Project Title	Virtual Presence in Moving Objects through 5G
Project Acronym	PriMO-5G
Grant Agreement No	815191
Instrument	Research and Innovation Action
Topic	The PriMO-5G project addresses the area of "a) Focus on mmWave and super broadband services" in the call "EUK-02-2018: 5G" of the Horizon 2020 Work Program 2018-2020.
Start Date of Project	01.07.2018
Duration of Project	36 Months
Project Website	https://primo-5g.eu/

D6.2 DISSEMINATION AND EXPLOITATION PLAN

Work Package	WP6, Dissemination, standardization, and regulation
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Due Date	31.09.2018, M3
Date	29.04.2019
Version	5.0 (Submitted)

Dissemination Level

X	PU: Public
	PP: Restricted to other programme participants (including the Commission)
	RE: Restricted to a group specified by the consortium (including the Commission)
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Disclaimer

PriMO-5G has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815191. The project is also supported by the Institute for Information & communications Technology Promotion (IITP) grant funded by the Korea government (MSIT) (No.2018-0-00170, Virtual Presence in Moving Objects through 5G). The dissemination of results herein reflects only the author's view, and the European Commission, IITP and MSIT are not responsible for any use that may be made of the information it contains.

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Executive Summary

The PriMO-5G project is leveraging mission-critical use cases (firefighting) to inspire research and technology advancements in the 5G radio access, core and edge segments. Moreover, the project targets to implement ocal and cross-continental testbeds validate some of these developments and demonstrate end-to-end operations of 5G system for vehicular and aerial (drone) setups that enable novel services, such as, immersive video services. The insights and results from these project activities are considered to of interest to stakeholders in four identified primary focus areas, namely: communication technologies, public safety, drones and machine learning.

To that end, the communications, dissemination and exploitation plans outlined in this deliverable are critical to ensure that the PriMO-5G reach the right external stakeholders in an accessible and timely manner. Moreover, this deliverable outlines plans to ensures that those results have an impact and/or exploitation potential beyond the project itself.

The overall strategic goals for PriMO-5G communications, dissemination and exploitation actions are summarized as follows:

- *PriMO-5G communications*: To facilitate outreach to society with aim of highlighting the potential impact and benefits of the PriMO-5G activities and results, particularly in providing solutions that addresses specific societal challenges.
- *PriMO-5G dissemination*: To transfer new knowledge and results with the aim of maximizing the impact of the project's results by enabling wider use and take up of project's results.
- *PriMO-5G exploitation*: To transform the project's actions and results into concrete value through scientific, technological, commercial or regulatory (or policy) exploitation routes.

In addition to outlining the strategic approach and plans, this deliverable presents also measurable objectives and mechanisms for periodically monitoring performance of communications, dissemination and exploitation activities, and initiating intervention measures where necessary.

List of Acronyms

Acronym	Definition
5G	Fifth-Generation Mobile Network
5GC	5G Core
ARF	Aalto Radio Framework
AWS	Amazon Web Services
CAA	Civil Aviation Authority
CAU	Chung-Ang University
CCE	Critical Communications Europe
CCW	Critical Communications World
CIS	Computational Intelligence Society
CMC	Cumucore
COMSOC	Communications Society (IEEE)
CoW	Cell on Wheels
CS	Computing Society
DoA	Description of Action
EAB	Ericsson AB
EC	European Commission
EENA	European Emergency Number Association
eMBB	Enhanced Mobile Broadband
eMBMS	Evolved Multimedia Broadcast Multicast Services
eNB	Evolved Node B
EU	European Union
EUC	EUCAST
EUCNC	European Conference on Networks and Communications
EURASIP	European Association for Signal Processing
GIST	Gwangju Institute of Science and Technology
GLOBECOM	Global Communications Conference
gNB	Next Generation Node B
ICML	International Conference on Machine Learning
ICT	Information and Communication Technologies
IEEE	Institute of Electrical and Electronics Engineers
IEEE CIS	IEEE Computational Intelligence Society
IEEE CS	IEEE Computer Society
IITP	Institute for Information and communication Technology Promotion
IJCAI	International Joint Conference on Artificial Intelligence
ICJNN	International Joint Conference on Neural Networks
IMLS	International Machine Learning Society
INNS	International Neural Network Society
IPR	Intellectual Property Rights
LSA	License Shared Access
LTE	Long Term Evolution
KAIST	Korean Advanced Institute of Science and Technology
KCL	Kings College London
KT	Korea Telecom
KTH	Royal Institute of Technology in Stockholm
MANO	Management and Orchestration
Mxx	Month xx
N/A	Not applicable
NFV	Network Function Virtualisation

Acronym	Definition
NI	National Instruments
NSA	5G Non-Standalone Architecture
OAI	Open Air Interface
ONAP	Open Networking Automation Platform
OPNFV	Open Platform for NFV
PoC	Proof of Concept
PSC	Public Safety Communications
PSCE	Public Safety Communications Europe
PU	Public (deliverable)
RIA	Research & Innovation Action
SA	5G Standalone Architecture
SAIS	Swedish Artificial Intelligence Society
SPS	Signal Processing Society
TCCA	The Critical Communications Association
ToC	Table of Contents
TRL	Technology Readiness Level
UPF	User Plane Function
URLLC	Ultra Reliable Low Latency
VTC	Vehicular Technology Conference
VTS	Vehicular Technology Society
WP	Work Package
WPL	Work Package Leader
WSAI	World Summit AI
YU	Yonsei University

1   Introduction

1.1   Scope of the document

The PriMO-5G project involves partners from several countries from Europe and a number of partners from South Korea, who together will be addressing objectives of the 'EUK-02-2018:5G' call in the area "*a) Focus on mmWave and super broadband services*". Specifically, the PriMO-5G EU aims to demonstrate an end-to-end 5G system providing immersive video services for moving objects. This is achieved by cross-continental testbeds that integrate radio access and core networks developed by different project partners. The cross-continental testbeds will show the end-to-end operations of envisaged use cases.

The purpose of this document is to provide both a framework and guidance for PriMO-5G partners in promotion of the project and its results, as well as, leveraging the project results in different exploitation actions. Furthermore, the public report provides external stakeholders an overview of the plan for communications, dissemination and exploitation activities of the PriMO-5G project.

The communications, dissemination and exploitation plans herein are there to support the overarching aim of the PriMO-5G-5G project to:

- Demonstrate an end-to-end 5G system providing immersive video services for moving objects. This will be done by cross-continental testbeds showcasing mmWave radio technologies, interoperable 5G core networks, and AI-assisted communications.
- The project contributes to the standardization of 5G Phase 2 and beyond, identifies possible regulatory bottlenecks that need to be solved in order to enable the system to operate globally, assesses the economic and business aspects related to the use of 5G for immersive video service in vehicular and aerial (drone) settings in two of its major markets.
- The PriMO-5G project will serve as a meeting place for leading industry players, top universities, and innovative SMEs in Europe and Korea, and thus will contribute to long-term partnership between the two regions.

It will help Europe and Korea retain the competitive edge in the fierce global 5G competition.

1.2   Structure of the document

This deliverable document is organised as follows. Section 2 presents the PriMO-5G communications, dissemination and exploitation strategy. This includes identified primary focus areas of the project and the stakeholder target groups considered by the project in each focus area. Section 3 describes the project's communications channels and dissemination activities, and their respective plans, whereas; Section 4 focuses on exploitation activities including outlines of individual exploitation plans of the different partners in PriMO-5G. The measurable objectives and key performance indicators (KPIs) for the project's communications, dissemination and exploitation activities are presented in Section 5 and finally the conclusions are presented Section 6.

1.3   Relationship to other project outcomes

The overall work structure of PriMO-5G is shown in Figure 1. In this work structure, WP1 provides the use cases that inspire research and technology developments in WP2, WP3, and WP4. Whereas, WP5 establishes the local and cross-continental testbeds to demonstrate end-to-end operations of 5G system for vehicular and aerial (drone) setups that enable novel services, such as, immersive video services. The communications, dissemination and exploitation plans outlined in this deliverable 6.1, and WP6 in general, is meant to ensure that the PriMO-5G project and its results from WP1 to WP5 reach the right external stakeholders in an accessible and timely manner. Moreover, this deliverable ensures that those results have an impact and/or exploitation potential beyond the project itself.
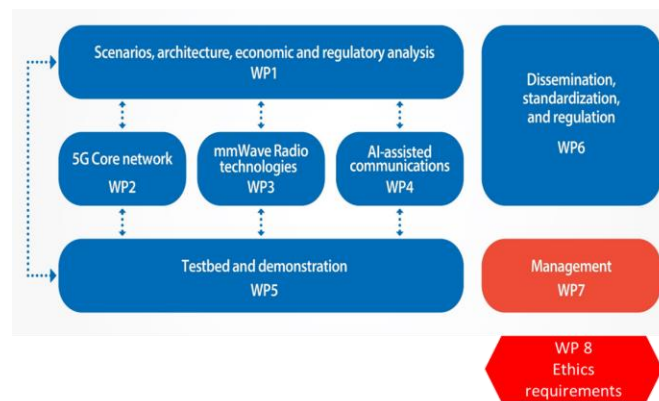

Figure 1 PriMO-5G work structure

2   PriMO-5G communications, dissemination, and exploitation strategy

2.1   Background and motivation

The processes of communications, dissemination and exploitation in PriMO-5G (and Horizon 2020 projects in general) aim to maximize the impact of the results produced by the project. To that end, we note that results from projects (or 'actions') in Horizon 2020 programme as being defined as:

> "*Any tangible or intangible output of the action, such as data, knowledge and information whatever their form or nature, whether or not they can be protected, which are generated in the action as well as any attached rights, including intellectual property rights.*"

Essentially, this refers to all project outcomes that may be leveraged (by stimulating further researcher, by commercial exploitation, etc.) either by the partners from within the PriMO-5G project consortium or by stakeholders outside the project.

However, before outlining the PriMO-5G communications, dissemination and exploitation objectives and strategies, it is worth recalling the definitions of these three processes, which typically have differing objectives, focus and target groups. For that, we adopt the definitions below derived from the European Intellectual Property Rights (IPR) Helpdesk guideline document [EU2018]:

- *Communications*: Encompasses all activities in relation to the promotion of the project itself and the project results beyond the project's own immediate community. This typically involves outreach actions not only to other research projects, but also to stakeholders (e.g. policy makers, media, general public etc.) who require the project messaging be packaged in a way that is comprehensible to each stakeholder group.
- *Dissemination*: The action of public disclosure of the project results by any appropriate means (other than resulting from protecting or exploiting the results), typically includes scientific publications and demonstrations.
- *Exploitation*: Involves the leveraging of project results for developing new standards, products, processes or services, or utilizing the results for further research activities beyond the scope of the existing project.

However, with the definitions above, it should also be noted that the implementation or outcomes of the processes may sometimes overlap, thus blurring the boundaries. For instance, tools originally designed for communications processes could also be used as dissemination tools, or a scientific dissemination from the project may trigger interest for commercial exploitation by stakeholders outside the project.

The achievement of envisioned impacts by the PriMO-5G communications, dissemination and exploitation activities requires a consortium-wide understanding of the overall strategic goals of each category, related measurable objectives, plan of actions towards achieving those objectives, continuous monitoring and improvements (or adjustments) throughout the project lifetime, and sustainability measures after the project ends. To that end, the overall strategic goals for PriMO-5G communications, dissemination and exploitation actions are summarized as follows:

- *PriMO-5G communications*: To facilitate outreach to society with aim of highlighting the potential impact and benefits of the PriMO-5G activities and results, particularly in providing solutions that addresses specific societal challenges.
- *PriMO-5G dissemination*: To transfer new knowledge and results with the aim of maximizing the impact of the project's results by enabling wider use and take up of project's results.
- *PriMO-5G exploitation*: To transform the project's actions and results into concrete value through scientific, technological, commercial or regulatory (or policy) exploitation routes.

The rest of this deliverable will outline in more detail the plans and objectives for the PriMO-5G communications, dissemination and exploitation plans.

2.2 Primary focus areas

The PriMO-5G project has four primary focus areas where the project is likely to address different target groups or stakeholders. These four focus areas are:

- Communications technologies (5G)
- Public safety
- Drones
- Machine learning

The definition of these primary focus areas is use case-driven and is based on the PriMO-5G firefighting use cases of WP1 (see Figure 2). The identification of the primary focus areas (and stakeholders therein) allows for differentiation of the dissemination and/or outreach strategies to meet specific needs of different target groups. Further descriptions of these four primary focus areas and their target group is provided in the remainder of Section 2.
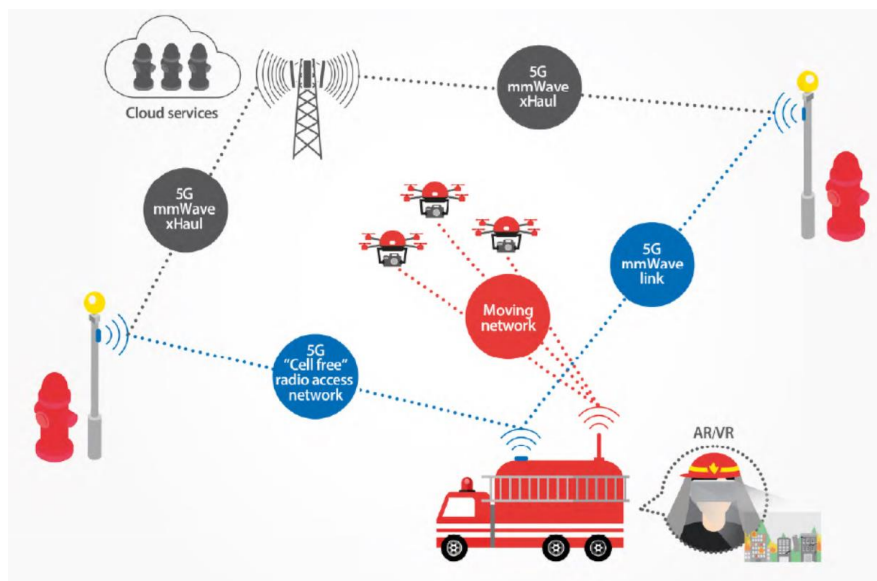
Figure 2 PriMO-5G firefighting use case

2.2.1 Communications technologies (5G)

The development of 5G technologies is influenced by the need to address a diverse range of use cases and business models for verticals with disparate and sometimes stringent requirements [5GPPP2016]. This is driving the development of a 5G NR radio interface with significantly reduced latencies, enhanced reliability, improved spectral efficiency, higher band operation and greater data throughput. Moreover, it is pushing the evolution of 5G systems toward flexible end-to-end infrastructure (based on technologies, such as, NFV/SDN, edge computing, network slicing etc.) from legacy monolithic core network to a shared pool of virtual resources allocated that can be dynamically based on different requirements of use cases.

The PriMO-5G project targets to contribute to development of 5G technologies with results, feasibility insights and approaches for implementation of end-to-end 5G systems for mission-critical use cases,

such as, firefighting. To that end, the project targets developing and combining various technologies in the radio access and core that include, but not limited to cell-free network architecture, flexible duplexing techniques, localization and beam steering, beacon-based mobility management, efficient end-to-end slicing and orchestration. Therefore, the communications technologies focus area the PriMO-5G target groups constitute traditional 5G innovation and supply side stakeholders. The target groups for this focus area and their potential interests are described briefly in Table 1.

Table 1 Target groups for the communications technologies focus area

Target groups for communications technologies focus area	Relevant interests of each target group
5G equipment/infrastructure vendors	Equipment vendors of different size that monitor research developments in 5G and beyond 5G technologies.
Network operators and service providers	Established mobile network operators and communications service providers interested to upgrade their networks to serve mission-critical vertical applications.
Open source communities and projects	Projects and communities based implementing an open source model for development of software-based 5G architectures and potentially receptive to contributions from research projects.
National regulatory authorities (NRAs) and policy makers	NRAs interested in gaining insights on new/innovative spectrum usage principles for mission-critical 5G vertical applications. ICT policy makers.
5G standards development organisations (SDOs)	SDOs specifying 5G core, edge and radio access technologies and potentially receptive to direct or indirect contributions from research projects.
Academic research community	Academic research community working on 5G and beyond 5G themes.

2.2.2   *Public safety*

The PriMO-5G use case could be considered under the Public Safety Communications (PSC) umbrella, which generally refers to utilisation of communications solutions for enhancing the interaction between (and among) citizens and authorities for improved situational awareness, rapid response and cooperation across domains, so as to reduce the risk and minimize the impact associated with a particular emergency event. Public safety or Public Protection and Disaster Relief (PPDR) is considered to be among the most critical target vertical areas for 5G [Lund2018]. Public safety as a focus area for PriMO-5G has a target group, which includes stakeholders outside the traditional telecommunications value chain noted in Section 2.2.1). The target groups for this focus area and their potential interests are described briefly in Table 2.

Table 2 Target groups for the public safety focus area

Target groups for public safety focus area	Relevant interests of each target group
General public and mainstream media	The general public and mainstream media have interest to understand and advocate for public safety technological developments that enhance their safety in everyday life.

Target groups for public safety focus area	Relevant interests of each target group
Public safety equipment vendors	Public safety equipment vendors (both communications and non-communications equipment) interested in 5G evolution of their products.
PSC operators and service providers	PSC network operators and communications service providers interested in 5G deployments/upgrades for their networks (from legacy TETRA, LTE etc. networks).
Public safety regulatory and policy making bodies	National or regional public bodies (policy, legal, regulatory, governance etc.) monitoring technological trends in public safety and soliciting inputs for regulatory or policy changes to facilitate adoption of the technologies.
Public safety initiatives or alliances	Membership initiatives or alliances bringing together different stakeholders in the public safety ecosystem for exchange of ideas on PSC developments. The focus for PriMO-5G is on initiatives in EU and Korea. Of particular interest is the PSCE[1], the Public Safety Communications Europe Forum, which is independent forum, where representatives of public safety user organisations, industry and research institutes can meet to discuss and exchange ideas and best practices, develop roadmaps and improve the future of public safety communication. In Korea, the SafeNet Forum[2] plays similar role to PSCE by bringing together members from network industry, academy and government to review policies and process for design and deployment of PPDR networks in Korea.
Emergency response organisations	Organisations responsible for public safety field operations, interested in new 5G technologies for enhancing safety and efficiency in their operations.
SDOs	SDOs active in the public safety domain (e.g. ETSI[3]) and potentially receptive to direct or indirect contributions from research projects.
Academic research community	Academic research community working on public safety, PPDR or other emergency response thematic research areas

2.2.3 Drones

Drones or unmanned aerial vehicles (UAVs) are a focus area for PriMO-5G due to their prominent use in the PriMO-5G use cases. The drone industry in general is one that is experiencing rapid growth across multiple sectors. The use of drones as a platform for remote sensing and mapping applications is well established. Furthermore, drone use cases for lifting payloads to otherwise inaccessible (or hard to reach) locations in a timely manner are expected to be increasingly prevalent in business critical logistics and last mile delivery services. This payload bearing capability also presents an opportunity for use of drones as an aerial extension of existing terrestrial wireless network (in the form of drone

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[1] PSCE Public Safety Communications Europe Forum https://www.psc-europe.eu/

[2] SafeNet Forum Korea http://www.safenetforum.or.kr/main/

[3] ETSI Special Committee on Emergency Telecommunications (EMTEL) http://www.emtel.etsi.org/

base stations, drone IoT sensors etc.) in mission critical applications [Zeng2016]. Therefore, the PriMO-5G considered drones as a focus area where again interaction with stakeholders outside traditional telecommunications industry value chain is vital. The target groups for drones focus area and their potential interests are described briefly in Table 3.

Table 3 Target groups for the drones focus area

Target groups for drones focus area	Relevant interests of each target group
Civil Aviation Authorities (CAAs)	Government agencies responsible for the regulation of aviation safety in a particular country and determining policy for the use of airspace. As drones traffic is on the rise, the CAAs are shouldering more responsibilities for monitoring drone usage.
Drone regulatory and policy making bodies	National or regional public bodies (policy, legal, regulatory, governance etc.) monitoring drone technological trends and soliciting inputs for regulatory or policy changes to facilitate safe adoption of drone technologies, particularly for critical application areas, such as, public safety[4]. For instance, the EU is currently formulating a regulatory framework[5] that will cover all type of existing and future drone operations in EU Member States.
Drone industry alliances	Alliances bringing together different stakeholders in the drone ecosystem for exchange of ideas on developments, promote standardisation, and advocating for regulatory and policy changes. The target for PriMO-5G is on drone industry in EU and Korea. Notable examples include: Drone Alliance Europe (DAE)[6] and Drone Manufacturers Alliance Europe (DMAE)[7]. Additionally, the European Emergency Number Association (EENA) also has a working group studying use of drones for public safety[8], which is aligned to PriMO-5G use cases.
SDOs	SDOs active in specification of drone technologies and potentially receptive to direct or indirect contributions from research projects.
Academic research community	Researchers working on drone thematic research areas.

2.2.4   *Machine learning*

The PriMO-5G project targets networking and multi-access edge computing (MEC) enhancements for the project's high mobility firefighting use cases through the use of Artificial Intelligence (AI) approaches, most notably machine learning, to improve the network key performance indicators (KPIs) and intelligence. This synergy between 5G and machine learning (and AI in general) has gained significant

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[4] http://ec.europa.eu/growth/sectors/aeronautics/rpas_en

[5] http://dronerules.eu/en/recreational/eu_regulations_updates

[6] http://dronealliance.eu/

[7] http://dronemanufacturersalliance.eu/

[8] https://eena.org/drones/

attention in recent times, with many interesting research directions (see e.g. [Li2019]). Therefore, designating machine learning as primary focus area allows the project to engage the mainstream machine learning community to exchange ideas on the PriMO-5G approaches but also gain insights from other machine learning application areas. To that end, the target groups for machine learning focus area are described briefly in Table 4.

Table 4 Target groups for the machine learning focus area

Target groups for drones focus area	Relevant interests of each target group
Machine learning /AI industries	Companies in EU and Korea working on or interested in machine learning/AI product development (for networking, edge computing, drones etc.) are targeted as potential exploitation partners for some of the solutions/approaches from PriMO-5G.
Machine learning / AI alliances and fora	Alliances and fora in EU and Korea bringing together different stakeholders addressing both technical and non-technical aspects of machine learning and AI in general. Notable examples include, the European AI Alliance[9] and European Association for Artificial Intelligence (EurAI)[10].
Academic research community	Researchers working on machine learning/AI/data science related areas. This may also include national research clusters, such as, the Finnish Centre for Artificial Intelligence (FCAI)[11] and the Swedish Artificial Intelligence Society (SAIS)[12].

2.3   Strategy rollout / phases

The PriMO-5G adopts the proactive strategy of continuously assessing the opportunities for communicating and disseminating results from ongoing research activities. Some of the project's results may present exploitation opportunities, but these are typically expected to manifest at the latter stages of the project lifetime.

Overall, the project is expected have two main strategic phases for communications, dissemination and exploitation of project results, with slightly different focus on these three key activity areas. These phases are:

  i.   Awareness-building and technical leadership phase
  ii. Societal impact and exploitation Impact enhancement phase

Figure 3 provides a juxtaposition of the two phases against the overall project timeline.

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[9] https://ec.europa.eu/digital-single-market/en/european-ai-alliance
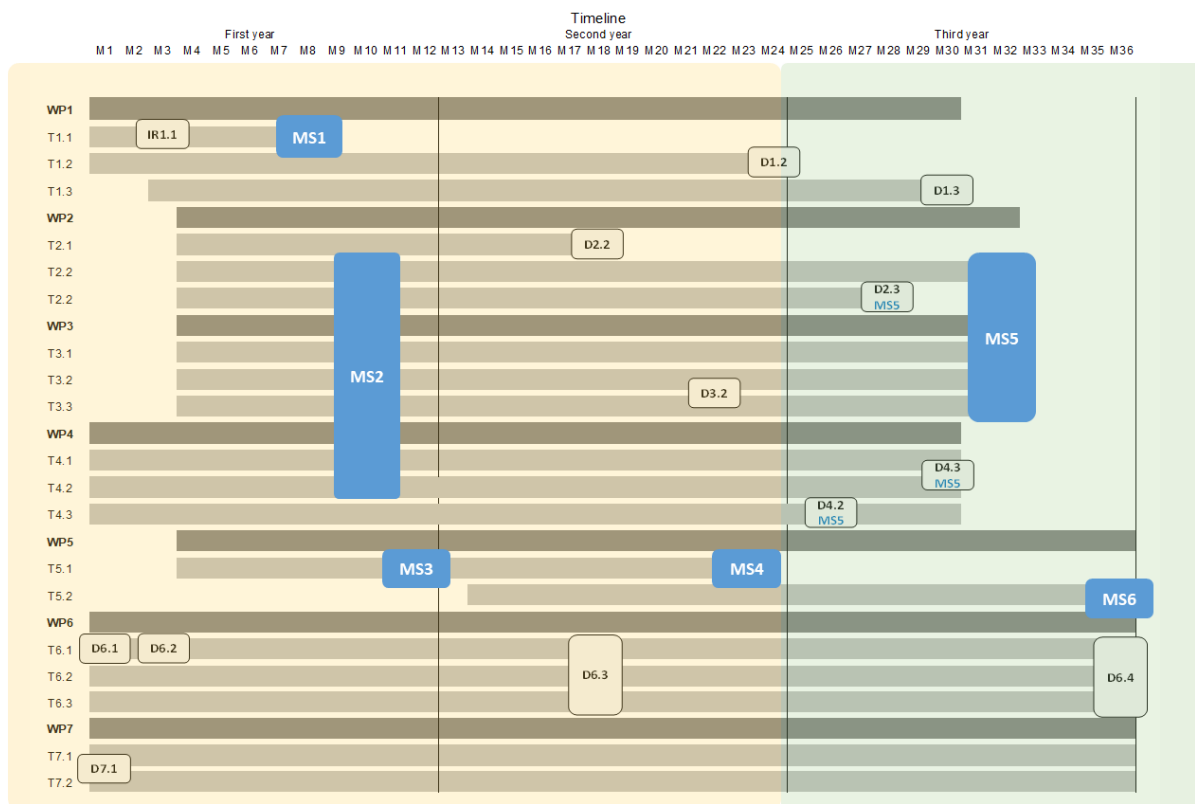
[10] https://www.eurai.org/

[11] https://fcai.fi/

[12] http://www.sais.se/

Milestone number	Milestone name	Due date (in month)
MS1	PriMO-5G use cases and scenarios selected	M8
MS2	Intermediate knowledge and detailed work plan for relevant technologies obtained	M10
MS3	Demonstration plan established	M12
MS4	Demonstrations of components	M23
MS5	Technologies necessary for demonstration developed	M32
MS6	Demonstrations of end-to-end operations	M36

Figure 3 Main phases of the PriMO-5G communications, dissemination and exploitation activities

2.3.1   *Awareness-building and technical leadership phase (M1-M24):*

In the awareness-building and technical leadership phase, the initial target is to make the project's objectives and vision known to the different target groups in the focus areas specified in Section 2.2. At this stage the main project results are based on research concepts and technical developments in WP2-WP4 (corresponding to milestone MS2 shown in Figure 3), mostly motivated by the PriMO-5G use cases of WP1 (corresponding to milestone MS1). During this phase, the project utilizes its communications channels and dissemination activities to share insights from the project, as well as, to exchange knowledge with different target groups in the project's focus areas. In this phase, there is also opportunity to carry out some preliminary experimental demonstrations.

2.3.2   *Societal impact and exploitation enhancement phase (M25-M36):*

The societal impact and exploitation enhancement phase of the covers the final third of the project

lifetime. In this period, the project research output and demonstrations are at an increased level of maturity and the potential of impact is higher (these developments correspond to milestones MS4-MS6 in see Figure 3. Therefore, different stakeholders targeted by the project can be addressed with insights that are more comprehensive. To that end, in this phase the project should be able to communicate in concrete terms on how society could reap the benefits from the research carried out in PriMO-5G. Exploitation activities are also a higher priority at this stage to provide pathways for transforming project results (research output) into patents, standards, products and so on.

3   Communications and dissemination plans

3.1   PriMO-5G communications materials and channels

The PriMO-5G project utilizes multiple communications materials and channels to be able to convey the project messaging and updates to relevant target groups across all PriMO-5G focus areas. These communications assets includes both offline and online materials and channels, which allow conveying of project messaging both remotely (virtually) and directly at face-to-face events. Overall, the joint use of these communications materials and channels is to *collectively* establish, maintain and communicate to key stakeholders a clear, consistent and compelling vision of PriMO-5G project's purpose, goals, benefits, as well as, showcasing project's results in a timely and accessible manner.

The PriMO-5G project branding is selected to enhance this consistency, by use of project logo and common schemes across not just all communications channels and materials, but also documents (deliverable reports and slides) used in presenting the project results. In all cases, particular attention is made to ensure that the acknowledgement of the funding bodies. To that end, a reference to the funding from the European Union's Horizon 2020 research and innovation programme and the Institute for Information & communications Technology Promotion (IITP) grant funded by the Korea government (MSIT) is indicated in all the communications channels and materials through use of both text and funding body logos.

Every communications action carried out using these materials or channels targets to fulfil at least one of the of the following communications goals:

- *To inform*: Communications to create awareness and stimulate interest in the project. This is more prevalent during the awareness-building phase of the project.

- *To persuade*: Communications to stimulate some action (e.g. collaboration proposal) from targeted stakeholders. This is relevant in both project phases described in Section 2.3.

- *To remind*: Communications to keep the project brand in the stakeholder's mind. This is also highly relevant in both project phases described in Section 2.3.

- *To engage*: Communications designed to form relationships with some of the project stakeholders and to encourage them to be advocates (share news) of the project. This is relevant in both project phases described in Section 2.3, but marginally more in the societal impact and exploitation enhancement phase.

The rest of Section 3.1 outlines briefly the different PriMO-5G communications channels and materials.

3.1.1   Project Website

The website of the PriMO-5G project is available at https://primo-5g.eu/ and is responsive to the browser, making it readable across all device platforms (desktop, tablet, mobile). All pages of the website feature the PriMO-5G logo at the top and at the Furthermore, navigation of the website is enhanced by having at the top of each page a menu with links to the main home page and the rest of the pages in the website (see Figure 4).
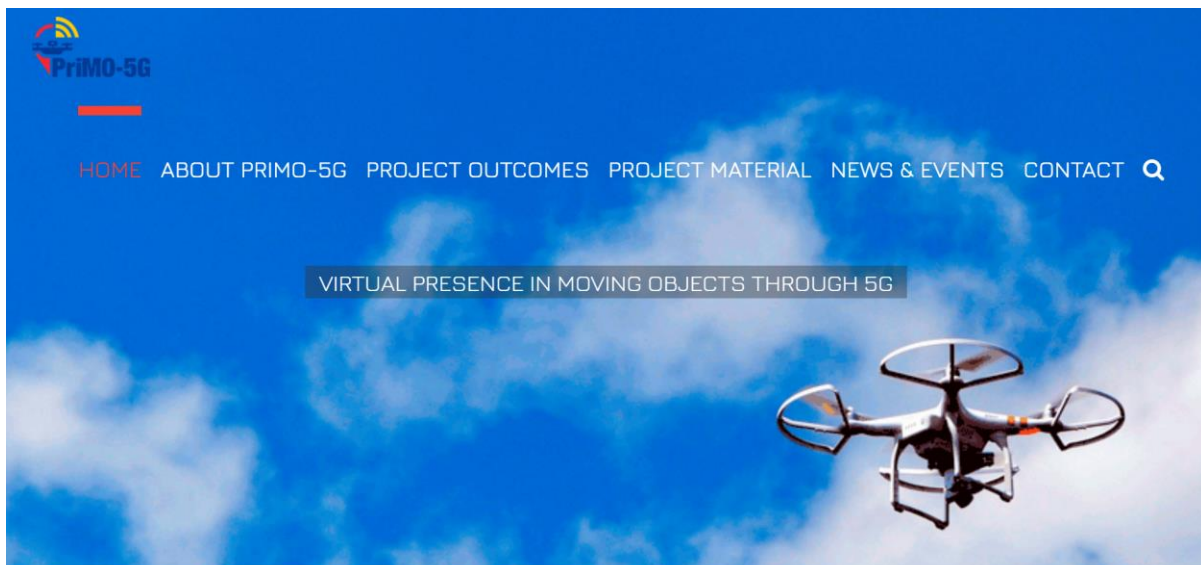
Figure 4 Screenshot of project website

The description of the different pages (and subpages) in the PriMO-5G website and is shown in Table 5. The website includes pages (*Home*, *About PriMO-5G* pages) that primarily target to inform (build-awareness) about the project. These pages hold general information about the project and that is usually unchanged. Additionally there are pages (*Project Outcomes, Project Materials, News and Events* pages) that are more regularly updated to promptly share project related events or results. These regular updates helps maintain a timely profile of the project and keeps the project in the stakeholders' thoughts.

Table 5 Description of PriMO-5G website pages

PriMO-5G website page	Description/contents
Home	Summarises the project goal, use case and provides partner list. The page also includes a gallery for showcasing photos from different project events or demos.
About PriMO-5G	Describes the three main project objectives and lists the project partners.
Project Outcomes	Presents the use case(s) in more detail and describes briefly the project testbeds in Europe and Korea. Furthermore, the page includes the list of project deliverables which also includes download links for deliverables classified as Public.
Project Materials	This page includes links for downloading project communications materials (e.g. flyers) and relevant presentations by different project partners. Moreover, the page includes section listing scientific publications. The publications classified as open access publications will include links for downloading the papers.
News and Events	Includes project news articles released by the project, as well as, news about PriMO-5G from third party channels. Also includes a feed from the project Twitter account. Moreover, the page includes listing of current and past events by the project.
Contact	Provides the project contact information.

3.1.2   Social Media

The communication of project information via the website is complemented by the PriMO-5G social media channels. Two of the social media channels already established (Twitter and YouTube) are described briefly below.

3.1.2.1   Twitter

The project Twitter feed is accessible via https://twitter.com/PriMO5G (see Figure 5). The project's Twitter account provides a channel for more frequent sharing of project micro-updates (including sharing links of updates appearing on the project website). Moreover, it facilitates continuous engagement of stakeholders who follow the Twitter feed.

Figure 5 Screenshot of PriMO-5G Twitter page

3.1.2.2   YouTube

The PriMO-5G YouTube provides a channel for archiving and sharing videos from project events, demos, presentations, partner interviews and so on (see Figure 6).
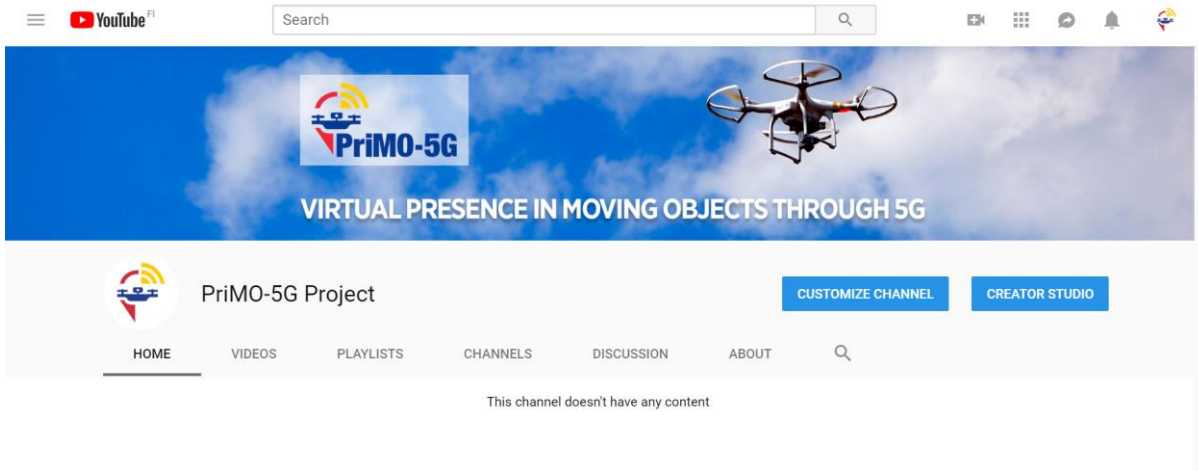
Figure 6 Screenshot of PriMO-5G project YouTube channel

3.1.3   *Flyers and rollup*

The portfolio of project communications assets includes printed communications materials. These materials include flyers distributed to relevant stakeholders or displayed as a rollup banner in face-to-face events. Both the flyers (see Figure 7) and the rollup banner (see Figure 8) includes introductory information on the project and links to the project's online communications channels.

Figure 7 PriMO-5G flyer

Figure 8 PriMO-5G rollup

3.2   PriMO-5G dissemination activities

Dissemination: The action of public disclosure of the project results by any appropriate means (other than resulting from protecting or exploiting the results), typically includes scientific publications and demonstrations.

The PriMO-5G dissemination activities provide means for more detailed disclosure of the results from the project's research and innovation activities. These dissemination activities generally may include (but is not limited to):

- Scientific papers and other publications

- Externally organized events

- Events (co-)organized by PriMO-5G partners

- Technical exchanges with other projects

These dissemination activities are described further in the remainder of Section 3.2.

3.2.1   *Scientific papers and other publications*

The PriMO-5G project consortium includes European and Korean partners from academic and research-focused organizations, which combine ambitions on applied research with quest for scientific excellence. Typically, these partners have local strategies and researcher development activities that strongly encourage sharing of their research output from the project through papers presented in conferences (oral paper or poster presentations) or published in reputable journals, book chapters, scientific magazines in the different primary focus areas the project.

Apart from the aforementioned peer-reviewed publications, the project may in some case also self-publish more concise and accessible (relatively non-technical) articles that target general public, policy makers and so on. Example of such articles include:

- 'Blog' type of web articles that provide an introductory overview of particular project deliverables or demos;

- Whitepapers that present project result(s) in a more illustrative way and a more detail than a web article

- Policy brief outlining policy implications (e.g. spectrum allocation, drone regulation etc.) of a particular PriMO-5G research result

3.2.2   Externally organized events

The PriMO-5G partners target regular presentations at a wide range of dissemination events of varying size (conferences, workshops, symposiums, forums, colloquiums, etc.), which cover any of the four primary focus areas of the project (5G communications technologies, public safety, drones and machine learning). The type events targeted includes traditional academic conferences, conferences with strong participation of researchers from industry, non-research events (e.g. gathering of policy makers), research outreach events and industry fairs. The aim of attending these events includes conveying project results, enhancing networking opportunities within different communities (e.g. technology, scientific, end users, regulators, policy makers etc.), and raising further awareness of the project (beyond the communications activities of Section 3.1).

3.2.3   Events (co-)organized by PriMO-5G partners

The dissemination of results from the project can benefit from the PriMO-5G project partners taking a more proactive by organizing events as single project or in partnership with other projects or stakeholders. Typically, these events could be workshops collocated with prominent conferences or demo events in some of the partner sites. These event (co-)organization actions have a number of potential benefits. PriMO-5G (co-)organized events allows the project increased exposure and creates the possibility to formulate event themes that are more closely aligned to the PriMO-5G primary focus areas. Furthermore, these type of events provide opportunity to strengthen external collaborations during the preparation phase and with invited contributors or participants to the PriMO-5G events.

3.2.4   Technical exchanges with other research projects

The PriMO-5G project will seek to have technical interactions and collaborations with other research projects that have common interests in one or more of the primary focus areas of PriMO-5G. The outcomes of these interactions may include (but not necessarily limited to) joint events (as noted in Section 3.2.3), joint experimental demonstrations, joint publications and collaborations for follow-up research projects.

While most of the PriMO-5G partners have linkages nationally-funded research projects that complement their activities in PriMO-5G, a particular effort will be made to target exchanges with international research projects, especially those funded under the H2020 programme. The H2020

projects are particularly attractive as they mostly adapt an open model for sharing of project results (e.g. deliverables). Moreover, these projects are usually collaboration projects with participants from academia, industry and end user organizations, which supports PriMO-5G objective of interacting with partners of different type (not just academia). The H2020 projects or programmes that are of particular interest for technical exchanges are profiled below.

3.2.4.1   EU-Korea projects

The PriMO-5G project is part of a cluster of three EU-Korea projects funded under the H2020-EUK-2018 call. These three projects have exact timelines, which facilitates technical exchanges at more equal footing. However, the focus of these projects is differentiated to allow for diverse research themes within the EU-Korea collaboration context. However, some common themes with PriMO-5G could still be identified that could justify technical exchanges (see Table 6). Therefore, dialogue is planned between PriMO-5G and these EU-KR projects to consider actions, such as, exchange of research results (e.g. deliverables) and joint participation or co-organization of events (both in Europe and Korea).

Table 6 Potential common research areas between PriMO-5G and other EU-KR projects

EU-Korea Project	Commonalities with PriMO-5G primary focus areas	
5G ALL-STAR (*5G AgiLe and fLexible integration of SaTellite And cellular*)[13]	5G technologies	• 5G-NR mmWave access for low latency services • Spectrum sharing approaches
	Public safety	• Support for mission critical applications
	Drones	• n/a
	Machine learning	• n/a
DECENTER (*Decentralised technologies for orchestrated cloud-to-edge intelligence*)[14]	5G technologies	• MEC, fog computing
	Public safety	• n/a
	Drones	• n/a
	Machine learning	• AI application-aware orchestration and provisioning of resources

3.2.4.2   5G-PPP projects

The 5G Infrastructure Public Private Partnership (5G-PPP)[15] is a 5G collaborative research program represented by the 5G Infrastructure Association (5G-IA) on the private side and the EC on the public side. The 5G-PPP constitutes projects are implemented in three phases (see Figure 9). The 5G-PPP Phase 1 projects where completed before PriMO-5G kicked-off, which rules out active exchanges.

By the contrast, 5G-PPP Phase 2 projects[16] constitutes 21 projects mostly active from mid-2017 to early 2020. These projects follow-up on the technology developments in Phase 1 by putting on emphasis on

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[13] EU-KR 5G ALL-STAR project website https://5g-allstar.eu/

[14] EU-KR 5G DECENTER project website https://www.decenter-project.eu/

[15] 5G-PPP website https://5g-ppp.eu/

[16] 5G-PPP Phase 2 projects https://5g-ppp.eu/5g-ppp-phase-2-projects/

prototyping, experimentation and small-scale trialling of those 5G technologies and components. These experimentation activities are vertical use case-driven and with public safety being one of the vertical categories. The 5G-PPP Phase 3 projects[17] are mostly active from 2019. These projects will focus on conducting large-scale trials and pilots for different 5G vertical use cases.
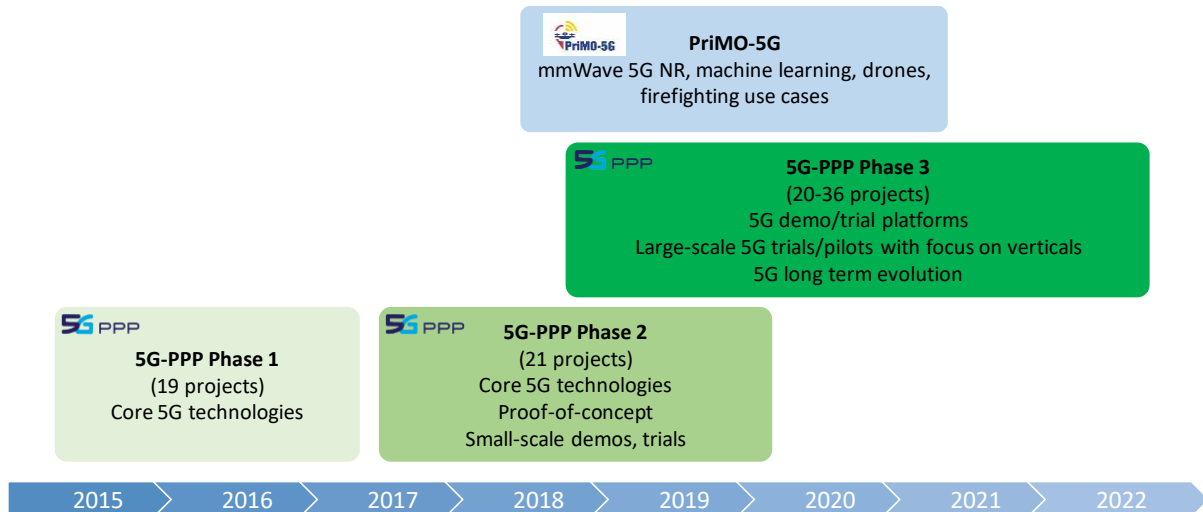
Figure 9 Timeline of the PriMO-5G project transposed on 5G-PPP project timelines

Based on the timelines of Figure 9, active technical exchanges for PriMO-5G could be feasible with Phase 2 projects, which will be in their final stages. However, even more active interaction is foreseen with Phase 3 projects which will be ramping up as PriMO-5G project enters into the societal impact and exploitation enhancement phase. At the time of writing, most Phase 3 projects where yet to start. Therefore, PriMO-5G will be actively monitoring the new projects as they kick-off to identify those that significant overlap with the PriMO-5G primary focus areas and research themes.

3.2.4.3   Other H2020 projects

The technical exchanges between PriMO-5G and other H2020 project is not limited to projects in 5G-PPP programme or previously mentioned EU-KR projects. There are a number of other H2020 projects, particularly on drone and public safety areas, which have similar timelines and could provide mutual benefit for PriMO-5G. These for instance include public safety type of projects in the H2020 Secure Societies[18] work programme (H2020 SEC), H2020 projects targeting Safe Integration of Drones (SESAR), and Marie Skłodowska-Curie Actions (MSCA) actions with projects studying drone integration into next generation mobile networks. A selected example of projects in these different categories is shown in Table 7. At the very least PriMO-5G should be monitoring the results of those projects and try to keep find channels to keep those projects aware of the results from PriMO-5G.

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[17] 5G-PPP Phase 3 projects https://5g-ppp.eu/5g-ppp-phase-3-projects/

[18] Secure societies – Protecting freedom and security of Europe and its citizens https://ec.europa.eu/programmes/horizon2020/en/h2020-section/secure-societies-%E2%80%93-protecting-freedom-and-security-europe-and-its-citizens

Table 7 Examples of other H2020 of potential interest to PriMO-5G

Example H2020 project	Duration	Programme	Relevant objectives of the project from PriMO-5G perspective
BroadWay[19]	05/2018 – 12/2022	H2020 SEC	To enable a pan-European broadband mobile system for PPDR, validated by sustainable test and evaluation capabilities
PODIUM[20]	01/2018 – 12/2020	SESAR	Large scale drone demonstrations to enable safe and secure use by various categories of users (e.g. authorities, drone operations, drone pilots) and for many types of drone operations (e.g. electricity line inspection, emergency services)
PAINLESS[21]	10/2018 – 09/2022	MSCA	To pioneer energy-autonomous portable network nodes (e.g. drone access points) which are self-subsistent and limitlessly-scalable, to satisfy future demands with minimal infrastructure.
TeamUp5G[22]	01/2019 – 12/2022	MSCA	Research focus on ultra-dense small cell systems for future heterogeneous 5G networks. Showcases (e.g. immersive video, drones) will be developed to illustrate the novelty and applicability of project's ideas.

3.3 Dissemination plans across different focus areas

3.3.1 Focus area: Communication technologies

This section outlines the project's dissemination plans towards the communications technologies focus area targets groups previously described in Section 2.2 and shown again in Table 8 below.

Table 8 Legend for target groups for communications technologies focus area

Target groups for communications technologies focus area	ID
5G equipment/infrastructure vendors	A1
Network operators and service providers	A2
Open source communities and projects	A3
NRAs and policy makers	A4
Communications (5G) SDOs	A5
Academic research community	A6

The top externally organized events targeted by the PriMO-5G for this focus area are shown in Table 9. This event list mostly includes a number of flagship events organized by IEEE affiliated societies. In most cases, the dissemination at the events is in the form of oral or poster presentations of previously

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[19] BroadWay project website https://www.broadway-info.eu/

[20] PODIUM project website https://www.sesarju.eu/projects/podium

[21] PAINLESS project website http://painless-itn.com/

[22] TeamUp5G project website http://teamup5g.webs.tsc.uc3m.es/

submitted papers. Moreover, in addition to individual paper or poster presentations these events could be leveraged by PriMO-5G and other projects to co-organize workshops held in conjuction with the events (providing the event organization benefits previously noted in Section 3.2.3). It is noted that EuCNC is an event that also provides opportunities for presentation of PriMO-5G demos. Furthermore, EuCNC has a strong presence from other H2020 5G projects, providing a valuable opportunity for inter-project technical exchanges (as envisioned in Section 3.2.4). Therefore, each edition of the EuCNC event will be targeted during the project lifetime (EuCNC 2019, 2020 and possibly 2021).

Table 9 Externally organized events targeted in the communications technologies focus area

Event	Main Organizer/ Supporter	Tentative event schedules and location	Planned PriMO-5G dissemination	Expected participants from Table 8
EuCNC (European Conference on Networks and Communications)	EC, IEEE COMSOC, EURASIP	Annually in June Europe	Demo, paper, poster	A1- A6
IEEE GLOBECOM (Global Communications Conference)	IEEE COMSOC	Annually in November or December Worldwide	Paper, poster	A1, A2, A6
IEEE VTC (Vehicular Technology Conference)	IEEE VTS	Twice per year in spring (April) and fall (September) Worldwide	Paper, poster	A1, A2, A6
IEEE 5G World Forum	IEEE Future Networks	Annually in September – October Worldwide	Paper, poster	A1- A6
IEEE ICC (International Conference on Communications)	IEEE COMSOC	Annually in May	Paper, poster	A1, A2, A6
5G Vertical Summit	5G Forum	Annually in December	Demo, paper	A1, A2, A4, A6

The priority publications targeted for the communications focus area are shown in Table 10. As with the case with the events, most of the top publications targeted in this area are published by IEEE and affiliated societies. The project targets to publish articles in both high-impact widely-read magazines (e.g. IEEE Communications Magazine), as well as, journal papers in publications with a strong reputation (e.g. IEEE Transactions on Wireless Communications).

Table 10 Top publications targeted in the communications technologies focus area

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 8
IEEE Access	IEEE	Continuous	3.557 (2017)	Multidisciplinary topics, applications-oriented articles	Open	A1, A2, A6

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 8
IEEE Communications Magazine	IEEE COMSOC	Monthly	9.27 (2018)	Tutorial-style magazine articles	Closed	A1-A6
IEEE Transactions on Wireless Communications	IEEE COMSOC, IEEE SPS	Monthly	5.888 (2018)	Scientific articles detailing advances in wireless communications	Closed	A6
IEEE Wireless Communications	IEEE COMSOC	Bi-monthly	9.202 (2018)	Tutorial-style magazine articles	Closed	A1-A6
EURASIP Journal on Wireless Communications	Springer, EURASIP	Continuous	2.407 (2018)	Basic research and application-oriented articles	Open	A1, A2, A6
IEEE Journal on Selected Areas in Communications	IEEE COMSOC	Monthly	7.172 (2018)	Scientific articles detailing advances in all areas of communications	Closed	A6
IEEE Transactions on Vehicular Technology	IEEE VTS	Monthly	4.432 (2018)	Theory and practice of electrical/ electronics technology in vehicular systems	Closed	A6
IEEE Wireless Communications Letters	IEEE COMSOC		3.096 (2018)	short papers in a rapid publication cycle on advances in the state-of-the-art of wireless communications	Closed	A6

3.3.2   *Focus area: Public safety*

This section outlines the project's dissemination plans towards the public safety focus area targets groups previously described in Section 2.2 and listed again in Table 11 below.

Table 11 Legend for target groups for the public safety focus area

Target groups for public safety focus area	ID
General public and mainstream media	B1
Public safety equipment vendors	B2
PSC operators and service providers	B3
Public safety regulatory and policy making bodies	B4
Public safety initiatives or alliances	B5
Emergency response organisations	B6
Public safety communications SDOs	B7
Academic research community	B8

The meaningful interaction with the public safety target group requires the project to present in events with a specific focus on this area. Some of the top public events targeted by PriMO-5G are listed in Table 12. These include events organized by the most prominent public safety alliances in Europe (PSCE and EENA, previously described in Section 3.3.2). Additionally, the project will also target the European and global critical communications events organized by The Critical Communications Association (TCCA)[23], an association with global members interested in the development of standards relating to critical mobile communications. All the events of Table 12 bring together most of the group members of this focus area shown in Table 11.

Table 12 Externally organized events targeted in the public safety focus area

Event	Main Organizer/ Supporter	Tentative event schedules and location	Planned PriMO-5G dissemination	Expected participants from Table 11
PSCE Conference	PSCE	Twice per year (May and November) Europe	Demo, paper, poster	B2-B8
EENA Conference	EENA	Annually in April-May Europe	Demo, paper, poster	B2-B8
Critical Communications Europe (CCE), Critical Communications World (CCW)	TCCA	Annually (March-June) Europe/ Worldwide	Demo, paper, poster	B2-B8

In the case of publications for the public safety focus area, there are almost no prominent publications that are purely dedicated to public safety communications. However, the project is able to target a number of high-impact mainstream publications (see Table 13), which accept multidisciplinary application-oriented papers in open calls but also have regular special issues calls for papers on public safety theme (although the expected readership is mostly from academia and research-oriented public safety institutions or organizations).

Table 13 Top publications targeted in the public safety focus area

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 11
IEEE Access	IEEE	Continuous	3.557 (2017)	Multidisciplinary topics, applications-oriented articles	Open	B2, B3, B8
IEEE Communications Magazine	IEEE COMSOC	Monthly	9.27 (2018)	Tutorial-style magazine articles	Closed	B2-B5, B8
IEEE Systems Journal	IEEE Systems Council	Monthly	4.337 (2018)	Application-oriented articles that address complex systems	Closed	B2, B3, B8

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[23] https://tcca.info/

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 11
				and system-of-systems		
IEEE Wireless Communications	IEEE COMSOC	Bi-monthly	9.202 (2018)	Tutorial-style magazine articles	Closed	B2-B5, B8
EURASIP Journal on Wireless Communications	Springer, EURASIP	Continuous	2.407 (2018)	Basic research and application-oriented articles	Open	B2, B3, B8

3.3.3 Focus area: Drones

This section outlines the project's dissemination plans towards the targets groups in the drone focus area, previously described in Section 2.2 and listed again in Table 14 below.

Table 14 Legend for target groups for the drones focus area

Target groups for drones focus area	ID
CAAs	C1
Drone regulatory and policy making bodies	C2
Drone industry alliances	C3
Drone SDOs	C4
Academic research community	C5

The stakeholders in drone focus area are strongly application-oriented. Therefore, this obliges the project to consider events, which are less academic in nature for this focus area (see Table 15).

Table 15 Externally organized events targeted in the drone focus area

Event	Main Organizer/ Supporter	Tentative event schedules and location	Planned PriMO-5G dissemination	Expected participants from Table 14
Commercial UAV Expo Europe	Diversified Communications	Annually in April Europe	Demo, poster	C1-C5
Drone Days	Taneo, Enterprise Europe Brussels	Annually in March Europe	Demo, poster	C1-C5
Drone Show Korea	Government ministries plus other associations	Annually in January Korea	Demo, poster	C1-C5

In the case of publications for the drone focus area, the target is to publish in both mainstream IEEE publications, but also some other more drone-focus non-IEEE publications, albeit with slightly lower

impact factors (see Table 16). Majority of the readership expected from these publication is from drone researchers in academia and industry.

Table 16 Top publications targeted in the drone focus area

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 14
IEEE Access	IEEE	Continuous	3.557 (2017)	Multidisciplinary topics, applications-oriented articles	Open	C5
IEEE Systems Journal	IEEE Systems Council	Monthly	4.337 (2018)	Application-oriented articles that address complex systems and system-of-systems	Closed	C5
Journal of Unmanned Aerial Systems	Emerald Publishing	Every three months	1.12 (2018)	Applied science, technology and know-how of autonomous systems	Open	C1-C3, C5
Journal of Intelligent and Robotic Systems	Springer	Continuous	1.583 (2018)	Articles from initial concept and theory to prototyping to final product development	Open (green)	C5
IEEE Transactions on Vehicular Technology	IEEE VTS	Monthly	4.432 (2018)	Theory and practice of electrical/ electronics technology in vehicular systems	Closed	C5

3.3.4   *Focus area: Machine learning*

The dissemination plans for the machine learning focus area focuses on the target groups listed in Table 17 and also described previously in Section 2.2.

Table 17 Legend for target groups for the machine learning focus area

Target groups for machine learning focus area	ID
Machine learning /AI industries	D1
Machine learning / AI alliances and fora	D2
Academic research community	D3

The highly active machine learning focus area has a number of prominent events that are targeted by the project. This includes both scientific (academic) events and those applications-oriented events with strong industry participation (see Table 18).

Table 18 Top externally organized events targeted in the machine learning focus area

Event	Main Organizer/ Supporter	Tentative event schedules and location	Planned PriMO-5G dissemination	Expected participants from Table 17
ICJNN (International Joint Conference on Neural Networks)	IEEE CIS INNS	Annually in April Worldwide	Paper	D3
IJCAI (International Joint Conference on Artificial Intelligence)	IJCAI	Annually in August Worldwide	Paper	D3
World Machine Learning and Deep Learning Congress	MEConferences	Annually in October Worldwide	Poster, paper	D1-D3
ICML (International Conference on Machine Learning)	IMLS	Annually in June-July Worldwide	Paper	D3
WSAI (World Summit AI)	World Summit AI	Annually in October	Presentation, poster, demo	D1-D3

In the case machine learning publications, the high-impact IEEE publications (on computational intelligence, neural networks etc.) remain the primary targets for PriMO-5G papers in the machine learning focus area. In most cases the expected audience for these publications is mostly from academia and other research-oriented organizations.

Table 19 Top publications targeted in the machine learning focus area

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 17
IEEE Access	IEEE	Continuous	3.557 (2017)	Multidisciplinary topics, applications-oriented articles	Open	D3
IEEE Computational Intelligence Magazine	IEEE CIS	Every three months	6.611 (2018)	Applications oriented developments, industrial implementations, tools, reviews	Closed	D1-D3
IEEE Transactions on Emerging Topics in Computational Intelligence	IEEE CIS, IEEE CS	Bi-monthly	1.12 (2018)	Emerging aspects of computational intelligence, theory, applications, and surveys	Closed	D3
IEEE Transactions on Pattern Analysis and Machine Intelligence	IEEE CS	Monthly	9.455 (2018)	Pattern analysis and recognition, with a particular emphasis on machine learning for pattern analysis	Closed	D3

Publication	Publisher	Frequency	Impact factor (year)	Papers accepted	Access type	Potential audience from Table 17
IEEE Transactions on Neural Networks and Learning Systems	IEEE CIS	Monthly	7.982 (2018)	Theory, design, and applications of neural networks and related learning systems	Closed	D3

4   Exploitation plans

4.1   Potential exploitable results

The PriMO-5G project is investigating 5G end-to-end system developments for very demanding use cases as noted in Section 2.2.. This constitutes research output and technical developments across radio access, edge and core network segments. To that end, a selection of potential technologies or products whose technology readiness level (TRL) to be advanced by the project research and innovation actions is shown in Table 20.

Table 20 TRL of selected outputs of the PriMO-5G project

Technology/Product	Current TRL	Estimated TRL after the project
Cell-free radio access network architecture	TRL 2	TRL 3
5G mmWave transceivers	TRL 4	TRL 6
Localisation and beam steering algorithms	TRL 4	TRL 6
Standalone UPF	TRL 5	TRL 6
Network Slice Manager & MEC Orchestrator	TRL 3	TRL 6
Mobile edge cloud	TRL 3	TRL 5
AI-assisted networking algorithms	TRL 2	TRL 4

The PriMO-5G exploitation activities will to maximize the ways in which the project results are leveraged for developing new standards, products, processes or services, or utilizing the results for further research activities beyond the scope of the existing project. Specifically, the each PriMO-5G project partner looks to exploit the project results in at least one of the following ways:

- *New or enhanced products/ services*: Use of project results for enhancing the features of partners existing products or services, or development of completely new products/news. This exploitation action is more relevant for industry partners in the consortium.
- *Patents, licenses or technology transfer agreements*: For some partners (both industry and academic) these activities enables transforming their research results into protected intellectual property with commercialization potential.
- *Contributions to standards*: The results emerging from the PriMO-5G coincide with continued standardization activities in 3GPP and other key SDOs. This creates an opportunity for contributions to ongoing standardization by some of the PriMO-5G partners who part of the standardization meetings.
- *Contributions to open source projects/communities*: Some of the key 5G-related developments are also taking place in community-drive open source projects [5GAmericas2019]. The openness of these initiatives creates opportunities for contributions from both academic and industry partners in PriMO-5G.

- *Regulatory/policy change or proposal*: The PriMO-5G research results may have insights that could potential inform decisions of regulators or policy makers in areas of spectrum, drones and public safety.
- *Demonstrators and prototypes*: The PriMO-5G activities have a strong experimentation focus with contributed testbed and experimental platforms from different partners. The PriMO-5G project provides opportunity enhancing these assets or even creating new ones.
- *Education and researcher develop*ment: Exploitation activities in this context include use of the project work as part of thesis works (masters or doctoral level) for some of the researchers participating in project implementation phase. The project results exploited by academic project partners for implementing intensive courses, lectures and so on.
- *Follow-up research*: The PriMO-5G project results also open new research questions or challenges, which could be pursued by partners in follow-up projects national or international calls.
- *Start-ups/Joint ventures*: The IPR generated from the project could also be a basis creation of start-up companies or joint ventures from the existing consortium members. This is an option is a commercialization path that could be considered by some academic partners in the project.

4.2   Individual exploitation plans

The heterogeneous nature of PriMO-5G consortium (see Figure 10), results in diverse exploitation strategies that takes advantage of the different strength of the partners in respective areas. Research-oriented (academic) partners focus on covering the scientific exploitation channels, whereas industry partners exploit their strength in domain specific channels or industry contacts. The individual exploitation plans for the PriMO-5G partners is presented in the remainder of this Section.
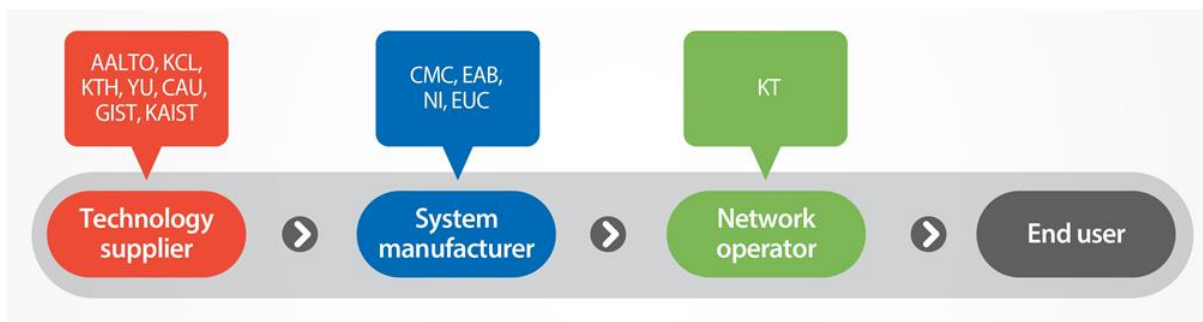
Figure 10 PriMO-5G partners and the positioning in the traditional 5G value chain

4.2.1   System manufacturer (equipment or software vendors)

4.2.1.1   CMC

Cumucore (CMC) is a spin off company from AALTO University that provides cloud EPC integrated with Software Defined Networking (SDN). The company has customers currently in Europe, South Africa and USA. The Cumucore main product cloud EPC has been used in an ETSI PoC to demonstrate the deployment of EPC as part of ETSI NFV. Moreover, Cumcuore together with other partners demonstrated the deployment of the world first pilot of Licensed Frequency sharing (LSA) and cloud EPC.

Exploitation	Short description of CMC exploitation plans
New or enhanced products/ services	*eMBMS media broadcast service*: The eMBMS system includes several modules. The BM-SC modules takes care of ingesting the content and starting the session with the gNB for the media broadcast using new 5GC interface. The MBMS-GW receives the data from the BM-SC to be encapsulated and send via multicast to the different gNBs for the broadcast delivery.
Patents, licenses or technology transfer agreements	N/A
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	*eMBMS system standalone*: The standalone local deployment is applicable for broadcasting the incoming media into a reduced geographical area where one or many gNBs belong to the same Service area. In this scenario the eMBMS system can be installed in a standalone server located on-site for receiving the data from drones or robots and after processing the media is sent it to all the end devices through the gNBs in proximity and connected to the local 5GC and eMBMS system *eMBMS deployed in cloud and xMB management interface for media broadcasters*: The cloud-based deployment is applicable for receiving and broadcasting media in larger geographical area or some of the gNBs are distributed in different regions. In this scenario the media is received in a centralized eMBMS system e.g. running in AWS from where the media will be broadcasted to several Service areas.
Education and researcher development	MSc instruction under supervision at Aalto University. Title "*Optimizing mobile backhaul using machine learning*" by Abdulkadir Mohammedadem
Follow-up research	N/A
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.1.2   EAB

Ericsson is one of the leading providers of Information and Communication Technology (ICT) to service providers, with about 40% of the world's mobile traffic carried through our networks. We enable the full value of connectivity by creating game-changing technology and services that are easy to use, adopt and scale, making our customers successful in a fully connected world. For more than 140 years, our ideas, technology and people have changed the world: real turning points that have transformed lives, industries and society.

Ericsson's long-term relationships with every major telecom operator in the world allow people, business and society to fulfil their potential and create a more sustainable future. Our services, software and infrastructure are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities. Ericsson combine global scale with technology and services leadership.

Exploitation	Short description of EAB exploitation plans
New or enhanced products/ services	Ericsson is developing and actively offering products and solutions based on the technologies for mobile communications, 5G as well as 4G. The next generation technologies for 5G will be further enhanced of subsequent releases of 3GPP standardization, following 3GPP R15. The results from PriMO-5G will be fed into research, standardization and product development with potential impact on designs.
Patents, licenses or technology transfer agreements	Ericsson is actively pursuing opportunities to build patents in all areas of PriMO-5G engagement areas. Main areas would be: Radio access networks, mobile packet core solutions, mobility and session management, Management and orchestration, drone and CoW communication as well as data management and artificial intelligence/machine learning
Contributions to standards	3GPP standardization is focused on finalizing R15 and exploiting R16. There is ongoing planning for 3GPP R17 and during the lifetime of PriMO-5G also standardization of 3GPP R17 will occur. 3GPP R17 is open for directional impacts as the scope and direction of 3GPP is discussed. Options for Public Safety and architectural contributions will be exploited. Other potential standardization open for impact are:, ITU-R WP5D: Future IMT spectrum for WRC-19 and IMT-2020 evaluation and ETSI NFV: Network function virtualization, Management and Orchestration.
Contributions to open source projects/communities	*(e.g. OPNFV, Open Source MANO, ONAP, OpenStack, OAI)* Ericsson is engaged in a set of different Open Source communities and may exploit results for further enhancement of the Open Source platforms.
Regulatory/policy change or proposal	Any conclusions from spectrum work can be fed into Ericsson activities to optimize spectrum impact in regulatory bodies, wireless industry and regional or national engagements.
Demonstrators and prototypes	Optimal routing for wireless networks.
Education and researcher development	Ericsson will actively engage with universities and offer opportunities.
Follow-up research	Likely areas to be further pursued by Ericsson are: public safety, drone and CoW communication, radio access networks, mobile packet core, machine learning and management and orchestration
Start-ups/Joint ventures	N/A

Exploitation	Short description of EAB exploitation plans
Others?	Research results may be exploited and further enhanced together with Ericsson customers.

4.2.1.3   NI

National Instruments Dresden GmbH, a wholly-owned National Instruments (NI) subsidiary is a developer and supplier of application specific wireless products. As one of NI's Centers of Excellence in RF National Instruments Dresden focuses on base-station test-systems, wireless systems, protocol stacks and signaling software as well as RF communication algorithms. Furthermore, National Instruments Dresden has been involved several current and past EU research projects and related activities with respect to setting up demonstrators and testbeds, including PriMO-5G.

Exploitation	Short description of NI exploitation plans
New or enhanced products/ services	NI is working in the area of developing tools for research, in particular developing a MAC-PHY research platform for 5G wireless. Part of the wireless research platform are the 4G/5G software reference designs that provide a rich set of high-performance FPGA IP for prototyping real-time wireless communication systems. When combined with NI's line of software defined radios, the 4G/5G reference designs form a complete hardware and software prototyping platform that enables researchers to accelerate their prototyping efforts and achieve results quickly. Within the project NI will learn about new application scenarios and requirements of researchers in the specific PriMo-5G environment and will improve the research platform and specifically extend the NI 4G/5G SDR platform with new 5G NR functionality focusing on Layer 1 – Layer 3. In general, the knowledge gained within the PriMo-5G project will guide NIs development efforts and help to prioritize development decisions.
Patents, licenses or technology transfer agreements	NI is actively pursuing opportunities of patenting innovative ideas which are created during the project work, e.g. on the 5G mmWave demonstrator.
Contributions to standards	NI is active in the 3GPP standardization body with focus on RAN WG1 and WG2 as well as WG4. NI will provide updates from the 3GPP standardization meetings including information relevant for the project. In 3GPP RAN WG1, the focus is on monitoring specification progress on initial access and MIMO. In 3GPP RAN WG2, the focus is on monitoring specification progress on initial access, beam management and L1 control. In 3GPP RAN WG4, the focus is on monitoring specification progress on RF performance on below as well as above 6 GHz. If aligned with internal strategies NI can contribute to joint 3GPP standardization activities with other partners highlighting project results.
Contributions to open source projects/communities	NI is actively using the Open Air Interface protocol stack with the goal to interface with the NI SDR platform which is an essential part of the planned PriMo-5G mmWave demonstrator. If possible, it is also planned to actively contribute to the Open Air Interface community.
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	Within the PriMo-5G project NI is responsible for the 5G mmWave link demonstration including a gNB and UE. It is planned to interface the NI

Exploitation	Short description of NI exploitation plans
	5G mmWave link with the Cumucore 5G Core to enable a real End-to-End transmission that finally allows to conduct field tests in the Aalto testbed. Furthermore, if aligned internally NI will highlight results made in the PriMo-5G project through its presence at internal conferences or other events e.g. with demonstrating the 5G mmWave link.
Education and researcher development	NI is continuously engaging internship students who will also contribute to the planned PriMo-5G demonstrator work. NI also plans to offer Master Thesis projects e.g. investigating mmWave beam tracking techniques incl proof-of-concept.
Follow-up research	The results and knowledge that NI will gain throughout the PriMo-5G project will be used to pursue follow-up research opportunities e.g. projects in European Horizon 2020 framework.
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.1.4   EUC

EUCAST (EUC) is leading force in the 4G wireless access technology and provides end-to-end wireless access solutions. Its solutions have been used for more than 10 years of commercial operation. EUCAST's LTE product lines are indoor/outdoor small cells, LTE-Railway and Portable LTE systems. Portable LTE system is composed of eNodeB and core networks so that it can operate at isolated locations without any backhaul connections. It has many application cases including public safety, military and marine communications, and quick communication link recovery at disaster.

Exploitation	Short description of EUC exploitation plans
New or enhanced products/ services	Eucast is developing 4G (LTE) products not only for commercial usage but also for public safety. Currently feature enhancement such as MCPTT is on going. The experience and result of this R&D will be used to contribute to PriMO-5G project, and vice versa.
Patents, licenses or technology transfer agreements	Eucast targets to file patents in 4G and 5G. As a result of such effort, Eucast will file a patent on 5G TDD Synchronization Detection Method (using low-end FPGA for repeaters) within February 2019.
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	Eucast will propose patent filed cheap 5G TDD Synchronization Detection Method for service providers or repeater vendors to reduce the cost of 5G repeaters. Prototype is under development
Education and researcher development	N/A

Exploitation	Short description of EUC exploitation plans
Follow-up research	Eucast is developing MeNB to support 5G NR NSA SgNB, and will start the development of 5G small cell from 2020.
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.2   Network operator

4.2.2.1   KT

KT, leading the development of the information and communications industries of Korea since its foundation in 1981. As becoming a government-funded corporation in 1997, KT changed its business portfolio by focusing more on wireless and internet services instead of fixed lines. Taking over Hansol M.com and merging with its subsidiary KTF, KT expanded its business scope and included mobile communication as its main service.

KT discontinued 2G service in Jan. 2012 in the Seoul, and Mar. 2012 in the rest of South Korea on the 1.8 GHz frequency, which was re-assigned for LTE network. 1.8 GHz LTE coverage all over South Korea was accomplished by Jun. 2012. In Jun. 2015, KT commercialized GiGA LTE to combine Wi-Fi and LTE in a gigabit speed mobile service. In addition, KT has organized KT PyeongChang 5G Special Interest Group (KT 5G-SIG) to realize the world's first 5G trial service at PyeongChang 2018 Olympic Winter Games. In Jun. 2016, KT completed the full 5G specification including the L2/L3 specification. In PriMO-5G, KT is pushing the development of the 5G trial network and is also planning the evaluate the performance of key 5G technologies.

Exploitation	Short description of KT exploitation plans
New or enhanced products/ services	KT is developing 5G SA and NSA products for commercial usage such as IoT and smart devices. The experience and result of this R&D will be used to contribute to PriMO-5G project, and vice versa.
Patents, licenses or technology transfer agreements	N/A
Contributions to standards	KT is participated in standardization in 3GPP S2/R1/R2 and so on.
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	KT will support 5G core system infrastructure and demonstrate interoperability between EU core system.
Education and researcher development	N/A
Follow-up research	N/A
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.3   Research institutions (technology/knowledge suppliers)

4.2.3.1   AALTO

Exploitation	Short description of AALTO exploitation plans
New or enhanced products/ services	N/A
Patents, licenses or technology transfer agreements	Selected AALTO research results from PriMO-5G may be considered for submission of internal invention disclosures. Each disclosure will be assessed by Aalto Innovation Services in terms of both technical and commercial potential, patentability and capabilities of the responsible AALTO PriMO-5G team submitting the disclosure.
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	In PriMO-5G project AALTO will continue to develop and enhance the Aalto Radio Framework (ARF). The ARF platform is a software-defined radio research platform targeting emerging and novel technologies in cellular communication. The platform is used to study of the behavior of various RAN features under non-ideal, real-world conditions. Being fully software-based enables rapid, flexible testing of new ideas at all layers on the protocol stack. Additionally, this makes the platform suitable for virtualization using clouds or container approaches. In PriMO-5G, the ARF platform can offer support for uplink video transmission from drones. Moreover, the ARF implements a beyond-5G cell-free architecture designed to further reduce the amount of signalling involved in mobility management of moving drones.
Education and researcher development	At least three research members from AALTO are leveraging their research outputs from the PriMO-5G for their doctoral theses.
Follow-up research	The PriMO-5G research is as used as reference point driving AALTO contributions (in thematic topics on beyond 5G, drones and V2X) in new research proposals for Horizon 2020 Work Programme 2018 – 2020, as well as, national proposals for Business Finland 5G Programme and Finnish Academy of Sciences.
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.3.2   KCL

Exploitation	Short description of KCL exploitation plans
New or enhanced products/ services	N/A

Exploitation	Short description of KCL exploitation plans
Patents, licenses or technology transfer agreements	N/A
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	TBD
Education and researcher development	Publication and education are the key objectives at KCL. The research work within the PriMO-5G project will serve for developing new experts in the area of AI and MEC. Results will be used for publications as well as teaching of advanced topics. KCL will also offer post-doc positions and several Master thesis projects within the framework of PriMO-5G.
Follow-up research	The PriMO-5G research is used as reference point for KCL in new research proposals for Horizon 2020 Work Programme 2018 – 2020, as well as, national proposals. Furthermore, KCL will exploit the results for searching new industrial partnerships.
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.3.3   KTH

Exploitation	Short description of KTH exploitation plans
New or enhanced products/ services	
Patents, licenses or technology transfer agreements	Although IPR is not a primary goal at KTH, the opportunity of IPR will be continuously observed, and IPR will be pursued when the outcome of work within PriMO-5G is deemed appropriate.
Contributions to standards	*N/A*
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	KTH has a close relationship with PTS, the national regulatory authority in Sweden. KTH will feed the outcome of PriMO-5G regulatory studies to PTS, and will also seek feedback from PTS. It will ensure that PriMO-5G makes an impact on regulatory and policy decisions in Sweden.
Demonstrators and prototypes	N/A

Exploitation	Short description of KTH exploitation plans
Education and researcher development	Publication and education will be the area of major exploitation at KTH. The knowledge obtained from PriMO-5G will be the source of publications during and after the project lifetime. KTH will review the courses at all levels (undergraduate, Master, and PhD), and put the new findings into the course contents. KTH will also offer post-doc positions and several Master thesis projects within the framework of PriMO-5G. The post-docs and Master graduates will contribute to industry and academia in EU and Korea.
Follow-up research	The concepts and knowledge developed in PriMO-5G will become the seeds of the follow-up research. Both theoretical (mmWave signal processing and AI-assisted networking) and practical (scalability analysis and implementation) are envisaged. The strong research network of PriMO-5G partners will be basis for follow-up projects in Horizon 2020 and EUREKA.
Start-ups/Joint ventures	KTH doesn't have a firm exploitation plan on innovation, but will encourage the participants to look for the opportunity.
Others?	N/A

4.2.3.4 YU

Exploitation	Short description of YU exploitation plans
New or enhanced products/ services	N/A
Patents, licenses or technology transfer agreements	YU plans to apply a number of patents over three years (2018~2021). Korean patents (domestic) as well as international patent applications are also scheduled. YU are preparing patents related to machine learning-based, wireless flight control of UAV fleet, high-quality image transmission processing, lens antenna, DoA estimation, hybrid beamforming.
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	YU plans to hold an annual demonstration event using 5G, UAV, and MEC with Korean academic and industry partners.

In December 2018, YU held remote drone control and video streaming demonstration event exploiting 5G commercial networks. A follow-up demonstration focusing on 5G URLLC and other 5G main services (VR, high-quality video, haptic device etc.,) will be held every year.

YU is developing 5G mmWave radio transceiver testbed on NI hardware platform. This testbed is to consider a complete closed loop environment consisting of an eNB and UE including feedback |

Exploitation	Short description of YU exploitation plans
	information about the beam quality to enable adaptivity to time varying transmission scenarios
Education and researcher development	Four doctoral students and four master students having contribution in PriMO-5G plan to graduate during the project duration, and their theses will cover a part of PriMO-5G project's achievement.
Follow-up research	For further research, YU plans to develop AI based machine learning algorithms. To that end, YU will pursue to integrate various deep learning methods in wireless network protocols, e.g. beyond 5G or 6G.

Research about Lens based antenna, fast moving object tracking system on mm-wave V2X environment.

Research about computation offloading scheme on Mobile Edge Computing network.

Research about joint association and resource management for wireless distributed machine learning. |
| Start-ups/Joint ventures | N/A |
| Others? | N/A |

4.2.3.5   CAU

Exploitation	Short description of CAU exploitation plans
New or enhanced products/ services	N/A
Patents, licenses or technology transfer agreements	N/A
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	N/A
Education and researcher development	Eight master students are having contribution in PriMO-5G and planning to graduate during the project duration. Their thesis will cover a part of PriMO-5G project's achievement. CAU will also offer a post-doc position within the framework of PriMO-5G.
Follow-up research	CAU plans to research better super resolution algorithm which is better than used at first demonstration. In addition, an enhanced computation node system equipped with the UAV and distributed caching and computing systems will be studied.
Start-ups/Joint ventures	N/A

Exploitation	Short description of CAU exploitation plans
Others?	N/A

4.2.3.6   GIST

Despite the short history of the past 20 years, GIST has grown to become a world-class research university by faithfully fulfilling the purpose of national science and technology development and fostering excellent science and technology talents. At present, GIST has made remarkable progress with its world-class universities. In addition, it has achieved outstanding achievements in the field of performance diffusion, including the 57th place in the US patent registration in 2016. GIST is committed to research and innovation that is responsible for society so that these capabilities can contribute substantially to the development of humankind, country and region.

Exploitation	Short description
New or enhanced products/ services	N/A
Patents, licenses or technology transfer agreements	N/A
Contributions to standards	N/A
Contributions to open source projects/communities	N/A
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	N/A
Education and researcher development	One doctoral and two master students involving in the project will graduate during the project duration with the topics of the object tracking
Follow-up research	Research on real-time object tracking and change detection with data from the drone is planned.
Start-ups/Joint ventures	N/A
Others?	N/A

4.2.3.7   KAIST

Exploitation	Short description of KAIST exploitation plans
New or enhanced products/ services	N/A
Patents, licenses or technology transfer agreements	N/A
Contributions to standards	N/A

Exploitation	Short description of KAIST exploitation plans
Contributions to open source projects/communities	As an algorithm testing/developing platform for UAV networking scenarios, we are working on extending an UAV simulator AirSim by integrating it with a network simulator OMNeT++. AirSim is an open source-powered simulator mainly being led by Microsoft, and our work can contribute to the project as an extension example.
Regulatory/policy change or proposal	N/A
Demonstrators and prototypes	N/A
Education and researcher development	Three research outputs from KAIST are acknowledged as part of the PriMO-5G project. These works were accomplished by eight graduate students during their graduate studies.
Follow-up research	Research about beam management is planned based on mm-wave V2X environment.
Start-ups/Joint ventures	N/A
Others?	N/A

5   Measurable objectives and associated KPIs

The PriMO-5G project communications, dissemination and exploitation action plans outlined previously (from Section 2 to Section 4) requires the definition of measurable objectives based on quantifiable key performance indicators (KPIs) for each category of targeted actions. These measurable objectives facilitate periodic assessment of the progress (and/or effectiveness) of the planned communications, dissemination and exploitation activities. Furthermore, it provides triggers for initiation of interventions where necessary to ensure defined communications, dissemination and exploitation objectives are met (or exceeded), throughout the project lifetime.

Beside this diverse exploitation strategy, the dissemination plan follows a more homogeneous approach in order to present the broader context of PriMO-5G to the public. The monitoring action plan presented in this section addresses all project wide actions in an aggregated manner, and thus, applies to different partners in various ways.

5.1   KPI definition and associated objectives

The Section outlines the defined KPIs and related project objectives along communications, dissemination and exploitation actions.

5.1.1   Communications KPIs and initial objectives

The KPIs different communications channels and their values for measuring achieved success are listed in Table 21. The KPI data for the different communications channels is gathered based on built-in analytics interfaces available in channel (with data available at different granularity levels, daily, week, monthly etc.).

Table 21 Communications KPIs and targets

Communications channel	KPI	KPI ID	Success criteria
Website	Number of visits	COM_1	≥ 60 per month (720 per year)
	Time spent on website	COM_2	Average visit ≥ 1:30 minutes
	Number of web (news) articles	COM_3	≥ 2 per month
Twitter	Number of Twitter Followers	COM_4	≥ 20 after year 1 ≥ 40 after year 2
	Number of Twitter Posts	COM_5	≥ 2 per month
	Tweet impressions[24]	COM_6	≥ 500 per month
YouTube	Video uploads	COM_7	≥ 4 per year
	Video impressions[25]	COM_8	≥ 20 per video

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[24] Tweet impressions are the number of times project's Tweets have shown up in other Twitter account timelines in a month (or number of times a user is served a Tweet in timeline or search results) https://sproutsocial.com/insights/twitter-impressions/

[25] How many times project video thumbnails were shown to viewers on youtube.com

Communications channel	KPI	KPI ID	Success criteria
	Impressions click-through rate[26]	COM_9	5% per video

5.1.2   Dissemination KPIs and initial objectives

The KPIs for the planned dissemination activities (of Section 3.3) is shown in Table 22. The project has specified guidelines for partners reporting of dissemination activities to the project mailing list. This data together with periodic tallying of the dissemination activities provides input to the KPI data gathering.

Table 22 Dissemination KPIs and targets

Dissemination actions	KPI	KPI ID	Success criteria
Journal papers and magazine articles	Number of papers/articles	DISS_1	≥ 4 per year (at least one per focus area from Section 3.3)
Externally organized events	Number of paper/poster presentations	DISS_2	≥ 4 per year (at least one per focus area from Section 3.3)
	Number of demo/exhibitions	DISS_3	≥ 4 per year
Organized/co-organized events	Number of workshops/seminars	DISS_4	≥ 1 per year
Technical exchanges with other projects	Number of new partnership with other H2020 projects (mentioned in Section 3.2.4)	DISS_5	≥ 1 per year

5.1.3   Exploitation KPIs and initial objectives

The KPIs for exploitation activities and respective targets are listed in Table 23. Previously it was noted (in Section 2.3.2) that most of the exploitation actions occur during the societal impact and exploitation enhancement phase in the final third of project lifetime. By contrast, the communications and dissemination activities occur continuously from the early phase of the project, allowing for regular periodic KPI data updates. Therefore, the KPI targets for the exploitation activities are mostly considered over the lifetime of the project (even if this KPI data is also refreshed regularly).

Table 23 Exploitation KPIs and targets

Exploitation actions	KPI	KPI ID	Success criteria
New or enhanced products/ services	Number of new or enhanced products or services	EXP_1	≥ 3 within project lifetime
Patents, licenses or technology transfer	Number of patents, licenses or	EXP_2	≥ 1 within project

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[26] How often viewers watched a video after seeing a thumbnail

| Exploitation actions	KPI	KPI ID	Success criteria
agreements	technology transfer agreements		lifetime
Contributions to standards	Number of contributions to standards	EXP_3	≥ 1 within project lifetime
Contributions to open source projects/communities	Number of contributions to open source projects/communities	EXP_4	≥ 1 within project lifetime
Regulatory/policy change or proposal	Number of regulatory/policy recommendations (e.g. policy brief from project)	EXP_5	≥ 1 within project lifetime
Demonstrators and prototypes	Number of component/system demonstrations and prototypes	EXP_6	*To be elaborated, monitored and reported in WP6 deliverables*
Education and researcher development	Number of (bachelor, master or PhD theses) thesis works supported by research from the project	EXP_7	≥ 4
	Number of intensive course, summer school etc.	EXP_8	≥ 1 within project lifetime
Follow-up research	Number of follow-up research projects	EXP_9	≥ 1
Start-ups/Joint ventures	Number of startups/joint ventures	EXP_10	*Optional*

5.2 KPI monitoring action plan

5.2.1 KPI Assessment and interventions

The KPIs for communications, dissemination and exploitation activities are periodically assessed to ensure timely initiation of intervention actions where necessary. The KPI assessment triage and color coding to be used in project reporting is shown in Table 24.

Table 24 KPI assessment, rationale and related interventions

KPI assessment	Rationale and interventions	Color code
Immediate action necessary	*Reasoning*: KPI is substantially below expected (success criteria) value. *Interventions*: Creation of high-priority action items by Coordinator/Project Manager, assigning or reassigning of responsibilities to certain partners, adapting activity plans, and/or effort reallocation to improve activities relevant to the KPI.	
Needs further attention	*Reasoning*: KPI is slightly below expectation or may deserve attention for other reasons, e.g. external	

KPI assessment	Rationale and interventions	Color code
	recommendations. *Interventions*: Issue addressed in the general project teleconference and further measures for KPI improvement need discussed consortium-wide. Actions to taken are to be carried out by specific partners assigned in the teleconference.	
Good progress	*Rationale*: KPI on track with current plans. *Interventions*: No specific intervention action. Continuation of existing positive actions.	
Overachievement	*Rationale*: KPI significantly exceeds expectation. *Interventions*: Potential adjustments of KPI targets considered to account for previous underestimation of communication, dissemination or exploitation results.	
Not applicable, change of plans or measures	*Rationale*: KPI cannot be evaluated at current point due to changes in plans or newly introduced measures. *Interventions*: Actions to be carried out need to include adjustment for enabling future tracking of KPI.	

5.2.2   Roadmap for KPI checkpoints

The KPI data for communications, dissemination and exploitation activities will be gathered continuously during the project lifetime. For instance, the partners always report their publication activities to the mailing list or Project Manager keeps track of the website analytics reports for different reports posts updated on the website. This KPI data is aggregated, analyzed and reported at several checkpoints in the project. These include reporting of the current KPI data in following reports or events:

- Period 1 project report and first review meeting [within M13-M14]

- D6.3 Rolling dissemination and exploitation plan and report [M18]

- Period 2 project report and second review meeting [within M25-M26]

- D6.4 Final dissemination and exploitation report [M36]

- Period 3 project report and third review meeting [1-2 month after project ending]

At each of these reporting points, any notable improvements and possible missed targets over the preceding period are highlighted and where necessary intervention actions of Table 24 are initiated. In addition to the formal reporting points above, an internal interim checkpoint for all the KPIs is added midway in the third year of the project (around M30-M31) to ensure timely interventions before the project ends.

6 Conclusions

This deliverable outlined the communications, dissemination and exploitation plans that are critical to ensure that the PriMO-5G project results reach the right external stakeholders in an accessible and timely manner. Furthermore, this deliverable outlined plans to ensure that those results have an impact and/or exploitation potential beyond the project itself.

In addition to describing the strategic approach and plans, this deliverable also presented measurable objectives and mechanisms for periodically monitoring performance of communications, dissemination and exploitation activities, and initiating intervention measures where necessary. The reporting on these periodic checkpoints and corrective actions taken will be presented in subsequent WP6 deliverables, namely:

- D6.3 Rolling dissemination and exploitation plan and report [M18]
- D6.4 Final dissemination and exploitation report [M36]

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