCB Common Service **PROVIDER**) offers an operational common service required by ANSP1. ANSP1 choses to **deliver** its Sub-regional service by CONSUMING the service offered by the PROVIDER. In doing so, ANSP1 avoids the cost of refreshing an operational capability but remains the delivery point of the operational service to the local actors.

The Sub-regional service PROVIDER is required to include an ANSP (henceforth **ANSP2**) – essential for provision of operational services - and a technical services partner. ANSP2 must have responsibility for airspace adjacent to ANSP1 in order to provide the close to time of operation elements of the Sub-regional DCB service.

In circumstances where an ANSP is creating a new Sub-region with a view to supporting multiple ACCs, or subsequently offering a common service, ANSP1 (operational service delivery interface) and ANSP2 (the ANSP partner within the Common Service) may be the same ANSP.

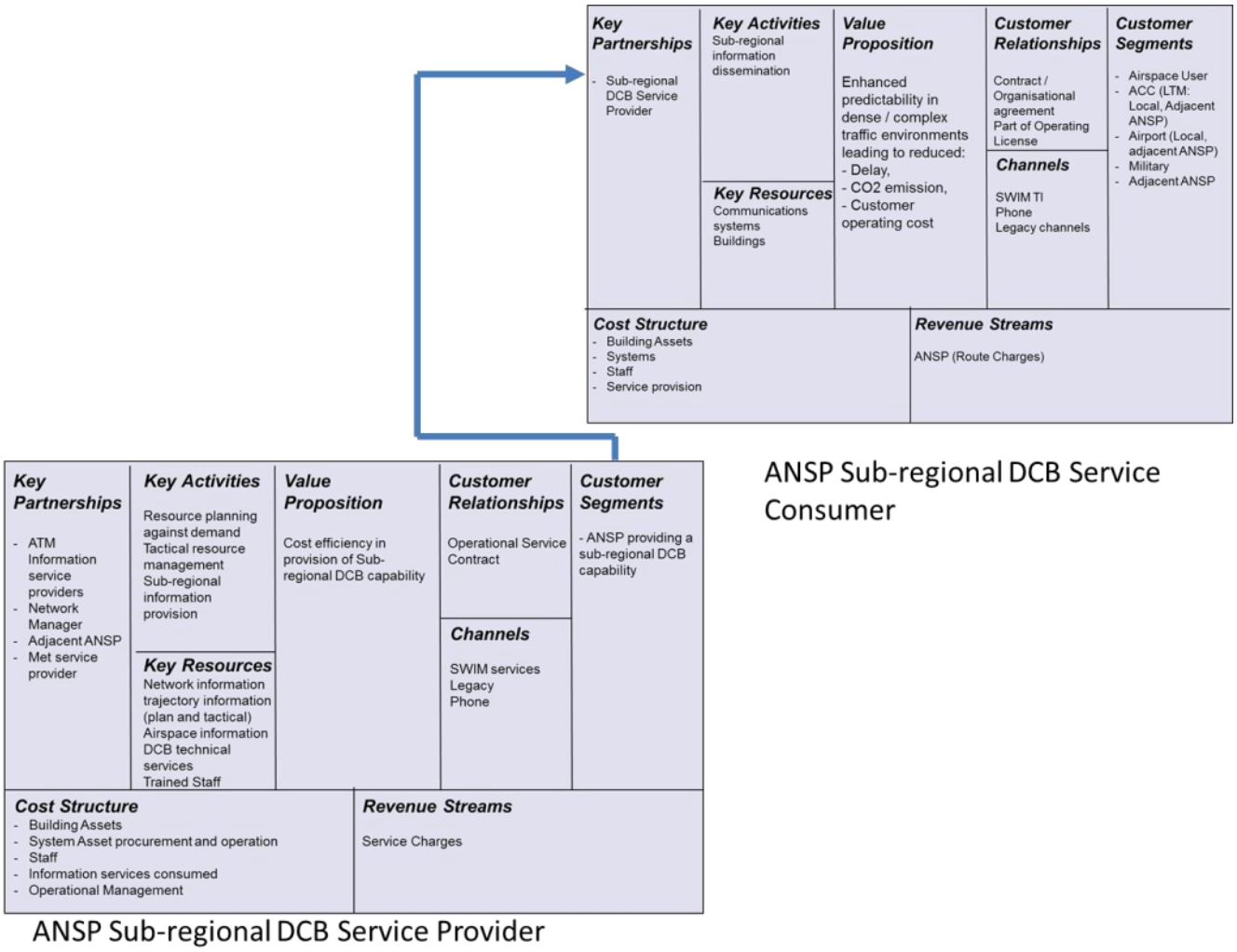

Figure 21: Sub-regional Provider – Consumer Canvas

4.4.2 Sub-regional Common Service Provider

This user story is written from the perspective of the Sub-regional Common Service Provider and discusses Operational service provision within the context of a Sub-Regional DCB service being provided to legacy consumer. In this user story a legacy customer has a Sub-regional capability but does not want the expense of replacing their processes or technical solutions and so elects to consume a Sub-regional capability to be provided via a common service. This provides a reduction in the cost of implementing updated processes and providing new system support. It is assumed from a service perspective, that the Sub-regional Common Service provider will provide an operational service to the Sub-regional service consumer and this provision will be via a Common Service.

4.4.2.1 Sub-regional Common Service Provider (Operational)

Replacement of a legacy Sub-regional operation would need to consider the replacement of technology and training of staff in new procedures meaning that the refreshment of a Sub-regional operation at many ANSP's in Europe can be costly. Accessing a Sub-regional service by contracting a suitable common service provider offers the opportunity to gain access to

affordable services that can be tailored to the level of service required. Being no longer dependent on local resources, the ANSP can quickly respond to increasing demand by drawing on Sub-regional services from the common service provider.

The Sub-regional Common Service makes this possible by defining the service on an open basis, employing standards wherever possible. The Sub-regional Common Service is provided remotely to the Sub-Regional Common Service consumer through communications channels and through common picture of demand and capacity between provider and consumer. An understanding of consumer business objectives and KPIs is essential is the provider is to provide the correct level of service.

The Common Service concept is based upon the ANSP having access to the common DCB picture described earlier. Systems to support the DCB process could be either purchased or leased from the Sub-regional provider or suitable manufacturers that are built to appropriate standards and have appropriate safety assurance. Exchange of the technical services is commonly done using SWIM in many locations and entirely feasible for an ANSP due to the availability of excellent wide band internet communications.

The management's next task is to select the Sub-regional Common Service provider. This is done again in open competition attracting prospective providers from an established ANSP. The Sub-regional provider could have an established Sub-Regional capability and extend that capability to the Sub-regional Consumer. It is also the case that a Sub-regional provider could be created to support one or more Sub-regional consumers. However, it must be noted that the creation of a new Sub-regional provider would require a level of system and process development. All of the providers are also certified to provide Sub-regional services.

One important area is integration of the Sub-region in to the overall ATM system. Integration into NM, aerodromes, Airspace Users and Adjacent ANSP's or Sub-regional providers needs some care. The Sub-Regional provider must understand how the Sub-regional consumers airspace is integrated into a wider European airspace network. The Sub-regional provider must also understand how the actors within the new Sub-region interact with the aim of ensuring that the Sub-region operates in the most efficient and safe manor. The Sub-regional Consumer retains overall responsibility and safety accountability for the movement of flights in the tactical phase.

The scope of the Sub-region must be defined. Settling on the scope of the Sub-region, the management select a provider and agree a contract over a defined period (e.g. 5 years) with clear levels of service and areas of liability defined along with appropriate dispute mechanisms. Options are included to both extend and increase the level of service as required. The scope of the Sub-region from an operational scenario perspective must also be considered by the scope of Sub-regional activities. The scope of activities for Sub-region are specific the tasks that require coordination, for example a set of complex TMAs with interacting traffic that requires collaboration would be a candidate for Sub-regional activities, whereas upper airspace with limited interactions or need for coordination would not be a scenario managed by the Sub-region and would be managed locally.

The Sub-regional consumer must enable the Sub-regional common service provider through provision of technical services (see Sub-regional consumer user story).

Good relations are maintained by regular management review meetings between the providers of the Sub-regional services and the local ANSP management based upon the data available from many of the automated systems used. Sharing of data on an open basis helps

prevent unnecessary discussion and argument on fault and in many cases leads to joint preventive measures being put in place to avoid losses of service.

4.4.2.1.1 Data Provision

Figure 22 describes the interactions between Sub-regional Provider and Sub-regional consumer and its stakeholders.

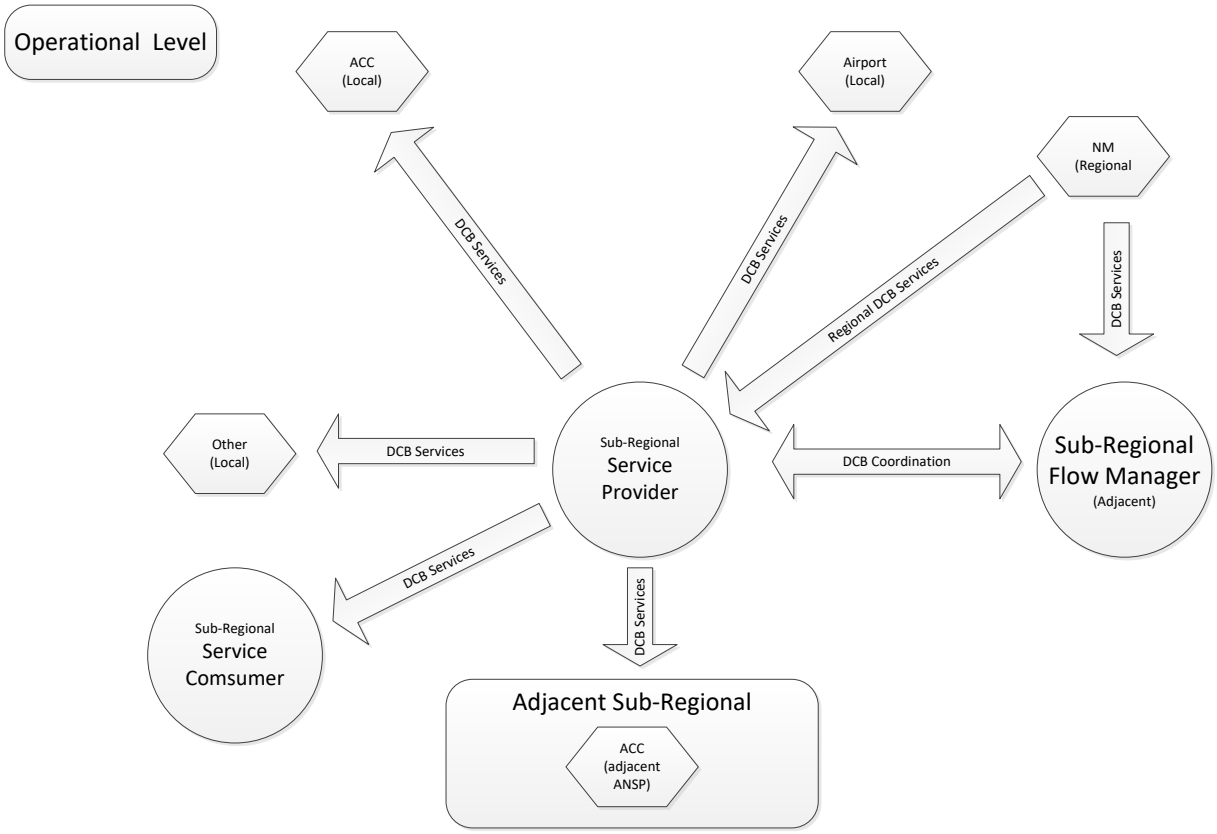

Figure 22: Sub-regional Service Provision (Operational Level)

At an operational level, the Sub-regional Service Provider could provide the following information to the Sub-regional consumer:

- Long-term, medium-term and close to the time of operation timeframes:
  - Demand vs Capacity analysis (Capacity/Entry Rates/Workload/Environment)
  - DCB set against KPIs (Business and Regulatory targets)
  - Hotspots information
  - Demand and Capacity solutions to manage hotspots
  - Post-Ops analysis
  - Enabler for CDM environment

4.4.2.1.2 Timeframes

As stated before, the time frames where Sub-regional provider would provide a Sub-regional common service are:

- 6 Months to D-1 day
- D-1 to T-6 Hours
- T-6 hours to close to time of operation
- Post-Ops

Note: Execution itself has been omitted as a timeframe for Sub-regional common service consumption, as safety accountability remains with the consumer within this time frame.

4.4.2.1.3 Scope of the Service

See Scope of the Service in the DCB Service Consumer section.

4.4.2.1.4 Sub-regional Scenarios

The scenarios where a Sub-regional common service can be provided needs to be developed. The common set of scenarios that require solutions to be applied and de-conflicted with other stakeholder measures ensuring consistency of solution throughout the Sub-region. Some examples of scenarios are Coordination of Airport measures interacting with LTM measures, LTM measures interacting with adjacent LTM measures and Compatibility of Sub-regional solutions with adjacent Sub-regional solutions.

4.4.2.2 Model Canvas for Sub-regional Provider (Operational)

<table>
<tr>
<td rowspan="2">Key Partnerships

No direct relationship between external stakeholders and service provider
Comms Infrastructure provider</td>
<td>Key Activities
Provision of strategic and pre-tactical demand, capacity and hotspot info.
CDM environment
Post-Ops</td>
<td rowspan="2">Value Proposition

Reduced cost of operating Regional DCB services
Reduced disruption and delay (in all phases of airline operation)
Reduced cost to ANSP</td>
<td>Customer Relationships

Contract Service Level Agreements</td>
<td rowspan="2">Customer Segments

Consuming regional ANSP
Consuming adjacent ANSP</td>
</tr>
<tr>
<td>Key Resources

Sub-Regional DCB systems
Flow Managers</td>
<td>Channels

SWIM</td>
</tr>
<tr>
<td colspan="3">Cost Structure

System technical costs
Staff costs</td>
<td colspan="2">Revenue Streams

Route Charges
Service Contracts</td>
</tr>
</table>

Figure 23: Sub-regional Provider - Consumer Canvas

4.4.3 Sub-regional Common Service Consumer

This user story is written from the perspective of the Sub-regional Common Service Consumer and discusses Technical service provision within the context of a Sub-Regional DCB service being provided to legacy consumer. It is assumed that from an operational service provision perspective that the Sub-regional Common Service Consumer will only consume the service and this consumption is described within the other user stories contained within this business model.

4.4.3.1 Sub-regional Common Service Consumer (Technical)

In order to achieve economies of scale an ANSP (with its neighbour(s) where appropriate) intends to consolidate its management of local activities to be provided through a central function organised as a Sub-region. In this user story the example is an ANSP(s) with a legacy Sub-regional operation wishing to transition to a lower cost, SESAR compliant operation due to operational or business pressure and would consume a Sub-regional common service from another Sub-regional provider (operational). This will result in a reduction of cost by a reduction of necessary resource to operate a Sub-region, which would have to be provided multiple times in a distributed scenario.

When thinking about the Sub-regional Service Consumer technical provision we need to think about what Sub-regional Service Provider needs from the consumer in order to provide the operational service. This User Story talks about the aspects that the Service Consumer must provide in order to enable the Service provider in providing a Sub-regional Common Service.

It is expected that the common service consumer will have to enable operational provision of the Sub-region in long, medium and short time frames and through to execution, plus post ops.

4.4.3.1.1 Data Provision

Figure 24 describes the interactions between Sub-regional Provider and Sub-regional consumer and its stakeholders at the technical level.

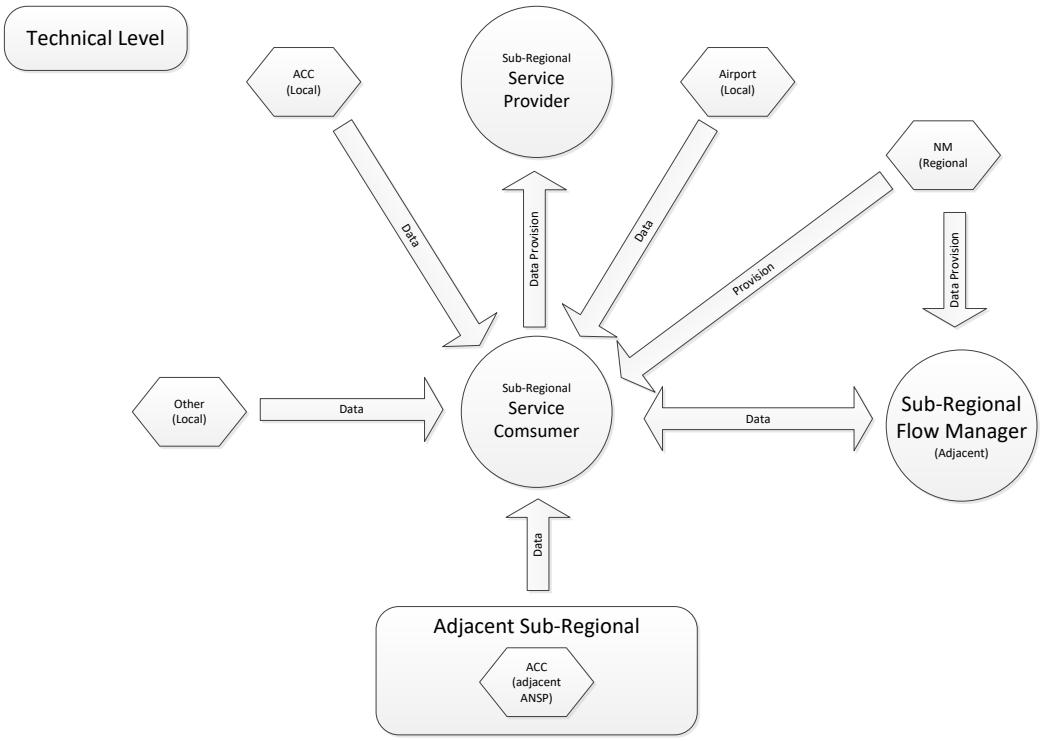

Figure 24: Sub-regional Service Provision (Technical Level)

At a technical level, the Sub-regional Service consumer provides the following information as an enabler for Sub-regional common service provision at an operational level:

- Demand Data
- Sector configuration options (Close to the time of operation and short-term time frames)
- Airspace Configurations
- Airspace Definitions
- SUA Availability
- Weather Information
- Monitor Values (including sustained and peak values)
- Stakeholder Information
- Method of Operations

Demand Data – Allows the Sub-Regional Manager to have situational awareness throughout the Sub-region through monitoring of demand data through the long, medium and short time frames through to execution. Data would typically include FDP data, DDR data and ETFMS Data.

Sector configuration options (driven by e.g. ATCO validations and availability at unit level) – As a part of understanding capacity, the Sub-regional manager would need to understand the level of staffing available and therefore the sectors configurations that are available.

Airspace Configurations – As a part of understanding capacity, the Sub-regional manager would need to understand the common airspace configurations that the Sub-regional consumer would be expected to operate.

Airspace Definitions – As a part of understanding capacity, the Sub-regional manager would need to understand the common airspace configurations that the Sub-regional consumer would be expected to operate.

SUA Availability – As a part of understanding capacity, the Sub-regional manager would need to understand Special Use Area availability. It is expected that this information would only be available in the short-term or close to time of execution time frame.

Weather Information – As a part of understanding capacity, the Sub-regional manager would need to understand the weather situation and the implications for capacity. It is expected that this information would only be available with high accuracy in the short-term or close to time of execution time frame.

Monitor Values – As a part of understanding capacity, the Sub-regional manager would need to understand the operating capacities of the elemental sectors and any common sector combinations. Monitor values would typically include sustained and peak values.

Stakeholder Information – As a part of understanding communication channels, the Sub-regional manager would need to have points of contact information for stakeholders within the Sub-region. This would typically include, AO's, AU's, ACC's, etc.

Method of Operations– As a part of understanding the working practices of the Sub-regional consumer the Sub-regional manager would need access to the Method of operations of the ACC.

4.4.3.1.2 Timeframes

When thinking about the Sub-regional Service Consumer, it is important to consider the time frames that the service consumer will interact with the service provider. The time frames where Sub-regional consumer would consume a Sub-regional common service are:

- 6 Months to D-1 day
- D-1 to T-6 Hours
- T-6 hours to time of operation
- Post-Ops

Note: Execution itself has been omitted as a timeframe for Sub-regional common service consumption as safety accountability remains with the consumer within this time frame.

4.4.3.1.3 Scope of the Service

The scope of the service should be focused around the following areas:

- Common DCB picture required – Common datasets, presented in a similar (or same) picture would allow effective communication and of DCB issues.
- Common picture of DCB what if modelling – Common modelling, presented in a similar (or same) picture would allow effective communication and of DCB issues.

- Common terminology – Common terminology between Consumer and Provider will allow effective communication.
- Common definitions of capacity – Capacity factors should be understood and where possible common.
- Common definition demand – Demand factors should be understood and where possible common.
- Common timeframes – working time frames and the outputs or each time frame should be well understood and where possible common.
- Concept concept/behaviours for application of measures – an understanding of how and when the consumer would like measures applied would allow the Sub-regional provider to maximise capacity while ensuring that the operating envelope of the consumer is maintained.
- Commonly understood safety accountability – It is essential that both consumer and provider have a common understanding of the safety accountabilities
- Supply of trajectory data by the consumer to the provider such that the provider can then provide a DCB service back to the consumer and other stakeholders.

4.4.3.1.4 Sub-regional Scenarios

The scenarios where a Sub-regional common service can be consumed need to be developed. The common set of scenarios that require solutions to be applied and de-conflicted with other stakeholder measures ensuring consistency of solution throughout the Sub-region. Some examples of scenarios are Coordination of Airport measures interacting with LTM measures, LTM measures interacting with adjacent LTM measures and Compatibility of Sub-regional solutions with adjacent Sub-regional solutions.

4.4.3.2 Model Canvas for Sub-regional Consumer (Technical)

<table>
<tr>
<td rowspan="2">Key Partnerships

Sub-Regional Airport
Sub-Regional NM
Sub-Regional Local TM
Sub-Regional ANSP</td>
<td>Key Activities
Provision of strategic and pre-tactical demand, capacity and hotspot info.
CDM environment
Post-Ops</td>
<td rowspan="2">Value Proposition

Reduced cost of operating Regional DCB services
Reduced disruption and delay (in all phases of airline operation)
Reduced cost to ANSP</td>
<td>Customer Relationships

Contract Service Level Agreements</td>
<td rowspan="2">Customer Segments

ANSP
Airport Operator
AU</td>
</tr>
<tr>
<td>Key Resources

Sub-Regional DCB systems</td>
<td>Channels

SWIM</td>
</tr>
<tr>
<td colspan="3">Cost Structure
ATM System technical costs
Staff costs
Network Costs</td>
<td colspan="2">Revenue Streams

Route Charges
Service Contracts</td>
</tr>
</table>

Figure 25: Sub-regional Consumer Canvas

4.4.4 Sub-regional Flow Manager (Adjacent ANSP)

Sub-regional Flow Manager X is situated adjacent from the Sub-region with centralised Service. The Sub-regional Flow Manager X has an established relationship that needs to be updated due to the update of the legacy Sub-regional Flow Manager. In order to keep its development and cost at a minimum Sub-regional Flow Manager X could prefer:

- That the Sub-regional common service uses legacy system (telephone) to provide and receive the DCB information.
- That the Sub-regional common service complies to the standardized interface defined in the context of SESAR.

Sub-regional Flow Manager X receives and provides the DCB information.

The business canvas shown in Figure 26 maps to the Sub-Regional ATFCM (Adjacent) Capability Configuration as described in the High-Level Architecture document [47].

<table>
<tr>
<td rowspan="2">Key Partnerships

Adjacent Sub-Regional Flow Manager
Regional NM</td>
<td>Key Activities

DCB measures impacting adjacent regions
Apply DCB measures</td>
<td rowspan="2">Value Proposition

Reduced cost of operating Regional DCB services
Reduced disruption and delay (in all phases of airline operation)
Reduced cost to ANSP</td>
<td>Customer Relationships

Contract Service Level Agreements</td>
<td rowspan="2">Customer Segments

Unchanged</td>
</tr>
<tr>
<td>Key Resources

Sub-Regional DCB systems</td>
<td>Channels

SWIM</td>
</tr>
<tr>
<td colspan="3">Cost Structure
ATM System technical costs
Staff costs</td>
<td colspan="2">Revenue Streams

Unchanged</td>
</tr>
</table>

Figure 26: Sub-regional Flow Management (Adjacent)
(only in the context of Sub-regional co-ordination)

The business canvas shown in Figure 27 maps to the Sub-Regional DCB Common Service Provision Capability Configuration as described in the High-Level Architecture document [47].

<table>
<tr><td rowspan="2">Key Partnerships

Adjacent Sub-Regional Flow</td><td>Key Activities

DCB measures impacting adjacent regions
Apply DCB measures</td><td rowspan="2">Value Proposition

Reduced cost of operating Regional DCB services
Reduced disruption and delay (in all phases of airline operation)
Reduced cost to ANSP</td><td>Customer Relationships

Contract Service Level Agreements</td><td rowspan="2">Customer Segments

Unchanged</td></tr>
<tr><td>Key Resources

Sub-Regional DCB systems</td><td>Channels

SWIM</td></tr>
<tr><td colspan="3">Cost Structure
ATM System technical costs
Staff costs</td><td colspan="2">Revenue Streams

None</td></tr>
</table>

Figure 27: Sub-regional Flow Management Service Provider (For costumer adjacent SFM only)

4.4.5 Regional Network Manager

The regional Network Manager is mandated to provide a DCB regional capability across European airspace. The primary activity is in the planning phase where NM collates and co-ordinate the various use of resources throughout Europe. As the time of operation, NM monitors the pan-European situation and makes the associated information services available to its customers. Further, NM supports its customers in management of major unplanned events where there is impact on its neighbouring airspace. This is achieved through provision of technical and operational services which allow customers to manage demand on restricted airspace demand in both the long to short-term planning environment (includes information support for the tactical operation).

In circumstances where traffic and complexity are increasing, creation of a new Sub-region allows the Regional Network Manager to remain focus on management of the Regional DCB capability, avoiding unnecessary the workload.

The business canvas shown in Figure 28 below maps to the Regional ATFCM Capability Configuration as described in the High-Level Architecture document [47].

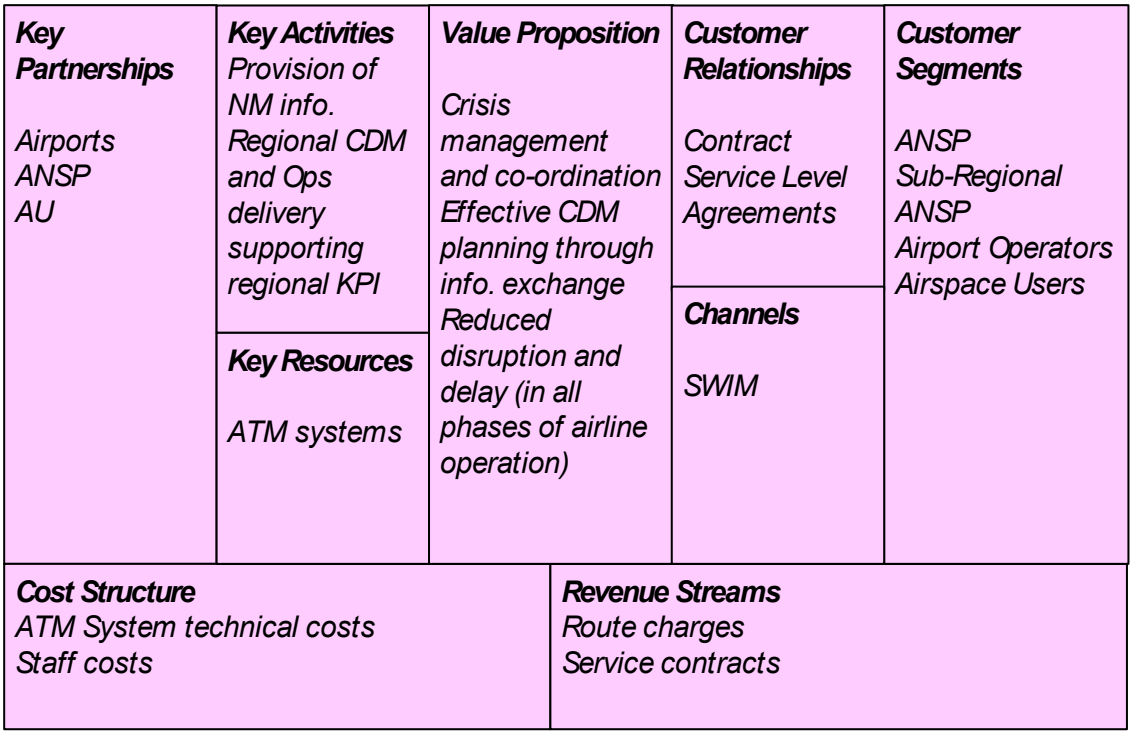

Figure 28: Regional Network Manager Canvas

4.4.6 ACC (Local)

If the ANSP decides to use the Sub-regional service to improve its performance due to the higher traffic forecast, it is expected that the ANSP will also improve the ACC interfaces with the Sub-regional Flow Manager as a mean to reduce workload and improve communication. Nevertheless, it is expected that this update will be performed in a stepwise approach, and legacy and new SWIM services will coexist for a given period.

The ACC local flow manager will receive the information about the DCB measures that need to be in place and provide the local requests.

The business canvas shown in Figure 29 below maps to the ER ACC (Local) Capability Configuration as described in the High-Level Architecture document [47].

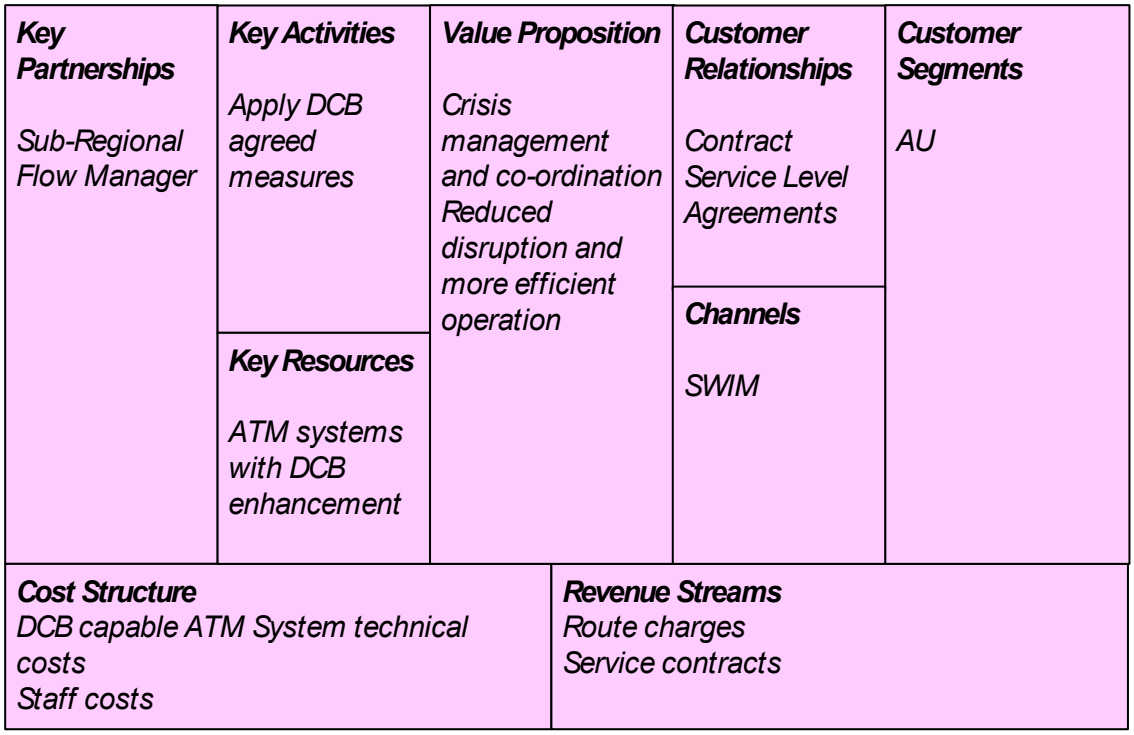

Figure 29: ACC (Local) (only in the context of Sub-regional DCB measures)

The business canvas shown in Figure 30 below maps to the Sub-regional DCB Common Service Provision Capability Configuration as described in the High-Level Architecture document [47].

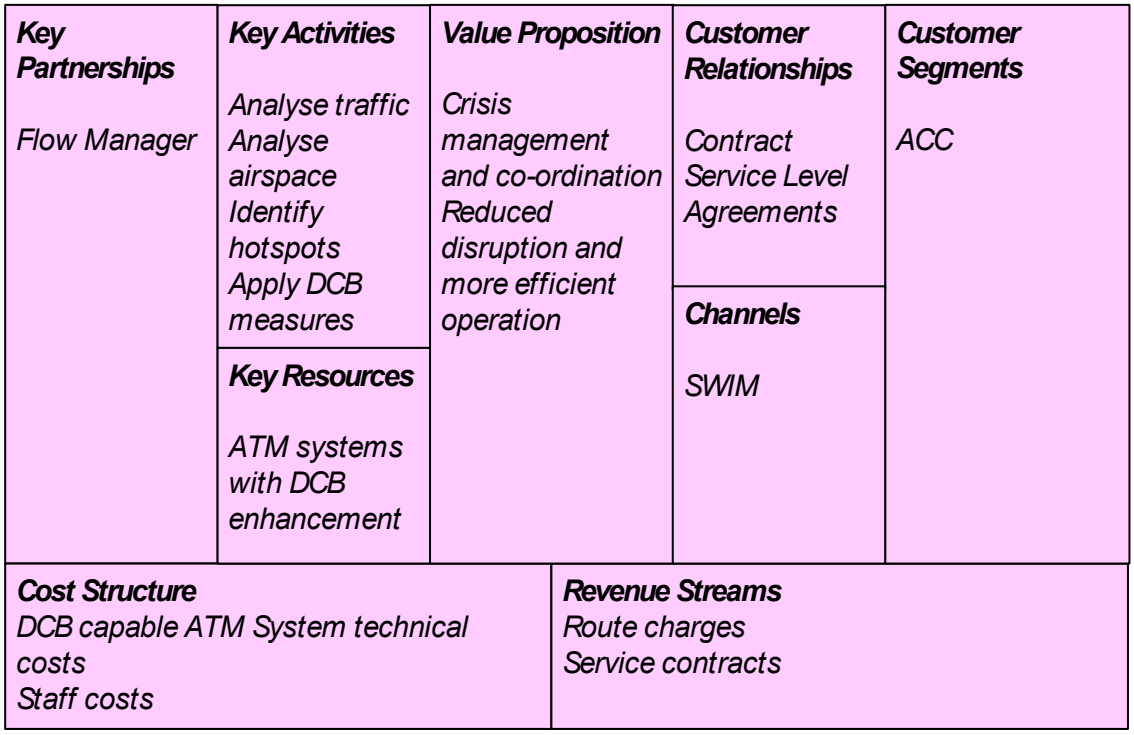

Figure 30: Sub-regional Flow Manager service provider

4.4.7 ACC (Adjacent ANSP)

The ACC X of an Adjacent ANSP has already an established process to coordinate with the new Sub-regional Flow Manager Service. The new centralised Sub-regional flow service could imply the necessity to modify this process.

The ACC X local flow manager will receive the information about the DCB measures that need to be in place and provide the local requests.

The adjacent ANSP could be of two different types:

- Has already modernised its infrastructures to be aligned with SESAR and can consume services information through SWIM.
- Has not updated its infrastructures and has legacy systems.

4.4.8 Airport (Local)

The airport is situated in the vicinity of one or more FIR (Flight Information Region) boundaries. Therefore, different FIRs generate the arrival flows. Furthermore, departures are fed into the different FIRs. Instead of coordinating with each single FIR partner the airport wishes to coordinate with only one partner which will be the Sub-regional Flow Manager. This means a more integrated planning, while not only an adjacent (upstream) ACC but also other impacting ACC (adjacent FIR as well as adjacent ANSP) are considered. This leads to better consistent arrival and departure flows. The available capacity can be used in an optimized manner.

The business canvas shown in Figure 31 below maps to the Airport Capability Configuration as described in the High-Level Architecture document [47].

<table>
<tr>
<td rowspan="2">Key Partnerships

ACC (adjacent and other ANSP)
NM
AU</td>
<td>Key Activities

Arrival and departure management</td>
<td rowspan="2">Value Proposition

Crisis management and co-ordination
Reduced disruption and more efficient operation</td>
<td>Customer Relationships

Contract Service Level Agreements</td>
<td rowspan="2">Customer Segments

AU
Airline operators</td>
</tr>
<tr>
<td>Key Resources

ATM systems
ATC staff</td>
<td>Channels

SWIM</td>
</tr>
<tr>
<td colspan="3">Cost Structure
ATM System technical costs
Staff costs</td>
<td colspan="2">Revenue Streams
Airport charges
Service contracts</td>
</tr>
</table>

Figure 31: Airport Consumer Canvas

4.4.9 Airspace User (AU)

Airspace users will continue to provide trajectory information in the planning phases as before. However, as the Sub-regional demand picture builds up there may be CDM with the Sub-regional DCB function in relation to evolving constrictions or weather issues. The key interaction will be on the day of operation where weather or other operational issues contrive to impact the original plan. Under these circumstances, the Sub-regional flow manager will endeavour to perform the co-ordination in support of the AUs prevailing operational priorities (provided by the AU). This includes any interaction with airports or Network Manager.

The primary benefit to the AU is the enhanced resilience of schedule to perturbations.

The business canvas shown in Figure 32 below maps to the Civil AU Operations Centre Capability Configuration as described in the High-Level Architecture document [47].

<table>
<tr>
<td rowspan="2">Key Partnerships

ANSP
Suppliers
Airport operators
Airline suppliers</td>
<td>Key Activities

Schedule planning
Operational management
Airline operations</td>
<td rowspan="2">Value Proposition

Improved planning for optimal service delivery maintaining schedules
Improved operational performance</td>
<td>Customer Relationships

Contract Service Level Agreements</td>
<td rowspan="2">Customer Segments

Airline passengers
Cargo operators</td>
</tr>
<tr>
<td>Key Resources

Aircraft
Flight crew
Ground crew
Ground resources</td>
<td>Channels

Ticketing agents
Cargo Sales/ contracts</td>
</tr>
<tr>
<td colspan="3">Cost Structure
ATM System technical costs
Staff costs
Route charges</td>
<td colspan="2">Revenue Streams
Airline
Service contracts</td>
</tr>
</table>

Figure 32: Airspace User Canvas

4.4.10 Military

The Sub-region interaction is with military actors utilising national airspace both for training and tactical operational purposes. Principally, this tends to be the state air force as well as the specialist branches of other forces (including remote vehicle and weapons related activity).

Creation of a Sub-region allows the military to plan events and training within the state via a single entity. However, a significant benefit is to the civil ATM operation where airspace capacity – primarily utilised by the military – can be made available to satisfy for civil demand through a defined negotiation process (Flexible Use of Airspace or FUA).

In the close to time of operation timeframe, the Sub-region co-ordinates priority military activity in order to minimise impact on planned civil operations.

4.4.11 Business Case for Cost Reduction

KPA (KPI)	Update of Legacy Services	
	Improvement	Description
Environment **Fuel Efficiency (Fuel Burn per Flight)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Airspace Capacity **(Throughput / Airspace Volume & Time)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Airport Capacity **(Runway Throughput Flights/Hour)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Predictability **(Flight Duration Variability, against RBT)**	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Cost Effectiveness	0.02%	Reduction due to reduced technology costs and reduction in staff training.
Customer / Community	0	No direct improvement – DCB concepts may improve this KPA, Common Service focuses on cost reduction only.
Total	0.02%	

Table 12: Comparative Benefits for the Update of Legacy Services

5 References and Applicable Documents

5.1 Applicable Documents

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[2] Foundation Method on Common Services

[3] Working Method on Services (S2020 edition)

[4] PJ19.2.1 SESAR 2020 Concept of Operations Edition 2017

[5] PAR for OFA06.03.01 Sub-regional DCB

[6] B04 05 Deliverable - Options of Common Services V01.00

[7] Business Model Generation: Alexander Osterwalder & Yves Pigneur, www.businesmodelgeneration.com

[8] ICAO Global Operating concept Doc 9854

[9] SESAR 2020 Multi Annual Work Programme

[10] SESAR 2020 Project Handbook

[11] SESAR 16.06.06-D26_04, Guidelines for Producing Benefit and Impact Mechanisms, Edition 03.00.01

[12] SESAR 16.06.06-D26_03, Methods to Assess Costs and Monetise Benefits for CBAs, Edition 00.02.02

[13] SESAR 2020 Multi Annual Work Programme, edition TRL2.0, 08/07/2015

[14] EU IR 716/2014: Pilot Common Project

[15] SESAR1 B04.02 – Update and maintenance of the development of the Concept of Operations (CONOPS) and associated ATM Services

[16] SESAR1 WP07 Global Co-ordination and Management and SESAR1 WP13 Enhanced DCB

5.2 Reference Documents

[17] EUROCONTROL: Challenges of Growth 2013, Task 4: European Air Traffic in 2035

[18] EUROCONTROL: SEVEN-YEAR FORECAST SEPTEMBER 2016, Flight Movements and Service Units 2016-2022

[19] EUROCONTROL – Standard Inputs 2018

[20] SESAR2020 CBA Template for EN projects

[21] SESAR 2020 Common assumptions, Edition 01.00.00 (17 May 2018)

[22] SESAR2020 Project Handbook

[23] SESAR B.04.05-D02, Options on Common Services, Edition 00.01.00

[24] eATM Portal – Working view. OBJ FCM04.2 – Short-term ATFCM Measures (STAM) – phase 2

[25] European ATM Master Plan Level 3 – Implementation View. Report 2015. Updated version of September 2016.

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[27] ATM Cost-Effectiveness (ACE) 2015 Benchmarking Report with 2016-2020 outlook. Visited on 15-08-2017 via: https://www.eurocontrol.int/publication/air-traffic-management-cost-effectiveness-ace-benchmarking-report-2015

[28]ATM Cost-Effectiveness (ACE) 2016 Benchmarking Report with 2017-2021 outlook. Visited on 21-12-2018 via: https://www.eurocontrol.int/publication/air-traffic-management-cost-effectiveness-ace-benchmarking-report-2016

[29] EUROCONTROL: Seven-year forecast February 2017, Flight Movements and Service Units 2017-2023.

[30] SESAR1 B.04.05 - T3 Service Identification

[31] PRR 2016 – Performance Review Report – Draft Final Report for consultation with stakeholders (17 March – 07 April 2017).

[32]PRR 2017 – Performance Review Report.

[33]PRB RP2 Annual Monitoring Report 2015. Volume 3 – CAPEX. Version 2.2 from 20/12/2016. Accessed on 11/04/2017 via: https://ec.europa.eu/transport/sites/transport/files/prb_annual_monitoring_report_2015_vol_3_capital_expenditures.pdf

[34]EATMA, European ATM Architecture baseline 10.0 applicable to this document.

[35]PJ.15-01 Sub-regionalDCBCOSER Service Description Document TRL-6, ID D2.1.00

[36]PJ.15-01 PostOperationsIndicators Service Description Document TRL-4, ID D2.1.090

[37]P13.2.3 - Update of Enhanced DCB SPR for Step 1 - Final (SPR) D323

[38]P13.2.3 - Enhanced DCB Safety and Performance Requirements for Step 1 - Final (SPR) Annex 1 - Safety Assessment Report

[39] SESAR 2020 Security Assessment Report (Low Risk Material) PJ15-01

[40] SESAR 2020 Security Assessment Report (Medium Risk Material) PJ15-01

[41] SESAR 2020 Security Assessment Report (High Risk Material) PJ15-01

[42]PJ.15-01 HotspotDefinitionAndProposedSolution Service Description Document TRL-6, ID D.2.1.010

[43] ICAO Service Delivery Management (ATM SDM), Circular 335

[44] Validation Targets (2018) Edition 01.00.00

[45] 07.02 Step 2 Release 4 Detailed Operational Description (DOD)

[46] PJ15-01 COSER D2.2.060 CBA for Sub-Regional DCB Common Service

[47] PJ15-01 COSER High-Level Architecture for Sub-Regional DCB Common Service