



5GZORRO

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D.6.2 Intermediate Dissemination and Communication Report

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0.4	27-04-2021	TID, CODI, UW, BARTR	Document re-structuring and more individual contributions
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Executive Summary

Dissemination, Communication and Standardization activities are essential for the success of any research and innovation project.

Due to the very innovative nature of the core topics covered by 5GZORRO research, i.e. zero-touch network and service management, security and trust across multiple domains, ubiquitous computing and connectivity for multi-operator 5G networks, Distributed Ledgers for Telcos, the Consortium planned to invest a significant amount of resources in generating awareness and visibility for research results, both within the scientific community working on 5G and within network industry, operators, regulators, SMEs, etc.

During the planning phase reported in deliverable D6.1, the 5GZORRO Consortium identified various types of outreach activities to best fulfil these goals. These included:

- *Production of scientific papers for international and impactful journals, where to promote and validate design artifacts and results from the implementation;*
- *Participation with talks and papers in scientific conferences of relevant interest for the 5G Community, where to maximise the impact of demonstrated results and generate opportunities for follow up research;*
- *Participation to relevant industry events with project activities and demos, in order to generate the conditions for profitable exploitation of 5GZORRO results for the various partners;*
- *Strong presence and recognition in the community through impactful and trending communication;*
- *Strong presence in standard developing communities, particularly at ETSI, leveraging on the profile of key researchers and partner organizations in the project, to achieve a long-lasting impact of results.*

Like many other activities, also the 5GZORRO impact creation plan suffered of the COVID-19 pandemic conditions, in particular for what concerns the resulting limitations to networking and showcasing opportunities in cardinal events of the 5G community (MWC20, EUCNC2020, ICT20, etc.). In fact, many calendarized events were cancelled or transformed into virtual programs since Feb 2020, with the majority of activities limited by force majeure to remote presentations of accepted papers. The 5GZORRO plans for MWC2020, EUCNC2020 and ICT2020 exhibitions, were completely jeopardised by last minute cancellations of planned showcases at booths, removal of workshop sessions, and overall reduction of programs.

Despite the effects of the pandemic on the outreach plan, the 5GZORRO Consortium re-focused the objectives and forms for impact creation for its first reporting period (M1-M18), by generating a significant number of valuable results which can be summarised in the following list of major highlights per activity area:

- **Dissemination Area**
 - **12 papers published** (5 journal papers, 5 conference papers in standard tracks of major conference with IEEE Xplore indexing, 2 extended abstracts in conference proceedings);
 - **6 publications currently under evaluation** (5 journal papers, 1 conference paper);
 - **1 survey journal paper** in preparation on Zero Touch Management for 5G /6G;
 - Participation in **11 events with 5GZORRO talks and presentations**, 2 of which organised by Consortium partners (CONNECT Tech Talks), 5 of which keynotes in relevant industry or standard forums;
 - Confirmed **plans for participation in 6 events in Q2/Q3-2021**;
 - Contributions to **4 whitepapers from 5G PPP**, 2 of which just published, 2 in final editing queue;
 - Active participation in **10 Working Groups of the 5G PPP or 5G IA**;
 - Quite productive collaboration with 3 parallel 5G PPP project (LOCUS, 5GCLARITY, 5G-COMLETE) thanks to common bridging partners;

- Internal dissemination and joint coding events, which included an initial training on Blockchain fundamentals done in Dec 2020 with video published on the 5GZORRO YouTube channel and an Internal Hackathon executed in March 2021 to prepare 5GZORRO platform's first Minimum Viable Products;
- **Communication Area**
 - Increased contents and impact statistics of the **5GZORRO website which reached 758 new users, accounting for 80.4 % of all visits, with an average visit of 2.73 pages**
 - Reached **701 followers and 1,738 profile visits on Twitter**
 - Reached **155 members on LinkedIn**
 - Uploaded **5 videos on the project's YouTube Channel, 2 of which with >1000 visualizations**
 - Produced and shared **3 blog posts** on 5GZORRO architecture vision and use cases
 - Produced and shared **4 press releases, 4 newsletters, 1 newsflash**
- **Standardization and Open-Source Communities Area**
 - **2 contributions made and approved in ETSI ISG PDL**, related to federated data (PDL009) and off-line scenarios, TEE applicability and the usage of sidechaining (PDL010);
 - **facilitated the approval of work items in ETSI ISG ENI** on intent models (ENI023), the analysis of control loop architectures (ENI027) and knowledge representation (ENI029).
 - **Contributed to an ETSI ENI Proof of Concept with the Vertical Slicer by Nextworks (POC#09)**, which is a core element of the 5GZORRO platform
 - Contribute to **1 IRTF draft for the Network Management Research Group** about the classification of intent declarations and their applications (*draft-irtf-nmrg-ibn-intent-classification*)
 - Contributed to the **re-chartering and timeframe extension for the IETF Interface to Network Security Functions WG (I2NSF)** with main focus on the management of network security functions
 - Participated to the **ETSI NFV&MEC Remote API Plugtests 2021** with the ICOM's CDN Anywhere Solution deployed as Edge vCDN solution.
 - Contributed to **Radio Spectrum Policy Group (RSPG) document RSPG21-016 – RSPG Report on Spectrum Sharing: A forward-looking survey"**;
 - Established **good links with the Cloud Native Computing Foundation (CNCF), Open Data Hub, TMForum, MEF, CBAN**;
 - Identified **7 jointly exploitable assets for potential future contributions to SDOs or opensource communities with Proof-of-Concept demos.**

1 Introduction

This Deliverable D6.2 contains the report of dissemination, communication, and standardization activities covering the first eighteen months of the 5GZORRO project (from Nov 2019 to Apr 2021).

The document complements the initial dissemination plan described in deliverable D6.1¹, and provides evidence on the achieved impact along different core activity streams, namely:

- production of contributions for scientific conferences and journals;
- participations to events (most of which in virtual mode due to pandemic);
- communication through the website, the social channels and various other means like blogposts, newsletters and press releases;
- contributions to standards and to open-source communities.

All the activities reported in this document are the result of good coordination among the 5GZORRO partners, who quickly adapted the planned outreach strategy to the rapidly changing difficult conditions due to COVID-19 lockdown in order to maximise the impact of project outreach despite the adverse conditions.

The action of the Consortium was implemented at various levels with partners diversely and complementarily involved in: (i) identifying and selecting scientific and industry events where to propose 5GZORRO results; (ii) preparation of the most appropriate contributions for the target events; (iii) execution of the dissemination and/or communication and/or standardization activities; (iv) reporting and follow-up on event feedbacks, contacts, etc.

1.1 Document outline

The document is structured in three core sections which report the main streams of impact creation activities of the Consortium:

- Section 2 provides details on the dissemination activities executed by eh partners in the period, with focus on scientific publications in conferences and journals, participation to events with presentations and keynotes, collaboration within 5G PPP;
- Section 3 gives on overview of the communications activities executed by the Consortium with evidence of impact results achieved and reports from analytics offered by the various tools;
- Section 4 covers the contribution towards Standard Developing Organizations (SDOs) and the Open-source communities of higher relevance to 5GZORRO research and technology portfolio;
- Section 5 contains the report conclusions and provides an overview of status progress ion impact creation KPIs.

¹ 5GZORRO Consortium, Deliverable D6.1 – “Dissemination, Communication and Standardization Plan”, Feb 2020

2 Dissemination Activities

To adapt to the new context mandated by COVID-19 lockdown measures all around Europe, the 5GZORRO Consortium decided to re-direct its dissemination efforts towards two major lines of action:

- Primarily elaborate papers for journals and standard tracks of top conferences where to convey the preliminary results of technical deliverables and design;
- Experiment new forms of digital dissemination for 5GZORRO vision and initial use cases through dedicated virtual events (i.e., the 5GZORRO Tech Talks) and follow up blog posts through which approach virtually the large professional communities of 5G stakeholders.

This section summarises the activities for dissemination executed in the first 18 months of the project, the majority of which run in parallel to lockdown and travel restriction regulations due to pandemic.

2.1 Scientific Publications in Conference & Journals

From the start of the project until April 2021, the 5GZORRO Consortium produced a good number of submissions, some of which just published or accepted for publications, others in review at the time of writing this report. All the published papers have been uploaded in Zenodo and/or public repositories, apart from being listed in the 5GZORRO Website under www.5gzorro.eu/papers.

In summary, the 5GZORRO Consortium produced:

- **12 publications, 5 of which are journal papers, 5 are conference papers in standard track** indexed in IEEE Xplore and **2 are extended abstracts** for special sessions/workshops in conference proceedings;
- **6 publications currently under evaluation, 5 of which in journal papers, 1 for a conference;**
- **1 survey on Zero Touch Management** is in preparation.

Table 2-1: Published scientific papers produced in M1-M18

#	Paper Title	Pub. Date	Journal / Conference	Status / Web Links	Involved Partners
1.	Adaptive ML-based Frame Length Optimisation in Enterprise SD-WLANs	Mar 2020	Journal of Network and Systems Management	Published https://zenodo.org/record/4627935#.YGs_DugzZPY	FBK
2.	aiOS: An Intelligence Layer for SD-WLANs	Jun 2020	NOMS 2020 Conference Paper	Published https://zenodo.org/record/4627950#.YGs_9zugzZPa	FBK
3.	AI-driven Zero-touch Operations, Security and Trust in Multi-operator 5G Networks: a Conceptual Architecture	Jun 2020	EUCNC 2020 Conference Paper	Published https://zenodo.org/record/4244063#.YGs_fegzZPa	NXW, I2CAT, ALB, UMU, ATOS, FBK
4.	Centralized and Federated Learning for Predictive VNF Autoscaling in Multi-domain 5G Networks and Beyond	Mar 2021	IEEE Transactions on Network and Service Management	Published https://ieeexplore.ieee.org/document/9319704/keywords#keywords	FBK, I2CAT

#	Paper Title	Pub. Date	Journal / Conference	Status / Web Links	Involved Partners
5.	Smart Contracts in the 5G Roaming Architecture: The Fusion of Blockchain with 5G Networks	Apr 2021	IEEE Communications Magazine	Published https://www.researchgate.net/profile/Babak-Mafakheri/publication/350877780_Smart_Contracts_in_the_5G_Roaming_Architecture_The_Fusion_of_Blockchain_with_5G_Networks/links/6077ede7881fa114b402d1bc/Smart-Contracts-in-the-5G-Roaming-Architecture-The-Fusion-of-Blockchain-with-5G-Networks.pdf	FBK, I2CAT
6.	Blockchain-Based Zero Touch Service Assurance in Cross-Domain Network Slicing	Jun 2021	EUCNC2021 Conference Paper	To be published	ICOM, IBM, I2CAT, UW, FBK, BARTR
7.	Multi-Party Collaboration in 5G Networks via DLT-Enabled Marketplaces: A Pragmatic Approach	Jun 2021	EUCNC2021 Conference Paper	To be published	I2CAT, NXW, BARTR, ALB, UMU, TID
8.	Zero-touch AIOps in multi-operator 5G networks	Jun 2021	EUCNC2021 Special Session 8 Paper	To be published	IBM, NXW, I2CAT
9.	Overview of the security and trust mechanisms in the 5GZORRO project	Jun 2021	EUCNC2021 Workshop 8 Paper	To be published	UMU, ICOM, BARTR, I2CAT, ALB, MCA
10.	Dynamic Slice Scaling Mechanisms for 5G Multi-domain Environments	Jun 2021	S4SI 2021: 4 th Workshop on Advances in Slicing for Softwarized Infrastructures (S4SI)	To be published	IBM, ICOM, FBK, NXW, UW,
11.	AI-Empowered Software-Defined WLANs	2021	IEEE Communications Magazine	To be published https://www.estefaniacoronado.com/publication/commag-aos-2021/	FBK, I2CAT
12.	Time-Sensitive Mobile User Association and SFC Placement in MEC-Enabled 5G Networks	2021	IEEE Transaction on Network and Service Management	To be published	FBK, I2CAT

The following papers are submitted under review or in elaboration at the time of release of this report.

Table 2-2: Publications submitted during M01-M18 and under review

#	Paper Title	Sub. Date	Journal / Conference	Status	Involved Partners
1.	Design of a security and trust framework for 5G multi-domain scenarios	Dec 2020	Journal of Network and Systems Management (JNSM) – Springer	Under review	UMU, I2CAT, ICOM
2.	Toward True Cloud Native NFV MANO	Mar 2021	The 14 th ACM International Systems and Storage Conference (SYSTOR '21)	Under review	IBM
3.	Toward pre-standardization of reputation-based trust models beyond 5G	Mar 2021	Computer Standards & Interfaces – Elsevier	Under review	UMU
4.	S3: An AI-enabled User Continuous Authentication for Smartphones based on Sensors, Statistics and Speaker Information	Apr 2021	Sensors – MDPI	Under review	UMU
5.	Federated Learning for Malware detection in IoT Devices	Apr 2021	Elsevier Computer Networks	Under review https://arxiv.org/abs/2104.09994	UMU
6.	Trusted Execution Environment-enabled platform for 5G security and privacy enhancement	Jun 2021	Book Chapter: Studies in Big Data	Under review	UMU, ICOM, UW
7.	Zero Touch Management: A Survey of Network Automation Solutions for 5G and 6G Networks	2021	IEEE Communications Surveys & Tutorials	To be submitted	I2CAT

2.2 Scientific and Industrial Events

The impact of lockdown restrictions due to COVID-19 pandemic impacted mostly the participation to events as can be derived from the following Table 2-3.

Despite the adverse conditions, the 5GZORRO Consortium has:

- contributed to **11 events** with 5GZORRO talks and presentations, **2 of which organised by Consortium** partners (CONNECT Tech Talks), **5 of which keynotes in relevant industry or standard forums**;
- Plans for participation to other 6 events.**

Table 2-3: Scientific Events with 5GZORRO participation during M1-M18

#	Event	Date/Place	Activity	Partners
1.	Barcelona CyberSecurity Congress – ISACA Event	29-31 Oct 2019 Barcelona (ES)	Presentation 5GZORRO project	I2CAT
2.	NOMS2020	20-24 Apr 2020 VIRTUAL	Paper Presentation	FBK

			aiOS: An Intelligence Layer for SD-WLANs	
3.	OpenNebula TechDays	11 Jun 2020 VIRTUAL	Presentation 5GZORRO project	I2CAT
4.	EUCNC20	15-18 Jun 2020 VIRTUAL	Paper Presentation: AI-driven Zero-touch Operations, Security and Trust in Multi-operator 5G Networks: a Conceptual Architecture.	NXW
5.	IEEE Communications Society EMEA Region	2 Oct 2020 VIRTUAL	Invited seminar with Diego Lopez, TID 5GZORRO mention on: Dissemination of project goals and plans.	TID
6.	CONNECT Tech Talk: TELCO & DLT/BLOCKCHAINS 5G TECH TALK	20 Oct 2020 VIRTUAL	Organised tech talk with 5GZORRO and external experts	All
7.	Ericsson Spain Outside-InSights Session	30 Oct 2020 VIRTUAL	Invited Keynote by G. Carrozzo, NXW AI-driven Zero-touch Operations, Security and Trust in Multi-operator 5G Networks	NXW
8.	LAYER123 WORLD CONGRESS 2020	12-15 Oct 2020 VIRTUAL	Invited Keynote by Diego Lopez – TID 5GZORRO mention on: Dissemination of project goals and plans.	TID
9.	IEEE Conference on Network Function Virtualization and Software Defined Networks, IEEE NFV-SDN 2020	11 Nov 2020 VIRTUAL	Invited Keynote by Diego Lopez – TID Dissemination of project goals and plans	TID
10.	CONNECT Tech Talk: 5G & Verticals	1 Dec 2020 VIRTUAL	5GZORRO Video presentation (2'16") closing the event.	CODI
11.	5G PPP Technical eWorkshop	9-10 Dec 2020 VIRTUAL	5GZORRO architecture presentation; Discussion of whitepapers	NXW, UMU, I2CAT

Moreover, Ubiwhere organised in March 2021 a webinar called “The City Nervous System: 5G enabled verticals for cities” inviting several speakers to approach the benefits and challenges related to the implementation of 5G networks and taking upon the opportunity to share the impact envisioned by 5GZORRO in this sector.

For the next period, the plan for participation to events includes the opportunities listed in Table 2-4 which are under evaluation by the Consortium partners. The Consortium plans to reactivate participation to events from Q4-2021, hoping for better health and safety conditions for travels.

Table 2-4: Plan for Scientific and Industrial Events from May 2021 onwards

Event Name	Date/Place	Planned Activities	Partners
5G FED2021	14 May 2021 VIRTUAL	Promotion of 5GZORRO	CODI
EUCnC2021	8-11 Jun 2021 VIRTUAL	<ul style="list-style-type: none"> Presentation of 2 papers in standard conference track 	I2CAT, NXW, IBM, ICOM, UMU

		<ul style="list-style-type: none"> • Chairing and presentation of Special Session 8 (Autonomous Network Management towards 6G) • Presentation in Workshop 8 (From 5G to 6G Automated and Intelligent Security). 	
MWC 2021	28 Jun -1 Jul 2021	5GZORRO Video, flyer and promotional material at i2CAT booth.	I2CAT
Barcelona Cybersecurity Congress	5-7 Oct 2021	5GZORRO Presentation or participation in a round table <i>Note: i2cat is involved in the organization of the event via the innovation office of Catalunya Cybersecurity Agency.</i>	I2CAT
2021 IEEE 5G World Forum (5GWF'21)	13-15 Oct 2021	Workshop proposal with LOCUS Project on "Pioneering Autonomous Network Management for the 6G era"	NXW
MWC 2022	Jun 2022	5GZORRO demos of project's use cases at multiple booths at MobileWorldCapital and/or i2CAT booths.	I2CAT, NXW, all

2.2.1 5GZORRO Teck Talk

Strong effort was spent by the Consortium in the organization and execution of the first 5GZORRO Live Tech Talk on 20 Oct 2020. Given the disruptive potential the 5GZORRO outcomes in Telecom industry and Regulatory bodies, the event aimed at stimulating a focus discussion with experts in the field on the role Distributed Ledger Technologies (DLT) / Blockchains are having in the 5G Telco business.

In fact, many standards developing organizations, associations and Telcos are looking today at DLTs as basic enablers for multi-stakeholder 5G network infrastructure and services across various actors of the value chain, capable to contribute to the automation, security and traceability of settlements when building cost-effective deployment of intelligent 5G networks in multi-stakeholder environments.

Standards, as well as technical solutions are in great demand by Telecom Operators, Spectrum Regulators, Vertical Users, Content Service Providers and Facility Owners who need to implement utterly secure and coordinated business operations for their flexible 5G network and services deployed across multiple domains and operators.

With this background, the 1st 5GZORRO Tech Talk explored all of these topics with the help of keynote speakers from IBM, IOTA, CBAN, R3 CORDA, MCA, BARTR. Four experts accepted to participate in the 1-hour panel demonstrating great interest on 5GZORRO and laying the foundations for continued collaborations in the future with the Consortium:

- External keynote speakers
 - **Artem Barger** – Manager, Blockchain Group, IBM Hyperledger
 - **Michele Nati** – Head of Telco and Infrastructure Development at IOTA Foundation – DLTs Architect, Data Trust Expert
 - **Thomas Spencer** – Telecom Lead, R3 CORDA
 - **Louisa Gregory** – CEO CBAN (Communications Business Automation Network)
- From 5GZORRO
 - **Antoine Sciberras** – Chief Spectrum Management & Technology, MCA (Malta Communication Authority) and 5GZORRO representative
 - **Paul Henderson** – CEO, Bartr Group and 5GZORRO representative
 - **Andrea Michelozzi** – CODI, Moderator and 5GZORRO representative



Figure 2-1: 5GZORRO: Telco & DLT/Blockchain 5G Teck Talk

The event was publicly streamed on 5GZORRO website, YouTube channel, and Twitter account, obtaining great results in terms of views and impressions:

- www.5gzorro.eu/5gzorro-tech-talktelco-dlt-blockchains
- <https://www.youtube.com/watch?v=8HJwALUCN5E>
- <https://twitter.com/5Gzorro/status/1318553068187885569>

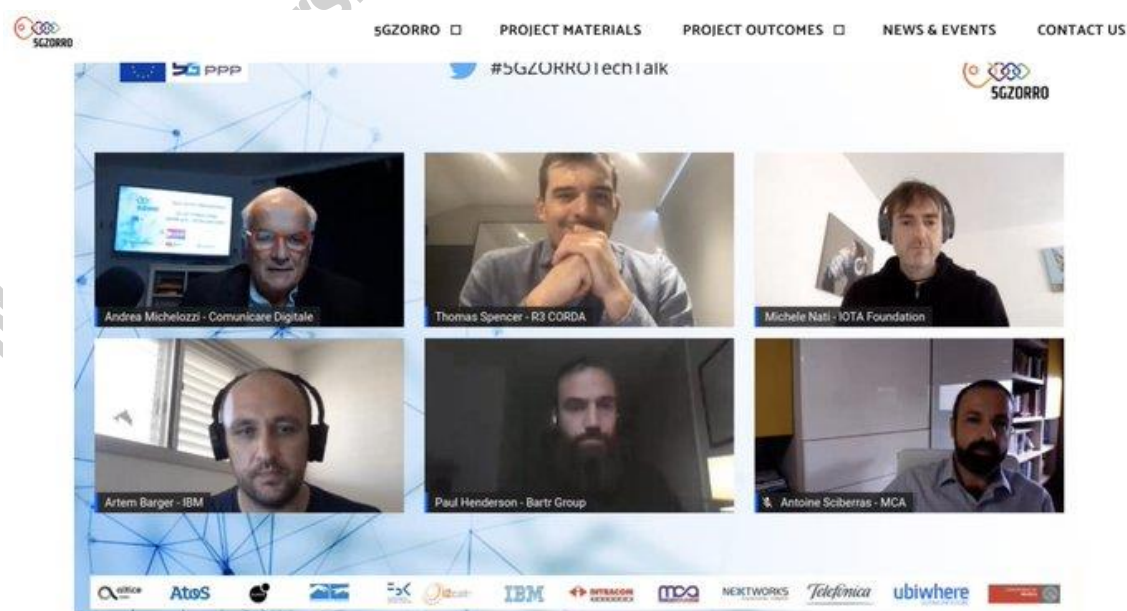


Figure 2-2: 5GZORRO Telco & DLT/Blockchain 5G Teck Talk speakers in action.

Impact analytics before the event:

- LinkedIn: 12,241 impressions (15 Oct 2020);
- Twitter 17,394 visualizations (17 Oct 2020); 36,818 visualizations, 1,111 engagements (19 Oct 2020).

Impact analytics during the LIVE on 20 Oct 2020:

- YouTube: 540 viewers live;
- Twitter 502 engagements, 11,645 impressions;
- LinkedIn 348 impressions.

Impact analytics after the event:

- Periscope 670 viewers;
- Twitter: 6,102 visualizations, 11,645 Impressions;
- YouTube 1,275 visualizations.

Due to the success of the first 5GZORRO Tech Talk a calendar of potential future similar events has been planned, whose organization depends on the availability of relevant external speakers who can animate the panels.

Table 2-5: Tentative calendar for future 5GZORRO Tech Talks

Tech Talk	Scope for topics to cover	Tentative Date
5GZORRO Tech Talk#2	<ul style="list-style-type: none"> • Data Lake oriented • Use Cases for Private 5G Networks 	Sept 2021 Virtual event
5GZORRO Tech Talk#3	<ul style="list-style-type: none"> • Trust in a multi-domain and multi-stakeholders Telecom ecosystem • Secured & trusted computing 	Dec 2021 Virtual event
5GZORRO Tech Talk#4	<ul style="list-style-type: none"> • Telecom Marketplaces • Spectrum sharing 	Q1 2022 Virtual event
5GZORRO Tech Talk#5	<ul style="list-style-type: none"> • Zero-trust Services management • Intelligent Orchestration • ETSI ZSM 	Q2 2022 Virtual event

2.3 Collaboration within 5G PPP and with Other Projects

The Consortium has played an active role in the various activities of 5G PPP working Groups and with other 5G PPP projects of Phase 3, following along with the discussions within these WGs, with the intent to contribute back with 5GZORRO's findings and outcomes.

The key Working Groups of 5G PPP and 5G Infrastructure Association where 5GZORRO partners participated are briefly reported in the following Table 2-6 together with the main activities executed in the period.

Table 2-6: 5GZORRO activity within 5G PPP

Area	Working Group	5GZORRO representative	Main activities
5G PPP	Steering Board	i2CAT (S. Siddiqui)–PC	<ul style="list-style-type: none"> • Main program coordination and SB periodic meetings • Annual Program report 2020, 2021
5G PPP	Technical Board	NXW (G. Carrozzo)–TM	<ul style="list-style-type: none"> • Project cartography for Phase 3 projects • Cross-project technical coordination • 5G PPP Whitepaper on Verticals for MWC2020 • Contributions to Whitepaper on Edge Computing for EUCNC'21

			<ul style="list-style-type: none"> Contributions to Whitepaper on AI/ML for 5G (in progress) Presentations of project progresses at Technical Workshop (May.20, Dec.20) Annual Program report 2020, 2021 EUCNC'21 coordinated participation
5G PPP	COMMS	CODI	<ul style="list-style-type: none"> Coordinated communication initiatives of the 5G PPP
5G IA	Pre-Standardization	TID	<ul style="list-style-type: none"> Contributions to WG activities and periodic meetings
5G IA	Spectrum	I2CAT, MCA	<ul style="list-style-type: none"> Discussion on spectrum sharing Contributions to WG activities and periodic meetings
5G PPP	Architecture	ALB, ICOM, NXW	<ul style="list-style-type: none"> 5GZORRO Architecture presentation Contributions to WG's Architecture Whitepaper (in progress) Initial contributions to the Whitepaper
5G PPP	Software Networks (SDN/NFV)	UW, ICOM, ATOS	<ul style="list-style-type: none"> Discussion on new whitepaper Workshops at EUCNC'21 Participation to periodic meetings
5G IA	Security	UMU, ICOM	<ul style="list-style-type: none"> Contributions to WG's new Security whitepaper Workshops at EUCNC Participation to periodic meetings
5G IA	Vision and Societal Challenges	NXW, TID	<ul style="list-style-type: none"> Contributions to Strategic Research & Innovation Agenda for Smart Network and Services Participation to periodic meetings
Networld 2020	SME	NXW	<ul style="list-style-type: none"> Co-chair of WG Coordination SME activities for events and within 5G PPP

The Consortium contributed to **4 whitepapers** from **5G PPP**, **2 of which just published**, **2 in final editing queue** as reported in Table 2-7,

Table 2-7: 5G PPP whitepapers with 5GZORRO contributions

5G PPP Whitepaper	Publication status	Involved partners	Originating WG	Link
Empowering Vertical Industries through 5G Networks	Published Sept 2020	NXW	5G PPP TB	https://5g-ppp.eu/wp-content/uploads/2020/09/5G-PPP-VerticalsWhitePaper-2020-Final.pdf
Edge Computing for 5G Networks	Published Feb 2021	I2CAT, NXW	5G PPP TB	https://bscw.5g-ppp.eu/pub/bscw.cgi/d397473/EdgeComputingFor5GNetworks.pdf
AI and ML – Enablers for Beyond 5G Networks	In progress	I2CAT, UMU, FBK, ICOM, NXW	5G PPP TB	n/a
SDN/NFV virtualisation 5G Slicing and Security Considerations	In progress	UMU	5GIA SEC WG	n/a

In addition, contacts and liaisons with other projects have taken place as planned, particularly with those funded in the same H2020 Call ICT-20-2019. In particular, liaisons via joint partners were possible with the following projects, mostly focused on the preparation of a joint workshop and the share of results:

- **LOCUS** (<https://www.locus-project.eu/>, bridging partners: NXW, IBM)
 - share of testing experiences with OpenData Hub for data lake implementation
 - co-organisation of the workshop on Autonomous Network Management
- **5GCLARITY** (<https://www.5gclarity.com/>, bridging partners: i2CAT, TID)
 - Share of vision and results on private and public networks using licensed spectrum
 - Contributions to the whitepaper on AI and ML as Enablers for Beyond 5G Networks coordinated by 5GCLARITY Technical Manager
 - Participation in the workshop on Autonomous Network Management
- **5G-COMPLETE** (<https://5gcomplete.eu/>, bridging partner: NXW)
 - Share of results on testing Kubernetes with ETSI OSM
 - Participation in the workshop on Autonomous Network Management

2.4 Internal events

In addition to participation and organization of public events, the Consortium also organised a couple of internal events, aimed at sharing knowledge (webinar on DLTs/blockchains) and progressing on software integration (internal hackathon).

2.4.1 Training on Blockchain fundamentals

To make sure the innovative outcomes of the project were correctly shared and disseminated among the Consortium from an early stage, on 12 Dec 2019 an internal webinar was organized on Blockchain Fundamentals – www.5gzorro.eu/project-materials. The event served as internal training for the Consortium, leveraging on the background expertise of BARTR Technologies on blockchain technologies.

Webinar material has been publicly shared via the 5GZORROs website and on the YouTube channel:

- <https://www.youtube.com/watch?v=3WP2GsPaHUQ>



Figure 2-3: 5GZORRO Technical Talk Webinar on Blockchain

2.4.2 Internal Hackathon

During the 3rd Plenary Meeting on 16-18 March 2021, an Internal Hackathon was organized by the Consortium to cover the following main topics:

- Jointly conclude open software development sprints for first Minimum Viable 5GZORRO Products (MVP);
- Execute first internal integrations of relevant MVP components;
- Execute preliminary tests to verify how the integrated modules worked together;
- Refine the demo-stories for the first 5GZORRO prototypes.

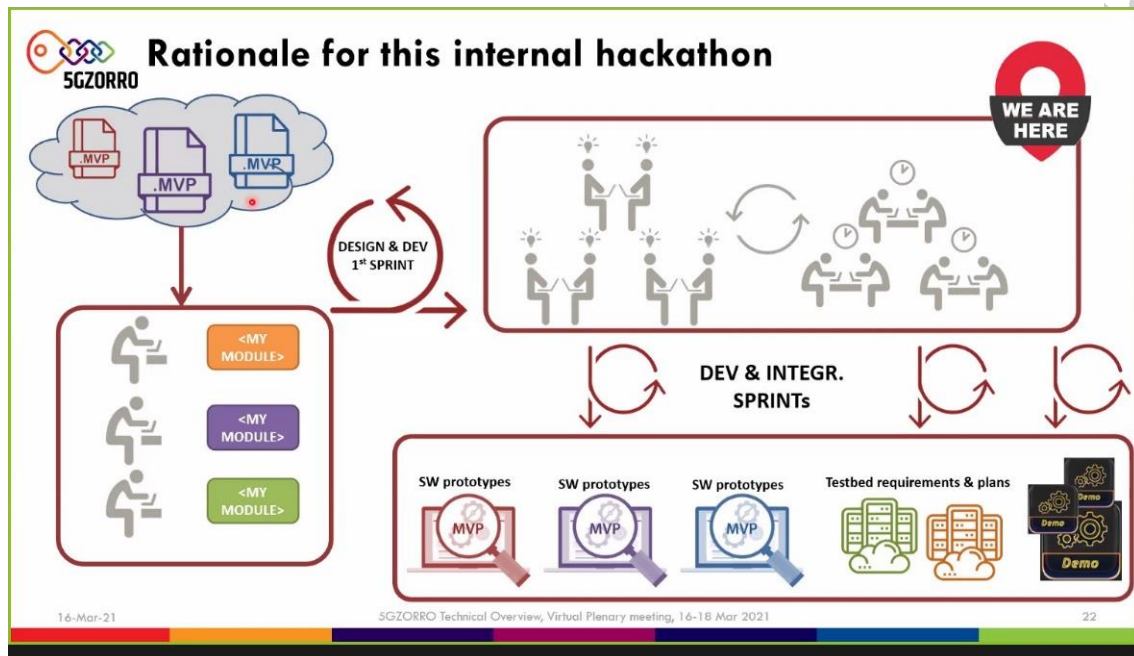


Figure 2-4: Internal 5GZORRO Hackathon rationale (March 2021)

In this first internal hackathon, partners were divided into five teams, each responsible to develop a comprehensive epic for the modules under their responsibility as reported in Table 2-8.

Table 2-8: Teams and goals of the 1st 5GZORRO internal hackathon

Team	Involved partners	Hackathon goals
Team 1: Governance	BARTR, ALB, UW	Stakeholder Onboarding and DID Governance/Member Governance management touching on the modules of 5GZORRO Marketplace Portal, Identity & Permissions Manager and Governance Manager.
Team 2: Marketplace	I2CAT, IBM, BARTR, NXW, ALB, UW	Product Offer Creation and "Simple" Offer Discovery in the 5GZORRO Marketplace portal and catalogue handling on the modules of Marketplace Portal, Identity & Permissions Manager, Virtual/Radio Resource Manager, Catalogue, Smart contract lifecycle manager, Smart Resource/Service Discovery and Data Lake.
Team 3: Zero-touch slicing	IBM, NXW, I2CAT, ALB, FBK,	Set-up of a cross-domain slice and monitoring for slice resources touching on the modules regarding ISSM, SRSD, NSSO, VRM, Data Lake and VPNaaS.
Team 4: e-Licensing Control	ATOS, NXW	e-License checking of a given sample service handling the modules for NSSO and e-Licensing Manager.
Team 5: SLA & DataLake	ICOM, ALB, I2CAT, IBM	Discuss the monitoring data ingestion and aggregation into the DL and SLA definition and breach detection approaching the modules for Intelligent SLA

		Breach Prediction, Data Lake, SLA Management/Smart Contract LCM, Monitoring Data Aggregator, TEE, Marketplace portal and ISSM.
--	--	--

Each team jointly worked towards the integration of the components introduced in the corresponding topic required to achieve the full potential envisioned for the 5GZORRO platform.



Figure 2-5: Virtual Group photo of some 5GZORRO developers in 1st Internal hackathon

The positive experience and interesting progress on software consolidation led the Consortium to decide to schedule similar events in each future plenary event, particularly when approaching prototype releases.

2.5 Planned Collaborations with EC Platforms

Following the latest recommendations of Mr. Jean-Eric PAQUET (Director-General of the European Commission's Research and Innovation department), the Consortium has planned its participation to the following EC platforms to further boost the project dissemination of results:

- **CORDIS:** 5GZORRO profile was just published at the beginning of the project. As soon as 5GZORRO Deliverables will be approved by the EC, these will be available for public access from the community.
- **Horizon Results Platform:** it will be used to publish 5GZORRO Key Exploitable Results (KERs) of any nature such as products, services, software, policy recommendations. Once a result is published on this platform, a dedicated team can help the project to promote it for free in various targeted audiences such as investors, public procurers, policy makers, as well as potential business partners.
- **Horizon Results Platform TV:** this platform offers the possibility to interview-show videos or podcasts of experts sharing their specific knowledge and practical insights, tackling the innovators' main challenges and needs. 5GZORRO can take advantage of this opportunity by pushing for having some interviews of its key persons / experts in order to raise attention on the project results.
- **Open Research Europe:** the project Consortium is taking into consideration the enrolment into this new open access publishing platform. The consistent number of original publications stemming from project activities are eligible to be submitted to the platform both during and also after the end of the project.
- **Horizon Results Booster:** Commission free of charge services to support projects in their Dissemination and Exploitation activities. The consortium is considering to use the [Business Plan Development](#) service in the second part of the project in order to bring project's results closer to the market through an effective business plan.

3 Communication Activities

This section reports on the results achieved with communication activities across the various channels which were configured at the beginning of the project (Nov 2020).

3.1 Website

Since the beginning of the project, the project website (www.5gzorro.eu) has been the main channel for project communications. In the first 18 months it has been continuously populated with news, newsletters, blog posts, press releases and the main results of the Consortium (i.e., project deliverables, papers, videos, etc.), which all complemented and completed the communication campaigns on social networks.

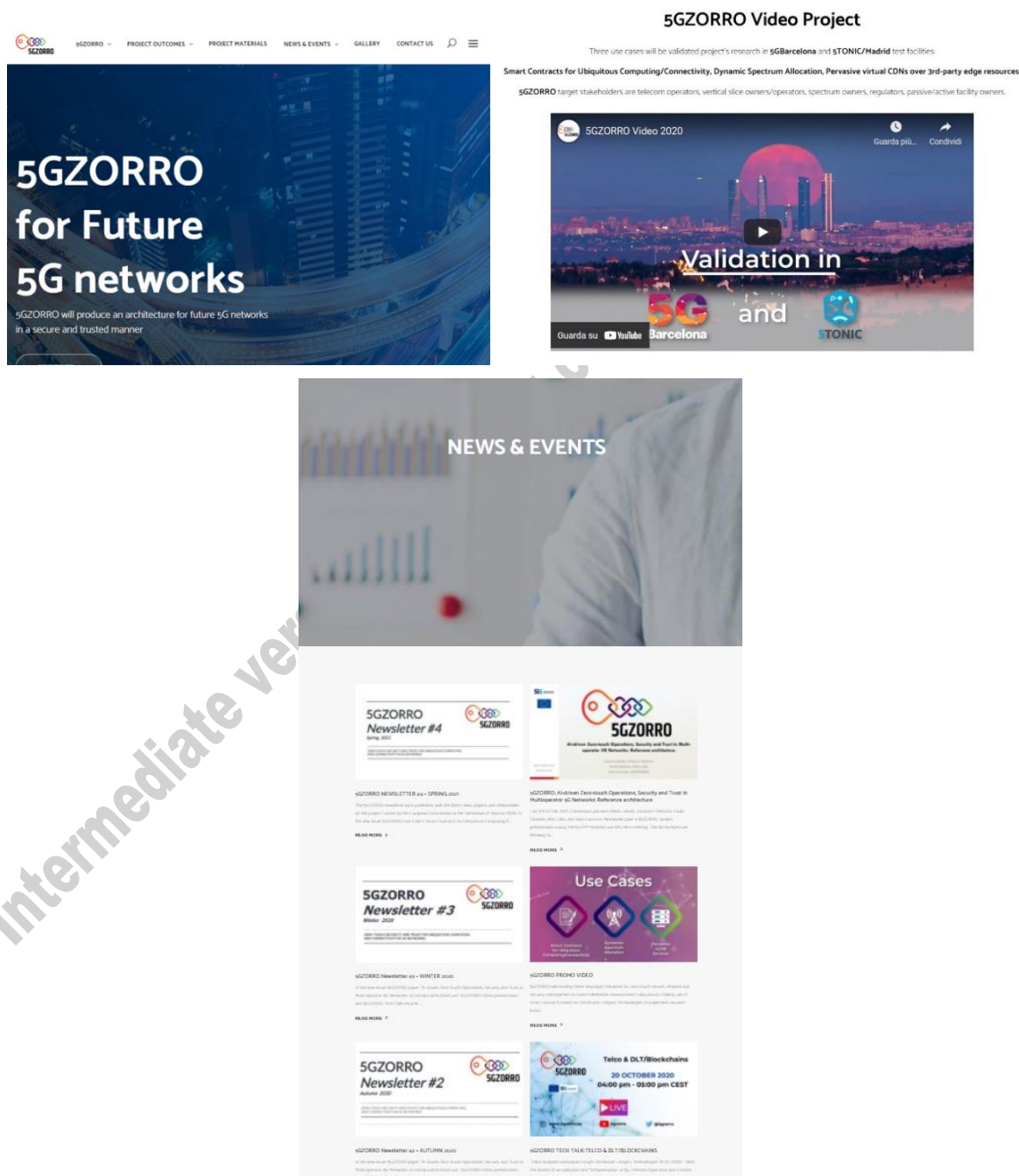


Figure 3-1: 5GZORRO website (homepage, video, and news section)

To measure the attractiveness and impact of the website in terms of number of visitors and engagement metrics, Google Analytics was used.

From January 2020 to March 2021, the number of new users topped up the number of 758, accounting for 80.4 % of all visits. This is a valuable indicator of project popularity, visibility, and promotion of its activities. Also, the page visualization is interestingly high (2.73) with an average of 3:10 minutes of visit duration.

The bounce rate appears still a bit high 58.31%. Efforts to reduce this rate have been activated to understand if visitors accessing the website are not interested in the content offered, despite the value the web brings to the community. If visitors are potentially interested, the website does not provide a recognized value.

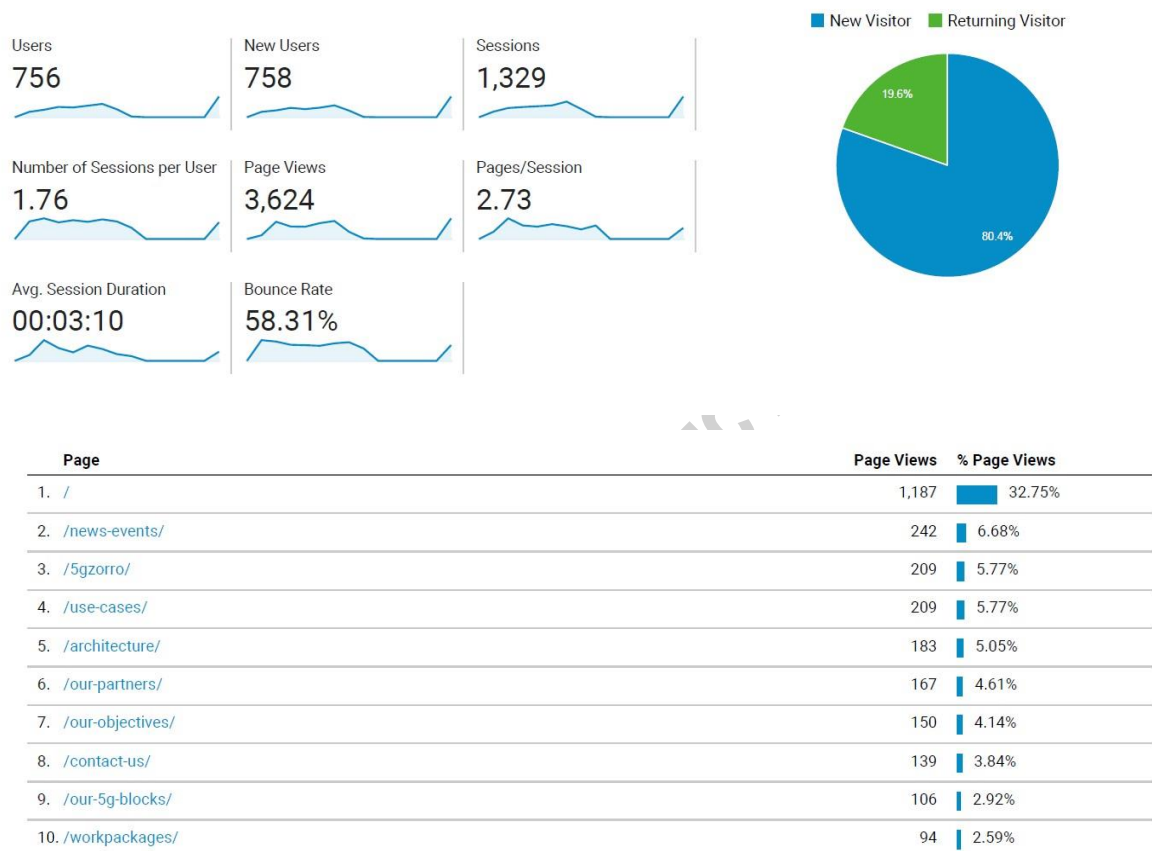


Figure 3-2: 5GZORRO Website Analytics Jan 2020 – Mar 2021

The comparison of analytics between March 2021 vs March 2020 (see Figure 3-3) shows that the Bounce rate decreased substantially to a -18.09%, with a 21.19 % increase on page views, an increase of 77.78% unique page views; reaching an average improved result of 90.81%. It is believed that the publication of papers, blog posts, deliverables, and newsletters have attracted more focused attention on the project.



Figure 3-3: 5GZORRO Website Comparative Analytics March 2020 vs. March 2021

In the following months, a new section on the website will be opened to better link the project website with the public software repository on GitHub (<https://github.com/5GZORRO>). This new page will allow visitors

to obtain comprehensive information on 5GZORRO software prototypes and direct references to the open-source code for download and contribution.

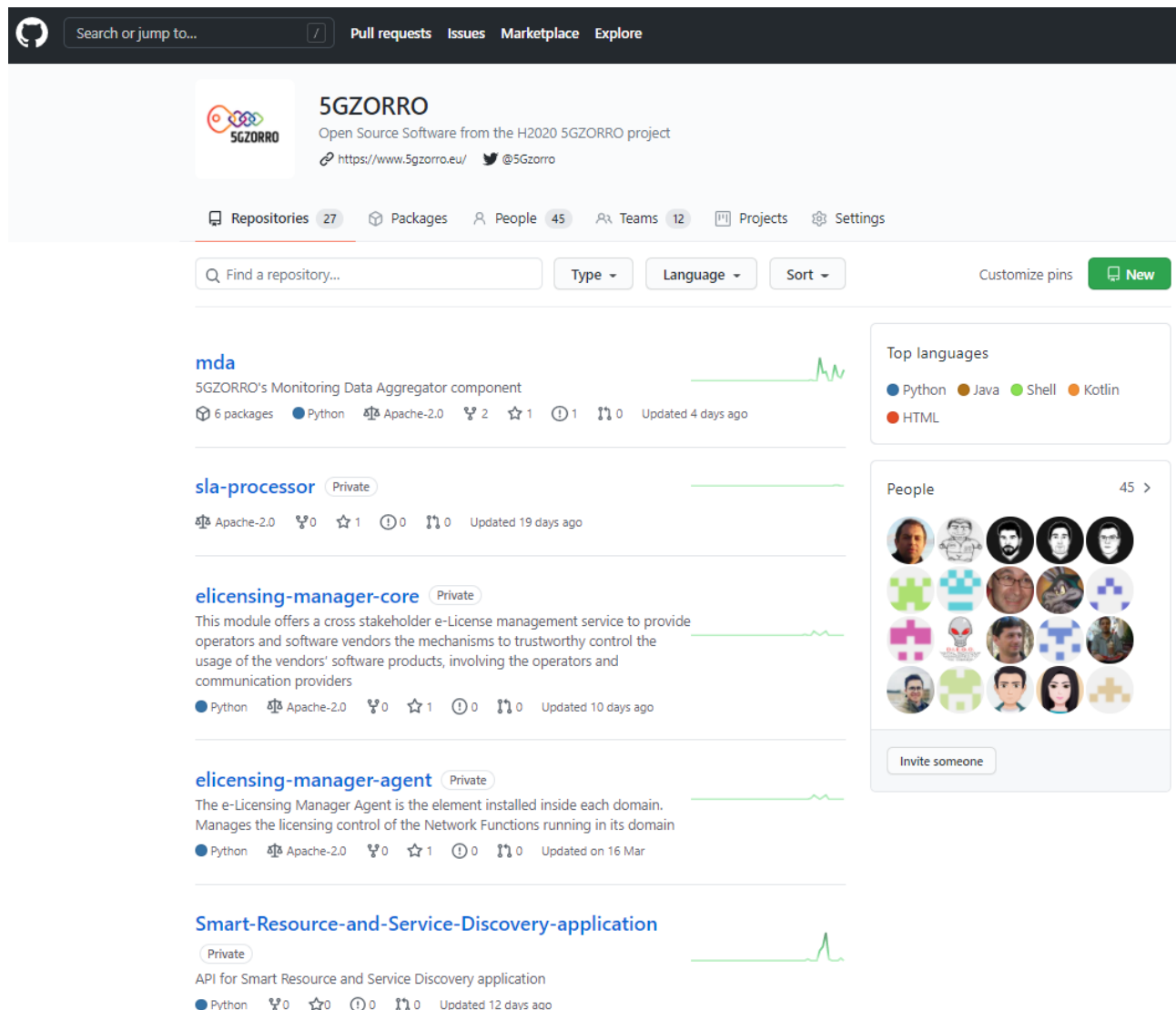


Figure 3-4: 5GZORRO GitHub Repository

3.2 Social Media

The set of 5GZORRO social media channels particularly relevant to communication of research and innovation actions activated have guaranteed and provided an effective communication and dissemination of project's results.

3.2.1 Twitter

Twitter (@5gzorro) is the most immediate and effective tool to communicate project's news, events, and achievements. It allows to keep the 5GZORRO partner, 5G community, EU institutions, media, and the large public of followers updated, informed, and involved in specific trending topics.

The 5GZORRO Twitter account started in Nov 2019 with 95 followers, less than 30 days from account creation; on Oct 2020, the impressions skyrocket to 93.6K in view of 5GZORRO Tech Talk (on 20 Oct 2020); and by April 2021, it has reached a total of **701 followers and 1,738 profile visits**.



Figure 3-5: 5GZORRO Twitter account



Figure 3-6: 5GZORRO Twitter account analytics

Among the followers, there are also important researchers, professors, experts, H2020 projects, institutions. Among the most relevant European and international Top followers, it is worth listing those presented in Table 3-1 due to the potential impact generated by their attention on the project activities.

Table 3-1: Top followers of 5GZORRO's Twitter account

Follower	Description
Thales Security @thallessecurity (10.8K followers) Europe	World-class technology, 80,000 employees and operations in 68 countries make Thales a key player in keeping the public safe and secure, guarding vital infrastructure and protecting the national security interests of countries around the globe.
QLC Chain @QLCchain (32,3K followers) Singapore	QLC Chain is the next generation public chain for Network-as-a-Service (NaaS). It is the multi-dimensional block lattice structured ledger with embedded telecom service capabilities.
Net Technologies @NetTechEU (6,263 followers) Europe	Network Technologies focusing on #5G & the #InternetOfThings/#IoT. Part of @DigitalEU- Flag of European Union.
GSMA @GSMA	represents the interests of +750 mobile operators worldwide, with almost 400 companies in the broader mobile ecosystem, device makers, software

(2,121 followers) <i>International</i>	companies, equipment providers and internet companies, and adjacent industry sectors. The GSMA produces the industry leading MWC events held in Barcelona, Los Angeles and Shanghai, and the Mobile 360 Series of regional conferences.
SEIDOR @seidor (3,389 followers) <i>International</i>	Multinational consulting firm in the technology sector, offers consulting, infrastructure services, implementation, development, maintenance applications, and outsourcing services. Turnover of €464 million in 2019. Workforce +4,800 highly qualified professionals. Service partner: SAP, IBM, Microsoft, Adobe.
Cyberwatching.eu @cyberwatchingeu (1,632 followers) <i>Europe</i>	The EU watch on #cybersecurity & #privacy. The EU's authoritative and independent source for democratising cybersecurity & privacy.
OSM – OpenSourceMANO @OpenSourceMANO (1,416 followers) <i>International</i>	OSM is an ETSI-hosted project developing an Open-Source MANO stack aligned with ETSI NFV.
Dr. Sally Eaves @sallyeaves (117,5K followers) <i>US/UK</i>	Innovating #tech #education #business CEO CTO Advisor Prof #AI #Cloud #IoT #IoT #TechForGood #FinTech #SDGs #STEM #education #CX #Sustainability
CONNECT Centre @connect_ie (4,339 followers) <i>Ireland</i>	Science Foundation Ireland Research Centre for Future Networks & Communications. Co-funded by European Regional Development Fund.
LACChain @LACChain (1,251 followers) <i>Latin America</i>	Global alliance for the development of the Blockchain ecosystem in Latin America and the Caribbean promoted by the @IDB_LAB (Laboratory of #innovation of @the_BID. Mobilizing capital, knowledge, and connections to promote innovation for #inclusion in LAC.

3.2.2 LinkedIn

A more effective communication strategy through LinkedIn was achieved by creating a 5GZORRO “company” profile (www.linkedin.com/company/5gzorro) to implement a more accessible and more direct link of followers to project activities than what could have been possible with a LinkedIn group. The company account has shared good news and updates during the period, but also insights, unusual and curious news from partners, EU institutions, specialized media, and the 5G ecosystem to keep a high level of attention and engagement with partners, followers, other groups connected to 5G, as well as companies, opinion leaders, press, and stakeholders. Always to broaden the project’s audience and highlight the capacities expressed by the Consortium.

The 5GZORRO LinkedIn account grown from 43 in Jan 2020 to **155 members by April 2021**. The visitor’s demographic shows that Research is by far the most significant community that follows the account, most coming from project partners, but also many from other renowned institutions and companies, such as the University of Luxembourg, North-western Polytechnical University, Ghent University, Swansea University, Qualcomm California, IOTA Argentina Community Cluster, Safran Elastomer, Cellnex, SMPTE, BBC, EBU, DigiTech Global Consulting, FastWeb, Dolby Labs, Italtel, Iskratel, Proximus, A-Tono, Kineton, etc.

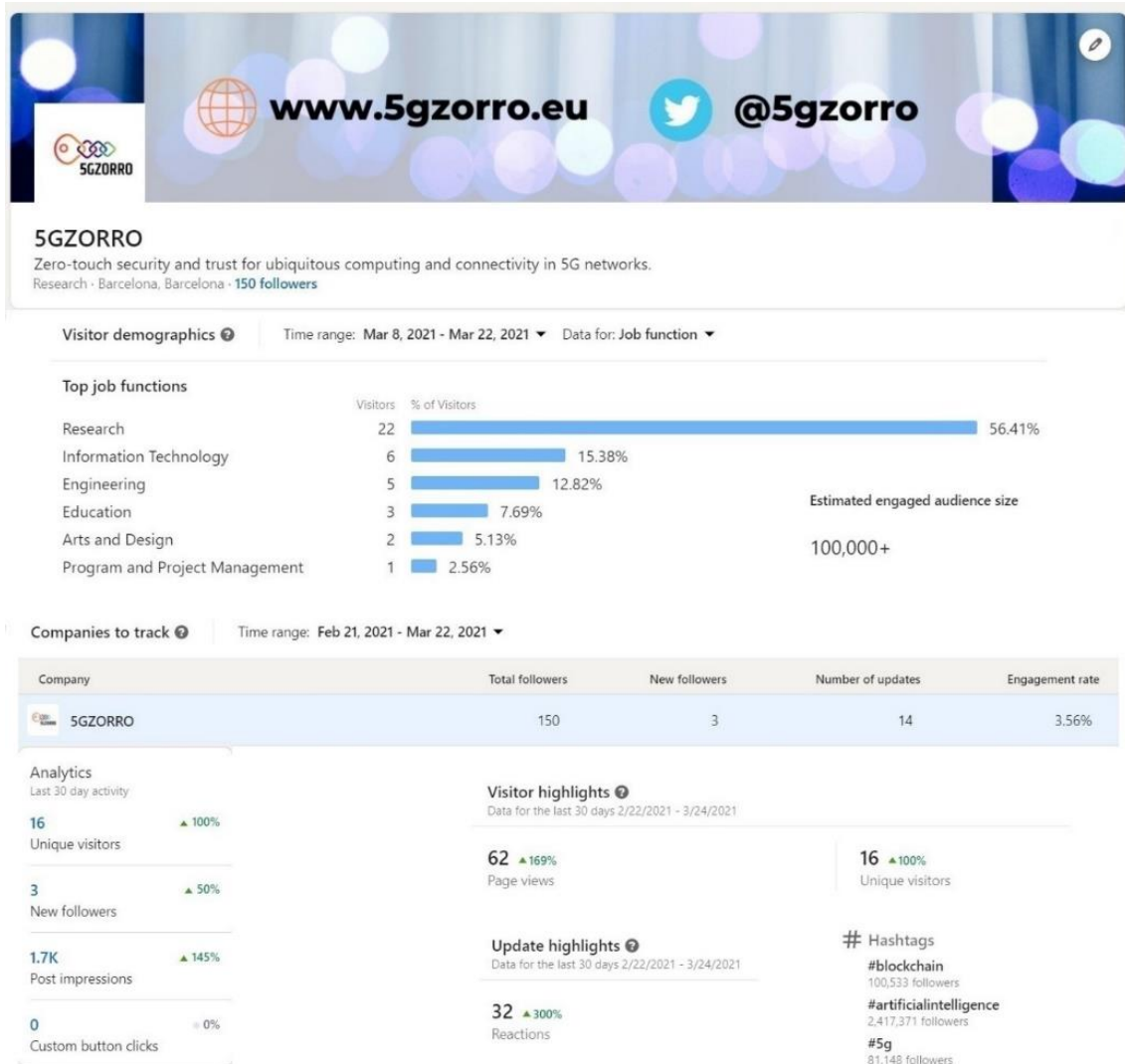


Figure 3-7: 5GZORRO LinkedIn analytics

3.2.3 YouTube

The project YouTube channel (www.youtube.com/channel/UCj6-rzyNR2PtXybmM9waRXOQ/videos) was created to host relevant 5GZORRO presentations, videos, tech talk, and interviews. The first video was created to illustrate the concept, goals, and use cases.

At the moment, **5 videos published in the channel** as described below:

- | | |
|--|---------------------|
| • 5GZORRO introduction – 2'17" | 1464 visualizations |
| • 5GZORRO Tech Talk Telco & DLT/Blockchain – 1h06'37" | 1275 visualizations |
| • Interview to Louisa Gregory, CBAN – 5'55" | 30 visualizations |
| • 5GZORRO presentation at EUCNC 2020 – 22'17" | 140 visualizations |
| • 5GZORRO webinar on Blockchain Fundamentals– 1h40'10" | 23 visualizations |

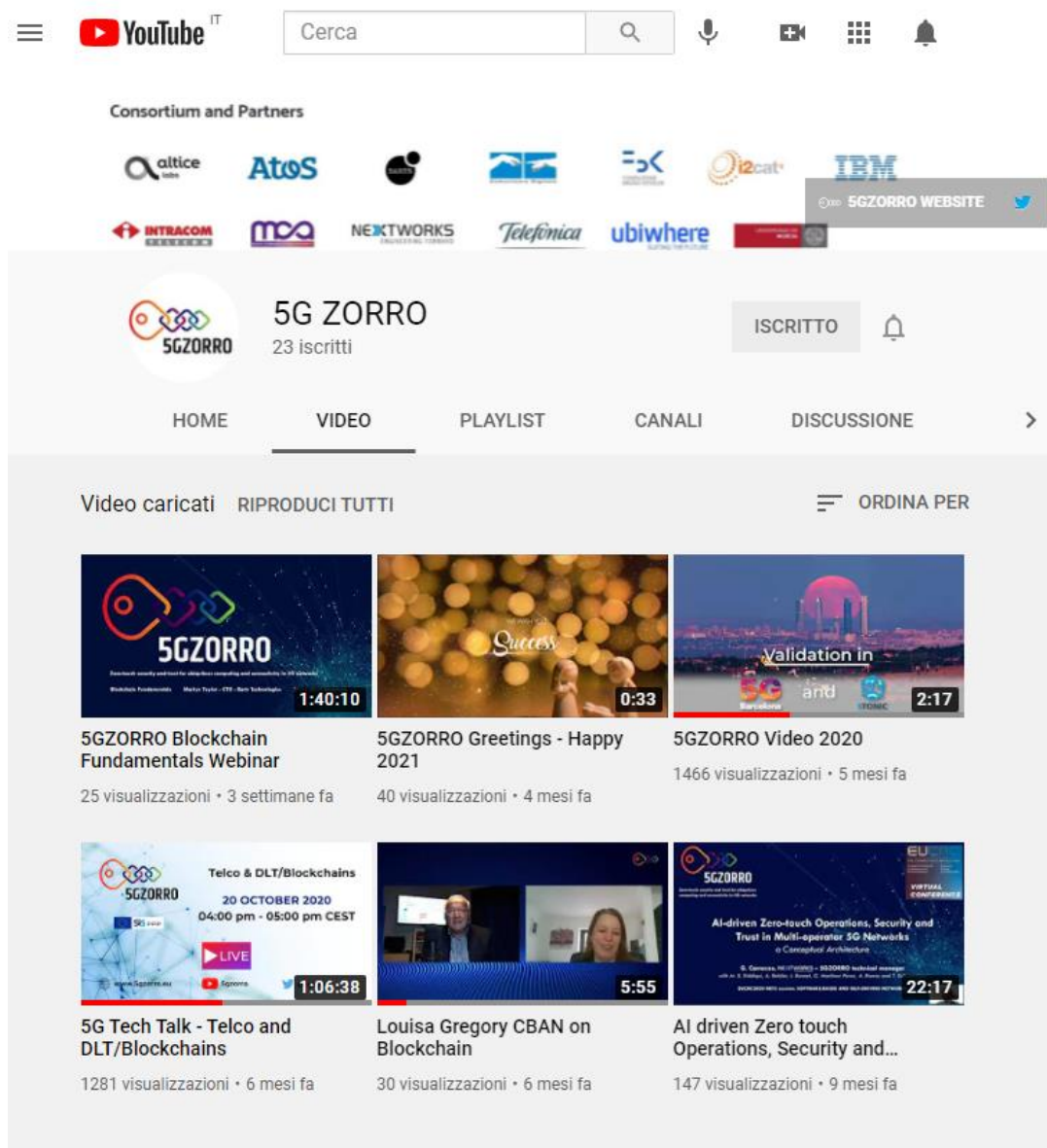


Figure 3-8: Video catalogue on 5GZORRO YouTube channel

To overcome give continuity to engagement with the community via videos, a series of short video interviews (around 1') has been programmed with 5GZORRO partners to complement specific Blog posts and paper publications. The schedule calendar is displayed below:

Table 3-2: Plan for video interviews from July 2021

Date	Video Interviews to 5GZORRO Partners
Jul 2021	Interviews on Security and Trust (WP3-WP4) (1')
Sept 2021	5GZORRO-core platform (1')
Oct 2021	On spectrum sharing and regulation (1')
Dec 2021	DLTs in the Telecom space (1')
Feb 2022	Zero-touch, Radio controllers, O-RAN (1')
Mar 2022	5G Operational data lakes (1')
Apr 2022	5GZORRRO use cases (1')

3.3 Blog Posts

To make 5GZORRO a reference influencer on zero-touch automation, spectrum sharing, AI, and DLTs for 5G, the Consortium started publishing blog posts on specific topics on the project research.

Since Dec 2020, **3 blog posts have been published** in the website dedicated section – www.5gzorro.eu/blog-posts, mostly linked to the major design results achieved in the period.

Table 3-3: 5GZORRO Blog post from the start of the project

Date	Topic	Partners
Dec 2020	Design principles for AI-driven Zero-Touch Operations, Security & Trust in multi-operator 5G Networks	NXW
Feb 2021	5GZORRO Use Case 1: Smart Contracts for Ubiquitous Computing/Connectivity	ATOS
Apr 2021	5GZORRO Use Case 2: Dynamic Spectrum Allocation	ATOS

The plan for future publications of blog posts has been scheduled to better capture mature on a monthly basis the design and development results matured in the meanwhile, as reported in Table 3-4:

Table 3-4: Plan for Blog posts from May 2021

Tentative Date	Blog Post Topic	Partners
May 2021	5GZORRO UC3	ATOS
Jun 2021	Security and Trust (WP3), based on a lightweight excerpt of D3.1.	BARTR
Jul 2021	Security and Trust (WP4), based on a lightweight excerpt of D4.1.	UMU
Sep. 2021	5GZORRO-core platform, based on D4.2 resulting prototypes	NXW, ALL
Oct 2021	On spectrum sharing and regulation	MCA
Dec 2021	DLTs in the Telecom space	BARTR, UW
Jan 2022	On ZSM or Radio controllers, O-RAN, etc...	i2Cat, FBK
Feb 2022	5G Operational data lakes	IBM
Mar 2022	vCDN in pervasive networks	ICOM

3.4 Promotional Material

3.4.1 Promotional Video

To follow a more dynamic communication approach, partners created a 2'16'' video describing 5GZORRO overall concept, core research areas, and use cases.

This video was meant to be in public events and at showcases, originally planned for MWC20 and EUCNC2020.

A renewed version of 5GZORRO video is planned in the upcoming months to show the progress and outcomes of Use Cases and reinforce 5GZORRO as a reference in applying emerging technologies (AI and Blockchain).



Figure 3-9: 5GZORRO Video presentation: www.youtube.com/watch?v=3Cy6nykhiJ0

3.4.2 Promotional Flyer

A project flyer was prepared for publication and distribution during MWC2020 in Barcelona. It describes the 5GZORRO vision, use-cases, and expected outcomes.

5GZORRO flyer: www.5gzorro.eu/wp-content/uploads/2020/11/5GZORRO-Flyer_v.5.7.pdf

Due to absence of physical events, the flyer was published on Newsletter#1 Spring 2020 and through the website and social media.

An updated flyer edition is planned to be prepared in the upcoming months to reflect updates on project results and findings. It will be disseminated at minimum via website and social media channels, hopefully in physical showcase events.

3.5 Press Releases & News

Press releases are commonly used to generate public awareness and reach the general public, industry, Telcos, ICT stakeholders, opinion leaders, institutions related to 5GZORRO research.

Press releases were periodically issued, especially for those events where 5GZORRO activities and relevant participation was expected. Also, news from partners' involvement in other appropriate events were published on the 5GZORRO web and socials.

Press releases issued in the period were aimed at promoting results from important project events as reported in the Table 3-5 below.



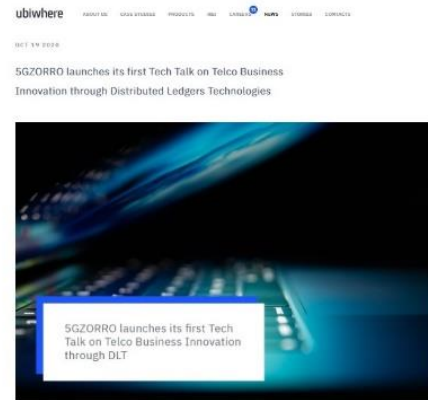
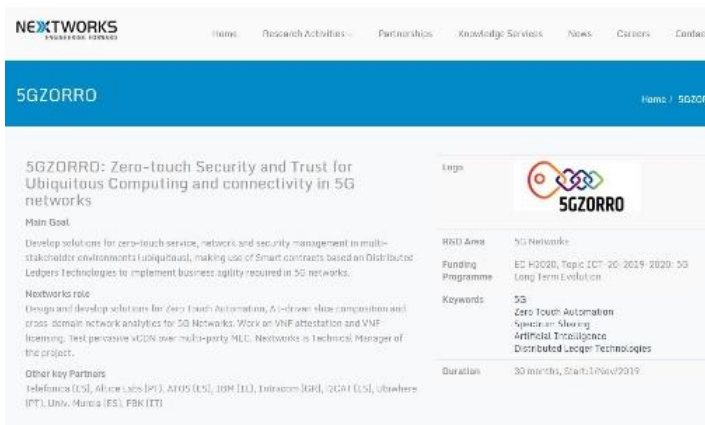
Figure 3-10: 5GZORRO News & Events

Table 3-5: Published Press Releases

Date	Type	Publication Date/Link	Dissemination channels
Nov 2019	5GZORRO Kick-off meeting.	25 Nov 2019 www.5gzorro.eu/kick-off-barcelona	5GZORRO Web/Socials Partners' Web/Socials 5G PPP Web/Socials
Feb 2020	5GZORRO Press Release pre-MWC20 event	10 Feb 2020 www.5gzorro.eu/5gzorro-at-the-mwc-2020	5GZORRO Web/Socials Partners' Web/Socials 5G PPP Web/Socials
June 2020	5GZORRO Press-release post-EUCNC2020 event – results	20 June 2020 www.5gzorro.eu/5gzorro-at-eucnc-2020	5GZORRO Web/Socials Partners' Web/Socials 5G PPP Web/Socials
2020	5GZORRO Tech Talk Press-release	15-19 Oct 2020 www.5gzorro.eu/5gzorro-tech-talktelco-dlt-blockchains	5GZORRO Web/Socials Partners' Web/Socials 5G PPP Web/Socials

In general, for any major conference or exhibition in which the project will participate (e.g., focused on topics in scope with 5GZORRO research like AI, ML, DLTs, security), the communication team will prepare a press release before the event to describe activities and locations, and/or to report participation results post-event.

Additional promotion of 5GZORRO news and events regularly occurs via communication channels (website, social accounts) of the Consortium partners, as shown in Figure 3-11.



5GZORRO project partners are introducing the first of two Tech Talks focused on the theme Telco & DLT/Blockchain: Telco Business Innovation through Distributed Ledgers Technologies on October 20th from 3.00 pm to 4.00 pm WEST.

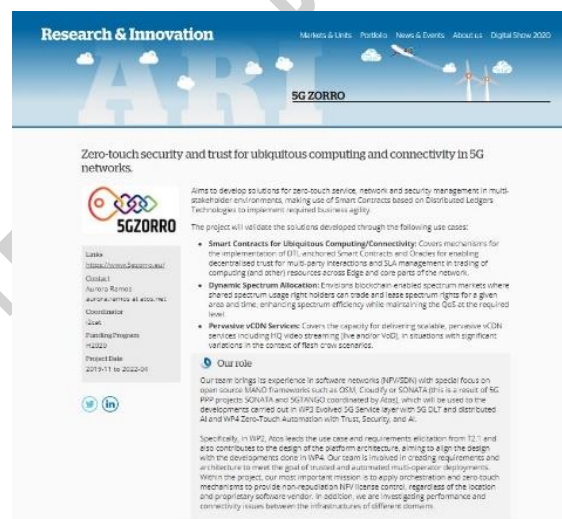
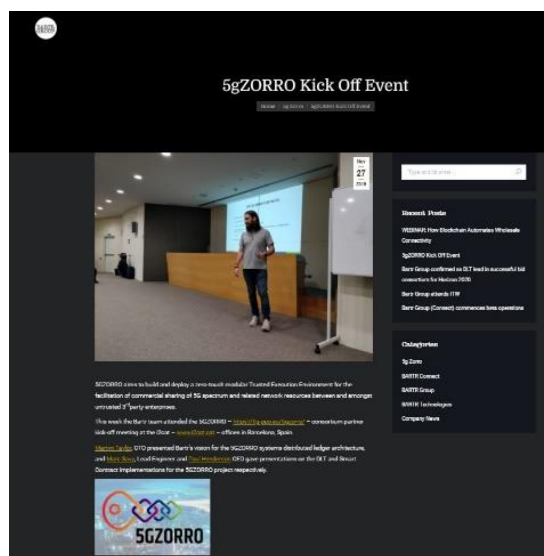


Figure 3-11: Partners press 5GZORRO News & Events

3.6 Newsletters

Newsletters and newflash are effective means to notify summary news to a network of contacts engaged with the project.

4 Newsletters and 1 NewsFlash have been produced to highlight project achievements in the period Nov 2020 – Apr 2021.

Table 3-6: 5GZORRO Newsletters in the period M01-M18

Document / Date	Covered Topics	Link	Analytics
NewsLetter#1 Summer2020	5GZORRO Website, Presentation at EUCNC2020, Upcoming Activity: Tech Talk#1, 5GZORRO digital Flyer.	www.5gzorro.eu/5gzorro-newsletter-1-summer-2020	N/A
NewsLetter#2 Autumn 2020	5GZORRO Website, Papers#1, Video presentation, Upcoming events: Tech Talk#2, Past Events: Tech Talk#1, Layer123, IEEE NFV-SDN.	www.5gzorro.eu/5gzorro-newsletter-2-autumn-2020	Recipients: 2347 Open: 315 Clicks: 54 Twitter: 798 impressions

NewsLetter#3 Winter 2020	Season Greetings (Dec 2020), Blog post#1, Papers#1, Public Deliverables D2.1, D2.2, D6.1 Upcoming Events 5GZORRO Tech Talk II.	www.5gzorro.eu/5gzorro-newsletter-3-winter-2020	Recipients: 2515 Open: 363 Clicks: 60 Twitter: 1398 impressions
NewsLetter#4 Spring 2021	Blog post#2 Paper#2 Public Deliverable D.3.1, D4.1; Past Events: 5G PPP Architecture WG presentation.	www.5gzorro.eu/5gzorro-newsletter4-spring-2021	Recipients: 1946 Open: 310 Clicks: 114 Twitter: 19806 impressions
NewsFlash #1 Spring 2021	Papers#3 + #4, Press News Plenary + Hackathon, Blog post#3	www.5gzorro.eu/5gzorro-newsflash-1-spring-2021/	Recipients: 1900 Open: 299 Clicks: 491

To amend these delays and achieve KPIs, a new calendar of five newsletters from 2021 and 2022 are planned to be issued. They will include, as always, relevant information from previews three months, such as contributions in workshops and congress, pictures, videos, publications, papers, dissemination actions and links to blog posts contents.

Table 3-7: Plan for 5GZORRO Newsletters from June 2021

Date	Document	Covered Topics
Jun 2021	NewsLetter#5	Blog post, Papers, Upcoming Events (EUCNC2021-results)
Sept 2021	NewsLetter#6	Blog post, Papers, Upcoming Events (5GZORRO Tech Talks)
Oct 2021	NewsFlash#2	Collection of news updates
Dec 2021	NewsLetter#7	Season Greetings, Blog post, Papers, Upcoming Events (MWC2022), Past events
Mar 2022	NewsLetter#8	Blog post, Papers, Upcoming Events (MWC2022-results), Past events
Apr 2022	NewsFlash#3	Collection of news updates
Jun 2022	NewsLetter#9	5GZORRO final outcomes/results

4 Standardization and Open-Source Activities

The standardization activities during this first phase of the project (M1-M18) have been essentially focused on setting the foundations to future contributions, beyond the initial task of identifying relevant and reachable standards initiatives.

4.1 Work within Standard Organizations

While the technical work packages focused on the definition of concrete business goals, the refinement of use cases, and the definition, design and initial development of the technology foundations for the 5GZORRO framework, the effort on standardization was centred on three main lines:

- consolidating the leadership in the ETSI Industry Specification Group on Permissioned Distributed Ledgers ([ETSI PDL](#));
- support the chartering of new standards work suitable to host contributions from the project in ETSI ISG on Experiential Networked Intelligence ([ETSI ENI](#)) and on Zero touch network & Service Management ([ETSI ZSM](#));
- consolidating the different standards proposals around the emerging Autonomous Network concepts within ETSI ZSM and ETSI ENI.

Apart from this, the mechanisms for reporting and tracking standards activities were put in place, using the project collaborative environment.

The leadership by TID of the **ETSI ISG PDL**, specifically focused on DLT operational issues, consolidated with new Term of Reference approved by the ETSI Director General until the end of 2022. Beyond defining the scope of the future work of the group, the 5GZORRO team has collaborated on the chartering of three work-items:

- PDL009 (report on federated data);
- PDL010 (report on DLT offline operations);
- PDL011 (on smart contracts, that will become the first specification by the group).

Two contributions have been made and approved in ETSI ISG PDL, addressing the general goals and table of contents for PDL009, and considerations on off-line scenarios, TEE applicability and the usage of sidechaining for PDL010. The group believes there is a good opportunity to contribute with a proof-of-concept based on the project use cases to the PDL011 specification. The project is preparing a presentation on its activities at the next ETSI ISG PDL plenary.

Within **ETSI ISG ENI**, which focuses on the application of AI to network management),

- **TID facilitated the approval of work items** on intent models (ENI023), the analysis of control loop architectures (ENI027) and knowledge representation (ENI029). In the first case, the use of intent expressions in brokering and the applicability of smart contracts for verification are being considered. For the last two, contributions on automation mechanisms are foreseen.
- **NXW contributed with their Vertical Slicer to the Proof of Concept #09 on Autonomous Network Slice Management for 5G Vertical Services**, which has direct impact on 5GZORRO platform

Related to the **ETSI ISG ZSM**, which deals with zero-touch network service management, the project team is **preparing a presentation** with the specific goal of addressing the growing interest on autonomous networks, and more specifically on the multi-domain scenarios being considered in this group. The main target will be the realization of proofs-of-concept regarding the application of multi-domain control loops and service categories.

At the **IETF/IRTF**, TID contributed to a **document on the classification of intent declarations and their applications** (*draft-irtf-nmrg-ibn-intent-classification*) that is already adopted by the NMRG (Network Management Research Group), and currently going through the process of group last call, the initial step towards its publication as informative RFC. In addition, a **new charter and timeframe extension for the IETF Interface to Network Security Functions WG (I2NSF)** (dealing with the management of network security functions) has been submitted to the IETF Security Area Director for its approval. If this extension is approved, 5GZORRO will be in the position of contributing results on trust evaluation, capability discovery and managed security.

As the concepts around Autonomous Networks (AN) are stabilizing, the project is actively participating in core initiatives such as the **TMForum Autonomous Networks Project**, the recently launched **ITU-T Focus Group FG-AN**, and the specific **ETSI OCG AN initiative**, where TID have been invited based on the ETSI ISG PDL leadership position. This participation opens opportunities for contribution to open-source communities also focused on Autonomous Network technologies, like ONAP, OpenConfig, OSM, TIP.

Related to Radio Spectrum Policy matters, the Consortium participated through MCA to the **Radio Spectrum Policy Group (RSPG)** from the European Commission, contributing specifically to the recent publication "[RSPG21-016 – RSPG Report on Spectrum Sharing: A forward-looking survey](#)" in which the 5GZORRO project is also mentioned among the initiatives working on DLT-based and real-time spectrum management with allocations among diverse spectrum owners.

In the area of DLTs, good visibility exists for some partners within the Communications Business Automation Network initiative – [CBAN](#) (i.e., BARTR, TID), which might lead to 5GZORRO contributions in the area of MVPs for 5G Network Slicing in the next period.

4.2 Work with Open-Source Communities

Related to Open Source, the Consortium continued following and contributing mostly to the **ETSI OpenSourceMano** community ([ETSI OSM](#)), and specifically:

- ETSI OSM Release 9 has been selected as one of the NFV Orchestrator for the 5GZORRO platform
- ICOM participated to the [ETSI NFV&MEC Remote API Plugtests 2021](#) in Feb 2021 with their CDN Anywhere Solution deployed as Edge vCDN solution. Network Service Descriptors and VNF Descriptors were defined and the translation from Opensource MANO Rel. 8 descriptors to SOL006 & Cloud-Native attributes was tested.

Good links exist from some partners (i.e., IBM, TID, NXW) with the Cloud Native Computing Foundation [CNCF](#) and [Open Data Hub](#), which might be recipient of 5GZORRO contributions in the next period.

Other examples of project of interest for the Consortium in relation to platform development activities are the [Accord project](#), which is working to provide the modelling of TMForum 623 based SLA using Accord's markup and logic representation, and the [SCONE project and framework](#), used to build x86 secure TEE platforms.

4.3 Towards Jointly Exploitable Assets

As the technical implementation of 5GZORRO is progressing, partners have started to jointly identify the main innovative results which will stand as results from the project and might be explored for joint exploitation activities.

The innovative assets summarised in Table 4-1 are mainly based on 5GZORRO software modules for the time being, due to the focus of the project activities of the first period (M1-M18) and the integration within testbed platforms for use case validations planned for the next period.

Table 4-1: 5GZORRO Jointly Exploitable Assets

5GZORRO asset	Preliminary Exploitation Strategy	Involved partners	Target (SDO/Open-source communities/projects)
Smart Discovery and Catalogue	The intent-based Smart Discovery module is following the same principles of zero-touch foundations discussed e.g., within ETSI ZSM. For this reason, 5GZORRO intends to establish a liaison with such ISG starting by demonstrating the platform's capabilities and jointly discuss how such work can be further improved and jointly discuss how it may accelerate the WG's efforts.	NXW, I2CAT, BARTR, TID, IBM, ALB	<ul style="list-style-type: none"> ETSI ZSM for a potential PoC
ISSM & Vertical Slicer	The main innovation here lies in adopting cloud native, workflow-based, declarative approach to orchestration. In 5GZORRO this is realised with open-source projects (cloud native platform like Kubernetes, serverless engines like OpenWhisk, workflow engine like Argo, model-based optimization engines like OptoPlanner) which are integrated and extend with the Nextworks' Vertical Slicer (open-source). Specific Argo flows and OptoPlanner models are being developed within 5GZORRO as well as support of TMForum APIs. Beyond slicing, the ISSM can be extended as MEC application orchestrator.	IBM, NXW	<ul style="list-style-type: none"> Contributions to open-source projects like OpenWhisk, OptoPlanner, Argo. ETSI ZSM for a potential PoC
Cloud-native MEC platform	The 5GZORRO extended k8s platform can act as MEC Host that MNOs can offer on 5GZORRO Marketplace and that ISSM can deploy to run MEC services on. Possible extensions are planned in support for multiple networks, network slicing, integration with 5G Core. In the next phase of the project a cloud-native MEC platform can be built and integrates with ISSM through MEC-specific workflows following standards and APIs put forward by ETSI MEC.	IBM, NXW	<ul style="list-style-type: none"> ETSI MEC for a potential PoC Validation with MEC API sandbox
Legal Prose Repository	The Legal Prose Repository stores SLA templates which are properly filled and agreed upon by different parties when making an order on the marketplace. TMForum has produced an SLA RESTful specification, as well as a common data model to be used in the Telecom space.	BARTR, ALB	<ul style="list-style-type: none"> TMForum for a potential demonstrator

5GZORRO asset	Preliminary Exploitation Strategy	Involved partners	Target (SDO/Open-source communities/projects)
	For this reason, 5GZORRO has adopted the standard, having modelled the Accord-based templates accordingly, and, thus, will be contributing back to this project with this particular model. Furthermore, collaboration with TMForum is envisioned, so as to demonstrate its applicability in a DLT-based Telecom environment, discussing also if such produced software may be added to TMForum's software repository.		<ul style="list-style-type: none"> Contributions to open-source project Accord
Identity Management	The 5GZORRO identity management solutions based on Distributed Identifiers has potentials for contributions under the open-source project Hyperledger Cloud Agent Python (ACA-Py). Involved partners are discussing the Open-source project's roadmap and list of planned features according to required features from 5GZORRO Identity and Permissions module.	ALB, BARTR	<ul style="list-style-type: none"> Contributions to open-source project Hyperledger Aires and Hyperledger Cloud Agent Python (ACA-py)
TEE for Trusted Computing	Providing that 5GZORRO is using SCONE as underlying tool enabling trusted and confidential computing, the Consortium is in the process of determining how viable and feasible it is to have it integrated with the 5GZORRO orchestration layer. Proven feasible, an extension to the particular SCONE module will be provided, improving that particular component.	UW, NXW, I2CAT	<ul style="list-style-type: none"> Contributions to open-source project SCONE
VPNaaS	5GZORRO is working on the configuration of secure cross-domain connections on demand at the slice level. The Inter-domain module will enable the configuration and deployment of a VPN tunnel between two different slice network endpoints.	UMU, i2CAT, NXW	<ul style="list-style-type: none"> Contributions to open-source via 5GZORRO GitHub

The strategy to ensure meaningful impact and outreach is being continuously updated, in order to also include and extend to evaluations to sustainability of the expected results, during and after the project end. In this respect, partners will actively engage European Standardisation Bodies and Open-Source Communities leveraging relations individually established to validate the exploitability of the aforementioned results.

5 Conclusions

This deliverable has reported on the results of dissemination, communication, and standardization activities carried out by the 5GZORRO Consortium during the first 18 months.

Overall, the Consortium has successfully worked to build a consistent and relevant impact through the preliminary project results, despite of the adverse conditions due to COVID-19 pandemic.

For the future period, the Consortium just counts on a significant number of publications for which review feedback is expected and various events have been planned where to publish the promotion of project results and continue the engagement with the scientific and industrial communities working on 5G.

5.1 Progress on Impact creation KPIs

A number of KPIs are identified in the 5GZORRO Description of the Action which are listed in Table 5-1 below. The progress on the achievement of respective targets has been evaluated at M18 (Apr 2021) and presented in the same table. It shows a fulfilment trend in line with the plan with substantial neutralization of the negative effects of pandemic restrictions.

Table 5-1: 5GZORRO Impact Creation KPIs –Status in Apr 2021

Key Performance Indicators	M12	M22	M30 (final target)	Status at M18
<i>Participation in relevant scientific events</i>	3	6	8	5
<i>Presentation or demonstrations of 5GZORRO in industry events</i>	3	7	10	6
<i>Number of scientific publications (journals and conference proceedings)</i>	3	20	30	12
<i>Number of standard contributions with adoption status</i>	1	2	>5	2
<i>Number of organized events, 5G PPP synergies, workshops</i>	2	4	6	4
<i>Contributions to joint publications from within 5G PPP WGs</i>	1	3	>5	4
<i>Number of yearly unique visits on 5GZORRO website</i>	>3.500	>7.000	>10.000	>750
<i>Social media channels followers</i>	>800	>1.400	>2.000	>879
<i>Press and news releases</i>	3	7	11	4
<i>5GZORRO Newsletter</i>	4	8	11	5
<i>Videos views on YouTube</i>	>300	>600	>800	>2900
<i>5GZORRO events</i>	3	4	5	3
<i>Joint events, workshops and networking</i>	4	5	9	6
<i>Trainings and workshops</i>	2	3	5	4 (2 internal)

6 Abbreviations and Definitions

6.1 Definitions

No definition introduced in this deliverable.

6.2 Abbreviations

5G IA	5G Infrastructure Association
5G PPP	5G Public Private Partnership
AIOps	Artificial Intelligence for IT operations
CNF	Cloud Native Function
DoA	Description of Action
DID	Distributed Identifier
DLT	Distributed Ledger Technology
EC	European Commission
ENI	Experiential Networked Intelligence
IPR	Intellectual Property Rights
LCM	LifeCycle Management
MANO	Management and Orchestration
NFV	Networks Function Virtualization
NFVI	Networks Function Virtualization Infrastructure
NFVO	Networks Function Virtualization Orchestrator
NSD	Network Service Descriptor
NSM	Network Service Mesh
OSM	OpenSourceMANO
PDL	Permissioned Distributed Ledgers
PoC	Proof of Concept
PPP	Public Private partnership
SBA	Service Based Architecture
SBI	Service Based Interface
SC	Smart Contract
SDO	Standard Developing Organization
SM	Service Mesh
VIM	Virtual Infrastructure Manager
VNF	Virtual Network Function
VNFM	Virtual Network Function Manager
WG	Working Group
WP	Work Package
ZSM	Zero touch network & Service Management

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