ARTES 4.0 Generic Programme Line Business Applications - Space Solutions
ACTIVITY DESCRIPTION

"Enhancing Port Safety and Efficiency through Space"

THEMATIC CALL FOR PROPOSALS

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Table of Acronyms

AI	Artificial Intelligence
AoF	Authorisation of Funding
APQ	Activity Pitch Questionnaire
ARTES	ESA Advanced Research in Telecommunications Systems Programme
BASS	ESA Business Applications and Space Solutions
DRT	Demand Responsive Transport
ESA	European Space Agency
FP	Full Proposal
GNSS	Global Navigation Satellite Systems
MaaS	Mobility as a Service
OP	Outline Proposal
OSIP	Open Space Innovation Platform
PSI	Project Security Instruction
SatCom	Satellite Communications
SatEO	Satellite Earth Observation
TEN-T	Trans-European Transport Network

- **OVERVIEW**

This document provides an overview of the "1. Enhancing Port Safety and Efficiency through Space" thematic call for proposals under the ARTES BASS, 5G and 4S programme lines. It invites companies to submit business ideas that develop space-based services aimed at enhancing either intermodal passenger or intermodal freight transport.

- **BACKGROUND AND RATIONALE**

The global smart port market is poised for remarkable growth, from an estimated $1.9 billion in 2022 to $5.7 billion in 2027, with a compound annual growth rate (CAGR) of 24.3%[1] . To improve operational efficiency and safety, ports are adopting innovative solutions and cutting-edge technology. Ports and docks are working environments that provide a unique range of hazards and exposure to injury, for example, the docking industry is considered to be a particularly high-risk industry since workers are required to work both night and day with heavy equipment and specialist machinery in all kinds of weather. Their activities[2] include operating container cranes, straddle carriers and other heavy machinery, lifting, carrying and manoeuvring loads, storage and warehousing activities. Docks operations often involve the use of vehicles in tight spaces near pedestrian workers. As such, there is an increased risk of being run over, crushed or falling from a moving vehicle, as well as property damage. Hazards associated with moving vehicles and equipment include the loading and unloading of vehicles, reversing vehicles on decks and manoeuvring through tight corners. Loading and unloading materials is the essence of port logistics operations. For large containers and items, workers use of a wide range of lifting equipment, including cranes and trucks. Poorly planned lifting operations can lead to significant risks to workers, including serious fatal injuries or being hit by falling or moving objects. Hazards from lifting operations on seaports and docks include falling loads resulting from poorly stacked stock and lifting equipment failure.

A substantial portion of cranes and other equipment currently in operation in the ports are not fully automated, which presents a bottleneck in efficiency, particularly as the volume of global trade and container shipping continues to rise. In Europe, the automated overhead crane market is expected to grow from $ 515.08 million in 2021 to $ 827.71 million by 2028[3] , indicating a shift towards modernization and automation. As the number of containers and the demand for efficient port operations is growing, the urgency to replace existing equipment with automated systems becomes more pressing. The investment in automation and new technology will not only enhance port efficiency but also secure the supply chain, a critical component in the face of escalating international trade volumes.

Innovative solutions may include surveillance and security devices that will be able to communicate with the port community platforms. Implementing these solutions can enhance marine environment monitoring and operational efficiency, bolstering safety and security measures. For example, integrated solutions for bathymetric surveys, routine inspections, and continuous monitor can provide vital data for informed decision-making and proactive

[1] https://www.chcnav.com/
[2] https://www.portskillsandsafety.co.uk/
[3] https://www.businessmarketinsights.com/reports/europe-automated-overhead-crane-market

maintenance of port infrastructure. Solutions for public safety and emergency response improve port resilience against disasters, offering real-time insights for better decision-making. Overall, integrating diverse platforms and vehicles into a cohesive system, is an innovative approach to enhance safety, efficiency, and reliability in port operations, ultimately enhancing port resilience. However, the required steps depend on port's digitalization[4] level, connectivity and on infrastructure responsibilities.

Pilot projects for automated vehicles and cranes are underway worldwide, for example automated equipment vehicles and different types of cranes, including rail-mounted cranes in the container yard and ship-to-shore cranes. These machines manage ship-to-shore operations, yard management, and gate automation with minimal human supervision. Control platforms play a crucial role in managing and optimising them by integrating artificial intelligence and sensors data to ensure smooth operations and continuous improvement through machine learning[5] . The terminal control tower plays a key role in orchestrating all operations by using advanced analytics and decision-making tools for tasks such as demand management, scheduling, and workflow coordination.

Autonomous equipment increases the efficiency of port operations by following predefined routes, operating without the need for breaks, ensuring a continuous and uninterrupted activity. Additionally, ports are ideal for autonomous vehicles due to their structured environment and repetitive tasks like cargo handling and transportation. This inherent suitability reduces the complexity of implementing automation in port operations[6].

The opportunities and challenges of autonomous vehicles for passenger and freight traffic around the ports have also become a major issue in the discussions about the future of the ports systems. Enabling autonomous road traffic on port premises implies investments in sensors and road infrastructure, for example to accommodate both autonomous and manual vehicles during the transition period. To ensure the proper processing and displaying of all the information, ports authorities must collect and manage reliable data on all vehicles to ensure safe traffic flow.

Unmanned aerial vehicles (UAVs) are used in the ports, but drone flights are tightly regulated Permission usually comes from the port authority and property owners like terminal operators. Local regulations may restrict flights over waterways and other infrastructure to keep them free of harm. Potential business cases for drones include services on terminals, such as automated flights for inspection or stocktaking and delivery of documents and small items to reduce delivery rides. UAVs can also send documents, medicaments or even food supplies to anchored ships via aerial corridors. From the readiness level, UAVs prove the highest automation level, as they are already in a state to start and fly autonomously and to land in designated areas on board and land.

Automated vehicles in ports rely on a suite of technologies and sensors like cameras, LiDAR and satellite data for navigation but face cyber security risks that require robust security

[4] https://www.iaphworldports.org/n-iaph/wp-content/uploads/2020/11/Study-Autonomous-Vehicles-Impact-on-Port-Infrastructure-Requirements_v002_30May2019.pdf
[5] https://www.marineinsight.com/videos/understanding-autonomous-port-operations/
[6] https://easymile.com/ez-experts/port-industry-transformation-embracing-autonomy-stability-efficiency-and-growth

systems and legislative frameworks to mitigate these risks and ensure safe operations. Advanced sensors, algorithms, safety features and remote assistance capabilities can enhance security in complex scenarios and unplanned cases. These vehicles rely on detailed terminal maps, including information about roads, lanes, buildings as a digital twin of the terminal, and tools like the inertial measurement units (IMU), and simultaneous localization and mapping (SLAM) to determine its exact location within the map, for precise navigation, constantly updating their position to follow optimal routes and avoid obstacles. In relation to infrastructure changes, while some require dedicated infrastructure, autonomous terminal trucks can function within existing layouts, lowering costs and complexity.

Challenges and use cases described in the next chapter emerged distinctly during the several discussions with the Belfast Harbour following the Belfast Harbour Workshop held in September 2024 in Belfast. It is expected that these use cases will be relevant also for numerous other ports, being representative of the main axis of development of the smart port market sector. Belfast Harbour[7] , known as "a gateway to opportunity," is Northern Ireland's main maritime gateway and logistics hub, serving the Northern Ireland economy and increasingly that of the Republic of Ireland, in addition of playing an essential role in global trade. It handles around 24 million tonnes of trade and hosts 1.7 million passengers annually. The port also accommodates an average of 158 cruise ships each year, from a wide range of lines. Spanning 2,000 acres, Belfast Harbour significantly contributes to the city's transport infrastructure and represents about 20% of Belfast City's area. The Harbour's strategy focuses to shape the landscape of the Harbour Estate creating an attractive and vibrant area for work, living, and leisure. It is important to mention that Belfast Harbour is available to act as pilot user to validate new solutions in pre-operational scenario and assist the development through its expertise and knowledge of the port environment.

- **OBJECTIVES OF THE CALL**

The objective of this call for proposals is to stimulate the emergence of innovative space applications and services with high market potential, addressing the challenges related to ports. The Bidder can propose the study and development of space-based services related to ports efficiency and safety that refer to use cases of interest to Belfast harbour described below or to other port stakeholders.The initial areas of interest include, but not limited to, the following.

Safety & Security in the port

- **Port safety**: Port safety is related to the safety of the terminal personnel[8] during the loading and unloading operations but also to the safety of the ships and for the duration of their stay in the port. There could also be some applications related to emergency response in case of safety-threatening situations occurring at the port or for ships approaching the port. Port safety training course are already provided to the terminal personnel offering an understanding of safety practices in ports and marine terminals, including risk assessment, hazard identification, and control measures in port

[7] https://www.belfast-harbour.co.uk
[8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1032153/port-marine-safety-code.pdf

operations. Innovative training courses could be developed making use of port digital twin based on satellite images and AR/VR and metaverse. These technologies allow to replicate hands-on experiences, which have been proven to be more effective for training than content delivered via lectures, text or video, allowing trainees to repeat a task until they've mastered in a realistic version of the work scenario. These advanced training solutions can leverage on satellite communication for seamless connectivity, Earth Observation for detailed environment replication, and satellite navigation for accurate geolocation of assets and trainees. In relation to the safety of ships entering the ports, this can be enhanced using satellite images and radar data to monitor changes in water depth, crucial for the coastal management and offshore construction planning. By combining these data with machine learning algorithms, it is possible to track any bathymetry changes and alert port operators to navigation threats. Observing patterns in wave reorientation and breaking helps identify changes in water depth due to erosion and deposition on the seafloor. The detected changes range from long-term trends in sedimentation and sea level to event-based changes due to storms. Monitoring these changes is essential for ports to assure sufficient water depth in navigation channels and docks, as well as for targeting dredging operations. They might also be used by the port at regular intervals[9] , for example, for monitoring port operation or to optimize ship navigation. These data can also benefit maritime and marine communities including fisheries, coast guards, port authorities, shipping companies, and research institutions, by providing detailed information on environmental variables, bathymetry, and marine activities.

- **Port security**: Port security measures are used to protect ports, cargo, and personnel from threats such as terrorism, theft, and vandalism. It also ensures international treaties are enforced properly. Port security[10] is part of maritime security and focuses on the security of marine commercial areas, beaches, and coastlines under the scope of the IMO[11] and the International Ship and Port Security Code introduced in 2002 as part of the Safety of Life At Sea (SOLAS) convention. In addition to these organizations, many port security measures are incorporated from the UN[12] marine security enforcement agenda. Due to their size, certain port areas can be hard to patrol, leading to issues like cargo theft. Effective port security is crucial for the thriving marine transport industry requiring diligent monitoring and inspection of transferred cargo involving security guards, video surveillance, alarm systems, CCTV cameras and sensors. Vessels calling at ports are also susceptible to acts of sabotage impacting commercial shipping and maritime transportation networks. With ports being large, international hubs with high volumes of shipments, and access to new markets, smuggling remains a challenge, with newer security methods blending electro-optical sensors, radar, sonar, uncrewed vehicles, and human patrolling. High-tech systems like electronic-scanning (e-scan) ground radar systems[13] can be used for counter-drone perimeter security, wide-area surveillance, and coastline security applications. Earth Observation images can be useful to provide maps movement within the ports and even enable the identification of

[9] https://www.porttechnology.org/wp-content/uploads/2019/05/088-089.pdf
[10] https://up42.com/blog/an-overview-of-maritime-and-port-security
[11] https://www.imo.org/en/OurWork/Security/Pages/GuideMaritimeSecurityDefault.aspx
[12] https://press.un.org/en/2023/ga12569.doc.htm
[13] https://up42.com/blog/an-overview-of-maritime-and-port-security

"dark" vessels, those that operate without radar transponders or that disable transponders. By using the tracing and tracking capabilities of the satellite navigation together with maps obtained by satellite images processed with sophisticated machine learning algorithms and using additional digital technologies as AR/VR and blockchain, innovative port security measures could be put in place.

Port Efficiency and Automation

- **Port operations automation**: Autonomous vehicles, like terminal tractors, are increasingly being utilized for horizontal transportation to enhance efficiency and safety in container terminals. Unlike manual operation, autonomous, electric vehicles can work 24/7, reducing labor, and optimizing driving patterns to increase productivity and safety. Equipped with various sensors that utilize sensor fusion, and integrating information from multiple sources, these vehicles can accurately interpret their environment for informed decision-making, even in poor visibility or congestion. Managed through control platforms, they are able to identify and classify objects, differentiating between various objects like containers, vehicles, people, and infrastructure elements; detect and track movement, to determine the speed and direction of other objects, enabling it to predict their paths and avoid collisions and assess environmental factors like road conditions and weather to ensure safe and efficient navigation. Earth Observation is used to provide to the autonomous vehicles detailed maps of the terminal layout to navigate efficiently within the port, including information about roads, lanes, buildings, and other fixed features. As the tractor moves, satellite navigation data integrated with inertial measurement units (IMU), and simultaneous localization and mapping (SLAM) algorithms is used to determine its exact location within the map. By continuously updating its position and comparing sensor data with the map, the tractor can follow optimal routes and avoid obstacles.

- **Movement of passengers**: Ports serve as crucial points in the transportation system but often face issues with congested infrastructure and limited capacity for expansion. Autonomous vehicles could be implemented in ports for passenger transport to improve safety, efficiency, and cost savings. Passengers may have the opportunity to use autonomous vehicles to travel from the port premises to nearby airports, terminals or rail stations. Examples of space applications include the management of autonomous vehicles routes according to the passengers' demand, the use of autonomous vehicle platoons, consisting of multiple vehicles traveling together, to assess the safety and efficiency of moving large numbers of passengers simultaneously, and the development of control platforms connecting the arrival of the passengers with the availability of vehicles. As in the previous use case, space data play a key role by enabling real-time seamless communication between vehicles, roadside infrastructure, mobile devices and back-office systems, which improves the safety and manageability of the transport network within the port while reducing congestion and costs. An important aspect related to this use case is the introduction of advanced sensor processing technologies, adaptive algorithms, high-definition (HD) mapping and the development of V2V (vehicle-to-vehicle) and V2I (vehicle-to-infrastructure) communication. Autonomous vehicles rely on real-time HD maps to support functions such as self-localization, event recognition and interaction with other traffic participants. Earth Observation is used to provide HD

maps which can deliver detailed representations of road infrastructure, including lane models, traffic signs, road furniture, and lane geometry, with precision down to a few centimeters. Emerging solutions combine Global Navigation Satellite System (GNSS) technology[14] with inertial navigation systems (INS), multiple cameras and lidar sensors into autonomous platforms for precise navigation increasing operational efficiency and positioning accuracy. Port authorities might benefit from HD maps by offering value-added services like parking space allocation, traffic light circuits, which could be utilized for infrastructural improvements. Digital technologies, machine learning algorithms play a key role to forecast the passenger arrival volume and directions.

- **Movement of goods**: Automation[15] in ports is crucial for faster and more precise handling of container traffic compared to human-operated equipment. It enhances control over logistics, making operations more predictable and reliable by simplifying planning and tracking. Autonomous vehicles are built to optimize efficiency, helping to increase fuel efficiency and reduce emissions. Many are electric, supporting environmental goals and renewable energy use. As container flows grow and shipping lines demand better performance from container terminals, a fleet of autonomous vehicles become essential for many ports. However, achieving this requires technological innovation and public infrastructure upgrades. This use case related to the optimization of the movement of autonomous trucks in the port for the transport of containers to streamline port processes, reducing operating costs, increased safety and improved cargo tracking. The introduction of autonomous trucks into mixed traffic terminal operations requires digital maps, GNSS navigation, 360-degree cameras, LiDAR for real-time positioning and mapping and seamless communication provided by terrestrial or when not available by satellite communication. The GNSS Precise Point Positioning (PPP) technique may achieve levels of accuracy of a few centimeters or millimeters.

- **SPACE ASSETS AND DIGITAL TECNOLOGIES**

Satellite technologies and data, integrated with other digital technologies, have a significant role to play for prospective services addressing ports challenges.

- **Satellite Positioning and Timing**
  Global Navigation Satellite Systems (GNSS) can enable innovative applications for the tracking and tracing of vehicles and goods through precise positioning, navigation, and timing. It can be used to provide the high accuracy positioning information required by autonomous vehicles. For instance, GNSS can enable various route optimisation solutions by providing real-time location data as well as monitoring fleets of vehicles and goods.

[14] https://www.gpsworld.com/on-the-road-to-autonomous-vehicles/
[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1099173/cam-2025-realising-benefits-self-driving-vehicles.pdf

GNSS are required for the navigation of robots, autonomous vehicles and drones, to provide georeferencing and geolocation, as well as for ensuring the accuracy and safety of flight operations.
GNSS can support smart traffic management by monitoring vehicle movements and traffic patterns. Real-time traffic updates and navigation assistance helping alleviate congestion.

- **Drones and Autonomous Vehicles**
  GNSS also enables the use of autonomous vehicles such as unmanned aerial vehicles, enabling awareness in and around freight nodes. This also includes the use of robots to move heavy freight autonomously in and out of nodes. Drones and other autonomous vehicles can provide very high-resolution data for detailed analysis of specific areas of interest and for gathering information from areas at risk.

- **Satellite Communications (SatCom) and terrestrial networks**
  SatCom plays a vital role in providing robust and reliable connectivity to support smart port infrastructure, addressing unserved / underserved areas by terrestrial communications. Integrating satellite and terrestrial networks can ensure reliable connectivity in these regions, supporting seamless data transfer and enhancing communication.
  Specifically, for safety and security applications, it is important to have a backup to terrestrial connectivity. Ubiquitous connectivity is a key requirement to address the autonomy of equipment and vehicles. It may support drone operations in the absence of terrestrial communication. More generally, in areas without terrestrial network coverage, SatCom is indispensable for establishing reliable connectivity and transmitting data from IoT sensor networks. Satcom solutions provide global coverage, ensuring connectivity from any location. Additionally, Satcom systems are highly scalable, versatile, and easily integrated, enabling hybrid communication setups that combine satcom with terrestrial networks like 5G and IoT. This flexibility supports robust and continuous communication, essential for remote monitoring and control of the infrastructure.

- **Satellite Earth Observation (SatEO)**
  SatEO is useful for mapping and monitoring environmental conditions such as boundary/feature delineation and change detection. It can also support the development of digital elevation/surface models and topography measurements. SatEO data can complement IoT sensor networks by providing detailed analyses of environmental and geographical conditions over time. By integrating real-time IoT data with historical EO data for specific locations, comprehensive insights can be generated. Satellite radar data may enable monitoring under any weather conditions.
  SatEO is also a key data source for AR/VR and metaverse applications.
  SatEO data combined with advanced machine learning algorithms, could be used to directly measure traffic flow, forecast the movement of people or other activities within the port, identify infrastructure needs, and understand direct effects of the events in the surroundings environment. SatEO data can be used for the planning of the infrastructure updates and traffic flows upgrades. Additionally, weather forecasts can be used to anticipate adverse situations that can affect events.

- **Digital tools**
  Digital tools such as artificial intelligence (AI) and digital twins offer significant opportunities by creating virtual replicas of the port environments. These digital models integrate data from satellite earth observation, satellite navigation, and satellite communications to provide a comprehensive and dynamic representation of the port. Digital twins enable real-time monitoring, simulation, and analysis of the infrastructure, traffic flows and movements, allowing for predictive insights and optimised decision-making..

- **SCOPE OF THE CALL**

The proposals submitted under this Call for Proposal (CfP) shall target innovative and user-driven services which rely on advanced digital and space-based technologies. The proposals shall leverage target opportunities in the port maritime sector related to safety and security and efficiency and automation.

The Bidder has two options for addressing use-cases in their proposal: either address the use-cases included in the document and provided by Belfast Harbour or address other use-cases and requirements related to the Call by involving other customers or users directly. If choosing the latter, the Bidder must provide letters of interest from these potential customers as evidence of their support, which should be attached to the Outline Proposal (the second step in the application process). Both options will be considered equally in the evaluation process

The service provider shall be identified and be part of the bidding team to ensure the commercial operational roll-out of the proposed service following completion of a demonstration project.

This Call for Proposal covers two types of activities:

1. **Feasibility Studies** which provide the preparatory framework to identify, analyse and define new potentially sustainable services.

   The applications and/or services covered by the proposed Feasibility Studies must:

   - **Be customer - and user-driven:** proposals should demonstrate a clear understanding of user needs and present a strong potential for sustainability.
   - **Leverage integrated space assets:** propose a service demonstrating the benefits of the utilisation of integrated space assets.
   - **Include a plan to test business hypotheses:** a plan should be included that details how the user desirability, technical feasibility, and commercial viability of the service will be tested.

- **Target marketed readiness:** Aim to evolve the targeted applications and services to marketability and operational roll-out, potentially through a Demonstration Project after successful completion of the Feasibility Study

2. **Demonstration Projects** dedicated to the implementation and demonstration of pre-operational services.

   The applications and/or services covered by the proposed Demonstration Projects must:

   - **Be customer- and user-driven**: Active user involvement is essential throughout the project, including their participation in defining requirements, validating results, and contributing to the pilot activities.
   - **Showcase the value of space assets**: Proposals must clearly demonstrate how the utilisation of space technologies provides a distinct advantage, with a strong potential for long-term sustainability.
   - **Deliver measurable socio-economic benefits**: The project should quantify its impact, highlighting improvements in efficiency, sustainability, or other key outcomes that align with user and societal needs.
   - **Ensure user participation**: Representatives from the target user communities must actively engage in the project, including participation in the pilot phases to ensure alignment with their requirements and expectations.

The goal of Demonstration Projects is to validate pre-operational services in a real-world environment, paving the way for scaling and operational deployment.

To apply to a demonstration project, the Bidder is required to have addressed the key technical and business risks associated with the proposed project, and to have established a solid business plan including clear support from prospective customers.

- **PROCUREMENT APPROACH**

The proposals submitted in reply to the call shall be implemented in the context of ARTES 4.0 Generic Programme Line “Business Applications – Space Solutions” or “Space Systems for Safety and Security” (4S) or “Space for 5G/6G and Sustainable Connectivity” Strategic Programme Lines in coordination with National Delegations if the activities proposed are suited to be implemented in the context of the respective Strategic Programme Line.

The Bidder shall submit first an Activity Pitch Questionnaire, and following evaluation, may be invited to submit the Outline and Full Proposal. The Activity Pitch Questionnaire (APQ) template provided by ESA shall be used. This is considered as entry point for companies to submit their idea, providing a simplified and single point of access to the ESA ARTES framework.

The price of activities carried out in a given State are charged against the contribution of that State in the programme. A letter of Authorisation of Funding (AoF) from the relevant National Delegation is therefore required as part of the Full Proposal. The Bidder is however advised to inform the relevant National Delegation(s) when submitting the Pitch. The contact information of the National Delegates can be found here:
https://artes.esa.int/national-delegations.

The Agency will admit for evaluation only (Outline and Full) proposals from a bidding team composed of a company and/or organisations (be it Prime or Subcontractor) residing in any of those states that subscribe to the Programme under which you wish you submit your proposal:

I) **for the ARTES 4.0 BASS Generic Programme Line:** Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Sweden, Switzerland and the United Kingdom.
II) **for the ARTES 4.0 Space for 5G/6G and Sustainable Connectivity Strategic Programme Line:** Austria, Belgium, Finland, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, the Netherlands, Norway, Portugal, Romania, Spain, Sweden, Switzerland, the United Kingdom and Canada.
III) **for the ARTES 4.0 Space Systems for Safety and Security (4S) Strategic Programme Line:** Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Norway, Portugal, Romania, Spain, Switzerland, the United Kingdom and Canada.

- **PROCESS AND SCHEDULE**

It is planned for the call for proposals to open on 18th June 2025 until the 18th September 2025.

7.1 Timeline and procedure

The Bidder shall submit first an **Activity Pitch Questionnaire,** and following evaluation, may be invited to submit the **Outline Proposal** and subsequent **Full Proposal.** The Activity Pitch Questionnaire (APQ) template provided by ESA shall be used, which is considered as entry point for companies to submit their idea. The details of the APQ can be found here: Open Space Innovation Platform - OSIP - Channel: APQ for ARTES Downstream Business Applications

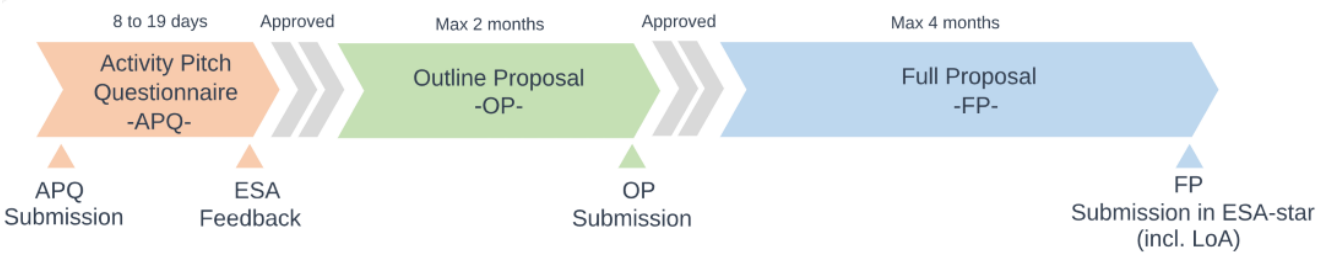

Figure 11: Application steps

This Call is planned to be implemented according to the following stepwise approach.

Step 1: APQ Submission

In Step 1, the interested Bidders are requested to submit their proposal(s) based on a short Activity Pitch Questionnaire (APQ) template made available by ESA that can be downloaded from the Thematic Call website. The pitch should provide the initial idea of what the Bidder would like to propose, elaborated on the basis of the thematic areas and either the use cases proposed by ESA's partners or others selected by the Bidder. If the Bidder has the relevant information available to them, they may consider completing the supplementary questions (AP5) in the APQ template as part of the APQ+, which may allow to skip Step 3 below, at ESA's discretion.

Should the bidder wish to cooperate with any of the listed partners in the annexes, they shall give to the Agency the authorisation to distribute the activity pitch questionnaire to these stakeholders by explicitly stating it in the Activity Pitch Questionnaire. Subject to such authorisation, the Agency will follow up distributing the APQ to the bidder's authorised stakeholder(s) and liaise with them to facilitate interactions with the Bidder.
The completed Activity Pitch Questionnaire (APQ) shall uploaded using the online web submitter, ESA's open space innovation platform (OSIP) in the channel named "APQ for ARTES Downstream Business Applications".

Multiple Pitches with different ideas can be submitted.

It is strongly recommended that the interested Bidder liaises from the beginning with the relevant ESA Member States Delegates.

APQ Evaluation

Following an assessment of the pitch by ESA, ESA will provide feedback to the company, aiming to provide a reply within 10 working days following the deadline for submission of the pitch.

It is recognised that some interactions with the Bidder may be required, and ESA may therefore consult with the Bidder and may offer support in providing further clarifications, aimed at better shaping the Outline Proposal(s). Dialogue sessions may be organised individually with potential partners prior to Step 3.

ESA might also consult, when necessary, with the relevant National Delegation(s) for orientation and will provide key information (e.g. title, cost, price, subcontractor) to the relevant National Delegation(s).

Subject to a positive evaluation of the pitch and the Bidder having informed the National Delegation(s), the Bidder will be notified by ESA and invited to submit an Outline Proposal. Note that the APQ+ can act as a substitute for the Outline Proposal, thus if having adequately

answered the additional questions included in the APQ+, the Bidder may be able to skip Step 2.

Step 2: Outline Proposal Submission

In Step 2, the Bidder will submit the Outline Proposal, based on a template provided by ESA, with letter(s) of interest from users/stakeholders. The Outline Proposal expands upon the pitch with a more extensive level of details. The Bidder will be allowed 2 months from ESA's approval of the APQ to the submission of their Outline Proposal. The outline proposal shall be submitted on the OSIP platform under the channel "Outline Proposal for ARTES Downstream Business Applications – Feasibility Studies/Demonstration Projects".

Step 3: Full Proposal Submission

In Step 3, subject to a positive assessment from ESA and in-principle support from the National Delegations, the Bidder will be invited to submit a Full Proposal on ESA-STAR in accordance with BASS programme line. The Bidder will be allowed 4 months from submission of their Outline Proposal to submit their Full Proposal on ESA-STAR.

A letter of Authorisation of Funding (AoF) from the relevant ESA National Delegation is required as part of the Full Proposal. The Bidder is however advised to inform the relevant National Delegation(s) when submitting the Pitch. The details of the National Delegates can be found here: https://artes.esa.int/national-delegations.

After the Bidder have submitted a Full Proposal with the Authorisation of Funding (AoF) from the relevant National Delegation(s) and following a positive assessment by ESA, the proposed activity will be approved for implementation.

7.2 Evaluation Criteria

The evaluation process is non-competitive, as each proposal will be assessed individually on its own merits, according to the evaluation criteria applicable for CALL FOR PROPOSALS FOR DOWNSTREAM APPLICATIONS IN ARTES 4.0 (esa star ref.: 1-10494).

More information for the assessment of the APQ and outline proposal stages can be found on the OSIP page "APQ for ARTES Downstream Business Applications".

More information on the evaluation criteria for the final proposals can be found within the document "Appendix 1 to AO/1-10494/20/NL/CLP (Issue 2.2) " which can be found on ESA-STAR at the following link under "Tender conditions".

- **GENERAL CONDITIONS**

The submissions and all correspondence relating to it shall be in English.

The tender shall not contain any Classified Information, whether in the APQ, Outline Proposal or in the Full Proposal. To avoid any confusion with Classified security markings, the unclassified protective marking used by the Tenderer in the proposal shall not contain the terms: "Restricted", "Confidential", or "Secret".

However, should the Tenderer consider necessary to include Classified Information in the tender, the Tenderer shall inform beforehand the ESA Security Officer.

The Tenderers are informed that Classified Information can be shared with ESA only in compliance with the Project Security Instruction (PSI) duly established by the Agency beforehand and subject to the approval by the ESA Member States.

The Agency will treat commercially sensitive or proprietary information confidentially and solely for the purpose of the assessment of the response.

Expenses incurred in the preparation and dispatch of the response to the announcement will not be reimbursed. This includes any expenses connected with a potential dialogue phase.
The announcement does not bind the Agency in any way to place a contract. The Agency reserves the right to issue amendments to the announcement.