H2020 5Growth Project
Grant No. 856709

D5.6: Technical and Exploitation Workshops

Abstract

As part of the Communication, Dissemination, and Exploitation Plan (CoDEP) of the project, one of the dissemination goals of 5Growth is to organize at least one workshop on the technical contents of the project during the second year and an internal Exploitation workshop at the end of the project intended to maximize and find new ways of exploiting the results produced by the project. This document briefly reports the activites related to both types of workshops.

Document properties

Document number	D5.6
Document title	Technical and Exploitation Workshops
Document responsible	Paola Iovanna (TEI)
Document editor	Paola Iovanna (TEI)
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Target dissemination level	Public
Status of the document	Final
Version	1.0
Delivery date	November 30, 2021
Actual delivery date	November 30, 2021

Production properties

Reviewers	Josep Mangues (CTTC), Carlos J. Bernardos (UC3M)

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This document has been produced in the context of the 5Growth Project. The research leading to these results has received funding from the European Community's H2020 Programme under grant agreement N° H2020-856709.

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List of Acronyms

5Gr – 5Growth

BASS – Business Automation Support Stratum

CapEx – Capital Expenditure

DASS – Data Analytics Support Stratum

DEEP – 5G-DIVE Elastic Edge Platform

IESS – Intelligence Engine Support Stratum

MNO – Mobile Network Operator

NFV – Netowrk Function Virtualization

SME – Small Medium Enterprise

UC – Use case

1. Introduction

As part of the project Communication, Dissemination, and Exploitation Plan (CoDEP) [1], one of the dissemination goals of 5Growth is to organize at least one workshop on the technical contents of the project during the second year of 5Growth and an internal Exploitation workshop at the end of the project intended to maximize exploitation and to find new ways of exploiting the results produced by the project.

As exploitation activity, both an external workshop and internal meetings/events have been organized.

A **external workshop** [2] has been organized in collaboration with 5G-DIVE [3] project to allow open discussion on relevant exploitation aspects related to the outputs of the projects.

The main take-aways from the field trials are that new actors and new roles should be considered in addition to the traditional services, when vertical services are provided. For each pilot, 5Growth has identified the involved stakeholders and their mutual relations in the value chain.

De facto, the concrete experience matured in the pilots' deployments allowed to learn what are the relevant aspects and main criticalities to be considered in the exploitation of the project's outcomes.

As for **internal meetings and events**, specific internal discussions (originated by the presentation of the project results and achievements) have been carried out as direct results from the projects. Most of such internal event/meeting assumed a confidential aspect because they deal with quite sensitive information like, for example, the opportunity to exploit specific solutions in products or services related to the partner's portfolios. In other cases, starting from project experience, bilateral collaborations among partners have been set to define directions and developments with a common business perspective.

Furthermore, as part of the regular dissemination activities of the project, some technical workshops were (co-)organized in addition to those already reported in [4].

This document describes the content of all these events with particular emphasis on the exploitation-related activities.

2. External exploitation workshop - 5Growth - 5G-DIVE: Experiences from field trial about vertical industry

Driven by cellular technology, a rapid transformation of all industries is underway, with countless innovative solutions reshaping every sector for the better. Any sector can harness cellular to solve ongoing challenges and boost their agility, efficiency, safety, and profitability.

In this context, business and technical aspects are strictly related as the new 5G paradigm has the merit not only to allow a simple "cable replacement" but also to unlock important use cases (UC) which were not possible with legacy technologies.

FIGURE 1: AGENDA AND MS TEAMS WELCOME SESSION

Several actors or "stakeholders" are involved in this revolution: Verticals, Mobile Network Operators (MNO), Small and Medium Enterprises (SME), and vendors of communication systems.

5Growth and 5G-DIVE explored the concrete applicability of 5G technologies to real-world use-cases across various vertical sectors, by the realization of advanced 5G validation trials aimed at proving the technical merits and business value propositions of 5G technologies.

This workshop aims at presenting the key aspects inferred by the project's outputs from several perspectives: vertical operators, vendors, SME, with scope to highlight the opportunities, challenges, and critical aspects and to perform concrete exploitation.

The **Innovation Manager** of 5Growth, Paola Iovanna (Ericsson) has chaired the **Welcome and introduction** section of the workshop. Then, three sessions have been organized with the involvement of Verticals, MNOs, SMEs:

- Session 1: **Experience from Verticals** (Chair: Carlos J. Bernardos, UC3M).
- Session 2: **Experience from Operators & Vendors** (Chair: Josep Mangues-Bafalluy, CTTC).
- Session 3: **Experience from SMEs** (Chair: Antonio de la Oliva, UC3M).

The concluding panel with an open discussion has been chaired by Bengt Ahlgren (RISE).

The following sections reports a summary of the three exploitation-oriented sessions.

2.1. Session 1 - Experience from Verticals

The session, chaired by Carlos J. Bernardos from UC3M, featured a presentation from Paulo Paixão (EFACEC_S), related to EFACEC Transportation pilot, and a presentation from Timothy William (NCTU) and Samer Talat (ITRI) entitled "Leveraging 5G communications for critical Transportation systems".

2.1.1. Leveraging 5G Communications for Critical Transportation Systems

The presentation focused on the capability to use 5G technology to support railway signalling operations, in particular in level crossing scenarios.

The more relevant outputs of the 5Growth project that will impact EFACEC refer the use of 5G technology to support the safety-critical communications between the train approaching detectors and the level-crossing controller. This allows to replace a cable communication to a wireless communication, and to obtain clear advantages in terms of reductions of : i) CapEx , ii) installation cost, iii) installation time, iv) cable cost, and v) maintenance cost.

FIGURE 2: SNAPSHOT OF THE PRESENTATION ABOUT TRANSPORTATION PILOT

2.1.2. E2E Deployment of 5G-enabled Edge Infrastructure to Support in Aerial Disaster Relief

The rising popularity of edge computing technology, as well as the advancement of fifth generation (5G) mobile networks have paved the way for revolution across vertical applications. Aerial disaster relief response application is one of the applications that are able to leverage the provisioning of high bandwidth, low latency, and reliable communication of 5G mobile network, as well as the high computing capability of edge computing technology. In this presentation, an End-to-End (E2E)

deployment of 5G-enabled edge infrastructure to support the aerial disaster relief response system is of focus. An example of real world disaster relief response scenarios to showcase the deployment are also presented.

The main aspects that will be considered for exploitation are:

- Integration of 5G-DIVE solution for public safety use (e.g., firefighter).
- Complete E2E deployment of 5G-enabled edge infrastructure to support for aerial disaster relief response system.
- 5G-DIVE DEEP platform (i.e., BASS, DASS, IESS) to enhance the overall performance of disaster relief response system.
- Deployment automation, to enable rapid response in a disaster relief mission.

FIGURE 3: SNAPSHOT OF THE AERIAL DISASTER RELIEF RESPONSE SYSTEM PRESENTATION

2.2. Session 2 - Experience from Operators & Vendors

The session, chaired by Josep Mangues-Bafalluy, (CTTC) presented a talk by Koen De Schepper (Nokia Bell Labs), on behalf of the 5Growth project, and a talk from Chenguang Lu (Ericsson), on behalf of the 5G-DIVE project.

2.2.1. Mission Critical: Latency or Throughput?

The presentation was given by Koen De Schepper, Nokia Bell Labs, and dealt about how queuing latency and low packet loss for scalable congestion control (L4S) can provide an alternative plan (plan B) for remote control purposes, even under constrained available resources.

Remote interaction with a 360-degree camera at the port of Zeebrugge is demonstrated using a 5G-SA setup. When the SLA is kept at 25Mbps, the remote user can have full remote control and high definition video quality. However, when SLA degrades to be lower than 20Mbps, the remote user will have a delayed response or even totally lose control, at the same time the video quality slows down

and skips fragments. With the introduction of L4S, the remote controllability can be fully maintained even with a lower video quality under 0.5Mbps throughput.

FIGURE 4: SNAPSHOT OF NOKIA PRESENTATION ABOUT CRITICAL REQUIREMENTS

2.2.2. Summary of 5G-DIVE Innovation and Exploitation

The presentation was given by Chenguang Lu (Ericsson). The presentation provided the summary about the innovation and exploitation activities in 5G-DIVE project, with focus on platform design and PoC testbeds.

The main aspects considered in the presentation were to introduce the 5G-DIVE DEEP platform design, system integration with DEEP and 5 PoC testbeds developed by 5G-DIVE partners.

Open platforms and open source software are key aspects for the future development and the outputs of European projects, and in this sense, they provide a relevant contribution in such direction.
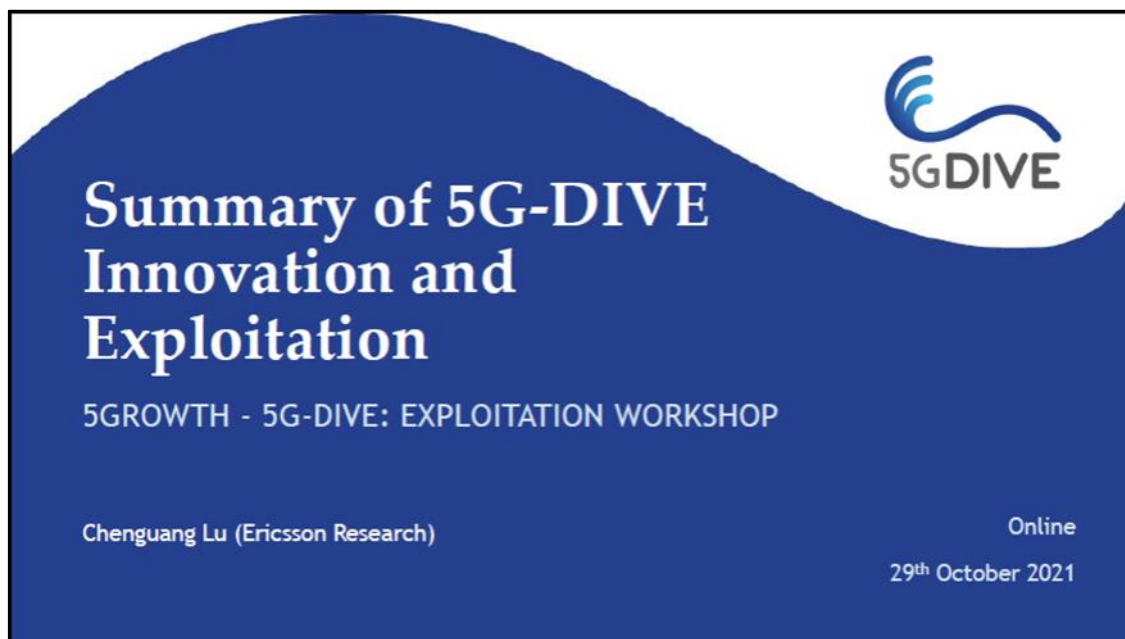
FIGURE 5: SNAPSHOT OF ERICSSON PRESENTATION ABOUT INNOVATION AND EXPLOITATION ASPECTS OF 5G-DIVE

2.3. Session 3 - Experience from SMEs

This session was chaired by Antonio De La Oliva, (UC3M) and it focused on the experiences of SME.

As output of 5Growth project, Giada Landi (Nextworks) provided a presentation about "SMEs' opportunities as technology providers for 5G solutions"; while from 5G-DIVE project, Matteo Pergolesi (Telcaria) presented "Easing the adoption of edge and AI technologies with 5G-DIVE DEEP: a vertical-oriented platform" .

2.3.1. SMEs' Opportunities as Technology Providers for 5G Solutions

Research and collaborations in EU projects addressing 5G technologies bring strong opportunities for SMEs active in the ICT sector as technological solutions provider. The participation in 5G trials is key to build practical know-how and on-field experience, understand technical and business requirements from a variety of vertical industries and develop software assets for custom solutions to propose in the consultancy market.

From an exploitation point of view, the following points remark the relevant aspects for Nextworks that well highlight the opportunity for SMEs:

- Relevant role of research to build strong and practical know-how on 5G technologies, towards 6G.
- Opportunities for SMEs in 5G projects: development of custom 5G management and orchestration components and support to verticals in trials design and execution.
    o   Key role of open-source contributions.

o   Example of Vertical Slicer software, developed in 5Growth and other 5G PPP projects, as building block of a complete 5G management and orchestration suite, easy to customize with added-value features and vertical-oriented services.

o   Collaboration with EU projects' consortia and participation in public demos, industrial events and standardization activities as opportunity to increase the company visibility and reach new potential customers.

- Business opportunities for SMEs.

o   Technology providers for 5G solutions, acting as 3rd party software providers, system integrators, etc., for vendors, small operators, vertical industries interested in stand-alone non-public networks.

o   Consultancy and system integration services for private 5G deployments targeting vertical industries.

o   Consultancy and 3rd party software development for 5G-enabled vertical services.
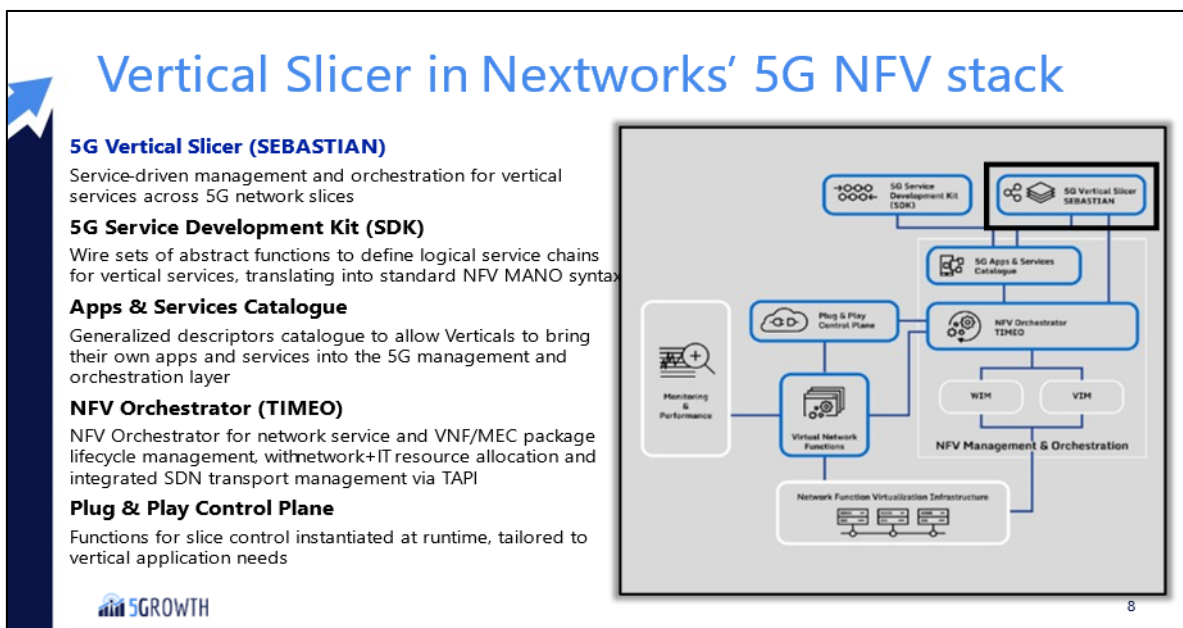
FIGURE 6: SNAPSHOT OF NEXTWORKS PRESENTATION ABOUT INNOVATION AND EXPLOITATION ASPECTS IN 5GROWTH

2.3.2. Easing the Adoption of Edge and AI Technologies with 5G-DIVE DEEP: a Vertical-Oriented Platform

In the fragmented world of cloud, edge, and AI platforms, there is a need for simplification and automation in order that verticals can exploit the full potential of new technologies. In 5G-DIVE, the DEEP platform was designed to unify the access to heterogeneous resources and provide advanced features, like monitoring, automatic scaling, and Machine Learning as a Service out-of-the-box.

This approach enables a new business model for SMEs that can propose themselves as platform providers to verticals. The model provides advantages for both parties, like efficiency in the integration and utilization of resources, optimized management, and last but not the least, data privacy.
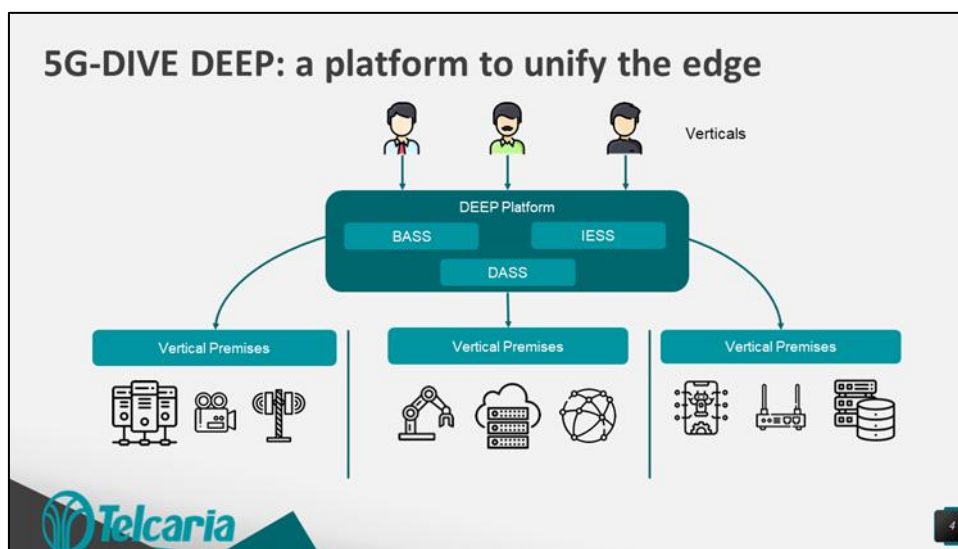
FIGURE 7: 5G-DIVE DEEP

2.4. Satisfaction Survey

As part of the regular quality control of the 5Growth project when organizing events, attendees were requested to fill in a satisfaction survey. A satisfaction poll was prepared aiming at verifying the percentage of satified and very satisfied attendees (the target was 70%). The following charts report the poll's results obtained from 24 attendees. A percentage of 87.5% of the responders declared to be "very satisfied" with the workshop indicating the quality of presentations and the quality of speakers as the main strengths of the event.

FIGURE 8: OVERALL SATISFACTION

FIGURE 9: INTENTION TO RECOMMEND THE WORKSHOP TO A COLLEAGUE

FIGURE 10: EVALUATION OF THE DIFFERENT ASPECTS OF THE WORKSHOP

3. Internal Meetings/Events

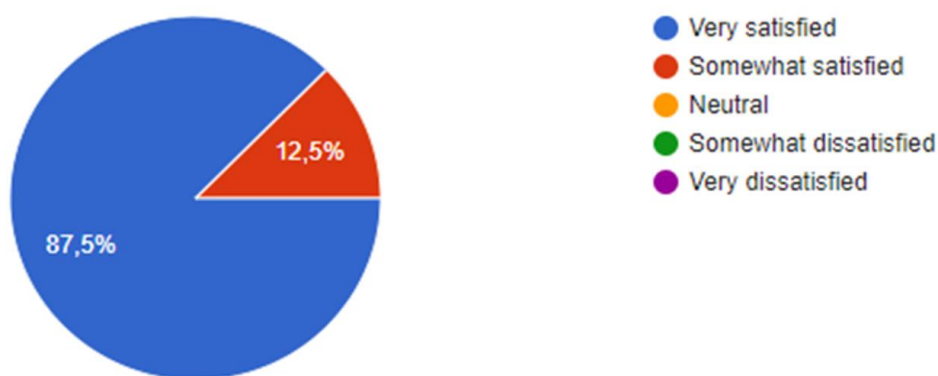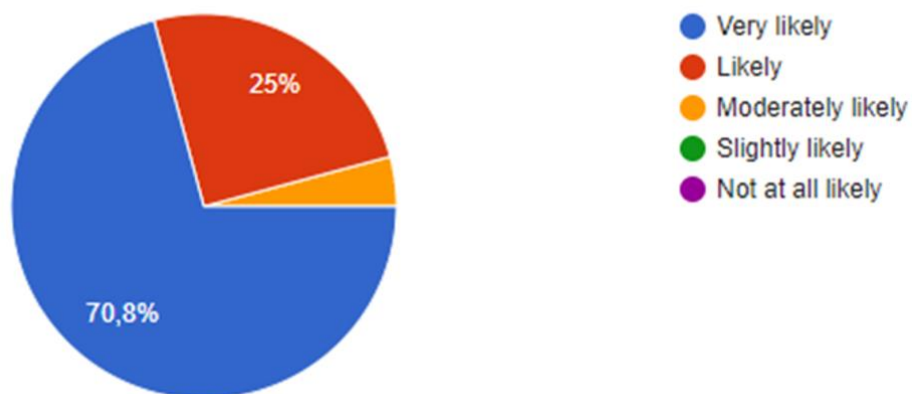This section reports on exploitation meetings and events internal to partners or, in some cases, joint between two 5Growth partners. Most of such internal events/meetings were confidential because they deal with quite sensitive information, like the opportunity to exploit specific solutions in products or services related to the partner's portfolios. In the following, relevant examples are reported while sharing non-sensitive information.

In some cases, vertical partners focused on the feasibility of the use cases that the experimentation on field allowed to highlight the opportunity and criticality. Vendors, focused on innovative features experimented in pilots deployed in the vertical premises in synergy with network operators. The latter pose the basis to define common business perspectives for the future.

3.1. INNOVALIA Pilot

Two main tracks of action are ongoing focused on promoting and maximizing the exploitation of 5Growth Spanish pilot's outcomes, and also planned for the final period of the project.

1. A selection of technology advancements delivered by 5Growth project is identified and being disseminated internally at each organization involved in the 5Growth Spanish pilot. Raising information awareness to internal stakeholders facilitates and influences decisions on internal technology and business roadmaps, mostly kept confidential due to its strategic nature.

2. A series of features and solutions incubated in the 5Growth project have become focal points for cooperative discussions in both bilateral and multi-lateral meetings among partners involved in the 5Growth Spanish pilot. This cooperative approach allows to incorporate technology and business perspectives to internal decisions and each form and institution and also facilitates the possibility of new joint projects and consortia proposals planning to leverage 5Growth outcomes as well as plan for further development of innovations upon them. Actually, as a result, several joint projects launched recently leveraging 5Growth results and also quite a few project proposals for evolving 5Growth have been submitted to European or national Research and Innovation programs (pending evaluation, expected for Q4 2021 and Q1-2022).

It is worth remarking that the approach and trend for these final efforts to promote exploitation of 5Growth results is somewhat balancing focused workshops solely dedicated to 5Growth with the increased presence of 5Growth in the agenda of relevant boards and workshops dealing with broader technology and business subjects and with extended and new partnerships.

A first example of internal exploitation opportunity is the weekly recurrent I4.0 5G Business Steering meeting, which is internally held by Ericsson Spain since July 2021, having technical, product, strategy and pre-sales responsibles at Ericsson Spain. This steering meeting secures continuous awareness of new research and innovation outcomes, by regularly reviewing new outcomes and learnings from ongoing projects in the field of I4.0 & 5G, including 5Growth Spanish pilot. As a result, several internal technology decisions have been facilitated and new joint projects with partners approved.

Major focus of attention for Ericsson Spain is on the sinergies with actors in the adjacent steps of the value chain (like Communication Service Providers) and the innovation/features discussed in depth include:

- Alternative architectures and deployment models for 5G NPN-PN integration for I4.0 5G-enabled applications. This is essential for CSPs to craft viable business models to address this market, and for CSPs and vendors to be efficient in costs and time for the deployments of 5G solutions for I4.0.
- Flexible deployment of Vertical applications in near-edge, far-edge and on-premise scenarios. This is key for CSPs to be enabled to market and deliver the respective advantages of either scenario, to their Enterprise (Vertical) customers, from higher economics of scale to optimal performance
- Generalization of use case needs -from those of Innovalia pilot- to general I4.0 requirements. This is very relevant for CSPs for configuring the necessary offerings for a broader customer Enterprise segment.
- KPI (Performance) optimization methods for serving latency-critical Vertical applications. This is instrumental for vendors to offer well-tested technology-segmented SLAs for predictable performance to CSPs, and, in turn, offer and customize it to Enterprise users.
- E2E integration learnings extending up to the 5G UE/CPE segment. This is a critical follow-up point since the 5G CPE segment is still immature (lagging vs 5G network infrastructure deployment) for enabling the massive adoption of 5G in I4.0 applications.

As a second example of internal meetings, bilateral bi-weekly meetings are also in place since September 2021 between Ericsson Spain and Telefonica including responsibles of technology, portfolio and partnership of the two partners. The high-level goal is to boost the industrialization of slicing services to Enterprise 5G customer segments. In this direction, 5Growth may provide with key learnings and solutions for re-use at this horizontal initiative in the aspects of flexible deployment, orchestration, NPN-PN integration approach, 5G KPI validation tools and methodologies, and E2E integration aspects. This can have an amplifying effect of the exploitation of 5Growth outcomes, with positive spill overs to other vertical use cases, projects and firms to be involved in this initiative in 2022 (three of them already onboarded). Specific sessions on each of those identified topics are already part of the agenda of this initiative and have started to be covered since October 2021 and will continue until March 2022.

3.2. COMAU Pilot

The outcomes of the COMAU pilot were presented to an Ericsson internal project which focuses on research areas related to 5G evolution in the 2030-time frame. The experience matured in 5Growth and in the related pilot has constituted one of the relevant inputs to the internal project to define multiple aspects with particular focus on: service-related vertical requirements expressed in a hetoregenous mix of E2E QoS, impacts on network infrastructures, need to dynamically and automatically orchestrate radio and transport resources on a specific coverage area.

These active involvement in the internal project has resulted in considering all these aspects, demonstrated in the pilot, as basis for further technical and business exploitation on a large scale.

The following meetings are part of the activity of the internal project:

- Regular periodical meetings were organized with technical focus.

- Two specific seminars (in April and November 2021) have hosted presentations of the 5Growth results (with a focus on the COMAU pilot) with the involvement of product and business organizations.

- As results of the internal interest of the activity, an Ericsson publication has been planned for Q1 2022 related to the E2E transport-aware slice orchestration for vertical services. The publication, which will be available for free download, will report the main results of the COMAU pilot.

Ericsson Research Day, on December 9th, 2021. It is an Ericsson internal event, to disseminate and discuss cutting-edge research topics and recent research findings. It is conceived as a day of inspiration, learnings, new insights and an opportunity to network with Ericsson experts, partners and customers. Here, a presentation titled "E2E slices orchestration for vertical services" has been selected for one of the main sessions of the event. The session will include a video recorded on COMAU and TIM premises.

Exploitation activities related to business opportunities with operators:

- Ericsson internal meetings with business organizations (market area) to identify possible opportunities to feed the product roadmaps with features and solutions originated in 5Growth. These meetings have been organized to directly involve network operators (TIM) leveraging on the common experience matured in the pilot on concrete vertical use cases.

- Ericsson and TIM have posed the basis for enforcing a joint technical collaboration on the exploitation of the 5Growth project. As a first joint initiative, an Ericsson-TIM Workshop is planned on December 10th , 2021. It will be dedicated to the E2E transport orchestrator developed in the project. The workshop aims at presenting technical leadership opportunities to the innovation and business organization of the two partners.

3.3. EFACEC_S (Transportation) Pilot

The main planned internal event in EFACEC_S is the presentation of 5Growth results to the Enterprise Architecture Board, on November 26th.

FIGURE 11: EFACEC_S PRESENTATION COVER AND AGENDA

Additionally, EFACEC_S is preparing a workshop in the Aveiro harbour facilities. planned in January 2022.

Figure 12 reports the EFACEC_S product roadmaps for the 2021-2024. LX (Level crossing) 3.0 – 5G, final solution will be launched at 2023 and a proof of concept is planned during 2022 Q1. This timing will constitute an opportunity to exploit the 5Growth project outcomes by internal meetings.
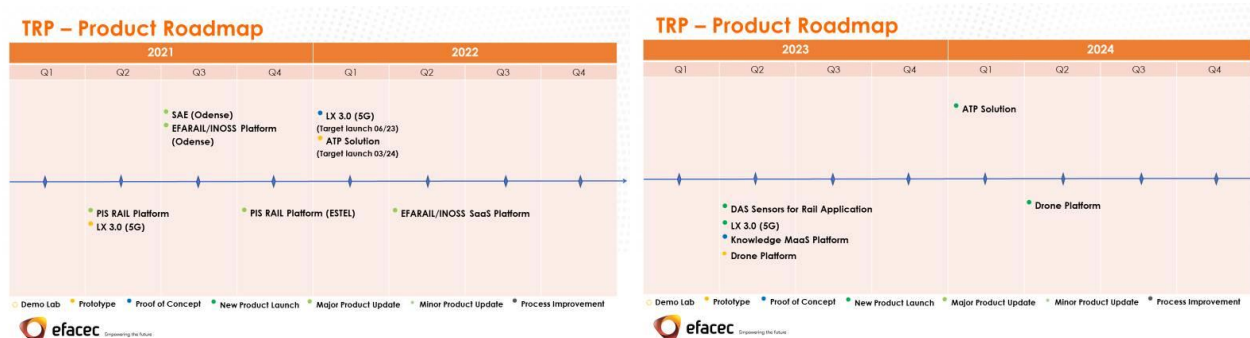

FIGURE 12: EFACEC_S ROADMAPS 2021-24

3.4. EFACEC (Energy) Pilot

Efacec (energy) is planning the participation to events for 2022, that are under discussion.

4. Technical Workshops

In addition to the internal and external exploitation workshops, some technical workshops have also been co-organized by 5Growth. Most of them are reported in [4]. The following table reports the ones that have been organized after D5.4 was delivered (May 2021).

Workshop	Event	Date
WS8: From 5G to 6G Automated and Intelligent Security	EUCNC21	June 2021
WS6: 5G Private Networks	EUCNC21	June 2021
1st International Workshop on Zero-Touch Network and Service Management	IEEE CNSM 2021	October 2021

5. References

[1].   5Growth project, "Communication, Dissemination, and Exploitation achievements of Y1 and plan for Y2," Deliverable 5.2, Jun 2020.

[2].   5Growth & 5G-DIVE Exploitation Workshop: "Experiences from field trial about vertical industry", https://www.youtube.com/watch?v=kTg6DA1DqRw

[3].   5G-DIVE project, https://5g-dive.eu/

[4].   5Growth project, "Report on WP5 Progress and Update of CoDEP", Deliverable 5.4, May 2021.