



Final Project Report

Document information

Project Title	Development of the Architecture of the Technical Systems within the EAEA
Project Number	B.04.03
Project Manager	EUROCONTROL
Deliverable Name	Final Project Report
Deliverable ID	D41
Edition	01.00.00
Template Version	03.00.04

Task contributors

EUROCONTROL

Abstract

Project B.04.03 was in charge of the collaborative development and maintenance of the Architecture of the Technical Systems with the Single European Sky ATM Research (SESAR). B.04.03 was responsible for identifying inconsistencies of the System, Service and Information architecture with a mix of top down and bottom up approaches of the programme. In order to fulfil this role, B.04.03 acted as a coordinator, consolidator and facilitator with Operational, Information, Service, System and the Master Plan projects. B.03.04 provided guidance and support for the SESAR Joint Undertaking (SJU), SESAR projects, to ensure consistency with the content of the European ATM Enterprise Architecture (EATMA).

Prepared By - <i>Authors of the document.</i>		
Name & Company	Position & Title	Date
EUROCONTROL		09/05/2016

Name & Company	Position & Title	Date
[REDACTED] DSNA	[REDACTED]	25/08/2016
[REDACTED] NATS	[REDACTED]	25/08/2016
[REDACTED] AIRBUS	[REDACTED]	25/08/2016
[REDACTED] THALES	[REDACTED]	25/08/2016
[REDACTED] Finmeccanica	[REDACTED]	25/08/2016
[REDACTED] FREQUENTIS	[REDACTED]	25/08/2016
[REDACTED] ENAV	[REDACTED]	25/08/2016
[REDACTED] AIRBUS DS	[REDACTED]	25/08/2016
[REDACTED] DFS	[REDACTED]	25/08/2016
[REDACTED] SEAC	[REDACTED]	25/08/2016
[REDACTED] ENAIRE	[REDACTED]	25/08/2016
[REDACTED] NORACON	[REDACTED]	25/08/2016

Name & Company	Position & Title	Date
[REDACTED] DFS		25/08/2016
[REDACTED] DFS		25/08/2016
[REDACTED] NATS		25/08/2016
[REDACTED] DFS		25/08/2016
[REDACTED] THALES		25/08/2016
[REDACTED] ENAIRE		25/08/2016
[REDACTED] Airbus		25/08/2016
[REDACTED] EUROCONTROL		25/08/2016
[REDACTED] Lufthansa Systems		25/08/2016
[REDACTED] UK MET [REDACTED]		25/08/2016
[REDACTED]		
[REDACTED] Leonardo FINMECCANICA		25/08/2016
[REDACTED] EUROCONTROL		25/08/2016
[REDACTED] INDRA		25/08/2016
[REDACTED] EUROCONTROL		25/08/2016
[REDACTED] LFV		25/08/2016

Name & Company	Position & Title	Date
[REDACTED] DSNA	[REDACTED]	02/06/2016
[REDACTED] NATS	[REDACTED]	02/06/2016
[REDACTED] AIRBUS	[REDACTED]	02/06/2016



2 of 11

THALES		02/06/2016
Finmeccanica		02/06/2016
FREQUENTIS		02/06/2016
ENAV		02/06/2016
AIRBUS DS		02/06/2016
DFS		02/06/2016
SEAC		02/06/2016
ENAIRES		02/06/2016
NORACON		02/06/2016

Rejected By - Representatives of the company involved in the project.

Name & Company	Position & Title	Date

Rational for rejection

None.

Document History

Edition	Date	Status	Author	Justification
00.00.01	09/05/2016	draft		Initial version
00.00.02	14/05/2016	release		Final version
00.00.03	21/06/2016	release		Approved version
01.00.00	25/08/2016	Final		Final version following SJU assessment

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
ADD	Architecture of technical systems Description Document
AIRM	Aeronautical Information reference Model
ATM	Air Traffic Management
CBA	Cost Benefit Analysis
CONOPS	CONcept of OPerationS
CNS	Communication Navigation Surveillance infrastructure
DOD	Detailed Operational Description
DP/DS	Deployment Package / Deployment Scenario
EAEA	European ATM Enterprise Architecture
EATMA	European ATM Architecture
ISRM	Information Service Reference Model
SCG	Service Coordination Group
SJU	SESAR Joint Undertaking
SOA	Service Oriented Architecture
STG	SESAR System Thread Guidance document
SWIM	System Wide Information Management
SWP	Sub Work Package
TAD	Technical Architecture Document
WBS	Work Breakdown Structure

1 Project Overview

The objectives of Work Package (WP) B were to elaborate and refine the high level Air Traffic Management (ATM) Target Concept and the corresponding European ATM Enterprise Architecture (EAEA) both addressing and detailing the ATM Concept of Operations, the ATM Operational Services and the Architecture of the Technical Systems consistent with validation targets derived from High Level Goals and performance assessments of the ATM Target Concept based on validation results.

Project B.04.03 was in charge of the collaborative development and maintenance of the Architecture of the Technical Systems with the Single European Sky ATM Research (SESAR) projects and the Master Plan. B.03.04 provided guidance and support for the SESAR Joint Undertaking (SJU), Information, Service and system projects to ensure consistency with the content of the European ATM Enterprise Architecture.

1.1 Project progress and contribution to the Master Plan

In the early days of SESAR, architecture and modelling work were not really recognised in the scope of work of the SESAR Projects. Thus these architecture and modelling works were not fully embedded in the working process. For example, most of the Technical Architecture Documents (TAD) were produced before any real architecture work; and most of the system models were produced after the TAD delivery. Thanks to a continuous awareness, coaching and training initiatives, B.04.03 project succeeded to better scope/refine what the Architecture of the Technical Systems should be made of, what it should provide to whom, and how this Architecture of the Technical Systems should worked out in a collaborative manner with the SESAR System projects and ATM Stakeholders. The last version of this Architecture of the Technical Systems represents the consistent and coherent set of System, Service and Information architecture elements that has been produced by the SESAR projects; and then integrated into the last version of the European ATM Architecture. The Architecture of the Technical Systems is composed of several views: System, Service and Information views. The System view is based on the Technical Architecture produced by the SESAR projects, Service view is based on the Information Service Reference Model and Information view is based on the ATM Information Reference Model.

B.04.03 was responsible for identifying inconsistencies of the System, Service and Information architecture with a mix of top down and bottom up approaches of the programme. In order to fulfil this role, B.04.03 acted as a coordinator, consolidator and facilitator. In this role it conducted and participated in meetings and workshops with SESAR Projects, SJU and Airspace Users to align the development of content in the System, Service and Information architecture and the integrated roadmap. In this role, the proactive interaction with the SJU, SESAR Projects and Airspace Users was a crucial success factor in order to identify options, facilitate common decisions, to identify gaps and issues regarding the System, Service and Information architecture and to propose mitigation actions when need be. This shown to be very positive in several contexts:

- in order to harmonize SESAR production like CONcept of OPERATIONs (CONOPS) and Architecture Description Document (ADD) under responsibility of WP B with deliverables like Detailed Operational Descriptions (DODs) or Technical Architecture Documents (TADs, Information Service reference Model (ISRM) and ATM Information Reference Model (AIRM) produced by SESAR Projects;
- in order to enable a real buy in and implementation of the Service approach within SESAR solutions;
- in the context of Architecture Issue Management which was set up on a case-by-case basis for the clarification / coordination of Various technical, service, operational issues in order to achieve overall consistency and coherency. This provided the ATM Masterplan with consistent information on different levels of detail;

founding members



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

- In the context of the elaboration of the ATM Master Plan by providing support in the production of the Integrated Roadmap (for what concerns the System Enablers) and the identification of the most promising Deployment Packages and Scenarios. The Master Plan portal was upgraded and integrated the architecture views.

The last version of the European ATM Architecture (EATMA V7) delivered in July 2016 provided a complete ATM System, Service and Information architecture covering the present state and changes proposed by SESAR projects.

1.2 Project achievements

In order to ensure a comprehensive and coherent development and maintenance of the Architecture of the Technical Systems, the work within B.04.03 focussed on several areas:

- Contribution to the European ATM Enterprise Architecture:
 - The ATM System, Service and Information architecture was produced with some major changes in the production process and its content:
 - The European ATM Architecture (EATMA) framework was defined and updated to develop the System, Service and Information architecture with functional (logical and deployment agnostic - capability driven), implementation (deployment) and service views;
 - The ATM System, Service and Information architecture aligned with EATMA releasing cycle. A dedicated Content Integration process was performed horizontally across different domain architectures and vertically with the Operational and Service architectures. It was used to ensure overall consistency and coherency of the ATM System, Service and Information architecture. This was made in a collaborative way with the SESAR Projects twice a year;
 - Overall consistency and coherency was performed via the EATMA Content Integration process;
 - A set of Design Principles (such as Open Architecture or SOA, Service oriented Architecture) to be applied when designing the System, Service and Information architecture were defined;
 - B.04.03 contributed to the SESAR System Thread Guidance (STG). This document provided guidance and clarification on the working arrangements, the dependencies and the projects deliverables for the SESAR project. From this guidance document, the EATMA Content Integration process was updated;
 - A dedicated Architecture Technical Issue and Consulting processes were defined in order to support the SESAR Projects and the SJU in their System, Service and Information architecture work. This process was used to sort out some architecture issues (such as for example Meteo system at Airport, Arrival MANager (AMAN) and Departure MANager (DMAN) coupling, Trajectory Management, Virtual Center, ATM Supervision system, etc ...).
- Contribution to the Service activity:
 - A dedicated method to identify, design and prototype services – so-called Service Method - was produced and updated to ensure full service approach in the programme, and to foster service design and prototyping;
 - A dedicated Service Coordination Group was set-up in order to steer the service activity in SESAR.
- Contribution to the Master Plan:
 - Architecture guidelines were produced to review and to consolidate the System Enablers in order to improve overall quality, traceability, consistency and coherency

founding members



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

of the System Enablers. It defined rules to be applied and EATMA elements to be linked to when defining or updating System Enabler. These guidances were used to contribute to the Integrated Roadmap Data set. All proposed changes for System Enablers were reviewed and approved by B.04.03 in a collaborative way with the SESAR Projects;

- The ATM Master Plan level 2 (OI and Enablers) have been integrated into the EATMA and linked to architecture elements.

1.3 Project Deliverables

The following table presents the relevant deliverables that have been produced by the project.

Reference	Title	Description
D102	Service Method update 2015-Report	The last update of the Service Method provided the approach and the process to identify, design and validate service in the context of the future SESAR programme. It was elaborated following lessons learnt of the service activity in SESAR, and tuned according to the new EATMA framework (and how service is put into the architecture). This corresponded to reference material for the future SESAR programme
D128	ADD SESAR1	The European ATM System, Service and Information architecture was produced in several iterations which enabled to improve the maturity and the completeness of the ATM System Architecture. The last version of the System, Service and Information architecture intended to be the baseline architecture that enabled a smooth transition from SESAR production to the future SESAR programme. It provided the System, Service and Information architecture that was produced by the SESAR1 System projects (be for Step1 or Step2). Last but not least, it provided the last update of the Design Principles that Design Principles. This SESAR architecture (Technical, Service and Information) and Design Principles corresponded to reference material for the future SESAR programme.

1.4 Contribution to Standardisation

The ATM System, Service and Information architecture did not integrate the Standardisation Enablers fully. But it was used to identify some standardisation needs that were integrated in the Standardisation roadmap. Investigations started to integrate the standardisation enablers into the Architecture (i.e. to propose links between architecture artefacts and standardisation enablers; and identification of existing standard in the Architecture), and to update the EATMA Content Integration

founding members



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

process to review the standardisation enablers when producing an EATMA release. This integration will be completed in the context of the future SESAR programme

1.5 Project Conclusion and Recommendations

The last update of the SESAR technical architecture (EATMA V7) provided the System, Service and Information architecture produced by the SESAR projects (be for Step1 or Step2). It demonstrated that using the elements from the reference architecture, various implementation options could be developed and evaluated. This last version of the System, Service and Information architecture intended to be the initial System, Service and Information architecture used as a reference material for the future SESAR programme.

Also, several processes/methodologies were matured in SESAR. They would be taken as reference material for and integrated into the handbook of the future SESAR programme. These were:

- The EATMA framework providing the list of architecture elements and their relationships used to describe the System, Service and Information architecture. The EATMA framework was aligned with the future SESAR programme set-up (SESAR solution, capability driven, performances and standardization enablers). Part of the future SESAR programme deliverables would be generated from this framework;
- The EATMA Content Integration process describing the working method/process to develop, integrate and check consistency and coherency of the System, Service and Information architectures. This Content Integration process would be used as a reference to define the maturity criteria that would be used at the future SESAR programme Maturity gate processes;
- The Service method describing the working method/process to identify and design services into the System, Service and Information architectures;
- The Design Principles produced for SESAR1 would be used to structure/drive the architecture work of the future SESAR programme;
- The System Enablers guidance providing rules to be applied when creating, updating or deleting System Enabler;
- The SESAR System Thread Guidance (STG) document providing guidance and clarification on the working arrangements, the dependencies and the deliverables for the projects when working out the System, Service and Information architecture.

It was recommended that for the future SESAR programme, these System & Service & Information architecture and modelling activities would be re-enforced at SESAR programme level but fine-tuned according to the available budget and effort. It was also recommended that these architecture activities should be fully embedded into the production of the future SESAR programme.

2 References

- [1] SESAR Programme Management Plan, Edition 03.00.01
- [2] [European ATM Master Plan](#)
- [3] Multilateral Framework Agreement (“MFA”) signed between the SJU, EUROCONTROL and its 15 selected members on August 11, 2009, amended on 14 June 2010, 19 October 2010 and 2 July 2012

Method

- [4] D01 - B.04.03 Architecture Methodology
- [5] D08 - Update to B.04.03 Architecture Methodology
- [6] D46 - Working methods on services (2nd edition)
- [7] D81 - SESAR Working Method on Services Edition 2013
- [8] D100 - Service Method update 2014
- [9] D102 - Service Method update 2015-ReportService Method updated for SESAR 2020 reference material and contribution to SESAR 2020 handbook

Architecture

- [10] D03 - ADDs- Roadmaps- V&V documents and Master Planning interface documentation for pilot tasks- for Step 1V1 and Step 1V2 (initial) (Cycle 1)
- [11] D32 - ADD Step 1
- [12] D33 - ADD Step 2-3
- [13] D43 - ADD Step 2-3 SWIM & CNS
- [14] D44 - ADD Step 1 complete
- [15] D73 - ADD Step1 - pre-released version
- [16] D74 - ADD Step1 - released version
- [17] D75 - ADD Step2 second iteration
- [18] D95 - ADD Step1 2014 edition
- [19] D98 - ADD SESAR 2020 Transition edition
- [20] D128 - ADD SESAR 1 edition SESAR1 architecture (technical and service) used as SESAR 2020 reference material

Reports

- [21] D04 - Integration team review reports and complement to the EA views for pilot tasks- for Step 1V1 and Step 1V2 (initial) (Cycle 1)
- [22] D05 - Integration team review report and complement to ADDs and Roadmaps for pilot tasks- for Step 1V1 and Step 1V2 (initial) (Cycle 1)
- [23] D06 - SEMP Reviews and Cluster sessions List of anomalies and recommendations for pilot tasks- for Step 1V1 and Step 1V2 (initial) (Cycle 1)
- [24] D07 - Working together list of anomalies and updates to the architecture of the technical systems deliverables for Cycle 1 (pilot tasks- for Step 1V1 and Step 1V2 (initial))
- [25] D09 - EA views for the architecture of the technical systems for Step 1 V2&V3- for Step 2V1 (initial) and Step 3V1 (initial) (Cycle 2)
- [26] D10 - ADDs- Roadmaps- V&V documents and Master Planning interface documentation for Step 1 V2&V3- for Step 2V1 (initial) and Step 3V1 (initial) (Cycle 2)

- [27] D11 - Integration team review reports and complement to the EA views for Step 1 V2&V3- for Step 2V1 (initial) and Step 3V1 (initial) (Cycle 2)
- [28] D12 - Integration team review report and complement of ADDs and Roadmaps for Step 1 V2&V3- for Step 2V1 (initial) and Step 3V1 (initial) (Cycle 2)
- [29] D13 - SEMP Reviews and Cluster sessions List of anomalies and recommendations for Step 1 V2&V3- for Step 2V1 (initial) and Step 3V1 (initial) (Cycle 2)
- [30] D14 - Working together list of anomalies and updates to the architecture of the technical systems deliverables for Step 1 V2&V3- for Step 2V1 (initial) and Step 3V1 (initial) (Cycle 2)
- [31] D27 - Scrum Report Sprint 3
- [32] D34 - Component Approach Report
- [33] D35 - Service Approach Report
- [34] D51 - B.04.03 contribution to 2012 EA
- [35] D53 - B.04.03 contribution to 2012 integrated roadmap
- [36] D76 - Service Coordination activity report 2013
- [37] D77 - Technical Issue Management activity report 2013
- [38] D78 - DS10 review report
- [39] D79 - DS11 review report
- [40] D80 - Consulting activity report 2013
- [41] D99 - Service Coordination activity report 2014
- [42] D101 - Service Coordination activity report 2015
- [43] D103 - Technical Issue Management activity report 2014
- [44] D104 - Technical Issue Management activity report 2015
- [45] D105 - Consulting activity report 2014
- [46] D106 - Consulting activity report 2015
- [47] D129 - Service Roadmap 2015-Report
- [48] D130 - Technical Issue Management activity report 2016
- [49] D131 - Consulting activity report 2016
- [50] D132 - Report on the Preparation for transition and hand-over 2020

-END OF DOCUMENT-

founding members



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

11 of 11