Final Project Report

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Abstract

To support the development of validation and verification platforms, Work Package 3 has defined a formal engineering methodology which has been applied by subsequent WP3 projects. In this scope, P03.02.02 has produced the description of IBPs used by validation exercises and their necessary evolutions to fulfil the expressed validation needs. P03.02.02 has contributed to the maintenance of the tools supporting the WP3 information management system. Additionally, studies to optimize or communalize verification and validation infrastructure tools have been conducted resulting on a series of recommendations..

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This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
ATG	Air Traffic Generator
ATM	Air Traffic Management
EUROCAE	European Organisation for Civil Aviation Equipment
IBP	Industry Based Platform
IMS	Information Management System
IOP	Interoperability
OV	Operational View
SESAR	Single European Sky ATM Research
SJU	SESAR Joint Undertaking (Agency of the European Commission)
UR	User Requirement
V&V	Verification and Validation
V&VI	Verification and Validation Infrastructure
V&VP	Verification and Validation Platform
WG-81	EUROCAE Working Group 81
WP03 / WP3	Work Package 3

1 Project Overview

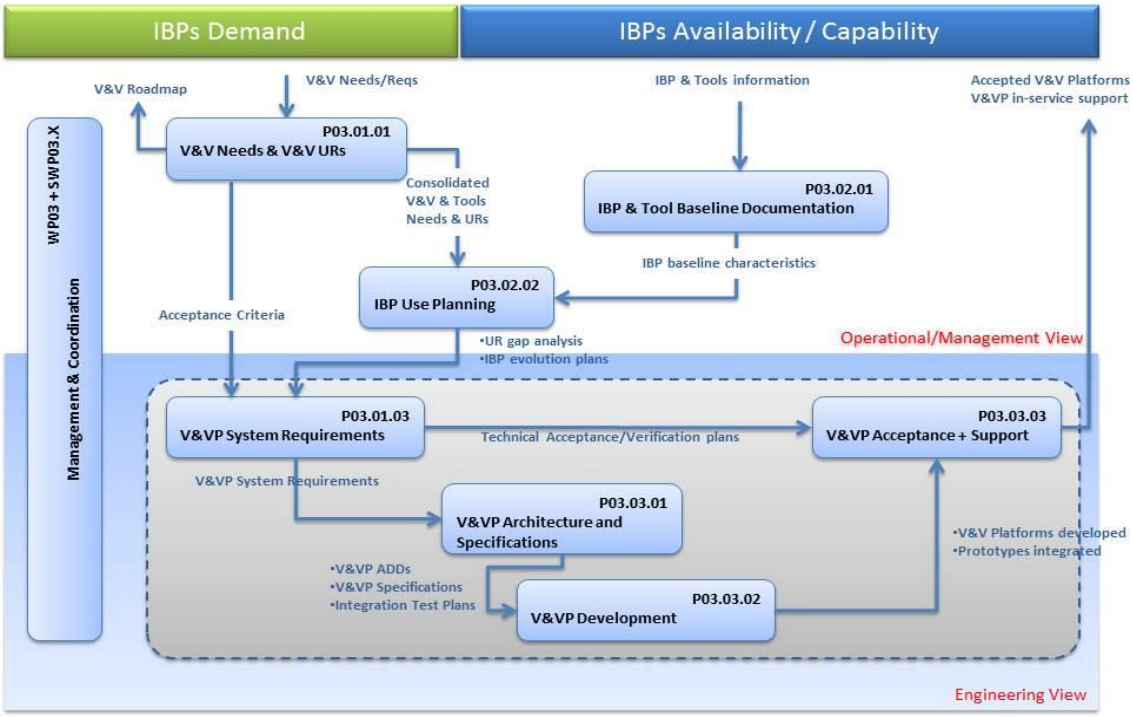
P03.02.02 aimed, firstly, to support the adaptation of Industry based pre-operational V&V Platforms (IBP) by performing the gap analysis against V&V Users Requirements, building the IBP evolution plans with respect to these gaps and, secondly, to provide recommendations to the SJU for possible optimization on V&VI tools.

1.1 Project progress and contribution to the Master Plan

As part of a transversal work package dealing with the adaptation and integration of Validation Infrastructure, P03.02.02 did not directly contribute to deployment activities as defined in the ATM Master Plan (ref [2]).

Nevertheless WP03, as a whole, has contributed to the SESAR cooperation framework by supporting the SESAR Partners and the Operational and System Threads to properly define and coordinate the timely evolution and setting up of V&V Platforms along with the required support to adaptation and integration of the relevant tools and prototypes focusing on V2 and V3 maturity phases.

WP03 has developed a System Engineering Methodology (ref [5]) defining the processes that ruled the development of V&VP and V&VI so to ensure the technical coherence and project contribution to the SESAR Programme objectives. P03.02.02 has contributed to these System Engineering processes by the elaboration of the gap analysis and the IBP baseline description and evolution plan documentations. To improve overall consistency with the programme, the IBP documentation was aligned with the system architecture produced by the WPB.04.03 (ref [6]). All documentation was stored in one of the two WP03 information repositories, namely the WP3-IMS-OV (ref [5]), that WP03 has developed and maintained to support the collaboration and information exchange within the SJU programme.



WP3 projects structure and framework

The Global Optimization tasks series aimed at identify possible optimizations on V&VI tools supporting Validation Exercises. These optimizations were targeting to increase consistency of results across validation activities thanks to common specifications and behaviours or a reduction of cost at programme level thanks to an increase of interoperability or interchangeability between the tools. The process applied consisted in analysing the requirements expressed on V&VI tools and in identifying whether common specifications could be produced or recommendations for evolutions on existing tools.
From these tasks, two main contributions have been made on Air Traffic Generator (ATG) and V&VI interoperability (IOP) requirements.

In addition to the main activity streams described above, P03.02.02 has also taken over extra activities that P03.02.01 was assuming up to its closure in 2014 and which were identified as mandatory for the sake of the overall WP3 processes. Consequently, P03.02.02 has maintained the WP3 Information Management System Operational View (IMS OV) and provided the users support. On a regular basis, the V&V roadmap in the WP3-IMS-OV database was kept aligned with the V&V roadmap managed by SJU and WP3-IMS-OV database snapshots were provided to 03.00.00. Lastly, P03.02.02 managed the registration of new IBPs.

1.2 Project achievements

This transversal project has contributed to the preparation and documentation of several validation exercises supported by WP03, by applying the Overall Engineering Process.

In particular, the yearly support consisted of :

- 7 IBP evolution plans in 2011
- 23 IBP evolution plans in 2012
- 26 IBP evolution plans for 20 exercises in 2013
- 16 IBP evolution plans for 9 exercises in 2014
- 21 IBP evolution plans for 15 exercises in 2015

Thanks to 03.02.02, exercises supported by WP03 were deemed better documented, thus improving the visibility on preparation activities done on the V&VP and facilitating the collaboration between validation exercise stakeholders whenever a distributed V&VP was used. Indirectly, P03.02.02 was contributing to the Master Plan, by facilitating the maturity assessment of these exercises, which contributed directly to mature the Master Plan.

Additionally, in the scope of the global optimization tasks, the following documents have been produced:

- Technical Specification - Air Traffic Generator (ref [7]): ATG technical specifications provide a reference for verifying the expected behaviour of Air Traffic Generators used in SESAR validation exercises and an input for the development of the missing capabilities.

- 2015 Global Optimization report (ref [8]), including some recommendations on V&VI IOP communalisation: These recommendations provide also a good starting point to make progress in this area.

1.3 Project Deliverables

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

Reference	Title	Description
D03	Initial Gap Analysis Report	This document provides a high level analysis of the Release 2 roadmap data with an objective of providing a number of considerations on the validation platforms which are proposed for the related validation exercises.
D19	2015 Evolution Plan Final	This document provides the overview of the IBP's Baseline Description and Evolution Plans delivered during Q3&Q4 2015. It contains the references to the artefacts uploaded on the WP3-IMS databases.
D12-001	2015 Global Optimization report	This document provides the outcome of the V&VP tools optimization activity performed by P03.02.02 project in 2015.
D16-002	Information Management Report (operational_management view) for 2015	This document provides the information relative to the operational view of the WP03 Information Management activity that has been performed in 2015.

1.4 Contribution to Standardisation

This project, through the "Global optimization" tasks series, has contributed to identify some common requirements that V&VI tools would need to cover to enhance platforms consistency, interoperability and reusability. Formally, no direct links were made by 03.02.02 project with standardization bodies to convert these requirements in standard. Nevertheless, many 03.02.02 participants are also active contributors to EUROCAE working group WG-81. The objectives of this group are to enhance the interoperability between ATM validation platforms, either real-time, fast-tool or any needed tools, to develop common standards for data interchange, data preparation facilities and high-level exchange protocols.

1.5 Project Conclusion and Recommendations

Despite of the complexity of the WP3 projects structure and the high number of WP3 artefacts that have been regularly challenged, it is commonly agreed that Validation Exercises supported by WP3 have delivered valuable materials for SESAR programme management.

P03.02.02 has contributed to WP03 engineering process by the implementation of a continuous monitoring process of the milestones under the responsibility of P03.02.02 (IBP baseline description and evolution plan) for all SESAR exercises supported by WP03. This process has allowed the early identification of issues related to IBP evolution, the provision of management support to achieve the milestones on time and the coordination of issues with WP03 management when necessary

In this context, the IBP baseline description and evolution plan documents are among the WP3 artefacts which have brought the most positive value.

They helped to provide more visibility on platforms capabilities, sharing the information with the SESAR community and not limited to IBP owners or users. The description has followed a common structure (driven by Functional Blocks), with similar level of granularity. The evolutions description has

allowed better identifying and quantifying the work to be done to fulfil the gaps on downstream WP3 life cycle activities, as well as the risks of deviation on the project schedule. IBP documentations are important assets of SESAR 1. The maintenance of these documentations should be maintained, in the frame of further SESAR activities.

The outcomes of global optimization tasks, both on ATG technical specifications and on V&VI IOP recommendations are good starting points to make progress in these areas, reflecting the current state of the art in SESAR and should evolve in line with new SESAR expectations.

Nevertheless, not many optimization topics have been identified to elaborate further recommendations or common requirements activities. This situation arose from a lack of both top-down (SJU to WP3) directive addressing common transversal topic and bottom-up (WP3 to validation platform) incentive aiming to communalize requirements with the consequent options to update some V&VI tools individually or to share common tools fulfilling these common requirements. These limited investigations and results probably reflect the level of maturity by partners to stick on the communalisation concept, a lack of well identified short or medium term benefits to implement it on their own facilities versus immediate costs (platform adaptations, trainings, etc.) and technical risks they may generate.

Nevertheless, such an optimization process should be sustained in the scope of next SESAR programme. It will contribute to improve existing standards (WG81 ref [4] or others) and their adequacy with SESAR needs, and may turn on overall cost efficiency and better V&VI tools quality.

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

[4] EUROCAE WG-81 / Interoperability of ATM Validation Platforms ED-147 - ATM simulators interoperability requirement specification, 01 January 2013

[5] SWP03.00 WP3 Engineering Methodologies Report D10-002, Edition 01.00.00, 30 April 2015

[6] B.04.03 ADD Step 1 (2013 Edition), D74, Edition 00.01.13, 04/07/2014

[7] P03.02.02-T007 Technical Specification ATG, Edition 00.00.02, 22/03/2013

[8] P03.02.02 D12-001 2015 Global Optimization report, Edition 00.01.02, 15/02/2016

[9] P03.02.02 D01 Inputs definition, Edition 00.01.00, 26/03/2011

[10] P03.02.02 D02 Outputs definition, Edition 00.01.00, 15/03/2011

[11] P03.02.02 D03 Initial Gap Analysis Report, Edition 00.00.05, 02/02/2012

[12] P03.02.02 D04 Report for 2011 IBP evolution plans, Edition 00.00.03, 26/01/2012

[13] P03.02.02 D05-001 2012 Global Optimization report 2nd draft (including R3), Edition 00.00.03, 26/01/2012

[14] P03.02.02 D05-002 2012 Global Optimization Final Report, Edition 00.00.03, 26/01/2012

[15] P03.02.02 D06-001 2013 Evolution Plan 1st draft, Edition 00.05.00, 05/07/2013

[16] P03.02.02 D06-002 2013 Evolution Plan Final , Edition 00.02.00, 08/01/2014

[17] P03.02.02 D07-001 2013 Global Optimization report 1st draft , Edition 00.01.00, 21/05/2013

[18] P03.02.02 D07-002 2013 Global Optimization Final report, Edition 00.01.00, 13/01/2014

[19] P03.02.02 D08-001 2014 Evolution Plan 1st draft, Edition 00.02.00, 08/07/2014

[20] P03.02.02 D08-002 2014 Evolution Plan Final, Edition 00.01.02, 12/01/2015

[21] P03.02.02 D09-001 2014 Global Optimization report 1st draft, Edition 00.01.01, 11/07/2014

[22] P03.02.02 D10-001 2015 Evolution Plan 1st draft, Edition 00.01.00, 09/07/2015

[23] P03.02.02 D13-001 Evolution Plan (1st 2012), Edition 01.00.00, 16/07/2012

[24] P03.02.02 D13-002 Evolution Plan (2nd 2012), Edition 01.00.00, 19/12/2012

[25] P03.02.02 D16-001 Information Management Report (operational_management view) for 2014, Edition 00.01.00, 18/01/2015

[26] P03.02.02 D16-002 Information Management Report (operational_management view) for 2015, Edition 00.01.00, 06/01/2016

[27] P03.02.02 D17-001 Report on ENAV support to P03.03.01-Activity 2014, Edition 00.01.00, 13/01/2015

[28] P03.02.02 D17-002 Report on ENAV support to P03.03.01-Activity 2015, Edition 00.01.00, 12/01/2016

[29] P03.02.02 D19 2015 Evolution Plan Final, Edition 00.01.00, 18/12/2015

[30] P03.02.02 D11 Final Project Report, Edition 01.00.00

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