



PROJECT “LOCUS”: LOCalization and analytics on-demand
embedded in the 5G ecosystem, for Ubiquitous vertical applications

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DELIVERABLE D7.5

“Report on Innovation and Exploitation Plan and Actions, v1”

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Short Abstract:	The goal of this deliverable is to define the project innovation plans and how to exploit the project findings with a proper target plan.
Keyword List:	Innovation, Exploitation

Content of the Deliverable

This deliverable aims at defining the initial plan on how to handle innovation and exploitation within the LOCUS project. The document describes the following main areas:

- Overall architecture of WP7 and T7.3
- Innovation platform deployed by the LOCUS project in order to:
 - assist partners in LOCUS to properly protect their novel ideas,
 - evaluate whether an idea can lead to a standard related IPR or not,
 - set brainstorming meetings to increase the chance of IPR drafting within LOCUS.
- Commercial exploitation platform deployed by LOCUS project in order to
 - initiate potential product exploitation within the project;
 - explore the benefits and advantages of the ideas from different stakeholders and users' perspectives;
 - define means to evaluate and test the idea with DevOps and Proof of Concepts (PoCs).
- Detail plans, in which there will be measurable targets within the project to identify the performance of the project work in respect to meeting the targets or exceeding the expectations in respect to exploitation of the results.
- Input from partners involved in T7.3.

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1. Executive Summary

Innovation and Exploitation of project results are among the key factors in the success of any European Horizon 2020 project. LOCUS has indicated a strong preference and motivation in terms of these two goals from the beginning. One indication is that there is a separate deliverable and task in respect to Innovation and Exploitation and these are dealt in a separate path compared to the general disseminations and publication of the project. This deliverable is solely focusing on how LOCUS becomes innovative and can exploit its internal results to different fora and stakeholders with a detailed plan.

In order to build up a consortium that can generate high level of innovation and exploitation, there is a strong need of team development, trust and motivation within all the partners in the project. Despite the very challenging first year of LOCUS in respect to COVID-19 situation, which limited us by cancelling several face-to-face meetings and normal team development platforms, LOCUS has been very successful in still filling this gap and making a good connection between all partners and members, which is the first building block on the journey of innovation.

In today's fast-paced telecom industry, it is very important to have access to the up-to-date research questions, concerns and problems timely. LOCUS is a project conceived and carried out for the 5G ecosystem, i.e. a cellular technology currently under standardization. The LOCUS activities are time aligned with an important phase of 5G standardization (and specifically the definition and consolidation of the Release 17 by the 3GPP). For this reason, a proper exploitation of LOCUS results cannot prescind from the standardization fora as the platforms in which research problems would be tackled, as the result of consensus among many different sectors and players in this field. LOCUS has the muscles in terms of engaged partners to monitor, identify and impact on the problems and solutions brought up in the positioning field of these standardization fora. The task T7.2 in LOCUS is dedicated to the consortium activities within such standardization fora. A first standardization plan is presented in D7.2 and will be updated in the following reports related to WP7. For example, LOCUS partners, in particular Ericsson and Samsung, are monitoring and contributing to the 3GPP Rel.17 Positioning Study Item and LOCUS has been already contributing to the August and October e-meetings in RAN2 on the topic of positioning integrity. Here we want to highlight how these standardization activities are also sources of standard related IPRs as well as platforms which initiate global solutions that would be adopted in all devices, networks in future releases in a wide aspect. Therefore, standardization is interrelated with the exploitation activities and a list of planned contributions will be included also in the exploitation plan and detailed within D7.2 and following reports related to T7.2.

One of the main characteristics of the team in LOCUS is the flexibility and the dynamic attitude towards change. For example, while COVID-19 has stroked all projects, and LOCUS has not been an exception, the discussion on how LOCUS can use its platform to find solutions in terms of virus tracking or any other support needed for such pandemics in short- and long-term horizons have been discussed and then included as an additional use-case and a separate task work to evolve within the project life cycle. One solid example in this respect is the engagement of a LOCUS representative in the work of new ISG group in ETSI called E4P ("Europe for



Privacy-Preserving Pandemic Protection), whose standardization scope is partially related to COVID-19 work in LOCUS. LOCUS has been updated with the status and roadmap of E4P and the ongoing COVID-19 use-case has been directed towards the roadmap of this standardization group so that the potential LOCUS contribution would be possible.

Aside from the potential of protecting novel ideas and presenting them to standardization fora, one main contribution of LOCUS to software, analytics, algorithms and edge computing societies is the fact that in this domain it would be very beneficial to share the knowledge in an Open-Source fashion. Of course, LOCUS is also receiving benefits from such communities, and hence it is a straightforward return of the access to the publicly available platform which is being used. One example in this respect is the use of Open-Air Interface (OAI) in WP3 where the 5G link channel model between the UE and the base station are fully defined and are being used for the URLLC use-case. It is very natural that the modifications and the changes tailored to the LOCUS project would be later on committed into this OAI source which can be used and exploited by others at a later phase. In LOCUS, we also make sure to provide the support in Open-Source platforms with proper documentation and explanation so that it would become easily reusable by anyone any time.

Finally, it is important to have a clear plan and setup to run brainstorming sessions, active collaboration in terms of new concept developments within the teams and taking steps in terms of proper contributions to both standardization and Open-Source communities. With this first deliverable, we managed to set a proper platform and also set some initial and quantified measures in order for the project and also external reviewers to evaluate the performance of the project in terms of innovation and exploitation and to identify if these goals are met or have been exceeded beyond the expectations of today's project perspective.



2. Introduction

This document presents a common framework and plan for identifying and driving the innovation and commercial potential of the technical work and technical goals of LOCUS.

The main goals of the LOCUS innovation and exploitation activities are to:

- Offer the LOCUS localization and analytics service within the consortium, for extensive testing by partners developing advanced location/context-based services.
- Extend access beyond the project to other projects and external players, including SMEs.
- Build a community of users.

This document sets an initial plan for all the innovation and exploitation strategies and activities targeted and planned to be addressed during the project. The future deliverables D7.6 and D7.7 will report on innovation and exploitation results, on the progress achieved and performance against plans, as well as on the awareness on achieved innovation and exploitation results.

2.1. List of Abbreviations

ABBREVIATION	FULL NAME
3GPP	3 rd Generation Partnership Project
CA	Consortium Agreement
BMB	Business and Marketing Board
CFS	Certificate on Financial Statement
DOA	Description of the Action
E4P	Europe for Privacy-Preserving Pandemic Protection
EB	Executive Board
ETSI	European Telecommunication Standards Institute
GA	Grant Agreement
GB	General Board
INEA	Innovation and Networks Executive Agency
IPR	Intellectual Property Rights
IvD	Invention Disclosure
KOM	Kick off Meeting
NDA	Non-Disclosure Agreement

OAI	Open Air Interface
O-RAN	Open- Radio Access Network
PC	Project Coordinator
PO	Project Office
PoC	Proof of Concept
RAN	Radio Access Network
RB	Review Board
SA	Service and System Aspects
SB	Scientific Board
UE	User Equipment
URLLC	Ultra-Reliable Low Latency Communication
WPL	Work Package Leader
WPT	Work Package Team

Table 1: Abbreviation List

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3. Innovation Plans

3.1. WP7 and T7.3 setup

According to Figure 1 which presents the whole structure of the LOCUS project, we can observe that the work in WP7 is linked and related to all other WPs within LOCUS while it is also the platform in which the project is being presented externally.

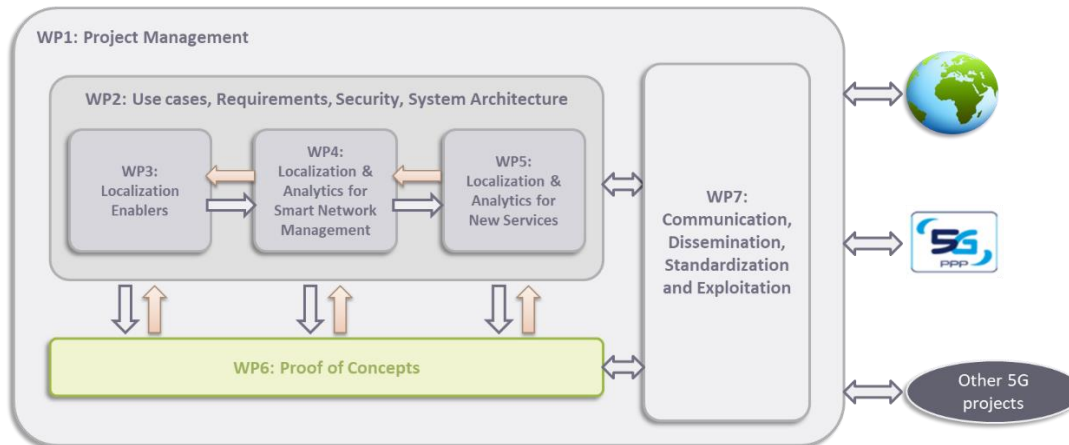


Figure 1 LOCUS structure overview

It is important to highlight the fact that the workflow within WP7 and its tasks need to be followed in certain orders. Figure 2 shows how the ideas and documents need to be set and followed within WP7. It is highly important that before communicating and disseminating the ideas and results externally, we make sure that we follow the checking process for innovation and standardization boxes.

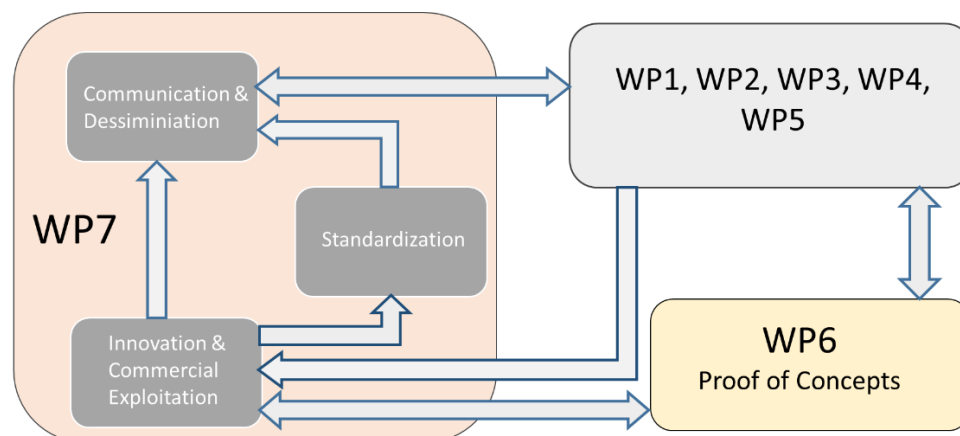


Figure 2 WP7 structure

3.2. LOCUS IPR management

Intellectual property rights (IPR) are legal rights aimed at protecting the creations of the intellect, such as inventions, the appearance of products, literary, artistic and scientific works and



signs, among others. IPRs include copyrights, related rights and neighbouring rights, patents and utility models, designs and trademarks.

IPR will be checked prior to dissemination and a decision will be made by giving priority to protection and exploitation. The strategy for translation of the foreground knowledge into technical inventions could include the possible filing of patents by the partner(s). These actions are assessed to be the adequate form of protection for information and will include specific statements indicating Community support for the achieved results where commercially viable.

The principle of territoriality for industrial property will be applied within LOCUS, and the most suitable instruments (several national patent registrations, European Patent application or an international application) will be selected. The consortium is aware of the services of the Commission's IPR Helpdesk. When needed, the Project Coordinator will contact this support organization to ensure that other EU projects and organizations worldwide are aware of any new pending patent.

LOCUS will deliver a wide range of results in terms of prototypes, test-bed facilities, services/procedures/processes, and data. The appropriate handling of intellectual properties on all these areas is the key for the success of the project. The partners in the consortium are well aware of the need to respect the property of background knowledge, and to correctly manage the Intellectual Property Rights of the generated foreground and side ground knowledge.

The consortium will handle IPR in line with the applicable IPR directives and regulations for H2020 ("Rules for Participation and Dissemination" (<http://www.iprhelpdesk.eu/>)).

IPR will be managed in line with a principle of equality of all the partners towards the foreground knowledge and in full compliance with the general Commission policies regarding ownership, exploitation rights and confidentiality.

3.3. LOCUS innovation strategy

LOCUS partners will regularly check and protect the innovative knowledge produced by means of IPRs. The LOCUS strategy is to provide a suitable platform for all partners to not only protect their innovative solutions in their own company or institute, but to also have a shared platform for patent filing within the project and a joint invention co-sourcing between partners. The latter case requires an approval of all partners engaging in the invention to assure that the solution has been solely created within the project.

WP7 is responsible for identifying and driving the innovation for LOCUS technical work and goals. We aim to identify potential inhibitors for innovation (including regular patent search) in and between all work packages.

The ownership, protection and sharing of the foreground knowledge, for those cases where multiple partners contribute to a result, and ways of sharing will be considered, such as co-ownership, royalties, licensing, etc.

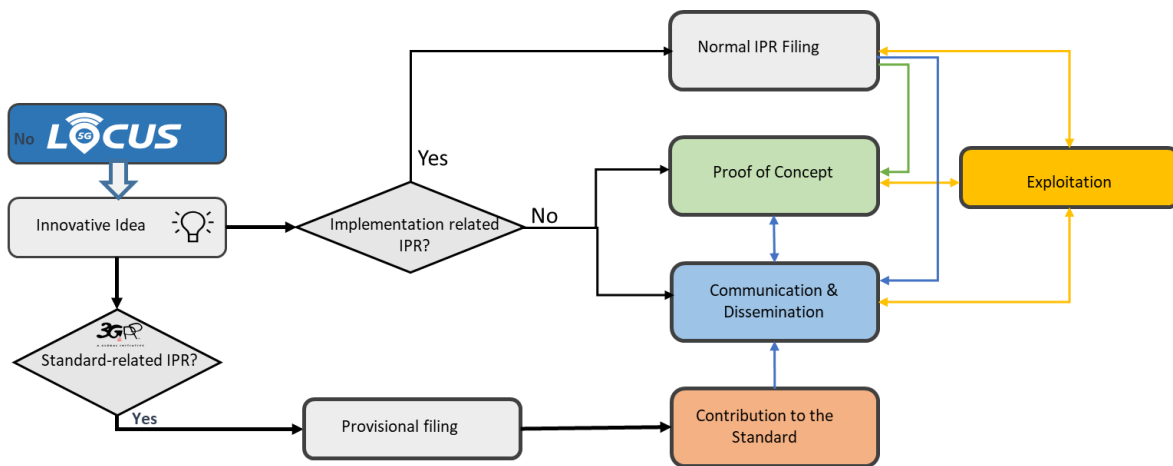


Figure 3 LOCUS Innovation and Exploitation setup

Figure 3 provides a flow chart of how an innovative idea would be evaluated and considered as an IPR filing until it is time to disseminate and exploit it. It is very important to identify within the project whether the idea is standard-related and needs to be shared as a contribution or it is mainly for implementation purposes. In case of standard related ideas, as it is maybe important to have a timely filing and it is also important to see if the idea would be agreed in the standard, provisional filing can be considered in this respect. In the occasion that after the novelty check of the idea, it is proven that there is no state of the art on the idea, the project will consider filing the idea as a patent. After the patent filing is complete, it is safe to communicate the idea in the different conference or journal papers, present it as a contribution to the standard or exploit it as a proof of concept or early product exploitation.

3.4. LOCUS innovation activities

A focus group has been created within LOCUS in which the standardization and innovation tasks are being followed regularly. This group will be meeting regularly with a bimonthly frequency. All partners involved in T7.3 have at least one representative in this focus group, and there is also at least one representative from each WP within this focus group in order to secure the potential novel ideas which may need to be evaluated within the focus group. Table 2 provides a list of representatives at this LOCUS focus group.

Table 2 LOCUS representatives in the focus group

Partner	Name
EAB	Sara Modarres Razavi
EAB	Fredrik Gunnarsson
EAB	Gustav Lindmark
EAB	Satyam Dwivedi
UMA	Sergio Fortes Rodríguez
SAMS	Mythri Hunukumbure
VIAMI	Takai Eddine Kennouche
NXW	Giacomo Bernini
NEC	Gurkan Solmaz
CNIT	Andrea Conti



INCE	Kostas Tsagkaris
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While the main bimonthly meetings are aimed to study the potential results and outcomes which can be considered for standardization fora or IPR drafting, depending on the outcome of the discussion, there may be a smaller team created in which a set of people within the project would be involved in the further brainstorming process and patent drafting for the specified idea. One of the main inputs to the bimonthly meetings would be any filled LOCUS Novel Idea Questionnaire which has been provided by any partner or WP leader. This form has been provided in Appendix A of this deliverable. This questionnaire will help in the process of evaluating the idea and drafting the potential IPR, while making sure that all legal aspects are taken care of from the early phase of this work. The project will also make sure that the partners engaged in patent collaboration would have encrypted emails for communication purpose.

4. Exploitation Plans

According to the Horizon 2020 program the term “exploitation” refers to “*the utilization of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardization activities*”.

LOCUS has the potential to generate a significant impact on the business of all its partners. Results produced in LOCUS in the form of reference architecture and specifications, simulations and proof of concept developments can validate project concepts, but also and more importantly act as key enablers for the long-term (post-project) impact, e.g., for the subsequent phases of the 5G PPP strategy, and in parallel, the 5G market product definition by the LOCUS partners. In particular, the activities of the LOCUS consortium towards the LOCUS exploitation plan can be classified in five main categories:

1. Support to product position: Technology providers, including vendors, large industry and SMEs, will be the first to **position their products in the new segments that LOCUS will define**, and additionally they can benefit from the additional knowledge and insight on the relevant technologies to increase their competitive advantage, incorporating LOCUS concepts and software into their product roadmaps.
2. Network operation and planning: Network operators will be in the position of **applying LOCUS concepts to enhance network planning and operations**, maximize network utilization, reduce operational expense and enhance their service portfolio.
3. Training services, industry support and consultancies, post-project, and spin-offs: For research institutes and universities, LOCUS can create a competitive advantage in terms of research themes and background, with potentials to **generate consultancies, as well as spin-off business initiatives**. LOCUS partners from academia are committed to the development of new training services exploiting the LOCUS experience and findings.
4. Standardization: Involvement of LOCUS in **standardization fora**, would allow the concept findings within the project to get the chance to be explored for standardization, and in case of agreements within these fora, the solutions of LOCUS would be exploited and adopted within all standard-based devices and networks globally. A dedicated standardization plan is provided within D7.2 and following reports but given the importance of standardization for the exploitation of LOCUS results during 5G standardization steps, here we include the standardization activities as an important part of the exploitation plan.
5. Open-source: Involvement and contribution of LOCUS in **Open-Source fora**, would provide easy and free access to the software and edge computing society to explore and exploit the code and algorithm development within the project.

It is also to be noted that the focus of LOCUS on a wide set of use-cases, provides the project with a proper study on the requirements and demands of the users and stakeholders of each use-case and this provides a more “real-life” view on the research projects in hand. To maximize the exploitation of LOCUS results beyond the lifetime of the project, a detailed plan has been created by leveraging the individual commitment of partners. This plan is based on the intentions of the different partners and will be developed and monitored progressively during the course of the project by defining at regular times the exploitable results (technical results as well as methodologies and knowledge) of the project and by relying on the target KPIs defined in Sec 4.2. Table 3 summarizes the exploitation plans of each partner.

Table 3 Exploitation plans of each partner.

Partner	Exploitation Plans
EAB	<p><i><u>Standardization:</u> Ericsson brings the most recent information from the 3GPP standardization work, and feedbacks insights from LOCUS into standardization work. During 2020, Ericsson was fully engaged in finalizing the Rel-16 work item (WI) on positioning and the Rel-17 study item (SI) 3GPP RP-193237 which was also in respect to study the enhancements of 5G positioning beyond what was possible in Rel-16. In 2021, Ericsson will be again involved in Rel-17 WI, which its finalization has been postponed until the end of 2021 due to COVID-19 situation. Ericsson attends all the E-meetings and potential future F2F meetings and contributes to all the agenda points in these positioning SI and WIs.</i></p> <p><i><u>Product Development:</u> Our core positioning product in 5G called (Ericsson Network Location) ENL is always getting updates with new releases based on the new 3GPP standards. There are also some proprietary solutions which would be developed in our product in case there is no need for any standardization agreement for those solutions. Monitoring and contributing to LOCUS is one way we try to analyse solutions for our internal products for both standardization and proprietary solutions.</i></p>
SAMSUNG	<p><i><u>Standardization:</u> Samsung continues to play an active role in the developing emergency services network (ESN) in UK as the contracted device provider. The initial results from our drone based indoor localization solution to LEN-UC1 use case have been shared with the Samsung ESN business units and with emergency communication experts. We have taken their inputs for the second-year work on-board and will continue to engage with them as we develop more precise solutions with mm-wave in the LOCUS second year. There is increasing interest in UWB based localization solutions from Samsung HQ, as this technology is embedded in the new 5G high end Smart phones. We have now introduced a new study on UWB to LOCUS WP3. We will regularly update the HQ on the new results and some of this work is likely to be taken up for future product development. The UWB work also provides us the opportunity to influence the standardisation in 3GPP SA2 and also the developing higher layer standards in the Fira consortium.</i></p>

	<p>Since June 2020, SAMSUNG has been directly involved in the work of new ISG group in ETSI called E4P (“Europe for Privacy-Preserving Pandemic Protection”). Its standardization scope is partially related to COVID-19 work in LOCUS. SAMSUNG is currently a rapporteur of the ‘Device-based mechanisms for pandemic contact tracing systems’ Group Specification and as part of this role organized drafting sessions, attended plenary meetings and drafting sessions of complementary specs. On the technical side, SAMSUNG contributions include updating the device-based mechanisms Group Specification draft and others, substantial input to E4P reference pandemic contact tracing systems architecture work, Back-End Task Force and high level and interoperability requirements definition. To allow LOCUS to have insights into E4P work progress so far, E4P status and roadmap presentations have been provided to WP5 and also draft E4P specifications were shared. In addition, suggested directions for its ongoing COVID-19 use cases work, and the potential LOCUS contributions to E4P in the future have been identified. This work has been supported by Samsung to make sure interoperable international implementation of the future digital contact tracing systems is enabled.</p>
<p>OTE</p>	<p><u>Network Operation:</u> OTE is the dominant telecommunications operator in Greece, and along with its subsidiaries one of the largest telecom groups in Southeastern Europe. OTE has been very much involved in wireless and wireline broadband technologies. As of that, OTE has long ago identified the growing need for investing in 5G technology since this has been proven one of the fields which is very promising for OPEX and CAPEX reduction while, at the same time, offering demanding and advanced services to the end users. Based upon technical and market-led priorities, OTE is expected to gain several advantages by the project results, so that to further increase its market profile. OTE aims to exploit the expected LOCUS concept by initially verifying the proposed platform and then coming with a plan of “how to promote it” into its existing and/or future solutions, thus strengthening customers’ confidence and enhancing its competence in the field of telecommunication networks. The innovative features of the expected LOCUS findings will also help to design and promote new business models.</p>
<p>UMA</p>	<p><u>Industry support and post-project activities:</u> UMA will focus its exploitation plan on the collaboration with companies within the project and external to the project. In the first case, UMA will aim possible outcomes to be patented in relation to location-aware management methods, possibly in collaboration with some of the companies in the project. In the second case, the project results will also be disseminated to the local companies by the links the UMA research group has with SME and international companies in the Andalusian Technology Park (PTA) as well as other national or international companies of different sectors that would be interested in the results obtained in LOCUS. In this context,</p>

	<p>UMA research group are in contact with national companies from construction sector to improve management tasks in the worksites by applying 5G location services. New national and international industrial research projects related to 5G and localization will be pursued to continue research in the area after the project lifetime, possibly in collaboration with these companies.</p> <p><u>Consultancies and Spin-offs:</u> Based on the project results in WP6, UMA will consider offering its testbed as a research infrastructure to external parties. Finally, an analysis will be carried out on the opportunities of creating a spin-off company based on the project results by means of the UMA incubator programme.</p>
<p>NEC</p>	<p><u>Standardization:</u> NEC considers exploitation through standardization in bodies such as ETSI (particularly in working groups such as ETSI ISG CIM). NEC has also been involved in the ETSI E4P. NEC is active in industrial research projects in Europe and overseas related to location data and/or location-based analytics. NEC Laboratories Europe has on-going collaborations with NEC internal units in countries such as Japan, Spain, India, and other industrial/academic partners. NEC plans to exploit the outcomes of the LOCUS projects in some of these collaborations where applicable. Moreover, NEC has a new project with the local municipality of Heidelberg in Germany where the focus is on human mobility and location-based analytics. Lastly, NEC research groups may aim for an IPR filing for a patent application based on the LOCUS project's outputs. NEC plans work with humanitarian institutes, such as ICRC, for projects related to refugee camps and tracking of Covid-19 spread. A humanitarian AI platform is planned to be developed through this collaboration to support location-based services and geographic AI (geo-AI) applications.</p> <p><u>Support to product position:</u> the Japan side of NEC is exploring the Locus use cases and the situation awareness research behind it. NEC explored a Covid-19 tracking use case in a Japanese hospital environment and on a smart district environment using context-based brokering and linked data features. Furthermore, NEC works for the "Indian Urban Data Exchange," where the resource servers now support both context management API and data model, including the location data.</p>
<p>VIAVI</p>	<p>VIAVI will exploit output results of LOCUS research activities and trials for development of geolocation solutions, network optimization, automation and orchestration. We also seek collaborative research to demonstrate the benefits of the technological enhancements developed in LOCUS. We may pursue IPR filings to patent inventions resulting from our activities in LOCUS.</p> <p><u>Standardization:</u> With this evidence we plan to build industry consensus that can lead towards standardization, in particular within O-RAN and 3GPP.</p> <p>We are looking for opportunities to find connections between LOCUS and O-RAN that will allow us to exploit the results of LOCUS in the O-</p>

	<p><i>RAN work related to use-cases that consume location information. Additionally, the creation of a simulation platform in LOCUS creates a sand box to allow us to explore and validate concepts that may relate to enhancements of products, especially products that exploit radio environment simulation to perform mass UE emulation, O-RU/O-CU emulation and testing of components that utilize advanced analytics such as the RIC.</i></p>
<p>NXW</p>	<p><i>Nextworks, as technology provider and software SME active in the ICT and telecommunication sectors, participates to LOCUS aiming at identifying and developing innovative solutions and application scenarios in the area of location-aware service management and operation, to be then turned into company assets and knowledge services for its ICT market.</i></p> <p><i><u>Consultancies:</u> Nextworks has indeed a wide portfolio of consultancy services, which include training courses, technology support, and third-party software development offers that are planned to be enhanced and augmented with new knowledge derived from the LOCUS outcomes. In LOCUS, Nextworks develops the localization analytics as a service platform as a virtualization platform for flexible operation and exposure of localization services.</i></p> <p><i><u>Support to product position:</u> This substantially contribute to the consolidation and improvement of the existing company research-oriented network and service management portfolio, which already includes a network slice manager, an NFV Orchestrator, a multi-NFVO catalogue and a Service Development Kit for designing services. Even if Nextworks does not have direct plans for commercialization of outcomes from LOCUS, the target is to build a comprehensive inventory of integrated software tools bound with specific 5G use cases to validate innovative concepts such as those related to the location-based services. This aims at attracting interest from telco industry players (e.g., through public demonstrations at relevant events) and foster the creation of new research and innovation collaborations.</i></p>
<p>CNIT</p>	<p><i>CNIT's exploitation plans revolve around three main directions: training services, industry support activities, and improvement of scientific reputation and international standing.</i></p> <p><i><u>Training services:</u> For what concerns training services, LOCUS' results on location security and privacy are being included in a newly offered training programme on 5G security and privacy which will be offered in the incoming year.</i></p> <p><i><u>Industry support and consultancies:</u> With reference to industry support/consulting activities, CNIT : (i) established a cooperation with the companies inside the project so as to impact future 3GPP RAN1 TRs and TSs, by offering new solutions for high-accuracy localization, especially for harsh wireless environments; (ii) sharpened knowledge in location-based services and technologies, along with the availability of addi-</i></p>

	<p><i>tional skilled personnel recruited during LOCUS, is fostering new industrial collaborations in Italy, especially in the Industry 4.0 and in the network management and planning – an area in which CNIT has specifically developed, during LOCUS, a methodology to tune the widths of the traffic beams in accordance with the localization uncertainty level of User Equipment.</i></p> <p><i><u>Open source:</u> The activity related to the network management and planning lead to the development of an open-source simulator for localization-based network planning, i.e. 5G-Pencil, that will be available on GitLab. In addition, CNIT is developing a suite of experimental air-interface security and privacy assessment tools, specifically intended for low-cost software-defined radio, that is currently being developed for assessing the various weaknesses that the 3GPP authentication process does expose, and for countering the relevant threats – these will also ultimately include tools (currently being designed) for detecting/classifying jammers and rogue base stations as well as mitigating the effects of counterfeit location messages.</i></p> <p><i>Finally, CNIT’ scientific reputation will be further fostered by the thorough dissemination of LOCUS’ results to the broad research and development community via publications on top-tier journals, co-authorship in 5G-PPP white papers, invited talks, keynotes and tutorials at flagship conferences. For a research institution, the improvement of scientific reputation is an important form of exploitation of the participation to a project, albeit not the main one.</i></p>
<p>IMDEA</p>	<p><i><u>Training services and spin-offs:</u> IMDEA will exploit the results of the LOCUS project by exposing the PhD students that work at the institute to a solid and multi-faceted knowledge in localization technology and 5G network architecture, creating the foundations for spin-offs from innovation generated in LOCUS.</i></p> <p><i><u>Industry support and post-project activities:</u> The 5TONIC open research and innovation laboratory for 5G technologies, hosted by IMDEA and of which IMDEA is a founding partner, will represent a unique opportunity to create a global open environment to perform research and innovation, boost technology and business innovative ventures and promote joint project development and entrepreneurial venture together with major players steering the evolution of future 5G and beyond networks.</i></p>
<p>INCE</p>	<p><i><u>Support to product position:</u> Incelligent’s core product is an analytics platform that has been developed out of years of R&D in the areas of Big Data and Advanced Machine Learning. The platform already exposes a set of APIs and services for implementing variant analytics-based use cases in various sectors. Incelligent will exploit the localization-centric principles, concepts and technologies developed within LOCUS for extending its platform’s set of APIs/services and eventually supported vertical applications, in order to enrich the company’s offerings</i></p>

and hopefully sales towards its customers. The same stands for service-based projects.

Network operation: As a matter of fact, Incelligent is already exploiting concepts and know-how gained through LOCUS involvement for implementing location-based analytics use cases in one of its customer telco operators. This mainly involves various mechanisms for ingestion and appropriate geo-tagging and enrichment of data, cell classification through geospatial correlations, mobility patterns and trajectories identification, transporters' classification etc., all of them to be used for supporting subscriber mobility and marketing-oriented use cases.

Post-project activities and spin-offs: Last but not least, Incelligent is continuously looking for further exploitation through funding opportunities for its products, new business plans and/or spin-off schemes. On such opportunity is now offered by a Greek-based Fund that was recently created in order to fund and support companies which exploit 5G networks and technology advancements to offer vertical services. This will be closely followed by Incelligent for promoting and exploiting its LOCUS technology enabled solutions.

All LOCUS partners consider the localization study in this project to be beneficial and have significant impact in their company or institute on so many different levels including economic, market and business aspects. Table 4 summarizes the impacts of LOCUS project on the business and missions for each partner.

Table 4 LOCUS impacts on each partner.

Partner	LOCUS Impacts
EAB	<i>For Ericsson it is highly important to be part of research and industry cooperation in understanding the requirements on 5G positioning components and 5G positioning solutions for massive IoT use-cases, critical machine type use-cases as well as regularity, manufacturing, automotive, logistics, construction and mining use-cases. LOCUS has made a great effort in exploring many positioning use-cases and requirements. To us the difference between 5G positioning and the previous LTE positioning is the impact of positioning as a feature that provides added value to many new sectors, and not necessarily only for emergency call scenarios. Therefore it is highly important for us to have up-to-date knowledge of new positioning research done in academy and also the use-cases explored in operators and UE vendors. Moreover, LOCUS positioning platform and algorithms is part of the input to our ENL product. This would be particularly the case when LOCUS solutions can be agreed in the standardization fora. Ericsson would be the bridge for 3GPP standardization work in LOCUS.</i>
SAMSUNG	Samsung considers localization solution development, especially their application to mobile devices, as of critical significance. Thus the work done in LOCUS, particularly our activities in relation to the ESN (UK), ETSI E4P and now UWB is followed closely by our technical and business units. In terms of impact, the LOCUS project outputs in the above domains are likely to influence the future product development and standardisation related activities in Samsung. Particularly for the current 4G focussed ESN project, these LOCUS results will help Samsung to showcase the benefits of a quick transition from 4G to 5G.
OTE	<i>The evolution of location-dependent services and applications in mobile networks continues to require the development of more accurate and reliable mobile positioning technologies. LOCUS results in the field of improved positioning using 5G networks are expected to have an impact in the development of future OTE's services portfolio. Precise location data will contribute to the identification of new market opportunities in the proximity of their assets creating thus new sources of revenue and growth and will assist in the future network planning and /or expansion in a cost-effective manner.</i>
UMA	<i>UMA will obtain important benefits from LOCUS. The participation in a European project in collaboration with the main companies of the mo-</i>

	<p><i>mobile communications sector is a significant advantage increasing the opportunities to obtain future national and international projects. Results obtained in LOCUS will be published in high impact journals, such as IEEE communications magazine or IEEE transactions, increasing the prestige of the research group in the scope of the project. The expertise acquired by the UMA research group will allow to apply the obtained results about optimization and failure management based on location information to other sectors such as construction or industry 4.0. In addition, several PhD theses will be supervised in the project improving the training capacity of the research group involved in LOCUS.</i></p>
NEC	<p><i>Use cases of LOCUS gave inputs for the internal research on situation awareness. In particular, Covid-19 use cases and indoor tracing of the infections using multi-modal data from sensors. The Wi-Fi dataset of the Emilia-Romagna region of Italy available in Locus COVID-19 use case opened a research path towards predicting COVID-19 spreads. Crowd mobility data analytics is considered useful in the smart cities, where activities in Heidelberg and other cities in Europe has been already initiated. Moreover, there are smart city related activities by NEC in Japan where NEC technologies are deployed in various cities.</i></p>
VIAVI	<p><i>LOCUS is enabling VIAVI to develop 5G localization methodologies with the objective of making localization 5G native and a service. It also gives early exposure of the architectural changes taking place. Furthermore it provides insight into how advanced analytics will be implemented to coexist with next generation networks to deliver distributed capabilities that underpin a variety of disparate use cases. This will also support VIAVI to build the global R&D relationships in 5G systems by cooperating with key vendors, operators, customers, and leading research centres and universities across Europe.</i></p>
NXW	<p><i>In terms of impact on existing company products and services, Nextworks actively develops and markets a “digital living” product platform called Symphony, a service-oriented middleware integrating several functional subsystems (media archival and distribution, voice/video communications, home/building automation and management, energy management) into a unified IP-based platform. Nextworks is evolving Symphony towards a fully decomposed, virtualized, distributed and generalized platform capable of integrating thousands of interconnected devices in support of multiple vertical needs and services, including industrial automation and eHealth. Here, the use of a micro-service and service-based architecture like the one adopted in LOCUS is crucial for flexible deployment and operation of Symphony. In this context, the localization technologies developed in LOCUS, including the various models and interfaces, are planned to be integrated with the evolved Symphony platform and are expected to enable the delivery of personalized services in public spaces (shopping malls, train stations, public buildings, etc.) in the medium term. In addition, the expertise acquired</i></p>

	<p><i>in the development of the LOCUS localization analytics as a service platform will allow in the short term Nextworks to offer more effective consultancy services in the NFV and network slicing management area, specifically targeting customers like service providers or small operators who are interested in delivering customized solutions while providing location-aware services to their vertical customers.</i></p>
CNIT	<p><i>The participation and coordination of LOCUS will build strong collaborations with companies and other institutions beyond the scope of the project and towards a top-level application-driven research. LOCUS outcomes will impact the scientific reputation of CNIT by leveraging not only the results themselves, but also, and more pragmatically, the open-source products that will be released to the community. These include i) an open-source simulator for location-aware planning activities, and ii) a suite of experimental air-interface security and privacy assessment tools. On a more internal perspective, LOCUS triggers new collaborations across different CNIT research units with complementary skills on localization and detection algorithms, resource allocation, and network services. Such cross-fertilisations and contaminations will strengthen the CNIT expertise.</i></p>
IMDEA	<p><i>The research conducted so far in the project is strengthening the scientific excellence of IMDEA in 5G localization, and it is perfectly aligned with IMDEA mission to perform first-class research, publish at top-tier conferences and journals in the area of computer networking, ensure successful technology transfer to the industrial sector and the creation of spin-offs.</i></p>
INCE	<p><i>Incelligent is a software SME with specialization in the area of big data and analytics for telecommunication providers and other enterprise and public sectors. Incelligent's core IP is a platform that has been developed out of years of R&D in the areas of Big Data and Advanced Machine Learning. On top of this platform Incelligent has packaged and commercialized RAN.ai, a suite of analytics-based use-cases covering traffic predictions, mobile network/spectrum/capacity planning & optimization, but also improved customer experience and analytics-based marketing/retail optimization. The localization technologies and location-based enablers and APIs designed and validated through LOCUS, will highly impact Incelligent, particularly by extending its RAN.ai suite with an advanced location and mobility analytics component that will support further use cases and thus, will enhance the company's offering towards their collaborating operators (including the LOCUS partner OTE).</i></p>

4.1. LOCUS exploitation strategy

LOCUS partners are well aware of the need to early involve policy makers, societal and environmental stakeholders aware of project results and discuss the early adoption of results based on a value proposition that can be understood by the public at large, therefore LOCUS will organize a workshop on these special topics.

In WP7, we are responsible for identifying and driving the commercial potential for LOCUS technical work and goals. To serve the task of commercial exploitation management we aim to ensure a common approach in all work packages while maintaining the overall vision of the project.

Effective internal and external LOCUS communications are essential for the full and long-lasting success of the project. Communication activities are also needed to stimulate both project partners and external target audience.

LOCUS has defined its communication strategy to determine which communication and dissemination channels will be effectively used. Indeed, communication activities and related efforts are concentrated on selected conferences, workshops, social media (LinkedIn, Twitter), website, press releases, consortium partners' internal communications, consortium meetings, public events, etc. in order to ensure effective dissemination of LOCUS achievements. More details on this can be found in D7.2.

4.2. LOCUS exploitation KPIs

Key exploitable results will be assessed in terms of development status, facts and figures that facilitate the assessment of the potential impact, differences from existing competing products/services, etc. In order to enable a project evaluation and assessment both internally and externally, we have set the following project exploitation targets for LOCUS shown in Table 5. Fulfilling these targets require full engagement from all partners. The values are set for the whole life cycle of the project and each year from now we try to see how much we have approached these targets and in case we are exceeding these goals in any way. These numbers have been set in a way to be very reasonable in terms of the early commitment of every partner to fulfil the target goals and then with some extra effort we shall be able to exceed the expectation and feel satisfied and accomplished from the project output.

Table 5 List of project targets

Goals	Target
LOCUS Open-Source contributions	1
LOCUS Standardization contributions	4
LOCUS IPR filing	2
LOCUS involvement in exploitation external activities	3

4.3. List of standardization contributions

A detailed standardization plan is presented in D7.2. The plan and the reporting of the standardization activities will be updated also in future versions of D7.x. Nevertheless, given the importance of standardization for the exploitation of LOCUS results, thanks to the time alignment between the consolidation of LOCUS results and the work of 3GPP towards Rel. 17, in Table 6 we also present the already published contributions in different standardization fora by LOCUS partners as part of exploitation activities.

Table 6 List of LOCUS partner contributions to the standards

SDO	Partner	Contributions
ETSI	SAMSUNG	<ul style="list-style-type: none"> COMPARISON OF EXISTING PANDEMIC CONTACT TRACING SYSTEMS (GROUP REPORT) HTTPS://DOCBOX.ETSI.ORG/ISG/E4P/OPEN/E4P-002v111PUBLISHEDVERSION_V120INTERNALVERSION.PDF REQUIREMENTS FOR PANDEMIC CONTACT TRACING SYSTEMS USING MOBILE DEVICES (GROUP SPECIFICATION) HTTPS://DOCBOX.ETSI.ORG/ISG/E4P/OPEN/E4P-003v0_2_2.PDF DEVICE-BASED MECHANISMS FOR PANDEMIC CONTACT TRACING SYSTEMS (GROUP SPECIFICATION) HTTPS://DOCBOX.ETSI.ORG/ISG/E4P/OPEN/E4P-006v0_4_0.PDF BACK-END MECHANISMS FOR PANDEMIC CONTACT TRACING SYSTEMS (GROUP SPECIFICATION) HTTPS://DOCBOX.ETSI.ORG/ISG/E4P/OPEN/E4P-008v0111.PDF PANDEMIC PROXIMITY TRACING SYSTEMS: INTEROPERABILITY FRAMEWORK (GROUP SPECIFICATION) HTTPS://DOCBOX.ETSI.ORG/ISG/E4P/OPEN/E4P-007v0_1_5.PDF
3GPP	EAB	<ul style="list-style-type: none"> R2-2006954, “POSITIONING INTEGRITY KPIS”, RAN2 CONTRIBUTION, ERICSSON. R2-2006955, “FACTORS IMPACTING RAT DEPENDENT POSITIONING INTEGRITY”, RAN2 CONTRIBUTION, ERICSSON. R2-2006957, “LPP SIGNALING FOR INTEGRITY SUPPORT”, RAN2 CONTRIBUTION, ERICSSON.
ETSI	NEC	<ul style="list-style-type: none"> CONTEXT INFORMATION MANAGEMENT (CIM); NGSI-LD API (GROUP SPECIFICATION) HTTPS://WWW.ETSI.ORG/DELIVERABLES/ETSI_GS/CIM/001_099/009/01.03.01_60/GS_CIM009v010301P.PDF new version under development CONTEXT INFORMATION MANAGEMENT (CIM); NGSI-LD PRIMER (GROUP REPORT) HTTPS://WWW.ETSI.ORG/DELIVERABLES/ETSI_GR/CIM/001_099/008/01.01.01_60/GR_CIM008v010101P.PDF new version under development CONTEXT INFORMATION MANAGEMENT (CIM); INFORMATION MODEL (GROUP SPECIFICATION) HTTPS://WWW.ETSI.ORG/DELIVERABLES/ETSI_GS/CIM/001_099/006/01.01.01_60/GS_CIM006v010101P.PDF new version under development CONTEXT INFORMATION MANAGEMENT (CIM); SECURITY AND PRIVACY (GROUP REPORT) under development



5. Appendix A

LOCUS Novel Idea Questionnaire

Title:

Names:

Partners:

Date:

- PROBLEM WITH THE EXISTING SOLUTION
- BASIC STEPS OF THE PROPOSED SOLUTION
- ADVANTAGES OF THE PROPOSED SOLUTION
- CORE ESSENCE OF THE SOLUTION

1. IS THE INNOVATION BEEN CREATED WITHIN LOCUS PROJECT?
2. DO YOU KNOW OF ANY CLOSELY RELATED INNOVATION?
3. WHEN WAS YOUR INNOVATION FIRST DOCUMENTED?
4. IS THE INNOVATION DIRECTLY RELATED TO LOCUS?
5. DO YOU THINK THAT THIS INNOVATION MAY BE INCORPORATED INTO A FUTURE PRODUCT?
6. COULD THIS INVENTION BE INCLUDED IN ANY STANDARD?
7. COULD THIS INVENTION BE RELATED TO IMPLEMENTATION IN A NODE/EQUIPMENT COMPATIBLE WITH A STANDARD?