INDUSTRIAL RESEARCH

sesar JOINT UNDERTAKING

SESAR PJ.32-W3-02 FRD

Deliverable ID:	**D3.1.090**
Dissemination Level:	**PU**
Project Acronym:	**PJ.32-W3 Virtual Centre**
Grant:	**101017587**
Call:	**H2020-SESAR-2020-2**
Topic:	**Virtual Centre**
Consortium Coordinator:	**EUROCONTROL**
Edition Date:	**27 February 2023**
Edition:	**00.01.01**
Template Edition:	**02.00.06**

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Authoring & Approval

Authors of the document

Beneficiary	Date
DSNA	28/10/2022
EUROCONTROL	28/10/2022
THALES	28/10/2022
ENAV	28/10/2022
LEONARDO	28/10/2022

Reviewers internal to the project

Beneficiary	Date
DSNA	29/11/2022
EUROCONTROL	15/11/2022
ACG / COOPANS	02/12/2022
CCL / COOPANS	02/12/2022
DFS	02/12/2022
ENAIRE	02/12/2022
ENAV	02/12/2022
FREQUENTIS	02/12/2022
INDRA	02/12/2022
LEONARDO	02/12/2022
LFV / COOPANS	02/12/2022
NAVIAIR / COOPANS	02/12/2022
SKYGUIDE	02/12/2022
THALES LAS	02/12/2022

Reviewers external to the project

Beneficiary	Date
DFS	06/12/2022
LEONARDO	09/12/2022

Approved for submission to the S3JU By - Representatives of all beneficiaries involved in the project

Beneficiary	Date
ACG / COOPANS	20/12/2022*

Co-funded by the European Union

CCL / COOPANS	20/12/2022*
DFS	19/12/2022
DSNA	16/12/2022
ENAIRE	20/12/2022*
ENAV	20/12/2022*
EUROCONTROL	18/12/2022
FREQUENTIS	20/12/2022*
INDRA	20/12/2022*
LEONARDO	20/12/2022
LFV / COOPANS	20/12/2022*
NAVIAIR / COOPANS	20/12/2022*
SKYGUIDE	20/12/2022*
THALES LAS	20/12/2022*

Rejected By - Representatives of beneficiaries involved in the project

Beneficiary	Date

Document History

Edition	Date	Status	Beneficiary	Justification
00.00.01	28/10/2022	Draft	DSNA	Version for authors review
00.00.02	28/10/2022	Draft	DSNA	Version for project review
00.01.00	15/12/2022	Final	DSNA	Integration of partners' comments for submission to SJU
00.01.01	27/02/2023	Final	DSNA	SJU comments taken into account

PJ.32-W3 Virtual Centre

PJ.32 W3 VC

This Functional Requirement Document is part of a project that has received funding from the SESAR3 Joint Undertaking under grant agreement No 101017587 under European Union's Horizon 2020 research and innovation programme.

Abstract

The objective of SESAR Solution P.32-W3-02 is to explore a selection of triangle architectures for the Virtual Centre, with two different purposes:

- Having a "specialised" ATC Data Service Provider providing some of the Virtual Centre Services (e.g. only the AMAN Services) to the Virtual Centre ATSU, and another ATC Data Service Provider providing all the other Virtual Centre services (in a consistent way with the specialised ATC Data Service Provider);
- Introducing a "Backup" ATC Data Service Provider which can provide all the Virtual Centre services to the Virtual Centre ATSU in case there is a contingency situation regarding its "regular" ATC Data Service Provider.

This document provides functional requirements and functional architecture views for each of the explored Triangle Architectures.

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Table of Contents

EUROPEAN PARTNERSHIP

Co-funded by the European Union

List of Tables

List of Figures

EUROPEAN PARTNERSHIP

Co-funded by the European Union

1 Executive summary

This document is the functional requirements document (FRD) for SESAR 2020 Solution P.32-W3-02. It presents a formal statement of the functional requirements for this Solution.

EUROCAE WG122, which aims at standardising services for implementing a vendor-independent Virtual Centre, has identified several possible architecture types in its ER-026 Report. One of them is the so-called “Triangle” architecture, which involves two ATM Data Service Providers (ADSP) for one Virtual Centre ATSU (VC ATSU) in a triangle relationship.

SESAR 2020 Solution P.32-W3-02 explores two categories of these Triangle architectures.

The first one involves a “specialised” ADSP providing only a limited set of the Virtual Centre Services (VC Services) to the VC ATSU (e.g. only the services related to Arrival Management Sequences) while a second ADSP provides all other required VC Services. Among the various specialised ADSPs that can be considered, the Solution partners have selected only the ones that make sense technically, and that raise an interest to stakeholders. Indeed, some functional blocks can be more easily separated from others and handled in a separate ADSP, such as conflict detection, safety nets, surveillance, SSR code management and arrival sequence provision.

The main challenge regarding these Triangle architectures with specialised ADSPs is of course to ensure an adequate data alignment between the specialised ADSP and the other ADSP, so that they provide consistent services to the VC ATSU. The type of data they need to exchange for this alignment is identified in requirements, and architecture views show which of the existing VC Services are good candidates to support these data exchanges. When a new service needs to be created, or when it is expected that existing services will need to be updated, an appropriate requirement has been provided.

The second category of Triangle architectures addresses a situation where the VC ATSU is connected to a single ADSP providing all the required services, but where another ADSP (“backup” ADSP) can be used if a failure occurs to the first one. In order to be able to take over in such a contingency situation, the backup ADSP must have data which is up-to-date and consistent with the regular ADSP.

Two alternatives have been studied for this triangle contingency architecture: one where the regular ADSP distributes data to both the VC ATSU and the backup ADSP, using the same distribution services (the backup ADSP being in “slave” mode), and one where the backup ADSP consumes the same external data as the regular ADSP, and processes them on its own (in “shadow mode”). The main advantages and disadvantages of the two options are discussed in this document, and high-level requirements applicable to both options have been derived from the analysis performed.

This document is based on DS23 at the EATMA level.

EUROPEAN PARTNERSHIP

Co-funded by the European Union

2 Introduction

2.1 Purpose of the document

This document is the functional requirements document (FRD) produced for SESAR Solution P.32-W3-02, which targets TRL2 level. It aims at describing “what” the SESAR Technological solution has to do but not the “how”.

SESAR Solution P.32-W3-02 explores a selection of architectures for the Virtual Centre, where the Virtual Centre ATSU (VC ATSU) gets some of its Virtual Centre services from a “specialised” ATC ATM Data Service Provider (ADSP) (e.g. an “AMAN” ADSP), and gets all the other Virtual Centre services from another ATC ADSP. It also explores an architecture where a second ATC ADSP is able to take over from the current ATC ADSP in case the latter is no more able to provide its services (contingency situation).

These architectures, involving a VC ATSU and two ADSPs (a specialised ATC ADSP and another ATC ADSP, or one main and one backup ATC ADSP), are referred to as “Triangle architectures”.

This document provides a functional view of each of the explored Triangle architectures studied in the context of the rationalisation of the infrastructure and provides functional requirements on both the specialised ATC ADSP and the other ATC ADSP. Those requirements address as well the exchanges needed between these two ADSPs. In particular, it highlights the new services needing to be designed and the former ones needing to be updated. Those services should be later addressed by TS-IRS documents of SESAR 3 Solutions to refine this initial work.

2.2 Intended readership

This document is mainly intended for:

- **SESAR 3 JOINT UNDERTAKING (S3JU)** as SESAR 2020 Programme coordinator.
- **SESAR 2020 PJ.10-W2** Virtual Centre for a follow-up of the expected evolutions of Virtual Centre Services
- **SESAR 2020 PJ.19-W2** Content Integration that aims at assuring coherency, consistency, and comparability of the validation results throughout all SESAR2020 Solutions.
- **SESAR 2020 PJ.20-W2** European Master Planning of objectives - Coordination contact (s)
- Future **SESAR 3 projects** which may pursue the work on the Virtual Centre concept
- Representatives of civil stakeholders: **ANSPs**.
- Representatives of ATM Data Service Providers: **ADSPs**.

2.3 Background

The Virtual Centre (VC) concept was originally explored in SESAR 1 B.04.04, which demonstrated its feasibility from a technical point of view for the first time.

On the operational side, PJ.15-09, in Wave 1, identified a preliminary list of possible use cases for the Virtual Centre, including the simple possibility to rationalise the infrastructure by isolating data

provision from an ADSP. Then PJ.10-W2-Solution 93 developed these use cases, focusing on the ones linked to the delegation of airspace and the contingency situation in case of ATSU failure.

On the technical side, PJ.16-03 was the Enabling Solution from SESAR 2020 Wave 1 which refined and matured the technological concept up to TRL6 for the purpose of rationalising the infrastructure. This solution explored an architecture where all the VC Services required by the VC ATSU were provided by a single ATC ADSP (the Voice Services being provided by a separate Voice ADSP), but, as a recommendation for further work, suggested to explore other architectures where the VC services are spread among various ADSPs, providing them from various locations, thus allowing an enhancement of the architecture flexibility.

As a follow-up of the work performed in the Wave 1 SESAR projects, EUROCAE launched the Working Group 122 to address the standardisation aspects of the Virtual Centre. The working group established a taxonomy of the possible architectures and identified in particular some architectures where two ATC ADSPs are connected to the same VC ATSU. Such architectures have been named “Triangle architectures”.

In direct continuation of PJ.16-03, this solution P.32-W3-02 explores several Triangle architectures in the context of infrastructure rationalisation.

2.4 Structure of the document

The document is structured as follows

- Chapter 1 contains the Executive Summary;
- Chapter 2 introduces the document, in terms of scope, purpose, intended readership. It also provides also a glossary of the terms and acronyms;
- Chapter 3 contains an overview of the solution, and functional architecture views for each triangle architectures studied in this document;
- Chapter 4 gathers the functional requirements for each triangle architecture;
- Chapter 5 is a pointer to the various assumptions used in this document;
- Chapter 6 lists the applicable and reference documents.

2.5 Glossary of terms

Term	Definition	Source of the definition
ATC ADSP	An ATM Data Service Provider providing all Services required by the Air Traffic Service Unit in the context of a Virtual Centre, except those related to the air-ground and	PJ.32-W3-02

	ground-ground voice communication systems.	
Functional Block	A logical and cohesive grouping of automated Functions in a Technical System.	EATMA
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.	EATMA
Service Interface	The mechanism by which a service communicates. *Note: A Service Interface specifies the Service Interface Definition provided and required by the Service.*	EATMA
Service Interface Definition	The specification of the service interface.	EATMA
Specialised ADSP	An ATM Data Service Provider (ADSP) specialised in a specific function and providing the subset of Virtual Centre Services related to this function, e.g. a Safety Net ADSP providing Safety Net- related Virtual Centre Services.	PJ.32-W3-02
SWIM Technical Infrastructure (SWIM-TI)	The SWIM Technical Infrastructure (SWIM-TI) contributes to the services' solution, aspects providing means supporting effective and secure ATM-specific service provision and consumption among SWIM-enabled ATM systems.	SESAR1 WP14
Technical System	A collection of Functional Blocks or Functions. Guidance: Technical Systems are artefacts that represent the technical part of Capability Configurations and contain Functional Blocks. Interaction between Technical Systems can be described via Resource Interactions (normally for	EATMA

	legacy exchanges) and via Services (normally, for new exchanges). Both interactions carry Data elements. A Technical System comprises a set of System Ports that are the part of the Technical System in charge of implementing such data exchanges. Technical Systems can be linked to Functions that represents what the Technical System does.	
Virtual Centre	A virtual centre is a single Air Traffic Service Unit (ATSU) or a grouping of collaborative ATSUs using data services provided by ATM Data Service Provider (ADSP). The concept provides, at least, geographical decoupling between ADSP (s) and some ATSU (s), through service interfaces defined in Service Level Agreements. One ATSU may use data services from multiple ADSPs, just as an ADSP may serve multiple ATSUs.	PJ.16-03 solution
Virtual Centre Services	The services provided by an ATM Data Service Provider to the Air Traffic Service Unit (ATSU) in the context of a Virtual Centre.	PJ.32-W3-02

Table 1: Glossary

2.6 Acronyms and Terminology

Term	Definition
ATM	Air Traffic Management
ADSCD	Automatic Dependent Surveillance Contract data Distribution
ADSCM	Automatic Dependent Surveillance Contract data Management
ADSP	ATM Data Service Provider
AFIS	Aerodrome Flight Information Service
AFTN	Aeronautical Fixed Telecommunication Network
AGDS	Air-Ground Datalink Service
AMAN	Arrival data Management
AMAND	Arrival data Distribution
ANSP	Air Navigation Service Provider

Co-funded by the European Union

APP	Approach
ASD	Airspace Data Distribution
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATSU	Air Traffic Service Unit
CHMI	Controller HMI
CORR	Correlation management
CORRD	Correlation data distribution
CORRM	Correlation data management
CPDLCD	Controller Pilot Data Link Communications data distribution
CPDLCM	Controller Pilot Data Link Communications data management
CTA	Calculated Time of Arrival
CTM	Coordination & Transfer Management
CTO	Calculated Time Over
CWP	Controller Working Position
DLKM	Datalink Management
EATMA	European ATM Architecture
E-ATMS	European Air Traffic Management System
EPP	Extended Projected Profile
ETA	Estimated Time of Arrival
FB	Functional Block
FDD	Flight Data Distribution
FDM	Flight Data Management
FDO	Flight Data Operator
FRD	Functional Requirements document
GGDC	Ground-Ground Data Communications
HMI	Human-Machine Interface
IFPS	Integrated Initial Flight Plan Processing System
IOP	Interoperability
IRS	Interface Requirements Specification
MONA	Monitoring Aids
MONAD	Monitoring Aids data Distribution
MTAPW	Medium Term Airspace Penetration Warning
MTCD	Medium Term Conflict Detection

OLDI	On-Line Data Interchange
OPSUPD	Operational Supervision data Distribution
OPSUPM	Operational Supervision data Management
POI	Preliminary Operational Improvement
SESAR	Single European Sky ATM Research Programme
S3JU	SESAR3 Joint Undertaking (Agency of the European Commission)
SNET	Safety Nets
SOA	Service-Oriented Architecture
SSR	Secondary Surveillance Radar
SSRD	Secondary Surveillance Radar data Distribution
SSRM	Secondary Surveillance Radar data Management
SUPPD	Support Function data Distribution
SUPPM	Support Function data Management
SUR	Surveillance
SURD	Surveillance data Distribution
TCT	Tactical Controller Tool
TECHSUP	Technical Supervision
TP&M	Trajectory Prediction & Management
TRACT	TRajectory Adjustment through Constraint of Time
TRACTD	TRajectory Adjustment through Constraint of Time data Distribution
TSUPD	Technical Supervision data Distribution
TS	Technical Specification
VC	Virtual Centre

Table 2: Acronyms and technology

Co-funded by the European Union

3 Functional Architecture View

3.1 SESAR Solution(s) Overview

The solution explores various Triangle architectures involving two ADSPs providing services to the same VC ATSU. This covers two general cases:

- the spreading of the functional coverage of the ATC ADSP over 2 ADSPs[1], resulting in the introduction of a "specialised" ADSP providing a specific service to the VC ATSU (e.g. an AMAN ADSP providing the AMAN service) and another ADSP ("principal" ADSP) providing the remaining services. The specific ADSP covers only one or a few ATC functions, the rest being handled by the other ADSP;
- the contribution of a second ADSP as a backup of the usual one in case of contingency (each ADSP (the usual one and the backup one) providing the whole set of VC services to the ATSU):

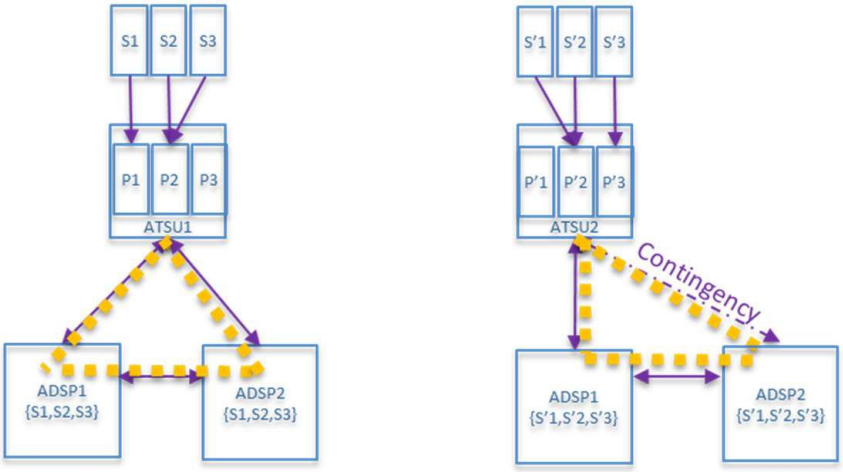

Figure 1: Two types of Triangle architecture

In both cases, the two ADSPs need to exchange data between themselves to be able to provide their services, and to do it consistently. This exchange need is of the main point to be studied in the analysis of these triangle architectures.

[1] Of course, the spreading could be extended to more than 2 ADSPs and combine several specialised ADSPs, depending on the chosen deployment option; however, as all combinations can not be studied, the architectures have been studied in a strict "triangle" configuration, involving only 2 ADSPs.

Co-funded by the European Union

The triangle architectures with a “specialised” ADSP which are studied in this solution were selected by the project partners as the most valuable to be studied, in terms of interest and feasibility, and are the following:

- Triangle architecture with a Conflict Detection Tools ADSP
- Triangle architecture with a Safety Net ADSP
- Triangle architecture with a Surveillance ADSP
- Triangle architecture with a SSR Code Management ADSP
- Triangle architecture with an Arrival management ADSP

SESAR Technological Solution ID and Title	SESAR Technological Solution POI	Comments on potential updates required at SESAR Technological Solution and/or POI level
PJ.32-W3-02 Multi-ADSPs (Triangle Architecture) Virtual Centre	**POI-0078-SDM** Supporting rationalisation of infrastructure by using the Virtual Centre concept with Triangle-Architectures	This POI covers several Triangle Architecture, in which a “specialised” ADSP provides a special service to the VC ATSU and another ADSP providing the remaining services. The interoperability between these two ADSPs requires new or updated services.
PJ.32-W3-02 Multi-ADSPs (Triangle Architecture) Virtual Centre	**POI-0079-SDM** Supporting rationalisation of infrastructure by using a Virtual Centre Triangle Architecture for ADSP contingency	This POI covers a Triangle Architecture, in which a second ADSP is introduced to be used as a backup in case the current ADSP of the VC ATSU fails to provide its services (ADSP contingency situation). To maintain the alignment between the two ADSPs, new or updated services are required.

Table 3: SESAR Technological Solution PJ.32-W3-02 Scope - POIs

SESAR Technological Solution ID and Title	Impacted Functional Block by the SESAR Technological Solution	Comments on potential updates required at impacted functional block
PJ.32-W3-02 Multi-ADSPs (Triangle Architecture) Virtual Centre	Technical Supervision (TECHSUP)	This Functional Block needs to be able to consume technical supervision data distributed by another ADSP as a service
CR06386	Conflict Management (CONF)	This Functional Block needs to be able to consume flight plan data, sector configuration data, ETA min-max data, CTO instructions approvals, surveillance and correlation data distributed by another ADSP as a service
CR06386	Air-Ground Datalink Service (AGDS)	This Functional Block needs to be able to expose services to distribute ETA min-max

Co-funded by the European Union

CR06389		instructions, CTA acceptance data, ADS-C Position reports and CTO uplink instructions, and to process CTO uplink instructions inputs and ETA min-max queries.
CR06387	Safety Nets (SNET)	This Functional Block needs to be able to consume flight plan data, sector configuration data, surveillance and correlation data distributed by another ADSP as a service
CR06388	Surveillance (SUR)	This Functional Block needs to be able to consume surveillance data and correlation data distributed by another ADSP as a service
CR06388	Correlation Management (CORR)	This Functional Block needs to be able to consume surveillance data and flight data distributed by another ADSP as a service
CR06388 CR06389	Ground-Ground Datalink Communication (GGDC)	This Functional Block needs to be able to consume surveillance data and arrival sequences distributed by another ADSP as a service
CR06388 CR06389	Monitoring Aids (MONA)	This Functional Block needs to be able to consume surveillance data and arrival sequences distributed by another ADSP as a service
CR06388	Trajectory Prediction & Management (TP&M)	This Functional Block needs to be able to consume surveillance data distributed by another ADSP as a service
CR06389	Arrival Management (AMAN)	This Functional Block needs to be able to consume flight plan data, sector configuration data, ETA min-max data, CTA instructions approvals and arrival management configuration data distributed by another ADSP as a service
CR06390	Controller HMI (CHMI)	This Functional Block needs to be able to consume and manage specific services provided simultaneously by 2 ADSPs (e.g. Technical Supervision, Support Functions…)

Table 4: SESAR Technological Solution PJ.32-W3-02 Scope - Impacted Functional Blocks

The solution is applicable to all En-Route and Terminal Airspace sub-environments.

3.1.1 Supporting reasons for this Technological Solution

One of the targets supporting SESAR vision is to deliver a fully scalable and resilient traffic management system, with a modular and agile infrastructure. To do so, the Airspace Architecture Study [9] prescribes to decouple service provision from local infrastructure, progressively increasing the levels of collaboration.

This Technical Solution aims at increasing flexibility in the possibilities of Virtual Centre architectures and service provision options offered to an ANSP, which will then be in a position to select the best

and most cost-effective option for its situation, thus contributing to the global ATM Cost Efficiency target.

Exploring possible implementation options, PJ.16-03 had already stressed the interest of fragmenting the ATC ADSP into multiple specialised ATC ADSPs, and suggested to further address these options. While exploring all combinations would not be possible in the timeframe of this project, the priority of this Solution has been given to the Triangle architectures that make technical sense, and that raise an interest to stakeholders. Indeed, some functional blocks can be more easily handled by specialised ATC ADSPs than others, so the Solution priority has been put on these specialised ATC ADSPs triangle architectures.

It also has to be noted that this Solution is a valuable complement to PJ.10 Solution 93, as the Triangle architectures with specialised ADSPs could also be combined with the Y and D architectures developed in Solution 93a and b, where for instance two VC ATSUs could use the same Flight Plan ADSP while using separate Surveillance ADSPs.

Regarding contingency situation, this Solution explores ADSP contingency situations whereas Solution 93 addresses the contingency for VC ATSUs. There may be links and similar technical issues relevant for both ADSP contingency categories and the VC ATSUs Contingency addressed by PJ10 Solution 93c, even though the respective covered use cases are different.

3.1.2 ATM Capabilities addressed by the ATM Solution

The Solution addresses the following SESAR ATM Capabilities:

SESAR ATM Capability	Capability description
ATM Data Provision in support of the Virtual Centre	The ability to provide ATM data in support of the Virtual Centre.
Data Centre Service Management	The ability to manage the delivery of Data Centre services in support of virtual centres.
ATM Contingency Management	The ability to plan and action procedures to ensure, to the extent possible and as far as practicable, the continued safety of air navigation in the event of disruption in the provision of air traffic services or supporting services.

Table 5: Addressed SESAR ATM Capabilities

The Functional Requirements provided in section 4 are grouped by Triangle Architecture, i.e.:

- For each Triangle Architecture involving a specialised ADSP (e.g. an AMAN ADSP);
- For the Triangle Architecture supporting ADSP contingency situation.

3.1.3 Stakeholders impacted by the Technological Solution

Stakeholder	Impact
Air Navigation Service Providers	Implementation of preferred Virtual Centre architectures according to selected ATM Data Service Providers

Co-funded by the European Union

Aeronautics Industry	Provision of interoperable ATC ADSP systems (specialised or backup)

Table 6: Impacted stakeholders

3.2 SESAR Technological Functional View

3.2.1 Introduction

The sections below provide the identification of the interactions for a given Triangle Architecture and the functional decomposition of the involved Specialised ADSP.

As exposed in Table 4, there is no impact on the Functional Blocks except the ability to provide or consume services; as a consequence, sub-sections regarding Functional Block Modes and States and the Functional Analysis are irrelevant and not provided.

Local specialised or backup ADSP:

The Triangle architectures below (involving a specialised ADSP) are studied in a situation where the two ADSPs are geographically decoupled from the VC ATSU. However, it must be kept in mind that the second ADSP may also be collocated in the VC ATSU.

Conflict Tools Management ADSP:

When studying the Triangle architecture involving a Conflict Tool Management ADSP, it has been deemed necessary to study the various conflict tools separately in order to maximise the benefit of the stakeholders, which may decide to outsource only one of the Conflict Tools.

ADSP Contingency:

In order to better capture the state of thinking among Solution partners at TRL2 level, it has been chosen to expose two possible alternatives with their respective benefits and drawbacks.

3.2.2 Triangle Architecture with a MTCD ADSP

3.2.2.1 Interaction(s) identification

This view presents the configuration where two ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of MTCD data.

In particular, it highlights:

- the services complementary to the Medium Term Conflict services that are also required by the ATSU from the MTCD ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

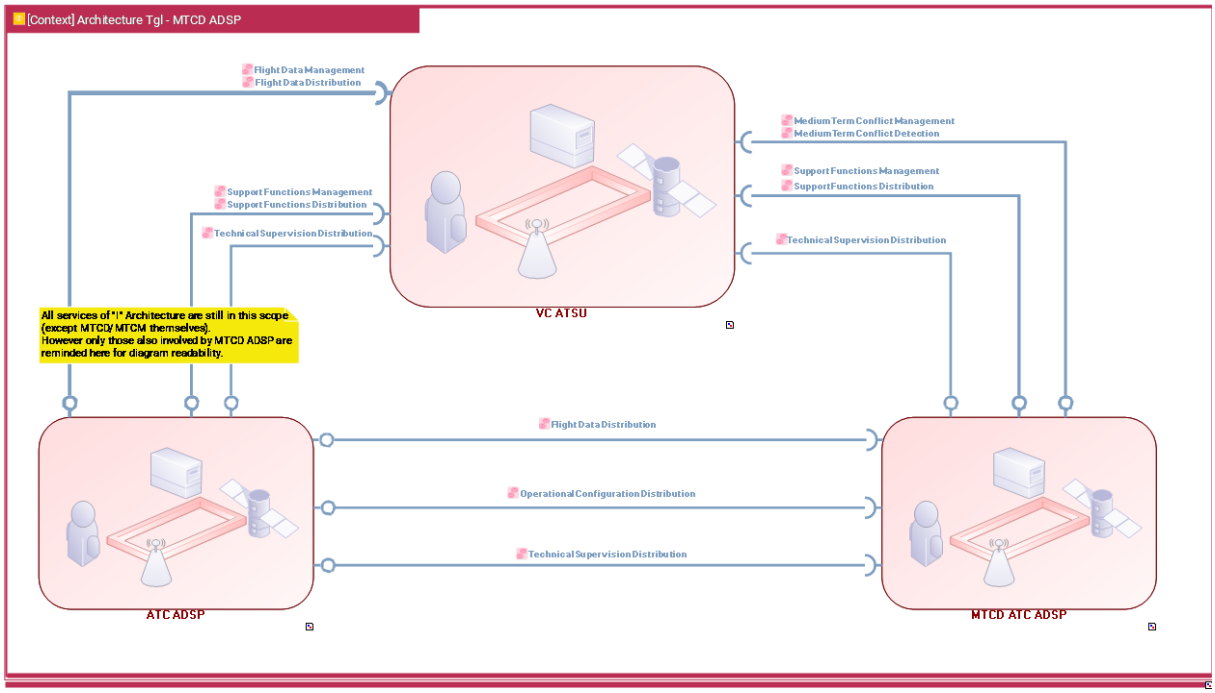

Figure 2: MTCD ADSP Interactions

EUROPEAN PARTNERSHIP
Co-funded by the European Union

3.2.2.2 Functional decomposition

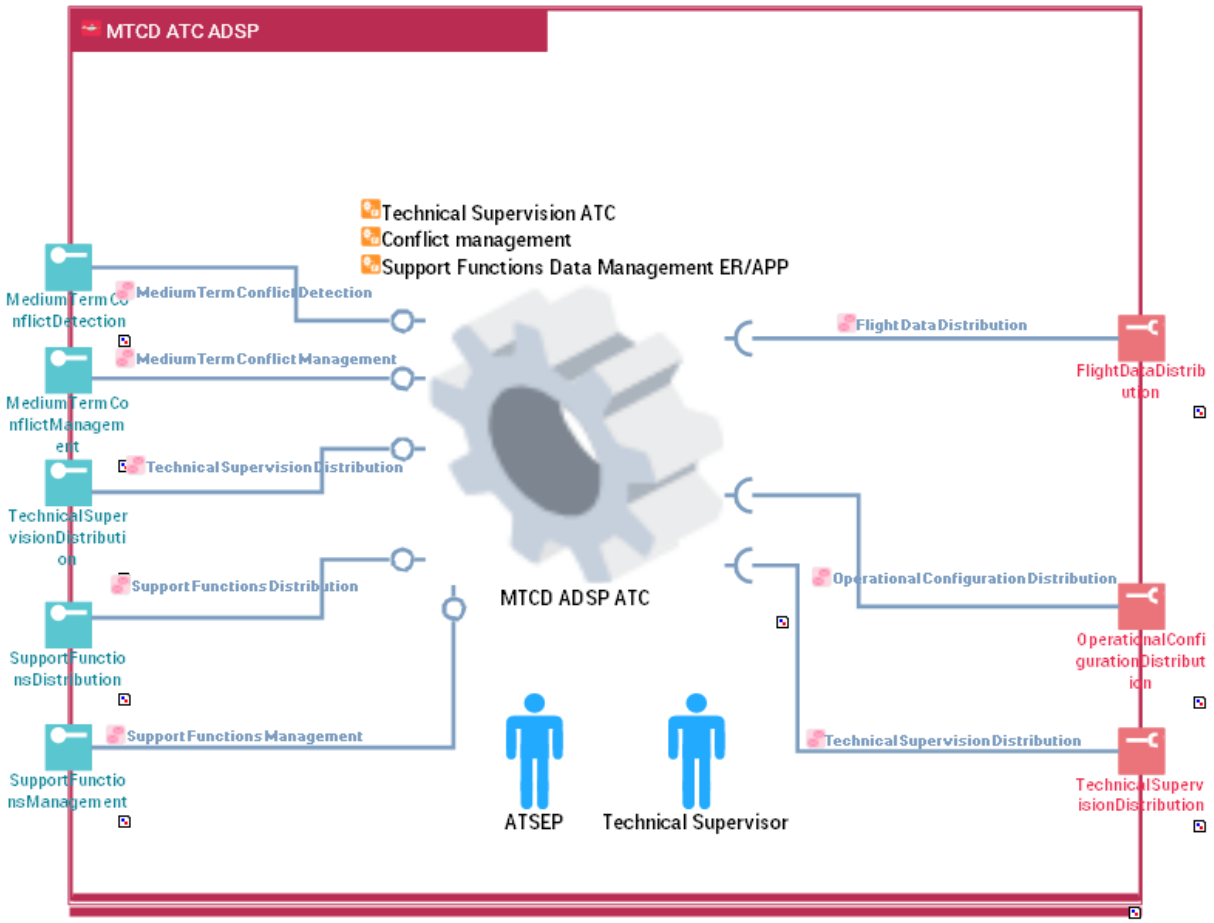

Figure 3: MTCD ADSP Decomposition

3.2.3 Triangle architecture with a TRACT ADSP

3.2.3.1 Interaction(s) identification

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of TRACT data (TRajectory Adjustment through Constraint of Time).

In particular, it highlights:

- the services complementary to the TRACT services that are also required by the ATSU from the TRACT ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

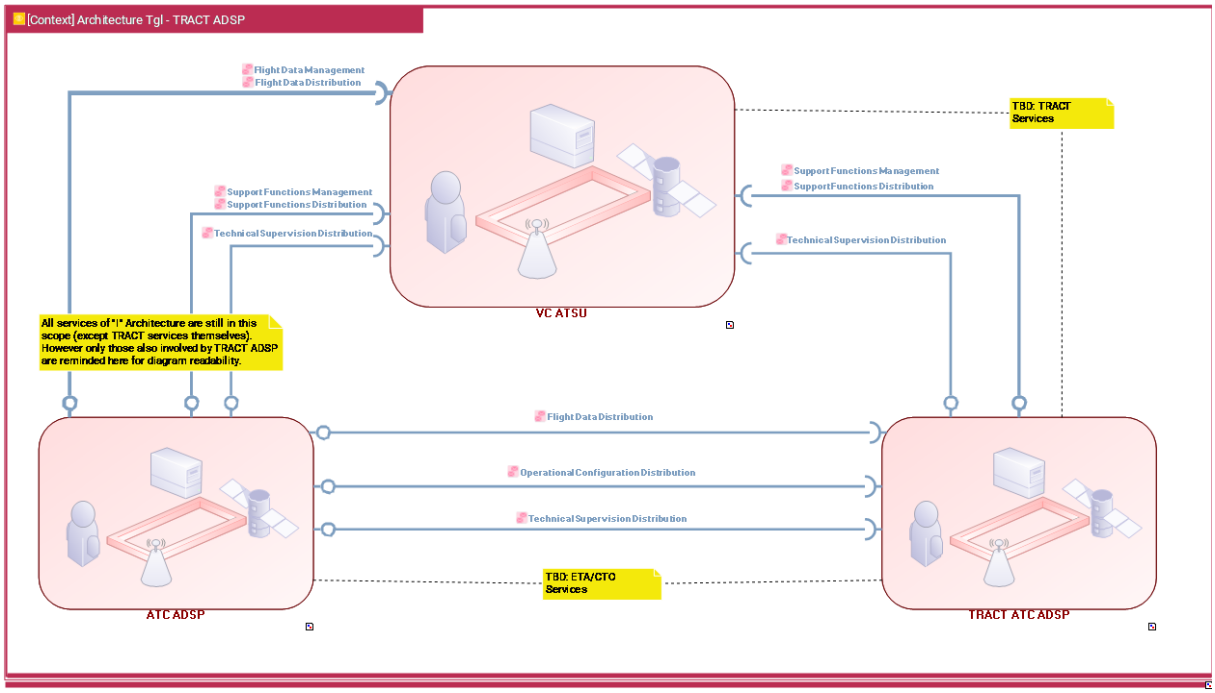

Figure 4: TRACT ADSP Interactions

EUROPEAN PARTNERSHIP

Co-funded by the European Union

3.2.3.2 Functional decomposition

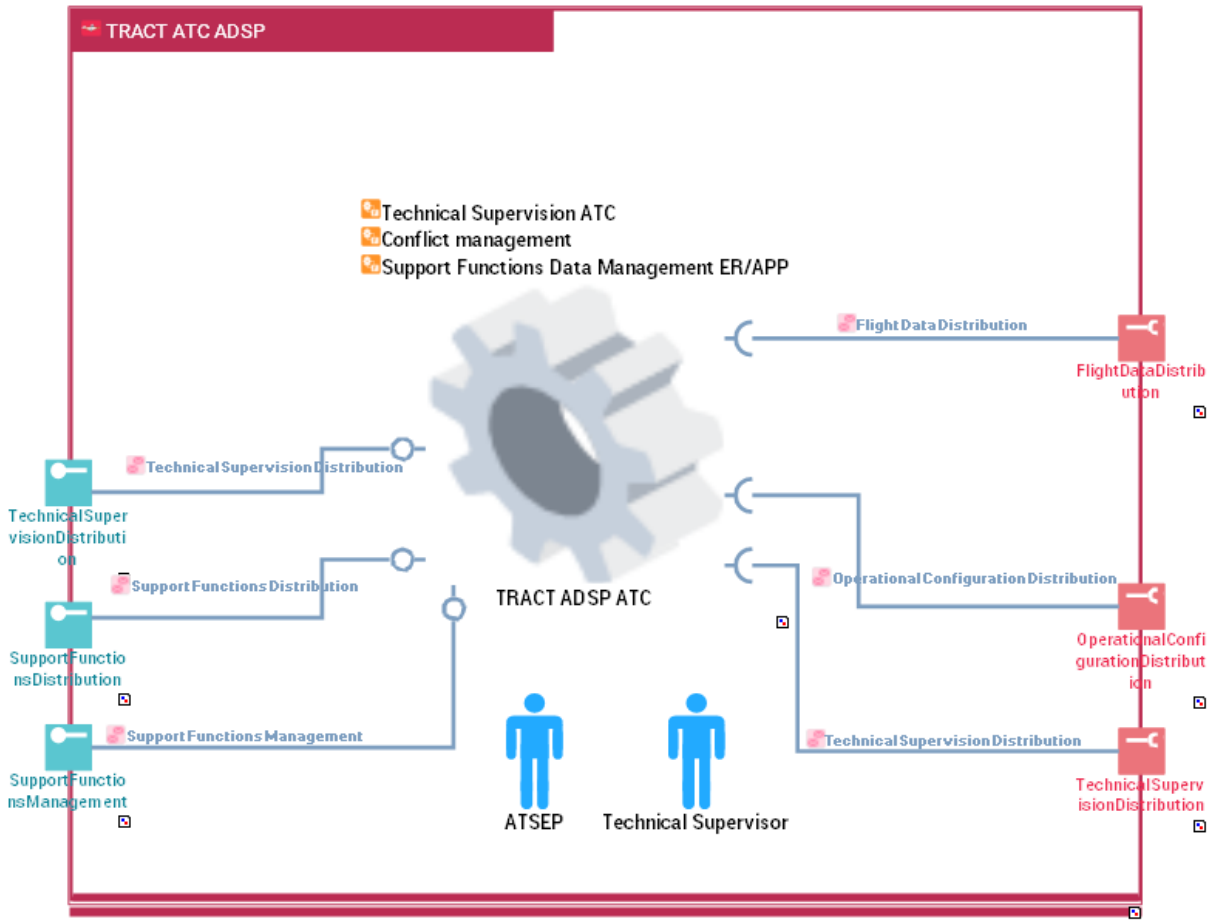

Figure 5: TRACT ADSP Decomposition

3.2.4 Triangle architecture with a MTAPW ADSP

3.2.4.1 Interaction(s) identification

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of MTAPW data.

In particular, it highlights:

- the services complementary to the Medium Term Airspace Penetration Warning services that are also required by the ATSU from the MTAPW ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

EUROPEAN PARTNERSHIP
Co-funded by the European Union

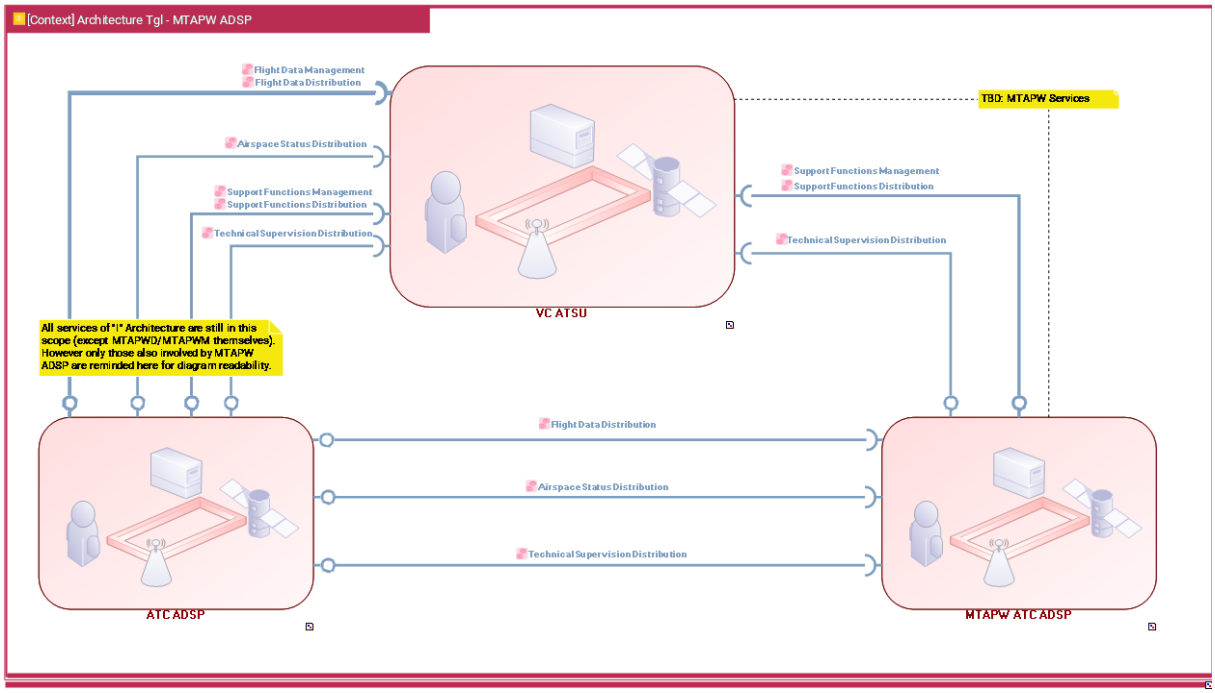

Figure 6: MTAPW ADSP Interactions

3.2.4.2 Functional decomposition

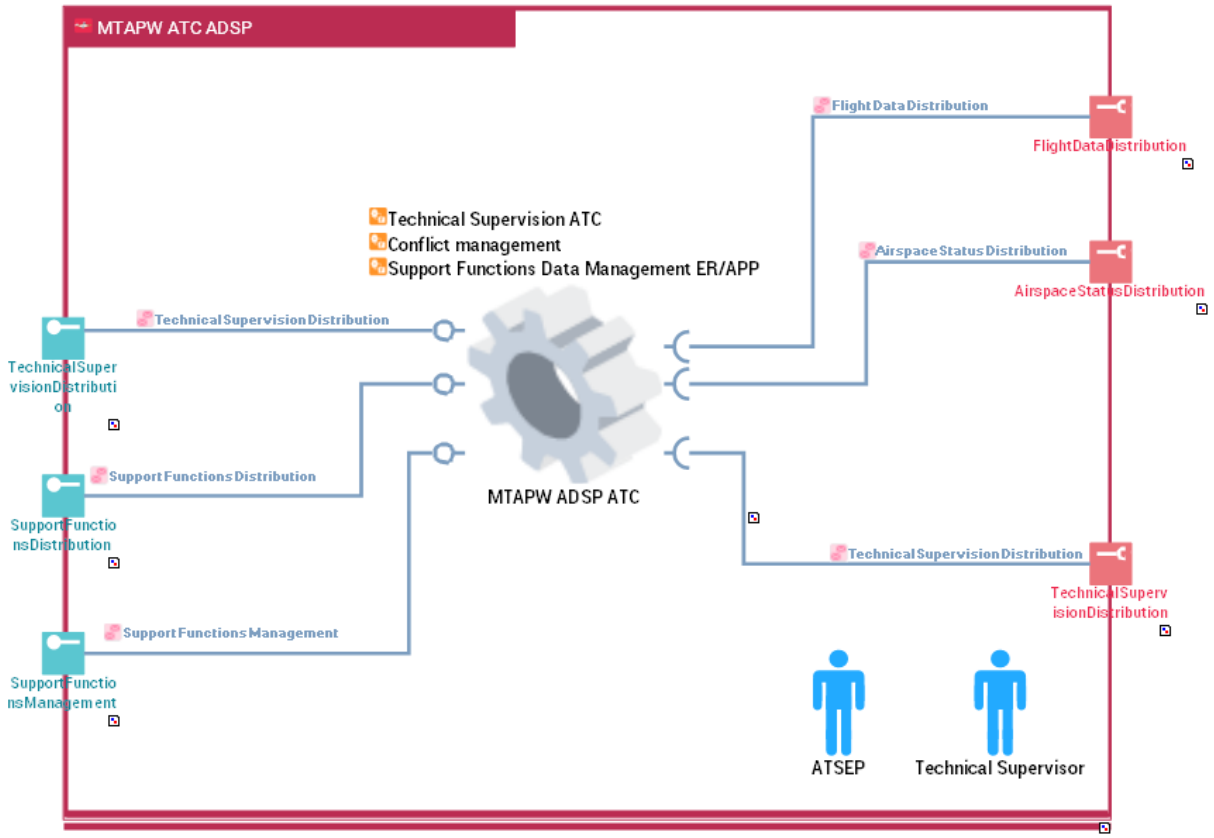

Figure 7: MTAPW ADSP Decomposition

EUROPEAN PARTNERSHIP
Co-funded by the European Union

3.2.5 Triangle architecture with a TCT ADSP

3.2.5.1 Interaction(s) identification

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of a Tactical Controller Tool.

In particular, it highlights:

- the services complementary to the TCT services that are also required by the ATSU from the TCT ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

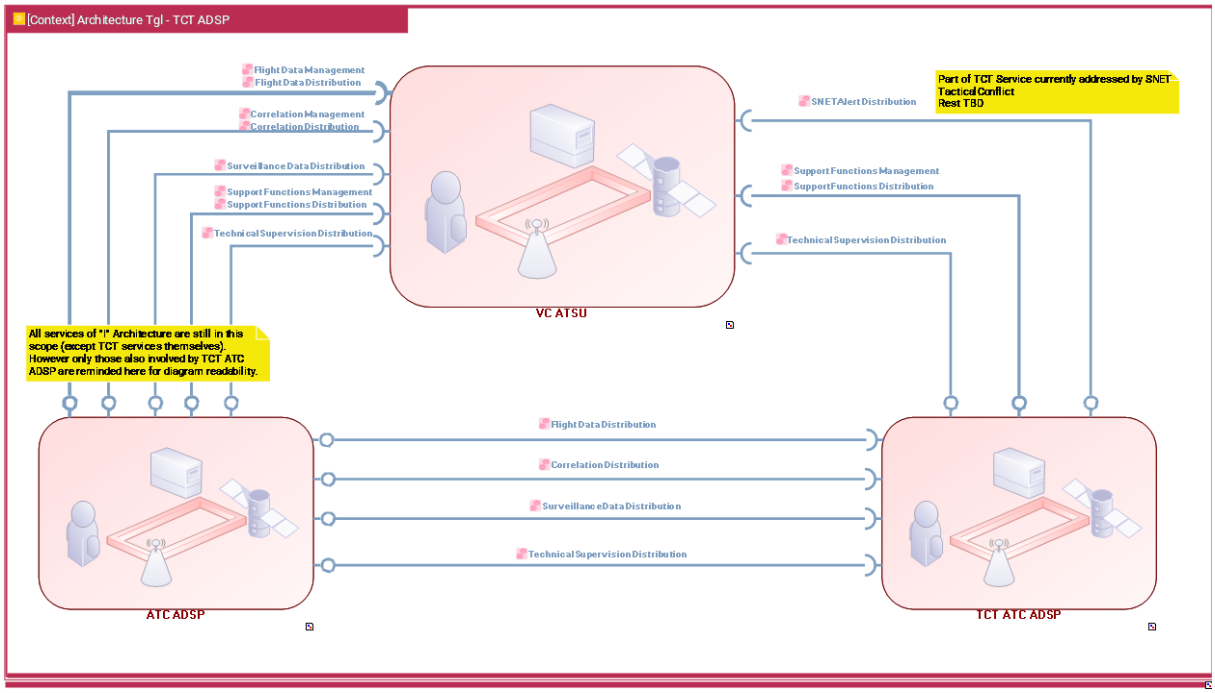

Figure 8: TCT ADSP Interactions

EUROPEAN PARTNERSHIP
Co-funded by the European Union

3.2.5.2 Functional decomposition

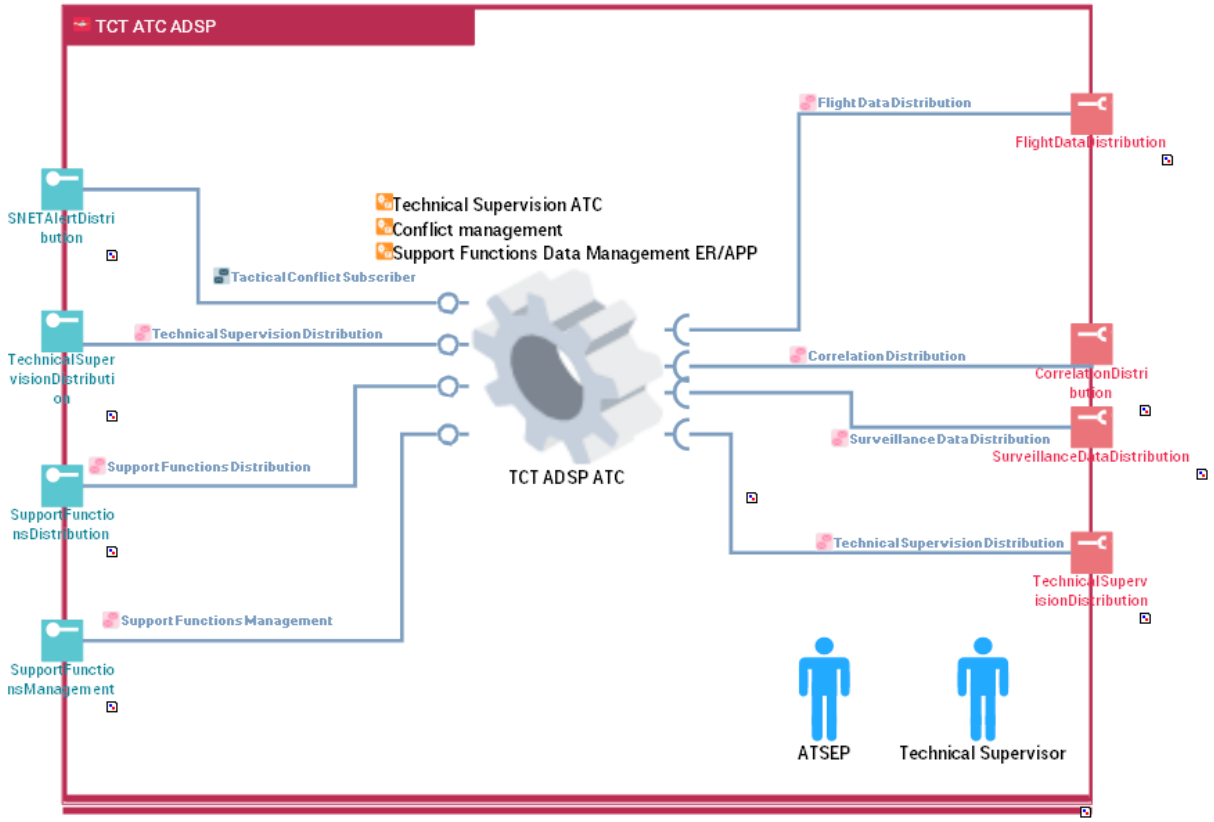

Figure 9: TCT ADSP Decomposition

3.2.6 Triangle architecture with a Safety Nets ADSP

3.2.6.1 Interaction(s) identification

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of Safety Nets data.

In particular, it highlights:

- the services complementary to the SNET Alert service that are also required by the ATSU from the SNET ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

EUROPEAN PARTNERSHIP

Co-funded by the European Union

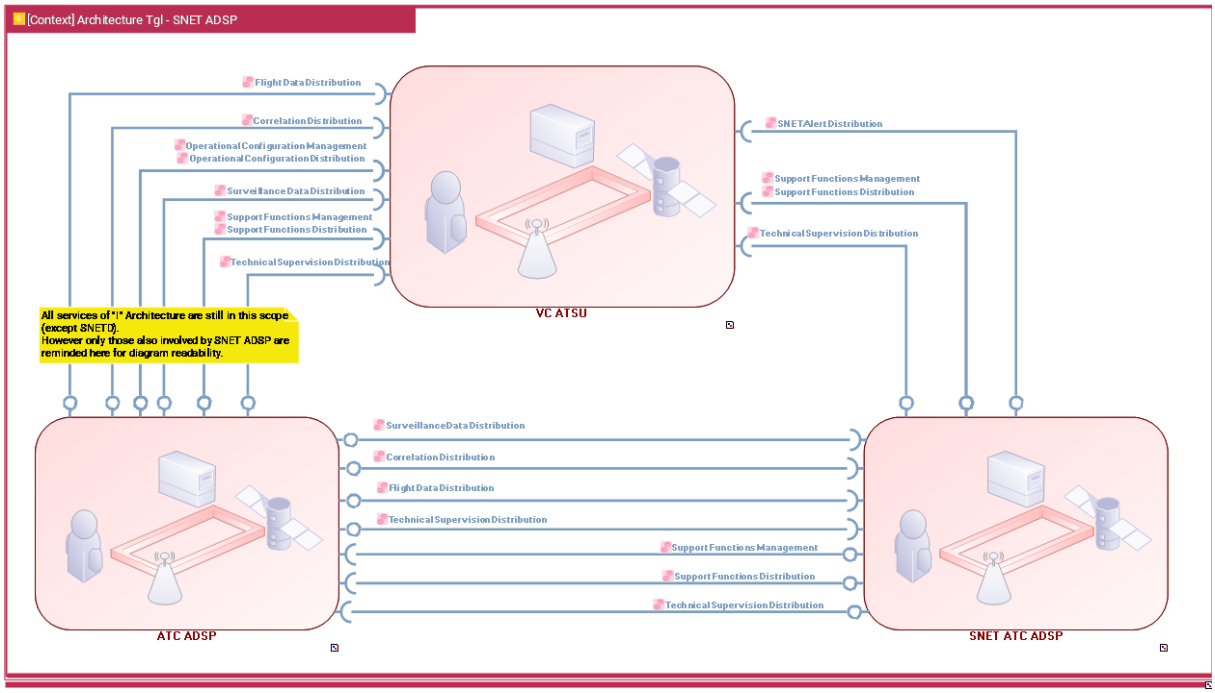

Figure 10: SNET ADSP Interactions

3.2.6.2 Functional decomposition

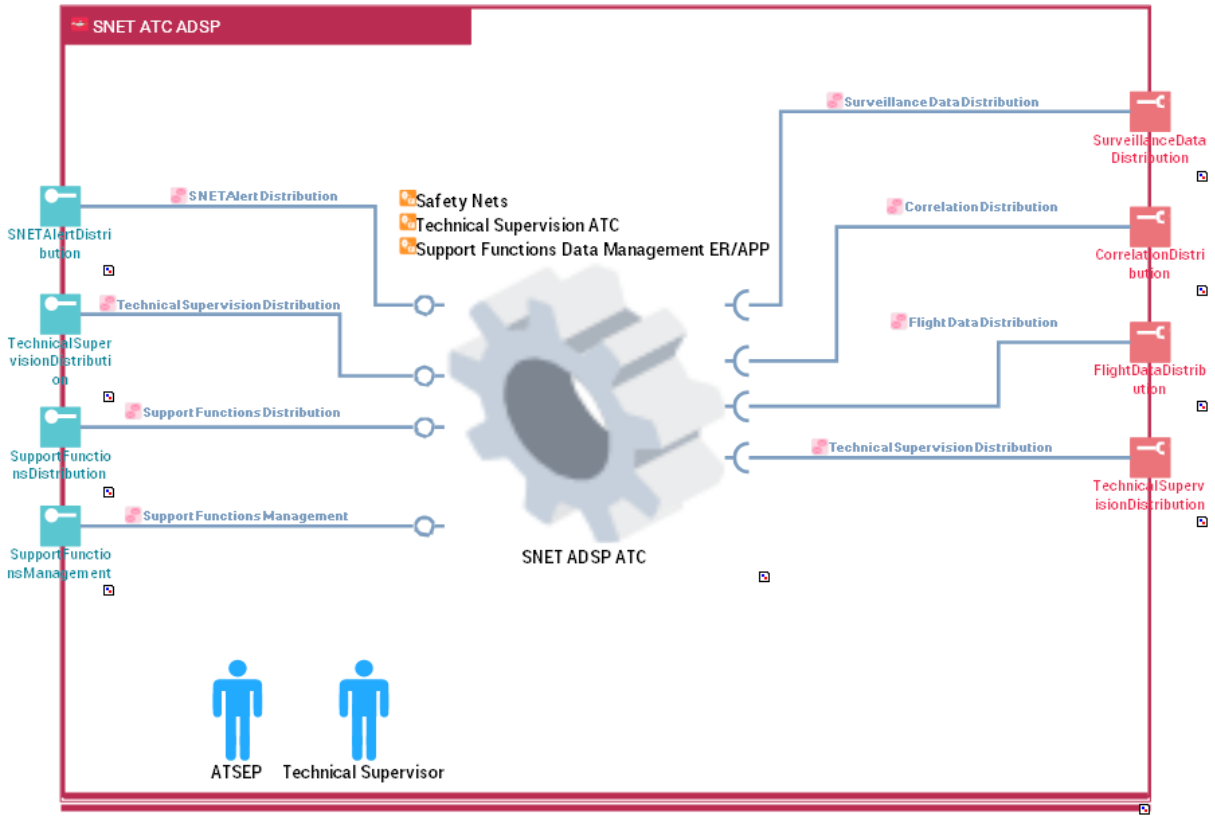

Figure 11: SNET ADSP Decomposition

3.2.7 Triangle Architecture with a Surveillance ADSP

3.2.7.1 Interaction(s) identification

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of Surveillance data.

In particular, it highlights:

- the services complementary to the Surveillance service that are also required by the ATSU from the Surveillance ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

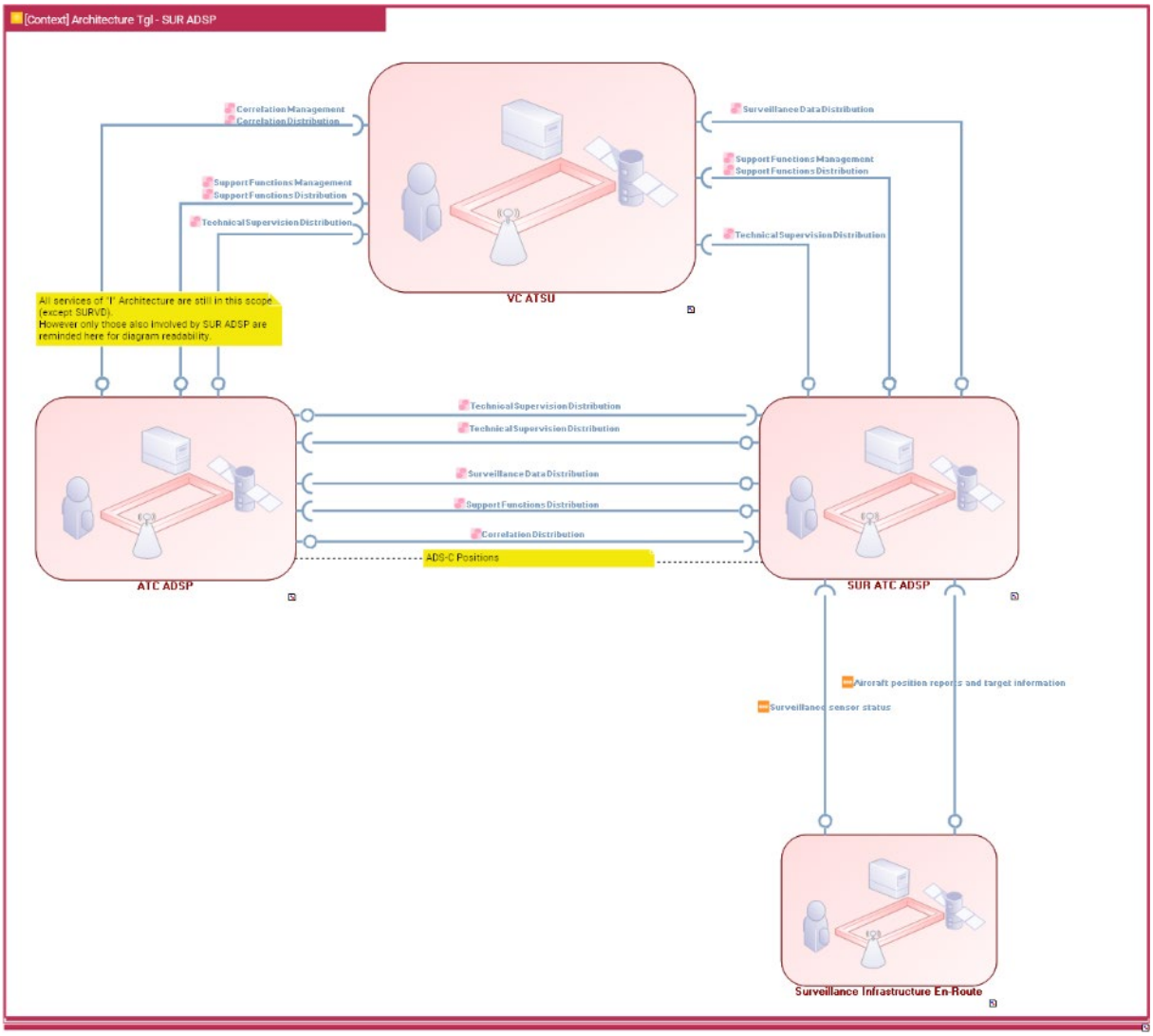

Figure 12: Surveillance ADSP Interactions

EUROPEAN PARTNERSHIP
Co-funded by the European Union

3.2.7.2 Functional decomposition

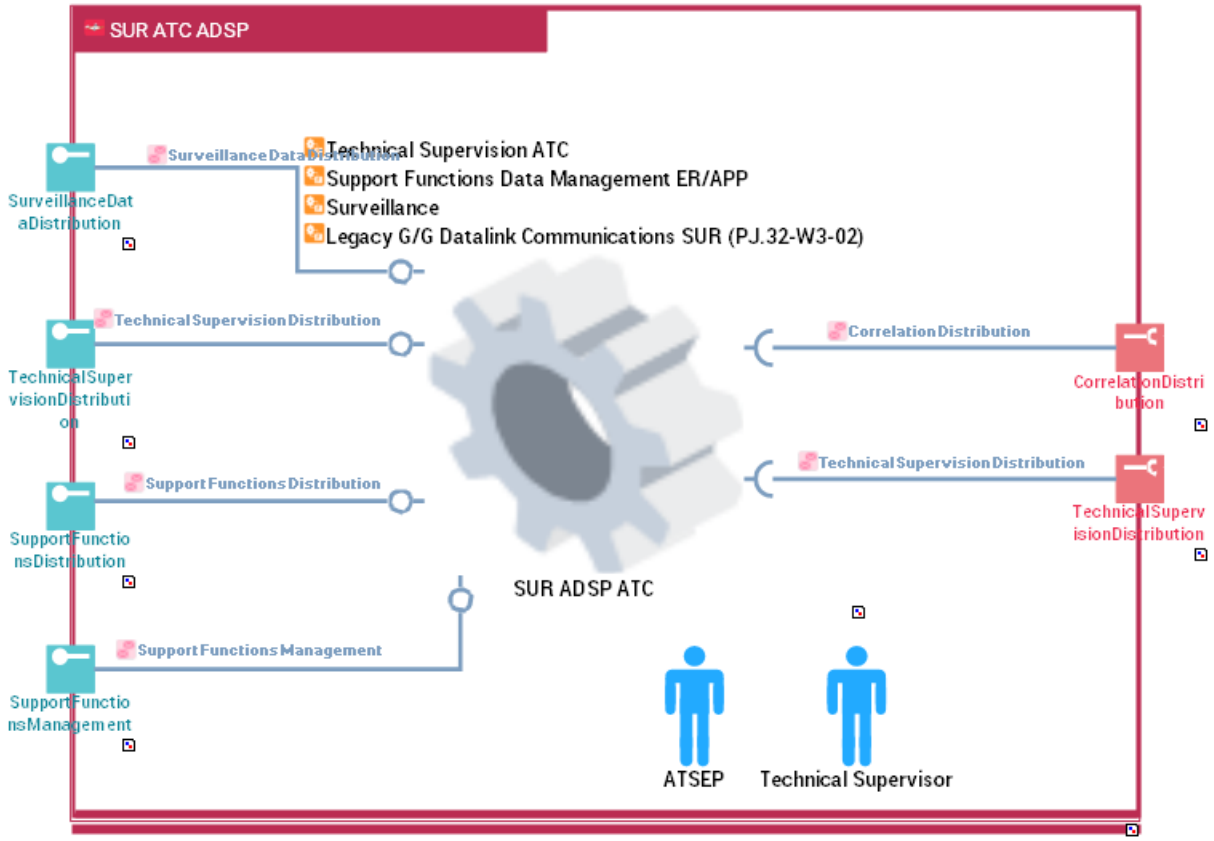

Figure 13: Surveillance ADSP Decomposition

3.2.8 Triangle Architecture with an AMAN ADSP

3.2.8.1 Interaction(s) identification

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the Arrival Sequence provision and management.

In particular, it highlights:

- the services complementary to the Arrival Management services that are also required by the ATSU from the AMAN ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

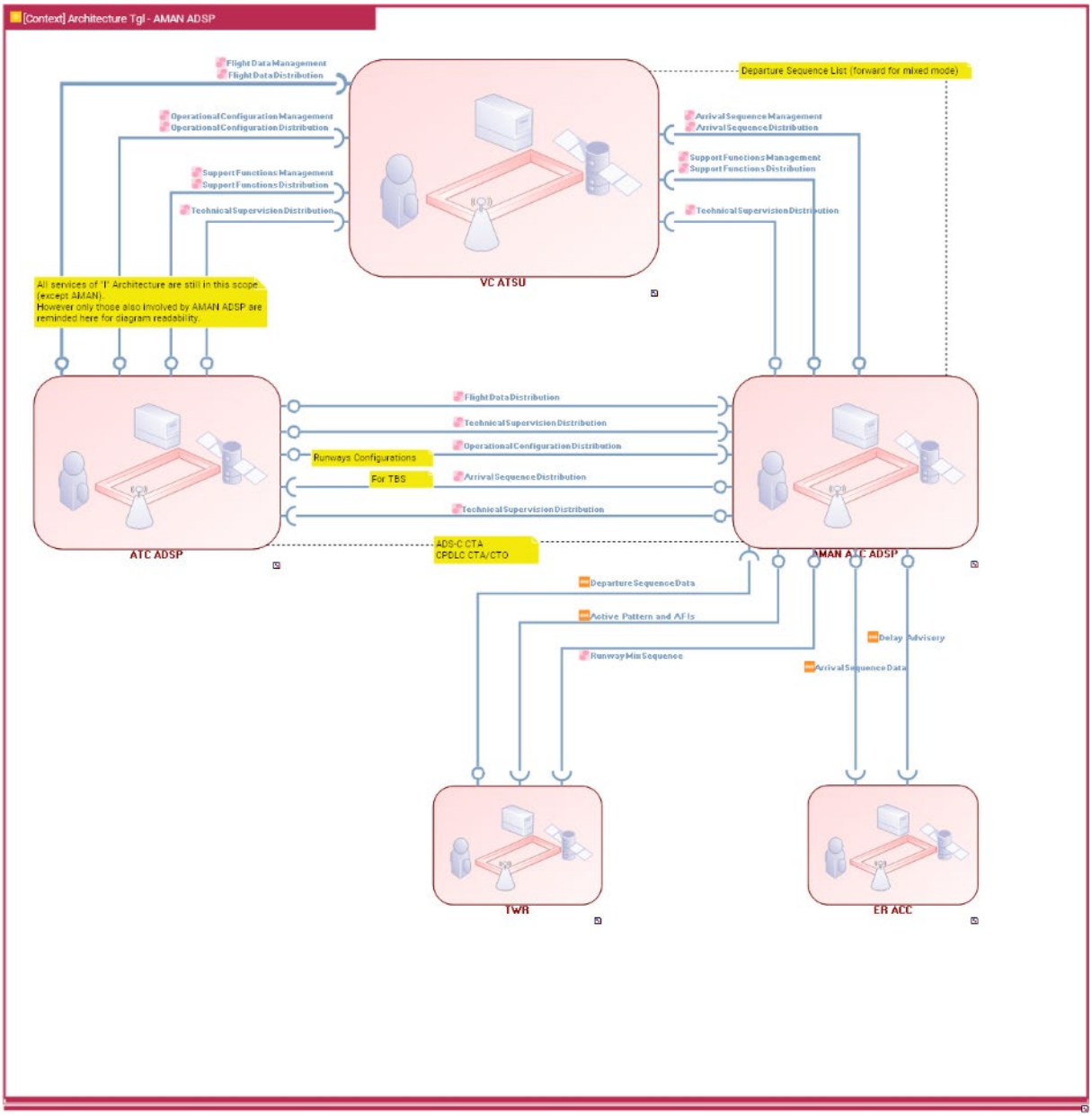

Figure 14: AMAN ADSP Interactions

EUROPEAN PARTNERSHIP
Co-funded by the European Union

3.2.8.2 Functional decomposition

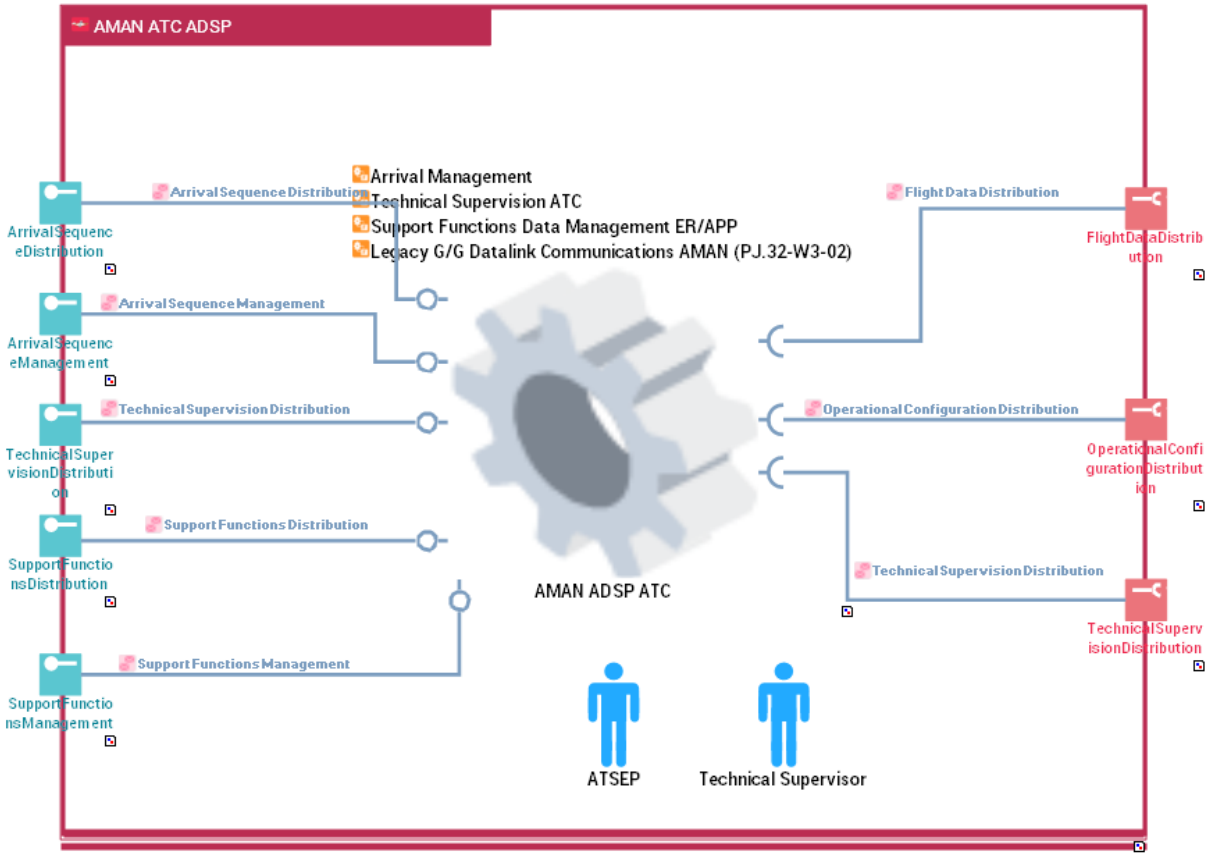

Figure 15: AMAN ADSP Decomposition

3.2.9 Triangle architecture with a SSR Code Management ADSP

3.2.9.1 Interaction(s) identification

This is the part of the ER/APP system that can provision the services proposed by a SSRCM ADSP.

It corresponds mostly to the SSRCM FB supported by some specific Support Functions (e.g. Recording, Configuration Parameters…) and a Technical Supervision.

This view presents the configuration where 2 ADSPs are providing the VC services to a common ATSU, of which one ADSP is specialized in the provision of SSR Code Management.

In particular, it highlights:

- the services complementary to the SSR Code Management services that are also required by the ATSU from the SSRCM ADSP
- the services required between the 2 ADSPs so that their respective sets of Functional Blocks can behave properly.

EUROPEAN PARTNERSHIP
Co-funded by the European Union

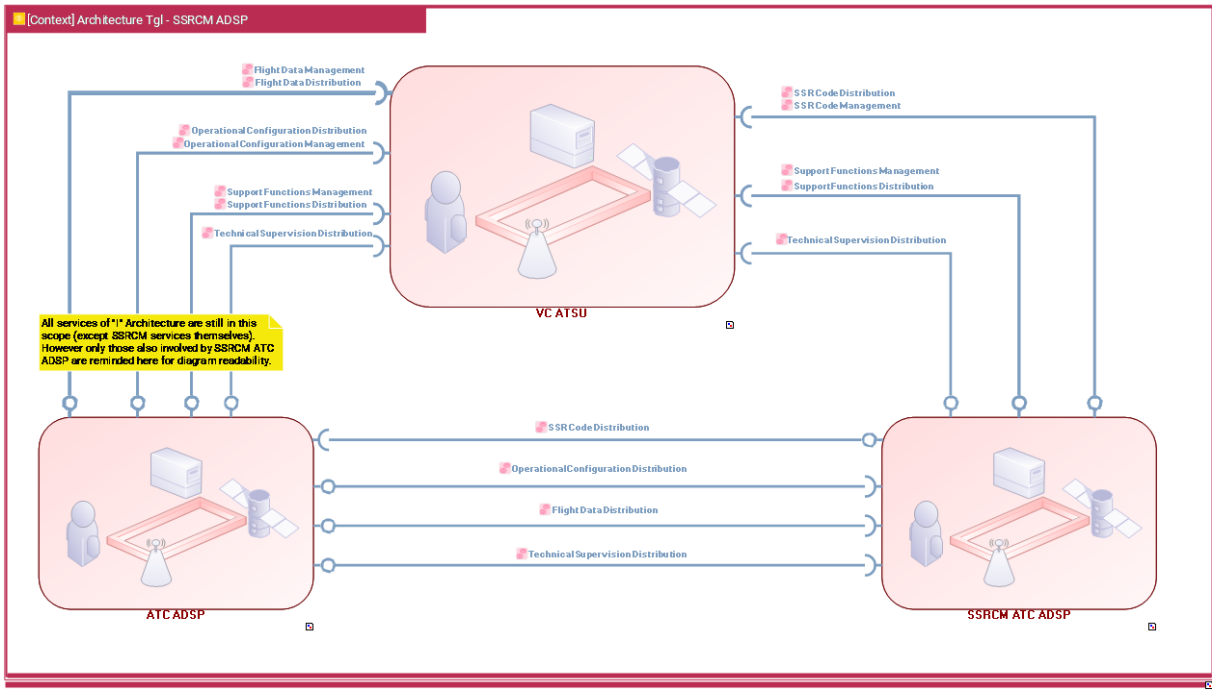

Figure 16: SSRCM ADSP Interactions

3.2.9.2 Functional decomposition

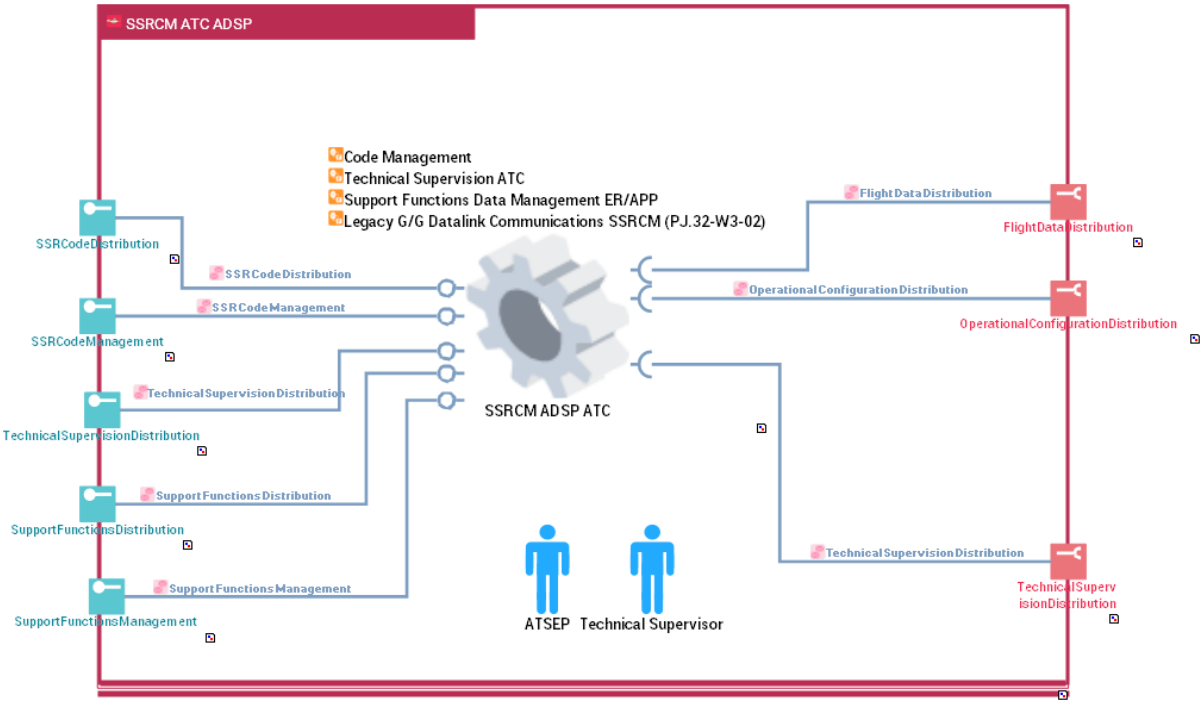

Figure 17: SSRCM ADSP Decomposition

3.2.10Triangle architecture for ATC ADSP contingency

3.2.10.1 Introduction

The objective of the contingency architecture studied in this section is to provide a backup ATC ADSP to a VC ATSU in case of failure of its “regular” (“main”) ATC ADSP.

This architecture is a solution that could be integrated by the ANSPs and ATM Data Service Providers in the contingency plan they would establish in the context of a Virtual Centre in case of failure of the “main” ADSP of the VC ATSU.

The generic life-cycle of contingency situations is depicted by Eurocontrol in [10] as follows:

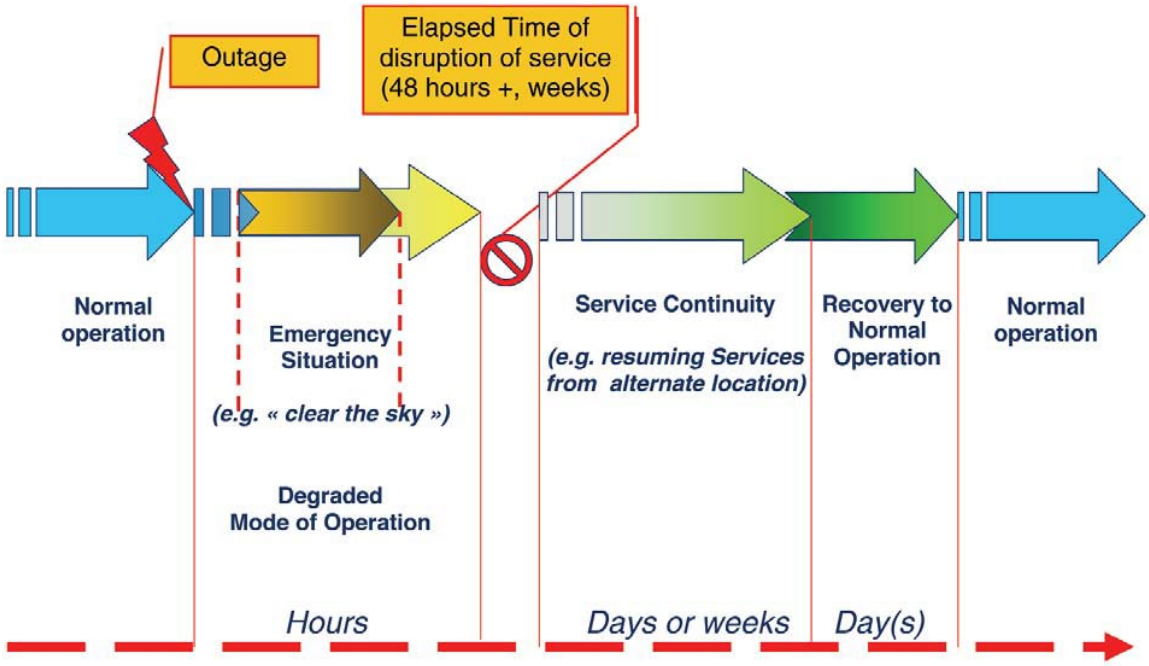

Figure 18: Generic Contingency Life-Cycle

In the perspective of this life-cycle, the objective of the ADSP contingency architecture is to reduce the duration of service disruption, and to provide the best service continuity before the normal operations are restored.

The Contingency solution must also be proportionate in terms of cost and complexity according to the requirements expressed in the contingency plan of the stakeholder

Two possible architecture alternatives have been studied during this TRL2 phase. They are documented and compared in the sections below.

Studying these two alternatives has also led to establishing high level requirements for an ADSP contingency architecture, which are presented in section 4.10.

3.2.10.2 Option 1: “adapter-based” solution

3.2.10.2.1 Main principles

The main principles of this architecture option are illustrated in the diagram below:

Co-funded by the European Union

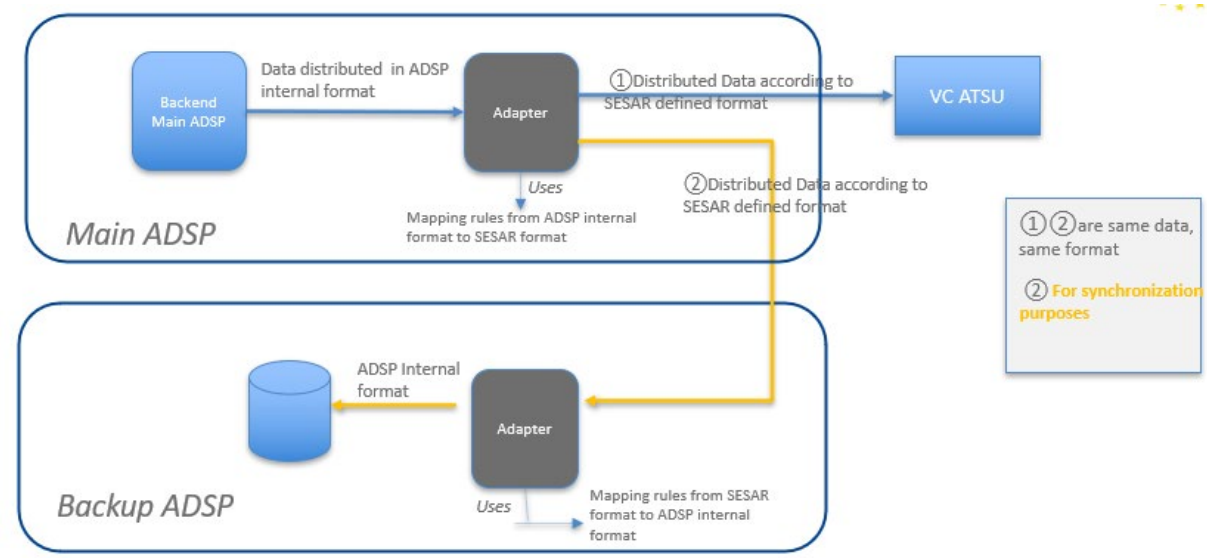

Figure 19: Main principles of the Adapter-based contingency option

In this option, the Main ADSP continuously distributes data to the Backup ADSP to keep it synchronised. These data are provided through the same VC Distribution Services that the ones used between the Main ATC ADSP and the VC ATSU.

In the Backup ADSP, the data are processed by an adapter, which is in charge of translating them (using mapping rules) into a format that is compatible with the backup ADSP database, and to store them in this database in a consistent way. The Backup ADSP only populates and updates its database thanks to the distribution services of the Main ADSP and does not perform any other functions during this stage.

Of course, the off-line environment data of the Backup ADSP database are also aligned with those of the Main ADSP, and this alignment is checked regularly.

When a failure of the Main ADSP occurs, the backup ADSP becomes the service provider of the VC ATSU instead of the Main ADSP, making use of the data previously stored in its database, and starting to directly receive data from external lines (e.g. OLDI) and data with a short period of validity, like tracks and weather data, instead of the Main ADSP.

When the contingency situation has ended, and the Main ADSP is restored, the same process applies in a symmetric way: the Backup ADSP starts distributing data to the Main ADSP (still using VC Distribution Services), and the adapter of the Main ADSP populates its database from these data. When the two ADSPs are considered fully synchronised, the Main ADSP can start providing services to the VC ATSU again, on technical supervisor decision. The Backup ADSP reverts back to “slave” mode towards the Main ADSP, i.e. its database is cleaned up, then receives data from the Main ADSP through VC Services.

3.2.10.2.2 Architecture and interaction identification

The following diagram provides an illustration of the interactions that can be put in place before the failure of the Main ADSP:

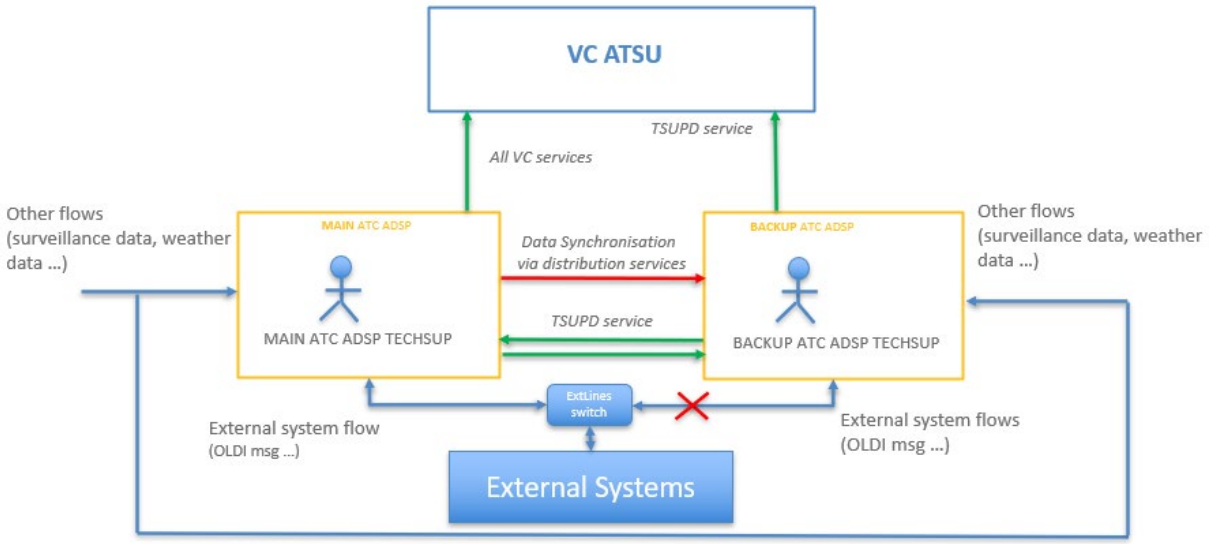

Figure 20: Proposed architecture for the Adapter-based contingency option

Please note that the green arrows represent *services provided* by an ADSP to a user (VC ATSU or other ADSP). The *data* themselves could flow in both directions if the service is a Management service (i.e. allowing the user to update the data on the ADSP).

The table below provides more details on the interactions:

Provider	Consumer	Data flow/Services	Comments
Main ATC ADSP	VC ATSU	All VC services	The VC ATSU uses these VC services both to update and receive data from the Main ATC ADSP. N.B. After the failure of the Main ATC ADSP, the VC ATSU will have to subscribe to the same services from the Backup ADSP. An ADSP Gateway could take care of this change of Service Provider, so that it is transparent to the VC ATSU (cf. fig. Figure 21).
Backup **ATC ADSP**	VC ATSU	TSUPD Service	The VC ATSU is subscribed to the TechnicalSupervisionDataDistribution Service of the Backup ADSP Adapter, which informs it of its current status (e.g. “available”) and role (“backup”)
External systems	Main ATC ADSP	I/O flows, e.g. IFPS, OLDI, Datalink messages	Only the main ATC ADSP is receiving/sending these messages. However, these messages are received through a Switch, so that they can later be routed to the Backup ADSP (when it takes over) with no impact on the External Systems – though introducing a potential single point of failure

Co-funded by the European Union

External systems	Main ATC ADSP	Input flows, e.g. surveillance and weather data	-
External systems	Backup ATC ADSP	Input flows, e.g. surveillance and weather data	These data are already sent to the backup ADSP, so that this backup ADSP is ready when it needs to take over.
Main ATC ADSP	Backup ATC ADSP	VC Distribution services	Data distributed for continuous synchronisation purposes. N.B. No distribution is provided for recording, Monitoring, Conflict detection, safety nets data (resp. SUPPD, MONAD, MTCD, TRACTD, SNET services), as these data are volatile and not needed by the Backup ADSP. Surveillance data (SURD service) are also not distributed by the Main ADSP, as they are directly acquired from external systems.
Main ATC ADSP	Backup ATC ADSP	TSUPD Service	The Backup ADSP needs to subscribe to the TechnicalSupervisionDataDistribution Service from the Main ATC ADSP, so that it is informed in case of any failure on the other Distribution Services.
Backup ATC ADSP	Main ATC ADSP	TSUPD Service	The Main ATC ADSP is subscribed to the TechnicalSupervisionDataDistribution Service of the Backup ADSP, which informs it of its current status (e.g. “available”) and role (“backup”)

The following diagram shows how the VC ATSU could, alternatively, be connected to the ADSPs through a Gateway, in order to mask the switch of ADSP to the VC ATSU, even if it could introduce a single point of failure:

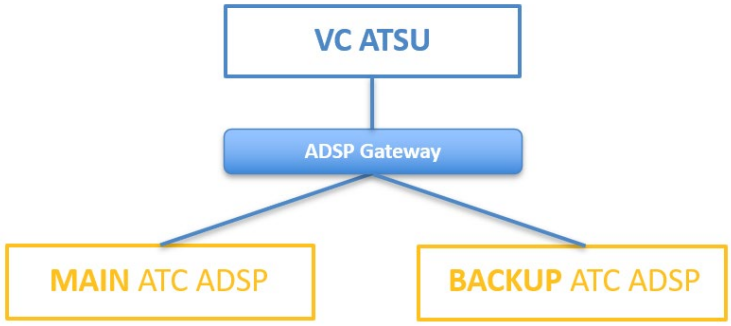

Figure 21: ADSP Gateway between VC ATSU and ADSPs

3.2.10.2.3 Main benefits and concerns of this option

Main benefits:

- It is expected that the ADSP providing the backup role maintains **several independent databases for different ATSUs**; then, in case of failure of the main ADSP of one of these ATSUs, an ADSP system instance is started with the database of this ATSU, while the other databases

Co-funded by the European Union

continue to be synchronised with the Main ADSPs of the other ATSUs. This would result into a significant **reduction of cost for VC ATSUs**, as the Service Provider offering the backup function would not have to dedicate an ATC system to each of them.

- The capability for an ADSP to be able to translate any VC Service data into its internal data format through the Adapters could **facilitate the introduction of Triangle Architectures with Specialised ADSPs,** as, in such architectures, each ADSP must be able to process data that are distributed to it by the other ADSP using VC services.

- The capability for an ADSP to be able to translate any VC Service data into its internal data format through the Adapters can facilitate the upgrade of version or change of ADSP systems for a given ATSU, as the switch from one Main ADSP to a Backup ADSP becomes a generic procedure with VC distribution services.

Main concerns:

- The initial cost to develop the ADSP Adapters is important.

- In case the software of the Main ADSP is not out of order, but just malfunctioning, the possible data corruption inside the Main ADSP may be propagated to the Backup ADSP; however, the risk is reduced by the use of services, which constrain the format of the exchanged data.

- The use of distribution services may lead to less precise data stored by the Backup ADSP than using a tailored interface between Main and Backup ADSP

3.2.10.3 Option 2: “shadow mode” solution

3.2.10.3.1 Main principles

The principle of this option is to duplicate to the Backup ADSP all the inputs received by the Main ADSP, including the inputs coming from the VC ATSU (from ATCOs, FDO, Operational Supervisors).

Unlike the previous option where the Backup ADSP was passive and performing no calculation, in this option the Backup ADSP does perform calculations based on the inputs it receives, working in “shadow mode”.

The possible misalignments between the ADSPs are monitored and minimised as much as possible, based on data exchanges of data and indicators (e.g. number of created, activated and correlated flight plans) between the two ADSPs.

3.2.10.3.2 Architecture and interaction identification

The following diagram provides an illustration of the interactions that could be put in place before the failure of the Main ADSP:

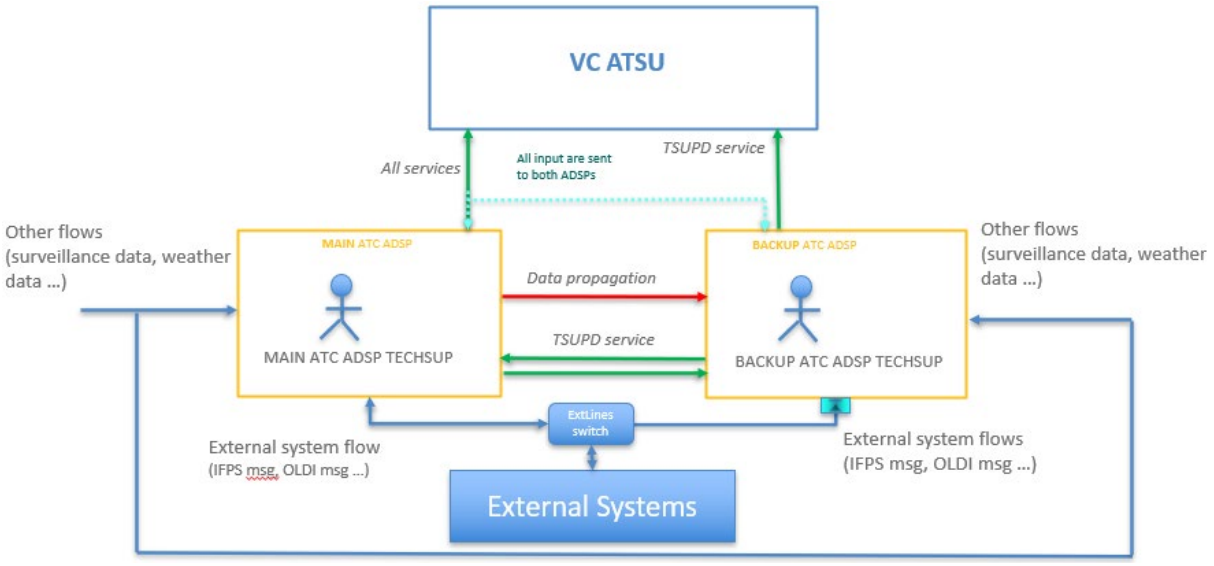

Figure 22: Proposed architecture for the shadow mode contingency option

Please note that the green arrows represent *services provided* by an ADSP to a user (VC ATSU or other ADSP). The *data* themselves could flow in both directions if the service is a Management service (i.e. allowing the user to firstly update the data in the ADSP), and then for the ADSP to distribute the updated data to the subscribing users).

The table below provides more details on the interactions:

Provider	Consumer	Data flow/Services	Comments
Main ATC ADSP	VC ATSU	All VC services	The VC ATSU uses these VC services both to update and receive data from the Main ATC ADSP. N.B. After the failure of the Main ATC ADSP, the VC ATSU will have to subscribe to the same services from the Backup ADSP. An ADSP Gateway could take care of this change of Service Provider, so that it is transparent to the VC ATSU (cf. fig. Figure 21).
Backup **ATC ADSP**	VC ATSU	TSUPD Service	The VC ATSU is subscribed to the TechnicalSupervisionDataDistribution Service of the Backup ADSP, which informs it of its current status (e.g. “available”) and role (“backup”)
Backup ATC ADSP	VC ATSU	VC Management services (CORRM, CTM, FDM, DLKM, OPSUPM)	The VC Management services are those which allows the VC ATSU to update the data stored in the ADSP. The Backup ATC ADSP provides management services so that it can receive a copy of all the input coming from the VC ATSU (as part of the shadow mode).

Co-funded by the European Union

			An ADSP Gateway could take care of providing these input data to both ADSPs, so that it is transparent to the VC ATSU (cf. fig. Figure 21).
External systems	Main ATC ADSP	I/O flows, e.g. IFPS, OLDI, Datalink messages	The Main ATC ADSP is receiving and sending these messages. These messages are received through a Switch, so that they are also routed to the Backup ATC ADSP with no impact of the External Systems
External systems	Backup ATC ADSP	I/O flows, e.g. IFPS, OLDI, Datalink messages **in INPUT direction only**	The Backup ATC ADSP is receiving these messages, but not sending any.
External systems	Main ATC ADSP	Input flows, e.g surveillance and weather data	-
External systems	Backup ATC ADSP	Input flows, e.g surveillance and weather data	All input received by the Main ATC ADSP are also sent to the Backup ATC ADSP, which is in Shadow Mode.
Main ATC ADSP	Backup ATC ADSP	Data propagation: Allocated SSR Codes	Most of the data are acquired by the Backup directly from the original sources (shadow mode), but the SSR Codes allocated by the Main ATC ADSP need to be sent to the Backup ATC ADSP (via the SSRCD Service), so that the Backup can overwrite the SSR Codes it may have allocated by itself.
Main ATC ADSP	Backup ATC ADSP	TSUPD Service	The Backup ADSP needs to subscribe to the TechnicalSupervisionDataDistribution Service from the Main ATC ADSP, so that it is informed in case of any failure on the SSRCD Service provided by the Main ADSP. The TSUPD service is also enriched with indicators to monitor the data discrepancy between the 2 ADSPs. The possible indicators could be: • Number of created Flight plan • Number of activated flight plans • Number of correlated flight plans
Backup **ATC ADSP**	Main ATC ADSP	TSUPD Service	The Main ATC ADSP is subscribed to the TechnicalSupervisionDataDistribution Service of the Backup ADSP, which informs it of its current status (e.g. “available”)

3.2.10.3.3 Main benefits and concerns of this option

Main benefits:

- The Main ADSP cannot propagate any data corruption to the Backup ADSP, as they both process the input data on their own.
- No need to develop costly adapters.

Main concerns :

- As ADSPs are from 2 vendors (according to assumption), they may compute different lists of sectors; as a consequence, the same ATCO input on the same flight (e.g. « assume »), based on Main ADSP sector list, may be discarded by the Backup ADSP, which has a different list of sectors for that flight.
- In case SSR codes are not updated simultaneously in each ADSP, the Backup ADSP may also receive OLDI messages with an inadequate SSR code.

3.3 High level impact of the SESAR Technological Solution on the baseline Architecture

Enabler ID (from EATMA)	Enabler Title (from EATMA)	Changes
CR 06386	MTCD ADSP in a VC Triangle architecture	Introduction of system “MTCD ADSP ATC” for new Capability Configuration “MTCD ADSP”
CR 06387	SNET ADSP in a VC Triangle architecture	Introduction of system “SNET ADSP ATC” for new Capability Configuration “SNET ADSP”
CR 06388	Surveillance ADSP in a VC Triangle architecture	Introduction of system “Surveillance ADSP ATC” for new Capability Configuration “Surveillance ADSP”
CR 06389	AMAN ADSP in a VC Triangle architecture	Introduction of system “AMAN ADSP ATC” for new Capability Configuration “AMAN ADSP”
CR 06390	TRACT ADSP in a VC Triangle architecture	Introduction of system “TRACT ADSP ATC” for new Capability Configuration “TRACT ADSP”
CR 06772	MTAPW ADSP in a VC Triangle architecture	Introduction of system “MTAPW ADSP ATC” for new Capability Configuration “MTAPW ADSP”
CR 06773	SSRCM ADSP in a VC Triangle architecture	Introduction of system “SSRCM ADSP ATC” for new Capability Configuration “SSRCM ADSP”
CR 06774	TCT ADSP in a VC Triangle architecture	Introduction of system “TCT ADSP ATC” for new Capability Configuration “TCT ADSP”

Table 7: List of changes due to the SESAR Solution

4 Functional Requirements

4.1 General

4.1.1 Introduction

This chapter is organised as follows:

- Section 4.1 introduces the definitions and assumptions that are applicable to all requirements; it also provides requirements that are applicable to all Triangle architectures
- Sections 4.2 to 4.9 provide requirements for various Triangle architectures involving a specialised ADSP;
- Section 4.10 provides requirements for the Triangle architecture for ADSP contingency
- Sections 4.11 and 4.12 provide, respectively, requirements about new services that are required for one or more Triangle architectures, and services that may need to be revised in the context of a specific Triangle architecture.

4.1.2 Definitions

The definitions below are provided to facilitate the reading of the requirements of sections 4.2 to 4.9:

VC Services: The services provided by an ATM Data Service Provider to the Air Traffic Service Unit (ATSU) in the context of a Virtual Centre. In this section, only ATC services are considered (i.e. not voice systems-related services).
Specialised ADSP: An ATM Data Service Provider (ADSP) specialised in a specific function and providing the subset of Virtual Centre Services related to this function, e.g. a Safety Net ADSP providing Safety Net- related Virtual Centre Services.
Specialised ADSP ATC: the system containing all the Functional Blocks of the Specialised ADSP Capability Configuration
Principal ATC ADSP: an ATC ADSP providing all ATC VC Services, except the Service(s) provided by the Specialised ADSP.

4.1.3 General Assumptions

For each Triangle architecture, only one Principal ATC ADSP is considered, and only one Specialised ADSP as well.
The VC ATSU is supposed to be able to consume any of the VC Services already defined in SESAR (and the logical definition of a given service does not depend on which ADSP is providing it). As a consequence, there is no specific requirement regarding the VC ATSU in this FRD. The provider

EUROPEAN PARTNERSHIP

Co-funded by the European Union

from which the VC ATSU shall consume a given service (in the context of a given Triangle Architecture) can be identified in the relevant “Interaction(s) identification” sections.
The VC ATSU is never in charge of reconciliating data from different ADSPs: the requirements on the ADSPs have the objective to ensure that the ADSPs are aligned together and provide consistent information to the VC ATSU. From the VC ATSU point of view, using VC services from different ADSPs in a triangle architecture does not change the dynamics of how the services can be used compared to using services from a single ADSP.

4.1.4 General Requirements

These requirements are applicable to all Triangle architectures with specialised ADSPs.

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0001
Title	Consistency between ADSPs
Requirement	When providing services to the same VC ATSU, the Specialised ADSP and the Principal ATC ADSP shall be **consistently configured**.
Status	<in progress>
Rationale	The processing of each ADSP must be based on consistent off-line data configurations, e.g. for the definition of their airspace. The data to be aligned depend on the considered specific Triangle Architecture.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0002
Title	Supervision data distribution

Co-funded by the European Union

Requirement	The Specialised ADSP shall be able to distribute **supervision data** as a service
Status	<in progress>
Rationale	A user consuming Specialised ADSP services (e.g. a VC ATSU) must be able to monitor their status.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	Specialised ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0003
Title	Supervision of the service(s) provided by the Principal ATC ADSP
Requirement	A Specialised ADSP which has subscribed to services from the Principal ATC ADSP shall also subscribe to the **TechnicalSupervisionDistribution service** from this Principal ATC ADSP.
Status	<in progress>
Rationale	A Specialised ADSP subscribing to service(s) provided by a Principal ATC ADSP also needs to monitor their status.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	Specialised ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0004
Title	Supervision of the service(s) provided by the Specialised ADSP
Requirement	The Principal ATC ADSP which has subscribed to services from a Specialised ADSP shall also subscribe to the **TechnicalSupervisionDistribution service** from this Specialised ADSP.
Status	<in progress>
Rationale	A Principal ADSP subscribing to service(s) provided by a Specialised ATC ADSP also needs to monitor their status.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0005
Title	Recorded data distribution
Requirement	If the Specialised ADSP exposes a service allowing the input of recorded data requests, then this Specialised ADSP shall be able to distribute **recorded data** as a service.
Status	<in progress>
Rationale	The user (e.g. a VC ATSU) consuming services from the Specialised ADSP must be able to get the recorded data he has previously requested to store.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	Specialised ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0006
Title	Recorded data requests
Requirement	A Specialised ADSP should expose a service allowing the input of **recorded data requests**.
Status	<in progress>
Rationale	The user (e.g. a VC ATSU) should be able to input recorded data request into the Specialised ADSP via a service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	Specialised ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0007
Title	Time synchronisation
Requirement	The Specialised ADSP, the Principal ADSP and the VC ATSU shall be time-synchronised
Status	<in progress>
Rationale	The processing of all the systems involved in a Triangle architecture must share the same time reference.

Co-funded by the European Union

Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

[REQ]

Identifier	REQ-32-W3.02-FRD-GEN.0008
Title	Services to be provided to the VC ATSU by the Specialised ADSP
Requirement	When providing data as a service to a VC ATSU, the Specialised ADSP and the Principal ATC ADSP shall use the already defined VC Services.
Status	<in progress>
Rationale	Receiving data in a triangle architecture instead of an “I” architecture should have a minimum impact on the interface of the VC ATSU.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

4.2 Triangle Architecture with a MTCD ADSP

4.2.1 Data Exchanges with the VC ATSU

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0001
Title	MTCD conflict data distribution

Requirement	A MTCD ADSP shall be able to distribute **MTCD conflict data** as a service.
Status	<in progress>
Rationale	It is the main purpose of the MTCD ADSP to distribute MTCD-related data via a service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTCD ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0002
Title	MTCD what-if instructions input via a service
Requirement	A MTCD ADSP shall expose a service allowing the input of **MTCD what-if instructions**.
Status	<in progress>
Rationale	The user must have the possibility to probe instructions in order to see the effect on a conflict. This may be done by sending what-if instructions to the MTCD ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTCD ADSP ATC

4.2.2 Data Exchange with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0003
Title	Subscription to FDD
Requirement	The MTCD ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data.
Status	<in progress>
Rationale	Flight plan data are needed to detect MTCD conflicts or to ensure a conflict is now solved. The flight plan data may contain current data and/or what-if data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTCD ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0004
Title	What-if flight-plan data processing
Requirement	A MTCD ADSP shall be able to process **what-if flight plan data**.
Status	<in progress>
Rationale	The user must have the possibility to probe instructions in order to see the effect on a conflict. This may be done by sending what-if instructions to FDM service of the Principal ATC ADSP, which will then distribute a What-If flight plan to the MTCD ADSP.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTCD ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0005
Title	Subscription to OPSUPD
Requirement	The MTCD ADSP shall subscribe to the **OperationalConfigurationDistribution service** from the Principal ATC ADSP in order to get sector configuration data.
Status	<in progress>
Rationale	Sector configuration data are needed for distribution of conflicts to appropriate CWPs.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTCD ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0006
Title	Up-to-date flight plan data
Requirement	The MTCD ADSP shall always dispose of the **latest flight plan data** available in the Principal ATC ADSP.
Status	<in progress>

Rationale	The MTCD ADSP needs to work with the latest flight plan data available known by the ATSU so that the ATCO HMI displays consistent information
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

4.2.3 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-MTCD.0007
Title	Airspace data alignment
Requirement	The MTCD ADSP and the Principal ATC ADSP(s) with which it interacts shall have consistent off-line definitions of their **airspace data**.
Status	<in progress>
Rationale	The two ADSPs must be able to process the flight plan data based on the same aeronautical information
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	MTCD ADSP ATC ADSP ATC (PJ.32-W3-02)

4.3 Triangle Architecture with a TRACT ADSP

4.3.1 Assumptions

The Principal ATC ADSP is able to send **ADS-C contracts and requests** to aircraft	The Principal ATC ADSP must have the possibility to establish ADS-C contracts and send ADS-C queries to aircraft, so that it can forward the ETA min-max queries received from the TRACT ADSP.
The Principal ATC ADSP is able to process **ADS-C reports** sent by aircraft	The Principal ATC ADSP must have the possibility to process ADS-C reports received from aircrafts, so that it can forward the aircraft ETA min-max data to the TRACT ADSP.

4.3.2 Data Exchanges with the VC ATSU

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0001
Title	TRACT conflict data distribution
Requirement	A TRACT ADSP shall be able to distribute **TRACT conflict data** (conflict detections, conflict resolutions) as a service.
Status	<in progress>
Rationale	It is the main purpose of the TRACT ADSP to distribute TRACT-related data via a service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TRACT ADSP ATC

4.3.3 Data Exchange with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0002

Title	ETA min-max query
Requirement	The Principal ATC ADSP involved in a triangle architecture with a TRACT ADSP shall expose a service allowing the input of **ETA min-max queries**.
Status	<in progress>
Rationale	The TRACT ADSP must have the possibility to input ETA min-max queries into the Principal ATC ADSP, so that this latter forwards them to the aircraft.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0003
Title	CTO uplink instructions
Requirement	The Principal ATC ADSP involved in a triangle architecture with a TRACT ADSP shall expose a service allowing the input **of CTO uplink instructions**.
Status	<in progress>
Rationale	The TRACT ADSP must have the possibility to input CTO instructions into the Principal ATC ADSP, so that this latter forwards them to the aircraft.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0004
Title	ETA min-max data
Requirement	The Principal ATC ADSP involved in a triangle architecture with a TRACT ADSP shall be able to distribute **ETA min-max data** as a service.
Status	<in progress>
Rationale	ETA min-max data are required by the TRACT ADSP to identify a suitable CTO for conflict resolution
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0005
Title	CTO data
Requirement	The Principal ATC ADSP involved in a triangle architecture with a TRACT ADSP shall be able to distribute **CTO data** as a service.
Status	<in progress>
Rationale	The TRACT ADSP must ensure that the CTO has been validated by the aircraft in order to indicate to the ATCO that the conflict is now resolved.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0006
Title	Subscription to FDD
Requirement	The TRACT ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data.
Status	<in progress>
Rationale	Flight plan data are needed to detect TRACT conflicts or to ensure a conflict is now solved.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TRACT ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0007
Title	Subscription to OPSUPD

Requirement	The TRACT ADSP shall subscribe to the **OperationalConfigurationDistribution service** from the Principal ATC ADSP in order to get sector configuration data.
Status	<in progress>
Rationale	Sector configuration data are needed for distribution of conflicts to appropriate CWPs
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TRACT ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0008
Title	Subscription to ADSCD
Requirement	The TRACT ADSP shall subscribe to the **ADSCDataGroundDistribution service** from the Principal ATC ADSP in order to get ETA min-max data.
Status	<in progress>
Rationale	ETA min-max data are required by the TRACT ADSP to identify a suitable CTO for conflict resolution
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TRACT ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0009
Title	Subscription to CPDLCD
Requirement	The TRACT ADSP shall subscribe to the **CPDLCDataGroundDistribution service** from the Principal ATC ADSP in order to get confirmations that the CTO was approved by the aircraft.
Status	<in progress>
Rationale	The TRACT ADSP must ensure that the CTO has been validated by the aircraft in order to indicate to the ATCO that the conflict is now resolved.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TRACT ADSP ATC

4.3.4 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-TRACT.0010
Title	Airspace data alignment
Requirement	The TRACT ADSP and the Principal ATC ADSP with which it interacts shall have consistent off-line definitions of their **airspace data**.
Status	<in progress>
Rationale	The two ADSPs must be able to process the flight plan data based on the same aeronautical information
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02) TRACT ADSP ATC

4.4 Triangle Architecture with a MTAPW ADSP

4.4.1 Introduction

4.4.2 Data Exchanges with the VC ATSU

[REQ]

Identifier	REQ-32-W3.02-FRD-MTAPW.0001
Title	MTAPW conflict data distribution
Requirement	A MTAPW ADSP shall be able to distribute **MTAPW conflict data** as a service.
Status	<in progress>
Rationale	It is the main purpose of the MTAPW ADSP to distribute MTCD-related data via a service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTAPW ADSP ATC

[REQ]

Co-funded by the European Union

Identifier	REQ-32-W3.02-FRD-MTAPW.0002
Title	MTAPW conflict probes input via a service
Requirement	A MTAPW ADSP shall expose a service allowing the input of **MTAPW what-if instructions**.
Status	<in progress>
Rationale	The user must have the possibility to probe instructions in order to see the if it generates a conflict.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTAPW ADSP ATC

4.4.3 Data Exchanges with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-MTAPW.0003
Title	Subscription to FDD
Requirement	The MTAPW ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data.
Status	<in progress>
Rationale	Flight plan data are needed to detect MTAPW conflicts or to ensure a conflict is now solved.
Category	<Interface>

[REQ Trace]

Co-funded by the European Union

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTAPW ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-MTAPW.0004
Title	Subscription to ASD
Requirement	The MTAPW ADSP shall subscribe to the **AirspaceDataDistribution service** from the Principal ATC ADSP in order to get restricted airspace status.
Status	<in progress>
Rationale	Restricted airspace status are needed to evaluate MTAPW conflicts.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	MTAPW ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-MTAPW.0005
Title	Up-to-date flight plan data
Requirement	The MTAPW ADSP shall always dispose of the **latest flight plan data** available in the Principal ATC ADSP.
Status	<in progress>

Rationale	The MTAPW ADSP needs to work with the latest flight plan data available known by the ATSU so that the ATCO HMI displays consistent information
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

4.4.4 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-MTAPW.0006
Title	Airspace data alignment
Requirement	The MTAPW ADSP and the Principal ATC ADSP with which it interacts shall have consistent off-line definitions of their **airspace data**.
Status	<in progress>
Rationale	The two ADSPs must be able to process the flight plan data based on the same aeronautical information
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	TRACT ADSP ATC ADSP ATC (PJ.32-W3-02)

4.5 Triangle Architecture with a TCT ADSP

4.5.1 Assumptions

Deviation based on EPP is not considered as part of TCT.
The TCT ADSP is configured so that it covers the AoR of the ATSU.

4.5.2 Data Exchanges with the VC ATSU

[REQ]

Identifier	REQ-32-W3.02-FRD-TCT.0001
Title	TCT conflict data distribution
Requirement	A TCT ADSP shall be able to distribute **TCT conflict data** as a service.
Status	<in progress>
Rationale	It is the main purpose of the TCT ADSP to distribute TCT-related data via a service. N.B. Currently, TCT is embedded in SNET service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TCT ADSP ATC

4.5.3 Data Exchanges with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-TCT.0002
Title	Subscription to FDD
Requirement	The TCT ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data.

Status	<in progress>
Rationale	Flight plan data are needed to evaluate if a clearance generates a TCT conflict.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TCT ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-TCT.0003
Title	Subscription to SURD
Requirement	The TCT ADSP shall subscribe to the **SurveillanceDistribution service** from the Principal ATC ADSP in order to get surveillance data.
Status	<in progress>
Rationale	Surveillance data are needed to detect and evaluate TCT conflicts.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TCT ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-TCT.0004
Title	Subscription to CORRD
Requirement	The TCT ADSP shall subscribe to the **CorrelationDistribution service** from the Principal ATC ADSP in order to get correlation data.
Status	<in progress>
Rationale	Correlation data are needed to match flight data with tracks.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Conflict Management
<ALLOCATED_TO>	<System>	TCT ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-TCT.0005
Title	Up-to-date flight plan data
Requirement	The TCT ADSP shall always dispose of the **latest flight plan** data available in the Principal ATC ADSP.
Status	<in progress>
Rationale	The TCT ADSP needs to work with the latest flight plan data available known by the ATSU so that the ATCO HMI displays consistent information
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

4.5.4 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-TCT.0006
Title	Airspace data alignment
Requirement	The TCT ADSP and the Principal ATC ADSP with which it interacts shall have consistent off-line definitions of their **airspace data**.
Status	<in progress>
Rationale	The two ADSPs must be able to process the flight plan data based on the same aeronautical information
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	TCT ADSP ATC ADSP ATC (PJ.32-W3-02)

4.6 Triangle Architecture with a Safety Net ADSP

4.6.1 Assumptions

It is **the Principal ATC ADSP** which allows the operational supervisor to make on-line updates to the safety net area configurations, and which is also in charge of distributing operational safety net statuses to the VC ATSU.
It is assumed that **OperationalConfigurationDistribution** and **OperationalConfigurationManagement** services provided by the Principal ATC ADSP to the ATSU are able to process data related to the on-line configuration of the safety nets (which requires an update of the definitions of these services).

4.6.2 Data Exchanges with the VC ATSU

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0001
Title	Safety Net notifications distribution
Requirement	A SNET ADSP shall be able to distribute **safety net notifications** (alerts and alert cancellation) as a service.
Status	<in progress>
Rationale	It is the main purpose of the SNET ADSP to distribute safety net notifications via a service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Safety Nets
<ALLOCATED_TO>	<System>	SNET ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0002
Title	Safety Net off-line configuration
Requirement	A SNET ADSP shall expose a service allowing the input **of safety net off-line configuration updates**.
Status	<in progress>
Rationale	The user needs to be able to update off-line the configurations of the Safety Nets.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	SNET ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0003
Title	Safety Net technical status distribution
Requirement	A SNET ADSP shall be able to distribute **technical safety net statuses** as a service.
Status	<in progress>
Rationale	The SNET ADSP must be able to inform the VC ATSU of the technical status of the various safety Nets that are activated. This could be done via the "reason" field of the Service Status distributed by the TechnicalSupervisionDistribution service.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Safety Nets
<ALLOCATED_TO>	<System>	SNET ADSP ATC

4.6.3 Data Exchanges with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0004
Title	Subscription to FDD
Requirement	The SNET ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data.
Status	<in progress>

Rationale	The SNET ADSP needs the flight plan data to detect the conflicts, and in particular trajectory data and clearances.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Safety Nets
<ALLOCATED_TO>	<System>	SNET ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0005
Title	Subscription to SURD (SNET ADSP)
Requirement	The SNET ADSP shall subscribe to the **SurveillanceDistribution service** from the Principal ATC ADSP in order to get surveillance data.
Status	<in progress>
Rationale	The SNET ADSP needs the tracks to detect the conflicts.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Safety Nets
<ALLOCATED_TO>	<System>	SNET ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0006
Title	Subscription to CORRD (SNET ADSP)

Requirement	The SNET ADSP shall subscribe to the **CorrelationDistribution service** from the Principal ATC ADSP in order to get correlation data.
Status	<in progress>
Rationale	Correlation data are needed to associate the tracks and the flight plan data received from the Principal ATC ADSP
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Safety Nets
<ALLOCATED_TO>	<System>	SNET ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0007
Title	Subscription to OPSUPD (SNET ADSP)
Requirement	If it distributes the conflict only to the relevant CWP, the SNET ADSP shall subscribe to the **OperationalConfigurationDistribution service** from the Principal ATC ADSP in order to get sector configuration data.
Status	<in progress>
Rationale	The SNET ADSP may distribute the conflicts along with the tracks to all CWPs. But it may also identify which CWP is concerned by the conflict, and distribute this conflict only to this CWP, in which case it requires to know the operational configuration.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

<ALLOCATED_TO>	<Functional block>	Safety Nets
<ALLOCATED_TO>	<System>	SNET ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0008
Title	Safety net configuration updates
Requirement	An SNET ADSP shall expose a service allowing the input of **safety net configuration updates**.
Status	<in progress>
Rationale	The Principal ATC ADSP must be able to update the configuration of the safety nets in the SNET ADSP, following the requests it has received from the Operational Supervisor, or following configurations it has received from external ATSUs. It is expected that the SupportFunctionManagement service will be used for this purpose.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	SNET ADSP ATC

4.6.4 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-SNET.0009
Title	Airspace data alignment
Requirement	The SNET ADSP and the Principal ATC ADSP with which it interacts shall have consistent off-line definitions of their **airspace data**.

Status	<in progress>
Rationale	The two ADSPs must be able to process the flight plan data based on the same aeronautical information
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02) SNET ADSP ATC

4.7 Triangle Architecture with a Surveillance ADSP

4.7.1 Data Exchanges with the VC ATSU and the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-SUR.0001
Title	Surveillance data distribution
Requirement	A SUR ADSP shall be able to distribute **Surveillance data** as a service.
Status	<in progress>
Rationale	It is the main purpose of the SUR ADSP to distribute surveillance data via a service to all interested users, including the VC ATSU and the Principal ATC ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

<ALLOCATED_TO>	<Functional block>	Surveillance
<ALLOCATED_TO>	<System>	SUR ADSP ATC

4.7.2 Data Exchanges with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-SUR.0002
Title	Subscription to SURD (Principal ATC ADSP)
Requirement	The Principal ATC ADSP involved in a triangle architecture with a SUR ADSP shall subscribe to the **SurveillanceDistribution service** from this SUR ADSP.
Status	<in progress>
Rationale	In a triangle architecture involving a SUR ADSP, the Principal ATC ADSP must subscribe to the SUR ADSP to get surveillance data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Legacy G/G Datalink Communications Safety Nets Monitoring Aids Correlation Management Trajectory Prediction and Management
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-SUR.0003
Title	Subscription to CORRD (SUR ADSP)

Requirement	The SUR ADSP shall subscribe to the **CorrelationDistribution service** from the Principal ATC ADSP in order to get correlation data.
Status	<in progress>
Rationale	Correlation data are needed to enrich the tracks with relevant SFPL data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Surveillance
<ALLOCATED_TO>	<System>	SUR ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SUR.0004
Title	ADS-C Position Reports
Requirement	The Principal ATC ADSP involved in a triangle architecture with a SUR ADSP shall be able to distribute **ADS-C Position Reports** as a service.
Status	<in progress>
Rationale	The SUR ADSP must be able to get ADS-C Position Reports known by the Principal ATC ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Surveillance
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

4.7.3 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-SUR.0005
Title	Area coverage
Requirement	The SUR ADSP shall be configured so that the surveillance data it distributes is aligned with the **AoI of the VC ATSU**.
Status	<in progress>
Rationale	The SUR ADSP must distribute relevant surveillance data to the VC ATSU and to the Principal ATC ADSP.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	SUR ADSP ATC ADSP ATC (PJ.32-W3-02)

4.8 Triangle Architecture with an AMAN ADSP

4.8.1 Assumptions

It is assumed that the AMAN ADSP receives Departure Management data from another system, which is out of scope of these requirements.

4.8.2 Data Exchanges with the VC ATSU and the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0001
Title	AMAN data distribution

Requirement	An AMAN ADSP shall be able to distribute **Arrival Management data** as a service.
Status	<in progress>
Rationale	It is the main purpose of the AMAN ADSP to distribute AMAN-related data (arrival sequence data, arrival flight meterings, CTAs, active patterns and AFIS, runway mixed sequences…) via a service to interested users, including the VC ATSU and the Principal ATC ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Arrival Management
<ALLOCATED_TO>	<System>	AMAN ADSP ATC

4.8.3 Data Exchanges with the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0002
Title	AMAN input processing
Requirement	An AMAN ADSP shall expose a service allowing the input of **arrival management-related data**.
Status	<in progress>
Rationale	The user needs to be able to input arrival sequences updates, to accept CTAs and sequence advisories, ...
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

Co-funded by the European Union

<ALLOCATED_TO>	<Functional block>	Arrival Management
<ALLOCATED_TO>	<System>	AMAN ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0003
Title	ETA min-max query
Requirement	The Principal ATC ADSP involved in a triangle architecture with an AMAN ADSP shall expose a service allowing the input of **ETA min-max queries**.
Status	<in progress>
Rationale	The AMAN ADSP must have the possibility to input ETA min-max queries into the Principal ATC ADSP, so that this latter forwards them to the aircraft. It is proposed that this is ensured via a new "ADSCDataGroundManagement" service
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0004
Title	ETA min-max data
Requirement	The Principal ATC ADSP involved in a triangle architecture with an AMAN ADSP shall be able to distribute **ETA min-max data** as a service.
Status	<in progress>

Rationale	ETA min-max data are required by the AMAN ADSP to calculate and propose a CTA. It is proposed that these data are distributed via a new "ADSCDataGroundDistribution" service
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0005
Title	CTA data
Requirement	The Principal ATC ADSP involved in a triangle architecture with an AMAN ADSP shall be able to distribute **CTA acceptance data** as a service.
Status	<in progress>
Rationale	The AMAN ADSP must ensure that the proposed CTA has been validated by the aircraft in order to update the arrival sequences accordingly. It is proposed that these data are distributed via a new "CPDLCDataGroundDistribution" service
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

Co-funded by the European Union

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0006
Title	Subscription to AMAND (Principal ATC ADSP)
Requirement	The Principal ATC ADSP involved in a triangle architecture with an AMAN ADSP shall subscribe to the **ArrivalManagementDistribution service** from this AMAN ADSP.
Status	<in progress>
Rationale	In a triangle architecture involving an AMAN ADSP, the Principal ATC ADSP must subscribe to the AMAN ADSP to get arrival management data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Monitoring Aids
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0007
Title	Subscription to FDD
Requirement	The AMAN ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data
Status	<in progress>
Rationale	Flight plan data, including trajectory data and arrival constraints, are needed to calculate arrival sequences.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Arrival Management
<ALLOCATED_TO>	<System>	AMAN ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0008
Title	Subscription to ADSCD
Requirement	The AMAN ADSP shall subscribe to the A**DSCDataGroundDistribution service** from the Principal ATC ADSP in order to get ETA min-max data.
Status	<in progress>
Rationale	ETA min-max data are required by the AMAN ADSP to calculate and propose a CTA.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Arrival Management
<ALLOCATED_TO>	<System>	AMAN ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0009
Title	Subscription to CPDLCD
Requirement	The AMAN ADSP shall subscribe to the **CPDLCDataGroundDistribution service** from the Principal ATC ADSP in order to get CTA acceptance data.
Status	<in progress>

Rationale	The AMAN ADSP must ensure that the proposed CTA has been validated by the aircraft in order to update the arrival sequences accordingly.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Arrival Management
<ALLOCATED_TO>	<System>	AMAN ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0010
Title	Subscription to SUPPD
Requirement	The AMAN ADSP shall subscribe to the **SupportFunctionDistribution service** from the Principal ATC ADSP in order to get arrival management configuration data.
Status	<in progress>
Rationale	In particular, runway configuration data are needed to calculate arrival sequences.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Arrival Management
<ALLOCATED_TO>	<System>	AMAN ADSP ATC

4.8.4 Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-AMAN.0011
Title	Airspace data alignment
Requirement	The AMAN ADSP and the Principal ATC ADSP with which it interacts shall have consistent off-line definitions of their **airspace data**.
Status	<in progress>
Rationale	The two ADSPs must be able to process the flight plan data based on the same aeronautical information
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	AMAN ADSP ATC ADSP ATC (PJ.32-W3-02)

4.9 Triangle Architecture with a SSR Code Management ADSP

4.9.1 Data Exchanges with the VC ATSU and the Principal ATC ADSP

[REQ]

Identifier	REQ-32-W3.02-FRD-SSRC.0001
Title	SSR Code data distribution
Requirement	A SSRCM ADSP shall be able to distribute **SSR code data** as a service.
Status	<in progress>
Rationale	It is the main purpose of the SSRCM ADSP to distribute SSR code data (assigned/released codes, warnings, …) via a service to all interested users, including the VC ATSU and the Principal ATC ADSP.

Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Code Management
<ALLOCATED_TO>	<System>	SSRCM ADSP ATC

4.9.2 Data Exchanges with the VC ATSU

[REQ]

Identifier	REQ-32-W3.02-FRD-SSRC.0002
Title	SSR Code data management
Requirement	A SSRCM ADSP shall expose a service allowing the input of **SSR code data**.
Status	<in progress>
Rationale	The user must have the possibility to input SSR code assignments or releases.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Code Management
<ALLOCATED_TO>	<System>	SSRCM ADSP ATC

4.9.3 Data Exchanges with the Principal ATC ADSP

[REQ]

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Identifier	REQ-32-W3.02-FRD-SSRC.0003
Title	Subscription to FDD
Requirement	The SSRCM ADSP shall subscribe to the **FlightDataDistribution service** from the Principal ATC ADSP in order to get flight data.
Status	<in progress>
Rationale	Flight plan data are needed for SSR code assignment
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Code Management
<ALLOCATED_TO>	<System>	SSRCM ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SSRC.0004
Title	Subscription to OPSUPD
Requirement	The SSRCM ADSP shall subscribe to the **OperationalConfigurationDistribution service** from the Principal ATC ADSP in order to get sector configuration data.
Status	<in progress>
Rationale	Sector configuration data are needed to adapt in real time the conditions of SSR code allocation.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Code Management

<ALLOCATED_TO>	<System>	SSRCM ADSP ATC

[REQ]

Identifier	REQ-32-W3.02-FRD-SSRC.0005
Title	Subscription to SSRCD (Principal ATC ADSP)
Requirement	The Principal ATC ADSP involved in a triangle architecture with a SSRCM ADSP shall subscribe to the **SSRCodeDataDistribution service** from this SSRCM ADSP.
Status	<in progress>
Rationale	In a triangle architecture involving a SSRCM ADSP, the Principal ATC ADSP must be subscribed to the SSRCM ADSP to get SSRCode data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Correlation Management Flight Planning - Lifecycle Management - Data Distribution
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

4.10Triangle Architecture for ATC ADSP Contingency

4.10.1Introduction

This section provides high level requirements regarding ATC ADSP Contingency. They apply to the two solutions described in 3.2.10.
Regarding the terminology used in the requirements:

4. the Main ATC ADSP refers to the ATC ADSP used by the VC ATSU in normal conditions, i.e. when no contingency situation has occurred; this ADSP provides all VC Services to the VC ATSU.

5. the Backup ADSP refers to the ATC ADSP used by the VC ATSU after a failure has occurred on the Main ATC ADSP.

4.10.2Assumptions

It is assumed that the Main ATC ADSP has its own redundancy solution solving most cases of system failures without high operational impacts.
It is assumed that Contingency technical solution takes place in the case where the Main ATC ADSP cannot be restarted or correctly restarted (for any reasons as redundancy mechanism failure, global fatal failure, technical building damaged).
To keep the solution generic, it is assumed that The Main ATC ADSP and the Backup ATC ADSP are provided by different vendors (otherwise, proprietary ADSP to ADSP connections could be used).
To keep the solution generic, it is assumed that IOP should not be considered, even if it could help for implementing external exchanges.
It is assumed that the switchover between Main and Backup ADSPs is always manual on technical supervisors decision. Automatic switchover seems risky and the switchover needs to be manually controlled under an emergency situation.

4.10.3Technical Supervision

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0001
Title	Monitoring the Backup ATC ADSP misalignment
Requirement	The Backup ATC ADSP shall be able to detect misalignments of its data with respect to the data of the Main ATC ADSP.
Status	<in progress>
Rationale	Data misalignment between the Main and the Backup ATC ADSP may compromise the ability of the Backup ADSP to switch to "main" role.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0002
Title	Notify Backup ATC ADSP misalignment
Requirement	The Backup ATC ADSP shall be able to notify the technical supervisors on data misalignment detection.
Status	<in progress>
Rationale	An indication of misalignment should lead technical supervisors to take actions on the system based on the misalignment severity.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0003
Title	Monitoring the Backup ATC ADSP status
Requirement	The Backup ATC ADSP shall provide the technical supervisors of both Main ATC ADSP and VC ATSU with its technical status.
Status	<in progress>
Rationale	The technical supervisors of both Main ATC ADSP and VC ATSU need to permanently be aware of whether the Backup ATC ADSP is ready for a contingency take over i.e. that it has not failed or it is not degraded.
Category	<Functional>

[REQ Trace]

Co-funded by the European Union

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

4.10.4Contingency Technical Solution Architecture Design

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0004
Title	Standardisation of Contingency technical solution
Requirement	The Contingency technical solution shall be designed to allow the Main and the Backup ATC ADPS to be provided by different vendors.
Status	<in progress>
Rationale	The Contingency technical solution should not be specific to a particular vendor. Main ATC ADSP and Backup ATC ADSP can be provided by different vendors.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0005
Title	Open design of the Contingency technical solution with the contingency plan
Requirement	The Contingency technical solution shall support "Y" and Triangle ADSP architectures.

Co-funded by the European Union

Status	<in progress>
Rationale	The Contingency technical solution should allow the setting of "Y" and Triangles ADSP architectures and provide a backup solution for these.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0006
Title	Architecture complexity hidden to VC ATSU
Requirement	The Contingency technical mechanisms shall not be visible to the ATSU.
Status	<in progress>
Rationale	Hide the architecture complexity to the VC ATSU.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0007
Title	Main and Backup ATC ADSP data alignment

Requirement	The Contingency technical solution shall maintain data alignment between the Main and the Backup ATC ADSPs.
Status	<in progress>
Rationale	After the switch, the quality of the service continuity depends on how much the dynamic data are identical between the Main and the Backup ATC ADPS.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0008
Title	Main and Backup ATC ADSP data version synchronization
Requirement	During normal operation and for data alignment purpose, the Backup ATC ADSP shall ensure that there is no missing information regarding those of the Main ATC ADSP.
Status	<in progress>
Rationale	Technical mechanisms shall ensure that no message is lost or desynchronised, so that the Backup remains up-to-date.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0009
Title	External data source connexion
Requirement	Main and Backup ADSPs shall be provided with the same surveillance data and weather data issued from the same sources.
Status	<in progress>
Rationale	The pre-established connections will help to restore service continuity in a minimum of time. Using the same sources for these flows during normal operations also participate to keeping ADSPs data aligned.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0010
Title	External stakeholder connexion
Requirement	The Contingency technical solution shall have no impact on AFTN and OLDI consumers and providers of the Main ATC ADSP.
Status	<in progress>
Rationale	Today, OLDI exchanges are point to point connection and need a single access point for connection. We could also rely on OLDI modernisation.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier

<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0011
Title	Datalink connexion
Requirement	The ADSP switch-over of the Contingency technical solution shall not have any impact on the aircraft having an on-going datalink connection; i.e. a datalink contingency switch shall be transparent from the aircraft perspective.
Status	<in progress>
Rationale	Today, datalink exchanges are point to point connexion and need a single access point for connexion.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

4.10.5Data Exchanges between Main and Backup ATC ADSPs

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0012
Title	Backup ATC ADSP role and status distribution
Requirement	An ATC ADSP involved in a Contingency technical solution shall be able to distribute its Technical Role ("main" or "backup") and its Technical Status as a service.
Status	<in progress>
Rationale	Each ATC ADSP needs to know the role of the other ATC ADSP, especially for synchronisation purposes when a failure occurs on

	the Main ADSP. It also needs to know if the other ATC ADSP is malfunctioning or not.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0013
Title	Subscription to TSUPD (Backup ATC ADSP)
Requirement	The Backup ATC ADSP shall subscribe to the **TechnicalSupervisionDistribution service** from the Main ATC ADSP.
Status	<in progress>
Rationale	The Backup ADSP needs to be able to receive all required supervision data from the Main ADSP (Technical Role, Technical Status, service status if applicable, ...).
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0014
Title	Subscription to TSUPD (Main ATC ADSP)
Requirement	The Main ATC ADSP shall subscribe to the **TechnicalSupervisionDistribution service** from the Backup ATC ADSP.
Status	<in progress>
Rationale	The Main ADSP needs to be able to receive all required supervision data from the Backup ADSP (Technical Role, Technical Status, service status if applicable, ...).
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Technical Supervision ATC
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0015
Title	Data for alignment purpose
Requirement	An ATC ADSP involved in a Contingency technical solution shall be able to provide as a service all necessary data for alignment purpose.
Status	<in progress>
Rationale	According to the chosen Contingency technical solution, new services may be required to ensure data alignment between the two ADSPs
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

4.10.6Off-Line Data Alignment

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0016
Title	Airspace data alignment
Requirement	The Main ATC ADSP and the Backup ATC ADSP shall be consistently configured with respect to aeronautical information.
Status	<in progress>
Rationale	The two ADSPs, Main and Backup, must be able to process the flight plan data based on the same aeronautical information.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0017
Title	Operational configuration data alignment
Requirement	The Main ATC ADSP and the Backup ATC ADSP shall be consistently configured with respect to operational configuration information.
Status	<in progress>

Rationale	The two ADSPs, Main and Backup, must be able to provide ATC services based on the same operational configuration information (definition of roles, sectors, distribution rules, control positions, …).
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

[REQ]

Identifier	REQ-32-W3.02-FRD-CTY.0018
Title	External exchange configuration data alignment
Requirement	The Main ATC ADSP and the Backup ATC ADSP shall be consistently configured with respect to the external stakeholders
Status	<in progress>
Rationale	The two ADSPs, Main and Backup, must be able to exchange data (AFTN, OLDI) based on the same external exchange configuration.
Category	<Interoperability>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Support Functions Data Management ER/APP
<ALLOCATED_TO>	<System>	ADSP ATC (PJ.32-W3-02)

4.11Missing Services

[REQ]

Identifier	REQ-32-W3.02-FRD-NSV.0001
Title	New CPDLCD service
Requirement	A new **CPDLCDataGroundDistribution** service shall be designed in order to support the ground distribution of CPDL-C data in the context of the AMAN Triangle Architecture and of the TRACT Triangle Architecture.
Status	<in progress>
Rationale	This service has not yet been designed in SESAR
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services

[REQ]

Identifier	REQ-32-W3.02-FRD-NSV.0002
Title	New ADSCD service
Requirement	A new **ADSCDataGroundDistribution** service shall be designed in order to support the ground distribution of ADS-C data in the context of the AMAN Triangle Architecture and of the TRACT Triangle Architecture and of the TRACT Triangle Architecture.
Status	<in progress>
Rationale	This service has not yet been designed in SESAR
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

<ALLOCATED_TO>	<Functional block>	A/G Datalink Services

[REQ]

Identifier	REQ-32-W3.02-FRD-NSV.0003
Title	New ADSCM service
Requirement	A new **ADSCDataGroundManagement** service shall be designed in order to support the ground management of ADS-C data in the context of the AMAN Triangle Architecture and of the TRACT Triangle Architecture.
Status	<in progress>
Rationale	This service has not yet been designed in SESAR
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services

[REQ]

Identifier	REQ-32-W3.02-FRD-NSV.0004
Title	New CPDLCM service
Requirement	A new **CPDLCDataGroundManagement** service shall be designed in order to support the ground management of CPDLC data in the context of the TRACT Triangle Architecture.
Status	<in progress>
Rationale	This service has not yet been designed in SESAR
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	A/G Datalink Services

4.12Services to be possibly refined/revised

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0001
Title	Reuse of existing VC Services
Requirement	The Specialised ADSP and the Principal ATC ADSP involved in a Triangle architecture shall reuse as much as possible already defined VC Services to exchange their data.
Status	<in progress>
Rationale	The reuse of existing services as much as possible is good practice in SOA.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0002
Title	Genericity of VC Services
Requirement	If there is a need to update an already defined VC Service to accommodate the exchange of data exchange between a Specialised ADSP and a Principal ATC ADSP involved in a Triangle architecture, then this service shall be updated so that it can still be used by VC ATSU users.
Status	<in progress>

Rationale	The reuse of existing services as much as possible is good practice in SOA.
Category	<Design>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0003
Title	Configuration data in SUPPD suitable for the Specialised ADSP
Requirement	The **SupportFunctionDistribution** service shall allow the Specialised ADSP to distribute the required off-line configuration data.
Status	<in progress>
Rationale	The user consuming services from the Specialised ADSP must be able to get the required off-line configuration data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	SupportFunctionsDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0004
Title	Configuration data in SUPPM suitable for Specialised ADSP
Requirement	The **SupportFunctionManagement** service shall allow to manage the off-line configuration data of the Specialised ADSP.

Status	<in progress>
Rationale	The user consuming services from the Specialised ADSP must be able to input the required off-line configuration data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	SupportFunctionsManagement

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0005
Title	Configuration data in SUPPD suitable for AMAN ADSP
Requirement	The **arrival configuration** data distributed in the **SupportFunctionDistribution** service shall fulfil the needs of the **AMAN ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the SUPPD service may need to be revised or enhanced in order to fulfil the needs of the AMAN ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	SupportFunctionsDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0006
Title	Flight data in FDD suitable for MTCD ADSP

Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **MTCD ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the MTCD ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0007
Title	Flight data in FDD suitable for TRACT ADSP
Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **TRACT ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the TRACT ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0008
Title	Flight data in FDD suitable for AMAN ADSP
Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **AMAN ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the TRACT ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0009
Title	Flight data in FDD suitable for TCT ADSP
Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **TCT ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the TCT ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0010
Title	Correlation data in CORRD suitable for TCT ADSP
Requirement	The **correlation data** distributed in the **CorrelationDataDistribution** service shall fulfil the needs of the **TCT ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the CORRD service may need to be revised in order to fulfil the needs of the TCT ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	CorrelationDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0011
Title	Flight data in FDD suitable for MTAPW ADSP
Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **MTAPW ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the MTAPW ADSP.
Category	<Interface>

[REQ Trace]

EUROPEAN PARTNERSHIP

Co-funded by the European Union

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0012
Title	Flight data in FDD suitable for SSRCM ADSP
Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **SSRCM ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the SSRCM ADSP.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0013
Title	Flight data in FDD suitable for SNET ADSP
Requirement	The **flight data** distributed in the **FlightDataDistribution** service shall fulfil the needs of the **SNET ADSP**.
Status	<in progress>
Rationale	The payload content, hence the specification, of the FDD service may need to be revised in order to fulfil the needs of the SNET ADSP.
Category	<Interface>

EUROPEAN PARTNERSHIP

Co-funded by the European Union

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Functional block>	Flight Planning - Lifecycle Management - Data Distribution
<ALLOCATED_TO>	<Service>	FlightDataDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0014
Title	OPSUPD service enhancement
Requirement	The **OperationalSupervisionDistribution** service shall be able to distribute **operational safety net statuses**.
Status	<in progress>
Rationale	The OPSUPD service specification needs to be updated to encompass the distribution of operational safety net statuses.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	OperationalConfigurationDistribution

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0015
Title	OPSUPM enhancement
Requirement	The **OperationalConfigurationManagement** service shall be able to offer the possibility for the user to input on-line updates of the **safety net area configurations**.
Status	<in progress>

Co-funded by the European Union

Rationale	The OPSUPM service specification needs to be updated to encompass the input of operational safety net statuses.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	OperationalConfigurationManagement

[REQ]

Identifier	REQ-32-W3.02-FRD-RSV.0016
Title	MTCD service suitable for MTAPW data distribution
Requirement	The **MediumTermConfictDetection** service shall fulfil the needs of the **MTAPW ADSP** for **MTAPW conflict data** distribution.
Status	<in progress>
Rationale	The payload content, hence the specification, of the MTCD service may need to be revised in order to encompass the distribution of MTAPW conflict data.
Category	<Interface>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.32-W3-02
<ALLOCATED_TO>	<Service>	MediumTermConflictDetection

5 Assumptions

5.1 Common assumptions for SESAR Technological Solution P.32-W3-02

In order to facilitate the reading, the general assumptions have been kept in the same section than the general requirements, and stored in the Requirement Repository.

As a consequence, please refer to section 4.1.3.

5.2 Specific assumptions for Function XX

As the Solution encompasses many different topics, and in order to facilitate the reading, it has been chosen to keep the specific assumptions as an introduction of the sections developing the requirements on a specific topic.

As a consequence, please refer to sections 4.x.2 for specific assumptions.

EUROPEAN PARTNERSHIP

Co-funded by the European Union

6 References and Applicable Documents

6.1 Applicable Documents

This FRD complies with the requirements set out in the following documents:

Content Integration

[1] PJ19 CI W2 D2.15 - EATMA Guidance 2020

[2] EATMA Community pages

[3] SESAR ATM Lexicon

System and Service Development

[4] ICAO AIRM v1.0.0

[5] B.04.03 D102 SESAR Working Method on Services

[6] PJ19 W2 CI D2.3 ADD 2020

System Engineering

[7] SESAR 2020 Requirements and Validation Guidelines Wave 2

6.2 Reference Documents

The following documents were used to provide input:

[8] ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.

[9] A proposal for the future architecture of the European airspace, 2019

[10] EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services (including Service Continuity), EUROCONTROL - GUID-0118, Edition 2.0, April 2009

[11] SESAR 2020 TS IRS – PJ.16-03 Solution, D.2.3.010 , Edition 02.00.00, 06/12/2019

[12] SESAR 2020 TS IRS – PJ.10-W2-PROSA, D.3.2.050 , Edition 00.01.00, 14/02/2022

[13] Technical Architecture Description – Cycle 2015, D120, Edition 00.01.00, 19/01/2016