



## **Annex I**

# **Tender Specifications annexed to Invitation to Tender**

**Ref. SDA.DLS.180504**  
**VDL Mode 2 Capacity and**  
**Performance Analysis**

**Open Call for Tender**

**Ref : SDA.DLS180504**

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# 1. Introduction

*As explained in the following paragraphs, the present document has the aim of identifying a contractor that will perform a capacity assessment for a thorough evaluation of the DLS performances. This study is, therefore, expected to be an update of the VDL Mode 2 Capacity and Performance Analysis performed by SJU.*

*In this sense, the present document has been structured in such a way to follow the above-mentioned study performed by the SJU in order to avoid risks of misunderstanding and to facilitate the third parties in the elaboration of a technical and economic proposal and its consequent execution, considering also the tight timeframe.*

## 1.1 SESAR and SESAR Deployment Manager

The modernisation of Europe's Air Traffic Management (ATM) networks is crucial for the sustainability of European aviation and the forecasted increase in air traffic by 2039. The Single European Sky (SES) ATM research project, "SESAR", is one of the most ambitious modernisation projects launched by the European Union contributing to the implementation of SES. SESAR's goal is to define, develop, and deploy the technological solutions needed to increase the performance of Europe's ATM system.

The SESAR Deployment Manager (SDM), established end 2014, came as the necessary step needed to coordinate SESAR deployment. Under the oversight of the Policy Level led by the European Commission, the SDM is responsible for the Management Level of the SESAR deployment governance and for the coordination of the implementation of the most essential SESAR operational improvements through the concept of Common Projects. The first Common Project is known as the Pilot Common Project (PCP) and is defined by the Regulation (EU) N°716/2014. The SDM synchronises and coordinates implementation against the SESAR Deployment Programme which is the project view of the PCP organizing their implementation into optimum sequences of activities by all the stakeholders required to implement.

Further information on the activities of the SDM is available at: <https://www.sesardeploymentmanager.eu/>

## 1.2 Context

In January 2009, the European Commission (EC) published the SES Data Link Services Implementing Rule (IR (EU) No 29/2009 – [REF3]) laying down the requirements on data-link services for the Single European Sky. Specifically, the regulation covered the implementation of four Datalink services (the ATN B1 services, including the Controller–pilot data link communications (CPDLC)) with adequate performance levels. Accordingly, the DLS implementation in Europe (especially in the Central part of Europe) started using a single frequency but, during the operational use of ATN B1 (Aeronautical Telecommunication Network Baseline 1) services, performances issues (provider' and users' aborts) were experienced leading to loss of trust in the service and significant delays in the DLS implementation. Considering this situation and especially the potential safety impacts, the EC **requested EASA to launch a technical investigation on the frequency of disconnections of ATN B1 and to determine the root causes.** EASA elaborated, therefore, a specific report **"Technical Issues in the implementation of Regulation EC 29/2009"** which identified different types of technical problems (provider aborts, user aborts, transmission delays) and some potential causes. **Considering that the stakeholders missed the IR (EU) No 29/2009 due to technical and organizational**

issues, the EC proposed to have five more years to properly deal with the current technical and organizational situation and amended the aforementioned regulation with the IR (EU) No 310/2015, which established the following new deadlines:

- February 2018, for the ground domain;
- February 2020, for the airborne domain.

Following the EC request, on October 2015, the SJU published the results of the “VDL Mode 2 Capacity and Performance Analysis” [REF 1] (hereinafter Capacity Analysis), highlighting that a single frequency deployment scenario was not able to ensure the performance required by the DL service provision; consequently, a MF environment should have been implemented as soon as possible to effectively face the foreseen air traffic growth.

Following the EASA report, the EC requested the SJU to analyse and prepare the inclusion of the EASA recommended actions in the SESAR Work Programme. For this purpose, SESAR JU launched an open call for tender aimed at concluding a direct service contract with one successful tenderer to provide a VDLM2 measurement, analysis, testing and simulation campaign. **A Consortium led by NATS and including a large number of stakeholders awarded the work and named the project ELSA** (Enhanced Large Scale ATN deployment). On the 30th June 2016 SJU released the final report of the ELSA study, presenting a wide range of recommendations, considered as necessary prerequisites for a timely and synchronized DLS implementation throughout Europe. Among them, according to EASA’s previous evaluations, the implementation of Multifrequency (MF) was strongly recommended. Following EC request to prepare a “DLS implementation strategy to encompass all implementation activities still required to get DLS and then AF6 implemented”, the SESAR Deployment Manager developed and successfully consulted with the stakeholders the strategy which was delivered to EC as an addendum to the Strategic View of the SESAR Deployment Programme 2016 on 28 September 2016.

Immediately after, EC requested the SESAR Deployment Manager, acting as the DLS implementation project manager, to derive from the afore mentioned strategy a “DLS Recovery Plan” to urgently implement the necessary technological upgrades to ensure a stable and reliable ATN/VDL Mode 2 service.

The DLS Recovery plan aims at focusing on the concrete and relevant activities required to be undertaken in the ground and airborne domains to achieve, in the right sequence, a synchronized DLS deployment in Europe. Taking into consideration the high-level principles concerning the DLS implementation outlined in the Addendum to the Strategic View of the DP 2016, as well as the outcomes of the ELSA study. The plan has been structured as follows:

- **Path I – Implementation of the DLS transitional solution:** identifying the deployment activities needed to meet EU (IR) No 2015/310 and ELSA’s recommendations, focusing in particular on the envisaged transitional solutions (Model B or Model C with Multi-frequency for the ground segment; and “best in class” avionics for the airborne segment).
- **Path II – Preparatory activities towards the target solution:** identifying the steps towards the target solution (Model D), through the implementation of ELSA’s recommendations in order to grant the required performance needed to achieve full AF6 implementation.

In this context, the SDM facilitated a direct involvement of all the relevant stakeholders to ensure a coordinated submission of required DLS implementation projects to the CEF Transport Calls for proposals for the two paths, according to the DLS recovery plan. Regarding the Path II framework, a Multi-stakeholders IP<sup>1</sup> (*hereinafter Path II project*) has been suitably designed and submitted for the 2016 CEF Transport Calls, with the specific objective of supporting SDM in the following activities with the aim of achieving the DLS target solution implementation within the deadlines set by EU regulations and PCP:

- **Requirements Collection & Service Area Definition:** starting from the analysis of the state of play on the current infrastructure/service models adopted within each State and possible RF network improvements, identification and collection of all the needed requirements for the Service Areas definition – groups of neighbouring Countries/regions which are in a similar operational environment and with similar state of play – and for the new European target mode;
- **European technical architecture definition:** definition the new European target model based on the identified Service Areas, the network architecture as well as the services needed to be provided by the European Target solution;
- **Elaboration of a Business case for the target solution:** elaboration of a dedicated Business case to evaluate the feasibility of the new European target solution;
- **Transitional Activities towards target solution:** identification of the future steps and activities that are expected to be put in place to ensure the transition from the Model deployment at Country/Region level towards the target solution;
- **Ensuring consistency of activities related to DLS Governance definition:** monitoring of the effective European DLS Governance definition by the involved stakeholders of the Path II project.

During the Path II project execution, some technical and non-technical open points have been highlighted and needed to be further investigated for the achievement of a complete definition of the overall technical architecture and of the benefits stemming from the Model D implementation throughout Europe. Regarding this, the SDM has promoted strong exploitation of the opportunities offered by the 2017 CEF Transport Calls, with the aim of creating a dedicated framework for performing the required analysis and evaluations.

### 1.3 Previous Analysis

Following the EC request, the SJU has elaborated a technical study “VDL Mode 2 Capacity and Performance Analysis”. The study identified the **limits of the operational performance of VDL M2** in terms of the VHF channel physical limitations and its operational usage for ATS purposes. Considering the available frequencies for the VDL M2 as in the ICAO plan, the study analysed two geographical areas:

- High Traffic Area: Lille
- Medium Traffic Area: Rome.

The study took into account two different traffic growth scenarios: *Median and Optimistic Traffic Growth scenarios*.

<sup>1</sup> 2016\_159\_AF6 - DLS Implementation Project - Path 2” participated by: 21 ANSPs (ENAV, Austrocontrol, BULATSA, Croatia Control, DCA, DFS, DSNA, EANS, ENAIRE, Finavia, Hungaro Control, LFV, LGS, LPS SR, MATS, MUAC, NATS, NAV Portugal, Oro Navigacija, PANSA, ESSP), 2 Service Providers (Arinc, SITA), 3 Airspace Users (Lufthansa, Ryanair, TAP Portugal).

The study concluded that:

- **VDLM2 over one single frequency would already reach its capacity limits before 2020 in the medium traffic area with the median traffic growth scenario;**
- **A 4 frequencies implementation should be considered as a minimum requirement to support VDLM2 deployment until 2025 in high traffic area;**
- **Further optimisation options may be able to extend the viability of VDLM2 over 4 frequencies beyond 2025 in high traffic area;**
- **It was highly recommended to anticipate the evolution of the European datalink infrastructure in the ATM masterplan and to prioritize the development of the next generation datalink technology within SESAR.**

It is worth highlighting that the SJU Capacity analysis has been released before the ELSA study that has presented a wide range of recommendations, considered as necessary prerequisites for a timely and synchronized DLS implementation throughout Europe.

## **1.4 Purpose**

In the light of what has been outlined in the previous paragraphs, some technical and non-technical open points need to be further investigated for the achievement of a complete definition of the overall technical architecture and of the benefits stemming from the Model D implementation throughout Europe. In order to support the open points definition, a DLS capacity assessment results fundamental as a key point for a thorough evaluation of the DLS Performances, enabling the provision of enough and consistent inputs for a complete Model D implementation.

The SDM is therefore launching an open call for tender aimed at concluding a direct service contract with one successful tenderer to provide an update of the VDL Mode 2 Capacity and Performance Analysis performed by SJU, as described better in the following paragraphs. Interested parties are invited to submit a tender, as defined in the Invitation to Tender ref. SDA.DLS.180504 addressing the requirements defined in paragraph 2.

## 2. Terms of Reference

### 2.1 Scope and objectives

The general scope of the study should address the capability of multi-frequency VDL M2 to support Datalink services across a number of simulation scenarios. Specifically, the analysis should determine the capability (capacity and performance) of VDL M2 to support the implementation of evolving datalink services within different increasing traffic cases. It should demonstrate the point at which VDL M2 will no longer be able to support the anticipated services within the SESAR Concept. The results should enable the determination of the time horizon by when the introduction of DLS will require greater datalink capacity & performance than VDL M2 can provide.

Datalink services to be considered include:

- ATN Baseline 1 (according to [REF 3]);
- Airline Operational Communication (AOC) (this service should include all data needed to AUs including, for example, the OEM data)
- ATN Baseline 2 (according to IR (EU) No 716/2014 - AF6 needs).

The analysis should address as a minimum, the time period 2018 through to (around) 2039, with 3 year intervals. Performing the study, the selected contractor shall ascertain the effect of system loads/key parameters on typical aircraft operating in dense continental airspace. Precise simulation of all protocol state machines etc. is not necessarily required, and use of probabilistic methods (e.g. Monte Carlo) may be appropriate, subject to provision of a reasonable justification that results are expected to be representative of the real-world behavior. The study is limited to the analysis of existing Datalink services (according to IR (EU) No 29/2009), ATN B2 (according to IR (EU) No 716/2014 - AF6 needs) and importantly AOC operations in Europe over VDL M2. Since there are unknown parameters such as the number of aircraft that will be equipped at a given time various “mixed equipage” scenarios will be required.

Taking account of services, link budgets, data volumes and timing, the predicted utilisation analysis to be performed must clearly show how the evolution and take-up of services will drive utilisation and affect performance. As indicated, the analysis must indicate clearly when VDL M2 reaches its limitations, the consequence of reaching them and the assumptions being made.

This capacity assessment will support the DLS implementation and it shall build upon the previous work performed by SJU in its VDL Mode 2 Capacity and Performance Analysis. It has to be intended, therefore, as an upgrade of SJU capacity analysis.

### 2.2 System and Analysis Metrics

#### 2.2.1 Simulation tools

The Hardware Platform & Operating System availability and the Analysis Tools to be used shall be clearly defined in the technical offer, including any existing or planned validation of the tools. It is important that

the tenderer provides evidence of the fact that the VDLM2 protocols and performance as defined in [REF 8] and [REF 9] shall be appropriately modelled.

Proposed analysis tooling shall be able to determine conformance to international standards [REF 4] [REF 5a] [REF 5b] for Safety and Performance requirements for a typical aircraft in dense continental airspace given the scenario under consideration.

### 2.2.2 Analysis Capability and Metrics

The Analysis tool supporting the VDLM2 Analysis shall include at least the capability to model and/or simulate:

- Predicted and/or user defined AOC data load, including evolution according to a time-based function (scenarios representing different years);
- Predicted and/or user defined CPDLC data load from IR (EU) No. 29/2009 CPDLC implementation including evolution according to a time-based function;
- Predicted and/or user defined data load for FANS1/A services over AoA where implemented by ANSPs in Europe including evolution according to a time-based function;
- Predicted and/or user defined data load for ATN B2 services (considering the IR (EU) No 716/2014 - AF6 needs) implementation including evolution according to a time-based function;
- Predicted and/or user defined additional ATN B2 services, mentioned in the EASA mandate (D-TAXI, DCL and D-ATIS), implementation including evolution according to a time-based function;
- Airspace volume under consideration;
- The density of aircraft occupying the airspace volume under consideration, in specified bands of flight levels;
- The number of VDL M2 channels deployed to support Datalink;
- Number of VHF Ground Stations (VGS) visible to a typical aircraft in each flight level band;
- User defined % proportion of aircraft that are using other available data link technologies (e.g. AeroMacs in the airport environment or Satellite Communication capabilities);
- The Aeronautical Telecommunications Network protocol suite behavior and overhead.

Key metrics characterising the behavior of the end-to-end link to be considered include:

- Median, 95 percentile and 99 percentile Transaction delay (TRN) [REF 4] [REF 5a] for each application/service.
- Median, 95 percentile and 99 percentile Technical Communication delay (RCTP) [REF 4] [REF 5a] for each application/service.
- Continuity for each application/service.
- Overall TP4 retry rate, expressed as a proportion of total TP4 PDUs transferred successfully.

For ATN Baseline 2 application/services the reference document is [REF 5b].



## 2.3 Description of the tasks to be performed

### 2.3.1 Work breakdown structure

The work to be performed under the future contract is described within three work areas (WA1-3) in the following paragraphs:

➤ **WA1.1: Definition of Scenarios**

The work area defines the Scenarios to be executed and reports to be produced for each. The study is envisaged as a multivariate analysis of the following sets of elements: architecture proposal, channel scheme and channel service sharing. So, each **minimum baseline scenario shall include the following combination of the elements to be simulated at minimum in two different areas (high traffic area and medium traffic area):**

- **E1:** ATS together with AOC deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 1 (single RF network implementing the Dual Language function or equivalent mechanism) implementing the *VDLM2 Channel scheme 1* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.
- **E2:** ATS together with AOC deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 1 (single RF network implementing the Dual Language function or equivalent mechanism) implementing *VDLM2 Channel scheme 2* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.
- **E3:** Only ATS deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 1 (single RF network implementing the Dual Language function or equivalent mechanism) implementing *VDLM2 Channel scheme 1* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.
- **E4:** Only ATS deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 1 (single RF network implementing the Dual Language function or equivalent mechanism) implementing *VDLM2 Channel scheme 2* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.
- **E5:** ATS together with AOC deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 2 (multiple RF networks as currently implemented in Europe) implementing the *VDLM2 Channel scheme 3* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.
- **E6:** ATS together with AOC deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 2 (multiple RF networks as currently implemented in Europe) implementing *VDLM2 Channel scheme 4* and in each case, generate results assuming median

and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.

- **E7:** Only ATS deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 2 (multiple RF networks as currently implemented in Europe) implementing *VDLM2 Channel scheme 3* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.
- **E8:** Only ATS deployment for dates 2018, 2021, 2024, 2027, 2030, 2033, 2036, 2039 regarding the RF layer of Architecture proposal 2 (multiple RF networks as currently implemented in Europe) implementing *VDLM2 Channel scheme 4* and in each case, generate results assuming median and optimistic traffic growth using EUROCONTROL STATFOR forecasts and other relevant sources, if available.

**Note:** the ATS deployment, according to IR (EU) No 29/2009 requirements, is assumed to be completed in 2020 with 75% of flight equipped but the number of aircraft equipped will continue to evolve as new aircraft are introduced and older aircraft retire.

**Note:** the ATN B2 deployment, according to IR (EU) No 716/2014 requirements, is assumed to be completed by the 1<sup>st</sup> January 2026 with the 20% of the aircraft corresponding to at least to 45% of flights equipped, during this time there will be mixed aircraft equipage (ATN B1, FANS1/A, ATN B2) and the number of aircraft equipped will continue to evolve as new aircraft are introduced and older aircraft retire.

As stated before, the study shall consider the current five available VDL Mode 2 frequencies and in particular specific VDLM2 Channel Schemes, outlined in the following table:

ID scheme	VDL Mode 2 Channel scheme description
1	<ul style="list-style-type: none"> <li>• 1 Common Signalling Channel;</li> <li>• 2 VDLM2 Channels to be shared by ARINC and SITA DSP ID providing DLS for AIR; it is intended to apply load balancing (decision at 1st channel assignment HO) over these 2 VDLM2 channels.</li> <li>• 2 VDLM2 Channels to be shared by ARINC and SITA DSP ID providing DLS for GND; it is intended to apply load balancing (decision at 1st channel assignment HO) over these 2 VDLM2 channels.</li> </ul>
2	<ul style="list-style-type: none"> <li>• 1 Common Signalling Channel;</li> <li>• 4 VDLM2 Channels to be fully shared by ARINC and SITA DSP ID providing DLS for AIR and GND; it is intended to apply load balancing (decision at 1st channel assignment HO) over these 4 VDLM2 channels</li> </ul>
3	<ul style="list-style-type: none"> <li>• 1 Common Signalling Channel;</li> <li>• 1 VDLM2 Channel used by ARINC DSP ID providing DLS for AIR;</li> <li>• 1 VDLM2 Channel used by ARINC DSP ID providing DLS for GND;</li> <li>• 1 VDLM2 Channel used by SITA DSP ID providing DLS for AIR;</li> <li>• 1 VDLM2 Channel used by SITA DSP ID providing DLS for GND.</li> </ul>
4	<ul style="list-style-type: none"> <li>• 1 Common Signalling Channel;</li> <li>• 2 VDLM2 Channels used by ARINC DSP ID providing DLS for AIR and GND; it is intended to apply load balancing (decision at 1st channel assignment HO) over these 2 VDLM2 channels;</li> </ul>

- 2 VDLM2 Channels used by SITA DSP ID providing DLS for AIR and GND; it is intended to apply load balancing (decision at 1st channel assignment HO) over these 2 VDLM2 channels.

**Notes**

**Note 1:** In the SJU capacity analysis TMA/ENR was used for AIR while APT was used for GND;  
**Note 2:** GND - ground use means that a channel is used by aircraft stations with its “wheels on the ground”; AIR - airborne use means that a channel is used by aircraft stations when airborne);  
**Note 3:** The use of the Common Signalling Channel shall be defined in accordance to the related VDLM2 standards (aircraft that can operate only on the CSC should be also considered); **Note 4:** More details about the VDLM2 channel frequencies allocation and use can be found in the Ref [11].

**The contractor shall build each baseline scenario on portions of European Airspace and at minimum two different areas shall be considered in simulation: high traffic area and medium traffic area** (it is suggested to adopt the same assumptions on the areas selected as in the SJU Capacity analysis).

The RF layer of Architecture proposal 1 and 2 are defined in *D12.2 - Report on Service Areas and overall DLS architecture* delivered to the European Commission by the 29<sup>th</sup> of September 2017 and available at: [http://www.sesardeploymentmanager.eu/wp-content/uploads/2016/10/Report-on-Service-Areas-and-DLS-overall-Architecture\\_Final.pdf](http://www.sesardeploymentmanager.eu/wp-content/uploads/2016/10/Report-on-Service-Areas-and-DLS-overall-Architecture_Final.pdf).

For each baseline scenario, the contractor shall deliver a detailed scenario description. Each scenario description report shall clearly identify the proposed scenarios for evaluation including the assumed ATS and AOC Datalink services and loads to be analysed and the associated performance criteria. Predicted data loads shall be derived from EUROCONTROL STATFOR forecasts and/or user defined values. Actual and predicted aircraft equipage levels shall be based on recognised data sources and/or user defined values.

Furthermore, additional evaluation of the proposed scenarios shall be considered assuming data moving (ATS and/or AOC) on complementary technologies (it is expected to have the availability of complementary technologies starting from 2025 (e.g. SATCOM and Aeromacs) and considering additional ATS (ATN Baseline 2 not specifically included in the IR (EU) No 716/2014).

Moreover, the contractor should analyse how many additional VHF frequencies are needed to handle the foreseeable traffic, taking into account, in particular, the growth of the AOC traffic.

Further scenarios, including some variations of the already defined ones, could be proposed by the contractor (i.e. other different VDLM2 Channel schemes and different frequency management principles; additional VDLM2 frequencies; introduction of the prioritisation of ATS over AOC).

The **Scenario report (D1.1)** shall also include a matrix summarising the datalink Services (and Combinations thereof) against Scenarios (and associated timescales).

**D1.1 (Scenario Report)** shall consist of the scenario reports to be provided to the SDM for approval before the execution of the simulation runs are carried out (see WA 2).

➤ **WA1.2: Definition of Analysis Report Template**

In parallel to the WA1.1 tasks, the selected contractor shall provide the Analysis Report Template (D1.2) at the same time as the scenario definitions. The template will include the outline and contents for scenario execution reports consisting of a summary of the key outputs identified in the above paragraphs.

An assessment of the number of frequencies needed to achieve the required performance levels for the various services and the capacity margins by which the required performance levels are met for a given scenario are a key output. Graphical presentation of results, including histograms illustrating statistical distribution of TRN and RCTP delays shall be proposed.

**D1.2 (Analysis Report Template)** shall consist of the Analysis Report Template to be provided to the SDM for approval before the execution of the simulation runs are carried out (see WA 2).

➤ **WA2: Scenario Analysis Runs and Reports**

This work area consists of the analysis of the scenarios runs and the production of the Scenario Analysis Reports. The factors for analysis and key metrics presented in paragraph 2.2 shall be addressed in this WA.

A first deliverable, **Simulation Run 1 Report (D2.1)**, will include the results of simulations run on the *baseline scenarios* built on the E1, E3, E5 and E7 elements simulated in a high traffic area and medium traffic area, according to WA1.1 and WA1.2.

A second deliverable, **Simulation Run 2 Report (D2.2)**, will include the results of simulations run on the *baseline scenarios* built on all identified elements (from E1 to E8) simulated in a high traffic area and medium traffic area, according to WA1.1 and WA1.2.

➤ **WA3: Final Report**

This work area shall result in the production of a final synthesis report bringing together the analysis of the various scenarios that have been undertaken in WA 2, and in particular shall contain:

- a focused analysis of the full set of scenarios results;
- recommendations for the way forward, including predicted timeline for the VDL/2 'breaking point' and the need for a complementary technology implementation;
- reference to the key metrics presented in paragraph 2.2 shall be made.

The **D3.0 (Final Report)** shall, therefore, consist of the Final Report including these mentioned points.

## **2.3.2 Deliverables & Milestones**

The tenderer shall address the following schedule of review milestones and summary of deliverables when preparing a tender since this will be the estimated planning for the performance of the contract. Adjustments to it might be agreed on the kick off meeting:

ID	Milestone Description	Due date
M1	Project Plan Review	$T_0^* + 1$ month
M2	Review of the Scenario Report (D1.1) and Analysis report template (D1.2)	$T_0 + 3$ months
M3	Delivery of Simulation Run 1 report (D2.1)	$T_0 + 6$ months
M4	Delivery of Simulation Run 2 report (D2.2)	$T_0 + 8$ months
M5	Final Report Delivery	$T_0 + 9$ months

A Final Deliverable Review milestone is set one month after the reception of each relevant deliverable by the tender.

The following deliverables will be provided:

ID	Deliverables Description	Due date
D1.0	Project plan	$T_0 + 1$ month
D1.1	Scenario report	$T_0 + 3$ months
D1.2	Analysis report template	$T_0 + 3$ months
D2.1	Simulation Run 1 report (including the baseline scenarios built on E1, E3, E5, E7 elements simulated in a high traffic area and medium traffic area)	$T_0 + 6$ months
D2.2	Simulation Run 2 report (including all the baseline scenarios)	$T_0 + 8$ months
D3.0	Final report	$T_0 + 9$ months

\*  $T_0$  - Date of the Kick off meeting (expected on the 2<sup>nd</sup> of July 2018)

The Deliverables shall be provided to the SDM in MS Word format or compatible software. All deliverables should be structure with, at least, a clear Executive Summary, the analysis, conclusions and recommendations.

## 2.4 Acceptance of the deliverables

Notwithstanding the provisions of paragraph 2.5 below, the SDM reserves the right for deliverables to be reviewed by the SDM and external experts during the milestone deliverable progress and deliverable reviews presented in the paragraph 2.3.2 above.

Acceptance of the deliverables by the SDM will be performed after the respective Final Deliverable Review milestone set one month after the reception of the relevant deliverables. In cases of need to update or rejection of the deliverables, a report justifying the reasons will be provided to the selected contractor. The contractor will have seven calendar days in which to submit additional information or corrections.

## 2.5 Intellectual Property Rights

The tenderer selected for award of the contract will be subject to the IPR provisions of the contract the draft of which is annexed to Invitation to tender ref SDA.DLS.180504. In addition, it should be noted that, if the activity results (please, refer to the draft contract for the definition of the “results”) are not to be fully created for the purpose of the contract it should be clearly pointed out in the tender. There should be information provided about the scope of pre-existing materials, their source and when and how rights to them have been acquired.

In the tender, all quotations or information originating from other sources and to which third parties may claim rights have to be clearly marked (source publication including date and place, creator, number, full title etc.) in a way allowing easy identification.

## **2.6 Place of Performance**

The activities will be performed at the contractor's premises. Where necessary, progress and deliverable review meetings between the contractor and the SDM shall be held at SDM's premises in Brussels unless agreed otherwise. Travel and/or accommodation costs will be borne by the Contractor and will not be reimbursed.

## **2.7 Variants**

Variants on the terms of reference of this call for tenders are not permitted.

## **2.8 Joint tenders and subcontracting**

Joint tenders and subcontracting are not permitted.

## **2.9 Value**

The maximum overall value allowed for the service contract is 200 000 EUR.

## 3. Assessment of the tenders and award of the contract

### 3.1 Introduction

The assessment will be strictly based on the content of the received tenders and in the light of the criteria set out hereunder. The assessment procedure will be carried out in three consecutive stages, each of them with a precise aim:

- Stage 1 – assessment in the light of exclusion criteria (see paragraph 6.2 below),
- Stage 2 – assessment in the light of selection criteria (see paragraph 6.3 below) and
- Stage 3 – assessment in the light of award criteria (see paragraph 6.4 below).

The aim of each of these stages is:

- To check on the basis of the exclusion criteria, whether the tenderer can take part in the procurement procedure;
- To check on the basis of the selection criteria whether the tender has the necessary legal, economic and financial, technical and professional capacity for the performance of the contract;
- To assess on the basis of the award criteria each offer which has passed the exclusion and selection stages.

### 3.2 Assessment in the light of exclusion criteria

In order not to be excluded from participation in the present procedure, the contractor shall provide evidence of not being in any of the following situations:

- a.) is not bankrupt or being wound up, is not having its affairs administered by the courts, has not entered into an arrangement with creditors, has not suspended business activities, is not the subject of proceedings concerning those matters, and is not in any analogous situation arising from a similar procedure provided for in national legislation or regulations;
- b.) has not been convicted of an offence concerning professional conduct by a judgment which has the force of res judicata;
- c.) has not been guilty of grave professional misconduct proven by any means which the contracting authorities can justify;
- d.) has fulfilled all its obligations relating to the payment of social security contributions and the payment of taxes in accordance with the legal provisions of the country in which it is established, with those of the country of the contracting authority and those of the country where the contract is to be carried out;
- e.) has not been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the EC/Union's financial interests;
- f.) is not a subject of the administrative penalty for being guilty of misrepresentation in supplying the information required by the contracting authority as a condition of participation in the procurement procedure or failing to supply an information, or being declared to be in serious breach of his obligation under contract covered by the EU budget.

**Evidence to be provided**

1. Accordingly, the tenderer must provide a Declaration on honour (see Annexe I), duly signed and dated, stating that they are not in one of the situations referred to above

**Nota Bene:**

The tenderer to which the contract is to be awarded shall provide, within 15 calendar days following notification of award and preceding the signature of the contract, the following documentary proofs (originals) to confirm the declaration referred to above:

1. For situations described in (a), (b) and (e), production of a recent extract from the judicial record is required or, failing that, a recent equivalent document issued by a judicial or administrative authority in the country of origin or provenance showing that those requirements are satisfied. Where the tenderer is a legal person and the national legislation of the country in which the tenderer is established does not allow the provision of such documents for legal persons, the documents should be provided for natural persons, such as the company directors or any person with powers of representation, decision making or control in relation to the tenderer.
2. For the situation described in point (d) above, recent certificates or letters issued by the competent authorities of the State concerned are required. These documents must provide evidence covering all taxes and social security contributions for which the Tenderer is liable, including for example, VAT, income tax (natural persons only), company tax (legal persons only) and social security contributions.
3. For any of the situations (a), (b), (d) or (e), where any document described in two paragraphs above is not issued in the country concerned, it may be replaced by a sworn or, failing that, a solemn statement made by the interested party before a judicial or administrative authority, a notary or a qualified professional body in his country of origin or provenance.

### **3.3 Assessment in the light of selection criteria**

The tenderer must have the overall capabilities (legal, economic, financial, technical and professional) to perform the contract. All the requirements listed below must be met in order to enter the next phase of the assessment in the light of award criteria:

Please note that in the selection phase, assessment focuses on the past experience and capacity of the tenderer, and not on the quality of the (technical) offer. The latter is to be assessed in the light of the award criteria.

The Tenderer is requested to prove that they are authorised to perform the contract under the national law.



### 3.3.1 Legal capacity

Participation in this procurement procedure is open on equal terms to all natural and legal persons established in an EU Members State or third country.

**Evidence to be provided:**

1. The tenderer shall provide a duly filled in and signed Legal entities' form of the Invitation to tender
2. Evidence of inclusion in a trade or professional register, or a sworn declaration or certificate, membership of a specific organisation, express authorisation or entry in the VAT register.

### 3.3.2 Economic and financial capacity

**Evidence to be provided:**

The tenderer shall present the following documentation:

1. Evidence of professional risk indemnity insurance; and
2. Balance sheets (or extracts from balance sheets) for at least the last two years for which accounts have been closed; or
3. Statement of overall turnover during the last three financial years; and

If, for some exceptional reason which the SDM considers justified, the tenderer is unable to provide the references requested here above, the tenderer may prove the economic and financial capacity by any other means which the SDM considers appropriate.

Nota bene: Public bodies and higher education establishments are not subject to a verification of their economic and financial capacity.

### 3.3.3 Technical and professional capacity

The Tenderer is required to prove sufficient technical and professional capacity to perform the contract. To that end, those not complying with the following will not go to the subsequent assessment stage:

**Minimum requirements:**

- The project manager who will be the interlocutor with the SDA AISBL must have at least 5 years of relevant experience;
- Team members should have relevant work experience in ATM Performance-related analysis on similar subjects with a decisive impact on the decision-making process;
- Capacity of the tenderer to undertake ATM Performance-related analysis on the subject with a decisive impact on the decision-making process;
- Having at its disposal the Hardware Platform & Operating System, providing evidence of the fact that the VDLM2 protocols and performance as defined in [REF 8] and [REF 9] shall be appropriately modelled;

- Having at its disposal the Analysis Tool, providing evidence of the fact that the VDLM2 protocols and performance as defined in [REF 8] and [REF 9] shall be appropriately modelled. Moreover, proposed analysis tooling shall be able to determine conformance to international standards [REF 4] [REF 5a] [REF 5b] for Safety and Performance requirements for a typical aircraft in dense continental airspace given the scenario under consideration. The Analysis Tool supporting the VDLM2 Analysis **shall** include at least the capability to model and/or simulate the items included in the paragraph 2.2.2, taking into account the Key metrics characterising the behavior of the end-to-end link as described in the same paragraph.

#### **Evidence to be provided:**

- a brief presentation of the structure of the organisation, focusing in particular on the research capacity and the organizational structure set up to perform the activity
- a presentation of the main current and other relevant activities of the tenderer
- detailed CVs of the team member that will be responsible for carrying out the tasks
- Proof of ownership of Hardware Platform & Operating System;
- Proof of ownership of Analysis Tool;
- list of projects and activities performed in the relevant field(s) within the last 5 years.

### **3.4 Assessment in the light of award criteria**

Only the tenders meeting the requirements of the exclusion and selection criteria will be evaluated in terms of quality and price for the award of the contract. The contract will be awarded to the economically most advantageous tender on the basis of the following evaluations:

#### **3.4.1 Technical evaluation**

The quality of each technical offer will be evaluated in accordance with the award criteria and the associated weighting detailed in the table below.

Should a tenderer be also an Implementing Partner under an Implementation Project Specific Grant Agreement (IP SGA) or in a current proposal under evaluation, its tender should clearly demonstrate which mitigation measures the tenderer intends to put in place so as to avoid any conflict of interests and any duplication of costs between the entity acting as contractor on the one hand, and as Implementing Partner on the other hand.

No.:	Technical Award Criteria		Maximum Score	Minimum score for compliance
1	Project management: <ul style="list-style-type: none"> <li>• Overall quality, identification and proposed mitigation of risks.Planning of the proposal proposed team, and balance of skills</li> </ul>		15	8
2	Quality and relevance of methodology:	Modelling Tools and Analysis Capability (See paragraph 2.2)	25	13

	<ul style="list-style-type: none"> <li>Understanding of the sector and the requirements (paragraph 2)</li> <li>Adequacy and relevance of the proposed tools and techniques</li> <li>Quality and relevance of the proposed approach to satisfy the requirements (paragraph 2)</li> </ul>			
		Proposed approach to WA (See paragraph 2.3)	60	33
	<b>Total score for technical compliance</b>		<b>100</b>	

### 3.4.2 Financial evaluation

Only tenders whose award evaluation gives them a score of at least the minimum score in each of the main criteria above and a total of at least 70 points may be subject to a financial evaluation and be recommended for the award of the contract. For lower scores the offers will be considered non-suitable and excluded.

The price to be taken into account for the financial evaluation and for the award of the contract is the one proposed by the tenderer in the financial offer as indicated in the Invitation to tender.

### 3.4.3 Recommendation for award

The Contract will be awarded to the Tenderer offering the highest ratio quality/price by applying the following formula:

**Ratio Quality/Price** = (Total quality score of Offer Y/Highest quality score) x 60% + (Lowest price/Price of Offer Y) x 40%

## 4. Appendix: References and Acronyms

### 4.1 References

- [REF 1]. SJU - VDL Mode 2 Capacity and Performance Analysis – October 2015
- [REF 2]. AOC Datalink Dimensioning (source SESAR), Nov 16th, 2010, Edition 01
- [REF 3]. IR (EU) No. 29/2009 – The Datalink Services Implementing Rule
- [REF 4]. RTCA SC-214/EUROCAE WG-78 PU-10 – Data Communications Safety and Performance Requirements Version J
- [REF 5a]. EUROCAE Document ED-120 / RTCA DO-290 - Safety and Performance Requirements Standard for Air Traffic Data Link Services In Continental Airspace (SPR IC), May 2004, including Change 1 (April 2007) and Change 2 (October 2007)
- [REF 5b]. EUROCAE Document ED-228 - Safety and Performance Requirements Standard for Baseline 2 ATS Data Communication (Baseline 2 SPR standard), Rev A March 2016
- [REF 6]. EUROCONTROL-SPEC-0116 V 2.1 EUROCONTROL - January 2009
- [REF 7]. Global Operational Data Link (GOLD) Manual (Doc 10037). International Civil Aviation Organisation. 1<sup>st</sup> Edition - 2017
- [REF 8]. ICAO Manual on VHF Digital Link (VDL) Mode 2 (Doc 9776). International Civil Aviation Organisation. 1<sup>st</sup> Edition - 2001.
- [REF 9]. ICAO Manual on VHF Digital Link (VDL) Mode 2 (Doc 9776). International Civil Aviation Organisation. 2<sup>nd</sup> Edition - 2015
- [REF 10]. ARINC Specification 631-6 VHF Digital Link (VDL) Mode 2 Implementation Provisions. Aeronautical Radio Inc. - Nov 2010.
- [REF 11]. ICAO - EUR FREQUENCY MANAGEMENT MANUAL – EUR Doc 011 – December 2017

## 4.2 Acronyms

<b>ANSP</b>	Air Navigation Service Provider
<b>ARINC</b>	Aeronautical Radio, Incorporated
<b>AOC</b>	Airline Operational Control
<b>ATC</b>	Air Traffic Control
<b>ATM</b>	Air Traffic Management
<b>ATN</b>	Aeronautical Telecommunication Network
<b>ATN B1</b>	Aeronautical Telecommunication Network Baseline 1
<b>ATN B2</b>	Aeronautical Telecommunication Network Baseline 2
<b>CPDLC</b>	Controller/Pilot Data Link Communications
<b>CSC</b>	Common Signalling Channel
<b>CSP</b>	Communications Service Provider
<b>DP</b>	Deployment Programme
<b>Dual DSP ID System</b>	It means that any VGS broadcasts the IDs of multiple DSPs in its GSIF frames on the RF channel
<b>EASA</b>	European Aviation Safety Agency
<b>EC</b>	European Commission
<b>ELSA</b>	Enhanced Large Scale ATN deployment
<b>ESSP</b>	European Satellite Service Provider
<b>EUROCAE</b>	European Organisation for Civil Aviation Equipment
<b>EUROCONTROL</b>	European Organization for the Safety of Air Navigation
<b>FANS</b>	Future Air Navigation System.
<b>GND</b>	Ground
<b>GSIF</b>	Ground Station Information Frames
<b>ICAO</b>	International Civil Aviation Organisation
<b>IOC</b>	Initial Operational Capability
<b>IPR</b>	Intellectual Property Rights
<b>MF</b>	Multi-Frequency
<b>PA</b>	Provide Abort
<b>PCP</b>	Pilot Common Project
<b>RCTP</b>	Required Communications Technical Performance

<b>RF</b>	Radio Frequency
<b>RF Network operator</b>	The entity licensed for operating on RF frequencies
<b>R&amp;D</b>	Research and Development
<b>RTCA</b>	Radio Technical Commission for Aeronautics
<b>SARPs</b>	Standards And Recommended Practices
<b>SES</b>	Single European Sky
<b>SESAR</b>	Single European Sky ATM Research Programme
<b>SJU</b>	SESAR JU
<b>TP4</b>	Transport Protocol, Class 4
<b>TRN</b>	Transaction Delay
<b>VDLM2</b>	VHF Digital Link Mode 2
<b>VHF</b>	Very High Frequency
<b>VGS</b>	VDL Ground Stations
<b>WA</b>	Work Area
<b>WG</b>	Working Group

## 5. ANNEXES

### 5.1 Annex I - Declaration of Honour

#### DECLARATION OF HONOUR

#### WITH RESPECT TO THE EXCLUSION CRITERIA AND ABSENCE OF CONFLICT OF

#### INTEREST

(Complete or delete the parts in grey italics in parentheses)

[Choose options for parts in grey between square brackets]

The undersigned (insert name of the signatory of this form):

- in [his][her] own name (for a natural person)

or

- representing the following legal person: (only if the economic operator is a legal person)

full official name:

official legal form:

full official address:

VAT registration number:

- declares that [the above-mentioned legal person] [he][she] is not in one of the following

situations:

a) is bankrupt or being wound up, is having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, is the subject of proceedings concerning those matters, or is in any analogous situation arising from a similar procedure provided for in national legislation or regulations;

b) has been convicted of an offence concerning professional conduct by a judgment of a competent authority of a Member State which has the force of res judicata;

c) has been guilty of grave professional misconduct proven by any means which the contracting authorities can justify including by decisions of the European Investment Bank and international organisations;

d) is not in compliance with all its obligations relating to the payment of social security contributions and the payment of taxes in accordance with the legal provisions of the country in which it is established, with those of the country of the contracting authority and those of the country where the contract is to be performed;

e) has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation, money laundering or any other illegal activity, where such activity is detrimental to the Union's financial interests;

f) is subject to an administrative penalty for being guilty of misrepresenting the information required by the contracting authority as a condition of participation in a grant award procedure or another procurement procedure or failing to supply this information, or having been declared to be in serious breach of its obligations under contracts or grants covered by the Union's budget.

- (Only for legal persons other than Member States and local authorities, otherwise

delete) declares that the natural persons with power of representation, decision-making or control<sup>6</sup> over the above-mentioned legal entity are not in the situations referred to in b) and e) above;

- declares that [the above-mentioned legal person] [he][she]:

g) has no conflict of interest in connection with the contract; a conflict of interest could arise in particular as a result of economic interests, political or national affinity, family, emotional life or any other shared interest;

h) will inform the contracting authority, without delay, of any situation considered a conflict of interest or which could give rise to a conflict of interest;

i) has not granted and will not grant, has not sought and will not seek, has not attempted and will not attempt to obtain, and has not accepted and will not accept any advantage, financial or in kind, to or from any party whatsoever, where such advantage constitutes an illegal practice or involves corruption, either directly or indirectly, inasmuch as it is an incentive or reward relating to award of the contract;

j) provided accurate, sincere and complete information to the contracting authority within the context of this procurement procedure;

- acknowledges that [the above-mentioned legal person] [he][she] may be subject to administrative and financial penalties<sup>7</sup> if any of the declarations or information provided prove to be false. In case of award of contract, the following evidence shall be provided upon request and within the time limit set by the contracting authority:

For situations described in (a), (b) and (e), production of a recent extract from the judicial record is required or, failing that, a recent equivalent document issued by a judicial or administrative authority in the country of origin or provenance showing that those requirements are satisfied. Where the tenderer is a legal person and the national legislation of the country in which the tenderer is established does not allow the provision of such documents for legal persons, the documents should be provided for natural persons, such as the company directors or any person with powers of representation, decision making or control in relation to the tenderer.

For the situation described in point (d) above, recent certificates or letters issued by the competent authorities of the State concerned are required. These documents must provide evidence covering all taxes and social security contributions for which the tenderer is liable, including for example, VAT, income tax (natural persons only), company tax (legal persons only) and social security contributions.



For any of the situations (a), (b), (d) or (e), where any document described in two paragraphs above is not issued in the country concerned, it may be replaced by a sworn or, failing that, a solemn statement made by the interested party before a judicial or administrative authority, a notary or a qualified professional body in his country of origin or provenance.

If the tenderer is a legal person, information on the natural persons with power of representation, decision making or control over the legal person shall be provided only upon request by the contracting authority.

Full name

Date

Signature

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