Final Project Report

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Abstract

P03.03.03 "Validation and Verification Platform acceptance and support", as part of the transversal work package dealing with the validation of infrastructure, its adaptation and integration within the SESAR programme; represented the last chain of the Validation and Verification process. To this end, it was in charge of the Technical Acceptance and Operational Acceptance review of the validation platforms, as well as in the provision of the In-Service Support Configuration Control and Problem Management tasks.

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This deliverable consists of SJU foreground.

Acronyms

Acronym	Definition
ATM	Air Traffic Management
E-OCVM	European Operational Concept Validation Methodology
IBP	Industry Based Platform
HMI	Human Machine Interface
M6	Milestones M6: Technical Acceptance
M7	Milestone M7: Operational Acceptance
M8	Milestone M8: Exercise Completed
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SWP	Sub-Work Package
TMA	Terminal Manoeuvring Area
V&V	Validation and Verification
V&VI	Validation & Verification Infrastructure
V&VP	Validation & Verification Platform
WP	Work Package

1 Project Overview

Project 03.03.03 provided Technical Acceptance, Operational Acceptance review and In-Service Support, Configuration Control and Problem management to all the validation exercises requesting this support. As such, it represented the last chain of the transversal work package WP03 "Validation Infrastructure Adaptation and Integration", being responsible for the final stage of the V&V (Validation and Verification) thread of the Industry Based/Pre-Operational V&V Platforms, just before the execution of any validation exercise.

1.1 Project progress and contribution to the Master Plan

WP03 "Validation Infrastructure Adaptation and Integration" supported the verification of system prototypes and the validation of the target concepts within the SESAR Programme by means of the V&V Platforms, in order to achieve the different ATM performance goals.

As an essential part of WP03, the main objective of P03.03.03 was to contribute to the Industry Based/Pre-Operational V&V Platform´s evolution process in its final stage.

As shown in Figure 1, for each validation exercise, once that the platform´s integration requirements coverage was granted by P03.03.02 "V&V Platform Development", P03.03.03 represented the next phase in the V&V lifecycle.

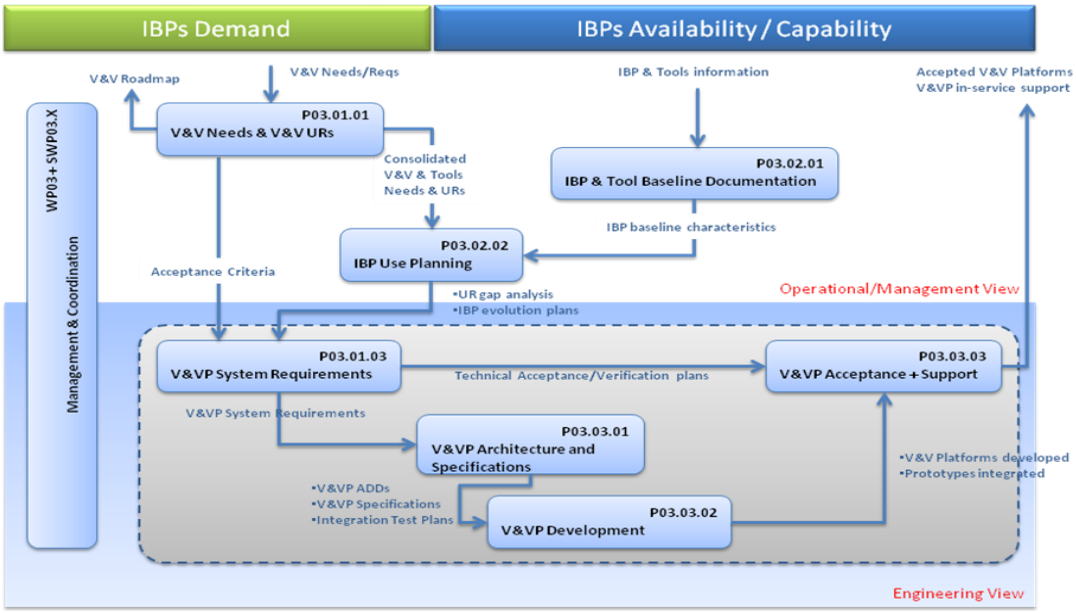

Figure 1 - WP03 overall process diagram

As part of the project´s technical activity, the first step was to deliver the platform´s Technical Acceptance, based on the Technical Acceptance/Verification Plans provided by P03.01.03 "Validation and Verification Platforms System Requirements". The outcome for each validation exercise was the Technical Acceptance Test Report, consisting of a list of technical test activities, grouped into test cases, where the results of the tests performed, as well as any issues encountered where detailed.

The next step was to deliver the platform´s Operational Acceptance. The outcome for each validation exercise was the Operational Acceptance Review Report, based on a list of operational test activities, grouped into test cases, where the results of the tests performed and any issues encountered where detailed. In many cases, the operational acceptance tests were difficult to quantify and describe on a test report, as it was based on the operational and subjective perception of a group of operators during several validation sessions. To tackle this issue, an email from an operational responsible was also accepted to confirm the operational acceptance of a V&VP Platform.

Finally, and in parallel to the Technical and Operational Acceptance tasks, P03.03.03 was also responsible for the provision of the platform´s In-Service Support, Configuration Control and Problem Management. This task addressed the efforts dedicated to activities like installing prototypes, setting up the validation platforms, training operators and solving any issues that could arise during the platforms´ integration, technical and operational tests; in order to guarantee a successful validation exercise execution by delivering technically and operationally accepted V&V Platforms.

As such, P03.03.03 did not directly contribute to the ATM Master Plan [2], but as a transversal project, it enabled the contribution of all the projects that required its support.

Apart from the three mentioned contractual tasks, P03.03.03 worked on the analysis of the delays suffered by the validation exercises throughout the WP03 process, focusing on P03.03.03 milestones. This analysis provided an overall view about the delays, their causes and some recommendations to mitigate them.

In relation to the delay analysis, a metric was developed named "Difficulty Indicator". This metric served to assess the difficulty of the different validation exercises and was used to identify potential issues, anticipate delays and mitigate potential risks based on its parameters and historical information. To develop this metric, all the factors, as well as their relative impact, that contributed to the difficulty of a validation exercise were agreed among all the partners of the project, based on their "Expert Judgement", and identified as variables and weights of a linear and normalised formula. This activity was performed by means of dedicated questionnaires designed for this purpose. Finally, the resulting formula was used to calculate the "difficulty" of each validation exercise and refined on a yearly basis, considering historical information and feedback from the partners. All the factors considered for the calculation of the Difficulty Indicator are shown in Figure 2.

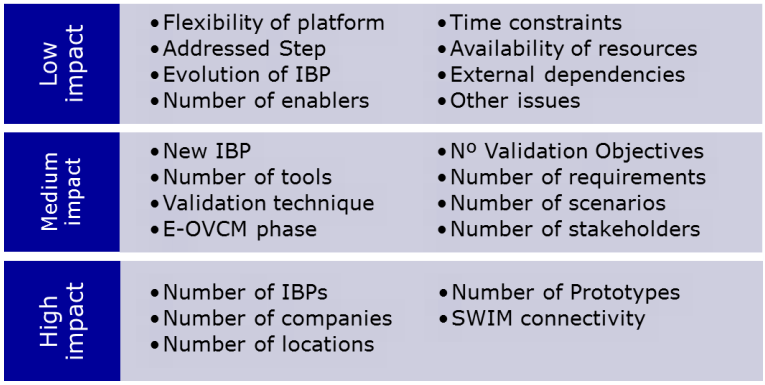

Figure 2 Factors Difficulty Indicator

The Delay Analysis and Difficulty Indicator tasks were not contractual and they arose as part of the continuous improvement procedures of P03.03.03.

1.2 Project achievements

P03.03.03 contributed to the overall WP03 target by providing support to the SESAR Partners in their Operational, Technical and Transversal Threads to define and coordinate the development and configuration of the V&V Platforms. The work was carried out fruitfully and any problems and risks detected were mitigated among partners by agreeing on specific actions.

For every V&V Exercise requesting WP03 support, P03.03.03 provided the V&V Technical Acceptance of the Platform by executing the Technical Acceptance Test Plans produced by P03.01.03. In addition, the Operational Acceptance Review was also delivered based on operational tests and operational perception.

Moreover, P03.03.03 provided support to all the tasks requiring configuration control and problem management of any issue raised on the V&V platforms during its integration, technical and operational acceptance trials.

During the lifecycle of the project, P03.03.03 supported the technical and operational preparation of 89 validation exercises belonging to the different ATM operational domains: En Route, TMA, Airport and Network Management. These validation exercises we performed in 39 different Industry Based Platforms from up to 11 different partners and were located all around Europe.

The outcomes of P03.03.03 were the provision of technical and operational readiness of the IBPs to successfully execute the targeted validation exercises. Sometimes, the validation platforms experienced some issues during the technical and/or operational acceptance milestones (i.e. unexpected HMI crashes, malfunction of recording systems, correlation problems, etc.). In these cases, the status of the associated technical and/or operational tests was set as "Passed with conditions" and the issues were registered as conditions with a related severity level, action description and due date.

The overall number of conditions was aligned to the number of supported validation exercises on a yearly basis. However, as the programme evolved, the proportion of low severity conditions was diminished while the proportion high and medium severity conditions increased. This could be explained due to the fact that the difficulty of the validation exercises increased and the validation platforms matured as the programme progressed, leading to a lower number of issues, but with higher severity.

Regarding the Difficulty Indicator, considering that it was implemented in 2014, the results showed that the difficulty of the validation exercises increased in the final part of the programme. Moreover, there was a correlation between the calculated level of difficulty and the issues and delays reported by the different validation exercises; therefore it could be used as a metric to make all the stakeholders aware of the complexity of a specific validation. This could be considered a risk management metric to identify when a validation exercise needs closer monitoring and control, as well as considering preventive and mitigation actions.

1.3 Project Deliverables

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

Reference	Title	Description
D489	IBP V&VP Technical Acceptance 2016	This deliverable includes all the technical acceptance activity performed during 2016. It gathers all the exercises which achieved milestone M6 "IBP V&VP Technical Acceptance", the status of the Technical Acceptance task and the conclusions derived during this period.
D491	IBP V&VP Operational Acceptance Review 2016	This deliverable includes all the operational acceptance activity performed during 2016. It gathers all the exercises which achieved milestone M7 "IBP V&VP Operational Acceptance Review", the status of the Operational Acceptance task and the conclusions derived during this period.
D452	In Service Support, Configuration Control and Problem Management Official Deliverable 2016	This deliverable includes all the in-service support activity performed during 2016. It gathers all the exercises which achieved milestone M8 "In-service support, configuration control and problem management", the status of the in-service support task and the conclusions derived during this period.

Table 2 03.03.03 Project Deliverables

1.4 Contribution to Standardisation

Project 03.03.03 has not contributed to any standardisation activity and its results did not have an impact on standards.

1.5 Project Conclusion and Recommendations

The following conclusions can be derived from the project:

-The harmonisation of a common procedure to establish and document the project milestones related to Technical and Operational Acceptance of the different V&VPs was highly appreciated. All the partners committed with a common set of templates and procedures, which were followed on a regular basis.

-The Technical Acceptance Test Reports have been successfully produced for each validation exercise; however the Operational Acceptance Review Reports need a more flexible structure and content. Since the beginning, and due to the issues encountered, it was agreed that an email from an operational representative would be enough to confirm the achievement of the Operational Acceptance.

-The Operational Acceptance was difficult to formalise based on predefined tests and requirements, as it was generally achieved through dry runs, interviews and operational perception techniques.

-In service support, configuration control and problem management task was very appreciated by the partners, especially for operational exercises.

-The development of the Difficulty Indicator served to understand the complexity of the different exercises and identify potential difficulties based on historical information.

-The monitoring and control activities have served to identify risks, issues and to take timely actions to mitigate and minimise their effects.

The following recommendations are proposed for the next development and deployment activities:

-Air Traffic Controllers (or any other operator) should be involved in the preparation of validation activities as early and as much as possible. This provides a better understanding, among the technical and operational teams, of the scope and objectives of the validation exercises, paving the way towards a successful validation.

-Technical and operational acceptance should be considered separately, as they address different needs and requirements; and it is stressed the importance of passing the Technical tests before the Operational trials. Besides, it is essential to pass both of them prior to every validation exercise execution.

-The minimum content of data required in the deliverables generated in the technical acceptance, operational acceptance and in service support tasks should be unambiguously agreed and committed among all partners. This data should be, in all cases, appropriate and consistent, for which guidelines and quality checklists could be provided as support material. Moreover, it should be stressed out the importance of allocating enough effort to documenting tasks, milestones and exercises.

-The Difficulty Indicator was proved to be a good tool to transversally foresee potential issues based on exercise information. Its elaboration should be refined and all the project stakeholders should be involved in its production and revision.

-A common and unique repository for the whole V&V process would be highly desirable, from V&V Needs to Technical/Operational Acceptance Test Reports, in order to keep track of all V&V activities. This repository should serve to upload, edit, save and submit artefacts and deliverables.

2 References

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[2] European ATM Master Plan

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