

Contextual note – SESAR Solution description form for deployment planning

Purpose:

This contextual note introduces a SESAR Solution (for which maturity has been assessed as sufficient to support a decision for industrialization) with a summary of the results stemming from R&D activities contributing to deliver it. It provides to any interested reader (external and internal to the SESAR programme) an introduction to the SESAR Solution in terms of scope, main operational and performance benefits, relevant system impacts as well as additional activities to be conducted during the industrialization phase or as part of deployment. This contextual note complements the technical data pack comprising the SESAR deliverables required for further industrialization/deployment.

Improvements in Air Traffic Management (ATM)

Dynamic DCB is envisaged as a process taking place on the day of operation and aiming at maintaining the balance between demand and capacity during the course of daily traffic operations. It will pro-actively monitor the traffic situation to identify and manage real-time imbalance situations. It will aim to apply all refinements needed to the DCB planning phase in order to restore network stability, addressing both flights in execution phase and on the ground.

Dynamic DCB shall nominally be restricted to addressing residual problems of limited magnitude (e.g. due to traffic bunching effect). Imbalances of greater magnitude shall either (if expectable) have been addressed during the planning phases or (if unplanned) be addressed following a network-wide pre-coordinated recovery plan after capacity reduction.

Advanced short-term ATFCM measures (STAMs) is a Dynamic DCB procedure which allows the Local Traffic Manager (LTM) to identify pre-regulation hotspots (airspace regions where there is an imbalance between demand and capacity, or where the expected workload is higher than the acceptable load) and apply short term ATFCM measures (STAMs).

Hotspot detection is based on supporting tools displaying hourly entry counts and occupancy counts, as well as on local analysis. The use of occupancy counts with OTMV (peak, sustain, overload duration, duration of counting) is the main enabler as advanced monitoring techniques are required for the application of targeted STAM.

Upon the hotspot confirmation, the LTM starts the analysis of the complex situation and proposes to solve it through the preparation of STAMs (Short-Term ATFCM Measures) such as ground delays, flight level capping and horizontal re-routings.

Once STAM is proposed by the LTM, the coordination phase starts with involved actors (ACC LTMs, Airport LTMs, AUs and NM) who evaluate and approve the measure that will be implemented by the LTM with relevant local DCB actors. STAMs are applied to a limited

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number of flights helping to avoid a considerable amount of the (sometimes unnecessary) ATFCM ground regulations and delays.

The Network Manager Operation Centre (NMOC) participates to the STAM process by monitoring the network problems (list of hotspots with severities, type of proposed measures, delay) and supervising the application of the STAMs implemented, thanks to the B2B services that allow to synchronize the NM view with the local view.

Advanced STAM is therefore a collaborative (CDM) process involving all partners in order to ensure that equity is maintained. Advanced STAM relying on improved predictability, together with automated tools for network view hotspot detection and for the promulgation and implementation of STAM enable ANSPs to adopt and improve the tactical capacity management procedures used to optimise traffic throughput. These tools work at both local and regional network management function level for information sharing and CDM.

The increased awareness and reliability of traffic and workload predictions, allow ANSPs to define and share sector capacities in a more pro-active, reliable way improving the predictability of capacity and network planning and the effectiveness of STAM.

CDM processes allow airspace users the ability to influence the kind and application of a constraint. This is further enhanced through the interoperability of local systems and the Network Manager.

Operational Improvement Steps (OIs) & Enablers

The solution addresses the following OI steps:

- **DCB-0308:** (Fully covered) Advanced Short Term ATFCM

The following enablers are considered as required in DS15

- **NIMS-13b:** Enhanced short term ATFM measures (STAM). Optional in DS15.
- **NIMS-27:** Network DCB sub-system enhanced with improved accuracy of processing real-time data
- **PRO-022:** FCM procedures for collaborating on SBT changes with Airspace Users
- **PRO-247:** FCM Procedures for hotspots information sharing and for CDM process to support STAM coordination and implementation.
- **SWIM-APS-03a:** Provision of ATFCM Information Services for Step 1
- **SWIM-APS-04a:** Consumption of ATFCM Information Services for Step 1
- **SWIM-INFR-05a:** General SWIM Services Infrastructure Support and Connectivity.
- **SWIM-NET-01a:** SWIM Network Point of Presence

The following enablers are considered as optional in DS15:

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- **NIMS-43:** Enhanced NM systems to process the Flight Object (FO) data related to the NM cluster including STAM, TTA and EFPL information
- **METEO-06b:** Generate and provide MET information relevant for Network related operations, Step 1. Optional in DS15.
- **SWIM-SUPT-01a:** SWIM Supporting Registry Provisions
- **SWIM-SUPT-03a:** SWIM Supporting Security Provisions
- **SWIM-SUPT-05a:** SWIM Supporting IP Network Bridging Provisions

Applicable Integrated Roadmap Dataset is DS15.

Background and validation process

Validation was structured around five goals: demonstrating the optimisation of traffic throughput using STAM, the use of automated support tools for hotspot identification and for the promulgation and the implementation of STAM, the interconnection of local and regional tools, the use of advanced ATFCM measures based on STAM deployment, and the improved predictability of operations. These goals demonstrate both the feasibility of the application of STAM measures and the potential increases in capacity (both in en-route and the TMA) through the application of solution 17.

To achieve the stated goals, a set of live-trials and shadow mode validations were performed. These validation exercises clearly demonstrated the feasibility of the proposed tools and methods. The results were complemented with the performance of real-time simulations and gaming exercises that allowed to refine the operational procedures and produce estimations of the expected benefits.

Results and performance achievements

STAM concept did show that less flights are impacted overall by STAM measures than the current DCB resolution techniques, although a minor fuel increase was recorded (in the case of flight level cap measures). This minor fuel increase was partially compensated tactically by ATC actions and in general must be seen as a trade-off to large amount of delay saved (cost of extra fuel vs cost of delay).

Although the quantitative safety assessment method chosen did not provide good enough evidence to make a judgement on the safety of STAM concept, the outcome of the qualitative safety assessment (questionnaires) clearly confirms positive safety impact through resolution of the traffic imbalance and reduced load.

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The capacity improvement and subsequent cost-efficiency benefit has not been quantified during the Step 1 STAM trials, although subjective assessments did confirm a notion of higher exploitation of the sector capacity in the case of increased predictability.

The validations demonstrated a reduction of the number of necessary regulations, as well as the number of flights impacted and average delay. As a consequence the departure punctuality was shown to be improved and the flights regulated through STAM measures shall see predictability improved.

Recommendations and Additional activities

The following activities are relevant once transitioned to industrialization (V4):

- Prepare appropriate training in the industrialisation and implementation phase to help to reduce the workload impact by familiarisation with the concept and the tool support.
- Automation of the hotspot detection and assistance in the hotspot resolution monitoring shall be further elaborated.
- Improve the flight selection and measure selection assistance by development and usage of predefined and fully integrated STAM scenarios and development of What If capabilities to facilitate assessment and sharing of STAM impact (for both ground and airborne measures).
- Develop What If capabilities to facilitate assessment and sharing of STAM impact (for both ground and airborne measures).
- Simplify the overall STAM coordination process possibly:
 - by pre-approving certain STAM measures via STAM scenario management,
 - by limiting the involvement of AU users to ground measures only and further simplify the AU STAM HMI,
 - by the development of the procedures for the very short term STAM (V-STAM) with simplified coordination workflow.
- Resolve minor technical issues in the STAM implementation process related to addressing mechanism (Approver / Implementer roles to be clearly pre-defined in scenarios).
- Refine and test the role and responsibility of NMOC in the STAM process
- Depending on the outcome of the NMOC actor role and responsibility refinement action, a Network Performance Monitoring support tool shall be developed to support the wide spread use of STAM (also useful for the Network Manager Function at the regional, sub-regional and local level).

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- Further improve the local FMP tools to address the usability and integration issues.
- Discrepancy between data owned by the local systems and NM systems raised some problems during the STAM process: it needs to be investigated, together with the accuracy, predictability and synchronisation needs. Whilst it is clear that concepts such as the Flight Object Interoperability (FO & IOP) will address this issue in the long-term, a solution acceptable to all parties needs to be found that will mitigate these concerns in the short and medium terms
- AU consultation shall be made to discuss the trade-off between the costs of extra fuel burnt vs cost of delay saved.

Actors impacted by the SESAR Solution

Airspace Users (Pilots), En-Route and TMA Controllers, Flow Managers, Network Managers.

Impact on Aircraft System

No impact on the aircraft systems is foreseen.

Impact on Ground Systems

Interoperability between the Network Manager and the Local Tools.

Regulatory Framework Considerations

This solution is directly linked to one (identified as S-AF4-1 “Enhanced STAM” under AF-4 “Network Collaborative Management”) of the six ATM Functionalities identified in the Implementing Regulation (EU) No 716/2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan.

It is assumed that the specification related to interface between the Network Manager and operational stakeholders’ systems will be made available by the Network Manager and would become reference document for the PCP implementation.

Standardization Framework Considerations

No specific Standardisation impact has been identified. Please refer to the previous section. However, the solution is also linked to SWIM standardisation activities such as AIRM/ISRM.

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Considerations of Regulatory Oversight and Certification Activities

No regulatory oversight or certification activities are foreseen.

Solution Data pack

OSD

- 13.02.03-D303 - Enhanced DCB OSD for Step1, Edition 00.05.01, 30/08/2016
- P04.07.01-D68 - STEP1 V3 Final Complexity Management OSD, Edition 00.02.01, 10/10/2016
- 07.06.01-D46 - Collaborative NOP OSD Step 1, Edition 00.04.02, 21/10/2016

SPR

- 13.02.03-D323 - SPR S1 Final, Edition 00.04.10, 23/09/2016

TS

- 13.02.03-D353 - Final Technical Specification for Step 1 Federated DCB and TT management, Edition 00.02.01, 15/09/2016.
- P10.08.01 (2016). D18 - Step 1 final Technical Specification, Edition 00.02.00, 29/04/2016.

SWIM

- TS: 14.01.04-D44-004 00.01.00 (04/07/2016). This document specifies the SWIM Yellow Profile including the requirements applicable to interface with the SWIM-TI.
- There are SDDs (and corresponding SWIM Compliance Report) for six non-ISRM Services that are relevant for solution #17: TrafficVolumeInformation, STAMMeasures, NMFlightData, NMCapacityData, MCDM and HotspotManagement. This information is EUROCONTROL foreground and is not available as part of this datapack.

In addition to the above mentioned documents, the SWIM reference documents are included in the data packs of the SESAR Solutions SWIM Yellow Profile and SWIM Framework.

Intellectual Property Rights (foreground)

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