5G INDUCE

Deliverable D7.3

Dissemination, communication and standardization activities - Version a

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Glossary of terms and abbreviations used

Abbreviation / Term	Description
5G PPP	5G Infrastructure Public Private Partnership
CMS	Content Management System
D	Deliverable
DM	Dissemination Manager
EC	European Commission
EM	Exploitation Manager
ExFas	Experimentation Facilities
HDA	Hierarchical Decode Algorithm
IDE	Integrated Development Environment
IPR	Intellectual Property rights
KPI	Key Performance Indicator
MEC	Multi-access Edge Computing
MVNO	Mobile Virtual Network Operator
PoC	Points of Contact
SME	Small Medium Enterprises
STM	Scientific & Technical Manager
SW	Software
T	Task
TB	Test Beds
TRL6	Technology Readiness Level 6
WG	Working Group
WP	Work Package

Executive Summary

During M1-M12 WP7 has watched closely the activities of the consortium regarding the development progress of NetApps. The current innovations apply to SMEs, Telecommunications Operators and Industries, inasmuch they provide services for remote control and work, 5G network and radio measurements, safety and security for dangerous or critical processes. The results were evaluated and analysed in accordance with the KPIs that were set in D7.1 and key impact pathways were produced in order to disseminate the technology outcomes and maximize the long-term impacts. The following picture represents the workflow that was applied in the context of WP7 activities, after the working group had received feedback from the rest of the Work Packages, towards upgrading the TRL level that was delivered by the ancestor projects.
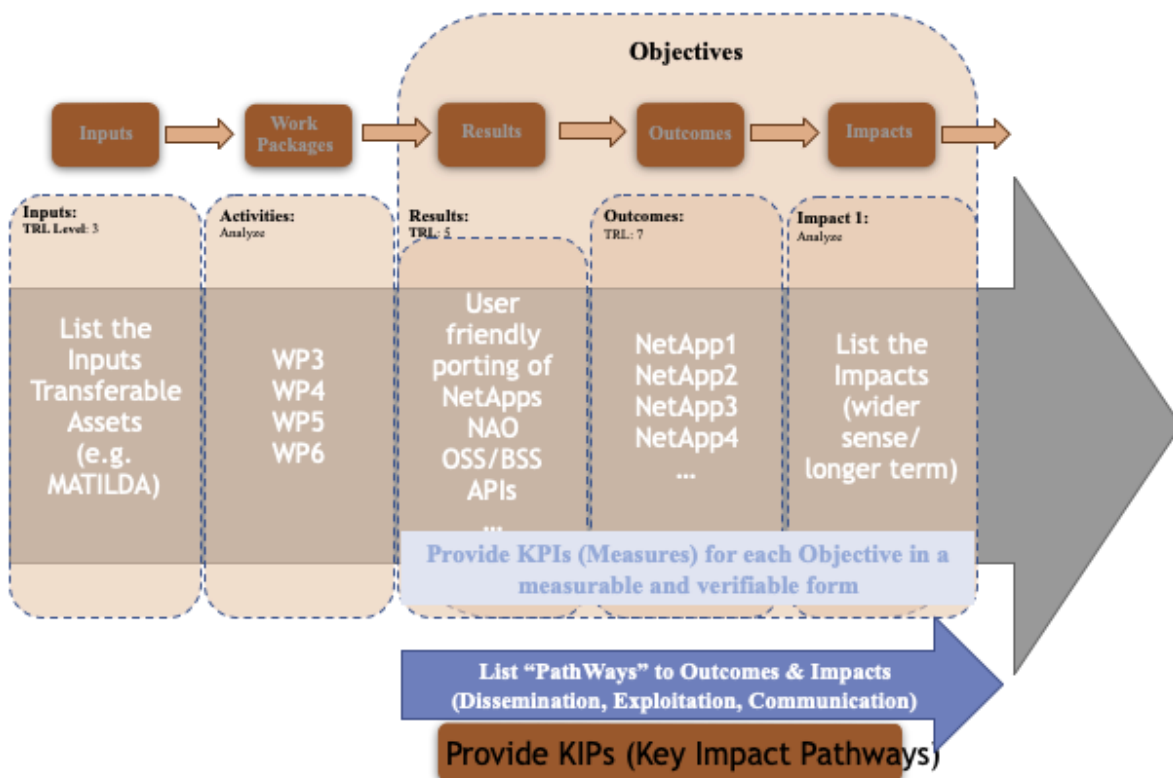
Figure 1: The workflow of WP7.

In that framework WP7 created two categories of messages: the overall messages addressed to the general public and the more specific messages that concern specialized audiences and target groups, as they include the business value of each NetApp individually. Moreover, WP7 supervised the communication and dissemination activities, which included presence in the web and social media, scientific publications, conference and workshop presentations, press releases, industry events, collaborations, lectures, seminars, training and demos. All the actions that took place and the material that was produced are presented in the form of tables in sections below.

1   Introduction

1.1   Scope

The key objective of this document is to evaluate the outcomes of the NetApps that are being developed in the context of 5G-INDUCE and present the communication and exploitation activities that took place in 2021, aiming to the maximization of the impact that will lead to the exploitation of the produced technology. It constitutes the written summary of the conducted work that was carried out in the framework of Work Package 7 (WP7), as it tracks the results that were committed by the tasks T7.1, T7.2, T7.3, T7.4 and T7.5 until the time of writing. Finally, it highlights the participation of 5G-INDUCE in 5G PPP activities and the liaisons with other sister projects.

The pathway to economical, societal, environmental and other impacts is strongly connected to the exploitation of the innovations that will arise from the consortium's activity and it is dependent on achieving the strategic outcomes that concern:

- Testing and validation of NetApp solutions on top of a 5G virtualized experimental environment with different implemented functions and vertical-specific configurations.
- Secure interoperability beyond vendor-specific implementation across multiple domains and availability of related standards or reference implementations.
- Open-source repository of network applications that can be further leveraged by other developers.
- Creation of 3rd party markets for start-ups and SMEs. 50% of SMEs are targeted for this action.
- Relevant 5G PPP KPIs; among others, Service Creation Time in minutes.
- Generation of results that may be appropriate for transfer towards an incubator or a start-up, either within the project or outside of the projects in follow-up actions

5G-INDUCE partners have the commitment to proceed for maximising the popularity of the project, set up the proper communication links to attract and interact with a wide audience, including public and private stakeholders, and take care of spreading the project results in several different activities and actions. For attaining that goal, the consortium's members, either as NetApp developers or end users, have created messages in order to inform the interested third parties regarding the target groups, the use cases and expected impact of each NetApp individually.

It is understood by all partners that the diffusion of the aforementioned messages is instrumental to effectively promote the exploitation activities. In this framework, the measures to maximise 5G-INDUCE impact include publications in the individual communication channels through a number of collaborations, participation in industry and corporate events, organization of academic lectures and workshops. The dissemination and communication activities are expected to propagate the scientific and technological knowledge generated in the context of the project, aiming to ensure both mid- and long-term impact.

1.2   Structure

Following this introduction in Section 1, the remainder of this document has been structured as follows:

Section 2 presents the impact pathway by analysing the meaning of strategic outcomes and how these will be achieved considering potential obstacles.

Section 3 presents the messages towards the general public and more specialized audiences. These messages concern the general definition of NetApps and the business value analysis of each NetApp individually.

Section 4 indicates the communication and dissemination activities that took place in 2021.

Section 5 presents the associated documentation that was developed, and it is available at the data repository of the project's website.

Section 6 presents the liaisons with other EU and international projects, as well as the clustering activities with industry associations (e.g., 5G ACIA) and 5G PPP workgroups.

Section 7 presents the KPIs for the evaluation of the progress of the implementation of the communication activities, as they were defined in the communication plan.

Section 8 provides the document conclusions.

2   Pathways to Impacts

The massive impact of Industry 4.0 is mainly empowered by the role of technology in fundamentally transforming business models and processes. This is well understood by 5G-INDUCE; hence, the challenge is to shed some light on key intermediate steps needed to harness and realize the benefits of 5G in the smart factory (Industry 4.0) sector, but most importantly to create a business and investment roadmap, in tandem with the technology roadmap, for the long term. For this purpose, 5G-INDUCE recognises three impacted sectors, towards which the exploitable project assets are directed and the related benefits are analysed. These are:

- The NetApp developer sector, which includes primarily SMEs offering dedicated customer-tailored applications, over the 5G-INDUCE open 5G platform environment and, specifically, the APIs for porting and managing NetApps.
- The Telecom Operator sector, which makes optimum use of the infrastructure and the links with industry and NetApp developers to provide advanced services. This supports a clear business model in which the operator as infrastructure owner hosts the 5G platform and manages the network, while exposing the open interfaces to NetApp developer SMEs (and Service Providers) to create and manage their services purely at the application layer, imposing strict or relaxed service requirements and KPIs, while obeying to certain policies.
- The Industry sector, which gains direct access to a pool of advanced services (not bound to specific contracted set services by a Service Provider), for benefiting in fields like increased product quality, reduced excessive costs, security and safety of their environment, leading to increased productivity, reduced operation costs and financial sustainability.

The following sections summarizes the expected impacts in various fields and according to the consortium's expectations.

2.1   Outcomes of the project

5G-INDUCE contributions to the strategic impacts of ICT41 are presented below with reference to specific KPIs. These are forming the expected outcome objectives of the project and linked to the exploitation activities.

Strategic Outcome #1 - Testing and validation of NetApp solutions on top of a 5G virtualized experimental environment with different implemented functions and vertical-specific configurations.

Strategic Outcome #2 - NetApps secure interoperability beyond vendor-specific implementation across multiple domains and availability of related standards or reference implementations.

Strategic Outcome #3 - Open-source repository of network applications that can be further leveraged by other developers.

Strategic Outcome #4 - Creation of 3rd party markets for start-ups and SMEs. 50% of SMEs are targeted for this action.

Strategic Outcome #5 - Relevant 5G PPP KPI: Service creation time in minutes.

Strategic Outcome #6 - Generation of results that may be appropriate for transfer towards an incubator or a start-up, either within the project or outside of the projects in follow up actions

The following table summarizes a set of KPIs which are relevant to the above outcomes and have been selected to be able to set and measure specific impact contributions of the 5G-INDUCE project.

Table 1: KPI's for measuring the impacts.

Description	Target Value	Verification Means
KPI.1: Number of technology solutions and services developed within 5G-INDUCE at TRL 7 or beyond.	7 11	5G platform building blocks. New applications.
KPI.2: Compliance of developed solutions and service products with emerging standardization activities.	100%	With respect to 3GPP rel 16.
KPI.3: Decrease in required investments for Industry 4.0 with the use of advanced edge processing and automation technologies.	15%	Market analysis in T7.5 per use case and cost benefits (savings)
KPI.4: Decrease the (a) service creation, (b) service deployment, and (c) service reconfiguration times.	(a)<20min, (b)<5min, & (c)<30 sec	To be verified in the course of the 5G-INDUCE use cases' validation (T6.2).
KPI.5: Increased interoperability between NetApps co-managed by the same underlying 5G platform in the course of specific industry 4.0 verticals.	> 3	Consortium representation per use case. Showcasing in T6.3
KPI.6:Increase the interest and open source contributions of external collaborators/developers, that will build upon the results of 5G-INDUCE.	> 10 external contributions	Exploitation plans and reports under WP7. Tech support under T4.3
KPI.7: Attract third party markets for start-ups and SMEs, acting as NetApp developers for Industry 4.0 verticals.	> 50% > 3 new	% of SMEs in the consortium. Interest by 3rd parties to showcase NetApps in 5G-INDUCE platforms.
KPI.8: (a) New business opportunities for project's SMEs and (b) plans for new start-ups by research partners with clear exploitation plans based on project developments.	(a) 11 new business opportunities (b) 2 start up plans	Exploitation plans from SMEs and business opportunities reports per. Plans by UWS, UoP and CNIT.

2.2 Financial and Business Impact

The following table summarizes tangible financial & business benefits expected for different stakeholder groups.

Table 2: Business Impacts & Outcomes.

Telecommunication Operators	
Impacts:	**Outcomes:**
1. Optimization and upgrade of existing infrastructure. 2. Creation of strong liaisons with the industry. 3. Return of Investment based on eight emerging vertical sectors (public safety, manufacturing, financial services, healthcare, energy utilities, automotive, media & entertainment, and public transport). 4. Benefits for small telecom operators and MVNOs that, through the adoption of the provided OSS and slice management mechanisms, have the potential to enter or expand their market penetration.	1. Provision of edge computing network services over sliced 5G infrastructures. 2. Actions as service creators atop the network level. 3. Development of solutions on top of their own platform. 4. Offering of open well-defined northbound APIs in order to render their 5G platform an innovation stratum for SMEs.

Industry	
Impact:	**Outcomes:**
1. Focus on machine-type communication and the Internet of Things (IoT). 2. Next era in industrial production, aiming to significantly improve the flexibility, versatility, usability and efficiency of future smart factories. 3. Transformation of today's industries into true digital enterprises, with physical products at the core, augmented by digital interfaces and data-driven innovative services.	1. Increase of automation, aiming at boosting the productivity of daily operations and the efficiency of the production line. 2. Highly optimized supply chains targeting reduced costs and higher availability. 3. Greatly facilitated maintenance and repair processes for limited down time and increased productivity. 4. Increased protection through smart surveillance of critical infrastructures, features of their applications.
SMEs and Service Providers	
Impact:	**Outcomes:**
1. 5G platforms empowered with novel industry-oriented features. 2. Small and medium sized enterprises, which are offered elevated privileges. 3. SMEs acting not only as classical service and application providers, but mainly as innovation drivers of Industry 4.0 applications.	1. Porting of existing services to an industry-oriented 5G ecosystem. 2. Renovation of services by infusing highly-distributed primitives stemming from the requirements of state-of-the-art cloud computing and MEC applications. 3. Boost of services' programmability through the exploitation of the underlying 5G programmability features. 4. Radical improvement of the QoE and QoS features of their applications. 5. Unprecedented scalability, robustness, and flexibility potentials due to their interaction with large-scale industrial environments. 6. Enhancement of services with self-adapting and self-healing characteristics, supporting optimal placement of application components based on the identified needs of the industry verticals. 7. Deployment and orchestration of applications, while taking into account policies and objectives based on network-aware events and data stemming from industrial verticals.

2.3   Societal, Environmental and Other Impacts

The digital technologies that will contribute the most to the formation of Industry 4.0 are 5G and the Internet of Things. These technologies will create a huge impact on the daily routines performed by people (i.e., workers, manufacturers, and their managers) in the industry as well as the way these people interact and collaborate with machines. The later factor (i.e., people-to-machine collaboration) is expected to be intensified with the emergence of Industry 4.0 as additional machines will be added in the production lines across all industries in favour of additional security, increased productivity, robustness, and safety (for example see UC2,3,6). This will create the need to train industrial personnel to be familiarized with the way that new technologies work, which contributes to the cultivation of the personal skills of workers, manufacturers, and other relevant staff. Having people being strongly supported by machines, and given a certain level of trust to these machines, industrial personnel will feel less stressed during work, which contributes to their well-being, Moreover, as industries may belong to the public sector, Industry 4.0 will also modernize several routines of the government, ranging from management to planning and maintenance.

Apart from the impact, specific to the industrial sector, the ICT technologies contributing to Industry 4.0 create a more general impact. Specifically, unlike 4G, 5G will not only be just a technical evolution of mobile broadband networks, but will rather bring new unique network and service capabilities. The Internet of Things and Tactile Internet era, that 5G facilitates, will also have an enormous impact on everyday living. From healthcare, government planning, citizen services and finance ("Digital Single Market"), to education and communication, a high-performance 5G infrastructure is of utmost significance for a huge number of people.

Finally yet importantly, industry and ICT power consumption are increasingly concerning matters for environmental reasons, which are of course linked with people's well-being. 5G-INDUCE, with its unique features, aims not only to address the technological challenges of 5G and IoT deployment, but also to provide a clear market competitive advantage to participating industrial partners, significantly contributing to job creation and social well-being, while at the same time making a reliable proposal to significantly decrease environmental pollution that is related to ICT.

2.4   Barriers to Achieve the Aspired Impacts

Apart from the strategic outcomes, 5G-INDUCE aspires to have significant financial and business impacts. These are achievable, others (the short-term ones) within the lifecycle of the project, and others (the long-term ones) after mass adoption of the project's concept, tools, technologies, and services. 5G-INDUCE brings together a highly skilled consortium with the research and technological competencies required to achieve the project's objectives and results with high quality and in time, whilst having unique validation partners to measure in a rigid and professional manner the exact impacts of the project's outputs in real-life industrial settings. From a business perspective, the consortium brings innovations in Industry 4.0 through network and software engineering closer to the targeted sectors' stakeholders. The consortium, on its behalf, has mobilised all resources required to realise the envisaged impact. Nevertheless, even though these impacts are tangible, they require good will and strong collaboration amongst all stakeholders involved, and significant effort to achieve the changes envisioned. In fact, certain barriers possibly hindering the achievement of these impacts, over which the project consortium has limited control upon and that may affect the project impacts (especially the long term ones), should be carefully considered and appropriately tackled, since they may affect the core factor of success, that of user acceptance. The most important of them include the following barriers, aggregated and presented in the form of a PEST analysis in Table 3.

Table 3: Barriers to achieve the aspired impacts.

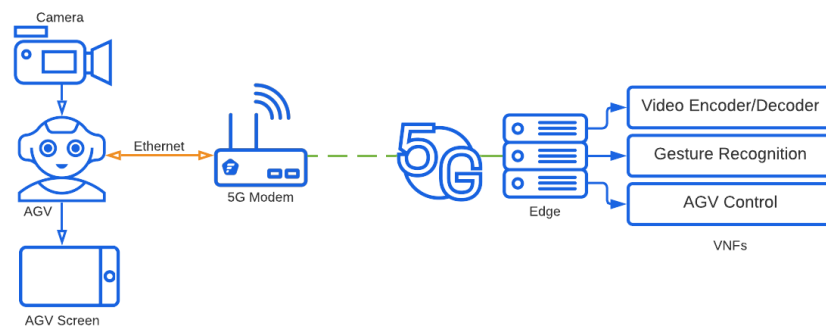| P – Political Factors	E – Economic Factors
Even though the trend and recommendations at global level is to push towards improving secure, pervasive, and widespread computing, potential restrictions in the use of IoT devices, possibly due to privacy, legal and ethical concerns could be brought into force, which may in turn hinder the business and innovation potential of 5G-INDUCE. Nevertheless, the potential value that can be produced through emergence of such services operating at the boundaries of networks, and the current European guidelines, recommendations and directives signifies the decreased likelihood of the occurrence of such phenomena at global level.	Currently, SMEs have limited capacity to implement cross-layer Industry 4.0 solutions that meet the stringiest requirements of industries. Moreover, small telecom operators are also reluctant entering the 5G ecosystem due to the large amount of expected investments. In contrast, large telecom operators are becoming more eager to invest on 5G technologies and decentralized services around the industry, as they recognize the potential value that those could offer. These high competing factors could impact the exploitation potential of 5G-INDUCE. Additionally, other economic / financial factors, such as limited integration between industrial and 5G platforms due to low trust between each other, may hinder the potential impact of the project, upon which the project consortium has limited control.
S – Social Factors	**T – Technological Factors**
The EU is a field comprising several countries with significant cultural diversity, and differences in population income, social inclusion, education, living conditions, and other related quality of life indicators. This could constitute a barrier towards a wide adoption of the 5G-INDUCE services at pan-European level, demonstrated through unwillingness to accept the new services as well as potentially decreased acceptance of devices that can operate within industrial fields at the edge, mostly due to privacy and trust concerns. With a view towards globalisation, 5G-INDUCE will try to integrate this diversity within its requirements analysis so as to limit the likelihood and impact of this risk. Recently, societal resistance to 5G deployment appears to be an issue in some countries, however anxiety is mainly directed at fixed telco installations that can be leveraged but are not the focus of the project.	5G deployment follows the same technology background within Europe but the choices may differ from country to country both in terms of regulations and in terms of operating licensed bands. The presence of operators and vendors of all 3 ExFas allows the design of functional software defined radio solutions that are easily adaptable to the 5G readiness of each European country. Moreover, potential lack of Industry 4.0 trained professionals, may limit the uptake of the innovative solutions proposed in 5G-INDUCE. The support of large industries within the consortium is essential to lift this barrier. Apart from this, the consortium partners will invest efforts in continuous education. Academic and research partners will ensure that these activities will reach a large audience, with additional focus on students, early stage researchers, and young professionals in the beginning of their careers. Industrial partners will ensure that 5G-INDUCE knowledge reaches their employees. Finally, the dissemination and communication activities are also considered a further step towards the effective diffusion of specialized knowledge.

3 Target Groups and Messages

Taking into account the inter-relation between the diverse activities to maximize the project's impact and outcomes, it is important to identify the potential targeted audiences of 5G-INDUCE along with their specific interest in the project. In order to achieve that goal, messages must be designed taking into account the target audience they are destined to. For some of them, general information about the project may only be needed, but for others the information should be more specific. For that reason, in the following sections we present the "Overall NetApps Messages", that include general information like the definition of NetApps, and the "Messages of Individual NetApps" for highlighting the features of the NetApps, which have been developed by the partners of the consortium.

3.1 Overall NetApps Messages

A NetApp comprises a set of networked Virtual Network Functions (VNFs), together with the required resources, deployable and operating over 5G and beyond networks, distributed across the various end-to-end network infrastructure including edge, core network and so on. The VNFs in a NetApp are typically developed by vertical business service developers for particular vertical use cases, and thus they are different from the network VNFs (such as 5G system data plane and control plane VNFs: UPF (User Plan Function), Access and Mobility Functions (AMF), Session Management Functions (SMF), etc.) usually developed and deployed by network service providers and/or network operators. However, a NetApp does not exclude additional VNFs (and even Physical Network Functions (PNFs)) from the service provider and/or network operator, in order to enhance its operation and or performance; examples may include encryption and decryption VNFs for secure communications, video processing VNFs and so on. There are three types of VNFs: customer-facing service VNFs, network-facing (3GPP) VNFs, and value-added middleware VNFs. A NetApp can be deployed on demand as requested by a vertical user, by a network operator or a service provider in conjunction with a network operator, depending on the business model. A NetApp should be cloud-native compliant to allow automated cloud-based deployment. A NetApp may have embedded edge intelligence in its edge VNFs to benefit from MEC. A NetApp should be compatible with private 5G and beyond networks, and hybrid private and public 5G and beyond networks, while possibly operating over a network slice. These vertical NetApps require low end-to-end latency between application and connected devices to enable real-time procedures and cognitive application reaction. To achieve these KPIs, a full compromise and understanding between the full-stack NetApp Management Platform, the Advanced NetApp Validation, the Industrial & 5G Experimentation Infrastructure and the businesses are necessary. The role of defining the appropriate messaging competes to the NetApp developer that is going to deploy a service as a NetApp in the 5G network.
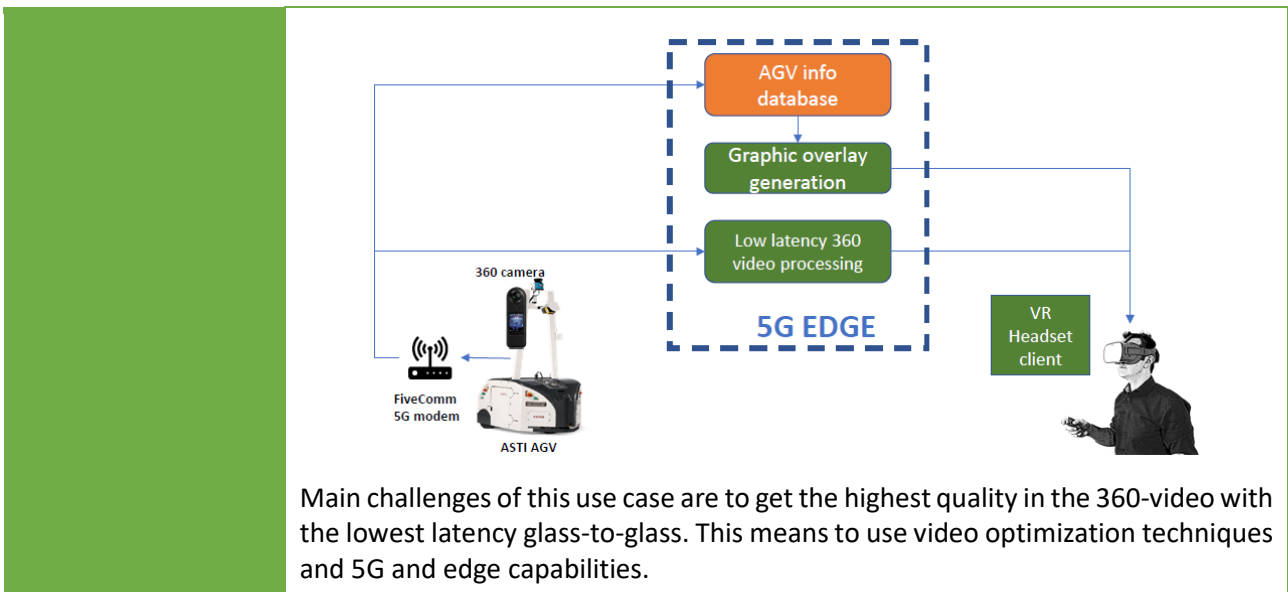
3.2   Messages on individual NetApps Use Cases

3.2.1 Smart operation based on human gesture recognition

Developer:	Fivecomm (5COMM)
NetApp:	Inspection and surveillance services for critical industrial infrastructures
Target Group(s):	Factories, shop floors and industrial parks, e.g., Ford
NetApp Description:	Ability to control an AGV without establishing direct contact on it. An operator performs different hand gestures that allow her/him to control the robot. The AGV has a video camera installed that captures the gestures made by the user. It also has a screen that displays information regarding the processed gesture. The 5G modem connects via Ethernet to the robot and establishes communication with the edge through the 5G network. All three VNFs of the use case are at the edge.
Impact:	Main stakeholders and industrial users will benefit from the following features: 1. Gesture control without any type of direct contact, increasing the distance between users and AGVs up to about 3 meters. This is important to prevent accidents and increase safety as well as trust in Industry 4.0 applications. The target is to eliminate this potential risk. 2. The application implements a user-friendly interface with easy access, which allows for intuitive control of AGVs. No advanced knowledge, studies or complex manuals are needed to provide different instructions to the AGV. This is useful for a new operator, whose learning curve is reduced by 50%. 3. The user-friendly interface also provides AGV information that allows the user to know better the processed gesture, avoiding navigation errors.

Pathway to Impact:	AGVs, located in an industrial environment are able to receive RGB/depth info from any type of camera. Through a flexible and compact 5G modem (14cm x 9cm x 6cm), connected to the AGV, users can send the high-quality video info to the 5G network (~2 Mbit/s). The NetApp, located at the edge, will get the video and gesture information, process the order, and send it back to the AGV. Finally, the AGV will move, stop, or change its direction depending on the worker's order.

3.2.2 VR immersion and AGV control

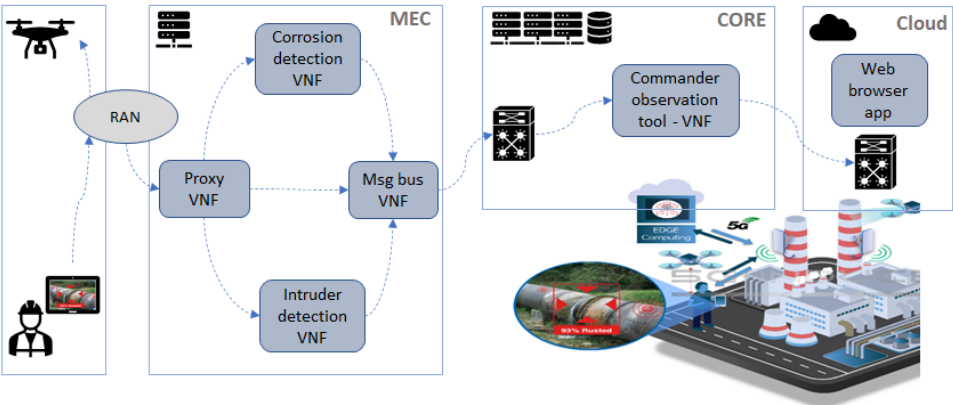| Developer:	Yerba Buena VR (YBVR)
NetApp:	VR Immersion and AGV Control
Target Group(s):	Industrial actions that require remote monitoring (e.g., Ford factory)
NetApp Description:	UC3 provides an immersive view (video 360 degrees) from the AGV to a remote operator, including AGV real-time data overlayed on the video screen. In a quick look from the steering centre, the operator can assess the situation of the AGV with a 360 degrees field of view and compare the situation with the parameters reported by the AGV.
Impact:	This NetApp allows a better way to monitor and apply industrial actions that are difficult, dangerous, or even impossible for humans to implement in a very limited time frame (e.g., in huge plant factories, dangerous mining, difficult to access cranes, auto-guided vehicles...). Immersive video allows an awareness of the environment that legacy video is not able to offer. This solution can reduce the time to diagnose an incident by up to 50% and the time to restore the service by up to 30%.
Pathway to Impact:	A 360-degree camera (8K) connected by 5G network to the 5G edge, where video is processed and environmental data is gathered. A multi-device player in the operator device overlays the real-time data onto the immersive video. 5G Edge will host the software in charge of the 360-video optimization and the data overlay generation. The APP installed in the operator's device (VR headset, mobile, tablet or browser for Mac&Win) will reproduce the video and will overlay the data on the video view.

Main challenges of this use case are to get the highest quality in the 360-video with the lowest latency glass-to-glass. This means to use video optimization techniques and 5G and edge capabilities.

3.2.3 ML-Supported Edge Analytics for Predictive Maintenance

Developer:	Suite5 Data Intelligence Solutions Limited (SUITE5)
NetApp:	ML-Supported Edge Analytics for Predictive Maintenance
Target Group(s):	Industrial Environments with Machinery that needs to be maintained (e.g., WHIRLPOOL, PPC)
NetApp Description:	Provides ML-powered analytics services for real-time and multi-source condition monitoring, anomaly detection and predictive maintenance in industrial settings
Impact:	The execution of analytics on the edge as well as on factory levels, utilizing real-time data from IoT devices and other data source instances within the factory, will allow for improved maintenance prediction accuracy, while the deployment of the analytics nodes at the edge speeds up the propagation of the analytics results, allowing the real-time monitoring of production lines and timely alerting of the human operators. Quality of production is improved by means of smart data analytics and predictive decision-making. In the paper of Lee et al. [1] it is stated that, in order to pursue optimization for each individual product, it is required to have zero defects, therefore quality control is necessary to accomplish this. In the literature so far big data collected from multiple IoT (Internet of Things) sensors embedded in components can support smart production, supply, and delivery for predictive maintenance in real-time. The role of 5G is instrumental in these actions, as it allows for quite bigger data sizes to be transferred, as well as for the smart and on-demand provisioning of computing infrastructures at the different topology nodes, being able to cope with flexible demands that might come from the outputs of the machinery. Higher level (factory level) machine learning algorithms will facilitate decision-making at production line level while considering overall production targets and at the same time protecting the confidentiality of data. Improved predictive maintenance scheduling and coordination will lead to optimized maintenance scheduling, decreased production downtime and overall cost savings. Operation of the machines is optimised via utilisation of environmental parameters as operational metrics. The 2018's PWC report [2] states that there is a reduction of

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	risks associated with safety, health, environment and quality by 14%. The report also has recorded that after factories used predictive maintenance there was a reduction of 12% in costs, as well as improving customer satisfaction by 12%, extended lifetime of assets by 20% and improved uptime by 9%. The CXP Group report [3] stated that 91% of predictive maintenance manufacturers have noticed a reduction of repair time and unplanned downtime, and 93% observe the improvement of ageing industrial infrastructure. References: [1] S.M. Lee, D. Lee, and Y.S. Kim, "The quality management ecosystem for predictive maintenance in the Industry 4.0 era", International Journal of Quality Innovation, vol. 5, no. 4, March, 2019 [2] M. Mulders, and M. Haarman, "Predictive Maintenance 4.0 Beyond the hype: PdM 4.0 delivers results", September 2018, Available: https://www.pwc.be/en/documents/20180926-pdm40-beyond-the-hype-report.pdf [3] M. Milojevic, and F. Nassah, "Digital Industrial Revolution with Predictive Maintenance", May 2018, Available: https://www.plm.automation.siemens.com/media/global/en/PAC_Predictive_Maintenance_Siemens_2018_Full_report-71129_tcm27-33185.pdf
Pathway to Impact:	VNFs will be deployed at components residing in the shop floor and factory level for the collection of data from various data sources through API and batch mechanisms. The collected data are pre-processed, through cleaning and transformation pipelines, to ensure high quality and data usability and are mapped to the underlying common data model. Afterwards, the cleaned and harmonised data are fed to the VNFs responsible for the execution of analytics, again at shop floor or factory level, where they are combined with ERP, MES and other information, to provide failure probabilities, maintenance schedules and generate the appropriate alerts whenever required.

3.2.4 Inspection and surveillance services for critical infrastructures

Developer:	University of the West of Scotland (UWS)
NetApp:	Corrosion Detection NetApp and Intruder Detection NetApp to provide inspection and surveillance services for critical industrial infrastructures.
Target Group(s):	Industrial sectors e.g., PPC, yet applicable to a wider range of business sectors that may need surveillance services.
NetApp Description:	The NetApps perform automatic UAV-based tank and pipeline inspection to detect corrosion on the surface, and area surveillance monitoring to detect intruders to the premises and provide real-time warning accordingly.

Impact:	1. Timely inspection and surveillance of critical industrial infrastructures is important to prevent accidental or malicious damages that may disrupt the mission-critical businesses operating over the infrastructures. The inspection can identify early corrosion over the infrastructures such as storage tanks or pipelines. The surveillance can identify uninvited and potentially dangerous presence of intruders such as humans or even animals.
	2. Some crucial statistics:
	- The global cost of corrosion is estimated to be US$2.5 trillion, which was equivalent to 3.4% of the global GDP in 2013. (source: http://impact.nace.org/economic-impact.aspx). Moreover, for some key sectors, indirect (user) costs, or referred to as social costs, can exceed the direct cost by a factor of 2 to 10. (source: https://www.degruyter.com/document/doi/10.1515/CORRREV.2007.25.3-4.247/html).
	- The cost of commercial crimes for 7 sectors only in UK alone was about £8.6 billion in 2015/2016, and those crimes were largely intruder-related. (source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/954485/the-economic-and-social-costs-of-crime-horr99.pdf)
	3. The target is to help reduce corrosion maintenance cost by at least 10% and detect intruders in real time to prevent damages to be caused significantly.
Pathway to Impact:	Empowered by advanced AI-assisted object status and human identification algorithms, linked to efficient warning mechanisms. NetApp services deployed with AI inspection and surveillance algorithms running in the edge and end user monitoring devices located both locally (at infrastructure premises) and remotely. UAV to be operated inside the facility and connected with 5G.

3.2.5 AR-based remote maintenance, repairing and upgrade

Developer:	oculavis (OCU)
NetApp:	Remote Service Platform for Inspection, Maintenance and Repair
Target Group(s):	Industrial sectors, e.g. Whirlpool
NetApp Description:	The application enables a broad and high-quality remote support video call through the combination of high-quality video and audio streams, collaborative working tools such as diverse augmented reality annotation features and the documentation and linking of respective data.
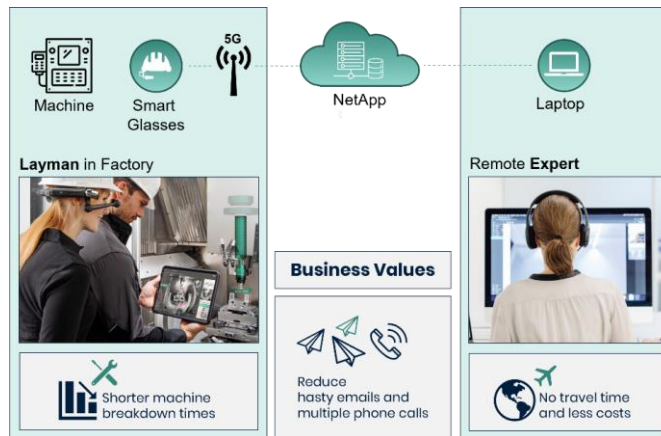
Furthermore, it enables the creation of bidirectional step-by-step instructions, linking to assets hierarchies and delivery to specific individuals. Also, 3D models can be shown and overlayed as AR models over real assets.

Impact:	Machine breakdowns are highly expensive for producing industries. Industries therefore need a fast and specific help on site. Operations like inspections, maintenance or repair are mostly done via service technicians of the machine manufacturer. These operations are time consuming, create additional cost (e.g., traveling via flight and hotel accommodation) and have a huge environmental impact. The Internet connection on site is often not sufficient to transmit high quality video and audio streams which are needed to execute the work remotely. Besides, the skills competencies required to effectively execute all the maintenance activities are today very difficult to be retrieved, created and maintained at shop floor level, and the need to leverage on a wider network to support operations is becoming crucial to succeed. Therefore, the oculavis SHARE Remote Service Platform creates the following business impacts for remote inspections, maintenance and repair operations.

Business Values:
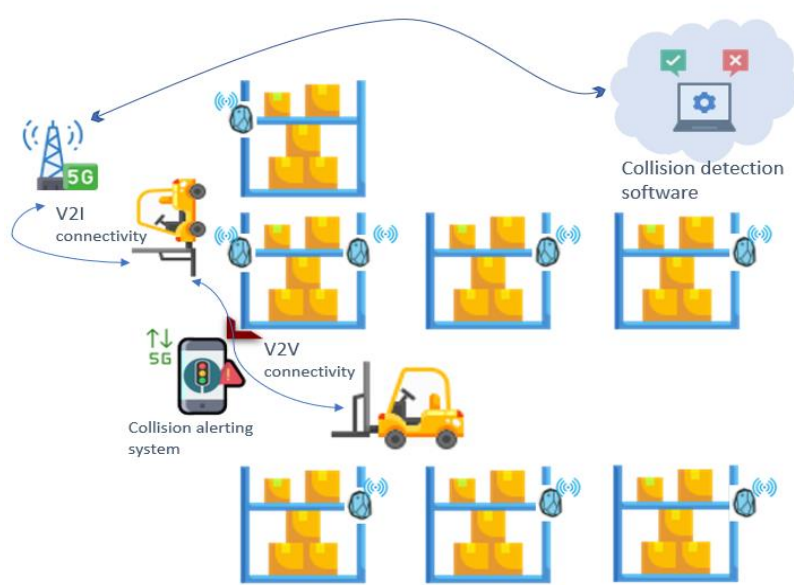
1) Reduce machine breakdown time and therefore increase machine availabilities (+15%) [1]

2) Improve service quality through creation of new digital business models (100% remote)

3) Reduce travel costs and CO_2 emissions (-30%) [2]

4) Improve remote service procedures through increased video quality via higher bandwidths (up to 10 MBit/s) and reduce possible accidents through reduced latencies (down to 200 ms)

5) Improve maintenance operators' capabilities through effective remote support: intervention time reduction of 30%

6) Improve operators upskilling through an easier access to information: new operators' learning curve time reduction 30%

Source references:

[1]: https://oculavis.de/de/blog/20200420-Augmented-Reality-Remote-Support-als-digitales-Geschaeftsmodell-in-der-Intralogistik/

[2]: https://cuttingtools.ceratizit.com/de/de/erfolgsgeschichten/livetechpro-jyoti-cnc-automation.html
https://www.liebherr.com/de/deu/aktuelles/news-pressemitteilungen/detail/xpertassist-remote-support-in-echtzeit.html

Pathway to Impact:	Through the deployment of oculavis SHARE components as VNFs, with a new star topology architecture, in a fully stand-alone 5G network, the available bandwidths (UL/DL up to 10 Mbit/s) and therefore video and audio quality are increased such as the availability and stability of network conditions (keyword: quality of service) are ensured. The new developed architecture enables the possibility to deploy media servers in form of selective forwarding units within the 5G network. Through the possibility of the NAO to deploy and configure the media servers in the 5G network the whole system is scalable and adaptable to the end user's needs.
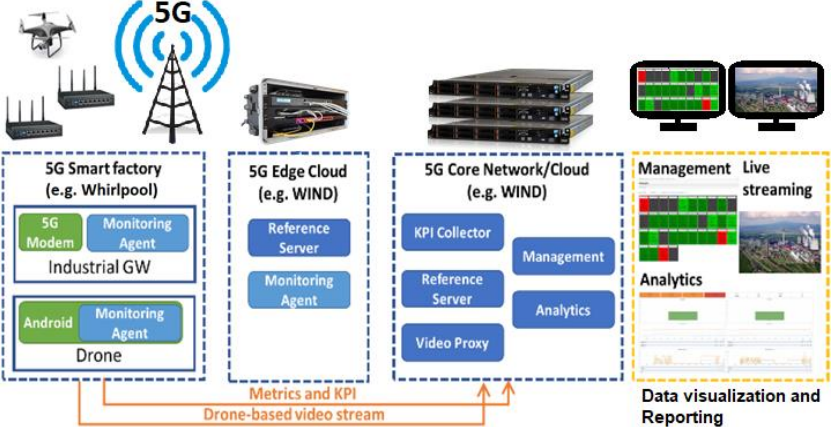
3.2.6 Indoor location identification & crossroad control for safety

Developer	iLink New Technologies (ILINK)
NetApp:	NetApp for indoor location identification & crossroad control for safety (forklifts case)
Target Group(s):	Industrial Factories (e.g., Whirlpool) Logistic warehouses
NetApp Description:	Provide the necessary means of alerting, when the probability of collision between forklifts inside a factory (due to lack of visibility) increases. Forklift drivers as well as workers moving around the plant (using the corridors of the factory) will be early notified about the potential danger in order to take all the necessary actions.
Impact:	1. Reduce number of accidents that take place inside factories or warehouses due to forklifts' routes. Corridors and shelves impose many hidden points that lead to dangerous cross-corridors. At these cross points the danger of an accident between two forklifts or a forklift and a human probabilistically increases a lot. 2. The yearly average number of fatal accidents due to this situation inside European Union industries is around 85, exposing a huge increase (more than 28%) in the last 7 years. As logistics becomes more and more a crucial factor of our daily life, it is sure that this number will exponentially increase. Some crucial statistics: - Forklifts account for around 85 deaths every year – a 28% Increase since 2011

	- Forklift accidents that result in serious injury total 34,900 annually. - Non-serious injuries related to forklift accidents reach 61,800 each year. - A forklift overturning is the most common incident, accounting for 24% of all forklift accidents. - On average 95 people are seriously injured in a forklift accident every day and 1 person is killed in a forklift accident every 4 days in the European Union. - 36% of forklift-related deaths are pedestrians - Approximately 11% of forklifts in the EU will be involved in an accident each year. This means that if a facility has 10 or more – something is going to happen this year. (source: https://www.mccue.com/blog/forklift-accident-statistics) 3. The target is to eliminate this risk and reduce the number of forklift accidents to zero 4. A potential further NetApp development may include the integration of moving assets with automatic stoppages and speed reduction of a forklift, driven by human or computer. 5. The NetApp solution may also be applied to alert management of approaching to fixed dangerous areas by moving connected assets (people, ways...) reducing also the risk of unauthorized access.
Pathway to Impact:	Through the early detection and immediate (less than 100ms communication latency) identification of forklifts' movement. Through a sophisticated optimization and prediction algorithm that takes into consideration the position of the forklifts in the factory (based on BT beacons or geolocation features), the direction of movement and their velocity, estimates the probability of an accident at specific cross-corridors and initiates the alarm process to notify the potentially involved parties in the accident, by using all available means of alert (noise, signal, vibration, etc.)

3.2.7 Drone assisted network performance and coverage monitoring for industrial infrastructures

Developer:	Internet Institute (ININ)
NetApp:	Drone assisted network performance and coverage monitoring for industrial infrastructures
Target Group(s):	Industrial environments, e.g., Whirlpool Logistic warehouses, indoor/outdoor connected services areas, digital ecosystems in general
NetApp Description:	The NetApp provides a comprehensive suite of monitoring tools for monitoring 5G network performance KPIs, radio coverage KPIs and service performance KPIs. The NetApp also provides supporting capabilities enabling both continuous and on-demand monitoring/measurements of the aforementioned performance KPIs. The solution includes drone assistance, in order to provide on-demand monitoring of height-related performance and coverage monitoring, as well as real-time video streaming aiming for the identification of potential sources of performance drop (e.g., identifying potential sources of interferences, metal obstacles causing signal scattering, etc.).

Impact:	Data collected through continuous monitoring (e.g., performed by fixed agent probes) and/or on-demand monitoring (e.g., performed by drone assistance) of 5G network in industrial environments serve as an essential factor in assuring required (high) level of QoS in industrial networks, thus enabling the main industrial process to run properly: high availability of critical communications enables, e.g., automated fork-lift operations, high availability of services enables, e.g., video-based remote-control operation.
	In turn, the NetApp supports automatic optimization of 5G network parameters (in order to maintain required QoS) utilizing collected monitoring data and supports optimization of 5G network radio coverage, as well, by identifying obstacles and/or interference sources through video stream provided by drone-mounted agent probes.
	If the NetApp is not used as an input for the automatic 5G network and radio coverage optimization, it can still be used as a source of control data for controlling SLA commitments (24/7) providing various data analyses, reports, and triggering alarms set by the customer (e.g., for critical parameters).
	Currently the network performance monitoring and control is often a highly specialized activity which cannot be managed internally, requiring specific tools and competencies. The NetApp will ensure companies to manage autonomously this task with relevant costs, resource usage and time reduction, enabling the full potential of a digital connected ecosystem.
Pathway to Impact:	Within the area of interest (e.g., factory indoor and outdoor area), deploy qMON agent probes on chosen fixed locations according to the plan, meeting customer's expectations on monitoring. Then, deploy qMON Network Monitoring Suite in edge and cloud facilities (the Suite consists of fully orchestrated and containerized backend components providing management, collection and reference endpoints for the agent probes). Deploy qMON agent probe to the drone to provide height-related radio signal monitoring and video stream aimed to identify obstacles and/or interference sources causing radio signal propagation issues. Make sure to comply with potential restrictions related to drone flying. Start continuous monitoring via fixed probes and prepare schedule for regular drone assisted monitoring. As well, set thresholds for alarms and to trigger on-demand monitoring procedures (the latter should be well defined, too). Define and schedule data analysis and relevant reports.

4 Communication and Dissemination Activities

After addressing the main target groups and the content of messages in the previous sections, we define the main dissemination and communications channels considering project resources and duration.

5G-INDUCE will use dissemination and communication activities to demonstrate tangible project achievements, by making use of the project internal resources, as well as resources provided by the EC.

In the sub-chapters to follow, 4.1 and 4.2, a full report of the developed and active communication channels and means of dissemination can be found.

4.1 Communication Channels

Several communication channels are used to reach the target audience, leveraging complementary media, in order to implement an incisive, yet not invasive strategy of Communication and Dissemination. The challenge is to tailor the content and the key messages to the typical expressiveness of each channel, so as to fit the expectations of the audience interested in that specific communication channel. The project has considered the full range of complementary and alternative communication channels available today, including the tools kindly provided by the EC.

4.1.1 Websites

Official Project Website

The 5G-INDUCE public website is one of the main communication tools. It provides a public window, accessible at https://www.5g-induce.eu/, in which the project can communicate the most important project information, and a private area, accessible at https://private.5g-induce.eu/, for internal communications and document sharing.

The public area comprises the following sections:

- Home.
- Main concept.
- Core activities.
- Experimentation facilities.
- Use cases.
- News & Events.
- Outcomes.
- List of Partners.
- Contact details.

The private area is intended both for managing internal communication and for providing a single interface where partners can continuously report and update all information on their communication and dissemination activities. It consists of the following sections:

- Management page for the personal profile.
- Repository of the 5G-INDUCE documents.
- Upload file wizard.
- Management section for the publications.
- Management section for the dissemination activities.
- Management page for the news.
- Contact page of the registered users and roles.
- Project planning (Gantt diagram).

- Description of the Work Packages.
- Management page for the mailing lists.
- Management page for the virtual meetings.
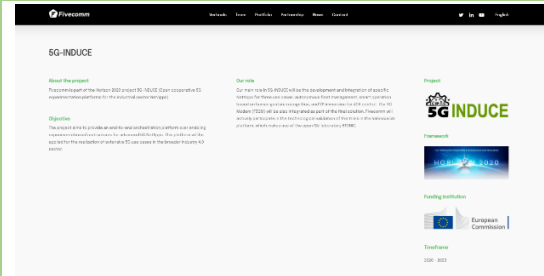
The development of the public website has been realised with the use of WordPress[1], a free and open-source content management system (CMS) written in PHP and paired with a MySQL[2] database. The public website runs on a FreeBSD 12.2 jail. The private website has been developed by CNIT in C# using the ASP.NET[3] core framework and it is an evolution of the website engine already fruitfully used and tested in other H2020 projects of which CNIT was the coordinator. It runs on an Ubuntu 20.04 virtual machine, using a MongoDB[4] database.

Screenshots of the 5G-INDUCE public website can be found in Annex 1, while screenshots of the various section of the private website can be found in Annex 2.

Individual Websites of Consortium Partners

Besides the official 5G-INDUCE website, the Consortium partners disseminate the project scope, objectives and results on the Consortium partners' websites (e.g., via blog articles) to extend the reach of this project. Therefore, the official 5G-INDUCE website is hyperlinked to access a greater number of detailed information. In that way, the project gains attention by exploiting the already existing communication networks and structures of the respective partners and raises the awareness of potential end users and further stakeholders.

Table 4: 5G-INDUCE's presence in websites of individual partners.

Partner Website	Website	Indicative Preview
8BELLS	https://www.8bellsresearch.com/projects/h2020-5gppp-5g-induce/	
5COMM	https://fivecomm.eu/industry-4-0/5g-induce/	

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[1] https://wordpress.com/

[2] https://www.mysql.com/

[3] https://www.asp.net/

[4] https://www.mongodb.com/

Partner Website	Website	Indicative Preview
INFO	http://www.infocomgenova.it/page4.html	
UWS	http://beyond5ghub.uws.ac.uk/index.php/5g-induce/	
SUITE5	https://www.suite5.eu/5g-induce	
OTE	https://www.cosmote.gr/cs/otegroup/en/5g_induce.html	

Partner Website	Website	Indicative Preview
K3Y	https://www.k3y.bg/5g-induce/	
ILINK	https://ilink.gr/node/141	
UBITECH	https://ubitech.eu/ubitech-undertakes-the-technical-coordination-of-the-5g-induce-innovation-action-on-open-cooperative-5g-experimentation-platforms-for-the-industrial-sector-netapps/	
OCULAVIS	https://oculavis.de/en/blog/	Blog article on website planned for March/April 2022 after initial onboarding of NetApp in Experimentation Facility.

4.1.2 Social Networks

The Consortium is committed to the requirement of spreading the progress of the project to a wider community. For this reason and in order to increase project visibility and create a space for exchange of experiences among professionals and stakeholders, we have created a LinkedIn group (5G-INDUCE EU) where the Consortium members exchange ideas and knowledge, not only between them but also with the greater industrial and scientific community. All project partners have invited stakeholders in this group and communicate 5G-INDUCE advances within this group. In addition to the LinkedIn group, a Twitter account has been created, too, because it is an excellent medium for conveying concise messages to the followers. The Twitter account is considered very important, especially during workshops, conferences and similar public events, where the activity of the Consortium is advantageous to be populated instantly; the use of hashtags also allows our vision to reach a wider audience.

All 5G-INDUCE social media can be found in the project's website, in the footer of every active page, beneath the project's contact info.

The primary Point of Contacts (PoC) are Dr. Riccardo Rapuzzi (CNIT) for the management of the 5G-INDUCE website and Dr. Ioannis Tomkos (UOP) for the LinkedIn group and Twitter. The main tasks of the PoCs are to maintain the 5G-INDUCE website, LinkedIn group and Twitter accounts and to provide updates on the project events, inviting members to elaborate on specific issues and responding to any post made in the group.

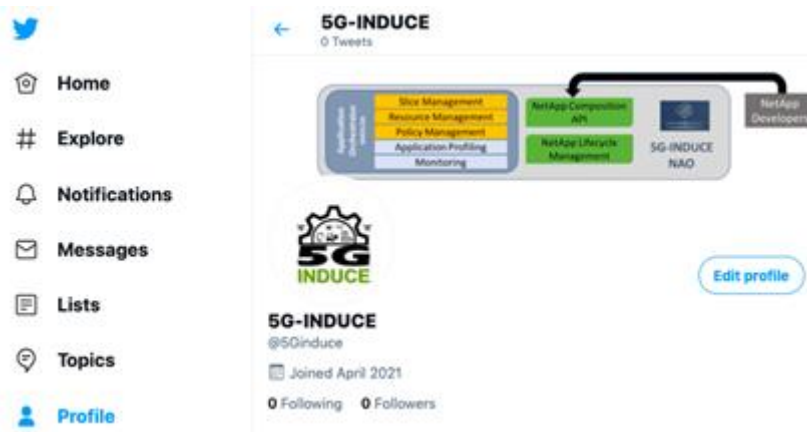*Figure 2: 5G-INDUCE LinkedIn account.*

Figure 3: 5G-INDUCE Twitter account.

Moreover, a dedicated YouTube account will be created, in which the forthcoming videos produced within the project activity will be published. When there is available content the management of the project's YouTube channel will be assigned to a partner.

The social network accounts are planned to be maintained at least throughout the course of the project and for 3 years beyond that. A plan will be agreed as part of project exploitation activities in how to address interest in the networks' contents, and the maintenance of them beyond the project end.

Table 5: Indicative posts in social media.

4.1.3 News published in web communication channels

In the section following, news and interviews are listed which were published on partners' individual websites, in the consortium's website, on social media and in the websites of third parties. The links below each publication are indicative, as the same event has been spread through the channels of many partners. Regarding the post on social media the title and the date are indicative in order to describe the content and the period of publication, respectively.

Table 6: List of news and posts published on partners' communication channels.

Type	Description	Date
Interview	5G ya empieza a mover las fábricas https://www.norbertogallego.com/5g-ya-empieza-a-mover-las-fabricas/2021/05/18/#more-33878	May 18, 2021
Interview	El 5G también avanza en la industria https://www.lavanguardia.com/economia/20210521/7456317/fabricas-5g-plantas-ericsson-telefonica-valencia.html	May 21, 2021
General news	La planta de Ford de Almussafes (Valencia), base para la experimentación en España del proyecto 5G-INDUCE de la UE" https://movilidadelectrica.com/ford-almussafes-y-5g-induce/	February 12, 2021
General news	5G-INDUCE: Industria 4.0 en la fábrica de Ford en Valencia https://www.redestelecom.es/conectividad/noticias/1123605051003/5g-induce-industria-40-fabrica-de-ford-valencia.1.html	February 8, 2021
General news	El 5G transformará la fábrica de Ford en Valencia https://www.todotransporte.com/texto-diario/mostrar/3273153/5g-transformara-fabrica-ford-valencia	February 17, 2021
General news	El 5G transformará la fábrica de Ford en Valencia https://www.abc.es/motor/reportajes/abci-como-transformara-fabrica-ford-valencia-202102160118_noticia.html?ref=https%3A%2F%2Fwww.google.com%2F	February 16, 2021
General news	El 5G transformará la fábrica de Ford en Valencia aplicando la innovación industrial al sector de la automoción https://www.automaticaeinstrumentacion.com/texto-diario/mostrar/2733838/5g-transformara-fabrica-ford-valencia-aplicando-innovacion-industrial-sector-automocion	February 24, 2021
General news	La planta de Ford Almussafes acoge una prueba piloto de 5G para la producción https://www.infoplc.net/plus-plus/empresas/item/109146-ford-almussafes-proyecto-piloto-5g	February 13, 2021
General news	Los AGV de Asti Robotics y el 5G llegan a la fábrica de Ford en Valencia https://revistaderobots.com/robots-y-robotica/los-agv-de-asti-robotics-y-el-5g-llegan-a-la-fabrica-de-ford-en-valencia/	April 2, 2021
General news	Así funcionará la planta inteligente de motores de Ford con 5G https://digitalpolicylaw.com/asi-funcionara-la-planta-inteligente-de-motores-de-ford-con-5g/	February 9, 2021

Type	Description	Date
General news	5G-INDUCE presented at 5G PPP webinar on ICT-41 projects https://5g-ppp.eu/event/5g-ppp-webinar-new-5g-core-technologies-innovation-projects	February 10 ,2021
General news	5G-INDUCE at EUCNC 21 – 5GPPP Security WG workshop https://www.5g-induce.eu/index.php/2021/06/14/5g-induce-at-eucnc-21-5gppp-security-wg-workshop/	June 14, 2021
General news	5G-INDUCE presented in ITU-T meeting https://www.5g-induce.eu/index.php/2021/11/03/5g-induce-presented-in-itu-t-meeting/	November 3, 2021
General news	5G-INDUCE at 5G-Techritory event https://www.5g-induce.eu/index.php/2021/11/22/5g-induce-at-5g-techritory-event/	November 22, 2021
General news	2nd 5G-INDUCE Plenary Meeting https://www.5g-induce.eu/index.php/2021/11/18/2nd-5g-induce-plenary-meeting/	November 18, 2021
General news	5G-INDUCE supported paper by CNIT and UBITECH submitted at HPSR'21 https://www.5g-induce.eu/index.php/2021/04/16/5g-induce-supported-paper-by-cnit-and-ubitech-submitted-at-hpsr21/	April 16, 2021
General news	5G-INDUCE supported paper by CNIT and UBITECH accepted at HPSR'21 https://www.5g-induce.eu/index.php/2021/05/08/5g-induce-supported-paper-by-cnit-and-ubitech-accepted-at-hpsr21/	May 8, 2021
General news	5G-INDUCE NetApp developments presented at 7th ITS Hellas conference https://www.5g-induce.eu/index.php/2021/12/08/5g-induce-netapp-developments-presented-at-7th-its-hellas-confrence/	12 Dec 2021
General news	5G-INDUCE presentation at ITS 2021 conference https://ilink.gr/node/140	8 Dec 2021
Post	5G-INDUCE Plenary online meeting https://www.linkedin.com/feed/update/urn:li:activity:6866658069166788608?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6866658069166788608%29	November 2021
Post	University of Patras presented 5G-INDUCE in 4 different events https://www.linkedin.com/feed/update/urn:li:activity:6875358812274991106/	December2021
Post	Whirlpool and Ubitech presented the Whirlpool's 5G enabled manufacturing case study at 5G-Techritory https://www.linkedin.com/feed/update/urn:li:activity:6872923064728920064?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6872923064728920064%29	December 2021
Post	5G-INDUCE at 5G-Techritory event https://www.linkedin.com/feed/update/urn:li:activity:6869229008794521600?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6869229008794521600%29	December 2021

Type	Description	Date
Post	Presentation of results concerning the ongoing NetApps is 5G-INDUCE plenary meeting https://www.linkedin.com/feed/update/urn:li:activity:6867032884281180160?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6867032884281180160%29	November 2021
Post	Agenda 5G-Techritory https://www.linkedin.com/feed/update/urn:li:activity:6854658082107121664?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6854658082107121664%29	October 2021
Post	The NetApp of Ubitech https://www.linkedin.com/feed/update/urn:li:activity:6859042778878406656?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6859042778878406656%29	November 2021
Post	NetApps as parts of global ecosystem https://www.linkedin.com/feed/update/urn:li:activity:6789826808524156928?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6789826808524156928%29	April 2021
Post	Registration of 5G-INDUCE in 5G-Techritory https://www.linkedin.com/feed/update/urn:li:activity:6849249097484951552?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6849249097484951552%29	October 2021
Post	Article (in Greek) of University of Patras regarding the importance of 5G in modern society https://www.linkedin.com/feed/update/urn:li:activity:6859824024919252992?updateEntityUrn=urn%3Ali%3Afs_feedUpdate%3A%28V2%2Curn%3Ali%3Aactivity%3A6859824024919252992%29	November 2021
Post	Digital Beach summit about the evolution of 5G networks in Greece https://www.linkedin.com/posts/dr-ioannis-tomkos-086b102_5g-networks-greece-activity-6844228967508000768-dzSm	October 2021
Post	Kick-off meeting of 5G-INDUCE https://www.linkedin.com/posts/dr-ioannis-tomkos-086b102_ubitech-undertakes-the-technical-coordination-activity-6757606537549619200-Kl2N	February 2021
Post	ININ activities in 5G-INDUCE project https://www.linkedin.com/posts/internet-institute-ltd_5ginduce-netapp-5g-activity-6876449095486095360-sNZy	December 2021
Post	Participation of UWS in ITU-T plenary meeting https://www.linkedin.com/posts/qwang_beyond5ghub-activity-6869231446167441408-Imi2	November 2021
Post	Predictive Maintenance and Anomaly Detection https://www.linkedin.com/posts/k3y_5g-induce-predictive-maintenance-netapp-activity-6874769253241786368-1a6D	December 2021
Post	5G-Records project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-records-project-34996a1bb_ebu-5g-networks-activity-6807985258160500736-NYUn	June 2021

Type	Description	Date
Post	EUCNC Workshop 6 https://www.linkedin.com/posts/5g-records-project-34996a1bb_5g-private-networks-activity-6808001296998686720-OHE5	June 2021
Post	5G-CLARITY project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-clarity-project-1538111a4_privatenetworks-npn-5gppp-activity-6805519212824580096--OA4	May 2021
Post	5G-CLARITY project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-clarity-project-1538111a4_5gabrclarity-5g-5gppp-activity-6816313294626816000-MBI7	June 2021
Post	Fivecomm Joins 5GTONIC https://www.linkedin.com/posts/5tonic_fivecomm-joins-5tonic-for-the-integration-activity-6773155543134560256-2Hge	February 2021
Post	5G-Records project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-records-project-34996a1bb_eucnc-6gsummit-5g-activity-6801474341558128640-gnEu	May 2021
Post	5G-Records project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-records-project-34996a1bb_5g-networks-5g-activity-6798161910874329088-yDyz	May 2021
Post	5G-Records project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-records-project-34996a1bb_5gppp-5gppp-eucnc-activity-6805397324064448512-OILz	May 2021
Post	5G-Records project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-records-project-34996a1bb_eucnc-6gsummit-5gppp-activity-6807586482317000704-PWw_	May 2021
Post	5G-Records project mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/5g-records-project-34996a1bb_5g-npns-workshop-activity-6807936547581636608-_WC7	June 2021
Post	Affordable 5G mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/affordable5g_eucnc-6gsummit-5g-activity-6807572679340630016-FLAv	June 2021
Post	Affordable 5G mentioned 5G-INDUCE in LinkedIn Post https://www.linkedin.com/posts/affordable5g_eucnc-6gsummit-5g-activity-6807925506604851200-LBia	June 2021
Post	5G-INDUCE NetApp explained in LinkedIn post https://www.linkedin.com/posts/ilink-new-technologies_project-5g-5ginduce-activity-6877578451876892672-lIba	Dec 2021
Post	5G-INDUCE mentioned at LinkedIn post as part of ITS conference participation https://www.linkedin.com/posts/ilink-new-technologies_%CF%80%CF%81%CF%8C%CE%B3%CF%81%CE%B1%CE%BC%CE%BC%CE%B1-its-hellas-7th-conference-activity-6874308487275405312-5c_J	Dec 2021

Type	Description	Date
Post	5G-INDUCE announcement post https://www.linkedin.com/posts/ilink-new-technologies_netapp-logistics-5g-activity-6861222264906266624-KnQt	Nov 2021
Post	«5G: From prospects to reality» LinkedIn post https://www.linkedin.com/posts/ilink-new-technologies_11o-mobile-connected-world-2021-activity-6813388686055493632-q3k3	June 2021
Post	5G-INDUCE at ITS Hellas conference announcement post https://www.linkedin.com/posts/ilink-new-technologies_live-activity-6813447268696395776-XnCo	June 2021

4.1.4 Press Releases

Local press is another important and useful communication channel for the project. In order to gain press coverage, creating and publishing press releases is one of the main communication tasks of the consortium. Press releases are optimally occurred, not only to keep the journalists and media updated about the project's status, goals, and progress, but also when major moments (milestones) of the project are achieved. According to the Communication roadmap, press releases are being prepared in M12, M18 and M30. All partners will translate the press releases in their local language and all expenses will be covered by the project budget.

The project partners have put additional effort to release the project concepts, scope, objectives, expected outcomes and results in the local press of Italy, Spain, Luxembourg, Greece, Bulgaria, Slovenia, United Kingdom, Cyprus and Germany. All partners are in charge of developing press releases in the English language, too. All relevant press releases are also circulated to the partners' business networks and media contacts and are published on their websites and/or newsletters, as well. The publication of the press releases takes place through every possible information provider (local and international) determined by the consortium. Examples of it are: journals/journalists, electronic newspapers, magazines, newsletters, decision makers, technical associations, etc.

A summary of the initial press releases, issued by the 5G-INDUCE partners, is listed in Table 7.

Table 7: Press Releases issued by 5G-INDUCE Partners.

Partner	Press Release Title & URL	Issued On
UBITECH	UBITECH participates with three new Innovation Actions at the 5G PPP Webinar "5G Innovations for Verticals" https://ubitech.eu/ubitech-participates-with-three-new-innovation-actions-at-the-5g-ppp-webinar-5g-innovations-for-verticals/	March 5, 2021
ERC	Ford engine production to benefit from Ericsson connectivity in pilot EU initiative https://www.ericsson.com/en/news/2021/2/ford-engine-production-5g-dedicated-network	February 8, 2021
5COMM	FIVECOMM joins 5TONIC for the integration and implementation of the 5G Módem (F5GM) https://networks.imdea.org/fivecomm-joins-5tonic-for-the-integration-and-implementation-of-the-5g-modem-f5gm/ https://fivecomm.eu/2021/02/26/fivecomm-joins-5tonic-for-the-integration-and-validation-of-our-5g-modem/	February 25, 2021

Partner	Press Release Title & URL	Issued On
UBITECH	UBITECH undertakes the technical coordination of the 5G-INDUCE Innovation Action on open cooperative 5G experimentation platforms for the industrial sector NetApps https://ubitech.eu/ubitech-undertakes-the-technical-coordination-of-the-5g-induce-innovation-action-on-open-cooperative-5g-experimentation-platforms-for-the-industrial-sector-netapps/	January 20, 2021
UWS	Beyond 5G Hub: Induce http://beyond5ghub.uws.ac.uk/index.php/5g-induce/	January 12, 2021
5COMM	5G set to transform Ford's factory in Valencia https://fivecomm.eu/2021/02/09/5g-set-to-transform-fords-factory-in-valencia-with-automotive-industrial-innovation/	February 9, 2021
5COMM	Fivecomm participates in 5G-INDUCE project https://fivecomm.eu/2021/01/24/fivecomm-participates-in-5g-induce-project/	January 24, 2021
ERC	Fivecomm joins 5tonic for the integration and validation of their 5G modem https://www.5tonic.org/news-20210224-fivecomm-joins-5tonic-for-the-integration-and-validation-of-their-5g-modem/	February 24, 2021
FORD	El 5G transformará la fábrica de Ford en Valencia aplicando la innovación industrial al sector de la automoción https://media.ford.com/content/fordmedia/feu/es/es/news/2021/02/12/el-5g-transformara-la-fabrica-de-ford-en-valencia-aplicando-la-i.html	January 12, 2021
ASTI	Transformation Ford Factory: ASTI Mobile Robotics implements 5G" https://www.astimobilerobotics.com/blog/transformation-ford-factory	February 9, 2021
UPV	El 5G transformará la fábrica de Ford en Valencia aplicando la innovación industrial al sector de la automoción http://www.iteam.upv.es/2021/02/10/5g-set-to-transform-fords-factory-in-valencia-with-automotive-industrial-innovation/?lang=es	February 10, 2021
K3Y	5G-INDUCE – Predictive Maintenance https://www.k3y.bg/5g-induce-predictive-maintenance-netapp/	December 9, 2021
UOP	5G as a key driver for the modern society https://www.mononews.gr/politics/columns-the-politic/to-5g-apoteli-monodromo-gia-tin-exelixi-tis-sigchronis-kinonias	November 9, 2021
UBITECH	Whirlpool and UBITECH present the Whirlpool's 5G-enabled manufacturing case study at 5G Techritory https://ubitech.eu/whirlpool-and-ubitech-present-the-whirlpools-5g-enabled-manufacturing-case-study-at-5g-techritory/	November 22, 2021
ILINK	ILink New Technologies is contributing to 5G-INDUCE EU Innovation Project https://www.metaforespress.gr/etairika-nea/%cf%83%cf%85%ce%bc%ce%bc%ce%b5%cf%84%ce%bf%cf%87%ce%ae-%cf%84%ce%b7%cf%82-ilink-%cf%83%cf%84%ce%bf-%ce%b5%cf%85%cf%81%cf%89%cf%80%ce%b1%cf%8a%ce%ba%cf%8c-%cf%80%cf%81%cf%8c%ce%b3%cf%81%ce%b1%ce%bc/	December 12, 2021

4.1.5 Participation in Industry Events

The project partners have seized opportunities to reach out the industry with the objectives and vision of 5G-INDUCE, towards raising awareness, as reported in Table 8.

Table 8: Participation in Industry Events by 5G-INDUCE Partners.

Partner	Industry Event-Presentation	Date
UBITECH	5G PPP Webinar: 5G Innovations for Vertical https://5g-ppp.eu/event/5g-ppp-webinar-5g-innovations-for-verticals/	March 5, 2021
YBVR	South Summit 2021. Booth with poster including 5G-INDUCE project https://www.linkedin.com/feed/update/urn:li:activity:6849622361793269760	October 5-7, 2021
OCULAVIS	5G-INDUCE and UC6 related presentation and discussions on All About Remote Conference (leading congress on visual remote support services, augmented reality and related digital business models) https://allaboutremote.com/	December 14, 2021
ININ	Sterle J, Koršič L, Development of a Private 5G Network for Industrial Vertical, 36th Workshop VITEL, Brdo pri Kranju, SI	May 17-18, 2021
ININ	Seminar on Radio Communications (presentation) http://srk.fe.uni-lj.si/2022/main.php	February 2022 *(planned)*
ININ	VITEL 2022, 37th Workshop on Telecommunications https://www.drustvo-sikom.si/dogodki/vitel-2021/	May 2022 *(planned)*
ININ	S&T Iskratel d.o.o. Industry company private event 5G benefits through use cases – Presenting INDUCE framework and UCs	December 2, 2022
5COMM	5G-EVE webinar presentation https://www.5g-eve.eu/successful-first-5g-eve-learn-and-drive-online-event-for-smes/	January 2021
UBITECH/WHR	5G Techritory - Europe's Leading 5G Ecosystem Forum https://www.5gtechritory.com/	November 22-25, 2021
ERC	South Summit 2021 https://www.youtube.com/watch?v=uXMqhsIDSRs&t=14753s	October 6, 2021
ILINK	Infocom Mobile Connected World 2021 https://mwc.gr/	23 June 2021
ILINK	Athens Summit '21 for Industry 4.0 digital conference https://athens4industry.e-expo.gr/	18 March 2021
ILINK	7th ITS Hellas conference https://www.ilink.gr/node/140	December 8, 2021
ILINK	6th ITS Hellas Digital Conference	December 14, 2020
ILINK	Supply Chain Logistics & CARGO TRUCK & VAN EXPO 2021 https://www.supplychainexpo.gr/	October 2, 2020

4.1.6 EC Communication Mechanisms

For better communication and maximum networking with other ongoing related activities, EC supported mechanisms (e.g., CORDIS) are used for publishing project information, as well as organizing networking activities, such as the concertation meetings organized within the EU Software Services and Cloud Unit.

EC's collective 5G PPP projects' site hosts information about the 5G-INDUCE project under URL: https://5g-ppp.eu/5g-induce/.

5G-INDUCE information is also available in CORDIS website under URL: https://cordis.europa.eu/project/id/101016941/.

CORDIS enables users to advertise their events or publish press releases relative to Research, Technological Development and Innovation activities on the CORDIS News and Events service. In addition, CORDIS helps the publication of important news and events and the proper categorization of them ordered per programme, subject or country, so that better online visibility can be obtained. Among the promotion initiatives, it is worth mentioning also the 5G-INDUCE subscription to the 5G PPP Communication and Dissemination mailing list comms@5g-ppp.eu, specifically conceived to allow multiple interactions about common presentation materials, brochures, flyers, webs, tweets, etc., and preparations for joint events.

5G-INDUCE will periodically share significant project milestones that are of great interest for the community. Furthermore, 5G-INDUCE explores functionalities in specialized platforms like OpenAIRE and Zenodo for publications or software deposit for open access. This will boost the visibility and discoverability of the project and will help in sharing the research results.

4.2 Dissemination Channels

A number of complementary dissemination channels are exploited to reach different communities, ranging from professional, academics, and young researchers.

4.2.1 Conferences and Workshops

Original papers describing the scientific work carried out by the project have already and will be submitted to scientific conferences and workshops, according to their rigorousness, quality, and maturity. Partners are strongly encouraged to participate in joint initiatives, targeting integration of their research effort and preparation of papers with broader scope and higher quality level.

The project partners were actively engaged in major upcoming events during 2021, since they had received relevant invitations to act as co-organizers or participate as speakers. Examples include: 5G World, Big 5G Event, 6G Digital Symposium, EuCNC, 5G-Techritory, ITS Forum and others as it is indicated in the Table 9 for each partner individually.

Table 9: Participation in Conferences and Workshops for disseminating 5G-INDUCE.

Partner	Conferences & Workshops	Date and Location
ILINK	Participation in a Conference **7th ITS Hellas conference** Presentation *5G INDUCE, indoors crossroads collision avoidance*	December 8, 2021 Athens, Greece
OTE	Participation in a Workshop **Infocom World Conference 2021: Scientific Section "More than 5G!"** Presentation *5G Networks in Industry 4.0: 5G-INDUCE and VITAL-5G Use Cases*	November 26, 2021 Online

Partner	Conferences & Workshops	Date and Location
CNIT	Participation in a Workshop **3rd Vision of Future Communications Summit** Presentation *Toward 6G Network Management and Control in Industrial IoT*	November 24, 2021 Lisbon, Portugal
CNIT	Participation in a Conference **2021 IEEE Internat. Conf. on Communications, Computing, Cybersecurity and Informatics (CCCI 2021)** Invited Keynote Speech *Mobile Applications in 5G and Beyond – Orchestration, Performance Management and Energy Efficiency*	October 15, 2021 Beijing, China *(Virtual event)*
ILINK	Participation in a Workshop **Supply Chain Logistics & CARGO TRUCK & VAN EXPO 2021** Presentation *5G INDUCE*	October 2, 2021 Athens, Greece
ILINK	Participation in a Conference **Infocom Mobile Connected World 2021** Presentation *Possible Synergies of Blockchain & 5G: the BiAM (Blockchain in Asset Maintenance)*	June 23, 2021 Online
UBITECH	Participation in a Workshop **Workshop 8 at EuCNC/6G Summit "From 5G to 6G Automated and Intelligent SecuriTy: FAST"** Paper presentation *5G-INDUCE – A NetApp orchestration platform enabling on-demand deployment of security services*	June 8, 2021 Porto, Portugal *(Virtual event)*
5COMM	Participation in a Workshop **Workshop 6 at EuCNC/6G Summit "5G Private Networks"** Presentation *5G-enabled AGVs for NPN Production Lines in Manufacturing*	June 8, 2021 Online
CNIT	Participation in a Conference **IEEE 22nd International Conference on High Performance Switching and Routing (HPSR)** Paper presentation *From Cloud-Native to 5G-Ready Vertical Applications: An Industry 4.0 Use Case*	June 7, 2021 Paris-France *(Virtual event)*
ILINK	Participation in a Conference **Athens Summit '21 for Industry 4.0 digital conference** Presentation *Smart Logistics in Last Mile Delivery*	March 18, 2021 Athens, Greece *(Virtual event)*
ILINK	Participation in a Conference **6th ITS Hellas conference** Presentation *5G INDUCE*	December 14, 2020 Online

4.2.2 Project Workshops

The organization of project workshops aims to create specific opportunities in order to disseminate the project's results in a common, coherent, and comprehensive manner. The Consortium will actively foster the participation of other researchers in the 5G domain, to create a bidirectional communication and dissemination opportunity for improving the quality of the project. In this respect, the Consortium' goal is to benefit from the organization of joint workshops with other H2020 funded projects involved in the 5G PPP initiative.

The Consortium has planned the organization of at least two workshops for the dissemination of the project results to all stakeholders, with 5G-INDUCE Experimentation Facilities and specific NetApp use cases.

Table 10: Workshops organized by partners.

Partner	Event Publication	Event Description	Date
UOP	EU CNC	A Workshop is planned to be organised in cooperation with other NetApp oriented projects, aiming to disseminate the common notion of NetApps.	June 7-10, 2022 *(planned)*
UBITECH	Webinar	Webinar on initial NetApp platform development outcomes from ICT-41 projects (5G-INDUCE, 5GASP, 5G-IANA common initiative)	~ May 2022 *(planned)*

4.2.3 Collaborations

The partners of the project have participated in several collaboration activities, in order to: 1) promote technical discussions and collaboration with other relevant projects, 2) identify areas where the 5G-INDUCE deliverables could be exploited in cooperation with other relevant projects (IA/RIA) or directly applied to industry applications, 3) engage more industry and academic vendors in the project. The focused projects are EU Horizon 2020 projects, especially those in the same ICT-41 call and those working on 5G and beyond networking technologies and/or applications.

In addition, ITS (Intelligent Transport Systems) Hellas, ERTICO (ITS Europe), SEKEE (Digital Transformation Innovators), ILME (Institute of Logistics & Management in Greece), SEV (Hellenic Federation of Enterprises), HBH (Hellenic Blockchain Hub) are indicative associations that can extend the deliverables of 5G-INDUCE to the industry.

Table 11: Partners' Collaborations.

Partner	Project	Collaborations (ongoing or planned)
UBITECH	EU H2020 5G-IANA	Ongoing collaboration for the definition of NetApp. Investigating extension towards intelligent NetApp toolkit and repository approaches, as well as incorporation of mobility notion in large industrial infrastructures
ININ	EU H2020 5G-IANA EU H2020 Int5Gent	Leveraging part of drone-based NetApp development in all projects mentioned: 5G-INDUCE, 5G-IANA, Int5Gent.

UBI, UOP, UWS	EU H2020 5GASP	Ongoing collaboration to define the notion of "NetApps". This definition will provide the characteristics or properties that a NetApp must, should or may have, in order to follow the ETSI VNF model and the 3GPP definitions and recommendations.
5COMM	EU H2020 5G-IANA	NetApp development, containerisation and testing activities in 5G-IANA will leverage on the work in 5G-INDUCE and vice versa.
5COMM	EU H2020 iNGENIOUS	Fivecomm's cockpit, initially developed under iNGENIOUS umbrella, is being used as the basis for NetApp and integration in 5G-INDUCE use cases.
UWS	EU H2020 6G BRAINS	Leveraging part of 6G BRAINS testbed for 5G INDUCE NetApp development and testing (ongoing)
CNIT	EU H2020 SPIDER	CNIT testbed adopted for cyber range experimentation in SPIDER – Enhancements to benefit both projects.

4.2.4 Standardization Bodies & Industrial Associations

At 5G-INDUCE Standards play a key role. A set of contextual and strategic considerations are reflected below before outlining the mindset and process initially proposed for maximizing impact in Standardization leverage and contribution within the 5G-INDUCE project.

Firstly, standards provide solid, widely adopted and future-proof foundations that the architectural solutions proposed in 5G-INDUCE may rely on, adopt, and even evaluate in the real-world, end-to-end scenarios targeted by the project, on the journey from analysis and design to validation.

Secondly, due to the involvement of very varied skills, disciplines and perspectives (from applied industry cases to 5G and cloud technologies) at 5G-INDUCE consortium, the spectrum of standards considered is very broad, including complementary relevant standards into the course of 5G-INDUCE's research and innovation activities. That scenario allows to open opportunities for leverage and impact of varied standards, for the benefit of the project outcomes and their exploitation, and potentially at large for other industry solutions, in varied manners:

- Assessing the level of support and/or potential gaps of specific adopted standards to the targeted uses cases and needs of the platform solutions created in the project. From this analysis potential contributions to such Standards can be either initiated directly by 5G-INDUCE partners with active delegates in the related Standardization bodies or motivated, with factual information derived from the actual experience in the project shared with key stakeholders and contributors of such standards.
- Spotting whitespaces in between the respective scope and coverage of several Standards adopted by 5G-INDUCE, along the process of designing the overarching solutions to the technology challenges addressed by the project. This fundamental aspect of identifying the missing glue-points between adjacent Standards and devising linkage points to securing their fruitful interwork can only arise from projects like 5G INDUCE. which bring the E2E perspective of multi-technology application scenarios. Given those situations, again, it is possible to directly by 5G-INDUCE partners or, indirectly, through influencing in relevant stakeholders of those Standards, aim at securing that those white spots can be well covered, for the benefit of 5G-INDUCE and, thereafter, for other end-to-end solutions likely to encounter the same challenges.

Thirdly, a broader understanding of the "Standards" reality beyond the world of Standardization bodies, leads to also identifying, considering, leveraging and contributing to three relevant types of ecosystems:

a. Open Source Communities (OSCs), proving an excellent way for rapid adoption, evolution and diffusion of new technological solutions, especially when a critical mass of contributors is reached. 5G-INDUCE will select concrete opportunities for leveraging opensource solutions and in a natural fashion may propose and even contribute to extending those solutions as part of the implementation activities.

b. Knowledge and Practice Communities that even if not devoted to creating new standards or norms, are instrumental for identifying common challenges and homogeneous solutions for multiple projects. This is certainly the case for 5G-PPP in the broad field of 5G research and innovation, actually becoming more and more influential, representing many projects, partners and stakeholders, into standardization bodies' agendas. 5G-INDUCE plans to establish a fluid collaboration into several WGs of 5G-PPP, so that jointly with other projects specific initiatives towards standardization can be triggered.

c. Industry forums. Especially in the case of 5G-INDUCE, with a variety of industry applications in the scope of action, the role of Industry forums, as both concentrators and disseminators of outstanding challenges and industry advancements, is also a source of inputs and a powerful lever for maximizing impact into new Standards related to specific industries.

From all those general considerations, the general approach and lines of action for maximizing adoption of and impact in Standards in the 5G-INDUCE project is as follows:

a. Relevant related Standardization bodies and Open Source communities have been identified

b. The project shall proactively seek opportunities for openly sharing on the context of its mission, technology challenges and potential adoption and evolution of standards, in relevant forums including Workshops facilitated by Standards organizations, Industry events, Communities of Knowledge and Practice, etc.

c. Activities in all technical WPs shall maintain a live and updated inventory of the Standards and Open Source components considered and adopted in their tasks. Even more importantly, activities in all technical WPs shall assess the goodness and potential evolution of the adopted technologies for meeting or exceeding the project goals.

d. As a result of this iterative analysis, whenever deemed necessary, concrete opportunities for evolving such base technologies with new contributions shall be discussed. That process may trigger actions at partner, project and ecosystem levels, opening complementary and reinforcing paths to maximize impact in Standardization, as explained in the following three bullet points.

e. Partners with active participation and influence in Standardization bodies related to the identified opportunities are expected to assess them and take possible actions, to be duly reported to the project for both follow-up and seeking further support of other partners.

f. Groups of partners might decide to join efforts for exploring opportunities of their common interest by coordinate contributions to Standards, which will also be reported and tracked at the project.

g. The project as a whole, and through its representatives, shall always share relevant challenges of potential general applicability to other projects in communities like 5G-PPP, as a way to leverage the collective experience of the community and apply existing solutions or even launching joint multi-project initiatives towards the creation of new useful practices, recommendations or standards.

From the overall project timeline perspective, first of all activities along the first year of the project have naturally focused on points (a) and (b), and more and more knowledge and experience is being gained in ongoing technical work packages related to Standards adoption and assessment in the line of point (c), so that it is expected that along the second year of the project concrete opportunities for achieving impacts in

Standardization are identified, as indicated in point (d), further leading to impactful actions along the lines of points (e), (f) and (g) for the second half of the project.

On the particular account of activities and progress in the first year of the project it is worth mentioning that the consortium has made several presentations to ITU-T Focus Group on Autonomous Networks (FG-AN), which are listed in the Table12:

Table 12: Standardization Activities.

Title	Description (activity type and topics)	Date
Autonomous Network Management for 5G and Beyond Services and Vertical Applications [ITU-AN-I-028]	Participating organizations included a number of standardisation bodies and policy makers such as ITU/TSB, ETSI ZSM, ETSI AFI, NGMN Alliance, TM Forum, IRTF, Ministry of Communications India, Department for Digital, Culture, Media & Sport (DCMS) UK.	2-4 February 2021
Autonomous Network Management for 5G and Beyond Services and Vertical Applications: Case Studies [ITU-AN-I-065]	This contribution presents three case studies for potential Proof-of-Concepts (PoCs) and/or technical recommendations: Self-protection against distributed cyber-attacks, Intelligent network slicing with online learning capabilities and Edge intelligence for vertical network applications	13-16 April 2021
Intelligent Network Applications (NetApps) over 5G and Beyond Networks [ITU-AN-I-156]	Intruder Detection use case and the INDUCE overall architecture.	3-5 November 2021

4.2.5 Seminars / Courses / Lectures

Beyond technological developments, the 5G-INDUCE project is also contributing to spreading knowledge about the project themes and the 5G technologies. The vast expertise brought by both the academic and industrial partners is a valuable resource that the project will exploit to train new generations of researchers through seminars, courses and lectures.

These activities are mainly focused to provide basic and advanced knowledge to students and young researchers, raising their interest and fostering their involvement in research activities within the 5G-INDUCE scope.

Seminars, courses and lectures may be independently organized by each academic partner and are reported both internally and in the list of the dissemination activities in the public website.

Table 13: Seminar Courses and Lectures.

Partner	Title	Description (activity type and topics)	Audience	Place	Date
UWS	RabbitMQ Getting Started	Talk to introduce this popular message broker scheme used in UWS 5G-INDUCE NetApps	Researchers, esp. new PhD students	Paisley, UK	22/10/2021

UWS	5G Mobile Networks	Lecture to introduce 5G networks and applications with reference to 5G-INDUCE	Master students	Paisley, UK	25/10/2021

4.2.6 Demos & Training

Demos are an effective dissemination channel for stakeholders, non-technical people, such as management officers and investors, who are primarily interested in seeing the technology in action, without wasting their time in reading technical stuff and details.

5G-INDUCE will demonstrate its technology both organizing live demos at conferences, workshops and fairs of the sector and realizing offline videos from the live demos, tutorials and how-to to be published in the project public website and the other social media channels.

Table 14: Demos and Training.

Partner	Event Description	Date
CNIT	Initial internal training video on how to use the NAO interface	Planned Q1-Q2/22
OCULAVIS	Initial Remote Support NetApp UC6 video demo	Planned after NetApp onboarding Q1-Q2/22
UWS	Initial corrosion detection NetApp UC5 video demo	Planned after NetApp onboarding Q1/22
UWS	Recorded video presentation of NetApp definition	Planned after D2.1

5 Communication and Dissemination Material

In this section, we include the description of the identified supporting documentation to be used during the 5G-INDUCE project. In addition to the "classic" materials described in more detail hereafter, the project will produce a high number of public deliverables that will be released to the identified target groups and to the general public. This is considered of great importance for the project itself and it fully complies with Horizon 2020 guidance related to the openness of project results.

5.1 Communication Material

Various communication material is and will be realized and spread during the project lifetime, targeting specific audiences and with different timeline. They must be designed with consistency and coherence, maintaining a common visual appearance while adapting the content to the targeted audience and the specific channel used. The creation of an engaging and compelling project identity is the underpinning pillar of the whole communication strategy and must be tightly reflected in all published documents.

5.1.1 Conferences Project's Logo

The project identity aims to give immediate and mnemonic insight of the project. It is mainly concerned with the visual appearance of all the communication and dissemination material, which is the first element that leaps out when approaching the project.

The first aspect for building project identity is, of course, the logo. The official 5G-INDUCE logo is depicted in Figure 4, on the left. In addition, square versions of the logo have been produced both for white and dark background. The squared versions are intended to be used in the headers/footers of documents and presentations and in situations where a more compact logo is required.

Figure 4: 5G-INDUCE Logo.

The second aspect of the project identity is visual appearance, meaning that congruent document templates are to be used for every communication and dissemination activity. The purpose is to give the feel of a professional, concrete, and well-organized project, fostering the audience to dig deeper (e.g., by reading more content, by joining and actively following the socials, by downloading the software, etc.).

The visual appearance shall make use of similar colours as used in the project logo. It has been already defined for official project deliverables (i.e., the style in use for this document) and will be similar for other kinds of documents (project website, leaflets, banners, and posters).

Finally, the layout and content of all communication material shall be able to capture the attention of the reader and instil key concepts and messages at first glance, stimulate further reading, and provide quick and intuitive access to all project's documentation.

5.1.2 Poster

The creation of posters will be used, for example, to visualize the use cases within the project dissemination. The background of using posters as a documentation tool lays on the fact that posters create an accessible

way of attracting attention through a balance of graphic and textual content. The posters contain graphic content (figures, screenshots) such as text descriptions to describe and visualize the use case itself, the used network application(s) (NetApps), the planned interfaces to the 5G network and interactions with the experimentation facilities (ExFas) environment (e.g., machinery, equipment and personas). The use case posters are structured consistently so that parts (figures and/or text) of their content can be used as well for the creation of further documentation (such as presentations, as input for creating videos, flyers and publications).

5.1.3 Presentations

The 5G-INDUCE presentations are the documents to be used by the project partners to provide an overview of the project scope, objectives and expected outcomes in various events (e.g., workshops, conferences, etc.). As an example, the 5G-INDUCE's general presentation, which aims to inform third parties concerning the project's activities, provides the following information:

- What 5G-INDUCE is;
- Partners;
- Objectives;
- General Architecture;
- Use cases;
- Contact info.

An overview of this presentation is shown in Figure 5.

Figure 5: 5G-INDUCE presentation overview.

5.1.4 Videos

5G-INDUCE partners plan to create videos to visualize the use cases in realistic scenarios in a later stage of the project. These videos will be released by 2022 and may include:

- Screen recordings during the use of a NetApp on different devices.
- Technical text descriptions and animations (e.g., to visualize architecture and interfaces).
- Video recording of actors executing workflows (e.g., shop floor worker assembling, drone pilot inspecting, network operator monitoring, etc.) or hardware (e.g. machinery, computer, drone, AVG, etc.).
- Dashboards of network architecture (5G orchestration platform).
- Company logos.

The main goal of the use case videos will be to promote the project and include its results such as the validation, verification and evaluation of the NetApp functionality over the integrated infrastructure in the external facilities.

The videos can be well structured so that parts of them may be used as well for the website, video descriptions in presentations, for social media posts, etc.

5.1.5 Brochures/Flyers

One of the most significant parts of the communication and dissemination activities of the 5G-INDUCE project is the preparation and distribution of instructive brochures. Brochures will comprise essential information regarding the 5G-INDUCE project, including the project's name, logo, core activities, etc., with their primary role to raise awareness to the relevant stakeholders and achieve increased involvement during the communication and dissemination activities.

Design of the Brochure

According to the Cambridge Dictionary, a brochure is "a type of small magazine that contains pictures and information on a product or a company". Due to the current situation of the pandemic, which heavily affects communication and dissemination activities on a worldwide level, the 5G-INDUCE project makes use of a 2-page digital brochure. The latter has a design that facilitates the communication activities of the project during these severe and restrictive circumstances. The official brochure can be found at Annex 3.

The digital design of the brochure was based on the colour palette, as it was indicated, by the project's official logo. Therefore, the main colours comprising the brochure are: the #669900 Christi green, the #000000 black, and the #FFFFFF white, as well as different shades of them. A first draft of the project's brochure is depicted in Annex 3.

Versions of the Brochure

More specifically, the aim of this brochure is to provide a general overview of the project and its main activities to the relevant stakeholders. This initial version of the brochure is based on the information provided by the project's GA, since the project and its use case scenarios are still in an early stage and would be more general.

In the later stages of the project, more specialized versions of the brochures will be released, which will be updated according to the individual dissemination plans of each partner as well as the progress and outcomes of each use case scenario. Any upcoming communication or dissemination events, held by the Consortium partners, will determine the adjustment period of each version of the brochure, where every necessary update of the content of the brochure needs to take place. In the same way, every potential amendment to the crucial components of the different use case scenarios, occurring according to the critical judgment of the partners during the implementation of the project, will result in updating the brochures accordingly.

5.2 Dissemination Material

Dissemination material provides more technical insights into the project, adding concreteness to the general concepts spread by the communication actions. The purpose is to share the main achievements and results, in accordance with the openness policies in Horizon 2020, up to the limit this disclosure does not preclude commercial exploitation. The general principle in realizing the dissemination material is to give enough information to demonstrate the potentiality of the proposed solutions paving the way for the next steps towards the fruitful exploitation of the project outcomes.

5.2.1 Scientific Publications

5G INDUCE plans to disseminate the R&D results in a range of selected well-established international journals and magazines, including but not limited to the following indicative targets:

- IEEE Transactions on Services Computing, e.g., on NetApp orchestration, etc.
- IEEE Transactions on Network and Service Management, e.g., on NetApp onboarding, etc.
- IEEE Transactions on Broadcasting, e.g., on video-related use cases, etc.
- IEEE Communications Magazines, e.g., on overall project vision and development.
- IEEE Internet of Things Journal, e.g., on IoT-related use cases, etc.
- International Journal of Remote Sensing, e.g., on AGV/UAV-based use cases, etc.
- Journal of Field Robotics, e.g., on AGV-based use cases, etc.
- Journal of Real-Time Image Processing, e.g., on AGV/UAV-based use cases, etc.
- Neural Computing and Applications, e.g., on AI-enabled use cases.

Moreover, 5G INDUCE is also interested to organise/co-organise special issues related to the theme of the project in such international journals and magazines.

All the scientific documentation will be published according to open-access principles. Table 15 presents the first papers that the consortium has published or submitted for review. Some of them have been presented in international conferences of EUCNC and IEEE.

Table 15: Papers for presenting 5G-INDUCE's work.

Authors	Publication Details
I. Martinez-Alpiste, G. Golcarenarenji, Q. Wang, J. Alcaraz Calero	Article in Journal *"Smartphone-based real-time object recognition architecture for portable and constrained systems"* **Journal of Real-Time Image Processing**, Springer, Germany, 2021
J. F. Pajo, G. Kousiouris, D. Kyriazis, R. Bruschi, F. Davoli	Publication in Conference proceedings / Workshop *"Evaluating Urban Network Activity Hotspots through Granular Cluster Analysis of Spatio-Temporal Data"* **17th International Conference on Network and Service Management (CNSM 2021)**, Izmir, Turkey, Oct. 2021, IFIP, Online, 2021 *(Virtual event)*
R. Bolla, R. Bruschi, K, Burow, F. Davoli, Z. Ghrairi, P. Gouvas, C. Lombardo, J. F. Pajo, A. Zafeiropoulos	Publication in Conference proceedings / Workshop *"From cloud-native to 5G-ready vertical applications: An industry 4.0 use case"* **Proc. IEEE Intern. Conf. on High Performance Switching and Routing (HPSR)**, Paris, France, June 2021, IEEE, USA, 2021 *(Virtual event)*

Authors	Publication Details
J. F. Pajo, G. Kousiouris, D. Kyriazis, R. Bruschi, F. Davoli	Article in Journal *"ANNs going beyond time series forecasting: An urban network perspective"* **IEEE Communications Magazine**, vol. 59, no. 5, May 2021, p. 88-94, IEEE, USA, 2021

5.2.2 White Papers

The goal of white papers is to promote 5G-INDUCE concepts, platforms and solutions and to illustrate how these solutions can address the different challenges in main application cases, hence focusing on commercial exploitation.

The Consortium is likely to release a limited number of official white papers, the majority of which are expected to be joint work under the 5G PPP initiative. Nevertheless, each partner is free and encouraged to give visibility to its own activities in technical white papers.

The following is the ongoing white paper that the consortium will release, and it will be available in the 5G-INDUCE website, together with the direct links for downloading.

Table 16: White paper for presenting 5G-INDUCE work.

Partner	Title of White Paper	Purpose	Link	Date
UBI, UWS, UOP	From VNF to API: Opening up 5G and beyond networks to verticals 5G-PPP projects analysis	Vision and ongoing efforts regarding NetApps in relevant 5G-PPP projects	5G-PPP Software Networking WG BSCW repository	Ongoing *(expected in 2022)*

5.2.3 Project's Deliverables

Public project deliverables represent the main contractual obligation for dissemination. They will describe the 5G-INDUCE concept, approach, architectures, technologies, and integrated solutions. They will focus on the overall platform and its integration, while referring to additional materials for technical details of specific components. Public deliverables will be published on the project public website.

6 Clustering and 5G PPP Interaction

6.1 Responsibilities & Target Activities

5G-INDUCE is aware of the contractual commitment of the 5G PPP, as well as the organizational structure as described in the 5G PPP contract and its technical annex. In particular the project acknowledges the roles and commitments of the European Commission, the PPP partnership board, the Networld2020 (now NetworldEurope) ETP, the 5G Infrastructure Association, the 5G for Europe: An Action Plan (COM(2016)588 and Staff Working Document - SWD(2016)306) and commits to constructive interactions with these bodies.

5G-INDUCE also commits to work with its peer 5G PPP projects as required under the complementary grant agreement clause 41.4 of the 5G PPP grant agreement. With respect to resource planning, the Consortium agrees to allocate sufficient resources to contribute to 5G PPP and actively participate in the Steering Board, the Technology Board, the Working Groups, and the representation and dissemination activities, as recommended by 5G PPP.

Moreover, under the Digital Single Market strategy, the Communication "Digitising European Industry" sets out its objective to ensure that "any industry in Europe, big or small, wherever situated and in any sector can fully benefit from digital innovations to upgrade its products, improve its processes, and adapt its business models to the digital change". 5G-INDUCE aspires at safeguarding and boosting the creation of a Digital Single Market that has been identified as a key priority for Europe, with the objective of developing an inclusive digital economy and society across Europe, to the benefit of citizens, consumers, and businesses. 5G-INDUCE will contribute to all three pillars, namely to the Access pillar by lowering the barrier for the development and deployment of Industry 4.0 technologies driven by state-of-the-art ICT technologies (e.g., 5G, IoT, and Cloud), to the "Environment" pillar by creating an environment of productivity, collaboration, and trust for organisations working in the 5G and vertical industries sector, and finally to the "Economy & Society" pillar though offering a solution that will lead to the development of new and viable business models that will digitally transform the industrial sector, allowing also the telecom and software industry to grow.

6.2 5G PPP Interactions and Activities

5G-INDUCE plans to have an active role in the activities of 5G PPP as these are coordinated through the Steering Board, the Technical Board and the various Work Groups. Our goal is to use 5G PPP as a vehicle for the communication of the project activities among the 5G projects' community, thus raising awareness on the project's innovative solutions, as well as promoting active collaborations with other projects.

With the active participation in 5G PPP we foresee the promotion of the following actions:

- Identification and potential attraction of NetApp solutions from related project activities to be adapted to the offered 5G-INDUCE ExFas.
- Exchange of important interfacing solutions and practical deployment aspects with other projects in particular under the ICT-41 call.
- Increases opportunities for dissemination of results with the use of the 5G PPP channels.
- Co-organization of events (e.g., conference workshops and webinars).
- Participation in publication action with extremely high visibility to the community through the planned white papers.

Information related to the project goals has already been communicated to 5G PPP TB on time and includes:

- The project main concept presentation in the "European 5G PPP Annual Journal 2021".
- The basic project information and the contact details for the "5G PPP Phase 3 Project Brochure".

- Contributions to the 5G PPP Demos and Trials Excel which summarizes the planned testbeds (ExFas in case of 5G-INDUCE) and the related use case topics.
- Presentation of the project targeted architecture and design concerns in the 5G PPP Arch WG.

Besides the participation of the project coordinator in the 5G PPP SB meetings and of the Technical Coordinator in the 5G PPP TB meetings, members of the project Consortium have been registered and attend the activities of the following work groups

- 5G Architecture WG – Dimitris Klonidis (UBITECH) and Christina Lessi (OTE).
- Vision and Societal Challenges WG – Ioannis Tomkos (UOP).
- Software Networks WG – Qi Wang and Jose Alcaraz Calero (UWS), Thanos Xirofotos (UBITECH).
  The project has raised the attention of the potential interest of NetApps in software networking topics, and have made two presentations in this WG promoting 5G-INDUCE approaches:
    - Qi Wang, Jose Alcaraz-Calero, Thanos Xirofotos, "5G-INDUCE NetApp Orchestration introduction", 5G-PPP Software Networks WG Virtual Meeting on 7th July 2021.
    - Qi Wang, Jose Alcaraz-Calero, Dimitrios Klonidis, Thanos Xirofotos, "5G-INDUCE Project Overview", 5G-PPP Software Networks WG Virtual Meeting on 21st July 2021.
  5G INDUCE is contributing to the ongoing white paper on NetApps, organised by this WG.
- SME WG – Dimitris Klonidis (UBITECH).
- Security WG – Athanasios Giannetsos (UBITECH).

It is noted that each WG supports the participation of two persons and therefore the Consortium plans to update the above-mentioned participants with additional names from the Consortium.

The currently active dissemination plans from the participation in the 5G PPP WGs include:

- A small contribution to the current version of the Architecture white paper on the offered application orchestration features; (a larger contribution is expected for the next version on the topic of NetApps management architectural solutions).
- A significant contribution for the planned white paper on 5G for the Industry 4.0 sector.
- Co-Editing of the "European Vision for the 6G Network Ecosystem" white paper.

Table 17: Participation in 5G-PPP.

Partner	Event	Date
UBITECH, UWS	5G-PPP Software Networks WG Virtual Meeting Invited Talk 5G-INDUCE Project Overview	July 21,2021 Online
UBITECH, UWS	5G-PPP Software Networks WG Virtual Meeting Invited Talk 5G INDUCE NetApp Orchestration Introduction	July 7, 2021 Online
UBITECH	5G-PPP webinar on ICT-41 projects Presentation 5G-INDUCE: Project Overview	February 5, 2021 Online

7 Evaluation and Reporting

7.1 Key Performance Indicators

In order to evaluate the impact of the project's dissemination and communication activities, the Consortium has set specific metrics per dissemination and communication activity, in order to effectively monitor its achievements. The effectiveness of the dissemination, as well as of the communication, activities will be assessed during the life of the project and the results of these assessments will be presented in each reporting period.

Table 18: Measurement of actual KPI's.

Activity	Expected Impact	Related KPIs	Target	Actual Activity
D1	Increased collaboration with other relevant initiatives; Synergies establishment for joint research, information exchange and dissemination; Increased awareness.	Number of workshops Number of demos	2 3	- -
D2	Ideas' gathering and knowledge exchange with relevant communities and initiatives; Information about the latest technologies/advancements; Liaisons with other initiatives; Increased awareness.	Number of attended events Number of events with project's presentation Number of project's demo booths	>20 >15 4	15 15 -
D3	Validation of project's concept, findings and advancements; Promotion of results to scientific communities; Ideas' gathering and knowledge exchange with communities and initiatives.	Number of conference papers Number of journal papers Number of articles in corporate magazines	>20 >8 >8	2 2 N/A
D4	Communication of project news, events & results; Validation of project's concept, findings and advancements; Ideas' gathering and knowledge exchange; Attraction of potential clients and adopters; Increased awareness.	Number of industry contact points Number of active industry stakeholders Number of information webinars	>100 >10 >2	N/A N/A N/A
D5	Knowledge exchange; Mutual validation of results; Joint dissemination activities exploiting synergies; Attraction of potential future partners for research collaborations.	Number of synergies with projects Number of joint activities	>15 >5	7 -
D6	Communication of project news, events & results; Validation of project's concept, findings and advancements; Ideas' gathering and knowledge exchange; Increased awareness.	Number of internal partners' events Number of social media posts/month Number of links to the project's website	>8 >4 >10	2 3 ~60
D7	Communication of project results; Validation of project's concept, findings and advancements; Increased awareness.	Number of working groups Number of project's presentations in standardization meetings	>3 >2	5 3
C1	Main online information point; Communication of project news, events & results; Liaisons with other initiatives, projects through links; Increased awareness.	Number of unique visitors Average duration of visits Number of page views	>5000 ~2min >10000	~3000 N/A ~8000

Activity	Expected Impact	Related KPIs	Target	Actual Activity
C2	Increasing visibility to stakeholders active in social media; Attainment of interest of stakeholders; Viral marketing by followers' "word of mouth" through the followers; Direct communication mechanism with followers.	Number of accumulative followers Number of accumulative posts Number of interactions	>750 >1000 >250	147 36 190
C3	Communication of main project's concepts and advancements in an easily understandable manner.	Number of posts Number of interactions	>50 >100	12 74
C4	Communication of project news, events, results; Increased awareness.	Number of press releases Active responses to social media posts/week	>8 up to 50	12 -
C5	Unique branding and visual identity of the project; Provision of instant information about the project; Creating a unified experience for the audiences targeted; Improved communication of results and information provision during events.	Number of project's factsheets/brochures and banners Number of Newsletters (after M12) Number of videos Number of blog posts in EC	>8 >6 >5 >6	1 - - -

7.2   Key Analysing Results

Communication measurements results have to be analysed and evaluated with respect to the overall communication plan KPIs.

In order to better visualize and evaluate the effectiveness of the planned communication efforts, a number of diagrams will be produced highlighting the evolution of a selective set of KPIs over a reporting period and including other important metrics. The aim is to provide the means of evaluating performances and also the other operation specifics that are crucial to drive decisions regarding communication activities.

A high number of the 5G-INDUCE website visits along with the download of on-line materials will assure the effectiveness of the website and the quality of on-line materials; otherwise, corrective actions will be triggered towards increasing outreach and/or improving quality.

The project will also focus on the balance of international and national activities, aiming at maximizing the outreach of the 5G-INDUCE results, while ensuring the creation of an exploitation potential in the countries involved in the project and at an international level, too.

7.3   Reporting

Reports are a very important part of the 5G-INDUCE dissemination and communication plan and cover two important aspects.

Firstly, the reports are used to update the Consortium members and the Project Officer about the development of the project dissemination and communication activities.

Secondly, the reports are crucial to assess the effectiveness of the 5G-INDUCE dissemination and communication plan based on specific quantitative metrics and KPIs, as defined in Section 7.1.

Therefore, these reports include all dissemination and communication activities carried out during a reporting period including main results, corrective actions for improvements and updates.

A possible outline of the project dissemination and communication report is illustrated below:

- List of dissemination activities (scientific publications, workshops and conferences, etc.).
- List of communication activities (LinkedIn, Twitter, YouTube channel, website, online discussions, press releases, etc.).
- Description of dissemination and communication activities and main results.
- Analytics and statistics for communication and dissemination activities conducted during the reporting period.
- Dissemination, communication and standardization plan performance assessment.
- Dissemination, communication and standardization plan updates and corrective actions.
- Conclusions.

During the project lifetime two intermediate dissemination and communication activities reports will be delivered (M12 – the current document – and M24), and a final report will be produced at the end of the project (M36); such documents will also report on the standardization activities carried out by the project.

The primary PoC for the production of these reports is Prof. Ioannis Tomkos with contributions provided by all partners, which shall generate short reports covering the aforementioned project periods by using the reporting templates provided by the PoC.

All project partners are also responsible to continuously report their dissemination and communication activities by means of the reporting facilities included in the private area of the project website. Thanks to these tools, the partners will be able to constantly monitor the dissemination and communication performances and keep each other aligned on the most recent dissemination and communication activities carried out, spreading the knowledge about the outcomes in progress and stimulating the intra-consortium cross-fertilization.

8 Conclusions

The consortium had set in D7.1 the communication and dissemination plan, whose implementation has been successfully supervised by the WP7. The current document records in details the communication and dissemination activities of each partner individually, that took place from M1 to M12 and they are compared to the expected KPI's that are valid for the whole lifetime of the project. Some future activities that have begun to run already, but are not yet completed are also included. Additionally, the 5G-INDUCE activities related to participation and contribution to 5G PPP Working Groups and Teams were presented, as well as the liaison activities with projects of specific interest.

In order to raise the awareness of various target groups that can benefit from the advancement of the TRL technology level that NetApps bring, WP7 has created messages that explain in detail each use case and the way that the NetApps can contribute in the operations' circle of industries, telecommunication operators and SMEs that utilize 5G for augmenting their efficiency or as part of their services. The aspiration for these messages is to evolve in a complete business value analysis, which will lead to the adoption of NetApps by a broad ecosystem of public and private stakeholders.

For scaling up the strategic outcomes that will lead to the exploitation of NetApps, except for achieving economic results, it is necessary to reach institutional recognition from the lawmakers, standardization organizations and the academic community. In this way, there will be long term social impacts like the protection of the environment, the ethical ICT in manufacturing, the insurance of workers and trust of people to ICT technologies. For that purpose, the consortium has been engaged in standardization activities and in the writing of scientific and white papers.

Annex 1: Website's Public Area
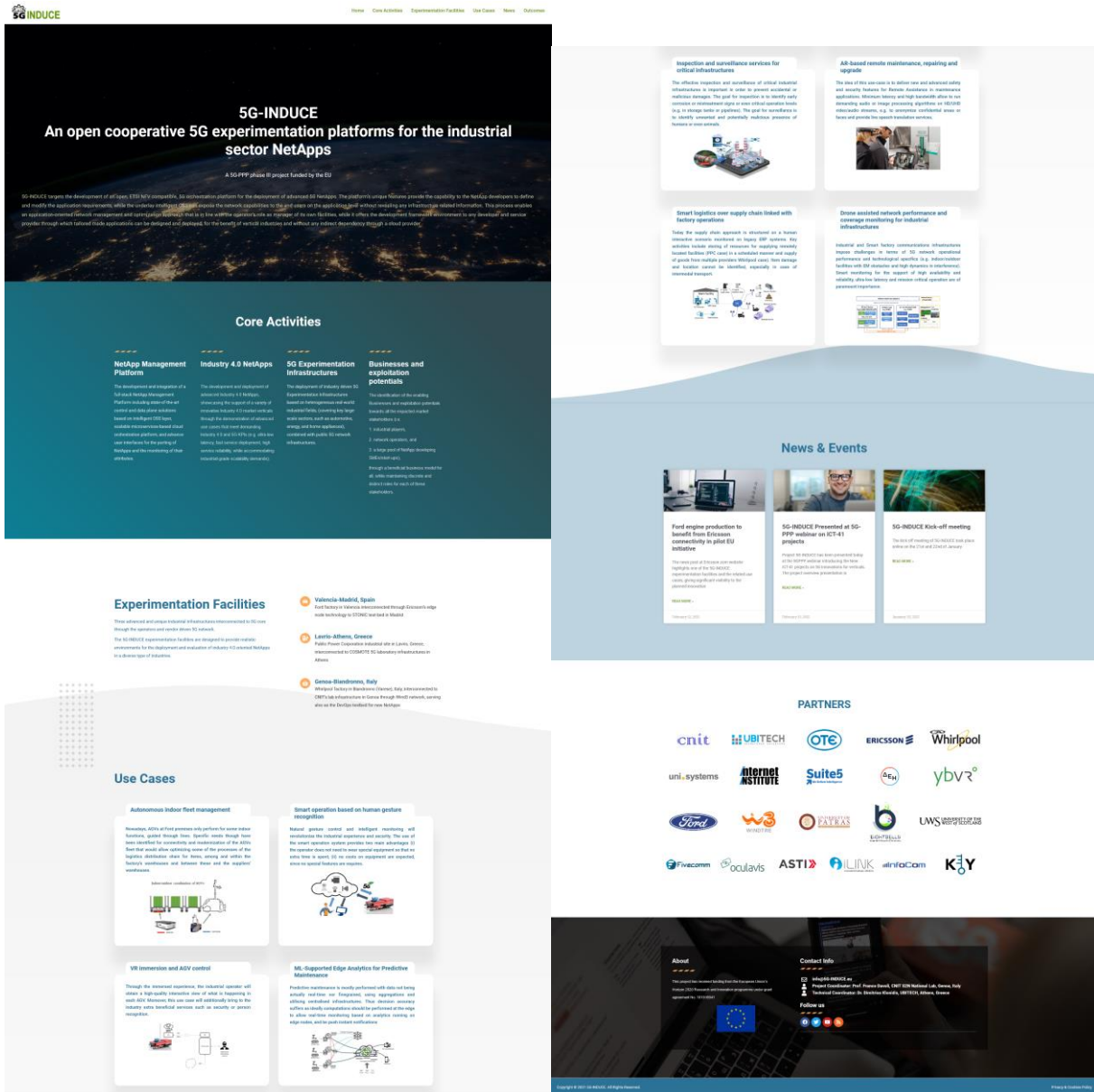
Figure 6: Screenshot of website's public area.

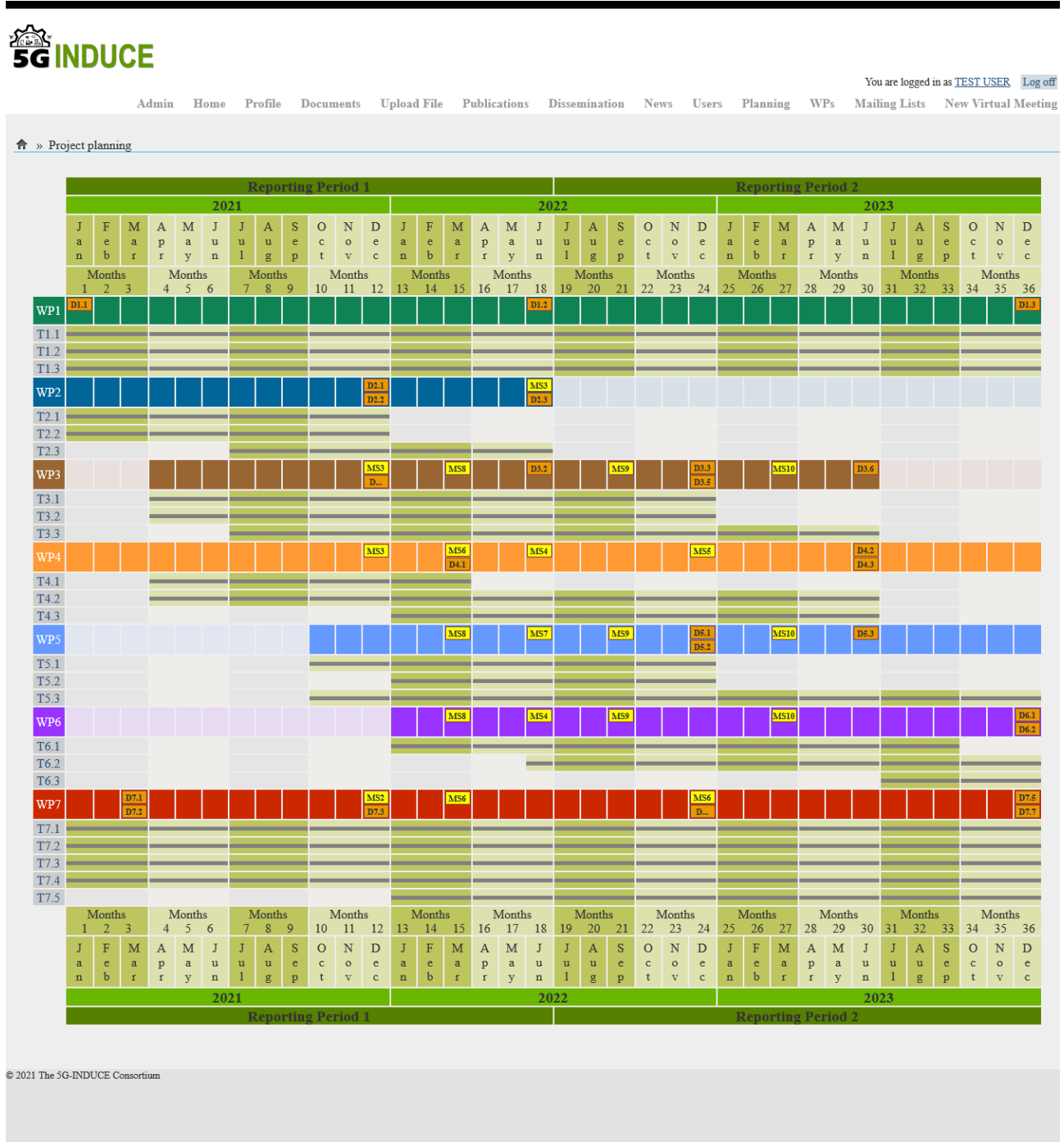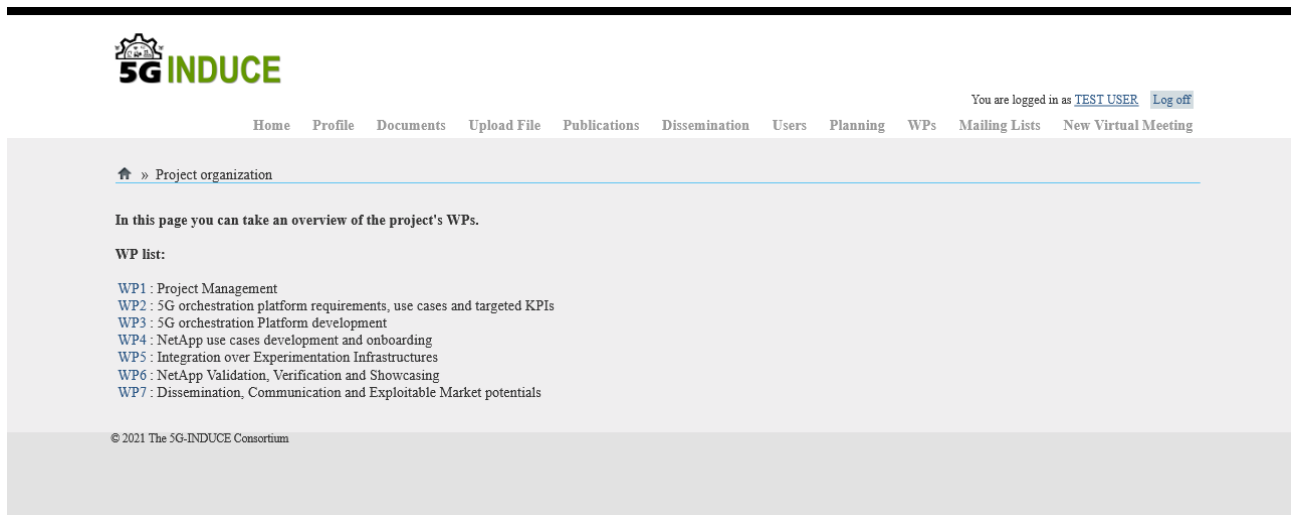# Annex 2: Website's Private Area
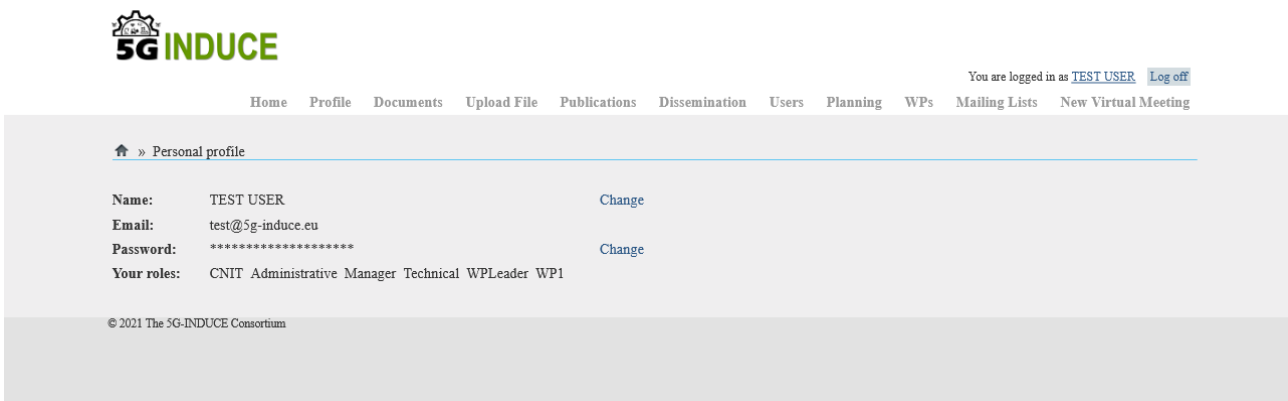
Figure 7: Screenshot of website's private area: Profile.
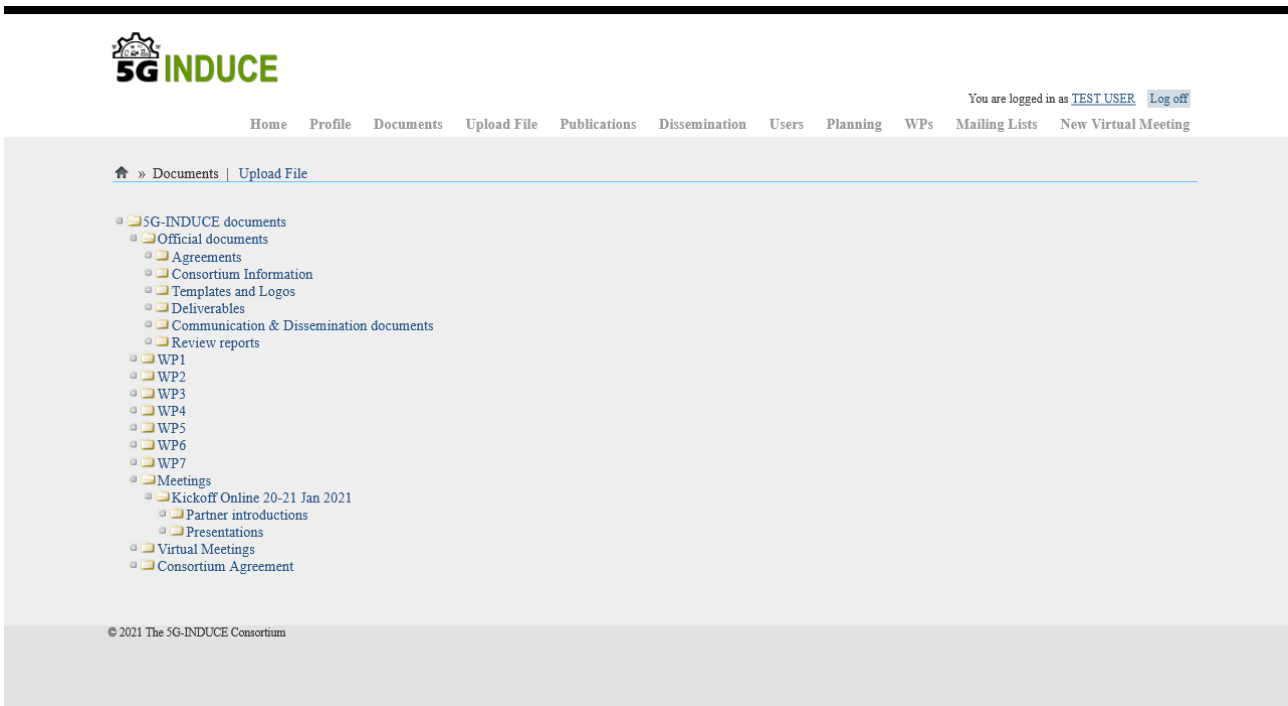
Figure 8: Screenshot of website's private area: Documents.
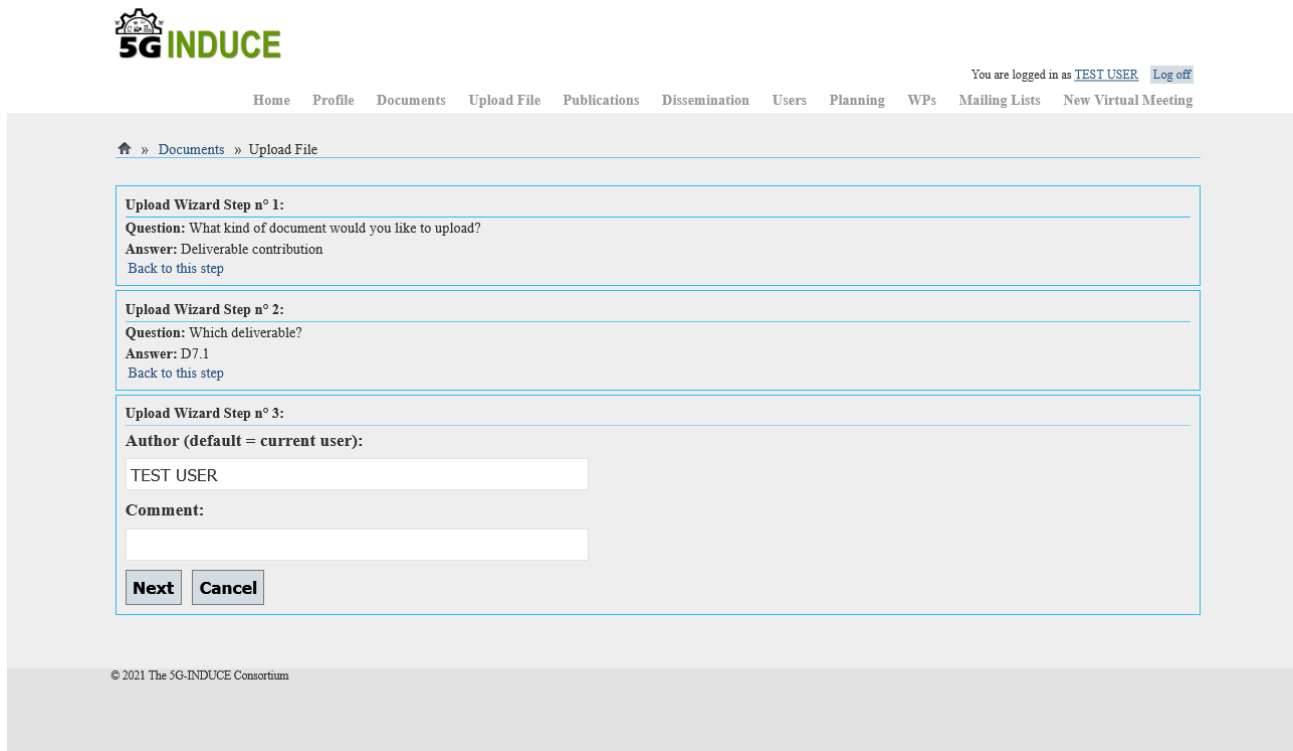
Figure 9: Screenshot of website's private area: Upload File.
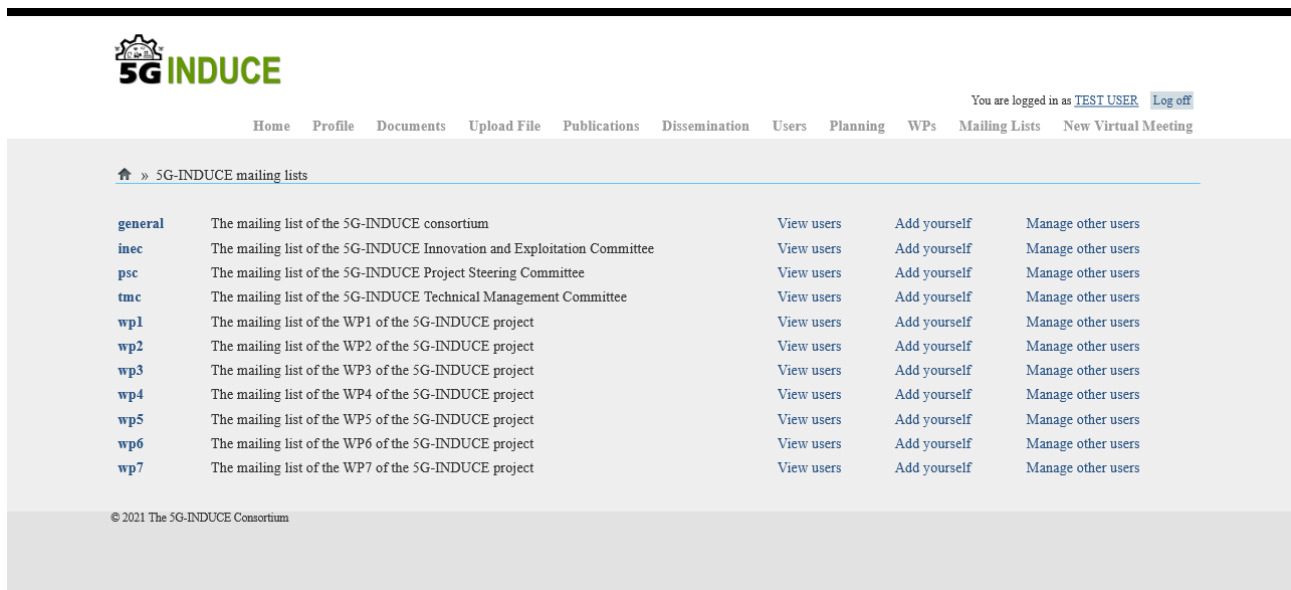
Figure 10: Screenshot of website's private area: Publications.

Figure 11: Screenshot of website's private area: Dissemination.
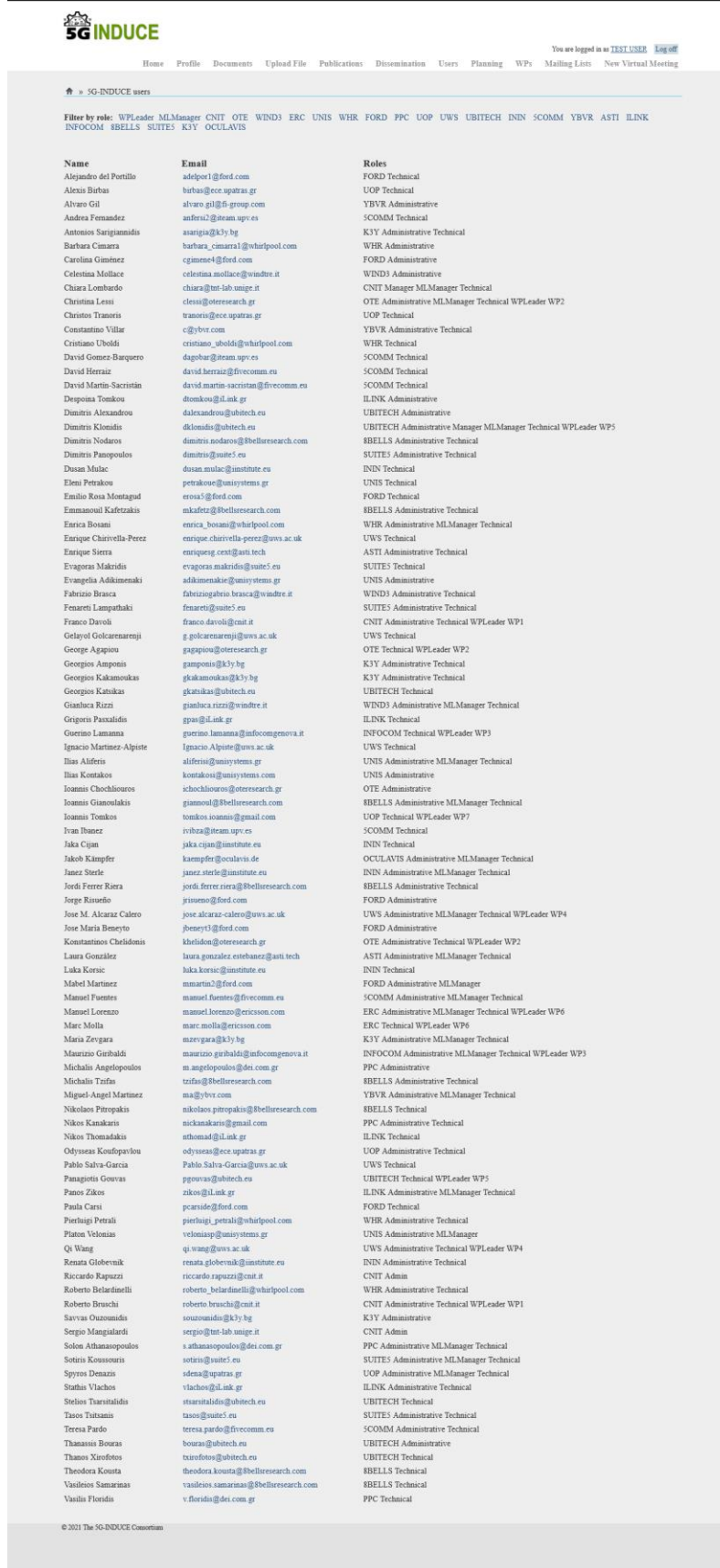
Figure 12: Screenshot of website's private area: News.

Figure 13: Screenshot of website's private area: Users.

Figure 14: Screenshot of website's private area: Planning.

Figure 15: Screenshot of website's private area: WPs.

Figure 16: Screenshot of website's private area: Mailing Lists.
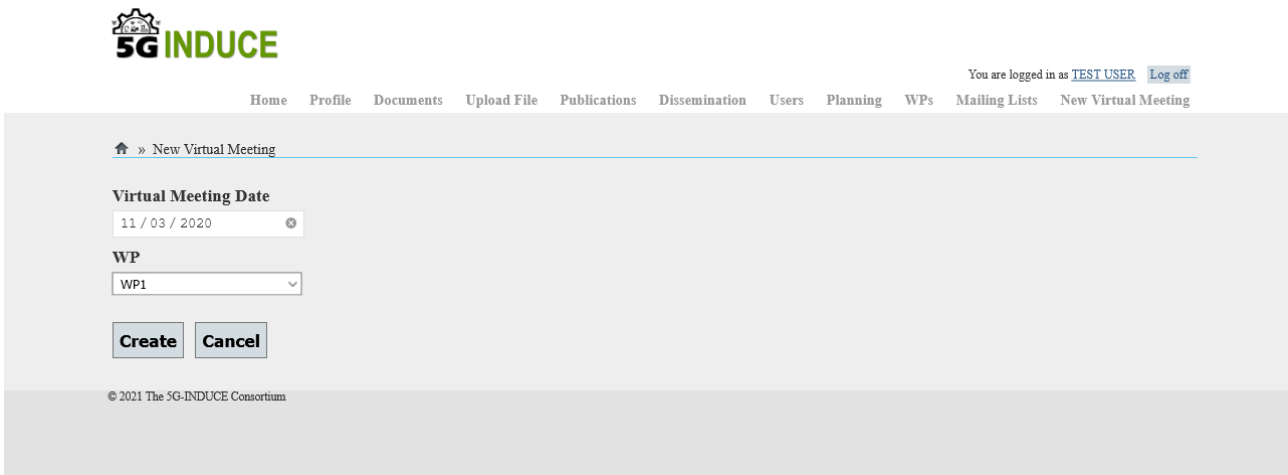
Figure 17: Screenshot of website's private area: New Virtual Meeting.

Annex 3: Brochure

Figure 18: Front page of 5G-INDUCE Brochure.

USE CASES

1. AUTONOMOUS INDOOR FLEET MANAGEMENT

Nowadays, AGVs at Ford premises only perform for some indoor functions, guided through lines. Specific needs though have been identified for connectivity and modernization of the AGVs fleet that would allow optimizing some of the processes of the logistics distribution chain for items, among and within the factory's warehouses and between these and the suppliers' warehouses.

2. SMART OPERATION BASED ON HUMAN GESTURE RECOGNITION

Natural gesture control and intelligent monitoring will revolutionize the industrial experience and security. The use of the smart operation system provides two main advantages (i) the operator does not need to wear special equipment so that no extra time is spent; (ii) no costs on equipment are expected, since no special features are requires.

3. VR IMMERSION AND AGV CONTROL

Through the immersed experience, the industrial operator will obtain a high-quality interactive view of what is happening in each AGV. Moreover, this use case will additionally bring to the industry extra beneficial services such as security or person recognition.

4. ML-SUPPORTED EDGE ANALYTICS FOR PREDICTIVE MAINTENANCE

Predictive maintenance is mostly performed with data not being actually real-time nor finegrained, using aggregations and utilising centralised infrastructures. Thus decision accuracy suffers as ideally computations should be performed at the edge to allow real-time monitoring based on analytics running on edge nodes, and be push instant notifications.

5. INSPECTION AND SURVEILLANCE SERVICES FOR CRITICAL INFRASTRUCTURES

The effective inspection and surveillance of critical industrial infrastructures is important in order to prevent accidental or malicious damages. The goal for inspection is to identify early corrosion or mistreatment signs or even critical operation levels (e.g. in storage tanks or pipelines). The goal for surveillance is to identify unwanted and potentially malicious presence of humans or even animals.

6. AR-BASED REMOTE MAINTENANCE, REPAIRING AND UPGRADE

The idea of this use-case is to deliver new and advanced safety and security features for Remote Assistance in maintenance applications. Minimum latency and high bandwidth allow to run demanding audio or image processing algorithms on HD/UHD video/audio streams, e.g. to anonymize confidential areas or faces and provide live speech translation services.

7. SMART LOGISTICS OVER SUPPLY CHAIN LINKED WITH FACTORY OPERATIONS

Today the supply chain approach is structured on a human interactive scenario monitored on legacy ERP systems. Key activities include storing of resources for supplying remotely located facilities (PPC case) in a scheduled manner and supply of goods from multiple providers Whirlpool case). Item damage and location cannot be identified, especially in case of intermodal transport.

8. DRONE ASSISTED NETWORK PERFORMANCE AND COVERAGE MONITORING FOR INDUSTRIAL INFRASTRUCTURES

Industrial and Smart factory communications infrastructures impose challenges in terms of 5G network operational performance and technological specifics (e.g. indoor/outdoor facilities with EM obstacles and high dynamics in interference). Smart monitoring for the support of high availability and reliability, ultra-low latency and mission critical operation are of paramount importance.

Figure 19: Back page of 5G-INDUCE Brochure.