ENVELOPE: Evaluation and Validation of Connected Mobility in real Open Systems beyond 5GS

OPEN CALL #2

Co-funded by the European Union
6GSNS

ENVELOPE has received funding from the Smart Networks and Services Joint Undertaking (SNS JU) under the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101139048. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the SNS JU. Neither the European Union nor the granting authority can be held responsible for them

Disclaimer

The ENVELOPE Consortium is the following:

Participant Number	Participant organization name	Short name	Country of Origin
1	EREVNITIKO PANEPISTIMIAKO INSTITOUTO SYSTIMATON EPIKOINONION KAI YPOLOGISTON	ICCS	Greece
2	HEWLETT PACKARD ITALIANA SRL	HPE	Italy
3	TELECOM ITALIA SPA	TIM	Italy
4	FONDAZIONE LINKS - LEADING INNOVATION & KNOWLEDGE FOR SOCIETY	LINKS	Italy
5	NEXTWORKS	NXW	Italy
6	TEORESI S.P.A	TEO	Italy
7	COMUNE DI TORINO	COTO	Italy
8	ORGANISMOS TILEPIKOINONION TIS ELLADOS OTE AE	OTE	Greece
9	NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"	NCSRD	Greece
10	FOGUS INNOVATIONS & SERVICES P.C.	FOGUS	Greece
11	ISFM INTELLIGENT SYSTEMS FOR MOBILITY	ISFM	France
12	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	TNO	Netherlands
13	KONINKLIJKE KPN NV	KPN	Netherlands
14	SIEMENS INDUSTRY SOFTWARE NETHERLANDS BV	SISW	Netherlands
15	COMMSIGNIA Korlatolt Felelossegu Tarsasag	CMS	Hungary
16	LENOVO DEUTSCHLAND GMBH	LNVO	Germany
17	UNIVERSITAET DUISBURG-ESSEN	UDE	Denmark
18	ATHINA-EREVNITIKO KENTRO KAINOTOMIAS STIS TECHNOLOGIES TIS PLIROFORIAS, TON EPIKOINONION KAI TIS GNOSIS	ISI/ATH	Greece
19	IQUADRAT INFORMATICA SL	IQU	Spain
20	FUNDACION CENTRO DE TECNOLOGIAS DE INTERACCION VISUAL Y COMUNICACIONES VICOMTECH	VICOM	Spain
21	EUROPEAN ROAD TRANSPORT TELEMATICS	ERT	Belgium

	IMPLEMENTATION COORDINATION ORGANISATION - INTELLIGENT TRANSPORT SYSTEMS & SERVICES EUROPE		
22	EBOS TECHNOLOGIES LIMITED	EBOS	Cyprus
23	INCITES CONSULTING SA	INC	Luxemburg

Funding Scheme: HORIZON JU Research and Innovation Actions ●Topic: HORIZON-JU-SNS-2023-STREAM-D-01-01 ● Start date of project: 01 January 2024 ● Duration: 36 months

Table of Contents

1. Introduction

The project ENVELOPE, funded by the European Union's Horizon Europe program, aims to advance and open up the reference 5G advanced architecture, and also to transform it into a vertical-oriented with the necessary interfaces tailored to the CAM UCs that:

i) expose network capabilities to verticals,
ii) provide vertical-information to the network;
iii) enable verticals to dynamically request and modify certain network aspects in an open, transparent and easy to use way.

ENVELOPE aims to deliver 3 large-scale B5G trial sites in Italy (operated by LINKS foundation), Netherlands (operated by KPN and TNO) and Greece (operated by OTE and NCSRD) for CAM services and beyond, implementing functionalities tailored to CAM services, along with advanced exposure capabilities.

Although focused on the CAM vertical, the resulting developments are reusable by any vertical. The ENVELOPE architecture serves as an envelope that can cover, accommodate and support any type of vertical services. The applicability of ENVELOPE capabilities will be demonstrated via the project CAM UCs and via projects selected in two rounds of open calls. Through these Open Calls, ENVELOPE will ensure wide acceptance and achieve sustainability of its results through collaboration with industrial partners, and will foster further take-up by inviting innovative use cases to tune up the ENVELOPE experimentation framework as well as the testbeds and large-scale trial facilities.

As a result, ENVELOPE launches this second Open Call i.e., Open Call 2 (OC2), for the involvement and engagement of "third parties" to run field trials on the developed experimental infrastructure. ENVELOPE is inviting large industry, SMEs, research institutes and universities to:

i) demonstrate the reusability of the developed functionalities/interfaces by other stakeholders and potentially other verticals and/or,

ii) to extend the provided infrastructure for experimentation as a service with additional functionalities tailored to the needs of other verticals.

The Open Calls will maximize the impact and accelerate adoption of ENVELOPE demonstrating flexibility, user acceptance and technology transfer.

A total of **€ 2.700.000**, for both ENVELOPE Open Calls, will be provided in the form of lump sum funding of up to

€300.000 per consortium of beneficiaries, with max **€60.000** per beneficiary. From the total amount, €1,350,000 will be allocated to projects selected for OC2.

Background information on the ENVELOPE project

ENVELOPE enables a two-way interaction between (CAM) vertical services and the B5G network through APIs and technology enablers specifically tailored to abstract the complexity of the underlying B5G Core and the APIs the core offers. As such ENVELOPE strikes a favorable state of affairs in which the vertical service providers reap the benefits of network exposure and programmability while lowering the barriers of service development.

In this effort, the project places particular emphasis on the interoperability of the offered solutions, adopting widely accepted standardized APIs such as those stemming from the LF CAMARA project, ETSI MEC and 3GPP. It follows that the extensive trialing capabilities offered in this Open Call provide vertical service providers with a forward-looking experimentation environment to practically test the adoption of these emerging APIs.

Vision of Experimentation as a Service

The ENVELOPE project offers an **Experimentation as a Service** (EaaS) module to guarantee a flexible and **user-friendly** environment for testing Connected and Automated Mobility (CAM) applications and other vertical services, leveraging the enhanced capabilities introduced in Beyond 5G networks and made available by the ENVELOPE Platform.

The EaaS module enables experimenters to configure, launch, and monitor experiments through the **ENVELOPE Portal** which is the dedicated interface for interaction. This key component provides a Graphical User Interface (GUI) for accessing the various functionalities related to application onboarding, experiment lifecycle management, and real-time monitoring. These functionalities ensure a smooth management of the experiments without requiring the experimenter to have an in-depth knowledge of the **Beyond 5G networks**.

ENVELOPE Platform

The **ENVELOPE Platform** enables experimenters to achieve a seamless experimentation and testing of applications from CAM and other verticals over a Beyond 5G (B5G) system. The Platform aims to facilitate the management of experiments, allocation of resources, and deployment of applications at the different network and infrastructure layers.

The key components of the ENVELOPE Platform architecture are the technical enablers (termed in the figure below as ENVELOPE Enablers) that offer experimenters a set of easy-to-use **standards-compliant APIs** for simplifying the interaction between applications and B5G networks interfaces. Example cases include the provisioning (to the application) of device location or performance information, support for dynamic allocation of resources (Quality-on-Demand), predictive QoS and several others, all presented in the remainder of this document. The technical enablers are software components that act as an intermediate **translation** layer which converts complex B5G system's interfaces into easy-to-consume interfaces exposed to the applications. The B5G system interfaces are:

- *B5G Network APIs*: they allow interactions with the *B5G core.*
- *Edge APIs:* they provide access to User Plane Functions (UPFs) at the edge level.
- *Far-Edge APIs*: related to Radio Access Network (RAN) and User Equipment (UE) resources, such as Onboard Units on vehicles.

In turn, the application-facing standards-compliant interfaces[1] expose a series of functional features such as the provisioning of device location or performance information, support for Quality-on-Demand and Access Traffic Steering-Switching-Splitting (ATSSS) Multi-connectivity, and several others, all presented in the remainder of this document. Fostering standards compliance and interoperability, the majority of the exposed APIs adopt (and in several cases extend) widely-accepted specifications provided by the LF CAMARA project, as well as ETSI MEC. The following figure presents a high-level illustration of the described platform structure.

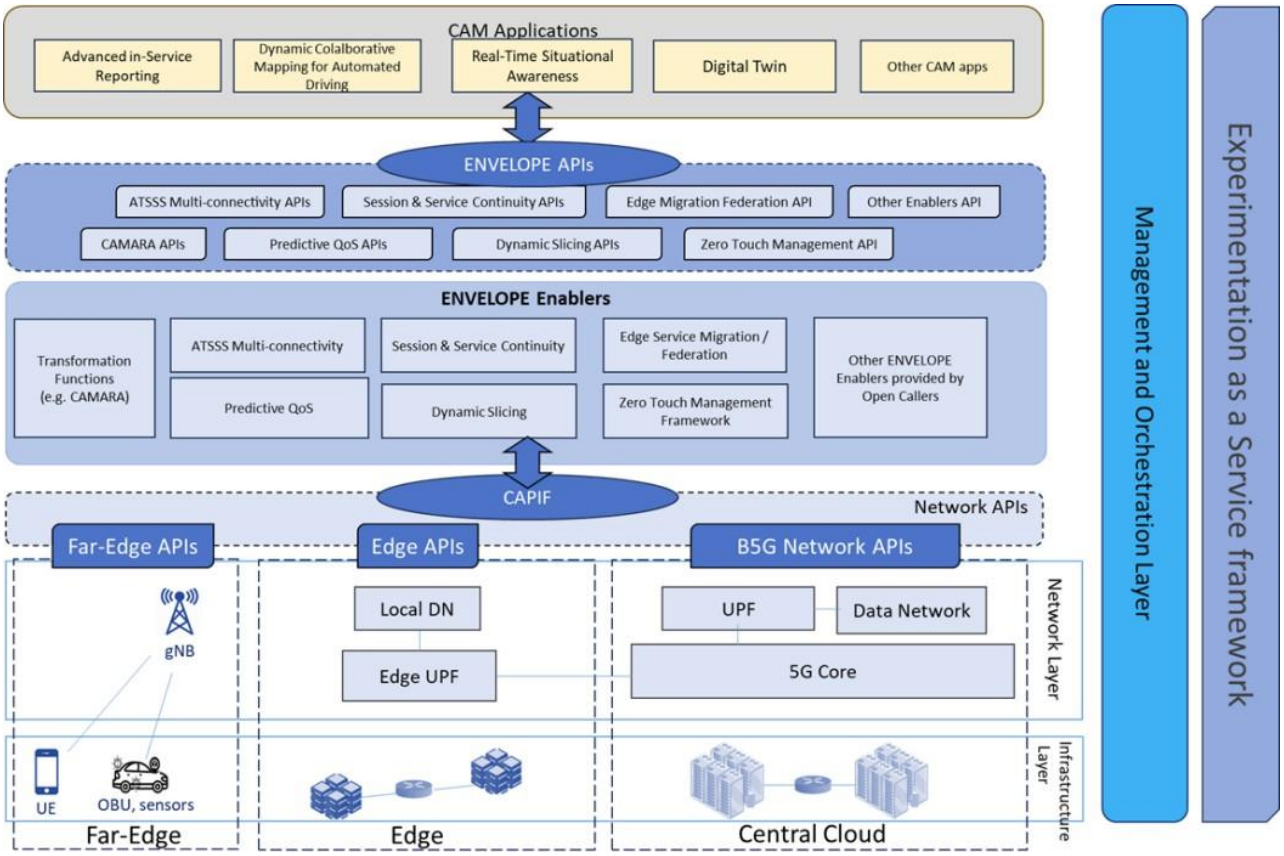

Figure 1: Envelope High Level Platform Architecture

Further information is also provided in public deliverables D2.2, D3.1 and D3.2[2].

[1] The supported APIs are collectively termed in the initial project deliverables as ENVELOPE APIs. Further developments within the project have introduced standards-compliance for the large majority of these APIs. This is reflected in the explicit reference to LF CAMARA and ETSI MEC APIs.

[2] Available here: https://envelope-project.eu/resource/?e-filter-549b21b-resource-categories=deliverables

2. Enablers and APIs

In this section we provide a detailed description of the supported enablers/APIs in ENVELOPE, presenting the supported functionality, elaborating on the associated benefits and listing a series of example applications where these could be applied, both for the CAM and other vertical domains. A detailed API specification is also available in the knowledge base.

2.1. Quality-on-Demand

In the last decade vehicles started to become more and more connected and autonomous, relying on guaranteed delivery of data with other vehicles and road infrastructures with stringent QoS requirements. Indeed, emerging CAM applications and V2X communication paradigms require ultra-low latency, high bandwidth, and guaranteed network service levels to deliver advanced services. In this context, public mobile connectivity offers limited, if not zero, control and visibility of network configuration parameters, resulting in unpredictable, if not degraded, network performances for latency- and bandwidth-sensitive CAM applications. In this context, ENVELOPE provides Quality on Demand (API) mechanisms that enable CAM applications to dynamically request, query, and adapt network quality and behaviour, thus exposing network capabilities to the vertical application domain in support of simplified application-to-network interactions.

In practice, the QoD enabler exposes programmable interfaces for vertical applications to query and request the enforcement of QoS profiles, in the form of prioritised and quality-assured data flows in terms of stable latency (reduced jitter) or enhanced throughput, without requiring detailed knowledge of the underlying network (e.g., 4G/5G systems). The QoD enabler exposes a set of northbound APIs compliant with the CAMARA Quality-On-Demand specification version 1.0.0 – first stable version.

LF CAMARA Compliance

The QoD enabler exposes a set of northbound APIs compliant with the LF CAMARA Quality-On-Demand specification version 1.0.0 – first stable version.

Use cases

The QoD Enabler is relevant for scenarios where network performance is critical. The following section introduces a list of use cases and usage scenarios, also exploiting LF CAMARA background information (https://camaraproject.org/quality-on-demand/), of the QoD enabler for the CAM vertical domain and other vertical domains.

CAM vertical domain

- Autonomous Driving: The QoD enabler enables reliable communication for autonomous vehicles and ensures both safety and efficiency.
- Cooperative Collision Avoidance: On-demand QoD activation allows to enforce prioritized network slices and QoS profiles for time-critical sensor data exchange among vehicles and roadside units.
- Remote Vehicle Control and Teleoperation: The QoD APIs can be used to request for guaranteed latency and jitter to enable secure, responsive vehicle monitoring and control from remote operation centres.
- Emergency and Incident Management: Dynamic QoD activation for vehicles involved in or responding to accidents, ensuring uninterrupted communication with remote control applications (e.g. in support of dashcam video streaming, additional sensor data delivery, etc.).

Other vertical domains

- Industrial IoT: The QoD enabler ensures stable communication for sensors and actuators in industrial environments.
- VR/Gaming: The QoD enabler provides low-latency connections for immersive virtual reality experiences and online gaming.
- Live Video Streaming: The QoD enabler maintains high-quality video streams with minimal buffering and interruptions.
- Telemedicine: The QoD enabler supports real-time data transmission for remote medical consultations and

monitoring.

Benefits

The following benefits, identified also by exploiting LF CAMARA background information (https://camaraproject.org/quality-on-demand/), are provided by the QoD enabler:

- Enhanced User Experience: The enabler improves application performance by ensuring stable latency and prioritized throughput.
- Simplified Network Management: The enabler abstracts the complexity of network technologies and allows developers to focus on application logic.
- Flexibility: The enabler can choose from predefined QoS profiles in order to meet specific latency and throughput requirements.
- Scalability: The enabler manages multiple QoS sessions efficiently and supports a wide range of applications and devices.

2.2. Device Location

The enablers for device location allow vertical applications to retrieve information about the position of devices and related events (e.g., device entering or leaving a certain geographical area). The following enablers for device location are considered in the ENVELOPE project:

• **Geofencing enabler:** it allows vertical applications to subscribe to event-based notifications related to the location updates of specified devices when they enter or leave a certain geographical area.

•**Devices in Area enabler:** it allows vertical applications to query which devices are present in a given geographical area or to subscribe to event-based notifications related to the devices that enter or leave the defined geographical area.

•**Location Reporting enabler:** it provides a standardized and secure way to expose real-time and on-demand location updates of UEs to authorized third-party applications within the CAM vertical and beyond.

LF CAMARA Compliance

- Geofencing enabler: this enabler exposes a set of northbound APIs compliant with LF CAMARA Device Location - Geofencing APIs (version 0.3.0).
- Devices in Area enabler: this enabler exposes a set of northbound APIs that are following the same approach and data models introduced by the available LF CAMARA Device Location APIs.
- Location Reporting enabler: this enabler exposes a set of northbound APIs compliant with LF CAMARA Location Retrieval API (version 0.4.0).

Use cases

The Device Location enablers are relevant for scenarios where position information of devices is needed. The following section introduces a list of use cases and usage scenarios, also exploiting LF CAMARA background information (https://camaraproject.org/location-verification/), of the Device Location enablers for the CAM vertical domain and other vertical domains.

CAM vertical domain

- Geofencing for Fleet Management: Track vehicle entry and exit from predefined zones (e.g., depots, delivery areas) for logistics optimization.
- Location-Based road monitoring: Deliver road monitoring content (e.g., potholes) based on current vehicle location.
- Dynamic Edge Application Selection: Use the vehicle's location to select the closest edge server for low-latency services like V2X or AR navigation.
- Dynamic QoS Adaptation based on location: enables Quality-of-Service (QoS) guarantees when vehicle enters a specific area. For example, when tele-operation of a vehicle must be enabled in a controlled/allowed area (e.g., private factory/yard).

- Emergency Assistance (eCall Enhancement): Share precise vehicle location with emergency services during accidents for faster response.

Other vertical domains

- Fraud Prevention in Banking and Financial Services: The device location enabler prevents fraud in location-dependent financial transactions by verifying the actual location of the user.
- Fraud Prevention in Media, Entertainment, and Retail Services: The device location enabler blocks unauthorized access to digital services by detecting location mismatches and location-masking attempts.
- Service Personalization: The device location enabler enables service personalization by verifying the user's location for access to location-dependent features.
- Delivery Services: The device location enabler confirms the device location to ensure accurate delivery of goods and services.
- Emergency Services: The device location enabler verifies the device location to provide accurate and timely emergency assistance.

Benefits

The following benefits, identified also by exploiting LF CAMARA background information (https://camaraproject.org/location-verification/), are provided by the Device Location enabler:

- Fraud Protection: The device location enabler protects clients from fraud risks related to identity exploitation or data theft and strengthens customer trust.
- Protection of Service Providers: The device location enabler protects the legitimate interests of service providers by ensuring the secure delivery of their services.
- Operational Efficiency: The device location enabler improves operational efficiency for API customers by reducing costs.

2.3. Performance metric

The performance metric enabler exposes periodic network performance metrics (i.e., uplink/downlink throughput) so that vertical applications (server side) can monitor the current performance of a given device.

LF CAMARA Compliance

There are no already defined LF CAMARA APIs for this enabler; an alignment with the CAMARA Session Insights API is being explored.

Use cases

The following section introduces a list of use cases and usage scenarios of the performance metric enabler for the CAM vertical domain and other vertical domains.

CAM vertical domain

- Predictive Maintenance Data Upload: Monitor uplink throughput for continuous transmission of sensor and diagnostic data to applications residing in the edge/cloud.
- HD Map Downloads: Validate that downlink throughput supports real-time map updates for navigation and autonomous driving.
- Over-the-Air (OTA) Updates: Monitoring of network performance to ensure sufficient downlink throughput to complete large software updates quickly.

Other vertical domains

- Network Impairments: Issues in the operator's network can lead to degradation in overall cell area throughput which could be identified with the collection of performance metrics.
- Video Streaming Services: Monitor data traffic throughput to adapt video quality and avoid buffering during playback.
- Cloud Gaming: Ensure sufficient downlink throughput for smooth, low-latency game streaming to end-users.

- Video Conferencing: Track uplink throughput to maintain stable video and audio quality during calls.
- AR/VR Applications: Validate downlink throughput for delivering immersive AR/VR content without frame drops.

Benefits

The following benefits are provided by the Performance Metric enabler:

- SLA Compliance: Helps verify that network performance meets contractual Service Level Agreements for critical applications (e.g., automotive, enterprise).
- Dynamic Service Adaptation: Applications can adjust behaviour (e.g., video bitrate, data upload frequency) based on actual throughput conditions.

2.4. Predictive QoS

The PQoS enabler allows vertical applications to obtain analytics and subscribe to notifications about predicted changes of the QoS at either the network or application level. Additionally, it enables vertical services to train PQoS AI/ML prediction models.

LF CAMARA Compliance

The PQoS enabler exposes a set of northbound APIs compliant with the CAMARA Connectivity Insights API and the LF CAMARA Predictive Connectivity Data API. Further API compatibility is currently under evaluation e.g., Session Insights.

Use cases

The following section introduces a list of use cases and usage scenarios, also exploiting 5GAA background information (https://5gaa.org/content/uploads/2023/01/5gaa-wi-presa-tr-predictive-qos-and-v2x-service-adaptation.pdf), of the PQoS enabler for the CAM vertical domain and other vertical domains.

CAM vertical domain

- Tele-Operated Driving: Remote control of vehicles using live camera feeds and sensor data. PQoS helps predict network degradation so systems can adjust video quality or enter safe modes in advance.
- Camera-Based Safety & Hazard Detection: Vehicle or roadside cameras stream video for detecting pedestrians, cyclists, or hazards. Predictive QoS ensures critical frames or alerts are prioritized when bandwidth drops.
- HD Mapping & Situational Awareness: Vehicles share or receive real-time map updates and perception data - PQoS enables prefetching, adaptive fidelity, or fallback to local maps when network issues are predicted.
- Cooperative Maneuvers & Platooning: Vehicles coordinate lane merges or platoon following with shared sensor/camera data; PQoS anticipates QoS drops so systems can adapt message size or switch to direct V2V links.
- Passenger Infotainment & Streaming: Passengers stream video or use video calls in cars; predictive QoS enables adaptive bitrate streaming, pre-buffering, or network slice switching for smoother experience.
- Emergency/Hazard Warnings (V2X Alerts): Systems send alerts about road hazards or vulnerable road users; PQoS provides early warnings of network latency issues so alerts can be rerouted via alternative channels.
- Over-the-Air (OTA) Software Updates & Diagnostics: Vehicles download updates or upload large logs; PQoS helps schedule heavy transfers during predicted good connectivity, avoiding wasted time or failed sessions.

Other vertical domains

- Smart Camera Surveillance & Analytics: Infrastructure cameras send video for analytics; PQoS enables dynamic video compression, edge processing, or event-only streaming when connectivity weakens.
- Drones for Inspection & Delivery: Industrial drones stream video for inspections (power lines, pipelines, agriculture) or carry goods; predictive QoS helps avoid mission failures by switching control strategies when coverage is expected to weaken.
- Cloud Gaming: Gamers stream high-performance titles; PQoS enables pre-buffering, adaptive bitrate, or temporary reduction in graphic quality to avoid lag when network degradation is predicted.
- Retail & Smart Venues: Stores or stadiums use AR shopping assistants, live offers, or crowd management cameras; PQoS helps maintain smooth experiences during peak load times by anticipating congestion.

- AR/VR & Immersive Experiences: Virtual reality and augmented reality apps (e.g. gaming, training, design) rely on ultra-low latency; PQoS helps adjust rendering resolution or pre-buffer assets before network drops.
- Remote Healthcare & Tele-Surgery: Doctors use real-time video and haptic feedback; PQoS predicts upcoming latency spikes so procedures can switch to lower-fidelity modes or pause non-critical data streams.
- Smart Factories & Industrial IoT: Connected robots, sensors, and machinery depend on stable networks; PQoS ensures critical control loops maintain reliability, and non-critical data (logs, monitoring) can be rescheduled during congestion.

Benefits

The following benefits are provided by the PQoS enabler:

- Proactive Adaptation: anticipate QoS drops and adjust application functionalities before service degrades.
- Safety & Reliability: ensure critical services (e.g. V2X, tele-driving) remain within safe QoS limits.
- Efficient Resource Usage: schedule/optimize data exchange based on predicted network quality.
- Enhanced User Experience: smooth video, AR/VR and gaming via pre-buffering and adaptive quality.
- QoS/QoE Assurance & Service Continuity: maintain consistent performance by switching modes, routes, or fallback connections when quality is predicted to decline.

2.5. ATSSS

The ATSSS enabler provides multi-connectivity functionality to enable the use of multiple network paths and provide redundancy, seamless transition, and improved performance.

LF CAMARA / ETSI MEC Compliance

The ATSSS enabler exposes a set of northbound APIs that are not currently based on existing LF CAMARA APIs, although alignment with the available LF CAMARA APIs and ETSI MEC-015 is being explored. In particular, ETSI MEC-015 describes the Multi-access Traffic Steering (MTS) API where applications can request traffic scheduling among different access networks. The API supports several distribution modes; for example, mode 0 (low cost), which prioritizes the use of unmetered access networks whenever available, and mode 1 (low latency), which selects the access network offering the lowest latency. For complete details on all distribution modes, please refer to Section 7.2.5 of ETSI MEC-015. This functionality is well aligned with the ENVELOPE ATSSS objectives.

Use cases

The following section introduces a list of use cases and usage scenarios of the ATSSS enabler for the CAM vertical domain and other vertical domains.

CAM vertical domain

- Dynamic offloading: When a vehicle is parked or stationary (e.g., during charging), ATSSS can offload non-critical or high-volume data such as camera uploads, diagnostics, software updates or HD map downloads, from 5G to Wi-Fi or other local networks. This optimizes resource use, reduces cellular load, and maintains service continuity.
- Ubiquitous Coverage: ATSSS enables continuous connectivity by seamlessly switching from terrestrial 5G to satellite or other networks when the vehicle moves outside regular coverage areas. This ensures that data, control signals, and safety-related communications remain available even in remote or rural regions.
- Data acquisition: ATSSS enables simultaneous use of multiple access networks to support real-time exchange of camera and sensor data between vehicles, edge nodes and other user equipment (e.g., from VRUs or RSUs). By dynamically splitting or steering traffic across available links, ATSSS ensures that both critical and non-critical perception data remain timely and reliable, enhancing cooperative awareness and safety in dynamic driving environments.
- Remote driving: Vehicles performing teleoperated or semi-autonomous maneuvers can utilize ATSSS to prioritize low-latency control data on the most reliable link while simultaneously maintaining video uplinks on a secondary link, ensuring safe fallback even under link failure.
- Cross-Border Handover: During international mobility across borders, ATSSS maintains session continuity by combining operators' access networks (e.g., national 5G and roaming partner 5G) and ITS-G5 or satellite

technology, minimizing disruptions during roaming transitions to favour critical applications e.g., teleoperating driving.

Other vertical domains

- Industrial Robotics and AGVs (Automated Guided Vehicles): Robots or AGVs in smart factories use ATSSS to maintain control and telemetry links over redundant wireless networks (e.g. private 5G + Wi-Fi). If one link fails, the other ensures uninterrupted operation.
- Smart City: Roadside/Infrastructure IoT sensors (e.g., city surveillance cameras and other telemetry units) transmit continuous data to analytics servers. ATSSS dynamically splits or switches traffic between 5G and Wi-Fi to sustain continuous data streaming and balance bandwidth loads.
- Aerial and Maritime Drones: Drones performing inspection or delivery missions in variable coverage conditions can maintain connectivity by dynamically switching between terrestrial 5G, satellite, or private radio links, avoiding control loss or video dropout.
- Public Safety and Emergency Response: First responders equipped with cameras or AR devices use ATSSS to maintain demanding uplink video streaming and mission data, ensuring reliable situational awareness.
- Video Streaming Services: On-demand video streams use ATSSS to simultaneously leverage multiple network paths, increasing the total throughput and enabling high-quality streams. For live video streams and web conferencing, ATSSS helps reduce latency by dynamically routing traffic over the fastest available path.

Benefits

The following benefits are provided by the ATSSS enabler:

- Fault Tolerance: Exploits the multi-homing capability of devices (e.g., 5G and Wi-Fi) to ensure fault tolerance and uninterrupted service continuity. By dynamically utilizing available access networks, it mitigates link failures and maintains reliable connectivity even under poor network conditions.
- Dynamic Path Optimization: Steers or switches traffic automatically based on latency, bandwidth, or policy constraints.
- Resource Efficiency: Distributes traffic intelligently to balance network loads and improve overall efficiency for operators and verticals.
- Aggregated Throughput: Uses simultaneous access paths to increase effective bandwidth for high-data-rate applications (e.g., multi-camera video streams).
- Redundancy & Reliability: Effectively duplicates critical flows in both links to ensure that information is reliably delivered to the application.

2.6. Edge

The convergence of 5G networks and edge/cloud computing is fueling the automotive vertical sector, specifically enabling connected and automated vehicles to exchange data, take near real-time decisions, and seamlessly integrate with the road-side infrastructures. From a CAM application perspective, this requires accessible and programmable edge infrastructures and platforms, capable to provide low-latency compute capabilities that can adapt to dynamic vehicle and application requirements. On the other hand, the current edge/cloud ecosystem is still fragmented, with heterogeneous platform and APIs solutions, and tailored deployment models that do not facilitate portability and scalability. In this context, the edge enablers and APIs provide a unified and open framework for advanced application-to-network interactions, with common capabilities for edge discovery, application deployment, application migration. This allows CAM vertical applications and developers to integrate edge capabilities into their solutions independently from the underlying specific characteristics of the network operator infrastructure. Finally, UE traffic re-routing (traffic influence) to the new edge using 3GPP URSP (UE Route Selection Policy) is supported in one of the trial sites.

LF CAMARA Compliance

The ENVELOPE edge enablers provide a programmable interface (exposed through a set of northbound APIs compliant with the LF CAMARA Edge Cloud – Edge Application Management APIs version 0.9.3) for: i) service/host discovery, ii) edge service orchestration (service registration and instantiation), and iii) service migration (handover). In addition, Traffic Influence functionality is compliant with LF CAMARA Traffic Influence 0.9.0.

Use cases

The following section introduces a list of use cases and usage scenarios facilitated by the ENVELOPE edge enablers (and the use and adoption of the related edge APIs) in the CAM vertical domain and other vertical domains.

CAM vertical domain

- Cooperative safety services: deployment and operation of edge applications for real-time fusion of sensor data collected from vehicles and roadside units to enhance situational awareness and avoid accidents.
- Dynamic map creation: deployment and operation of applications for near-real-time distribution and creation of collaborative HD maps with sharing of live traffic data from edge nodes to vehicles in support of assisted and augmented driving.
- Predictive maintenance: deployment and operation of applications for continuous analysis of vehicles telemetry and sensor data at the edge to detect common anomalies, predict failures, and optimize maintenance operations.
- Digital Twinning: deployment and operation of applications for real-time synchronization between vehicles and digital replicas at the edge in support of assisted and augmented driving, and predictive vehicle analytics.

Other vertical domains

- Media and cloud gaming: deployment and operation of edge applications for low latency media content caching, gaming servers, immersive AR/VR services, and interactive streaming enabled by proximity-based service delivery.
- eHealth: deployment and operation of applications for remote diagnostics and real-time monitoring of patient data with guaranteed latency and privacy through localized data processing.
- Public safety: deployment and operation of applications for edge-based analytics of media contents from first-responders, remote control of UGVs and AGVs in disaster areas, and emergency response coordination with situational awareness.
- Remote Surgery Assistance: Deploy real-time video analytics and haptic feedback services at edge zones for surgical support.
- Robotics Control: Host control logic at edge zones for low-latency robotic arm coordination.

Benefits

The following benefits are provided by the Edge enablers:

- Interoperability: the edge enablers and APIs provide a unified, common and operator-agnostic framework for seamless access to edge computing resources and infrastructures in support of distributed CAM applications and services.
- Simplified application-to-network interaction: CAM applications and developers can have access to exposed edge/cloud capabilities and dynamically deploy and operate workloads at the edge through developer-friendly APIs that hide the complexity of the underlying telco infrastructures.
- Reduced application latency: the dynamic, on-demand and application-driven deployment and operation of CAM applications with proximity-based workload placement at the edge facilitates near-real-time responsiveness for latency sensitive CAM services.
- Enhanced Service Continuity: when combined with device location and performance enablers and APIs, the edge enablers and APIs unlock the implementation of application-driven service continuity mechanisms with guaranteed performance in high mobility and handover scenarios.
- Optimal Edge Resource Utilization: Allows discovery of the best edge zones based on location, capacity, and performance, ensuring efficient resource allocation.
- Scalability and Elasticity: Supports scaling up or down of application instances dynamically as demand changes, reducing operational costs.
- Automation and Orchestration: Facilitates automated workflows for edge application deployment and management, reducing manual intervention.

2.7. Other enablers/APIs

Roaming

The project targets at the support of seamless mobility in inter-PLMN environments, through two alternative roaming schemes, both targeting a Local BreakOut (LBO) operation i.e., once connected to the visited PLMN (vPLMN), UE user-plane traffic is directed to a local User Plane Function (UPF), without traversing the home PLMN (hPLMN).

HPE-Open5GS solution

In this solution the hPLMN is served by the HPE Aruba Networking Private 5G Core Network (HPE ANP 5GC), physically located within the OTE infrastructure in the Greek trial site[2]. The visited networks served by an Open5GS instance located within NCSRD's infrastructure in the Greek trial site.

Open5GS-Open5GS solution

The Open5GS-Open5GS approach will operate using SEPP. The solution is realized in the Greek site with two Open5GS core deployments, one in the NCSRD PLMN and one in OTE PLMN. The setup supports LBO roaming based on SEPP interface between the two networks. SEPP handles secure communication between the two cores, allowing devices to register, authenticate, and establish sessions across networks.

Native AI zero touch management

Native AI zero touch management: it is responsible for controlling CAM application related parameters with an AI-driven closed-loop (CL). It is realized through the Intent Engine. The Intent Engine module enables users to express service requests in high-level intent representations following the TMF 921 standard. It streamlines network operations and translates user intent into actionable tasks. The actions based on the Intents are handled by the respective Intent Handler. The Intent Engine has been implemented as a stand-alone module. It can be used in order to support a variety of applications/decision engines/closed loops that can configure app and/or network parameters. In order for an interested experimenter (Open Caller) to expand it and use it, he/she should:

- Provide the logic/app that will configure specific parameters (related to the network or not)[3].
- Train the Intent Engine using custom intents, with the help of the consortium.

2.8. Overview of supported APIs

The following table provides an overview of the presented information on the enablers/APIs supported by ENVELOPE. The overview summarizes the value proposition of the project focusing on standards compliance and associating their benefits with example application domains. The table further shows which ENVELOPE trial sites support each API.

[3] For example in the context of ENVELOPE, a helm chart was provided for the Decision Engine (a CL performing malfunction detection) which is used in the Italian trial site. The Intent Engine controls specific parameters of the Decision Engine (malfunction detection sensitivity).

API	Description / Comments	Benefits	CAM Example Use Cases	Other verticals	Trial Site
LF CAMARA Quality-On-Demand API (version 1.0.0)	Exposes programmable interfaces for vertical applications to query and request the enforcement of QoS profiles	Enhanced User Experience: Simplified Network Management Flexibility	Autonomous Driving Cooperative Collision Avoidance Remote Vehicle Control and Teleoperation Emergency and Incident Management	Industrial IoT VR/Gaming: Live Video Streaming Telemedicine	NL, IT, GR
LF CAMARA Device Location - Geofencing APIs (version 0.3.0)	Subscription to location updates of specified devices	Protection of Service Providers Avoid over-the-top implementationoverheads	Geofencing for Fleet Management Location-Based road monitoring Emergency Assistance (eCall Enhancement):	Fraud Prevention in Banking and Financial Services Service Personalization Delivery Services	NL
LF CAMARA Device Location APIs	Devices in an area; Arrival/Departures of devices in an area				IT
LF CAMARA Location Retrieval API (version 0.4.0)	Real-time and on-demand location updates of UEs				GR
Performance metric API	Periodic network performance metrics	SLA Compliance Dynamic Service Adaptation	Predictive Maintenance Data Upload: HD Map Downloads Over-the-Air (OTA) Updates:	Video Streaming Services Cloud Gaming AR/VR Applications	NL
LF CAMARA Connectivity Insights API	DN Performance: notifications about predicted changes of QoS	Proactive Adaptation: Safety & Reliability Enhanced User Experience Efficient Resource Usage	Tele-Operated Driving HD Mapping & Situational Awareness Cooperative Maneuvers & Platooning: Passenger Infotainment & Streaming	Drones for Inspection & Delivery Cloud Gaming Smart Factories & Industrial IoT	GR
LF CAMARA Predictive Connectivity Data API	QoS Sustainability: confidence notifications about sustainability of performance				NL
ETSI MEC-015	ATSSS Multi-connectivity	Fault Tolerance Redundancy & Reliability Aggregated Throughput:	Dynamic offloading Ubiquitous Coverage Data acquisition Cross-Border Mobility	Industrial Robotics and AGVs Smart City Aerial and Maritime Drones Public Safety and Emergency Response	GR
LF CAMARA Edge Cloud – Edge Application Management APIs (version 0.9.3)	i) service/host discovery, ii) edge service orchestration (service registration and instantiation), and iii) service migration (handover).	Interoperability Reduced application latency Scalability and Elasticity	Cooperative safety services Dynamic map creation: Predictive maintenance	Media and cloud gaming eHealth Public safety	NL, IT, GR
LF CAMARA Edge Cloud – Traffic Influence (version 0.9.0)	Traffic re-routing (traffic influence) to the new edge using 3GPP URSP (UE Route Selection Policy)	Reduced application latency	Cooperative safety services Tele-operation Traffic offloading	Media and cloud gaming	NL

3. ENVELOPE Trial Sites

3.1. Italian Trial Site

The Italian trial site offers a facility area where experimenters can test applications of the automotive and other verticals exploiting the new features introduced in B5G networks.

The main focus of the Italian trial site is to experiment with the dynamic configuration of the network to meet varying QoS demands from the end users. A further target of the Italian trial site is the automatic instantiation of applications at the far edge, edge and cloud network segments when triggered by events or by other running applications. Real-time requests of networking resources for on-demand QoS are enabled by an API that interacts with the relevant components of the B5G network. Similarly, an API for the dynamic instantiation of applications will be available on this trial site.

The Italian trial site hosts a B5G network that includes the HPE ANP 5GC, and a Management and Orchestration (MANO) software stack from Nextworks. The RAN equipment consists of two outdoor gNBs from SmaR-TY. Two edge servers complete the set of network-side hardware resources.

The 5GC is a fully virtualized solution that provides the components as virtualized network functions to offer a flexible deployment that can be tailored to the needs of the vertical use cases to be experimented with. The 5G core can support a dynamic reconfiguration to satisfy the on-demand QoS requests from applications. Network slices can be activated through an automatic placement of dedicated edge UPF in the relevant edge nodes.

The MANO solution is based on a multi-edge service orchestrator that operates on the inter-domain infrastructure at the application and at the network level. The edge/cloud continuum orchestrator manages the lifecycle of the applications, while the network orchestrator dynamically configures and re-configures the slices of the 5G core. The logic of the MANO is supported by AI/ML-driven closed-loops that enable the zero-touch automation of network and applications management.

The technical enablers for the Italian trial site include the support of the following APIs:

- ***LF CAMARA Quality on Demand***: to allow dynamic QoS offers to UEs.
- ***LF CAMARA Edge Application Management***: to allow dynamic instantiation of applications on far edge (i.e., UEs), edge and cloud resources.
- ***LF CAMARA Device Location***: to provide information about UE position.

The experimenters will have available as UEs the OnBoard Unit (OBU) developed by LINKS. The OBU includes a 5G network modem and an RTK GNSS receiver. The carrier board of the OBU integrates a GPU to offer advanced computing resources. These 5G-enabled OBUs will be installed on at least one Automated Vehicle prototype that Teoresi makes available for experimenting with CAM applications. The experimentation will be set in public streets. For this reason, the autonomous capabilities are enabled except for the actuation that will be performed by Teoresi driver. The prototype of autonomous vehicle is based on electric microcars (L7) that have been equipped with state-of-the-art sensors such as a stereocamera Leopard, a 120° Solid State LiDAR Robosense M1 and two 360° rotating LiDAR Robosense 32 channels.

3.2. Dutch Trial Site

The Dutch trial site provides a test bed to run CAM and other vertical experiments with a B5G implementation that supports Release 17 functionalities while leveraging new capabilities introduced in B5G networks.

The Dutch trial site features a B5G network with Nokia 5G radios (KPN) and Edge / VMs (KPN). The RAN setup includes 5G-based CCAM vehicles (Siemens/Commsignia), OBUs (Commsignia), and RSUs (Commsignia). It also supports two interconnected cloud zones to run workloads for edge applications.

The main features are as follows:

- Extended B5G core based on Release 17 compliant Open5GS (commercial license from NextEPC).
- Extensions include Network Exposure Function (NEF), Network Data Analytics Function (NWDAF), extended AMF, PCF, and other NFs to support Location Reporting and UE Route Selection Policy (URSP).
- OpenAPI standard Quality on Demand (QoD), Device Location (geofencing), and Performance metrics APIs already implemented and tested in the lab.
- Multi-zone cloud deployment with OpenNebula and Kubernetes.

The technical enablers for the Dutch trial site include transformation functions for the following exposed APIs:

- ***LF CAMARA Quality on Demand***: to allow dynamic QoS offers to UEs.
- ***LF CAMARA Device Location***: to provide geofencing updates about UE position.
- ***LF CAMARA Edge Cloud (Edge Application Management)***: to allow dynamic instantiation of applications on far edge (i.e., UEs), edge and cloud resources.
- ***LF CAMARA Edge Cloud (Traffic Influence)***: Traffic re-routing (traffic influence) to the new edge using 3GPP URSP (UE Route Selection Policy).
- ***LF CAMARA Predictive Connectivity Data:*** to provide a prediction indicating whether the network will be able to support a certain QoS in a short time horizon.
- ***Performance Metrics:*** to enable the delivery of Key Performance Indicators (KPIs) values by the network.

3.3. Greek trial Site

The Greek trial site is a large-scale B5G experimental facility deployed across two interconnected locations in the Athens metropolitan area: the OTE Academy campus and the NCSR Demokritos campus. It supports 3GPP Release 17 functionalities and offers a dual-network setup that includes both a enterprise-grade 5G SA network and a flexible experimental 5G-SA network. More specifically, the Greek trial site offers the following features:

- Integration of multiple 5G Core implementations (Amarisoft, Open5GS, HPE Aruba Networking Private 5G) alongside supporting software like UERANSIM, COTS UEs and programmable UEs.
- Multi-domain cloud platform (OpenNebula installation) spanning across both campuses for efficient and effective management of platform resources.
- Support of prevailing cloud orchestration platforms such as OpenNebula, ProxMox, OpenStack and Kubernetes to manage virtual machines and containerized network functions.
- Support of OpenCAPIF as a common API framework for exposed APIs authorised access and discoverability.
- Open5GS with NEF implementation of MonitoringEvent API is available for exposing UE location
- The commercially available COSMOTE 5G spectrum will be used for the outdoor trials.

The Greek trial site offers a variety of RAN equipment deployments attached to both enterprise-grade and experimental networks such as:

- At NCSRD side:
  - two indoor cells and one outdoor cell are available by the enterpise-grade 5G-SA network.
  - a portable outdoor deployment with AMARI-RAN and a combination of available core network technologies is also supported.
- At OTE side:
  - one indoor cell and one outdoor cell connected to the enterprise grade 5G-SA network,
  - an outdoor cell supporting MOCN (Multi Operator Core Network) configuration and access to both enterprise-grade and experimental networks.

Technical Enablers/Innovations:

- ***ETSI MEC-Compliant ATSSS Multi-connectivity:*** ATSSS-like multi-connectivity enabling parallel network paths (e.g., using both 5G and non-3GPP access networks).
- ***LF CAMARA Connectivity Insights:*** Predictive QoS service to pre-emptively notify applications for potential performance degradation.
- ***LF CAMARA Quality on Demand***: to allow dynamic QoS offers to UEs.
- ***LF CAMARA Device Location***: to provide information about UE position.
- ***Roaming*** between enterprise-grade network and experimental network exhibiting Local Break Out capability.

4. ENVELOPE 2nd Open Call Details

4.1. Scope

OC beneficiaries will have to: (i) make use of at least 1 API and technology enabler developed by the ENVELOPE Consortium; and/or (ii) design, develop, integrate and validate a new standards compliant API/technical enabler, extending this way the functionality of the ENVELOPE platform. In both cases the OC project must demonstrate the associated benefits in development, deployment and performance of a novel vertical service. Priority will be given to services from the automotive vertical domain, but other vertical sectors are eligible and can be selected.

The suggested projects must:

- demonstrate the benefits brought by the employed ENVELOPE platform features (enablers/APIs) in development, deployment and performance of a novel vertical service. The projects have to clearly include a final validation stage for this purpose. The results of the assessment will be supported by a user acceptance and impact assessment survey provided by the ENVELOPE consortium. The survey should only be taken as the basis to the evaluation actions conducted by the beneficiary as beneficiaries have to come up with their own user assessment plan; and
- enhance the impact of the ENVELOPE platform by contributing to the range of use cases that can be supported and the ecosystem that can be created.

The rules for participation and funding in the Open Calls are subject to the General Annexes to Horizon Europe for the Work Programme 2023-2025[4].

- **Feasibility check period:** 10/11/2025 –3/12/2026
- **Submission period:** 4/12/2025 –4/2/2026
- **Beneficiaries**: Beneficiaries are consortia of up to 5 legal entities that can either be SMEs, Universities ,Research Institutes or large industry acting as technology and/or application suppliers for use case execution. At least half of the participants in each consortium have to be for profit organisations/companies. All organizations have to be established in any of EU Member States and their Overseas Countries and Territories (OCT) or Horizon Europe Associated Country. ENVELOPE partners can NOT be involved in the grantees' projects neither their affiliates nor employees – including persons working under employment contract or contract or similar to employment contract and board members. Applications for sub-projects previously funded by an SNS JU project Open Call will be rejected. Applicants must have not participated in a sub-project funded in ENVELOPE Open Call 1.
- **Exclusion:** Grants will not be awarded in the event of: 1. Bankruptcy, winding up, court-administered affairs, creditor arrangements, suspended business activities, or other comparable procedures (including procedures that involve persons who have unlimited liability for the applicant's debts). 2. Non-compliance with social security or tax obligations (including if such noncompliance is committed by persons with unlimited liability for the applicant's debts). 3. Commission of grave professional misconduct.
- **Countries:** Entities must be located in one of the EU Member States, its Overseas Countries and Territories (OCT), or a Horizon Europe Associated Country.
- **Funding Support:** Fixed Lump Sum per sub-project. The maximum funding per beneficiary is **€60.000** and the maximum funding per project is **€300.000**. A total amount of €1,350,000 will be allocated to at least 5 projects selected for OC2.
- **Duration of sub-project:** 6 months
- **Total number of proposals to be selected:** minimum 5 depending on the participants per submitted project.
- **Submissions** are available via https://envelope-project.eu/

4.2. Open Call-2 Timeline

Submissions to the second Open Call will be enabled on 4/12/2025 and will end on 4/02/2026 at 17:00 CET time. Selected projects are expected to start the definition stage on 1/5/2026. Below the dates for the different phases are presented. The opening and closing dates for each phase may change in the event of modifications to the project's

[4] European Commission. Horizon Europe – Work Programme 2023-2025: 13. General Annexes. European Commission Decision C(2025) 2779 of 14 May 2025. Brussels: European Commission, 2023.

schedule.

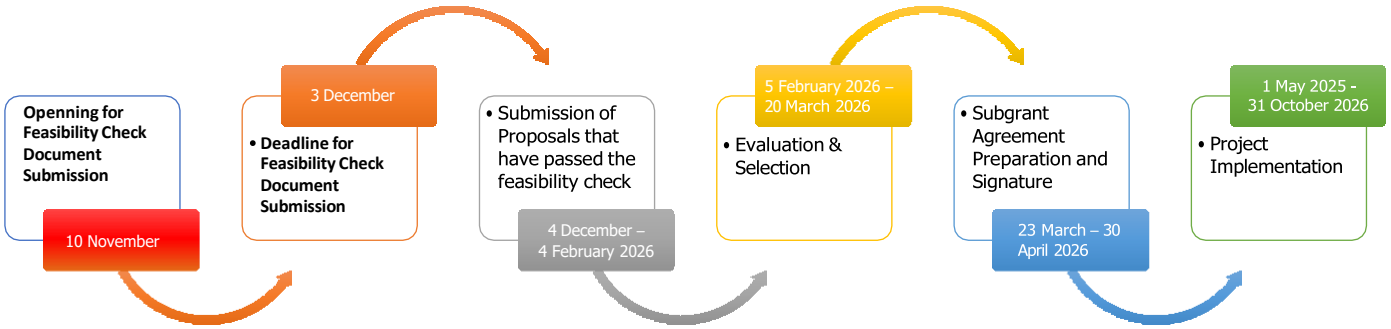

Figure 2: Second Open Call Timeline.

4.3. Open Call submission and selection process

The ENVELOPE Project will apply a selection process (as illustrated in Figure 3) which guarantees the fulfilment of the EC requirements and adhere to Horizon Europe standards with respect to transparency, equal treatment, conflict of interest and confidentiality, in the management of open calls based on the indications established in the 'Horizon Europe - Work Programme 2023 -2025 General Annexes [5]. ENVELOPE Project will apply a funnel process (i.e., selection process by phases) to select the beneficiaries.

The open call proposers are encouraged to contact the ENVELOPE consortium and communicate their intentions to verify the feasibility of the proposals intended for implementation within the project's scope. This will also allow them to receive initial feedback on the planned activities outlined in the proposal. To perform the feasibility check, a description of the planned experiment (up to one page in length) must be sent to

greek-ts@envelope-project.eu -> for applications targeting the Greek Trial site
dutch-ts@envelope-project.eu -> for applications targeting the Dutch Trial site
italian-ts@envelope-project.eu -> for applications targeting the Italian Trial site

using the template provided at https://ENVELOPE.eu/open-calls/.

4.4. Feasibility check criteria

Feasibility Check is a preliminary step in the ENVELOPE Open Calls process. Before applicants submit their full proposals, they are required to send a Feasibility Check Form. This form includes a project summary and details about the requested ENVELOPE resources. The ENVELOPE Open Calls Selection Committee reviews this information to assess the feasibility of the proposed project.

The Feasibility Check is a crucial step to ensure that proposed projects align with the goals and resources available in the ENVELOPE Open Calls. If the project passes the Feasibility Check, applicants are given the green light to proceed with the submission of a full proposal.

Feasibility check submission deadline: 3/12/2025

[5] European Commission. Horizon Europe – Work Programme 2023-2025: 13. General Annexes. European Commission Decision C(2025) 2779 of 14 May 2025. Brussels: European Commission, 2023.

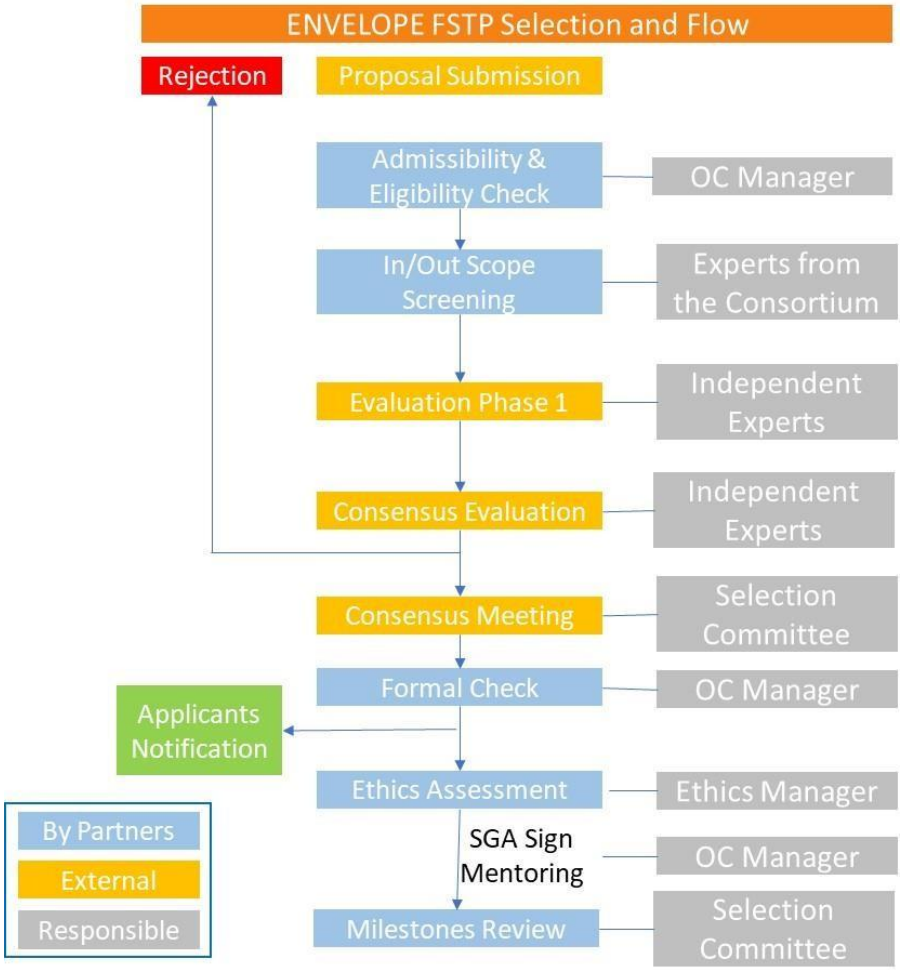

Figure 3: ENVELOPE Selection Process

Specific Criteria:

1. **Compatibility with ENVELOPE Baseline Infrastructure Technologies:** The proposed project will be assessed for compatibility with the ENVELOPE infrastructure technologies e.g., RAT for own devices, virtualization technology., etc.
2. **Adequate Resource Volume Requirements:** The proposed project must not necessitate the allocation of an excessive volume of resources e.g., number of terminal devices, vCPUs/RAM/storage per container, number of container instances, etc.
3. **Feasibility Check Document Formally Completed:** All required information for the feasibility check will be verified to be included in the document.
4. **Functionality Validation:** The proposal will be evaluated for compatibility with the functional features of the ENVELOPE facilities, ensuring the expectations/requirements of the proposed project are in alignment with the ENVELOPE platform capabilities.
5. **Alignment with ENVELOPE Technical Objectives and the Open Call Scope:** The check will assess the alignments of the proposed project with both the technical objectives outlined by ENVELOPE and the scope of the Open Call.
6. **Budget Estimation and Justification:** Accuracy and justification of the budget estimates provided in the proposal.
7. **Risk Assessment:** Identification and assessment of potential risks associated with the proposed project, along with proposed mitigation strategies.
8. **Innovation and Impact:** Level of innovation presented in the proposal and the potential impact of the proposed project.
9. **Project Timeline:** The proposed timeline is feasible and appropriate.

4.5. Admissibility and Eligibility check Criteria

All proposals received will be checked against the **Admissibility Criteria** set out in the *Guide for Applicants* which are as follows:

1. **Submission system**: Proposals need to be submitted through the online ENVELOPE Open Call management system. Proposals submitted by any other means will not be accepted.
2. **Deadline:** Proposals need to be submitted before the calls' Deadline. Applications must be submitted by the closing time and date of the open call. The time recorded by the Open Call management webpage, as submission time of the proposal, will be the official one. Late proposals will not be accepted.
3. **English-language:** English is the official language for the open calls. The proposal must be in English in all its mandatory parts to be admitted.

Additionally, proposals received will be checked against the **Eligibility Check Criteria** set out in the *Guide for Applicants* which are*:*

4. **Type of Activity:** The use of one of the ENVELOPE experimentation facilities is a compulsory requirement for all experimenters.
5. **Type of Third Party:** As described above.
6. Established in an **EU Member State and their Overseas Countries and Territories** or **Associated Country.**

4.6. Independent individual evaluation criteria

After the initial eligibility check, two (2) experienced external evaluators will evaluate each proposal, scoring it based on the following evaluation criteria:

EXCELLENCE:

Excellence will be evaluated according to the following criteria:

1. **Innovation:** Applications are expected to furnish details regarding the extent of novelty present in their field and the extent to which their proposed project differs from existing ones.
2. **Ambition:** Is the proposed work ambitious and goes beyond the state of the art? Does the proposal include novel concepts and approaches, new products, services or business and organisational models?
3. **Soundness of the approach** and credibility of the proposed methodology.

IMPACT:

The Impact will be evaluated according to the following criterion:

1. **Market opportunity**: Applicants are required to exhibit a well-defined understanding of their proposed course of action and the potential marketability of their new or improved product or process, for instance, how it could effectively address a specific problem in a particular field. Additionally, they must *showcase the potential of the ENVELOPE Experimental facility in their respective domains*.
2. **Commercial Strategy and Added Value**: It is required that applicants showcase the value added by their new or improved product or process, which could involve commercializing it to address a systematic issue in a particular industry or procedure rather than a specific problem instance. Moreover, *experimenters must exhibit the extra performance, power, portability, or scalability - at least in two dimensions - achieved by their experiments in the particular domain*.
3. **User[6] Acceptance:** Apart from the technical viability the proposed solution has to exhibit the potential of wide user acceptance. A suitable evaluation process must be set (e.g., questionnaire, interviews) by the applicants to contribute to conclusions on the user's acceptance.
4. **Environmental and social impact**: Applicants must exhibit how their project can contribute to sustainable

[6] The term 'user' refers to the user of the ENVELOPE platform, responsible for the development, deployment and validation of a vertical service

development goals, and other European policies by demonstrating its impact on the environment, society and the economy.

Due to the firm interest of the project on the impact of its contributions to the uptake of the B5G APIs, priority will be given to proposals with promising perspectives after their implementation. As such, the Impact evaluation rate will be assigned additional weight of 1.1 on the total evaluation score.

IMPLEMENTATION:

Quality of the implementation: The quality and the efficiency of the implementation will be evaluated according to the following criteria:

1. **Team:** Applicants are required to demonstrate their skills in management and leadership, including their ability to develop an idea from conceptualization to market, their capacity to execute their plans, and their understanding of the market they intend to enter. The team should consist of individuals with diverse backgrounds and skillsets, and its gender balance should be taken into consideration.
2. **Resources**. Provide evidence of the quality and efficacy of the allocated resources in achieving the proposed objectives and deliverables.

4.7. Evaluation consensus group -criteria

After carrying out the Independent Individual Evaluation, the external experts who have evaluated the proposals will join in a Consensus Group as part of the Selection Committee to agree on a common position, including comments and scores for all evaluated proposals. Consensus Group will specially discuss the cases where there is a significant divergence between the evaluators' scoring. In case no consensus is reached between the evaluators, an additional evaluator will be included to provide an extra evaluation.

4.8. Panel meeting - criteria

The 'Selection Committee' including the 2 external experts who participate in the Independent Evaluation and the internal Ethics Manager (ISI) will decide, at this stage, the 'List of finalists'. Whilst normally the highest ranked proposals will be selected for funding, the Selection Committee might have fair reasons for objecting to a specific third party, like the alignment with ENVELOPE Project goals and scope, the ability to achieve the highest impact possible, as well as the existence of significant ethical concerns or a potential conflict of interest. In this case, the choice may pass to the next-ranked proposal. The exact number of proposals approved will be decided based on the overall quality of the proposals.