

**STF 685 - ESTIMED - 101196630**

**Description of the Action (Part B)**

(SMP STAND Standard)

**Version 6.0**

**21 August 2024**

**PROJECT FACT SHEET**

**STF 685 / [2024-08**]

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| Reference Body | ISG MEC/ oneM2M / TC SmartM2M |
| EC/EFTA Funding | Manpower: 588 510 € Travels (estimated): 50 000 €  Other Costs: 50 000€  **Total Budget (estimated):             688 510 €** |
| Project Duration | **36 months** |
| |  |  |  |  | | --- | --- | --- | --- | | **WP#** | **Task in BC** | **Task names** | **Amount** | | **WP1: Project management and coordination** | T00 | T1.1 Project Setup | 0€ | | T01 | T1.2 Project Management | 39 780€ | | **WP2: Use Cases selection, Deployment Scenarios and Requirements definition** | T02 | T2.1 Use Cases selection and Deployment Scenarios | 23 400€ | | T03 | T2.2 Requirements for MEC and oneM2M | 14 040€ | | T04 | T2.3 Scenario Application / Device Requirements | 14 040€ | | T05 | T2.4 MEC and oneM2M implementation selection | 9 360€ | | **WP3: Standards interworking and core deployment technologies** | T06 | T3.1 oneM2M and MEC interworking and deployments | 32 760€ | | T07 | T3.2 oneM2M and MEC integration solutions | 32 760€ | | T08 | T3.3 oneM2M IoT service continuity across distributed MEC nodes | 32 760€ | | T09 | T3.4 Task off-loading and federated learning using swarm computing | 9 360€ | | T10 | T3.5 oneM2M enhancements Implementation | 25 272€ | | T11 | T3.6 MEC enhancements implementation | 25 272€ | | **WP4: Proof of Concepts** | T12 | T4.1 Application and device simulation development for the PoCs | 33 696€ | | T13 | T4.2 MEC-oneM2M Proofs of concept implementations and Deployment Instructions | 63 180€ | | T14 | T4.3 PoCs Reporting and Recommendations | 63 180€ | | **WP5: Test Scenarios** | T15 | T5.1 Interoperability Test Scenarios | 21 060€ | | T16 | T5.2 Conformance Test Specifications | 28 080€ | | T17 | T5.3 Validation of the Test Specifications | 21 060€ | | **WP6: Dissemination and ecosystem** | T18 | T6.1 Project Promotion and Dissemination | 19 890€ | | T19 | T6.2 Developer Teaching Materials | 39 780€ | | T20 | T6.3 Conferences and Events | 19 890€ | | T21 | T6.4 Hackathons | 19 890€ | | |

# TECHNICAL DESCRIPTION (PART B)

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| **HISTORY OF CHANGES** | | |
| VERSION | PUBLICATION DATE | CHANGE |
| 1.0 | 01.03.2022 | Initial version (new MFF). |
| 2.0 | 01.06.2022 | Consolidation, formatting and layout changes. Tags added. |
| 3.0 | 27.05.2024 | Version submitted to Board for review |
| 4.0 | 04.06.2024 | Addressing Board comments |
| 5.0 | 06.06.204 | Final version for EISMEA Submission |
| 6.0 | 20.08.2024 | Comments addressed following ESR:   * Relevance:   + - Update Part 1.1: Background and general objectives   + to elaborate on how the project implementation will support the EU industrial strategy and challenges identified in the SMP 2023, including support to SMEs. * Quality – Project Design and implementation   + - Update Part 2.3: Outside resources—Provide more detail on the selection panel and selection procedure and ensure that efforts will not be duplicated with other similar EU-funded activities during implementation.     - Update Part 2. 7   + to add a new risk and its own mitigation related to difficulties in finding interested industrial partners |

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| **PROJECT** | |
| **Project name:** | Enabling Standardized IoT deployments in MEC Environments for advanced systems |
| **Project acronym:** | ESTIMED |
| **Project Duration (in months)** | 36 Months |
| **Coordinator contact:** | Jan Ellsberger, ETSI |



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#@PRJ-SUM-PS@# [This document is tagged. Do not delete the tags; they are needed for the processing.]

## PROJECT SUMMARY

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| **Project summary** |
| Internet-of-Things (IoT) and edge computing are key enablers for the digital economy, with high potential in the industrial sector where 5G networks offer low latency and bandwidth efficiency advantages. Moreover, the interoperable design of edge IoT systems can allow clusters of devices and agents to interact with each other to achieve common goals, e.g. using swarm computing techniques. These kinds of deployments require unifying standards from the edge IoT space. This is the objective of ESTIMED project, bringing together open standards in ETSI ISG MEC (Multi-access Edge Computing) and in oneM2M on a horizontal platform for interoperable and scalable IoT systems, that is offered to edge IoT application developers via outreach activities in the ecosystem.  In a June 2023 ETSI White Paper, experts from MEC, oneM2M and SmartM2M described how the ETSI MEC and oneM2M architectures complement each other to enable full data access and interoperability. This included initial ideas on deployment options. The next step is to assess the technical implications and deployment approaches that can be tested via multiple proofs of concepts (PoCs). This will also identify potential standardization gaps to carry forward in ETSI bodies.  The ESTIMED project will bring together user and industry supply side perspectives starting with an assessment of promising use cases and related requirements. From these, the project team will focus on PoC implementations (with software made available open-source) and standardization activities (including interoperability tests) that will enable global scale in the market. Project impact to facilitate adoption will be ensured by alignment with the ecosystem (e.g. MetaOS and open-source communities), by testing application ideas and identify innovative uses through developer hackathons. Finally, the ESTIMED project includes outreach activities such educational tutorials, webinars and publications on professional media and trade-press sites.    ***ESTIMED project concept****: Enabling Standardized IoT deployments in MEC Environments for advanced systems* |

#§PRJ-SUM-PS§# #@REL-EVA-RE@# #@PRJ-OBJ-PO@#

## 1. RELEVANCE

### 1.1 Background and general objectives

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| Rationale The market for Cloud and Edge Computing is one of the top six priorities in the European Union’s 2021 industrial strategy[[1]](#footnote-2). Cloud Computing enables on-demand, flexible and cheaper data handling. However, by 2025, 80% of data generation is expected to occur at the edge, drawing on Internet of Things (IoT) devices and sensors such as industrial machinery, household equipment, wearable electronics and vehicles among others. Edge computing, an evolution of cloud computing, brings application and data hosting from centralized cloud data centres to the network edge, closer to the consumers and the applications that use the data. Edge computing is acknowledged as one of the key pillars for meeting the demanding Key Performance Indicators (KPIs) of 5G and beyond, especially as far as low latency and bandwidth efficiency are concerned.  Besides its broad innovation potential, the IoT is critical for industrial sector businesses and to improve the resilience of asset tracking in extended supply-chains. In the strategic context, IoT is a critical building block for Europe’s Green and Digital transitions. The intersection of IoT with Edge/Cloud Computing will generate new requirements for handling and computing data across industry sectors and different supply-chain participants. Some of these requirements will rely on concepts such as swarm computing of clusters of devices. Swarm computing, also known as swarm intelligence, refers to a collective behaviour observed in decentralized, self-organized systems where individual entities (devices or agents) interact locally with their environment and each other to achieve a common goal or task. In the context of the Internet of Things, swarm computing involves clusters of IoT devices that work collaboratively to solve complex problems or perform tasks more efficiently than a single device or a centralized system. It therefore allows a common way to access data and apps as well as process swapping from one device to another.  Internet-of-Things and edge computing are expected to attract a growing interest from industry. Bringing compute capabilities to the so called “Edge” is also likely to influence future communication systems and enable new services for consumer and business customers. Rather than sending field data to a centralized cloud server, the benefits of edge computing for IoT solutions will reduce latency, optimize bandwidth, enhance data sovereignty, data privacy and security and enable offline operation when the network connections are intermittent or unavailable. Overall, the combination of IoT and edge computing offers a more efficient, responsive, and secure ecosystem, enabling organizations to make the most of their IoT deployments in various industries and use cases.  An important consideration among European goals is to assist Small and Medium Sized Enterprises (SMEs). This implies the need for technical solutions that can begin from a small scale and grow without user organizations having to lock-in to large cloud service providers. This is attainable through standardization which makes it easier for multiple organizations to work together and capitalize on interoperability benefits.  ETSI (European Telecommunications Standards Institute) plays a pivotal role in supporting European industry and SMEs through Industry Specification Groups (ISG), which are designed to be quick and easy to set up, and Specialist Task Forces (STF) whose purpose is to accelerate standardization in areas of strategic importance and in response to urgent market needs. The project make up for ESTIMED draws on representatives from the ETSI-MEC ISG and oneM2M. oneM2M is strategically important in promoting a global and open standard for the IoT in industrial application scenarios. It benefits from significant EU support to promote international ICT standardization in regions such as Brazil and India. The Chair of one of oneM2M's Working Groups is a representative of the European Digital SME Alliance and representatives from elevator maintenance SMEs in Italy recently added IoT data interoperability enhancements to oneM2M's standard. In essence, ETSI’s project initiatives not only mitigate the challenges faced by SMEs but also empower them to thrive in the dynamic telecommunications landscape.  *Building on Established Foundations*  Bringing together European expertise in the IoT and Edge Computing is best achieved through the foundations provided by oneM2M (IoT standardization) and ETSI’s Multi-access Edge Computing (MEC) industry specification group.  oneM2M is the global standards initiative that develops technical specifications for a common Internet of Things (IoT) and Machine to Machine (M2M) Service Layer. oneM2M is creating a horizontal platform for the exchange and sharing of data among applications. It also defines a distributed software layer - similar to an operating system - that facilitates unification of devices by providing a framework for interworking with different technologies. Since it started in August 2012, oneM2M was developed to be an interoperability enabler for the entire IoT and M2M ecosystem by defining a variety of common service functions and interworking technologies.  ETSI ISG MEC (Multi-access Edge Computing) is pioneering open standards on edge computing. MEC offers application developers and content providers cloud-computing capabilities at the edge of the network, in an environment characterized by ultra-low latency and high bandwidth together with real-time access to network information that can be leveraged by applications. ETSI ISG MEC published s 2017 the first set of API specifications for application enablement in an Edge Computing node and for information/capability exposure to applications. Anticipating widescale industry adoption of MEC solutions, the group maintained its focus on Phase 3 activities (2021-2023) that expanded its scope from previous Phase 2 (2018-2020) by considering a heterogeneous cloud ecosystem. This MEC Phase 3 work embraced MEC security enhancements, expanded traditional cloud and NFV Life Cycle Management (LCM) approaches, and mobile or intermittently connected components and consumer-owned cloud resources. Recently ETSI ISG MEC also started a collaboration with CAMARA project (LF Edge). Focused on accelerating growth of the MEC ecosystem, ISG MEC Working Group DECODE (Deployment and ECOsystem Development) continues to manage all MEC STFs, Proof of Concepts (PoCs), Deployment Trials (MDTs), MEC APIs, testing/compliance and Hackathons as well as the MEC ecosystem wiki. DECODE also curates the MEC Sandbox, an environment that allows developers to experience and interact with an implementation of ETSI MEC APIs while testing their own applications. Moreover, a recently opened ETSI MEC Work Item (MEC 046, on “Sensor Sharing”) introduced a new set of APIs that is devoted to the provision of network-connected sensors’ information and data to MEC applications. The target of these MEC APIs is to ease the MEC applications in collecting data from network-connected sensors. The MEC sensor-sharing APIs (which a first version was published in April 2024) provide information about the available sensor types, including details about the types and the related features, and they inform the MEC applications how to connect to the sensors. Furthermore, they can forward data to MEC applications using hardware-independent data formats and interfaces. The information that can be shared, the procedures for requesting the information, and the data will be defined together with the response methods.  One of the goals of ESTIMED project is to focus on MEC IoT scenarios and identify the standard requirements to enable interoperable deployments. These can include architectural enhancements (potentially in both ETSI MEC and oneM2M systems), new APIs and/or updated versions of current APIs. |

### 1.2 Needs analysis and specific objectives

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| Objective of the present proposal This proposal responds to Topic 18 SMP-STAND-2024-ESOS-01-IBA Enabling standardized interoperability and access to data in IoT Edge and swarm computing environments, in the call for Support to Standardisation activities performed by CEN, CENELEC and ETSI.  Improving the interoperability of Internet of Things (IoT) in the new edge-cloud paradigm, especially in the context of emerging concepts like swarm computing of clusters of devices, requires a combination of standardized protocols, data formats, and middleware solutions. Here are some strategies to achieve better interoperability.   1. Standardized Protocols and Data Formats: To enable seamless communication and data exchange between IoT devices, edge nodes, and cloud services, it's crucial to adopt widely accepted and standardized communication protocols and data formats. Examples of commonly used IoT protocols include MQTT, CoAP, and AMQP, while JSON and XML are prevalent data formats. Ensuring that devices and services support these standards enhances compatibility. 2. API-driven Development: Emphasize the use of Application Programming Interfaces (APIs) to provide a common way to access data and applications across different devices and services. By following RESTful API design principles, developers can create consistent interfaces that allow easy integration and interaction. 3. Edge Middleware: Implement edge middleware solutions that handle communication, data pre-processing, and protocol translation at the edge of the network. These middleware components act as intermediaries between devices and cloud services, ensuring that data from various sources can be efficiently processed and exchanged. 4. Edge-to-Cloud Data Syncing: Establish mechanisms for seamless data synchronization between edge devices and the cloud. This ensures that data remains consistent across the entire network and allows for efficient data aggregation, analysis, and visualization. 5. Device Swapping and Load Balancing: Swarm computing and cluster-based IoT solutions require the ability to distribute tasks and processing across devices dynamically. Develop algorithms and mechanisms for load balancing and task migration to optimize resource utilization and ensure smooth operation when devices join or leave the cluster. 6. Edge-Cloud Orchestration: Create a centralized orchestration layer that manages and coordinates the activities of edge devices and cloud resources. This layer can handle task allocation, migration, and resource management to achieve efficient and effective utilization of computing resources. 7. Identity and Security: Implement robust identity management and security mechanisms to ensure that only authorized devices and services can access and interact with data and applications. This helps to prevent unauthorized access and data breaches, fostering trust and interoperability in the ecosystem. 8. Open-Source Collaboration: Encourage collaboration and contributions from the open-source community to develop and enhance interoperable IoT frameworks, libraries, and tools. Open-source initiatives can drive innovation, foster standardization, and accelerate the adoption of interoperable solutions. 9. Industry Standards and Consortia: Engage with industry standards organizations and IoT consortia that focus on interoperability and compatibility. Participation in such groups can help shape best practices, drive the development of interoperable technologies, and ensure alignment with industry trends.   By adopting these strategies, the IoT community can pave the way for a more connected and interoperable edge-cloud ecosystem, where devices and services seamlessly work together to deliver efficient and intelligent IoT solutions.  In June 2023, ETSI has published a White Paper “Enabling Multi-access Edge Computing in Internet-of-Things: how to deploy ETSI MEC and oneM2M”, contributed by experts from oneM2M, SmartM2M and ISG MEC. The paper aims to bring together Internet-of-Things and edge computing standardization efforts from ETSI MEC and oneM2M groups in order to provide a comprehensive view on what is available in the standards. It describes how the two architectures complement each other and some overall ideas on how to deploy oneM2M in a MEC environment.  The conclusion of this White Paper is that both standards oneM2M and ETSI MEC match the requirements to reach full data access and interoperability, but now standardization efforts need to be improved, to support effective and highly profitable deployments for MEC-based IoT applications.  Following the outcome of this joint white paper, the project proposal aims at answering the required standardization effort. The integration of these two architectures well-recognized and adopted worldwide, enhances the benefits of each of them, making them more attractive for edge deployment of IoT systems. The combination of oneM2M and ETSI ISG MEC frameworks also enables the IoT ecosystem to benefit from some of the key 5G technologies that allow the deployment of IoT applications tailored according to the end users’ requirements.  The proposed action will bring a common effort to build in a timely manner standardization work to address the challenges raised by the Single Market Programme 2023 described in Topics#9 and to improve the interoperability of the Internet of things fostered by the strength of new edge-cloud paradigms and emerging concepts.  It should be noted that the ESTIMED project proposal is running on a timeframe of 36 months (instead of 24 months indicated in the call). There are multiple reasons for that choice, explained in the following:   * Contributions to 3 standardization committees require more time (MEC, SmartM2M and oneM2M). This include and physiological timing needed for the standardization alignment (that should be formally compliant, e.g. via LS exchanges) across multiple bodies. Also, the complexity of standard interworking requires two stages approach in ETSI MEC (starting GR MEC, and then identifying the needed normative changes in subsequent GS MEC), finally, foreseeing an impact and pertinent transfer on oneM2M specifications. * Definition of interoperability and conformance testing needs mature specifications and can only be performed when the work on standardization is complete. * The ETSI Call for Experts procedure (including the time needed to select the project personnel and sign the related contracts, in order establish the project team, as ready and operational) requires from 2 to 3 months in total. So, practically the ESTIMED project can start afterwards (note the team selection and hiring procedure, the project won’t consume any EU budget, but simply require to shift the actual start date of the ESTIMED project technical activities). * Also, from a Project Management perspective, given the complexity of the project, to minimize risks, having a longer timeframe is in general helping to have margins and degree of freedom, e.g. in case of WI delays coming from the standardization processes (note that this is an exogenous factor, i.e. not in the power of project proposers, for the same nature of standardization). * Last but definitely the least, project impact (including ecosystem and developers engagement) can be maximized by considering a 3-years project lifetime. For example, the annual conferences, Hackathons and dissemination events, will be critical to fine tune the project work based on ecosystem feedback (e.g. developer teams using the PoCs at the Hackathons) and further maximize the project visibility in the ecosystem, other than the impact on industry and stakeholders. |

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### 1.3 Complementarity with other actions and innovation

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| The ESTIMED project operates in an ecosystem of existing solutions and standards, and as such it plans to exploit the many synergies and opportunities deriving from a collaboration with key initiatives, with the goal to maximize the project impact (see also section 3). In the following, we present these various activities (from standards and innovation projects). As underlying principle for ESTIMED project, the aim is not to “reinvent the wheel” but to leverage the best practices, and assets produced by other players, and collaborate as much as possible, for the joint goal to kick-off the edge IoT market, with special emphasis on European market, and at the same time by taking care of global interoperability for wider adoption.  The standardisation of the innovative field of IoT interworking, data interoperability, Semantic Interoperability in ETSI is mainly based on:   * the oneM2M IoT Service enablement Layer which acts as an interoperability and communication framework within and across the different solutions existing in the various vertical IoT ecosystems. oneM2M is a global initiative leaded by ETSI in worldwide collaboration with the major standard organisation for the joint development of IoT open standards. * SAREF, a common reference ontology and a methodology to determine the commonalities between existing ontologies and to create common ontology patterns. SAREF was initially identified in a European Commission study on Smart Appliances reference ontology, the ancestor of SAREF/Smart Applications REFerence ontology solution. * NGSI-LD is an ETSI-standardized API for managing context information through a structured, linked data format, fostering interoperability for smart applications. It facilitates operations like creating, updating, and subscribing to data across various entities, utilizing linked data to enhance the connectivity and reuse of information in smart environments. NGSI-LD emphasizes seamless data integration and dynamic relationship establishment within the Internet of Things (IoT) ecosystems.   ESTIMED project team (also with the guidance of the Steering Committee) is fully committed in building upon the work done so far by oneM2M in this space.  The standardisation of the innovative field of Edge Computing in ETSI is mainly based on:   * The ETSI MEC (Multi-access Edge Computing) Platform is a framework that brings computational resources closer to the user by integrating cloud computing capabilities at the network edge. This platform is complemented by a suite of service APIs designed to enable edge applications to leverage network information and services efficiently, ensuring lower latency and improved performance. The related service APIs facilitate diverse functions, such as location tracking and radio network information, crucial for the deployment of responsive edge-based applications and services. * The MEC sandbox as emulating tool to help the software community, is a testing environment that provides developers with the necessary tools and network conditions to create, experiment, and validate applications in a simulated edge computing ecosystem. It emulates the characteristics of edge computing, such as low latency and high bandwidth, to help developers understand how their applications will perform in a real-world MEC deployment. * The NFV architecture, is a network architecture concept that uses IT virtualization technologies to virtualize entire classes of network node functions into building blocks that may connect, or chain together, to create communication services. NFV decouples network functions, such as firewalls, load balancers, and intrusion detection systems, from dedicated hardware, allowing them to run in software on standardized hardware platforms. The architecture is designed to increase network flexibility and agility, reduce equipment costs, and accelerate the deployment of new network services. * OSM (Open Source MANO) is an ETSI-hosted project that delivers an open-source NFV Management and Orchestration (MANO) stack, which provides a production-quality MANO infrastructure that meets the requirements of commercial NFV networks. The OSM Open MANO Orchestrator is a component within this stack, responsible for the orchestration and lifecycle management of network services and virtual network functions. It enables users to manage network services that combine virtual and physical network functions, providing an operational framework for managing instances across virtualized infrastructure, such as VMs and containers, in a scalable and vendor-neutral manner.   All the above ETSI activities are also a key asset for the ESTIMED project, in which organization the leading SDO is ETSI MEC (in fact, the entire MEC work was indeed based on NFV definitions). The project is fully committed in building upon the work done so far by ETSI MEC in this space, and produce the needed enhancements to enable interoperable and standardised edge IoT deployments.  Other relevant standardisation efforts in this space are also conducted by ISO and IEC.  ITU-T's Study Group (SG) 11, Intelligent Edge Computing (IEC), is actively developing standards for intelligent edge computing. This includes developing specifications for signalling requirements and architectures necessary for edge computing, along with related standards for cloud computing, big data, and big data-based networking. The ITU-T Q.5001 standard, developed by IEC, addresses the networking and data processing capabilities needed to implement artificial intelligence in edge computing. It defines use cases and requirements for mission-critical services that rely on edge computing for reliable data collection, immediate data analysis, and response. Additionally, IEC is proposing standards for intelligent edge networking and ambient intelligence analysis capabilities, which are expected to evolve into swarm computing technologies in the future.  ISO/IEC JTC1 SC 38 defines Edge Computing as a pivotal technology that extends the scope of traditional cloud computing into applications requiring real-time, low-latency processing, such as smart factories, autonomous vehicles, drones, and virtual/augmented reality. The TR 23188 "Edge Computing Landscape" developed by ISO/IEC outlines fundamental concepts and structures of edge computing and its relationship with existing cloud standards, making it a useful standard for integrating edge computing from a traditional cloud perspective. Additionally, ISO/IEC JTC1 SC 42's TR 30164 addresses the concepts, technologies, functions, and deployment of edge computing from an IoT perspective, presenting use cases like smart elevators, intelligent transport systems, and smart factories. SC 42 focuses on applying AI and big data across various applications, developing standards related to reference models for IoT data and AI-enabled computing technologies.  The table below lists several standard deliverables related to Edge computing and IoT from ITU-T and ISO/IEC JTC1.   |  |  | | --- | --- | | Standards # | Title | | ITU-T Q.5001 | Signalling requirements and architecture of intelligent edge computing | | ITU-T Y.3500 | Information technology – Cloud computing – overview and vocabulary | | ITU-T Y.3600 | Cloud computing based requirements and capabilities | | ISO/IEC TR 23188 | Cloud computing – Edge computing landscape | | ISO/IEC DIS 5140 | Concepts for multi-cloud and the use of multiple cloud services | | ISO/IEC TR30164 | Internet of Things – Edge computing |   ITU-T and ISO/IEC recognize the importance of edge computing and IoT technologies, developing standards to provide use cases and reference models applicable across various industries.  However, these reference models defined by ITU-T and ISO/IEC offer only guideline-level information, presenting limitations in practical service development, scalability, and compatibility with products from different manufacturers. Thus, there is a crucial need for the development of global standards that facilitate genuine integration and interworking between IoT and edge platforms. Additionally, practical validation of these standards through interoperability and conformance tests, open sources, and hackathons is essential for the widespread adoption of these technologies. The goal of ESTIMED is to progress on standardization efforts, by taking into account the existing specifications, to provide actionable specifications for real-world edge IoT deployments. The project will align with these bodies, also via LS exchanges, by ensuring proper communication and coherence of standards, in order to avoid confusion and market fragmentation.  ESTIMED project is also planning to leverage the many initiatives (mostly from EU projects and communities) available in the ecosystem. In particular, due to an always growing popularity of open-source communities for innovators and developers (which is especially true when it comes to edge and IoT devices, where the attention to costs of deployments is critical, due to limited margins), Eclipse Foundation is a very relevant community for the project activities, where in particular ESTIMED plans to align with its EU-based legal entity Eclipse Foundation Europe.  Eclipse Foundation Europe GmbH is the German subsidiary of the Eclipse Foundation AISBL established in Belgium since January 2021 to help, support and develop the large and growing Eclipse open-source community in Europe. Eclipse is a global open-source community with over 415+ projects, more than 2000+ committers, over 350+ member organisations supporting the operation of the Foundation, and with an estimated 18 million active developers using Eclipse technologies. Half of the Eclipse user community is located in Europe, and more than half of the member companies are based in Europe.  Eclipse Foundation Europe staff members are specialised in developing the European Eclipse Ecosystem, and helping research projects implement open innovation and disseminate their results as Open-Source projects. Since 2014, they have participated in 29 European projects such as to different projects (Horizon 2020, Horizon Europe, ITEA3, ITEA4, BMBF and BMWi).  More recently, they participated in 3 projects concerning this call:   * [NEMO](https://meta-os.eu/) (HEU, GA 101070118, 2022 - 2025): NEMO aims to establish itself as the game changer of AIoT-Edge-Cloud Continuum by introducing an open source, flexible, adaptable, cybersecure and multi-technology **meta-Operating System**, sustainable during and after the end of the project.   Eclipse leads Liaison with Clusters and Open-Source communities. * [NEPHELE](https://nephele-project.eu/) (HEU, GA 101070487, 2022 - 2025): The vision of NEPHELE is to enable the efficient, reliable and secure end-to-end orchestration of hyper-distributed applications over programmable infrastructure that is spanning across the compute continuum from Cloud-to-Edge-to-IoT, removing existing openness and interoperability barriers in the convergence of IoT technologies against cloud and edge computing orchestration platforms.   Eclipse leads Open-Source Ecosystem, Community Building and Sustainability.   * [OpenContinuum-CSA](https://eucloudedgeiot.eu/task-forces/coordination-and-support/#opencontinuum) (HEU, GA 101070030, 2022 - 2024): OpenContinuum addresses the coordination and support of the Cloud-Edge-IoT domain, with a specific thematic focus on the supply-side of the computing continuum landscape. An integrated, open ecosystem built around Open Source, Open Standards, and the effective blending of the two vibrant European communities of Cloud Computing and Internet of Things (IoT) is the key enabler for European prosperity in the Cloud-Edge-IoT domain and more widely in the data economy.   OpenContinuum is one of 3 CSAs behind the [EUCloudEdgeIoT.eu](http://eucloudedgeiot.eu) cluster.  Eclipse leads the Open-Source task force.  In this perspective, the role of Eclipse in OpenContinuum is key for ESTIMED project, as it is focused on the strategy for European digital autonomy in edge-to-cloud (through Open Source) and contributes to the definition of a common open architecture for the computing continuum. On its side, ESTIMED standardization activities will take into account these initiatives, as working solutions inspiring standards (as it should be always the case, and not viceversa). Of course, those IoT solutions from Open-Source will need to be enhanced in ESTIMED project, to obtain the needed interoperability in MEC standardized deployments, but certainly a complementarity with these initiatives is key. Moreover, the aim of ESTIMED is to leverage also the related implementations coming from this cluster, such as the definition of the so-called meta-Operating System (meta-OS) in NEMO project. These implementations will be evaluated in the view properly feeding the PoCs that will be used in ESTIMED events and Hackathons (planned to be jointly organized with Eclipse leaders).  The Eclipse Foundation is also home to Eclipse IoT, the largest collection of open-source IoT building blocks currently available. Eclipse IoT components span the entire Edge-to-Cloud continuum, from constrained devices to edge nodes to IoT Cloud platforms. In particular, Eclipse IoT possesses implementations of all the most popular IoT and industrial automation protocols such as CoAP (Eclipse Californium), LwM2M (Eclipse Leshan, Eclipse Wakaama), MQTT (Eclipse Amlen, Eclipse Mosquitto, Eclipse Paho), oneM2M (Eclipse OM2M), and OPC UA (Eclipse Milo). The Eclipse Foundation also hosts innovative protocols that were initiated by its member community, such as Eclipse Zenoh and Sparkplug™. Overall, the Eclipse Foundation has over 45 projects in the embedded and IoT domain. Recently, they were joined by Eclipse ThreadX, the first open-source real-time operating system certified for safety-critical applications.  In summary, given the importance of the above initiatives, ESTIMED project plans to leverage the presence of Eclipse leaders in the Steering Committee, to maximise the project impact. The goal is not to duplicate these activities, but really to complement with relevant standards and meaningful implementation of PoCs as reference for developers. Indeed, these PoC implementations need to leverage existing solutions also from open source projects (since the goal is not to reinvent the wheel), but the role of ESTIMED as key stakeholder in the space of international standards is critical for steering the right implementation design guidelines and promote a really open and interoperable environment, that will definitely help companies (and especially SMEs and developers) to ramp up with edge IoT deployments. As such, ESTIMED project will collaborate with Eclipse and foster synergies with MetaOS cluster and Edge IoT initiatives with developers’ communities. Moreover, ETSI is committed to hire Special Task Force members based on requirements which will include awareness on these initiatives, to ensure practical execution of these strategic collaborations during ESTIMED project lifetime. |

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## 2. QUALITY

### 2.1 Concept and methodology

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| ESTIMED project aims at providing a comprehensive set of international standards and recommendations, together with practical implementation guidelines and reference software for developers for deployable edge IoT systems in MEC environments. The figure below shows the ESTIMED concept, where the various activities are linked together for the achievement of the projet goal. In particular, starting from the selection of use cases for joint edge IoT scenarios, the project is deriving key requirements for MEC and oneM2M deployments, where the four deployment options are considered (leveraging the analysis conducted in the ETSI White paper published in 2023), as they are all in principle relevant in the market, and have different technical and business impacts:   * Option A: deploy the oneM2M as a cloud, MEC as an edge * Option B: oneM2M and MEC as an edge with the different physical node * Option C: oneM2M and MEC in the same physical edge node * Option D: oneM2M and MEC are tightly coupled in the same edge node   These above deployment options will be considered in ESTIMED to trigger the definition of specific “Use Cases and Requirements” for the entire project (textbox in the figure below). This set of four options will act as a reference to explore the impacts of the various integration levels, not only by deriving the required standard enhancements (textbox “Reports and Standards” in the figure below) but also as a reference for the implementation of the respective four project Proof-of-Concepts (textbox “PoC implementations”). Both standards and PoC will be linked together, as from one hand reports/deliverables will act as guideline for PoC implementations, wherease PoCs can provide feedback to standards, e.g. for bug fixing and corrections/improvements bvased on actual implementation (as normally happens e.g. according to the MEC PoC framework in ETSI). Such a complex integration of standards (and related interoperability tests) with PoC implementations will properly feed the organization of “Impactful Events” (textbox in the figure below), indeed with the goal to stimulate market adoption, both for application design and interoperability testing purposes. In fact, developers communities and technology companies need to be involved, to stimulate global adoption and maximize ESTIMED project impact. This plan includes both realising developers and education programs, and engaging with ecosystem and other projects (as depicted respectively in the two textboxes of the figure below). Also these impactful events will serve as relevant feedback for fine tuning standardization, based on the insights from Hackathons and Testing events, where e.g. PoCs, standards and APIs can be corrected in case of bugs spotted during the reallife implementations, and also where e.g. testing procedures can be cross-validated by the actual interoperability test executions (as it happened so far in ETSI).    The ESTIMED project is thus committed to put in practice the above concept, combining the technical expertise of project team (essential for the internal implementations) with the leadership of international standards, and also complemented by coordinated actions with the ecosystem, including both industrial players and developers, to maximize project impact.  The overall project approach, depicted in the figure below, consists in a three-phases project, where in Phase 1 (the first year) the ESTIMED activities (starting from the assumptions from the ETSI WP and the present project proposal) will produce a set of Requirements and ESTIMED system design and specifications, relevant for the ESTIMED Phase 2, which in the second year will produce more mature PoCs implementations (also based on Hackathons results), and standard reports specifications. The last year, ETSI MEC Phase 3 will deliver the final standards (and related interoperability tests) together with final PoC implementations (also with open-source software).    The final outcome of the project will be to deliver integrated standards and deployments, with impact on ecosystem of industry and developers, with benefits for the edge IoT market also after project lifetime. |

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### 2.2 Consortium set-up

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| Not Applicable for ETSI |

### 2.3 Project teams, staff and experts

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| Name and function | Organisation | Role/tasks/professional profile and expertise |
| Léa Belloulou  Head of Funded Activities | ETSI | Head of ETSI funded Projects planning and control   * Management of the project costs and funding * Responsible for the Reporting to ETSI Management and EC/EFTA. * Management of audit processes on Funded projects * Management of contractual aspects * Monitoring of the administrative and financial tasks of the projects * Validation of milestones, payments |
| Patrick Guillemin  Technical Officer | ETSI | ETSI Technical officer for the Technical Committee TC SmartM2M   * Act as prime ETSI Secretariat contact for the standardization activity. * Supervise the operation of the standardization activity under the relevant Directives, monitor progress of work programme. * Advise the group on the application of the relevant directives, drafting rules, and common best practice. * Ensure that deliverables are fit for purpose, and in line with the relevant directives, drafting rules and quality recommendations, and accompany them through the drafting and publication phases. * Act as secretary where appropriate, provide official reports of the group’s meetings, highlighting actions and decisions. * Ensure that decisions, actions, approval of new work items and deliverables are properly recorded and communicated within the Secretariat. * Monitor activities of other relevant groups, both inside and outside of ETSI and advise of relevant activities as required. * Take appropriate actions to develop and maintain personal expertise in the relevant technical areas, and associated regulatory and market affairs |
| Chantal Bonardi  Technical Officer | ETSI | ETSI Technical officer for the ISG MEC   * Act as prime ETSI Secretariat contact for the standardization activity. * Supervise the operation of the standardization activity under the relevant Directives, monitor progress of work programme. * Advise the group on the application of the relevant directives, drafting rules, and common best practice. * Ensure that deliverables are fit for purpose, and in line with the relevant directives, drafting rules and quality recommendations, and accompany them through the drafting and publication phases. * Act as secretary where appropriate, provide official reports of the group’s meetings, highlighting actions and decisions. * Ensure that decisions, actions, approval of new work items and deliverables are properly recorded and communicated within the Secretariat. * Monitor activities of other relevant groups, both inside and outside of ETSI and advise of relevant activities as required. * Take appropriate actions to develop and maintain personal expertise in the relevant technical areas, and associated regulatory and market affairs |
| Laurent Velez  Director, Centre for Testing and Interoperability (CTI) | ETSI | Director of ETSI’s Centre for Testing and Interoperability, responsible for ETSI’s interoperability event programme and activities, leading a team of 6 experts in testing and interoperability. |
| Dario Sabella, ISG MEC Chair | ETSI ISG MEC chair | Chair of ETSI Industry Specification Group (ISG MEC)   * ISG MEC will work in collaboration with the selected experts, monitor progress and give technical directions for the deliverables * Highlighting deliverables of the ISG and related standardization groups to the group of Experts   Notify the experts with the ongoing work |
| Enrico Scarrone, SmartM2M chair | ETSI TC SmartM2M chair | Chair of ETSI Technical Committee SmartM2M  · TC SmartM2M will work in collaboration with the selected experts, monitor progress and give technical directions for the deliverables  · Highlighting deliverables of the TC and related standardization groups to the group of Experts  Notify the experts with the ongoing work |
| Roland Hechwartner | oneM2M chair | Chair of oneM2M   * oneM2M will work in collaboration with the selected experts, monitor progress and give technical directions for the deliverables * Highlighting deliverables of oneM2M and related standardization groups to the group of Experts   Notify the experts with the ongoing work |

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| **Outside resources (subcontracting, seconded staff, etc)** |
| According to ETSI Technical working procedure on the selection of the service providers, ETSI will issue a call for expertise to get the necessary skills and resources as described below.  The ETSI Staff will be integrated to guarantee the proper support and management.  The selection panel will comprise ETSI Secretariat (Head of Funded Activities, ETSI Technical Officers), and the Chairs of the three involved standard groups (i.e. ETSI ISG MEC Chair, ETSI TC SmartM2M Chair and oneM2M Chair). They will review the potentials candidates and select those who best meet the workplan, including the assignment of the project leader.  The review of the applicant will be based on multiple criteria such as technical competencies, skills, working experience, proposed contribution to tasks & related costs, the explanation of the parts of the tasks and the scope that the service provider will cover, the way to achieve the objectives in this Project and proposed approach/methodology for the execution of the tasks, the approach to the management of the quality, the approach to the management of the risks and their mitigation, the implementation schedule, etc.  ETSI Secretariat will ensure during implementation that there is no duplication of efforts with any other EU Grant, thus avoiding any issue with double funding.  A project manager will be appointed from one of the Service Providers and will be responsible for coordinating the execution of the tasks assigned to the individual Service Providers, according to the project requirements and following the technical direction given by ETSI TC SmartM2M and ISG MEC.  The project Manager will possess project management experience, report-writing skills, experience of consensus building, presentations skills, experience of working in an international environment, and in liaising with other international organisations.  C:\Users\kozubal\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\CCC5FF89.tmp  The activity in this proposal foresees the need for up to 10 experts according to the following required competences:   * Knowledge about the global IoT standardisation landscape and ecosystem * Knowledge about the global Edge/Cloud/Swarm Computing standardisation landscape and ecosystem (e.g. MetaOS cluster and related projects) * Expert knowledge of ETSI SmartM2M and oneM2M standards. * Expert knowledge of ETSI ISG MEC specifications * Expert knowledge of 3GPP specifications (4G/5G) * Software development skills * Capability of collaborating in teams, mostly online, while carrying out independent work to achieve the common results. * Proficient in English writing. * Leadership and project management for the STF Leader position.   Using the ETSI-defined call for expertise and contractor selection process outlined above, the selected experts will begin the project with the preparatory meeting at the end of the second month of the project (M2). |

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### 2.4 Consortium management and decision-making

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| Not applicable for ETSI |

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### 2.5 Project management, quality assurance and monitoring and evaluation strategy

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| ETSI will be responsible for overseeing the project activities, and for the needed relations with EISMEA and EC representatives. As responsible of ESTIMED project management, ETSI will also oversee the project activities with the help of steering committee members, as relevant experts and stakeholders from the ecosystem. For these reasons, an STF Steering Committee (STF-SC) will be set up by ISG MEC (i.e. the leading SDO in this project) in order to steer the STF activities, verify its progresses in periodic meetings and guide the STF. An anticipation of the possible STF-SC members composition is as follows:   * + ISG **MEC** Chair and Vice-Chairs   + TC **SmartM2M** Chair and Vice-Chairs,   + **oneM2M** Chair and Vice-Chairs   + ETSI Secretariat **IoT Support Officer** and EC/ETFA Relations Manager,   + STF Leader (when selected),   + ETSI TC SmartM2M liaison officer to the ETSI **oneM2M** Partnership Project**.**   + **Eclipse Foundation** representatives (as stakeholders from **MetaOS** project)     - Frédéric Desbiens (Eclipse), Senior Manager, Embedded and IoT Programs     - Dr. Philippe Krief (Eclipse), Director, Research Programs   + Other interested stakeholders from **industry** and **ecosystem**     - Kai Hackbarth (**Bosch**), Head of Products and Solutions Europe     - Antonio Kung (Trialog), chair **AIOTI** WG Standardization, Liaison officer AIOTI to JTC 1/SC 41, and involvement in ISO/IEC, ISO, ITU-T, CEN CENELEC.   ETSI will perform the project work by the creation of an ETSI Specialist Task Force (STF), reporting the milestones to the ISG MEC and the ETSI SmartM2M Technical Committee (TC SmartM2M), according to their planned meetings and additional dates agreed by the TGs officials. ISG MEC will lead an active role in technical guidance for the ESTIMED STF, who will be actually contributing to this work.  The figure below shows the various entities involved in the ESTIMED project organization, and the relations between them and toward the EISMEA representatives.    Duties of the ESTIMED STF:   * The STF will report regularly to the STF-SC and at TC SmartM2M and ISG MEC meetings to consult on the latest advances. * The STF leader will organise periodic internal meetings of the STF to share and review the latest content produced. * The technical content of each of the provided deliverables (draft Technical Reports/Technical Specifications) will be evaluated by ETSI TC SmartM2M at regular and ad-hoc meetings and reported a minimum of 2 times in the ETSI TC SmartM2M mailing list/meeting collecting comments and suggestions, possibly using the remote consensus ETSI Portal tool. The SmartM2M approval will take place preferably at the meetings of TC SmartM2M (Remote or F2F).   The STF will organise reviews of its draft documents by the stakeholders, in addition to the TC SmartM2M and ISG MEC members.  A member of the STF will be selected by ETSI to act as STF Leader, and will be the ESTIMED project coordinator (COO), practically reporting to ETSI on project achievements, and attending the meetings in ETSI MEC and oneM2M to report on the progress of ESTIMED project developments. The STF Leader will be also part of the STF-SC.  Performance indicators will be used to check the effectiveness and efficiency of the STF work, the level of stakeholder engagement and dissemination activities. Depending on your needs for project management, you can use the following text and table:  “*A combination of frequent on-line progress meetings, face-to-face meetings and internal progress reports will create a clear view of the progress. Over and above the management of individual WPs, a lean, yet rigorous management framework linking all project components will be implemented.*  *From previous projects in ETSI, a formal internal review process has proven to be the most effective way to ensure a high-quality orientation throughout the project. The main instrument will be the peer-review by at least two technical experts from within the project, the formal check of the deliverables by the ETSI secretariat and a final check by the Coordinator and WP1 leader.*  *In the initial phase the WP1 leader takes care for a harmonised peer-review process, i.e., the evaluation against defined scientific criteria and quality standards as proposed in the table below.”*   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | *Criteria* | *Definitely* | *Satisfactorily* | *Somewhat* | *Not at all* | *Not applicable* | | *Deliverable matches the expected requirements?* |  |  |  |  |  | | *Objectives are clear and in line with the planned activities?* |  |  |  |  |  | | *Issues at project level are properly treated?* |  |  |  |  |  | | *Author responds to readers’ needs?* |  |  |  |  |  | | *Technical approaches used are appropriate?* |  |  |  |  |  | | *Content is well organised?* |  |  |  |  |  | | *Issues raised are relevant?* |  |  |  |  |  | | *Contents contribute to the state of the art?* |  |  |  |  |  | | *Conclusions (if any) are valid?* |  |  |  |  |  | | *Deliverable is complete (no major parts missing)?* |  |  |  |  |  | | *Deliverable is formally correct?* |  |  |  |  |  | |

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### 2.6 Cost effectiveness and financial management

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| ETSI Secretariat does not have technical experts as staff thus all the EC/EFTA funded projects are subcontracted.  For reasons linked to French social Regulations and to avoid a risk of subordinate relationship that could trigger negative consequences for ETSI, on advice of its lawyers, ETSI has abandoned the principle of a daily rate to contract its experts and ETSI works now under the principle of service contracts. The contractor is bound by delivering the agreed service for the price determined. It is the responsibility of the service provider to make available the necessary experts to deliver the expected service. The company contracted may allocate different experts of different seniority and expertise level, having each a different daily rate.  Each subcontractor is allocated to specific tasks with an expected level of contribution. The financial resources allocated to the subcontractor are calculated on this principle.  At the start of the project, ETSI develops a baseline cost plan. It is calculated with the cost of the tasks and the scheduled progress of task at each milestone cut-off date. This baseline cost plan provides the costs at each milestone cut-off date.  The milestone payment schedule for each subcontractor is then calculated considering the baseline cost plan and the expected level of contribution. The milestone payment schedule is contractual.  The subcontractors’ payments are submitted to the validation of the project milestones. The TC and ETSI proceed to the validation of the milestone.  As the number of person days and the maximum daily rates are requested in the part 0 Introduction, of the EISMEA Call for Proposals, and taking into account the needed expertise, the maximum daily rate is assumed to be 650 EUR and is based on the market price.  The estimated effort for all work packages amount to approximately 905,4 days of work spread out over a period of 36 months.  Travels are strongly reduced, as teleconferences will be the most common tool for organising technical meetings. Travels are accounted to allow for face-to-face participation in the ETSI Technical Committee and for coordination.  ETSI Secretariat ensures that neither the project as a whole nor any part of it have benefited from any other EU Grant thus avoiding any trouble with double funding. |

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## 3. IMPACT

### 3.1 Impact and ambition

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| According to the estimations, the edge IoT market is expected to grow in the forthcoming years (see figure below), where in particular Cloud, Edge and IoT represent three major, interconnected technology trends enabling the digital transformation of European organisations and economies. [[2]](#footnote-3)    In particular, according to these forecasts, when it comes to European Edge Spending (expected to grow with a CAGR of 14.1%), the majority of investments will come from the introduction of new services enabled by Multi-access Edge Computing. Similar growth projections are expected also for the IOT European spending (with a CAGR of 10.8%), where also Cloud Computing is a consolidated trend and clearly continuing its grow (CAGR of 20.8%), also triggered by many other factors (not necessarily related to edge or IoT domains).  In this environment, the ESTIMED project has a great potential to have impact on the market, where in fact the need of developing interoperable solutions to support IoT (Internet of Things) and edge computing is expected to be substantial, given the rapid growth and transformative potential of these technologies. Here are several ways in which such ESTIMED project solutions are expected to affect the market:   * **Increased Efficiency**: Solutions that effectively integrate IoT with edge computing can drastically reduce latency by processing data closer to the source, improving real-time data analysis and decision-making in industries like manufacturing, healthcare, and transportation. * **Enhanced Data Management**: As IoT devices proliferate, the volume of data generated is vast. Edge computing solutions can help manage this data deluge by prioritizing and processing data locally, reducing the need for bandwidth and mitigating the strain on cloud resources. * **Business Innovation**: The ability to harness real-time, actionable insights from IoT devices via edge computing can lead to the creation of new products, services, and business models, driving innovation across sectors. * **Expansion of IoT Applications**: With edge computing addressing concerns over latency and bandwidth, IoT applications can be expanded into areas where immediate data processing is crucial, such as autonomous vehicles or remote surgery in healthcare. * **Operational Cost Savings**: By processing data locally and reducing the need for constant cloud connectivity, businesses can save on operational costs related to data transmission and storage. * Improved Security and Compliance: Local data processing means sensitive information does not need to traverse the network to the cloud, which can help in complying with data protection regulations and reduce exposure to cybersecurity risks. * **Market Differentiation**: Companies that are early adopters of integrated IoT and edge computing solutions could differentiate themselves in the market, offering faster, more reliable, and secure services. * **Growth of Related Sectors**: This integration will likely spur growth in related sectors, including network infrastructure, cybersecurity, and specialized hardware for edge computing, creating new opportunities for businesses in these domains. * **Global Competitiveness**: On a larger scale, advancements in IoT and edge computing could contribute to the competitiveness of companies on a global stage, with more agile and responsive technology infrastructure. * **Sustainability**: Edge computing can lead to more sustainable solutions by reducing the energy required for data transmission and processing, contributing to greener technology operations.   Furthermore, in the view of interoperability of solutions, application portability, and global deployments, the standardization role of ESTIMED project is key for the success of edge IoT market. As such, the **standards impact** of combining IoT and Edge Computing is an asset for ESTIMED project, in terms of the development of the digital market and the engagement of stakeholders from various business domains. Cross-sector interoperability is essential to ensure the evolution of IoT and related services in human markets. The availability of an initially validated architecture that describes how IoT systems can be deployed using edge/cloud computing back-ends will greatly facilitate the definition of IoT systems capable of utilizing edge/cloud back-ends while remaining interoperable, secure, and manageable. This would positively impact the IoT market by enabling a broader range of open IoT systems.  In turn, the potential expansion of oneM2M standards support to include these new architectures will enhance the oneM2M standardization's reach and support a wider array of actors and activities. The ETSI ISG MEC framework also enables the IoT ecosystem to leverage key 5G and forthcoming 6G technologies, providing opportunities to develop innovative IoT applications and use cases.  Data sharing is regarded as a strategic resource and an essential utility for economic progress globally. The vast quantity of public data held by the EU, both centrally and through the Member States, could yield substantial benefits in terms of growth and innovation if mechanisms for safe and secure sharing are implemented. The potential advantages of Government-to-Business (G2B) and Business-to-Government (B2G) data sharing are significant for Europe, as recognized by the EU Data Strategy.  In summary, ESTIMED project will help European industry and Europe has a whole to better position itself in the space of IoT/Edge/MEC, on one hand by developing coherent standards inspired by working solutions, to ensure adoption and interoperability, and on the other hand by implementing PoCs based on those standards, and by promoting project solutions with international events and Hackathons (jointly organized with open-source and other initiatives relevant in this space) to maximize the project impact. The beneficiaries of these actions from ESTIMED will include not only big companies and telecommunication operators, but also SMEs, innovators, startups and the huge community of developers addressed by the project. This will in turn provide benefits for European industry, and help to strengthen Europe’s leadership role in this technology space. |

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### 3.2 Communication, dissemination and visibility

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| Information will be provided on the effectiveness of activities related to the dissemination of project deliverables and efforts made to raise industry awareness of the activity.  A separate Work Package (WP6) is dedicated to dissemination. This task will operate to achieve the objectives as follows.  There are several target audiences for the output of this project. These range from participants involved standardization, product managers involved in EDGE and IoT systems, open-source developers and student communities. It will be important to tailor dissemination activities using different formats and channels for these audiences. It will also be important to maintain a regular cadence of dissemination building up and engaging different audiences over the 36-month period of the project. Industry attention to Edge and IoT systems cannot wait to the completion of the project to benefit from its outputs.  The mix of dissemination approaches will include articles in the trade press (e.g. ETSI Enjoy, ETSI web-site news items, on-line technical journals), webinars, short-format video talks (disseminated via YouTube), short articles posted on LinkedIn targeting Edge and IoT communities, White Paper publications and developer guides (descriptive documents, open-source code etc.). The content of trade press articles and White Papers will vary according to audience types with some outputs focusing on technology issues while others will cover industry and policy topics.  The project team will also report regularly to key communities within ETSI (MEC ISG, SmartM2M TC and oneM2M) through work item documents, workshops and presentations)  To reach the wider Edge and IoT communities, project team members will attend and participate at relevant industry conferences. There will be a dedicated portal with information about the project (following the ETSI Specialist Task Force format) so that interested parties can learn about the project and make contact with project team members. The project team will also present and demonstrate proof-of-concept developments at ETSI IoT Week and via online, webinar-style events.  To enhance the global outreach of the project's outcomes, project team members plan to participate in events such as IoT Week Korea and IEEE conferences held around the world. Project team members will showcase the developed PoCs and share open-source resources through oneM2M’s Academic Relationship Ad-Hoc group, enabling developers and students to utilize enhanced oneM2M and MEC standard functionalities.In all dissemination activities, the project will make evident the funding coming from the EC; more specifically the EU flag logo will be highlighted in all official presentations and press releases. |

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### 3.3 Sustainability and continuation

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| The work in ESTIMED project is expected to continue through normative standardization on oneM2M and ISG MEC also after the end of project lifetime. This can include e.g. updating the existing specifications or adding new ones, to better support IoT deployments in MEC environments. In particular, the specifications led by ESTIMED will be:   * ETSI GR MEC-DEC 051, “ESTIMED integration solutions” * ETSI GS MEC-DEC 052, “ESTIMED Interworking and deployments“ * oneM2M TR XXX XXX (Number to be assigned), “oneM2M and MEC integration scenario and mechanisms” * oneM2M TS XXX XXX (Number to be assigned), “oneM2M and MEC interworking and deployments” * ETSI GR MEC-DEC 057, “ESTIMED Interoperability Test Scenarios” * ETSI GR MEC-DEC 058, “ESTIMED Conformance Testing”   In addition, the project is releasing a set of open source software packages (related to key MEC and oneM2M components, and to PoC implementations), together with scripts, developer guides and other teaching material. This set of assets will act as basis for future developments in the edge IoT ecosystem, that is anticipated to take benefits from ESTIMED project, for a long-term sustainability, by ensuring the continued application beyond the project.  In particular, ESTIMED project will produce software related to the following deliverables:   * D3.7, “Open Source code contribution for oneM2M and MEC implementations” * D4.1, “Software artifacts of simulation for PoCs” * D4.2, “Deployment scripts” * ETSI GR MEC-DEC 053, “ESTIMED PoC A report” * ETSI GR MEC-DEC 054, “ESTIMED PoC B report” * ETSI GR MEC-DEC 055, “ESTIMED PoC C report” * ETSI GR MEC-DEC 056, “ESTIMED PoC D report”   Moreover, educational and developer community initiatives through the project will aim to create a supportive open-source support community. This will include the following:   * oneM2M TR XXX XXX (Number to be assigned), “Developer Guide on interworking between oneM2M and MEC”   Finally, the ESTIMED project will work in close collaboration with Eclipse Foundation and metaOS cluster communities, by planning at least the joint organization of three annual Hackathons and conferences. For these events, the four PoCs will be offered as an asset for developers in the space of edge IoT. This will help creating a developer community around the implementation of use cases also after the project lifetime. |

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## 4. WORKPLAN, WORK PACKAGES, ACTIVITIES, RESOURCES AND TIMING

### 4.1 Work plan

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| The project is planned for 36 months. It will be implemented in Work Packages (WP) each of them managed by ETSI and subcontracted specialists. The work plan is organized in five (5) technical inter-related WPs and one (1) management WP, as follows:   * WP1: Project management and coordination * WP2: Use Cases selection, Deployment Scenarios and Requirements definition * WP3: Standards interworking and core deployment technologies * WP4: Proof of Concepts * WP5: Test Scenarios * WP6: Dissemination and Ecosystem   The following figure depicts the various WPs and their relationship, from a project management perspective, to clarify on the ESTIMED project organization.    While WP1 will project guidance from ETSI (the ESTIMED project beneficiary) and cover all Project management and coordination aspects, which will be handled by an STF Leader, WP2 will be focused on Use Cases selection, Deployment Scenarios and Requirements definition. This WP will provide outputs for the technical implementations on standards (WP3), proof-of-concepts (WP4) and interoperability tests (WP5). All these activities will be linked to each other, and will provide relevant outputs for proper disseminations and ecosystem engagement activities in WP6, to maximize ESTIMED project impact. |

### 4.2 Work packages, activities, resources and timing

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| **WORK PACKAGES** |

#### Work Package 1

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| **Work Package 1: Project management and coordination** | | | | | | | | | | | | | | | |
| **Duration:** | | | M01 – M36 | | | **Lead Beneficiary:** | | | ETSI | | | | | | |
| **Objectives** | | | | | | | | | | | | | | | |
| - Coordination, reporting and leading of the STF team activities, in collaboration with the ETSI secretariat, TC SmartM2M , ISG MEC and the STF Steering Committee.  - Project management, including risk management and relation with ETSI Board and EC representative for the funding.  - Intermediate and final reporting to EISMEA | | | | | | | | | | | | | | | |
| **Activities and division of work (WP description)** | | | | | | | | | | | | | | | |
| Task No  (continuous numbering linked to WP) | Task Name | | | Description | | | | | | | Participants | | | | In-kind Contributions and Subcontracting  (Yes/No and which) |
| Name | | Role  (COO, BEN, AE, AP, OTHER) | |
| T1.1 | Project Setup | | | ETSI Secretariat will arrange a call for experts. The Chairs of the three involved standard groups (i.e. ETSI ISG MEC Chair, ETSI TC SmartM2M Chair and oneM2M Chair) will review the potentials candidates and select those to best meet the workplan, including the assignment of the project leader.  ETSI Secretariat will make arrangements for project members (service contracts, etc…). The three standards chairs will check that the objectives of all WPs are clearly covered by the participants. | | | | | | | ETSI,  ISG MEC Chair,  TC SmartM2M Chair,  oneM2M Chair | | BEN | | ETSI,  In-kind |
| T1.2 | Project Management | | | The overall management of the project will be under the responsibility of the Project Leader.  The Project leader will ensure effective coordination among the different Tasks, working in close collaboration with the different Task Leaders and supervising them if needed, but also with ETSI TC SmartM2M, ISG MEC and oneM2M representatives.  The overall project management consists in:   * Planning the work of the project members, ensuring that the timescales of the project deliverables are met * Assessing and mitigating risks that may arise during project execution, including strategic planning and actions targeted to prevent situations that might impose risks to the normal project flow. This will also include strategic plan for quality assurance and for monitoring, in accordance with this plan, the quality of the scientific outcomes of the project. This includes, in particular, overseeing the deliverable approval process. * Organizing meetings to discuss the drafts, recording any major issues and resolutions of issues * Reporting to SmartM2M, MEC and oneM2M on the progress of work * Presenting the project results in other external meetings as appropriate e.g., EU Commission and business stakeholders.   providing the project Reports to the ETSI Staff and ETSI SmartM2M, ISG MEC and oneM2M Partnership Project: the Progress Reports (to be submitted to EISMEA after 12 months and 24 months) and the Final Report (to be submitted to EISMEA at the end of the project).  Also, this task will ensure alignment of the STF team, planning travel budget for the needed activities. This can include, e.g.:   * Organization of meetings for the STF alignment on the MEC and oneM2M APIs and capabilities of selected implementations; workshops giving to project team experts a common understanding and practical experience on the use of both standards technologies. The main purpose is to teach project team experts familiar with oneM2M how to use MEC and vice-versa. | | | | | | | ETSI | | COO | | Yes, subcontracting |
| **Milestones and deliverables (outputs/outcomes)** | | | | | | | | | | | | | | | |
| Milestone No  (continuous numbering not linked to WP) | | Milestone Name | | | Work Package No | | Lead Beneficiary | Description | | | | Due Date  (month number) | | Means of Verification | |
| MS1 | | Project Team established | | | 1 | | ETSI | STF members selected and hired by ETSI. Steering Committee established. | | | | 2 | | Contracts signed by ETSI and all STF members.  STF-SC kickoff meeting held. | |
| MS2 | | First Intermediate results have been delivered | | | 1 | | ETSI | First term Progress Report with the achieved results approved by TC SmartM2M and ISG MEC and sent to EISMEA | | | | 12 | | Report by ETSI Staff to EISMEA | |
| MS3 | | Second Intermediate results have been delivered | | | 1 | | ETSI | Second-term Report approved by TC SmartM2M and ISG MEC and sent to EISMEA | | | | 24 | | Report by ETSI Staff to EISMEA | |
| MS4 | | Final results have been delivered | | | 1 | | ETSI | Final Report approved by TC SmartM2M and ISG MEC and sent to EISMEA | | | | 36 | | Report by ETSI Staff to EISMEA | |
| Deliverable No  (continuous numbering linked to WP) | | Deliverable Name | | | Work Package No | | Lead Beneficiary | Type | | Dissemination Level | | Due Date  (month number) | | Description  (including format and language) | |
| D1.1 | | ESTIMED  first Interim Report | | | 1 | | ETSI | R — Document, report | | SEN — Sensitive | | 12 | | * The activities performed until month 12, the coordination work of the activities and the production of the expected deliverables anticipated in the work-plan. * The latest drafts of the deliverables are available according to the time plan. * Overview of ad-hoc meetings if necessary. * The plan for the future activities to complete the deliverables and further expected (coordination) meetings. * Quality intermediate report. * Standard EISMEA reporting * English | |
| D1.2 | | ESTIMED second Interim Report | | | 1 | | ETSI | R — Document, report | | SEN — Sensitive | | 24 | | * The activities performed until month 24, the coordination work of the activities and the production of the expected deliverables anticipated in the work-plan. * The latest drafts of the deliverables are available according to the time plan. * Overview of ad-hoc meetings if necessary. * The plan for the future activities to complete the deliverables and further expected (coordination) meetings. * Quality intermediate report. * Standard EISMEA reporting * English | |

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| **Estimated budget — Resources** |
| See TOTAL PROJECT COSTS table below. |

#### Work Package 2

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| **Work Package 2: Use Cases selection, Deployment Scenarios and Requirements definition** | | | | | | | | | | | | | | | |
| **Duration:** | | | M03 – M18 | | | **Lead Beneficiary:** | | | | ETSI | | | | | |
| **Objectives** | | | | | | | | | | | | | | | |
| WP2 aims to identify scenarios using IoT and Edge computing technologies, focusing on standard-based cases where oneM2M and ETSI MEC apply. It seeks to derive common requirements to support oneM2M-MEC interworking. The project team will select scenarios for relevant applications, preferring industry partner test beds over simulations. Example scenarios may include domains such as agriculture, smart cities, industrial processes, highway traffic, and swarm services.  The project team will investigate implementations (open source and commercial) of MEC and oneM2M that support or are adaptable to enhancements needed to meet the implementation requirements. Non-functional characteristics and data sharing capabilities are crucial, with criteria including authorization, speed, consistency, and reliability.  The project team will define Proof of Concept (PoC) requirements covering applications, devices, sensors, and edge computing services like machine learning, focusing on customer value.  This WP will also finalize the use cases of interest, based on the feedback coming from the first hackathon (WP6), as relevant outside voice from developers communities.  This WP will develop criteria for the options available to select the appropriate MEC-oneM2M deployment architecture. | | | | | | | | | | | | | | | |
| **Activities and division of work (WP description)** | | | | | | | | | | | | | | | |
| Task No  (continuous numbering linked to WP) | Task Name | | | Description | | | | | | | Participants | | | | In-kind Contributions and Subcontracting  (Yes/No and which) |
| Name | | | Role |
| T2.1 | Use Cases selection and Deployment Scenarios | | | * Identify and specify use cases to demonstrate MEC-oneM2M integrations that will be used as the basis for the project development and the four project POCs. * Search for Industry partners to participate or sponsor a test bed (if possible) * Exemplary scenarios that might be selected:   + Autonomous vehicles, e.g. lane changing   + Industrial machine/process monitoring   + Smart City traffic congestion management   + Smart Agriculture, Real-Time Kinematic location service and path planning   + Federated learning hosted on Edge node   + Swarm computing based scenarios   + Best ideas from planned hackathon(s) * Includes partner identification and selection. Potential travel to partner(s) max 2 * Project team will also select 2 scenarios for implementation in WP4. The goal is for 1 simulation-based PoC and 1 partner-based PoC. * Starting from the outcome of the joint ETSI White Paper between MEC and oneM2M, the STF will identify deployment scenarios that include greenfield project deployment as well as a migration to an edge architecture for brownfield projects already deployed. Scenarios defined in T2.1 will be analysed across this spectrum of deployment options. * Define criteria (technical and business related) for the selection of the deployment scenarios that are most suitable to the use cases. | | | | | | | N/A | | | OTHER | YES (subcontracting) |
| T2.2 | Requirements for MEC and oneM2M | | | Identify new requirements, if any, for MEC and oneM2M to meet the needs of the deployment options and scenarios | | | | | | | N/A | | | OTHER | YES (subcontracting) |
| T2.3 | Scenario Application / Device Requirements | | | Specify the applications requirements, sensor and actuator requires for scenarios that are implemented as a simulation. These will be developed in WP4. Edge node hosted applications will also be defined.  Capture requirements and goals of partner testbed applications and devices (if partners are identified). | | | | | | | N/A | | | OTHER | YES (subcontracting) |
| T2.4 | MEC and oneM2M implementation selection | | | Investigate solutions as candidates for use in WP4 development and WP5 testing. Selected implementation must be able to be extended to implement new functionality added to the oneM2M or MEC standards as needed for the PoC implementations. Preference given to open-source solutions over commercial solutions. Goal is to have 2 MEC implementations and 2 oneM2M implementations, if available.  This task will also provide a guide for selected MEC and oneM2M implementations. | | | | | | | N/A | | | OTHER | YES (subcontracting) |
| **Milestones and deliverables (outputs/outcomes)** | | | | | | | | | | | | | | | |
| Milestone No  (continuous numbering not linked to WP) | | Milestone Name | | | Work Package No | | Lead Beneficiary | Description | | | | Due Date  (month number) | Means of Verification | | |
| MS5 | | Use cases definition and criteria for deployment scenarios selection | | | 2 | | ETSI | Use cases selection, assessment of implementations and gap analysis for needed features in PoC implementations. | | | | 6 | D2.1 delivered. | | |
| MS6 | | Selection of the deployment scenarios most suitable to the use cases, and definition of requirements | | | 2 | | ETSI | Use-case driven identification of architectural evolutions (components, required mappings, etc.) to both oneM2M and MEC. | | | | 12 | D2.2 and D2.3 published | | |
| MS7 | | Final requirements for deployment and interoperability | | | 2 | | ETSI | Guide for selected MEC and oneM2M implementations | | | | 18 | D2.4 published | | |
| Deliverable No  (continuous numbering linked to WP) | | Deliverable Name | | | Work Package No | | Lead Beneficiary | Type | Dissemination Level | | | Due Date  (month number) | Description  (including format and language) | | |
| D2.1 | | Analysis and selection for oneM2M and MEC implementations | | | 2 | | ETSI  (ISG MEC) | R — Document, report | Sensitive | | | 9 | Report summarizing the oneM2M and MEC implementations that are investigated. Lists the use case selection criteria and assessment of implementations for use in the PoC implementations. It Includes evaluation of the existing features that are needed as well as assessment of development effort to implement new features. Also identifies selected implementations and the reasons for the selection.  (Based on T2.4) | | |
| D2.2 | | ETSI GR  MEC-DEC 050  PWI\_MECDECODE\_2411\_v1 (GR)  ESTIMED Use Cases & Requirements | | | 2 | | ETSI  (ISG MEC) | R — Document, report | Public | | | 12 | MEC Technical Report providing detailed description of selected use cases, and identification of architectural evolutions (components, required mappings, etc.) to the oneM2M and MEC framework.  Starting from the outcome of the joint White Paper from MEC and oneM2M, the STF will identify use cases that can utilize IoT and Edge computing technologies, with a particular focus on standard-based use cases where oneM2M and ETSI MEC can be applied.  (Based on T2.1, T2.2, T2.3) | | |
| D2.3 | | oneM2M Requirements  oneM2M WI -0120 | | | 2 | | ETSI  oneM2M | R — Document, report | Public | | | 12 | Specification contributions to oneM2M TR-00XX (use cases) and TS-0002 (Requirements) to address new requirements, if any. Report of oneM2M features that will be used in the PoCs and the MEC APIs that will be integrated/interworked with oneM2M in TR-000X (new work item TR).  (Based on T2.2) | | |
| D2.4 | | Guide for selected MEC and oneM2M implementations | | | 2 | | ETSI  (ISG MEC) | R — Document, report | Public | | | 18 | Slide packages and hands-on exercises for the use of selected MEC and oneM2M solutions.  (Based on T2.4) | | |

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| **Estimated budget — Resources** |
| See TOTAL PROJECT COSTS table below. |

#### Work Package 3

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| **Work Package 3: Standards interworking and core deployment technologies** | | | | | | | | | | | | | | | |
| **Duration:** | | | M09 – M36 | | | **Lead Beneficiary:** | | | | ETSI | | | | | |
| **Objectives** | | | | | | | | | | | | | | | |
| WP3 analyzes new functionalities and enhancements needed for oneM2M and MEC, based on scenarios, deployment options, and requirements from WP2. It suggests solutions supporting these enhancements and shares them with relevant standards committees and open-source projects.  Anticipated deployment scenarios suggest the necessity for both tightly and loosely coupled solutions. This WP involves analyzing solutions and presenting them at standards meetings (oneM2M, MEC, others). Additionally, this WP includes efforts to implement the defined standards solution into selected implementations of MEC and oneM2M. | | | | | | | | | | | | | | | |
| **Activities and division of work (WP description)** | | | | | | | | | | | | | | | |
| Task No  (continuous numbering linked to WP) | Task Name | | | Description | | | | | | | Participants | | | | In-kind Contributions and Subcontracting  (Yes/No and which) |
| Name | | | Role |
| T3.1 | oneM2M and MEC interworking and deployments | | | This task outlines the core technologies and architecture necessary for delivering IoT services through interworking between oneM2M and MEC.  Additionally, this taks analyses standardisation impacts on oneM2M and MEC.  Regarding oneM2M, possible standard impacts may involve:   * Identification of functionalities required for Edge Nodes * Dynamic configuration and deployment of the oneM2M platform to the target MEC platform * Discovery of available MEC platforms * Deployment capabilities for oneM2M resources and Common Service Functions * Support for applications and Interworking Proxies that utilize MEC-provided APIs * Support for security and authentication   Regarding MEC, possible standard impacts may involve:   * Supporting capability exchange features for IoT platform support * Supporting authorization for the oneM2M platform * Allocating required resources for oneM2M Edge Instances * Support for security and authentication | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T3.2 | oneM2M and MEC integration solutions | | | Based on the use cases and requirements identified in WP2, T3.2 will propose integration solutions that can support these enhancements. Both loosely coupled and tightly couple solutions are investigated with the purpose of achieving multiple paths toward realizing joint MEC-oneM2M deployment for existing scenarios. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T3.3 | oneM2M IoT service continuity across distributed MEC nodes | | | T3.3 aims to establish standards facilitating the adaptation of the oneM2M edge platform to accommodate the mobility of supported IoT devices. This involves the development of common service functions enabling the platform to dynamically detect the movement of these IoT devices. Additionally, it aims to create mechanisms for identifying adjacent MEC nodes positioned along the trajectory of these moving devices. Subsequently, the focus shifts to devising seamless procedures for migrating the oneM2M edge platform to ensure uninterrupted delivery of oneM2M IoT services the mobile devices. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T3.4 | Task off-loading and federated learning using swarm computing | | | T3.4 aims to define swarm computing by facilitating the offloading of oneM2M data resources and common service functions (CSFs) including AI-enablement features to MEC edge nodes. This task involves distributing data and processing across multiple MEC edge nodes in a standardised manner and gathering the outcomes for decision-making within the oneM2M cloud platform.  Standard features needed to support machine learning at the edge and the privacy protecting federated learning methods. To integrate Federated Learning into oneM2M, standardized protocols and interfaces are needed for collaboration among distributed IoT devices. APIs and protocols facilitating coordination and synchronization of model updates are required. Mechanisms for managing federated learning tasks, such as model aggregation and parameter synchronization, are essential components. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T3.5 | oneM2M enhancements Implementation | | | Development of oneM2M functionalities. This will include:   * an Interworking Proxy Entity (IPE) that implements the call flows and procedures defined in T3.2 for loosely coupled deployment options of MEC-oneM2M. * development of oneM2M CSE common service functions that implement the call flows and procedures defined for the tightly coupled deployment option. The project team will attempt to implement this in twoseparate oneM2M CSE open-source implementations to support interoperability testing. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T3.6 | MEC enhancements implementation | | | The scope of this task is the development of MEC functionalities (e.g. update existing APIs or define new ones) that implement the call flows and procedures defined. The project team will attempt to implement this in two separate MEC open-source implementations to support interoperability testing. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| **Milestones and deliverables (outputs/outcomes)** | | | | | | | | | | | | | | | |
| Milestone No  (continuous numbering not linked to WP) | | Milestone Name | | | Work Package No | | Lead Beneficiary | Description | | | | Due Date  (month number) | Means of Verification | | |
| MS8 | | First set of requirements | | | 3 | | ETSI | First set of requirements for standards interworking. | | | | 12 | Early/stable drafts of ETSI GR MEC-DEC 051 and oneM2M TR-0077 | | |
| MS9 | | Finalized requirements | | | 3 | | ETSI | Finalized requirements for standards interworking and early core deployment technologies. | | | | 24 | Published ETSI GR MEC-DEC 051 and oneM2M TR-0077 Early/stable drafts of ETSI GS MEC-DEC 052 and oneM2M TS-0042 | | |
| MS10 | | Finalized standards | | | 3 | | ETSI | Finalized standards and core deployment technologies. | | | | 36 | Published ETSI GS MEC-DEC 052 and oneM2M TS-0042 Open-Source code for oneM2M and MEC implemented | | |
| Deliverable No  (continuous numbering linked to WP) | | Deliverable Name | | | Work Package No | | Lead Beneficiary | Type | Dissemination Level | | | Due Date  (month number) | Description  (including format and language) | | |
| D3.1 | | ETSI GR MEC-DEC 051  PWI\_MECDECODE\_2401\_v1 (GR)  ESTIMED integration solutions | | | 3 | | ETSI | R — Document, report | Public | | | 24 | Based on the use cases and requirements identified in that can utilize IoT and Edge computing technologies, this GR will propose various solutions that can support these enhancements for enabling MEC-oneM2M deployments  (Based on T3.1, T3.2 and T3.3) | | |
| D3.2 | | ETSI GS  MEC-DEC 052  PWI\_MECDECODE\_2402\_v1 (GS)  ESTIMED Interworking and deployments | | | 3 | | ETSI | R — Document, report | Public | | | 34 | Based on the use cases, requirements and on recommendations identified in D3.1, this GS will specify how MEC can interwork and be deployed in the context of oneM2M.  (Based on T3.2, T3.3 and T3.1) | | |
| D3.3 | | oneM2M TR-0077 oneM2M and MEC integration scenario and mechanisms | | | 3 | | ETSI | R— Document, report | Public | | | 24 | Contributions to oneM2M   * this technical report describes the requirements of a ETSI MEC Interworking Proxy Entity, that can be added to existing oneM2M and ETSI MEC deployments that do not internally integrate the desired interworking capabilities. * Detailed description of the oneM2M and MEC architectures to support IoT edge service. * Exploration of various real-world scenarios where oneM2M IoT services can be delivered via MEC platforms, detailing the operational environment and expected benefits. * Discussion of specific standards technologies and functions for integrating oneM2M edge platform with MEC, including data flow, interface requirements, sharing service information. * Identification of potential challenges in the integration process and proposed solutions. * Analysis of existing standards and gaps in standardisation that need to be addressed to support seamless integration.   Based on results of T3.1, T3.2 and T3.3 | | |
| D3.4 | | oneM2M TS-0042  oneM2M and MEC interworking and deployments | | | 3 | | ETSI | R— Document, report | Public | | | 34 | * Describe the background and motivation for interworking between oneM2M and MEC. * Standardise the high-level architecture supporting the interworking. * Define the required functions to support the interworking with MEC.   Specify detailed interworking procedures. | | |
| D3.5 | | oneM2M Specification Change Requests collection | | | 3 | | ETSI | R— Document, report | Public | | | 36 | * Contributions to oneM2M specification to implement the change requests identified to support MEC-oneM2M integration developed by the project team.   Based on Tasks 3.1, 3.2 and 3.3 | | |
| D3.6 | | White Paper on advanced oneM2M and MEC interworking using Swarm Computing | | | 3 | | ETSI | R— Document, report | Public | | | 24 | * Investigation of deploying Federated Learning in the MEC-oneM2M node. * Investigation of discovery of data suitable for training machine learning models in a privacy-protecting manner. * Investigation of sharing and deploying trained machine learning models to clients based on location-specific conditions associated with the deployed ETSI MEC node and local oneM2M CSE.   Based on T3.4 | | |
| D3.7 | | Open Source code contribution for oneM2M and MEC implementations | | | 3 | | ETSI | R— Document, report | Public | | | 36 | * The software implemented for the MEC system should contain: * MEC APIs for IoT services (updated or new ones) * MEC APIs for communications (if any) * Interworking Proxy Entity (IPE) application for MEC * The software implemented for the oneM2M system should contain: * offloading oneM2M resources to MEC, * supporting MEC interworking, instantiating of the oneM2M Cloud platform. * The MEC open-source implementations used in the STF should contain: * interwork with oneM2M APIs * hosting oneM2M edge instance to support IoT service provisioning of oneM2M IoT devices into the MEC system   Based on T3.5 and T3.6 | | |
| **Estimated budget — Resources** | | | | | | | | | | | | | | | |
| See TOTAL PROJECT COSTS table below. | | | | | | | | | | | | | | | |

#### Work Package 4

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| **Work Package 4: Proof of Concepts** | | | | | | | | | | | | | | | |
| **Duration:** | | | M07 – M36 | | **Lead Beneficiary:** | | | | | ETSI | | | | | |
| **Objectives** | | | | | | | | | | | | | | | |
| This WP involves developing applications and model devices for selected scenarios, as well as creating blueprints for deploying MEC-oneM2M solutions.  The project team will create four Proof of Concepts (PoCs) (one for each of the deployment options) by using open source oneM2M and MEC implementations, along with related demonstrations (e.g., IoTS service producing MEC App). These PoCs will rely on scenarios from WP2 deliverables and interworking solutions from WP3 deliverables, aiming to simplify the adoption of oneM2M-MEC based edge IoT solutions in the future. Results of the PoCs analysis will be presented and documented in the related PoCs reports. Also, software artifacts will be hosted on an open source repository.  As clarified in section 2.1, ESTIMED project will implement the PoCs based on the following four deployment options (leveraging the analysis conducted in the ETSI White paper published in 2023):   * Option A: deploy the oneM2M as a cloud, MEC as an edge * Option B: oneM2M and MEC as an edge with the different physical node * Option C: oneM2M and MEC in the same physical edge node * Option D: oneM2M and MEC are tightly coupled in the same edge node   All these above deployment options are in principle relevant in the market, and have different technical and business impacts. As such, they will be considered in ESTIMED project to trigger the definition of specific Use Cases and Requirements (WP2), and will act as a reference to explore the impacts of the various integration levels, not only by deriving the required standard enhancements (WP3) but also as a reference for the implementation of the respective four PoCs in the present WP4.  As an important remark, all the four PoCs in WP4 are associated with a Work Item in ETSI ISG MEC, simply for reporting purposes (under four respective GRs in MEC). However, the PoC team will be intended as jointly composed by PoC members from both MEC and oneM2M experts (not just MEC, of course). | | | | | | | | | | | | | | | |
| **Activities and division of work (WP description)** | | | | | | | | | | | | | | | |
| Task No  (continuous numbering linked to WP) | Task Name | | | | | Description | | | | | Participants | | | | In-kind Contributions and Subcontracting  (Yes/No and which) |
| Name | | | Role  (COO, BEN, AE, AP, OTHER) |
| T4.1 | Application and device simulation development for the PoCs. | | | | | For the scenarios defined in WP2, the project team will implement applications, edge node services, and devices necessary for developing and executing the PoCs. This is done for each of the scenarios that are demonstrated as simulations (as opposed to testbed). | | | | | N/A | | | OTHER | Yes, subcontracting |
| T4.2 | MEC-oneM2M Proofs of concept implementations and Deployment Instructions | | | | | For each of the deployment options, the project team will implement a MEC-oneM2M PoC, develop platform configuration and provisioning instructions to setup the related PoC. | | | | | N/A | | | OTHER | Yes, subcontracting |
| T4.3 | PoCs Reporting and Recommendations | | | | | Comparison of results of the scenarios using different deployment options. The project team will provide recommendations for future investigation. | | | | | N/A | | | OTHER | Yes, subcontracting |
| **Milestones and deliverables (outputs/outcomes)** | | | | | | | | | | | | | | | |
| Milestone No  (continuous numbering not linked to WP) | | Milestone Name | | Work Package No | | | Lead Beneficiary | Description | | | | Due Date  (month number) | Means of Verification | | |
| MS11 | | Early PoCs | | 4 | | | ETSI | Early definition of PoCs, to be used as input for the first Hackathon and event in WP6. | | | | 10 | 4 early PoCs ready for the 1st Hackathon & event.  Early version of application and device software ready, as support for mature PoCs. | | |
| MS12 | | Mature PoCs | | 4 | | | ETSI | Mature implementation of PoCs, as done in WP4 (and taking into account also the WP6 feedback from the 1st Hackathon & event). | | | | 22 | 4 mature PoCs ready for the 2nd Hackathon & event.  Application and device software ready, as support for final PoCs. | | |
| MS13 | | Final PoCs | | 4 | | | ETSI | Final implementation of PoCs, as done in WP4 (and taking into account also the WP6 feedback from the 2nd Hackathon & event). | | | | 34 | 4 final PoCs ready for the 3rd Hackathon & event.  NOTE: delivery dates of the 4 final PoC reports are due 2 months after the PoCs finalization (thus by M36). | | |
| Deliverable No  (continuous numbering linked to WP) | | Deliverable Name | | Work Package No | | | Lead Beneficiary | Type | Dissemination Level | | | Due Date  (month number) | Description  (including format and language) | | |
| D4.1 | | Software artifacts of simulation for PoCs | | 4 | | | ETSI | OTHER | Public | | | 22 | Application software (either web based or host platform based) and device (sensor or actuator) software for each node of the selected simulation scenario. This software will be used as support for PoC implementations.  Based on T4.1 | | |
| D4.2 | | Deployment scripts | | 4 | | | ETSI | R — Document, report | Public | | | 34 | Report on the continuously updated/developed documentation and scripts (e.g. on github/gitlab repository).  Used for deployment of MEC-oneM2M implementations.  Based on T4.2 | | |
| D4.3 | | ETSI GR  MEC-DEC 053  PWI\_MECDECODE\_2403\_v1 (GR)  ESTIMED PoC A report | | 4 | | | ETSI | R — Document, report | Public | | | 36 | PoC report capturing the use cases design and implementation deploy oneM2M as a cloud, MEC as an edge (option A); instructions for the (re-) creation of the prototypes from the selected framework and components; lessons learned; reference to the software source code of the developed PoC available on public repository.  Based on T4.2 and T4.3 | | |
| D4.4 | | ETSI GR  MEC-DEC 054  PWI\_MECDECODE\_2404\_v1 (GR)  ESTIMED PoC B report | | 4 | | | ETSI | R — Document, report | Public | | | 36 | PoC report capturing the use cases design and implementation deploy oneM2M and MEC as an edge with different physical nodes (option B); instructions for the (re-)creation of the prototypes from the selected framework and components; lessons learned; reference to the software source code of the developed PoC available on public repository.  Based on T4.2 and T4.3 | | |
| D4.5 | | ETSI GR  MEC-DEC 055  PWI\_MECDECODE\_2405\_v1 (GR)  ESTIMED PoC C report | | 4 | | | ETSI | R — Document, report | Public | | | 36 | PoC report capturing the use cases design and implementation deploy oneM2M and MEC in the same physical edge node (option C); instructions for the (re-)creation of the prototypes from the selected framework and components; lessons learned; reference to the software source code of the developed PoC available on public repository.  Based on T4.2 and T4.3 | | |
| D4.6 | | ETSI GR  MEC-DEC 056  PWI\_MECDECODE\_2406\_v1 (GR)  ESTIMED PoC D report | | 4 | | | ETSI | R — Document, report | Public | | | 36 | PoC report capturing the use cases design and implementation deploy oneM2M and MEC are tightly coupled in the same edge node (option D); instructions for the (re-)creation of the prototypes from the selected framework and components; lessons learned; reference to the software source code of the developed PoC available on public repository.  Based on T4.2 and T4.3 | | |

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| **Estimated budget — Resources** |
| See TOTAL PROJECT COSTS table below. |

#### Work Package 5

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| **Work Package 5: Test Scenarios** | | | | | | | | | | | | | | | |
| **Duration:** | | | M025 – M36 | | **Lead Beneficiary:** | | | | | ETSI | | | | | |
| **Objectives** | | | | | | | | | | | | | | | |
| WP5 develops scenarios that can be used to test whether the solutions derived from WP3 are functioning correctly. It especially focuses on developing test scenarios based on the interoperability of the oneM2M and MEC platforms. Additionally, it aims to confirm the provision of End-to-End oneM2M IoT services through MEC by developing tests that reference existing oneM2M interoperability test standards.  It is expected that ETSI CTI will support this WP and will provide if required, the needed effort and skill for testing on a voluntary basis. | | | | | | | | | | | | | | | |
| **Activities and division of work (WP description)** | | | | | | | | | | | | | | | |
| Task No  (continuous numbering linked to WP) | Task Name | | | | | Description | | | | | Participants | | | | In-kind Contributions and Subcontracting  (Yes/No and which) |
| Name | | | Role  (COO, BEN, AE, AP, OTHER) |
| T5.1 | Interoperability Test Scenarios | | | | | Guidelines on Interoperability testing for MEC-oneM2M interworking | | | | | N/A | | | COO  OTHER | ETSI CTI (in kind)  and subcontracting |
| T5.2 | Conformance Test Specifications | | | | | * Identification of the requirements to test * Development test purposes * Development of the Abstract Test Suite | | | | | N/A | | | COO  OTHER | ETSI CTI (in kind)  and subcontracting |
| T5.3 | Validation of the Test Specifications | | | | | Validation of the test specifications versus available oneM2M and MEC implementations. Any issues or improvements will be immediately fixed and integrated into the documents or code produced in tasks T5.1 and T5.2  A conformance Test System will be developed to validate the Abstract Test suite (TTCN-3) produced in Task 5.2. It includes a Codec and a Test Adapter. This is required to execute the test suite. | | | | | N/A | | | COO  OTHER | ETSI CTI (in kind)  and subcontracting |
| **Milestones and deliverables (outputs/outcomes)** | | | | | | | | | | | | | | | |
| Milestone No  (continuous numbering not linked to WP) | | Milestone Name | | Work Package No | | | Lead Beneficiary | Description | | | | Due Date  (month number) | Means of Verification | | |
| MS14 | | Early tests | | 5 | | | ETSI | Early interoperability tests and conformance testing documents. | | | | 30 | Early/Stable drafts of ETSI GR MEC-DEC 057 and ETSI GR MEC-DEC 058 | | |
| MS15 | | Final tests | | 5 | | | ETSI | Final interoperability tests and conformance testing documents. | | | | 36 | Publication of ETSI GR MEC-DEC 057 and ETSI GR MEC-DEC 058. | | |
| Deliverable No  (continuous numbering linked to WP) | | Deliverable Name | | Work Package No | | | Lead Beneficiary | Type | Dissemination Level | | | Due Date  (month number) | Description  (including format and language) | | |
| D5.1 | | ETSI GR  MEC-DEC 057  PWI\_MECDECODE\_2407\_v1 (GR)  ESTIMED Interoperability Test Scenarios | | 5 | | | ETSI | R — Document, report | Public | | | 36 | Guidelines on Interoperability testing for MEC-oneM2M interworking.  The outcome of this report would be used to contribute later to oneM2M TS-0013 (oneM2M interoperability test specifications) and if it makes sense to include some parts in a revision of MEC-DEC 0042.  (Based on T5.1 and T5.3) | | |
| D5.2 | | ETSI GR  MEC-DEC 058  PWI\_MECDECODE\_2408\_v1 (GR)  ESTIMED Conformance Testing | | 5 | | | ETSI | R — Document, report | Public | | | 36 | The document will gather all the conformances test requirements and conformance tests to verify the interworking MEC and oneM2M, covering T5.2 and T5.3:  - identification of the requirements to test;  - development test purposes;  - development of the Abstract Test Suite.  - Validation report  This GR will be used by the STF team to contribute to the existing Test specifications for MEC (GS MEC-DEC 0032-2 and -3).  Possible impacts on other specifications from oneM2M (e.g. TS-0018 and TS-0019) will be captured as well in this deliverable D5.2, but won’t be part of the ETSI ISG MEC work item MEC-DEC058.  (Based on T5.2 and T5.3) | | |

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| **Estimated budget — Resources** |
| See TOTAL PROJECT COSTS table below. |

#### Work Package 6

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| **Work Package 6: Dissemination and ecosystem** | | | | | | | | | | | | | | | |
| **Duration:** | | | M01 – M36 | | | **Lead Beneficiary:** | | | | ETSI | | | | | |
| **Objectives** | | | | | | | | | | | | | | | |
| This WP focuses on dissemination activities and engagement with the ecosystem, to maximize the impact of the project. The engagement will be twofold: presence in relevant conferences and related events (to engage not only researchers but also decision makers in the industry), and organization of proper Hackathons, to engage developers and stimulate the creation of applications for IoT and MEC deployments.  In particular WP6 tasks will: 1) produce dissemination material, by conveying the technical activities and achievements into e.g. papers, website, social media, webinars, Wiki pages, and other promotional materials complementary to project reporting; 2) developing teaching materials, that can be used by developers communities, as complementary material to project deliverables (although based on them), and exploited for e.g. organization of seminars, summer schools, etc; 3) engage in conferences and related initiatives for the industry outreach (e.g. OCX[[3]](#footnote-4), Eclipse IoT Day[[4]](#footnote-5)) with focus on raising awareness about MEC and IoT deployments and testing, by promoting the project, disseminating key accomplishments and fostering developer and user communities for the Proof of Concept and standardisation outputs. 4) organize Edge IoT Hackathons with developer communities (e.g. Eclipse, Linux Foundation), to stimulate the app market kick-off with practical examples in the IoT and MEC domains. | | | | | | | | | | | | | | | |
| **Activities and division of work (WP description)** | | | | | | | | | | | | | | | |
| Task No  (continuous numbering linked to WP) | Task Name | | | Description | | | | | | | Participants | | | | In-kind Contributions and Subcontracting  (Yes/No and which) |
| Name | | | Role  (COO, BEN, AE, AP, OTHER) |
| T6.1 | Project Promotion and Dissemination | | | Promote project progress as well as intermediate and final deliverables via a mix of articles in on-line trade publications (ETSI Enjoy etc.), LinkedIn technical groups, webinars, White Papers, news items posted on etsi.org and video channels (e.g. oneM2M channel on YouTube). | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T6.2 | Developer Teaching Materials | | | Preparation of teaching materials (documentation, software, tools) addressed to the developer community. The goal is to guide developers to implement IoT solution taking benefit of the interworking oneM2M and MEC. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T6.3 | Conferences and Events | | | Organization of conferences, preferably in collaboration with other communities to maximize impact and global visibility. Goal is to host conferences online and in person in multiple regions. Outcomes from T6.2 would be used for instructional content (maybe also refer to PoC deliverables/tasks). | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| T6.4 | Hackathons | | | Organization of technical challenges for Hackathons, as joint effort from MEC and oneM2M experts, and in collaboration with other organizations (e.g. Eclipse, Linux Foundation), as event hosts, providing structure and logistics for the hackathon’s booths.  This task will form the organizing committee, lead the technical challenge, and will contribute with ESTIMED funding for the organization of the Hackathon (e.g. prizes for developers, marketing expenses for the pitch and prizegiving, booth at the event). Goal is to host hackathons online and in person in multiple regions.  Outcomes from T6.2 will be used as suitable material for developers (also contents from PoCs deliverables will be reused).  None of these hackathon implies double funding from European Commission. They are not included in any of the ETSI Interoperability projects with EC. | | | | | | | N/A | | | OTHER | Yes, subcontracting |
| **Milestones and deliverables (outputs/outcomes)** | | | | | | | | | | | | | | | |
| Milestone No  (continuous numbering not linked to WP) | | Milestone Name | | | Work Package No | | Lead Beneficiary | Description | | | | Due Date  (month number) | Means of Verification | | |
| MS16 | | Dissemination Plans and ecosystem reach out | | | 6 | | ETSI | Definition of a detailed plan for dissemination and ecosystem reach out, to maximize project impact, also in the long-term. | | | | 6 | D6.0 delivered and D6.3-1 published. | | |
| MS17 | | First industry event and Hackathon #1 | | | 6 | | ETSI | A first annual event will be organized, in collaboration with other communities.  Focused on Edge IoT use cases (identified in WP2), this first hackathon will challenge developers to produce ideas/ implementations for marketable solutions. The Hackathon itself can then serve as well as validation of the project use cases (and, as by product, to steer the subsequent project work). | | | | 12 | D6.4-1 published. After action report, summarizing notable projects, attendance numbers and types of participants (student, professional, SME, etc). | | |
| MS18 | | Second industry event and Hackathon #2 | | | 6 | | ETSI | A second annual event will be organized, in collaboration with other communities.  Focused on Edge IoT use cases of interest, this hackathon can offer as HW/SW asset to developers an consolidated version of some project PoCs. The Hackathon itself can then serve as well as validation of the PoCs thenselves (and to steer the related project work). | | | | 24 | D6.4-2 published. After action report, summarizing notable projects, attendance numbers and types of participants (student, professional, SME, etc). | | |
| MS19 | | Third industry event and Hackathon #3 | | | 6 | | ETSI | A third annual event will be organized, in collaboration with other communities.  Focused on Edge IoT use cases of interest, this hackathon can offer as HW/SW asset to developers a final version of some project PoCs. The Hackathon itself can then serve as well as a mean to foster application portability for future developers (and maximize the impact of the project work). | | | | 36 | D6.4-3 published. After action report, summarizing notable projects, attendance numbers and types of participants (student, professional, SME, etc). | | |
| Deliverable No  (continuous numbering linked to WP) | | Deliverable Name | | | Work Package No | | Lead Beneficiary | Type | Dissemination Level | | | Due Date  (month number) | Description  (including format and language) | | |
| D6.1 | | Dissemination plan | | | 6 | | ETSI | R — Document, report | Public | | | 6 | This will include a list of planned dissemimation activities in ESTIMED project.  This will be outcome of T6.1 | | |
| D6.2 | | oneM2M TR 0078 Developer Guide on interworking between oneM2M and MEC | | | 6 | | ETSI | R — Document, report | Public | | | 36 | A light teaching material for education on IoT deployment using oneM2M and ETSI, based on examples.  The associated software of the apps will be available on public repository.  This will be outcome of T6.2 | | |
| D6.3-1 | | Introductory White paper | | | 6 | | ETSI | R — Document, report | Public | | | 6 | - introducing oneM2M and MEC interworking targeting a broader audience with a mix of technical, industry and policy topics  This will be outcome of T6.1 | | |
| D6.3-2 | | White paper on project achievements | | | 6 | | ETSI | R — Document, report | Public | | | 30 | - focusing on technical aspects of oneM2M and MEC interworking  This will be outcome of T6.1 | | |
| D6.4-1 | | Post-event Hackathon#1 report | | | 6 | | ETSI | R — Document, report | Public | | | 12 | post-event report, summarizing notable projects, attendance numbers and types of participants (student, professional, SME, etc)  Based on T6.3 and T6.4 | | |
| D6.4-2 | | Post-event Hackathon#2 report | | | 6 | | ETSI | R — Document, report | Public | | | 24 | Post-event report, summarizing notable projects, attendance numbers and types of participants (student, professional, SME, etc)  Based on T6.3 and T6.4 | | |
| D6.4-3 | | Post-event Hackathon#3 report | | | 6 | | ETSI | R — Document, report | Public | | | 36 | Post-event report, summarizing notable projects, attendance numbers and types of participants (student, professional, SME, etc)  Based on T6.3 and T6.4 | | |
| D6.5 | | Dissemination activities reporting | | | 6 | | ETSI | R — Document, report | Public/ | | | 36 | Report including the list of all ESTIMED ecosystem engagements and disseminations. Publication in English language and as a MS Word and a PDF document.  This will be outcome of T6.1 | | |
| D6.6 | | Project Promotion and Dissemination Materials | | | 6 | | ETSI | R — Document, report | Public | | | 36 | Library of articles, technical papers and slide presentation for use in promotional activities over the course of the project. There will be additional video content comprising short presentations for developers, recordings of webinars that will be disseminated via e.g. oneM2M and MEC websites, YouTube, etsi.org and professional media sites (LinkedIn, developer forums etc.). | | |

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| **Estimated budget — Resources** |
| See TOTAL PROJECT COSTS table below. |

## Total Project costs

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Description automatically generated*

#### 4.3 Subcontracting

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subcontracting** | | | | | | | |
| Work Package No | Subcontract No  (continuous numbering linked to WP) | Subcontract Name  (subcontracted action tasks) | Description  (including task number and BEN/AE to which it is linked) | | Estimated Costs  (EUR) | Justification  (why is subcontracting necessary?) | Best-Value-for-Money  (how do you intend to ensure it?) |
| 1-6 | N/A | N/A | All Tasks (from T1.2 to T6.4) | | 638 510 | Expertise not available in ETSI Secretariat | Subcontractors are selected on a case-by-case basis in the context of an open call through a clearly defined process (typically one or more of the following, publication of the call through ETSI Collective letters (see section 2.3 above) to the membership, Technical Body mailing lists or explicit calls for tender).  Travel costs are included in the subcontracting cost. |
| Other issues:  *If subcontracting for the project goes beyond 30% of the total eligible costs, give specific reasons.* | | | | Each subcontractor/expert is allocated to specific tasks with an expected level of contribution. The financial resources allocated to the subcontractor are calculated on this principle. For reasons linked to French social Regulations and to avoid a risk of subordinate relationship that could trigger negative consequences for ETSI, on advice of its lawyers, ETSI has abandoned the principle of a daily rate to contract its experts and ETSI works now under the principle of service contracts.  ETSI Secretariat (Funded Activities, Technical officers…) will ensure the project planning and controlling with the Technical Committee without charging the related costs to the project, as the EC funds ETSI through an Operating Grant, whereas subcontractors will perform the development and technical execution of the project.  ETSI Secretariat has no expert as staff thus all tasks are subcontracted. Besides the technical project management (WP1) will be handled by the selected subcontractor as Project Leader to ensure the technical tasks execution and quality by the other subcontractors. | | | |

#### Timetable

The table below depicts a simplified ESTIMED Gantt chart. The letters “D” and “M” give a visual cue of the timeline of Deliverables and Milestones, respectively. Milestones are assigned to the task that is expected to contribute the most towards its completion. Note that a Milestone can include multiple Deliverables (contributed by one of more Tasks).

|  | **Months** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | **25** | **26** | **27** | **28** | **29** | **30** | **31** | **32** | **33** | **34** | **35** | **36** |
| **Task 1.1** |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 1.2** |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |
| **Task 2.1** |  |  |  |  |  | M |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 2.2** |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 2.3** |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 2.4** |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 3.1** |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 3.2** |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  | D |  |  |
| **Task 3.3** |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  | D |  | M |
| **Task 3.4** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 3.5** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| **Task 3.6** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| **Task 4.1** |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Task 4.2** |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |  | D |
| **Task 4.3** |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  | M |  | D |
| **Task 5.1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  | D |
| **Task 5.2** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  | M |
| **Task 5.3** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| **Task 6.1** |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  | D |
| **Task 6.2** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | D |
| **Task 6.3** |  |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  |  |  | D |
| **Task 6.4** |  |  |  |  |  |  |  |  |  |  |  | D |  |  |  |  |  |  |  |  |  |  | M |  |  |  |  |  |  |  |  |  |  |  |  | M |

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## 5. OTHER

### 5.1 Ethics

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| Not applicable. |

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### 5.2 Security

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| Not applicable. |

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## 6. DECLARATIONS

|  |  |
| --- | --- |
| **Double funding** | |
| **Information concerning other EU grants for this project**  *Please note that there is a strict prohibition of double funding from the EU budget (except under EU Synergies actions).* | **YES/NO** |
| We confirm that to our best knowledge neither the project as a whole nor any parts of it have benefitted from any other EU grant *(including EU funding managed by authorities in EU Member States or other funding bodies, e.g. EU Regional Funds, EU Agricultural Funds, etc)*. If NO, explain and provide details. | YES |
| We confirm that to our best knowledge neither the project as a whole nor any parts of it are (nor will be) submitted for any other EU grant *(including EU funding managed by authorities in EU Member States or other funding bodies, e.g. EU Regional Funds, EU Agricultural Funds, etc)*. If NO, explain and provide details. | YES |

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| **Financial support to third parties (if applicable)** |
| Not applicable. |

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**Annex I Response to the Request for Proposals  
CfE – STF 685 (REFERENCE BODY MEC - ONEM2M - SMARTM2M) Deadline:** **21 November 2024**

**If you are an ETSI Member \***

**ETSI membership status (Indicate your status):**

 Full

 Associate

 Observer

**If you are not an ETSI Member \***

Please indicate:

**Full name of the ETSI member supporting the application (list of ETSI members on etsi.org):**

-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Official contact name of the ETSI member supporting the application:**

-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Note: A formal confirmation of the support from the Official contact is required (e.g. by e-mail sent to STFLINK@etsi.org) and an “ETSI Member Support Letter” will be required if you are selected.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Contractor information \*** | | | | |
|  | | | | |
| **Contractor name \*:**  *Indicate the Company/Organization Name* | |  | | |
|  | | | | |
| **Contact person for the technical aspects** | | **Contact person for Decision on ETSI financial offer to this project (if any)** | | |
| Title |  | Title |  | |
| First name |  | First name |  | |
| Last name |  | Last name |  | |
| Role |  | Role |  | |
| e-mail |  | e-mail |  | |
| Phone |  | Phone |  | |
|  | | | | |
|  | | **Yes** | | **No** |
| Do you or any employee of your Company/Organization hold an elected or appointed position in the Reference Body requesting the STF 685 creation? | | o  Indicate in which position:  ----------------------------------- | | o |
| **If you are self-employed candidate:**  Do you currently have other contracts in progress with ETSI? | | o | | o |

All fields marked with an asterix (\*) are mandatory

**1.1 Introduction**

A short presentation of the technical structure responsible for this activity, e.g.:

* Business area, number of employees, link to WEB site,
* Department(s)/team(s)/experts in charge of the technical activities related to this Project,
* Reference to products/services of your Company/Organization or supporting Member to which the standards developed by this Project will apply,
* Motivation for your Company/Organization or supporting Member to participate in this Project.

**1.2 Proposed approach**

**Proposed contribution to tasks & related cost**

Identify the tasks to which your Company/Organization is proposing to contribute by filling-in the table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Tasks\_No | Tasks\_Description | Max\_Budget\_Allocated\_\_in\_Euro | Amount\_in\_Euro\_(mandatory) | %\_of\_whole\_Task\_(mandatory) |
| 00 | T1.1 Project Setup | Managed by ETSI | | |
| 01 | T1.2 Project Management | 39 780 | . | . |
| 02 | T2.1 Use Cases selection and Deployment Scenarios | 23 400 | . | . |
| 03 | T2.2 Requirements for MEC and oneM2M | 14 040 | . | . |
| 04 | T2.3 Scenario Application / Device Requirements | 14 040 | . | . |
| 05 | T2.4 MEC and oneM2M implementation selection | 9 360 | . | . |
| 06 | T3.1 oneM2M and MEC interworking and deployments | 32 760 | . | . |
| 07 | T3.2 oneM2M and MEC integration solutions | 32 760 | . | . |
| 08 | T3.3 oneM2M IoT service continuity across distributed MEC nodes | 32 760 | . | . |
| 09 | T3.4 Task off-loading and federated learning using swarm computing | 9 360 | . | . |
| 10 | T3.5 oneM2M enhancements Implementation | 25 272 | . | . |
| 11 | T3.6 MEC enhancements implementation | 25 272 | . | . |
| 12 | T4.1 Application and device simulation development for the PoCs | 33 696 | . | . |
| 13 | T4.2 MEC-oneM2M Proofs of concept implementations and Deployment Instructions | 63 180 | . | . |
| 14 | T4.3 PoCs Reporting and Recommendations | 63 180 | . | . |
| 15 | T5.1 Interoperability Test Scenarios | 21 060 | . | . |
| 16 | T5.2 Conformance Test Specifications | 28 080 | . | . |
| 17 | T5.3 Validation of the Test Specifications | 21 060 | . | . |
| 18 | T6.1 Project Promotion and Dissemination | 19 890 | . | . |
| 19 | T6.2 Developer Teaching Materials | 39 780 | . | . |
| 20 | T6.3 Conferences and Events | 19 890 | . | . |
| 21 | T6.4 Hackathons | 19 890 | . | . |
|  |  | **588 510** |  |  |

***Amount in Euro (mandatory)***: *Indicate the price offered for your contribution to the task(s)*

***% of whole task (mandatory)***:  *Indicate to which percentage of the execution of the whole task your offer corresponds*

Provide a description of the proposed approach, competences, reference to related activities:

* Explain which part of the task is corresponding to the requested percentage that your Company/Organization will handle,
* Explain the scope that your Company/Organization will cover,
* Explain your approach to the management of the quality and,
* Explain your approach to the management of the risks and their mitigation,
* Describe and justify the proposed costs to achieve this project objectives.

**Annex II Terms and Conditions  
CfE – STF 685 (REFERENCE BODY MEC - ONEM2M - SMARTM2M) Deadline:** **21 November 2024**

**2.1 Submission of Proposals**

All proposals in response to this CfE shall be submitted before the deadline indicated in thisCollective Letter, using exclusively the WEB application on the ETSI Portal at the following address: <https://portal.etsi.org/cfe>.

Proposals shall be composed of Curriculum Vitae of the proposed service providers’ personnel and the Annex I of this CfE duly filled-out.

Proposals that will be partial or incomplete at the deadline will not be accepted.

The Terms and Conditions in this Annex will apply.

**2.2 Modification and Withdrawal of Proposals**

Applicants may, without prejudice to themselves, modify or withdraw their proposal by written request, provided that the request is received by ETSI prior to the due date and time, at the address to which their proposal was submitted. The applicant may submit a new proposal provided that such new proposal is received prior to the deadline for responding which is specified in this Collective Letter.

**2.3 Assessment of Proposals**

The ETSI Director-General, in consultation with the Reference Body Chairman, is responsible for the selection of the service providers that will be contracted to perform this Project work. The ETSI Director-General and the Reference Body Chairman may be assisted by a Selection Panel to assess the applications received and make the final decision.

As per article 1.10.4 of the ETSI Directives, the Director-General may discard proposals that could be identified as creating potential conflict of interest.

The ETSI Secretariat will only communicate to the applicants the result of the selection (accepted or not accepted). Should applicants need more information on the rationale for the selection, they must address a formal request to the ETSI Director-General.

1. The following evaluation criteria will be applied to all proposals, in order of priority:

* Evidence that the applicant has the necessary structure and expertise to ensure delivery
* Reference to current or previous activities in the specific technical domain of this project
* Critical review of the most efficient way to achieve the objectives in this Project ToR
* Effective proposed approach/methodology for the execution of the tasks
* Implementation schedule
* Clear pricing policy

Compliance with the first two (2) criteria is mandatory.

Proposals that are not considered compliant with these criteria will be discarded.

Priority will be given to technical quality of the proposals. Pricing considerations will be taken into account to ensure that the best value for money is achieved. Compatibility with the maximum budget allocated to this Project will be verified before placing a Service Contract.

Following the assessment process, ETSI reserves the right to grant contracts to other than the cheapest proposals, to accept or reject any offer completely or in part, or to reject all proposals, without providing the reasons. If no offer is accepted, ETSI may decide to abandon the work or proceed in any other manner ETSI may select.

**2.4 IPR and confidentiality Agreements**

The information provided in this CfE, as well as the fact that the applicant has received the CfE, is considered confidential and protected under copyright laws. The applicant may not discuss, share, or use the information in this CfE for any purpose other than the response to this CfE.

ETSI will not disclose the content of any proposals to other applicants or any other party, with the exception of the persons involved in the assessment process described in §2.3 above.

However, ETSI reserves the right to make use of the information provided in this proposal to improve this project definition for the purpose of this CfE or any other manner in which ETSI may decide to proceed to select the service providers.

If successful, the applicant will be required to sign a Service Contract, which includes IPR and Confidentiality clauses aligned with the relevant policies in the ETSI Directives.

**2.5 Preparation cost**

ETSI will not be responsible for any costs or expenses that the applicant may incur in preparing and/or submitting the proposal.

**2.6 Service Contract**

A Service Contract will be proposed to the applicants that will be selected to perform the work.

Details on the Terms and Conditions of this contract can be found on the ETSI Portal, at the following address: <https://portal.etsi.org/STF/STFs/Contracts.aspx>

1. <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy/depth-reviews-strategic-areas-europes-interests_en#cloud-and-edge-computing> [↑](#footnote-ref-2)
2. EUCloudEdgeIot market forecast: <https://eucloudedgeiot.eu/market-forecast/#:~:text=Edge%20Forecast%20European%20edge%20spending%20reached%20EUR,from%20both%20enterprises%20and%20telecom%20service%20providers>. [↑](#footnote-ref-3)
3. OCX: <https://www.ocxconf.org/event/2024/summary> [↑](#footnote-ref-4)
4. Eclipse IoT Day:   
   <https://wiki.eclipse.org/Eclipse_IoT_Day_Grenoble_2023>

   <https://www.ilaria-academy.com/events/france-lyon-cybersecurity-eclipse-iot-day-grenoble-2023-8944>

   <https://videos.univ-grenoble-alpes.fr/recherche/eclipse-iot-day-grenoble-2023/> [↑](#footnote-ref-5)