

ORIGAMI

Optimized resource integration and global architecture for mobile
infrastructure for 6G

Deliverable D5.1: Communication, dissemination, and
exploitation plan (CoDEP)

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V1.0	Final version

GLOSSARY

6G-IA SB	6G-IA Steering Board
6G-IA TB	6G-IA Technical Board
AF	Application Function
CA	Consortium Agreement
CCL	Compute Continuum Layer
CoDEP	Communication, Dissemination and Exploitation Plan
DoA	Description of the Action
DOI	Digital Object Identifier
EA	Ethical Advisor
EC	European Commission
EM	Ethical Manager
GA	Grant Agreement
HFT	High-Frequency Trading
ICML	International Conference on Machine Learning
IETF	Internet Engineering Task Force
IPR	Intellectual Property Rights
ISG	Industry Specification Group
KER	Key Exploitable Result
MEC	Multi-access Edge Computing
MNO	Mobile Network Operators
MWC	Mobile World Congress
NEF	Network Exposure Function
NI	Network Intelligent
OER	Open Educational Resources
PC	Project Coordinator
PoC	Proof of Concept
R&I	Research and Innovation
RRI	Responsible Research and Innovation
SDO	Standards Development Organization
SIEM	Security Information and Event Management
SNS JU	Smart Networks and Services Joint Undertaking
TC	Technical Committee
TM	Technical Manager
TRL	Technology Readiness Level
WG	Working Group

EXECUTIVE SUMMARY

This document outlines the communication, dissemination, and exploitation plan (CoDEP) of the ORIGAMI project and presents the initial steps towards the implementation of the same.

To ensure that the results of ORIGAMI reach relevant communities and to spread the innovations produced by the project, the CoDEP implements a comprehensive dissemination and communication strategy, by targeting different audiences and tailoring communication activities accordingly. As set out in the Description of the Action (DoA) of the Grant Agreement (GA), the CoDEP of ORIGAMI plans the communication, dissemination, and exploitation activities of the project.

- Communication includes all the activities related to the promotion of the project and its results beyond the project's own community, so as to explain the research results in layman's terms to the media and the general public.
- Dissemination includes activities related to raising awareness of the project results within the technical community working on the broad field of computer science with a focus on communication systems: in general, this will be achieved through publications, organization of scientific events and participation in academic conferences.
- Exploitation finally covers activities aiming at using the results in further research activities other than those covered by the project, such as developing and marketing products or processes, creating and providing innovative services, or achieving impact in standardization activities.

This document outlines the different stages of the ORIGAMI CoDEP, and then focuses on the first phase to be executed during the initial stages of the project throughout the first year of execution of the action. This phase primarily aims at raising awareness about the vision and methodology set forth by ORIGAMI. Therefore, this phase focuses on communication activities (e.g., setting up the web portal and social media accounts and high-level project presentations) to make the project known not just to the technical community but to a larger audience outside the technical community already working in the topics addressed by the project, including the general non-expert public. Dissemination, exploitation, and standardization activities also start in this phase with the outlining of suitable plans to be followed throughout the project execution.

The document also presents early results achieved by the ORIGAMI consortium during the first three months of execution of the project. This includes communication and dissemination accomplishments such as the setup of the official website and social media accounts, the preparation of the first project press release and project leaflet, as well as initial scientific publications produced in the context of the project.

KEYWORDS

Communication, Dissemination, Exploitation, Standardization, Open source, Strategy.

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1 INTRODUCTION

The ORIGAMI project defines a dedicated Communication, Dissemination, and Exploitation Plan (CoDEP) that outlines the overall plan for all activities related to the diffusion of results generated by the consortium. The ORIGAMI CoDEP aims at changing the mindset of researchers and end users in industry and academia by promoting the adoption of the new layers proposed by ORIGAMI in architectural designs; it also encourages the widespread adoption of the solutions developed by ORIGAMI, including by major standardization bodies; and it fosters the communication to the general public about the implications that the ORIGAMI vision has on societal aspects. Therefore, the CoDEP targets the following three dimensions for the diffusion of the ORIGAMI action.

- Communication activities. These activities encompass all actions concerning the promotion of the project and its results beyond the project's own community. Hence, the target of this activity is the non-specialist general public, and the message shall be encoded in a way that is understood by this audience.
- Dissemination activities. These activities have the goal of raising awareness of the ORIGAMI results in the technical community that is working and researching in mobile telecommunications. These activities will usually be performed through peer-reviewed publications in scientific conferences and journals, and through participation and organization of technical events.
- Exploitation activities. These activities cover initiatives that foster further research activities, i.e., other than those covered by ORIGAMI. These include (i) activities to develop, create and market products or processes, (ii) activities to create and provide a service, and (iii) standardization activities.

1.1 GOALS OF THE ORIGAMI CoDEP

To achieve these goals, the ORIGAMI CoDEP aims at implementing the measures detailed next, which are fully aligned with the Description of Action (DoA) in the project Grant Agreement (GA).

- To promote the widespread adoption of our technology, ORIGAMI will disseminate project outcomes to key stakeholders in the industrial community, including network operators, network function vendors, cloud providers, and possibly network service providers who stand to benefit from the developed technology. To achieve this, the CoDEP plans for three industrial workshops outside the consortium, as well as a series of webinars on our project technologies. The workshops will focus on specific target groups, i.e., cloud infrastructure providers, service providers and the broader network community. Via these activities, the CoDEP fosters adoption by stakeholders outside the consortium.
- To promote the long-term adoption of the project technology, ORIGAMI will disseminate the project results to the scientific community. To this end, the CoDEP plans for publishing the project findings in high-quality scientific venues. Based on the ORIGAMI partners' publication record, the CoDEP anticipates producing at least 80 publications, also targeting highly selective venues that publish research result which really have the potential to shape the future technology landscape (e.g., conferences ranked A/A* in CORE¹ and Web of Science² Q1 journals). By publishing results in such prestigious scientific venues, the project will contribute

¹ CORE Conference Portal, <http://portal.core.edu.au/conf-ranks/>

² Web of Science Journal Info, <https://wos-journal.info/>

to the advancement of the field and encourage the adoption of our technology by the scientific community.

- To encourage the widespread adoption of our technology and facilitate its rapid commercial utilization, ORIGAMI aims at developing a new ecosystem of network solutions that integrates expertise in access, core, and orchestration network function design. Accordingly, the CoDEP plans for contributing to the activities of a wide range of relevant standardization bodies, so as to bring together different areas of expertise and pave the way for a powerful architectural platform for 6G networks that can support a wide range of applications and use cases, including new ones that involve emerging players.
- To protect the key innovations of the project, ORIGAMI also intends to preserve the commercial interest and strategic positioning of its partners. To this end, the CoDEP pursues a plan of patent protection for the project findings. At the same time, we are committed to providing players outside the consortium with fair, reasonable, and non-discriminatory access to our project findings through licensing agreements. By striking a balance between protecting our commercial interests and fostering the adoption of our technology, we aim to position ourselves as a leader in the industry and ensure the long-term success of our project.
- To promote the adoption of its technology, ORIGAMI will foster the publication of developed solutions as open-source software, encourage collaboration, accelerate innovation, and position the project as a reference in the industry. To this end, the CoDEP includes plans for making the project solutions freely available to the community, and to contribute to CAMARA, i.e., the major open-source initiative that the GSMA.
- To generate awareness about our project technologies and attract future researchers with the necessary competences, ORIGAMI will communicate all project outcomes to a wide range of audiences. The CoDEP includes plans to convey the implications of the ORIGAMI activities to the general public and students, promoting the benefits of the project technology and raise interest about the potential impact of its findings, potentially inspiring the next generation of researchers and encourage them to pursue careers in this field.

1.2 TIMELINE OF THE ORIGAMI CoDEP

The measures presented above will be implemented according to a practical sequence of CoDEP phases. These phases are detailed next and emphasize the appropriate activities for each stage of ORIGAMI. Their timeline is also illustrated in Figure 1.

1.2.1 CoDEP PHASE 1: RAISE AWARENESS

The raise awareness phase is executed at the beginning of the project throughout its first year. The focus is on communication activities such as setting up the website, social media coverage, and high-level overview presentations. At such early stages of the project, the objective is to make the project known, not only within the research community, but also to a larger audience including the general public. As depicted in Figure 1, dissemination and standardization activities also start at this phase of the project, with preliminary technical contributions. Specifically, this early stage focuses on the following set of activities.

- Setting up the official ORIGAMI website and social media accounts.
- Designing the project brochure.
- Publishing press releases about the vision of ORIGAMI.
- Presenting the high-level project concept and participating at events to explain project scope.
- Participating in events for a general audience such as open science weeks.

- Lecturing in university courses about the innovations of ORIGAMI.
- Appoint representatives for the SNS/6G-IS working groups (WGs).

The aforementioned activities are allocated more effort at the beginning of the project, in order to raise awareness and set up the initial framework used for communication throughout the project, yet the timeline spans the lifetime of the whole project.

1.2.2 CoDEP PHASE 2: RESULT PRESENTATION

During the result presentation phase, ORIGAMI will increase focus on dissemination and exploitation activities, which at this stage will rely on actual results produced by the project. Indeed, results obtained via dependable simulations, measurement-driven analyses and controlled experiments in laboratory environments are expected to be produced during this stage, and the CoDEP plans their publication in top-tier scientific conferences and workshops. Preliminary demonstrations, including at events such as Mobile World Congress or EuCNC, will be also envisioned. In more detail, the focus will be put into the following set of activities.

- Dissemination and communication
 - Publishing of research results in peer-reviewed scientific conferences, workshops and journals.
 - Enrolling of PhD and Master students on topics related to the ORIGAMI project.
 - Participating in public exhibitions and demonstrations.
 - Organizing special events, including industrial workshops.
 - Collaborating with other relevant research projects and initiatives, especially with the SNS and 6G-IA.
- Exploitation
 - Identifying products and services that may integrate solutions developed in the project.
 - Issuing patents and licensing ORIGAMI solutions.
 - Contributing to relevant open-source software projects.
 - Contributing to relevant standardization bodies and activities.

1.2.3 CoDEP PHASE 3: DEMONSTRATION

In the demonstration phase, the CoDEP re-focuses on the development of demonstration and proof-of-concept (PoC) prototypes of the solutions designed and implemented in ORIGAMI. These activities will help validate the scientific concepts underpinning the project and will empower the dissemination and communication of more mature results to the scientific and industry communities, as well as to the general public at large. This phase thus encompasses all aspects of dissemination, communication and exploitation, and the main target is the diffusion of convincing demonstrators at a variety of events.

1.2.4 CoDEP PHASE 4: LONG-LASTING IMPACT

The final stage of the CoDEP is the long-lasting impact, which will begin towards the end of the project lifetime and will last several months after ORIGAMI has concluded. During this stage, the partners of the project will keep disseminating the results of ORIGAMI and exploiting the solutions designed and developed in the project towards technology transfer into actual products and services. The industrial partners of ORIGAMI will play a critical role in this phase, with the aim of augmenting their portfolio of technical offers with solutions originated in the project and suitably protected via IPR and licenses.

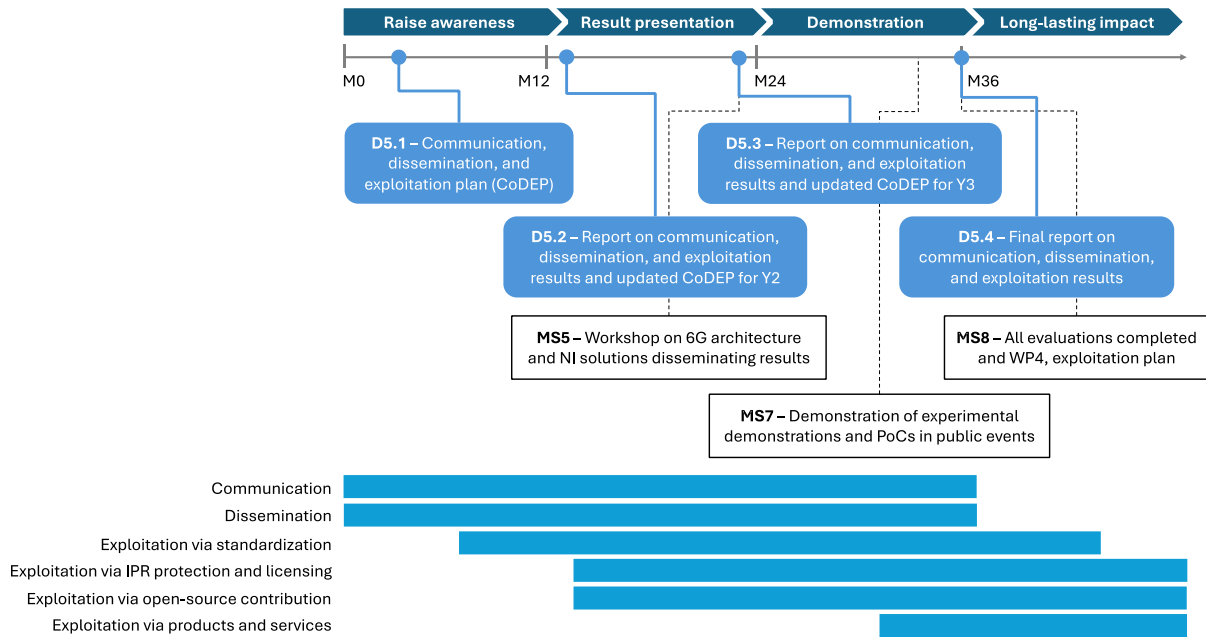


Figure 1. Timeline of the CoDEP of ORIGAMI, annotated with relevant project deliverables and milestones

1.3 THE ORIGAMI CoDEP AS A LIVE DOCUMENT

The CoDEP of the ORIGAMI project will be periodically updated throughout the lifetime of the action. The live nature of the document will allow accommodating new activities executed in the project, including new collaborations or dissemination opportunities that are not yet foreseen as planned during the early stages of ORIGAMI. In particular, ORIGAMI’s CoDEP will be further enriched and updated in subsequent deliverables of WP5, namely, D5.2 “*Report on Communication, dissemination, and exploitation results and updated CoDEP for Y1*”, D5.3 “*Report on Communication, dissemination, and exploitation results and updated CoDEP for Y2*” and D5.4, “*Final report on Communication, dissemination, and exploitation results*”.

2 COMMUNICATION PLAN

The ORIGAMI project sets forth a comprehensive plan for communication. As indicated in Section 1, the communication activities encompass all actions concerning the promotion of the project and its results beyond the project own community. Hence, the target of this activity is the non-specialist general public, and the message shall be encoded in a way that is understood by this audience.

Audience	Activity	Timing	Metric
All General public Research	<u>Project website</u> . ORIGAMI will share its concepts, results and achievements through its official project website. The website is synchronized with the project social network accounts and will be the primary tool for the communication and promotion of the project activities.	M1, then continued updates	Analytics including country of access, number of unique visits per page, total number of visits, and retention index.
All General public	<u>Press releases, posters, leaflets</u> . ORIGAMI will prepare and distribute project poster, press releases and leaflets to raise public awareness.	M3, then updates based on need	One (1) leaflet produced at the start of the project and used as the reference basic communication item for in-presence events. Ten (10) press releases produced to announce the landmark achievements of the project. Posters prepared based on need and shown at events.
General public	<u>Public communication</u> . The results of ORIGAMI, including its impact on the transformation of vertical industry, will regularly be promoted through participation and organization of events for society at large. ORIGAMI will also make use of EC communication tools, like the SNS annual Journal and CORDIS.	M2, then throughout project execution	Participation in ten (10) public events dedicated to mobile technologies, starting with Mobile World Congress 2024 in M2. Showcasing of eight (8) demonstrators at such events.
All General public Research	<u>Social media</u> . ORIGAMI is present on main social networks with official profiles and project pages. These social network profiles will advertise all outputs from the project, and swiftly inform via short feeds about the main results and events that the ORIGAMI consortium will deliver.	M1, then updates based on need	Four (4) social media posts per month produced on average on Twitter/X and LinkedIn by the official project accounts. Relevant metrics include the number of visualization, interactions, re-publishing, and/or comments.
General public Interest groups	<u>Videos</u> . ORIGAMI will create public videos to advertise the vision of the project and its scientific output.	M6, then updates based on need	Five (5) videos produced that introduce the ORIGAMI concepts and the main demonstration activities, which will be made available through the project

			website and official YouTube channel, as well as on Zenodo with open access DOIs. Relevant metrics include the number of views, likes and comments.
Students	Lecture materials related with the ORIGAMI project will be introduced in academic courses and webinars taught by consortium partners.	Based on opportunity	Number of academic courses where project topics are introduced.

Table 1. Planned communication activities and measurable metrics to assess their success

The different strategies adopted by ORIGAMI for communicating the project vision, results and overall implications to different communities are summarized in Table 1, along with the measurable metrics that will be monitored in order to assess the success of each activity.

Next, we provide further details about the specific dimensions of the ORIGAMI communication plan.

2.1 COMMUNICATION PACKAGE FOR DIVERSE AUDIENCES

In addition to scientific dissemination efforts for the core technology enablers, ORIGAMI plans to communicate their results to various audiences, including other technical and non-technical groups that are not immediately linked to the research activities of the project. Among the technical audiences, cloud technology providers and network service operators will be engaged through two industrial workshops and by leveraging partner roles in organizations such as GSMA. To this end, ORIGAMI sets out the preparation of a properly designed communication package that aims at reaching diverse and wide audiences that are relevant to the project activities. Efforts will be made from the early stages of the project to create presentation materials tailored to various types of publics, creating a communication package that will be used as the core communication measure to promote the project activities.

The communication package will include the ORIGAMI official website, which will serve as a central hub for obtaining detailed information about the action and will be accessible by all public (both expert and general). The project website will also include pointers to all the documentation, code and data repositories generated by the action. Presentation material will also be part of the communication package, including flyers, leaflets, and posters to be used on all occasions for communication, and displaying an easily recognized official ORIGAMI logo specifically designed for the project and evocative of the goals of the action. Assets of sufficient quality will be made publicly available under a Creative Commons Attribution (CC BY) license, allowing others to use them with attribution and increasing project exposure. Media assets, including videos of the project vision and demonstrations, will be made available for download from the project website, and through other appropriate channels such as YouTube or Zenodo.

2.2 COMMUNICATION TO THE GENERAL PUBLIC

ORIGAMI will establish a presence on popular social media channels largely used by the non-expert public, such as Twitter/X and LinkedIn, where regular updates on the action progress will be posted. Social media will be also fully integrated with the project website, and will be used to advertise the project results, announce events such as conferences and showcases, inform about the most recent results and reports, and provide a platform for discussion. In addition, the official social media

accounts of all partners will be linked (e.g., via following, re-posting, or re-tweeting) to the ORIGAMI accounts, so as to maximize its reach and visibility. Streaming platforms like YouTube will be leveraged to publish videos showcasing demos, trials and panels in order to provide a simple and effective way of accessing the project results and main ideas.

Online seminars may also be employed as an effective way to share slightly more technical information about the knowledge and tools produced by ORIGAMI with hands-on sessions explaining the fundamentals of the project solutions. If the opportunity arises the project will contribute to producing white papers aimed at explaining the evolution of network technologies to a non-expert public, aiming especially at the ones produced with the end user of the technologies. For the production of white papers that are orchestrated in the context of SNS and 6G-IA, ORIGAMI is committed to providing contributions, as described in section 3.

Efforts will also be made to reach out to traditional media such as newspapers, TV, or radio, as this is a very effective way to make the general public aware of the benefits to society resulting from research projects. When addressing these media, emphasis will be placed on the benefits of the project for society. It is worth noting that several project partners have dedicated communications offices, excellent track records of public engagement activities, and well-established links with the media; they have already succeeded in having impact on mass media as well as on national and regional broadcasters.

2.3 COMMUNICATION TO STUDENTS AND PROSPECTIVE RESEARCHERS

The solutions proposed for the future-generation mobile networks developed by ORIGAMI will be included in teaching material presented to students of academic courses on 5G technologies and beyond, including classes of various graduate and undergraduate courses held by the academic partners of the consortium, which will also present the ORIGAMI activities during seminars they regularly hold as integral part of university courses. Targets for this kind of communication include the Bachelor's degree in Telecommunication Engineering, the Master's degree in Telecommunication Engineering and the Master in NFV and SDN at UC3M, and MSc courses such as Real-Time Systems, High Performance Networking, and Measuring and Simulating the Internet at TU Delft.

Internships for graduate students and industrial PhD programs will be offered by the industrial partners and research centers participating in ORIGAMI on the research topics of the project, exposing early-stage students to the problems and solutions investigated by the project, and starting their training in developing the necessary skills to address the challenges of 6G systems. In this framework, research stays especially for PhD students will be targeted by the project partners.

Finally, partners will take full advantage of open research events and science fairs to showcase the project results to the public, and in particular to students. This will include participation in initiatives such as those in the context of European Researchers' Night, the UC3M t3chfest, or IMDEA Networks weekly seminars.

3 DISSEMINATION PLAN

The purpose of the ORIGAMI dissemination plan is to guarantee that all concepts and technologies developed in the project are brought in front of the technical community that is working in mobile telecommunications research. As already set out in Section 1, the consortium will target both academic and industry communities.

In order to ensure that the vision and outcomes of ORIGAMI are disseminated adequately to relevant entities, the project dissemination plan will pursue the following goals: (i) creating a radical shift in the mindset of the networking research and development community that span both industry and academia towards the innovative view of a 6G mobile network architecture that can overcome practical barriers that exist today; and, (ii) fostering the widespread adoption of the architectural solutions proposed by ORIGAMI and of the technical approaches that build on top of them to perform key network management.

3.1 SPECIFIC DISSEMINATION ACTIVITIES

The planned dissemination activities are carried out continuously when there is the appropriate combination of availability of project results and opportunity, as presented next.

3.1.1 SCIENTIFIC PUBLICATIONS

The ORIGAMI consortium will seek to publish the innovations developed in the project in selected venues that are considered as references by the global scientific community. These include: (i) top-tier IEEE/ACM journals, transactions and magazines, such as IEEE Transactions on Mobile Computing, ACM/IEEE Transactions on Networking, IEEE Journal on Selected Areas in Communication, IEEE Transactions on Network and Service Management, or IEEE Communications Magazine; (ii) selective and prestigious international peer-reviewed conferences in the networking domain such as IEEE INFOCOM, ACM MobiCom, ACM CoNEXT, IEEE NOMS, IEEE SECON, IFIP/IEEE IM or IEEE CNMS, as well as in applied machine learning such as AAAI, NeurIPS or ICML. On a related aspect, ORIGAMI will also target edited journal special issues, bringing together in a single publication the leading research groups in the area and reaching out to a very specific but highly relevant audience.

3.1.2 PARTICIPATION IN AND ORGANIZATION OF SCIENTIFIC EVENTS

ORIGAMI representatives will give presentations and more generally participate on behalf of the project in both academic and industry-oriented scientific conferences workshops, and technology platforms. This will include the participation in panels, seminars or tutorials (either online or face-to-face) organized during the aforementioned events or by the SNS/6G-IA. In addition to participating in such events, the ORIGAMI consortium will also produce organized scientific workshops and/or tutorials co-located with well-established international conferences and exhibits, with the aim to create major awareness of the project work and inviting contributions from the research community active in the 6G area.

3.1.3 PARTICIPATION IN INDUSTRY FORA

The project partners will also participate in public exhibitions that are primarily of industrial interest. The primary target will be the Mobile World Congress (MWC), which is the highest-impact industrial event for the mobile network industry, hence the best opportunity to reach out to the main players in the area. Another major target will be EuCNC, which is a primary venue for activities around the European Commission SNS initiative. In addition, ORIGAMI will target other excellent trade shows for the dissemination of the project results, including ones related to the usage of AI such as the Telco AI

Summit, World Summit AI, Cloud Native Telco Day, The AI Summit London; others related to network at large like FutureNet World, The Edge Event, Turing Fest, and Connected Britain, Network X as well as in-house events held in each partner premises as NEC Open House or Telefonica Research Fair. In these events, ORIGAMI representatives will seek to showcase the operation and performance of working prototypes and small-scale demonstrators of the solutions developed in the project.

3.1.4 ORGANIZATION OF ORIGAMI INDUSTRIAL WORKSHOPS

ORIGAMI will also organize independent industrial workshops specifically targeted at key players in the global and European telco ecosystem. The aim of these workshops will be to gather technology stakeholders beyond those in the ORIGAMI consortium and communicate to them the project concept and results in a direct and effective way. Particular efforts will be devoted to reach global service providers and mobile network industries outside the consortium, making them aware of the new business use cases and operational advantages that the ORIGAMI proposed 6G architecture entails. A strong emphasis will be given to the use cases demonstrations, to show the advantages and benefits of AI technology to address real problems and provide practical solutions. Ultimately, these events will allow engaging with practitioners in the field, provide opportunities for feedback on the ORIGAMI technologies, and facilitate knowledge exchange and new collaboration establishment.

3.2 RESULT DISSEMINATION STRATEGY

ORIGAMI will adopt a strategy for knowledge management that abides by the provisions of the “Smart Networks and Services Joint Undertaking (SNS JU) Programme Online Communication Guidelines”. Thus, the consortium is committed to provide “green” open access to all publications resulting from the project: either the published version, post-print or pre-print of all project publications will be available at public repositories in conformance with the publisher policies. Complementary to this approach, “gold” open access will be considered for some articles in specific justified cases, where high impact can be best achieved in this way; decisions will be based on the target audience and quality of the venue, among others. In general, the spirit of the project will be to share the project results with all potentially interested stakeholders in an open, transparent, and timely manner.

More generally, ORIGAMI will openly publish several resources that are related to research and industry (e.g., deliverables, papers, datasets) or to public communications (e.g., videos, slides, white papers). All such resources will all have an open-access Digital Object Identifier (DOI), optimizing citations and/or re-usability of the project results and supporting the free sharing of ORIGAMI outcomes while avoiding limits to knowledge distribution.

In order to implement the policy above, all ORIGAMI-produced resources will be hosted in Zenodo³, which is the general-purpose open-access repository developed under the European OpenAIRE⁴ program and operated by CERN. Specifically, ORIGAMI will have its own project community created in Zenodo, and the consortium will put in place and adopt a structured pipeline ensuring that all project outcomes are correctly uploaded to Zenodo and referenced in OpenAIRE.

³ <https://zenodo.org/>

⁴ <https://www.openaire.eu/>



Figure 2. ORIGAMI pipeline for the open-source provisioning of project resources

The pipeline is illustrated in Figure 2, and summarized by the following points.

- Project partners prepare open-access versions of the resource. In the case of copyrighted documents, pre-prints, post-prints, or authors' versions are employed in agreement with the rules of the publisher.
- Project partners upload the open-access resource on Zenodo, indicating that it is part of the ORIGAMI Zenodo community. An open-access DOI of the resource is requested in Zenodo if the resource does not have one, otherwise the original open-access DOI is re-used. If a new open-access DOI is used, the resource is also linked in Zenodo with the copyrighted DOI to compute total metrics for the resource. In this stage, related resources are referenced by their different DOIs: for instance, a conference paper is linked with the dataset generated in the experiments, and the slides of its presentation in the venue.
- All Zenodo entries are automatically referred to in OpenAIRE, where the ORIGAMI project will be indexed by its GA number, and where information based on the CORDIS repository⁵ will be displayed. Analytics such as the number of reads and downloads that are calculated in Zenodo are automatically populated in the corresponding OpenAIRE repository.
- The project partner in charge of the dissemination task periodically updates the official ORIGAMI website with information about the open-access resources published in Zenodo and OpenAIRE, including open-access DOIs and links to the repositories where the resources can be found. The different types of resources will be separated under diverse tags or headers on the website, so as to facilitate their browsing and identification by the visitors of the website.

3.3 LIAISON ACTIVITIES WITH 6G-IA AND EXTERNAL FORA

Dissemination and Collaboration activities are expected to be conducted throughout the project lifetime to help promoting the project concept and results to the large European and more International R&D community and raise opportunities for synergy with other projects. The 6G-IA will be a primary target to that end, and the ORIGAMI consortium will especially aim at establishing collaborations with other research projects funded by the European Commission through the 6G-IA working groups, towards the realization of the European 6G vision.

⁵ <https://cordis.europa.eu/project/id/101139270>

3.3.1 ALIGNMENT WITH SNS AND 6G-IA

The European Smart Networks and Services Joint Undertaking (SNS JU) is a Public-Private Partnership that aims to facilitate and develop industrial leadership in Europe in 5G and 6G networks and services. In that sense, the SNS JU funds projects like ORIGAMI that shape a solid research and innovation (R&I) roadmap and deployment agenda by engaging a critical mass of European stakeholders and facilitating international cooperation on various 6G initiatives.

The public side of the partnership is represented by the European Commission (EC) itself, whilst the private side is represented by the 6G Smart Networks and Services Industry Association (6G-IA). Indeed, the 6G-IA is the voice of European Industry and Research for next generation networks and services and its primary objective is to contribute to Europe's leadership on 5G, 5G evolution and SNS/6G research. ORIGAMI partners are aware of the contractual commitment of the SNS JU and they acknowledge the roles and commitments of the European Commission, the 6G-IA, and commit to constructive interactions with these bodies. Upon submission of this deliverable, the following 11 partners were actively engaged as members of the 6G-IA association: TID, NEC, TIM, EMN, FOGUS, CMC, ISRD, UC3M, IMDEA, I2CAT, TUD. In addition, NETAI submitted an application to become an associate of 6G-IA in late February 2024.

ORIGAMI is funded under this framework, hence; it is expected to actively collaborate with the SNS and the 6G-IA through a range of dynamic activities, including:

- Full alignment regarding dissemination and communication activities. Indeed, with the aim to promote and widespread dissemination, ORIGAMI's CoDEP includes active engagement with SNS and 6G-IA social media channels.
- Participation and provision of contributions to whiter papers produced under the framework of SNS and 6G-IA working groups (WGs). In fact, the project has already appointed key main representatives (and deputies) for relevant SNS/6G-IA WGs, as described in section 3.3.2.
- Participation in joint dissemination activities, panels, workshops or events (e.g., EUCNC) either organized by the SNS, the 6G-IA or other projects funded under the same framework.

3.3.2 PARTICIPATION IN SNS/6G-IA BOARDS AND WORKING GROUPS

SNS-JU Working Groups (SNS JU WGs) are cross-project collaborations where the activities of multiple SNS JU projects are discussed by representatives from project participants to converge and create positive synergies. The results of these discussions are published regularly in the form of white papers.

Although the organizational structure of the WGs may vary and upgrades can take place at any time, two types of WGs seem to be consolidated:

- SNS JU WGs: Open to representatives of ongoing SNS JU projects.
- 6G-IA WGs: Open to 6G IA Members and, if appropriate, representatives of ongoing SNS JU projects.

Within each type, the following WGs are being considered:

- SNS JU WGs:
 - 6G Architecture WG
 - Reliable Software Network WG
 - Test, Measurement and KPIs Validation WG

- **6G-IA WGs:**
 - Vision WG: <https://6g-ia.eu/6g-ia-working-groups/#vision>
 - Open SNS WG: <https://6g-ia.eu/6g-ia-working-groups/#open-sns>
 - Trials WG: <https://6g-ia.eu/6g-ia-working-groups/#trials>
 - Pre-Standardization WG: <https://6g-ia.eu/6g-ia-working-groups/#pre-standardization>
 - 5G/6G for Connected and Automated Mobility WG: <https://6g-ia.eu/6g-ia-working-groups/#5G-6G-for-connected-and-automated-mobility>
 - Spectrum WG: <https://6g-ia.eu/6g-ia-working-groups/#Spectrum>
 - Security WG: <https://6g-ia.eu/6g-ia-working-groups/#security>
 - WiTaR WG: <https://6g-ia.eu/6g-ia-working-groups/#witar>

Three additional WGs are expected to be formally approved by either the SNS or the 6G-IA governance structures soon. Upon submission of the present deliverable, the expected titles for these WGs are:

- Hardware WG
- SMEs WG
- Communication WG

ORIGAMI has already scrutinized relevant WGs for the envisioned scope of work and have appointed the following representatives for a close follow-up of activities and provision of contributions to white papers:

WG	Representative(s)	ORIGAMI Partner
6G Architecture	Marco Gramaglia (main) Dimitris Tsolkas (main) Arifur Rahman (main)	UC3M FOGUS ISR D
Reliable Software Network	Dimitris Tsolkas (main)	FOGUS
Test, Measurement and KPIs Validation	Nikos Passas (main) Javier Garcia (second) Andrés Garcia-Saavedra (second)	FOGUS TID NEC
Vision and Societal Challenges (Societal Needs and Value Creation Sub-Group)	Javier Garcia (main)	TID
Open SNS	Andrés Garcia-Saavedra (main) Arifur Rahman (main)	NEC ISR D
Pre-Standardization	Simone Bizzarri (main)	TIM
WiTaR	Livia Chatzieftheriou (main)	IMDEA
SME	Arifur Rahman (main)	ISR D
Comms	Marco Gramaglia (main) Marco Fiore (second)	UC3M IMDEA

Table 2. SNS/6G IA WG representatives

In addition to these WGs, two boards are formally constituted for the governance of the above-mentioned WGs:

- **6G-IA Steering Board (6G-IA SB)**: It consists of mandated representatives of each SNS project who are usually leaders and coordinators with the responsibility to decide on common actions and initiatives at programme level.
 - Mr. Javier Garcia Rodrigo (TID) as Project Coordinator and T5.3 leader will represent ORIGAMI in the 6G-IA SB.
- **6G-IA Technical Board (6G-IA TB)**: The technical board addresses the inter-working of the technical solutions developed within the projects and also ensures coherence and consistency across the programme:
 - Dr. Andrés Garcia-Saavedra (NEC) as Technical Manager will represent ORIGAMI in the 6G-IA TB. Professor Marco Gramaglia (UC3M) will also join Andrés as second representative for ORIGAMI.

ORIGAMI acknowledges that while grant agreements operate at the project level, the evaluation of success may extend to the program level. Hence, pursuant to article 7 of the complementary grant agreements, this program-level responsibility is considered an integral part of the project commitment. Adequate resources have been allocated by ORIGAMI to engage with the SNS JU program across all tiers, including SB, TB, and rest of WGs, as well as to facilitate joint dissemination activities and program representation. Also, sufficient budgetary provisions have been made to cover travel expenses, contributions to program-level events, and dissemination materials. Additionally, resources for participation in SB and TB are delineated in Task 5.3, while provisions for engagement in WGs are allocated within relevant work packages addressing the subject matter of the respective working groups.

3.3.2.1 EFFORTS IN SNS/6G-IA BOARDS AND WORKING GROUPS PARTICIPATION

Primary responsibilities of the designated liaison individuals as they engage with the SNS JU WGs entail (non-exclusive):

- Active participation in conference calls and meetings of the WGs.
- Regular attendance to WG calls. Whilst physical meetings are rare and only arranged under extraordinary circumstances, conference calls are standard practice. Depending on the WG schedule, these calls may occur bi-weekly to monthly.
- Provide the consortium with WGs reports back to the project.
- Introduce project proposals to the WG. If the WG works on a specific White Paper, liaison individuals will compile possible contributions to the white paper in production.
- Engage with other projects of the same WG for the setup of joint activities.
- Organise project presentations along the interest topics of the WG.
- Participate in webinars or conference sessions organised by the WG.

3.3.3 ALIGNMENT WITH SNS EU-FUNDED PROJECTS

ORIGAMI will endeavor to assess the feasibility of establishing connections, disseminating project updates, and coordinating collaborative efforts through a systematic evaluation process. This may involve the exchange of project-related information, the coordination of joint scientific publications, and the coordination of workshops and technical panels at relevant international conferences such as EuCNC.

In that sense, ORIGAMI primarily expects to develop close collaborations with the following EU projects funded under call 2 of the SNS, Stream 01-01 (System Architecture):

- 6G-CLOUD (Service-oriented 6G network architecture for distributed, intelligent, and sustainable cloud-native communication systems)
- 6G-TWIN (Integrating Network Digital Twinning into Future AI-based 6G Systems)
- 6G-INTENSE (Intent-driven Native AI Architecture supporting Compute-Network abstraction and Sensing at the Deep Edge)
- EXIGENCE (Devise & explore a novel approach for energy consumption and carbon footprint reduction of ICT services in the era of next-generation mobile telecommunications (6G))

It is however envisioned a collaboration that will naturally happen with Stream C projects. In particular, tight collaboration and joint activities will be planned with call 1 project Stream C project *“6G-SANDBOX: Supporting Architectural and technological Network evolutions through an intelligent, secureD and twinning enaBled Open eXperimentation facility”*⁶ for the development of the Global Operator use-case.

Upon submission of the present deliverable, a proposal for a joint workshop between Stream D project *“TrialsNet: TRials Supported By Smart Networks Beyond 5G”*⁷ and ORIGAMI on KPIs and KVI is under way. The suggested workshop has been introduced to the Technical Board of the 6G-IA with positive feedback. The target is to open the invitation to other SNS projects from other streams as the proposal matures over time.

3.3.4 INTERNATIONAL COLLABORATION WITH EXTERNAL FORA

ORIGAMI plans to foster international cooperation both within Europe and globally. This objective will be pursued by means of:

- Active participation and collaboration in major international 5G/6G events.
- Engaging and contributing to workshops, panels and events on a global scale.
- Interacting with associations such as Global 6G Fora or other 6G clusters in the USA, Japan, Korea, India.

In collaboration settings, ORIGAMI partners will internationally collaborate either via exchange of results, sharing knowledge and experience or best practices for the emerging 6G services to different systems architectures.

In close collaboration with WP1, this activity has primarily the responsibility of searching and reaching out in the international community, and coordinating contacts, events, and workshops. Also, via WP1, ORIGAMI plans to leverage from the Scientific Advisory Board whose members are expected to provide scientific support free-of-charge, as described in D1.1 *“Project Management Handbook”*.

In specific, ORIGAMI plans to collaborate with CAMARA *“The Telco Global API Alliance”*. Indeed, the global partnership addresses challenges in porting and reproducing API services across heterogenous operator and cloud architectures. CAMARA has been launched by the Linux Foundation (a non-profit organization enabling mass innovation through open source), and the GSMA (a global organization

⁶ <https://6g-sandbox.eu/>

⁷ <https://trialsnet.eu/>

unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change). For more details, see section 4.3.3.

4 EXPLOITATION PLAN

The exploitation plan of ORIGAMI builds on strategies to leverage the project results and protect the Intellectual Property Rights generated, to bring the innovations developed by the project in the telco ecosystem, and to push the project outcomes into relevant standardization efforts and large open-source projects.

4.1 EXPLOITATION AND IPR STRATEGY

In this section some fundamental definitions and approaches are provided, targeting to facilitate the exploitation of project results and outcomes and the management of Intellectual Property Rights (IPR). As such, a classification of the expected project results and outcomes is described in Section 4.1.1 and the main principles of IPR management before and during project lifetime (Section 4.1.2).

4.1.1 EXPLOITATION OF PROJECT RESULTS AND OUTCOMES

ORIGAMI sets out a comprehensive approach to the exploitation of the project results and outcomes, according to the definitions and steps detailed next.

4.1.1.1 CLASSIFYING RESULTS AND OUTCOMES

We adopted from the EC (Horizon Europe framework⁸) two basic definitions regarding *project results* and *project outcomes*, as follows.

- **Project Results:** What is generated during the project implementation. This may include, for example, know-how, innovative solutions, algorithms, proof of feasibility, new business models, policy recommendations, guidelines, prototypes, demonstrators, databases and datasets, trained researchers, new infrastructures, networks, etc. Most project results (inventions, scientific works, etc.) are ‘Intellectual Property’, which may, if appropriate, be protected by formal ‘Intellectual Property Rights’.
- **Project Outcomes:** The expected effects, over the medium term, of projects supported under a given topic. The results of a project contribute to these outcomes, fostered by the dissemination and exploitation measures. This may include the uptake, diffusion, deployment, and/or use of the project’s results by direct target groups. Outcomes generally occur during and shortly after the end of the project.

Based on the above definitions, the ORIGAMI results shall span various categories, which have been defined as follows:

- **Demonstrators** – Demonstrations of one or more project results/products in the field or in lab environment; either as Proof of Concept (PoC) or as Solutions addressing specific end-user needs.
- **Prototypes** - Stand-alone, modular products which have been either developed or enhanced in the context of the project.
- **Validation results** – Results from processes that aim at validating the functionalities of specific products or concepts.
- **Research results** – Results that can be delivered to the research community and industry through dissemination paths.
- **Standardization inputs** – Results that can be delivered to industry through standardization paths.
- **Processes and tools** – Activities conducted, and tools developed/integrated that aiming at enhancing processes/services related to the introduction/deployment of other project results (e.g., studies, algorithms, techno-economical tools, knowledge transfer etc.).

⁸ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/af/af_he-ria-ia_en.pdf

Considering the above-mentioned categories of results, ORIGAMI is already well positioned in identifying potential innovations for some of those categories. Based on the results, the expected outcomes of the ORIGAMI project are classified in five different types as listed below:

- **Product development**, which includes the introduction of new products/features (together with a roadmap definition) and the product validation that increases the technology readiness level (TRL) towards a successful deployment. This outcome category is related mostly to commercial companies and SMEs.
- **Business development**, which includes enhancement of existing processes/services and/or the creation of new services/activities. This outcome category is also related mostly to commercial companies and SMEs.
- **Standardization achievements** refers to the process through which the commercialization and sustainability of a project's results can be supported. Partners that are actively involved in standardization and regulatory activities may promote the results of the project to provide technical contributions to relevant standards bodies.
- **Research achievements**, including publications, IPRs and prototypes and can be produced by all partners.
- **Start-Up companies** refers mainly to spin-offs from universities and research centers to exploit one or more of the project's exploitable results and indirectly pursue a product development outcome.

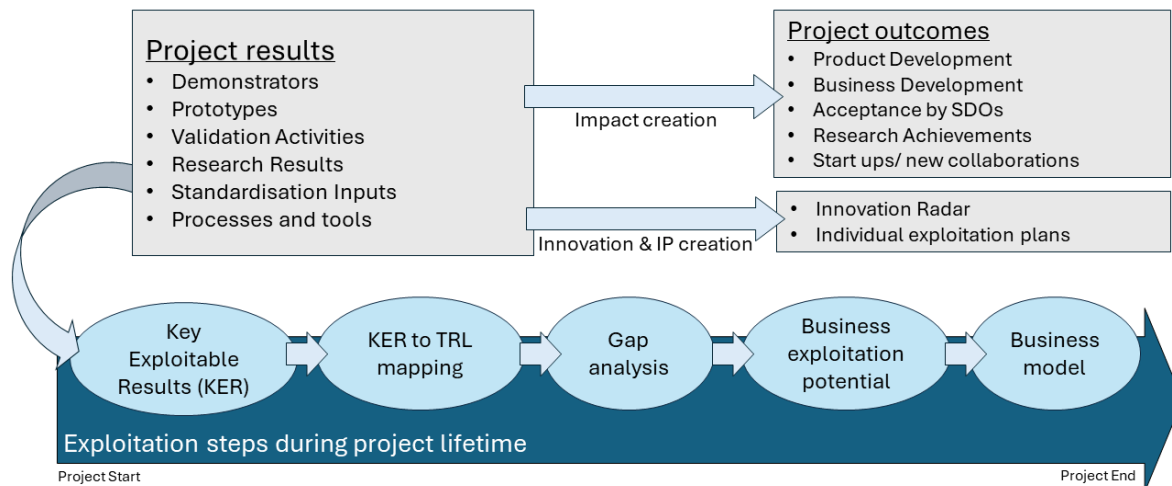


Figure 3. ORIGAMI approach for results and outcomes management

4.1.1.2 DEFINITION OF THE EXPLOITATION STEPS

Having set the basic result categories and outcome type, the exploitation process encompasses the following steps, which are also illustrated in Figure 3.

1. As a first step, during the regular work-package meetings the project members discuss and agree on the list of Key exploitable results (KER). Then this list is semantically structured, and it is associated with the Result Categories with the Outcome Types. A **Key Exploitable Result (KER)** is an identified main interesting result (as defined above) which has been selected and prioritized due to its high potential to be “exploited” – meaning to make use and derive benefits-downstream the value chain of a product, process or solution, or act as an important input to policy, further research, or education.
2. Subsequently, each KER in the list gets associated with the target TRL (Technology Readiness Level) and broad classification as part of an elementary maturity assessment.
3. As a next step, for each KER in the list, considering the evolution of project's technical work and early findings, a basic gap analysis is performed, considering the most promising customer segment. In conjunction with the feedback from the technology transfer activities and the market

analysis, the refined list of project outcomes that are candidates for business case development will be finalised.

4. For those Exploitable Outcomes that are beyond the 'Research to Prove Feasibility' TRL category, and whose potential for business exploitation is mature based on the technology transfer plan and market analysis conclusions, a Value Proposition Canvas is filled.
5. For the KER with promising Value Propositions, the Lean Canvas/Business Canvas methodology is used to further develop the exploitation potential and identify the key parameters to build the business case.

4.1.2 PROJECT-LEVEL IPR MANAGEMENT

For the success of the project is essential that all partners agree on explicit rules concerning IP ownership, access rights to any Background and Foreground IP for the execution of the project and the protection of Intellectual Property Rights (IPR) and confidential information. Effectively exploiting research results depends highly on the proper management of IPR, and in the project, it is considered thoroughly as part of the overall management of knowledge. For the success of the ORIGAMI project, all project partners agreed in the internal Consortium Agreement (CA) and before the project started on explicit rules concerning IPR ownership, access rights to any Background and Foreground IPR for the execution of the project and the subsequent protection of IPRs. Overall, the proper handling of the ownership, protection and granting of knowledge inside the Consortium is essential to fulfil the following purposes.

- Stimulate an effective cooperation among the Parties during the Project implementation;
- Encourage an innovative contribution from all the Parties independently from their workshare;
- Protect the commercial interests of the Parties;
- Facilitate further research developments and commercial exploitations.

4.1.2.1 IPR MANAGEMENT ACTIVITIES BEFORE THE START OF THE PROJECT

A Consortium Agreement (CA) has been agreed and signed among consortium partners before the project starts to establish a legal framework for the project to minimize any internal issues within the consortium related to the work, IP-Ownership, Access Rights to Background and Foreground IPR for the duration of the project and any other matters of the consortium's interest.

In terms of definitions, the following hold:

- Management of "Pre-existing know-how" (**Background**), relates to any information owned by the Parties before the CA is signed and any intellectual property rights owned by the Parties relating to such information. Within the CA all partners will determine any Background IP they are willing to provide to the project and detailed rules for access rights. The granting of access rights may be made conditional on the conclusion of specific agreements aimed at ensuring that they are used only for the intended purpose and of appropriate undertakings as to confidentiality. Access rights for commercial exploitation shall be granted under fair and non-discriminatory conditions to be regulated by case-by-case agreements among the Parties.
- Management of "Knowledge" (**Foreground**) relates to any information generated because of carrying out the project; and any intellectual property rights (such as copyrights, patents, and pending application for patents) arising from that information. Foreground IPR shall be owned by the project partner carrying out the work leading to such Foreground IPR. Where several Parties have jointly carried out work generating the knowledge and where their respective contribution to the work cannot be ascertained, they shall have joint ownership of such knowledge. The principle is that the ownership of joint knowledge belongs to the Parties that generate it according to their share of participation in the common work. The Parties shall

agree among themselves how that joint ownership will be exercised. Any details concerning the exposure to jointly owned Foreground IPR, joint inventions and joint patent applications will be addressed in the Consortium Agreement. A party shall not publish foreground generated by another party or any background of such other party without the other party's prior written approval. Rules for prior written notices of the final version of any planned publication are defined in the CA.

4.1.2.2 AUDITING OF GENERATED IPR DURING THE PROJECT LIFETIME

Auditing and managing of generated IPR will be performed in collaboration with the Research and Management staff of the project to provide an objective audit and reporting on the title and ownership of the IPR generated during the project lifetime. This is done via periodic reports using an Intellectual Property and Foreground Control questionnaire that will be created for that purpose. The aim of this process is to keep track of the generated foreground and avoid conflicts among creators of joint results. A first IPR Audit is planned at the end of the first reporting period (M18), and a final audit will be carried out again in M36 at the end of the project, to create the required input for the respective project periodic reports.

The different sections of the Audit, based on the Intellectual Property and Foreground Control questionnaire, are as follows:

1. Control of access rights needed for the implementation of the project
 - a. Control of access rights to party background needed for the implementation of the project
 - b. Control of access rights to party foreground needed for the implementation of the project
2. Control of third owners' software used in the implementation of the project
 - a. Control of commercial software license
 - b. Control of open source software license
3. Control of commercial hardware used in the implementation of the project
 - a. Control of commercial hardware acquired using projects funds
 - b. Control of commercial hardware acquired without using projects funds
4. Control of third owner intellectual property (IP) rights used in the implementation of the project
5. Control of party background used in the implementation of the project
6. Control of party foreground generated in the project
7. Control of party exploitable (industrial, commercial) foreground generated in the project
8. Observations – comments.

Therefore, these IPR audits identify the Foreground IP generated by the project, its dependencies on External IP or Background knowledge, and recommend actions to be taken by the consortium for its protection. All the Individual IPR Reports will be provided as Annex to the next releases of this deliverable, and a summary report for ORIGAMI will be included in the Final Report of the project.

4.2 INNOVATION POTENTIAL FOR THE INVOLVED STAKEHOLDERS

The ORIGAMI consortium has made a major commitment to exploitation, and the corresponding actions will start early as soon as the project produces first results. The "first exploit, then disseminate" exploitation method will optimize ORIGAMI's potential for exploitation. The Innovation Manager (NETAI) and the Technical Committee (TC) will oversee all project outcomes, which will be classified as either freely distributable or economically exploitable, based on the general assembly's decision.

In order to quickly discover pertinent new works on linked scientific disciplines, new market/research trends in 6G, and the roadmaps of significant industrials and international organizations, ORIGAMI members will conduct a continuous research and market analysis. Press releases, scientific and technical papers, and market intelligence are the most often used methods of keeping tabs on competitors. Each partner will be in charge of keeping an eye on the competitive form that most suits its needs; for example, academic partners will be more interested in publications, whilst industrial partners will be more interested in market/patents and standardization. In order for the consortium to position the results more effectively in their anticipated market and better align the planned specifications of the created technological platform, ORIGAMI understands the need to have a strong understanding of the trends, standards, and roadmaps that shape the 6G sector. In this endeavor, the industrial partners will work together to generate an annual application analysis report that will serve as justification for the ongoing work program or suggest alterations in course when suggested by market/commercial forces and the appearance of new product opportunities. Likewise, within their respective planned in ORIGAMI, the academic partners will design and develop highly exploitable results through research prototypes and scholarly publications.

The ORIGAMI consortium emphasizes exploitation from the project's results, focusing on innovative solutions aligned with market needs. The consortium's industrial members are pivotal for maximizing project impact. Carefully curated, the consortium encompasses key industry players essential for mobile network design with AI integration. Indeed, the ORIGAMI consortium includes partners that represent 6G mobile network ecosystem from different perspectives and with complementary roles, namely: infrastructure owners, OEMs. MNOs, technology aggregators, NI functionality providers, and Softwarization/virtualization experts. The composition of these roles is summarized in Figure 4.

The next subsections are structured based on those roles and depict the innovation potential brought by the project partners.

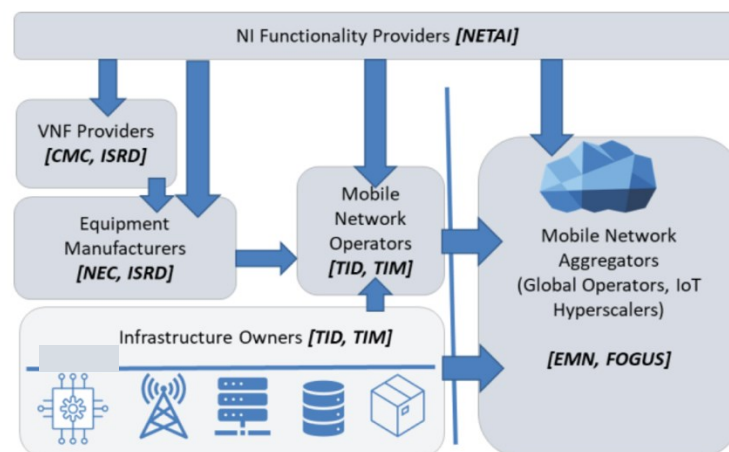


Figure 4. Complementary roles in the 6G cellular ecosystem

4.2.1 MOBILE NETWORK OPERATORS

4.2.1.1 TELEFONICA INNOVACION DIGITAL

The innovations that ORIGAMI will put forward are very well aligned with the interests of Telefónica, and the innovation roadmap of the corporation.

Indeed, Telefónica's new strategic plan GPS⁹ eyes telecommunications as the supercomputers of the future in which connectivity is at the heart of everything, and digital sustainability plays a pivotal role. For the realization of this strategic vision, network openness via exposure of business and network APIs so that external developers and third parties can build applications and services on top of network capabilities is key. This is strategically targeted by Telefonica as the new path to monetize network elements that are currently untapped.

This must be done in a sustained way though. While Telefónica as a group remains steadfast to meeting the goal of achieving net zero emissions by 2040, reduction of energy consumption is also envisioned. For example, during the 2024 edition of the MWC Telefónica's chairman announced that networks operated by Telefónica were able to reduce energy consumption by 9%.

TID's exploitation plan in ORIGAMI is fully aligned with Telefónica's renewed GPS vision for the next three years. In particular, the scientific work to be done in ORIGAMI will strengthen Telefonica's GPS as follows.

- **Global Alignment Among Telcos:** TID will monitor the already ongoing partnerships and alliances (like CAMARA) with other telecom operators worldwide and whenever possible, influence decisions on key issues related to roaming, IoT vertical applications integration with other emerging operating models. Key to this will be the exploitation of the global operator model.
- **Standardized APIs for Network Capabilities.** TID will remain active in relevant standard bodies like 3GPP and ETSI. Key to this work will be the upgrades on the CAPIF Core Function for securing interoperability in the API provisioning and consumption.
- **New billing Models.** Explore and implement innovative billing models that support the exchange of services in a zero-trust manner. This may involve transitioning from traditional billing approaches to dynamic, usage-based billing systems or other models that promote transparency, fairness, and trust among entities. Key to this will be the exploitation of the IoT/MVNO wholesale billing models.

Indeed, roaming was not meant to support the global operator models emerging. However, changing the emerging operating models for global operators that support, for example, IoT vertical applications or digital nomads requires fundamental changes within the cellular ecosystem. First, global alignment among telcos is required. Second, consistent standardized APIs that expose network capabilities. Third, new billing models are required, that allow entities to interact and exchange services in a zero-trust manner. The global operator model that we build in this project aims to enable these three points.

4.2.1.2 TELECOM ITALIA MOBILE

The innovations that ORIGAMI will bring align with TIM's interests. TIM will gain insights into solutions and architectures to evolve its management systems, ensuring high-performance services (QoE and QoS). Efficient management of network resources is also crucial for TIM to minimize energy consumption and the network's environmental footprint. An integrated and pervasive network resource management and orchestration system can achieve these objectives. These align with the goals of the ORIGAMI project, specifically:

⁹ <https://www.telefonica.com/en/communication-room/press-room/telefonica-presents-its-gps-plan-and-targets-fcf-of-e5000-million-by-2026/>

- the definition of an open and flexible network management system (according to the GSBA paradigm),
- the use of automatic optimization functionalities (CCL) through AI/ML-based technologies,
- and an intrinsically safe framework (ZTL).

Moreover, the results of the ORIGAMI project must align with the SDOs activities (mainly 3GPP and Open RAN Alliance) to establish a common framework that simplifies the construction of such a system.

The overall network management system has to be based on open source and standard functionalities; it also must allow the following aspects:

1. collaboration with third parties (e.g. software companies, universities, industrial partners) for the development of RAN optimisation algorithms (e.g. based on AI/ML or quantum computing),
2. openness to external software providers for the development and/or integration of specific modules,
3. integration of Open RAN functionalities such as RIC modules, analytics, dashboards, etc., through interaction between modules using bus communication and open APIs approach.

TIM also plans to disseminate the results mainly through contributions to standardization.

4.2.2 MOBILE NETWORK AGGREGATORS

4.2.2.1 EMNIFY

Emnify's general exploitation strategy revolves around leveraging emerging technologies and industry trends to develop innovative solutions that address the evolving needs of their customers. By actively participating in research projects like ORIGAMI, forging strategic partnerships, and continuously investing in R&D, Emnify aims to stay at the forefront of technological advancements. Emnify focuses on agility and adaptability, quickly integrating new technologies and concepts into their existing infrastructure while maintaining a customer-centric approach. Through this strategy, Emnify aims to solidify its position as a leader in the telecommunications industry.

Specifically, the novel paradigms envisioned in the scope of ORIGAMI are well aligned with the innovation needs of Emnify. As a key player in the current mobile, and specifically international roaming, landscape, Emnify is in the unique position as a network aggregator and IoT connectivity provider to adapt the concepts and innovations into novel business models and revenue streams as well as alleviate technical limitations present in the current mobile architecture.

Roaming and Global Operation. Based on the mechanisms introduced in the scope of ORIGAMI, Emnify can exploit 6G's ultra-reliable low-latency capabilities to offer premium services for applications that require real-time data processing, such as autonomous vehicles, augmented reality, and industrial automation. This can open up new revenue streams and attract clients with specific low-latency requirements. Emnify is already leading when it comes to the availability of regional breakouts. Through exploitation of the GSBA envisioned in ORIGAMI, the regional deployment of customer facing services will be possible, providing the possibility for novel services requiring in-network processing.

Emnify can exploit ORIGAMI advancements to seamlessly integrate with global networks, providing customers with an optimized and simplified roaming experience. This can be particularly attractive for

businesses with international operations, reducing the complexity and costs associated with managing multiple network providers. With the flexibility offered by the ZTL and GSBA, Emnify can explore dynamic roaming agreements that adapt in real-time based on network conditions, costs, and performance metrics. This can lead to more efficient use of resources and potentially cost savings, providing a competitive advantage.

Enhanced Reliability. The enhanced reliability and low-latency resulting from the ORIGAMI architecture can be leveraged by Emnify to target mission-critical IoT applications in sectors like healthcare, where instant and reliable communication is crucial. Emnify can develop tailored solutions for industries that demand high-performance, real-time connectivity on a global scale.

Exploiting ORIGAMI's potential for improved security, Emnify can develop zero-trust authentication and authorization mechanisms. This not only enhances security but also builds trust among users and partners, furthering Emnify's profile as a secure and reliable telecommunications provider. Emnify can exploit enhanced security features to cater to the growing demand for secure IoT transactions. This can be especially valuable in industries such as finance, where secure communication between devices is essential.

Distributed Compute. Emnify will exploit the flexible compute capabilities of the GSBA to offer industry-specific edge computing solutions. This could include healthcare-focused edge services for medical data processing or manufacturing-focused solutions for real-time production control. Tailoring edge computing services to specific verticals can unlock new markets and revenue streams. At the same time, based on the support for distributed applications, Emnify can exploit this capability to deploy applications across the network, enabling more efficient and scalable solutions. This can be particularly advantageous for applications that require distributed computing resources.

Finally, through the collaboration in ORIGAMI, Emnify can actively engage with other stakeholders in the mobile ecosystem, including technology providers, device manufacturers, and application developers. By participating in collaborative projects and forming strategic partnerships, Emnify can exploit the synergies within the ecosystem to deliver comprehensive and innovative solutions. In conclusion, the exploitation of ORIGAMI research results can enable Emnify to offer new, high-value services, optimize roaming solutions, enhance security measures, provide customized edge computing services, and foster collaborations within the evolving 6G ecosystem. By strategically leveraging these opportunities, Emnify can strengthen its position in the telecommunications market and create a competitive edge in the rapidly advancing landscape.

4.2.2.2 FOGUS INNOVATIONS & SERVICES

FOGUS adopts a comprehensive approach to exploitation activities, recognizing their significance both at the project and company levels. Our philosophy entails viewing exploitation activities through multiple dimensions. We incorporate a theoretical and technical perspective, focusing on network architecture and its components. Additionally, we emphasize a practical standpoint, involving the development of network components like CAPIF API manager. Lastly, we prioritize research and communication perspectives, crucial for delving deeper into the field and effectively sharing knowledge to inspire and motivate others interested in the domain.

FOGUS R&D activities are tightly related to network architecture enhancements and to network performance evaluations. FOGUS personnel have already contributed to 5GPPP activities related to 5G and beyond architecture and to scientific publication on the same field. Moreover, we offer state-

of-the-art performance evaluation & modeling toolkits that enable the assessment and the enhancement of a system's performance. When needed, we can move beyond the traditional measurement of objective indicators by encompassing human- and context- related parameters (Quality of Experience measurements).

It is expected that within the ORIGAMI project FOGUS will provide know-how on experimentation processes and gain knowledge on 6G network infrastructures. FOGUS also offers a mature and well tested implementation of the 3GPP CAPIF API manager to assist the research on the exposure layer activities within the ORIGAMI project. In that sense the FOGUS activities are in line with activities of ORIGAMI project, and thus, the involvement of the company in ORIGAMI project is expected to strengthen company's position against the competition in the fields of experimentation and benchmarking.

FOGUS aims to explore and enhance its understanding and contribution in two primary sectors: mobile network openness and mobile network virtualization. These sectors are interconnected, influencing each other's development, and the advancement of one will strengthen the application of the other. The potential impact of these sectors is significant and will be pivotal in shaping the foundation of 6G.

Mobile network openness provides new business opportunities for third party network application developers and communication service providers. The ORIGAMI project proposes an exposure layer on top of a global bus implementation for the interaction of the network control management orchestration and access domains. FOGUS sees a business gap brought by this openness due to the need for features/services that can assist third party applications to interact with the infrastructure of the communication service providers in an easy, secure, and interoperable way. This gap in the future could be filled by companies that will take advantage of the exposure layer offered by the ORIGAMI project.

Mobile network virtualized software is the ongoing evolution of network softwarization and virtualization which is poised to revolutionize the mobile market, presenting avenues for established entities to fortify their market presence and welcoming new entrants into this evolving ecosystem. ORIGAMI presents a significant opportunity to enhance the position of established entities, particularly forward-thinking SMEs like FOGUS, empowering them to lead the way in developing premium solutions for virtualized software in mobile networks, supported by major MNOs such as Telefónica or Telecom Italia Mobile.

FOGUS has acknowledged the significance of network virtualization and has demonstrated its commitment by developing its own network application as part of the EVOLVED-5G project, which was effectively executed within the Horizon 2020 framework. Within this endeavor, FOGUS created a network application designed to communicate with the 5G core network and integrate with a third-party Security Information and Event Management (SIEM) application also developed by FOGUS. Through this endeavor, FOGUS gained insight into the intricacies of end-to-end communication and acquired the essential expertise, positioning itself to explore the possibilities presented by 6G networks.

Lastly, as previously mentioned, at FOGUS, we firmly believe in the value of disseminating knowledge and fostering dialogue through courses and training materials. This practice not only benefits individuals interested in exploring 6G and engaging with ORIGAMI's objectives but also proves advantageous for beginners in the field. Embracing an ethos of knowledge sharing and engaging with

diverse groups such as SMEs and MNOs is beneficial both at the company and project levels. It allows us to gather feedback and gain insights into their approaches within the sectors we operate in. With this mindset, the FOGUS team actively participates in acceleration programs, develops online courses, and delivers various presentations at booths and events, all aimed at sharing the knowledge and vision of previous projects that it has participated, as well as promoting research and innovation in general. In this context, FOGUS is eager to undertake similar efforts within the framework of ORIGAMI, effectively communicating the project's objectives and innovations.

4.2.3 EQUIPMENT MANUFACTURERS

4.2.3.1 NEC LABORATORIES EUROPE

NEC plans to exploit the outcomes of ORIGAMI projects along four main paths: product innovation, scientific dissemination, SDO contributions, and IPR generation.

More specifically, NEC is set to harness insights from the ORIGAMI project concerning the Compute Continuum Layer (CCL) and the network intelligent (NI) solutions therein to advance its current vRAN and O-RAN product lines, along with creating a high-value management and orchestration platform. This platform aims to introduce the versatility of SDN/NFV into NEC's offerings, influencing its Mobile Radio Access Networks and Mobile Wireless Networking sectors. The findings from ORIGAMI on the aspects above will be showcased to illustrate the orchestration platform's advantages to NEC's development teams and prospective clients, such as European network operators. NEC anticipates forming a unified perspective on the existing gaps and bottlenecks in today's mobile carrier network technology, jointly establishing requirements and uncovering new 6G concepts.

These efforts are designed to support NEC's strategy and guide its contributions to the standardization roadmap within key global Standards Development Organizations, like the Internet Engineering Task Force (IETF) and the O-RAN Alliance. This collaborative effort aims to solidify a standards and technology foundation for beyond 5G communication systems. Driven by the goal to cater to various industries and both mobile and stationary device types with diverse communication needs, duty cycles, traffic patterns, and functionalities, NEC envisions the 6G Compute Continuum Layer as pivotal in optimizing network resource utilization and guaranteeing energy- and cost-efficiency gains in RAN virtualization solutions.

NEC intends to submit patent protection for at least three innovations conceived during the ORIGAMI project, aiming to promote the commercialization of these solutions within NEC Corporation. Additionally, NEC is committed to sharing the relevant research findings at top-tier scientific forums, such as ACM MobiCom, IEEE INFOCOM, or IEEE Transactions on Mobile Computing. This initiative is part of NEC's strategy to broaden the influence and application of ORIGAMI's outcomes.

4.2.4 VNF PROVIDERS

4.2.4.1 CUMUCORE OY

Cumucore has spearheaded the development of a comprehensive 5G Standalone (SA) core platform, setting a new benchmark in network innovation. Embracing full virtualization, each function within the Cumucore platform resides within its dedicated container, ensuring seamless operation and optimal performance. Interfacing between functions adheres to rigorous 3GPP standards, guaranteeing interoperability and compatibility.

The Cumucore platform offers unparalleled versatility in communication, boasting two distinct methods for interaction with external systems: the Network Exposure Function (NEF) and Application Function (AF), both featuring RESTful interfaces. Through these interfaces, Cumucore not only exposes vital information but also empowers users to manage dataflows, network slices, and network users with unparalleled ease.

As part of the ORIGAMI project, Cumucore anticipates the integration of new functionalities into its core platform. Plans are underway to design and develop a feature-rich interface, unlocking unprecedented communication capabilities between mobile networks and the broader global ecosystem.

To elucidate the groundbreaking advancements achieved through ORIGAMI, Cumucore plans to disseminate insights through various channels. ORIGAMI is visible on Cumucore intro slide deck that is used on weekly basis when introducing Cumucore to potential partners. From informative blog posts to engaging videos, Cumucore aims to demystify the complexities of new functionalities developed within the project. Target is to have annual blog post to cover progress in ORIGAMI and produce one video to be used in MWC and other industry events. Cumucore is committed to showcasing its innovative strides at prominent industry events worldwide, where experts will elaborate on the transformative impact of ORIGAMI on the future of mobile networking.

4.2.4.2 ISRD SP. Z O.O. (IS-WIRELESS)

IS-WIRELESS is a provider of reliable Private 5G solutions addressing use cases of industry 4.0, mission critical and campus networks. The offer covers all network functionalities from RAN to Core and includes pre-integrated hardware and software network elements ready to be installed at the customer premises. At the heart of IS-Wireless' (ISRD) Private 5G is Liquid RAN – a groundbreaking, patented technology which brings open, disaggregated networking onto the next level of extremely efficient use of communication resources. It builds on Open RAN, is 3GPP and O-RAN Alliance compliant but safeguards transition from 5G to 6G.

The RIC platform of IS-Wireless' is the O-RAN compliant Near-Real Time RAN Intelligent Controller (Near-RT RIC), which connects to the O-DUs and O-CUs over E2 interface and can be deployed in a few different ways, for example with Docker Compose, Docker Swarm, and Kubernetes. The RIC platform can be deployed on different infrastructure (computers, servers, cloud). The hardware requirements depend on the network configuration and performance of the used processor. The RIC platform consists of a set of high-performance.

As a part of the ORIGAMI project, the design along with successful implementation of the RIC platform with novel development of O-RAN compliant xApps will contribute to the RIC software solution product portfolio of ISRD. ISRD exploitation plan in ORIGAMI is fully aligned with product portfolio for the next three years. In particular, ISRD will consider the following pathways for exploitation.

Inter-operability of O-RAN components: ISRD will actively participate in developing solutions related to enabling the interoperability of the O-RAN components through effective deployment of the RAN bus (i.e., the E2 interface) in the project. The interoperability of the RAN intelligent controller by allowing the integration of third-party xApp developed in ORIGAMI will further enrich our product portfolio and enable us to deploy O-RAN solutions globally in the market.

Novel xApps development: The takeaways from the integration of RB quota optimization per slice, slice admission and congestion control xApps from ORIGAMI projects at our RIC platform will be used

to improve performance of the networks by avoiding multi-vendor and/or multi-MNO slice congestion in the networks. It will prove the capability of allocating resources in such a way that it will allow to have the global view from the centralized processing entity through the RAN bus.

4.2.5 NI FUNCTIONALITY PROVIDERS

4.2.5.1 NET AI

Net AI has developed a family of cloud-native software solutions that use artificial intelligence to elucidate communication network usage and performance in real-time and enable mobile operators to automatically allocate the appropriate computing and networking resources as required. Net AI's software can be integrated seamlessly through standardised APIs in 5G, 4G, broadband, etc. networks to improve operational efficiency, reduce the infrastructure's energy footprint and enhance customer experience. The company holds unique IP for mobile network traffic decomposition, and provisionals for uncertainty- and capacity- aware traffic forecasting, and predictive anomaly detection technologies.

Net AI is a member of the O-RAN Alliance and has packaged some of the company's solutions as O-RAN-compliant xApps. Their successful integration with near real-time RAN Intelligent Controller (RIC) solutions from vendors such as VMware and Accelleran was demonstrated at multiple O-RAN Global PlugFests.

During the ORIGAMI project, Net AI will advance NI solutions that address challenges of reliability, cost efficiency, energy efficiency and interoperability with core and RAN solutions such as those developed by project partners CumuCore and IS Wireless. In particular, Net AI will expand its portfolio of neural network solutions with new designs that encompass the latest advancements in spatio-temporal neural modelling, graph-based representations of mobile network deployments and graph processing applied directly onto these representations, as well as novel loss functions for neural model training, which accuracy with practical constraints such as computational cost, capacity/compute resource overprovisioning, and service quality. These will materialise as O-RAN compliant xApps, rApps and 3GPP compliant NWDAF that leverage the innovative architectural elements introduced by ORIGAMI.

To promote innovation and technology transfer, Net AI will also act as the Innovation Manager for the ORIGAMI project, taking advantage of its strong innovation-driven outlook of the ecosystem and significant patenting momentum. Additionally, Net AI will demonstrate the solutions developed in this project at flagship industry shows such as the Mobile World Congress and FutureNet.

4.2.6 ACADEMIA

4.2.6.1 IMDEA NETWORKS INSTITUTE

IMDEA is committed to support the transfer of technology to the industrial sector, in order to improve its capacity for innovation and competitiveness, as well as to spin-off-companies in order to promote the release of new products and services to the global market. In this context, ORIGAMI will offer new opportunities to IMDEA researchers to develop novel Network Intelligence solutions to be transferred into products through the wide network of collaborations that IMDEA has established with the telecommunication industry.

In the context of programmable user planes, IMDEA is a member of the Intel Connectivity Research Program and of the Intel Connectivity Academy: this ensures that the solutions developed by IMDEA

in the context of user-plane intelligence are communicated and highly visible at Intel, which is a leading company in the field that has already supported the research work of IMDEA with a donation within the Intel 2022 Fast Forward Initiative. IMDEA will exploit its preferential links to the Intel Connectivity Academy to disseminate the project vision and solutions across the community around network programmability that such an Intel initiative gathers. This includes interacting with the many researchers and industry partners via the forums provided by the initiative, and making sure that all relevant ORIGAMI results are present on and advertised by the official Intel Connectivity Academy website and P4 social media.

During ORIGAMI, IMDEA will also explore opportunities to leverage the existing 5TONIC platform, jointly created with Telefonica, which involves the leading European industry players in 5G, for demonstration purposes. This includes in particular investigating the possibility to integrate any ORIGAMI-developed technology in the 5TONIC platform, within one or more of the many experimental setups deployed in the laboratory.

Finally, ORIGAMI will allow IMDEA to recruit and train PhD students and postdoctoral fellows, creating new expertise at the interface of machine learning and mobile networking that will be critical to the European industry. Network programmability is indeed poised to become a primary trend in the telco space in the coming years, as soon as the softwarization and cloudification of the network infrastructures is completed. The project will generate, through the activities of IMDEA, domain experts with a profound knowledge of P4 coding on a variety of hardware platforms that range from programmable switches to SmartNICs and NPUs.

Note that IMDEA is a public research organization and has no direct industrial exploitation plans. The novel solutions on user-plane intelligence developed by the project will primarily enable faster and more efficient management of the mobile network. Yet, there are areas where these same solutions may also open new business opportunities for network infrastructure operators, allowing them to accommodate new service use cases that demand low-latency decision-making to optimize network traffic management, such as in the context of High-Frequency Trading (HFT).

4.2.6.2 UNIVERSIDAD CARLOS III DE MADRID

Being a project member is an opportunity that UC3M will exploit in several ways, along three main axes as discussed next. Mostly, the exploitation strategy by UC3M is focused on the knowledge generated by the project, which is exploited through the academic programs, scientific excellence, and possibly IPR generation.

Short-term Objectives. Incorporation of Advanced Knowledge into Academic Programs: ORIGAMI will integrate cutting-edge knowledge related to mobile networking, artificial intelligence, and large-scale validation technologies into the UC3M academic portfolio. This will be implemented as enhancements of the Telecommunication Engineering Bachelor's and Master's degrees and the Master in NFV and SDN. Development and Deployment of Training Materials: High-quality technical training materials will be designed and released as Open Educational Resources (OER) under an open license for broad accessibility. This will include the latest developments and best practices in 5G architecture and 6G design and their applications in various industries. Organizing Interactive Learning Activities: Host training sessions, DevRooms, and Hackathons in collaboration with prominent events across Europe, like the ETSI MEC Hackathon. These activities will allow UC3M students to understand the evolution of 5G, its architecture, and its practical applications.

Medium/Long-term Objectives. Enhancing Technology Transfer and Consulting Capabilities: Leveraging the knowledge from ORIGAMI, UC3M aims to extend its portfolio in consulting activities towards next-generation technologies, impacting standardization bodies like IEEE and IETF to obtain essential IPR for future exploitation. This could also be a fundamental factor in laying the groundwork for high-tech spin-offs and strengthening UC3M role in the European technology transfer landscape. Strengthening Scientific Leadership: Through collaboration within the ORIGAMI consortium, UC3M will improve its research quality, targeting top-tier publications and strengthening its profile as a leading European institution in mobile network research. Improving Teaching Quality with Interdisciplinary Focus: Insights from ORIGAMI will enrich course materials and potentially lead to new degree programs that intersect various fields like AI and mobile networking.

Cross-cutting Themes. Besides the areas discussed above, UC3M will also exploit project results in areas that are not related to a specific area only, such as promoting Responsible Research and Innovation (RRI), by aligning technological innovation with broader social values to improve trust between technology and society. Also, UC3M aims to improve accessibility and Inclusivity in Training, to ensure training materials are accessible to non-specialist profiles, tailored to local languages, and support up/re-skilling across various digital capabilities. Finally, UC3M aims to empower Graduates for Industry Leadership, by offering research-oriented positions to graduates in forward-looking fields, reinforcing Europe's leadership in 6G technology.

4.2.6.3 DELFT UNIVERSITY OF TECHNOLOGY

TUD has a solid and multifaceted plan for exploiting the results of ORIGAMI, as follows.

Education and teaching. The research results of ORIGAMI will contribute to updating the syllabus of several key courses that the NS group of TUD is teaching. For example, MSc courses such as Real-Time Systems, High Performance Networking, and Measuring and Simulating the Internet will integrate findings and methodologies as they are developed by the ORIGAMI partners, and hence will offer to the students an up-to-date perspective on emerging mobile network technologies. Furthermore, the agenda of ORIGAMI will fuel several MSc thesis projects that will be supervised by the TU PIs. And, similarly, the evaluation datasets and testbeds that will be developed and prepared during the project, will be made available to students for MSc research thesis and other similar student projects.

Research capacity. The project will enable TUD to develop further its capacity for research in the strategic area of next generation of communication systems and transfer this expertise and knowledge to other Dutch institutions. For instance, such cross-fertilization activities can take place in the context of synergistic projects that TUD leads (e.g., the national Future Network Services program). Furthermore, TUD will leverage its participation in ORIGAMI to expand its collaboration with key industry players in 6G, which participate in the project, such as NEC and TID. This, in turn, is expected to enable TUD to develop further its testing and evaluation capabilities, and as such, expand the scope and portfolio of its in-house testing facilities (e.g., the DoIoT field lab).

Funding acquisition and valorization. Leveraging its in-house and experienced valorization office, TUD will explore possibilities for valorization of ORIGAMI's research, in collaboration with the project partners. Similarly, TUD will build on the project's outcomes in order to acquire complementary funding and launch synergistic activities. To that end, the NS group will make systematic efforts for disseminating the research outcomes of ORIGAMI within associated research groups of TUD as well as other groups in Dutch universities.

4.2.6.4 I2CAT FOUNDATION

I2CAT exploitation strategy is focused on transferring the knowledge generated by the ORIGAMI project to the industrial and social sectors, and to academia. While I2CAT Foundation is public research organization and has no direct industrial exploitation plans, it will exploit ORIGAMI results following the next three axes.

Industrial sector. First, I2CAT will support the transfer of technology to the industrial sector through market exploitation of the software IP assets developed in the project. This will be pursued through license transfer agreements and spin-off creation. Already existing I2CAT's spin-offs such as Neutron may also be recipient of some of the innovations developed in ORIGAMI. Additionally, I2CAT will disseminate relevant project results to the industrial sector, starting with the members of its board of trustees that include Mobile Network Operators (MNOs) such as Orange, Vodafone, Telefonica, and Parlem, and vendors like Juniper, Cisco and Fujitsu.

Social sector. Also, I2CAT will also disseminate the relevant project results to the public administration of Catalonia that is fostering policies around digitalization. This will be done through the connectivity strand of the DIH4CAT¹⁰, which is a digital innovation hub aimed at strengthening the digital competences of Catalan SME, and I2CAT is leading.

Academia. Finally, I2CAT will generate new, critical expertise to the European industry in the fields of AI/ML enabled mobile networking by recruiting and training PhD students and postdoctoral fellows. By collaborating with the ORIGAMI consortium, I2CAT will target top-tier conferences and journals, which will build up its profile as a relevant European institution in the research field of mobile networking.

4.3 STANDARDIZATION POTENTIAL AND OPEN-SOURCE CONTRIBUTION

In order to produce contributions that have an impact on the activities of the SDOs, the ORIGAMI project will carry out the following steps.

1. Identification of SDOs and appropriate working groups with standardization activities correlated to the main ORIGAMI topics (mainly but not limited to GSBA, ZTL and CCL).
2. For each identified WG, select study/work items directly correlated to the ORIGAMI topics (if these SI/WIs do not exist, it is possible to contribute by proposing a new SI or WI).
3. Define contributions taking into account the objectives of the selected SI/WI.

4.3.1 RELEVANT STANDARDIZATION BODIES AND ACTIVITIES

The following is a list of some SDOs of interest for promoting ORIGAMI outputs (as innovative architectures, functionalities and AI/ML based on solutions).

1. **3GPP.** This SDO covers mobile telecommunications technologies, including radio access, core network and service capabilities, and provides a complete system description for mobile telecommunications.
2. **O-RAN Alliance.** It is a world-wide community of mobile operators, vendors, and research & academic institutions with the mission to re-shape Radio Access Networks to be more intelligent, open, virtualized and fully interoperable.

¹⁰ <https://dih4cat.cat/en>

3. **ETSI.** It provides members with an open, inclusive and collaborative environment. This environment supports the timely development, ratification and testing of globally applicable standards for ICT-enabled systems, applications and services.
4. **TM Forum.** It is an alliance of 800+ global companies working together to break down technology and cultural barriers between digital service providers, technology suppliers, consultancies and systems integrators.

In addition to the above, the ORIGAMI consortium will also consider opportunities to contribute to other SDOs that are relevant to the scope and activities of the project, such as IETF.

4.3.1.1 3GPP

The following appropriate working groups may be selected.

5. **RAN3** is responsible for the overall UTRAN/E-UTRAN/NG-RAN architecture and the specification of protocols for the associated network interfaces.
6. **SA2** develops the overall 3GPP system architecture and services, including user equipment, access network, core network and IP multimedia subsystem.
7. **SA3** has the main objective of defining the requirements and specifying the architectures and protocols for security and privacy in 3GPP systems.
8. **SA5** is currently responsible for Management and orchestration, which covers aspects such as operation, assurance, fulfilment and automation, including management interaction with entities external to the network operator (e.g. service providers and verticals). Charging, which covers aspects such as quota management and charging data record (CDR) generation in relation to end users and service providers.
9. **SA6** has the main objective of providing application layer architecture specifications for 3GPP verticals, including architectural requirements, functional architecture, procedures, information flows, interworking with non-3GPP application layer solutions and deployment models where appropriate.

The most important and relevant WGs identified for ORIGAMI's work that involve (mainly) AI/ML based solutions are: RAN3, SA2, SA5. TIM is the ORIGAMI partner with active presence in **RAN3** and **SA5** working groups. TID will lead the follow-up of activities in SA6 working group. Besides, TID is actively monitoring SA1, SA2 and SA6.

4.3.1.2 O-RAN ALLIANCE

The following working groups could be considered.

1. **WG1:** Use Cases and Overall Architecture Working Group. It has overall responsibility for the O-RAN Architecture and Use Cases. WG1 identifies tasks to be completed within the framework of the architecture and use cases and assigns Task Group Leaders to drive these tasks to completion, working across other O-RAN Working Groups.
2. **WG2:** The Non-Real-Time RAN Intelligent Controller and A1 Interface Working Group. The primary objective of the Non-RT RIC is to support non-real-time intelligent radio resource management, higher layer procedure optimisation, policy optimisation in the RAN and to provide AI/ML models for the Near-RT RIC.
3. **WG3:** The Near-RT RIC and E2 Interface Working Group. The focus of this WG is to define an architecture based on Near-Real-Time Radio Intelligent Controller (Near-RT RIC) that enables near real-time control and optimisation of RAN elements and resources through fine-grained data collection and actions over the E2 interface.

4. **WG6:** The Cloudification and Orchestration Working Group. The Cloudification and Orchestration WG aims to drive the decoupling of RAN software from the underlying hardware platforms and to produce technology and reference designs that would enable the use of commodity hardware platforms for all parts of a RAN deployment, including the CU and DU.
5. **WG10:** OAM Working Group. This WG is responsible for OAM requirements, for the OAM architecture and for the O1 interface.
6. **WG11:** Security Work Group. This WG focuses on the security aspects of the open RAN ecosystem.

TIM personnel follows standardization activities related to WG1, WG2 and WG3. NEC representatives in O-RAN will push contributions from ORIGAMI's research work in WG1, WG2, WG3 and WG6.

4.3.1.3 ETSI

It supports the timely development, ratification and testing of globally applicable standards for ICT-enabled systems, applications and services. The most relevant Specification Groups for ORIGAMI are the following:

1. **MEC:** Industry Specification Group (ISG) on Multi-Access Edge Computing. It defines open environment allowing the efficient and seamless integration of applications from vendors, service providers, and third parties across multi-vendor Multi-access Edge Computing (MEC) platforms.
2. **NFV:** Industry Specification Group (ISG) on Network Functions Virtualisation. From an architectural point of view, NFV specifications describe and specify virtualization requirements, NFV architecture framework, functional components and their interfaces, as well as the protocols and the APIs for these interfaces.
3. **ZSM:** Industry Specification Group (ISG) on Zero Touch Network and Service Management. The pivotal deployment of 5G and network slicing has triggered the need for a radical change in the way networks and services are managed and orchestrated. Full end-to-end automation of network and service management has become an urgent necessity to deliver services with agility and speed, and to ensure the economic sustainability of the very diverse range of services offered by digital service providers. The ultimate goal of automation is to enable largely autonomous networks driven by high-level policies and rules; these networks will be capable of self-configuration, self-monitoring, self-healing and self-optimisation. All this requires a new horizontal and vertical end-to-end architectural framework designed for closed-loop automation and optimised for data-driven machine learning and artificial intelligence algorithms.

Through the leadership and establishment of a New Software Development Group for Common API Framework (openCAPIF), TID plans to engage with ETSI-MEC to exploit CAPIF for invoking and exposing APIs. There is currently no such architecture defined in ETSI MEC.

4.3.1.4 TM FORUM

The following topics developed by TM Forum will be studied and considered for contribution.

1. **Data and AI:** reducing risk and governing AI and data to manage and monetize AI opportunities at scale. It covers the following aspects:
 - 1.1. AI readiness
 - 1.2. AI governance
 - 1.3. AI and data management
2. **Autonomous Operations:** it enables end-to-end automation to achieve zero-touch operations. This topic covers the following aspects:

- 2.1. Redesigning your operations to support AI
- 2.2. Self-healing network domains
- 2.3. 5G deployment
3. **Cloud Native IT & Networks:** it provides the architecture and frameworks to enable plug-and-play IT and networks. This topic covers the following aspects:
 - 3.1. Transforming OSS/BSS
 - 3.2. Cloud based agility
 - 3.3. New business models.

4.3.2 TIMELINE OF IMPACT ON 3GPP STANDARDIZATION

We next detail the expected timeline of the impact of ORIGAMI on 3GPP standardization activities. Similar contributions may be proposed for other SDOs such as O-RAN Alliance and ETSI; however, these bodies do not have long-term time plans as clear and precise as the 3GPP ones at the time when this deliverable is prepared, which prevents us from defining a thorough alignment with the ORIGAMI standardization plan at this time. In all cases, 3GPP is also our most relevant target as SDO, and having a well-defined plan over time for that specific body is already an important step in the ORIGAMI CoDEP.

More specifically, 3GPP is currently defining Release 19 of the standard (the final 5G release), and the timeline for this release is shown in Figure 5. The SA5 specific timeline for release 19 is instead shown in Figure 6. Finally, the meeting schedule defined for the RAN3 and SA5 WGs is reported Table 3 and Table 4.

Taking into account this information, the following schedule for the production of contributions could be considered in ORIGAMI.

1. **What:** Preparation of first high-level general contributions starting from the third meetings of RAN3 and SA5 in 2024.
Objectives: to present to each of the working group communities the innovation themes proposed by ORIGAMI, putting in evidence the relations with the activities related to specific SI/WIs.
When: starting from R3-128 and S5-161 (May of 2024).
2. **What:** Preparation of a possible second contribution to the final meetings of RAN3 and SA5 in 2024, focusing in particular on specific topics (*to be confirmed*):
 - 2.1. for RAN3, a possible contribution could be related to the network architecture aspects (GSBA)
 - 2.2. for SA5, a possible contribution may relate to architecture aspects (GSBA) applied to the orchestration and management plane and/or CCL aspects.

For the years 2025 and 2026, further contributions may be proposed depending on the status of activities in the ORIGAMI project and the evolution of standardization activities in the selected SDOs.

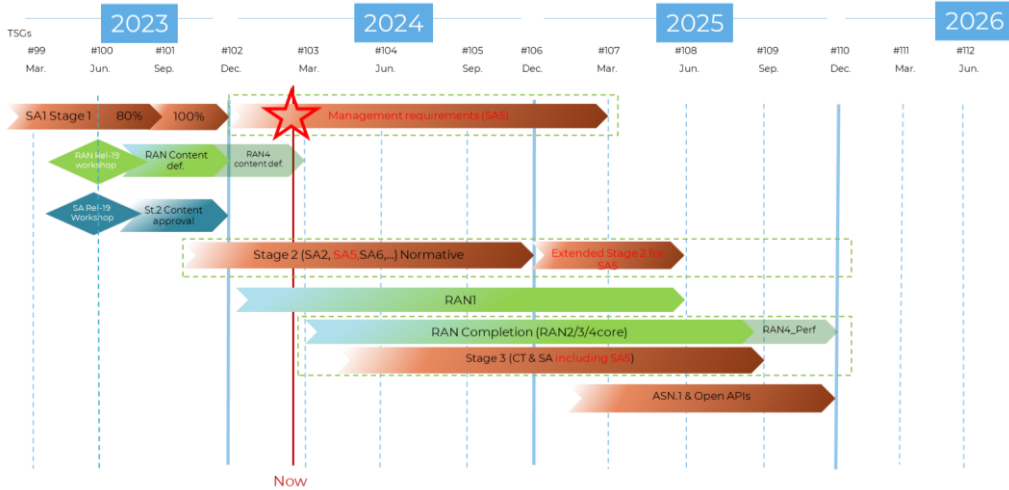


Figure 5. 3GPP Release 19 timeline

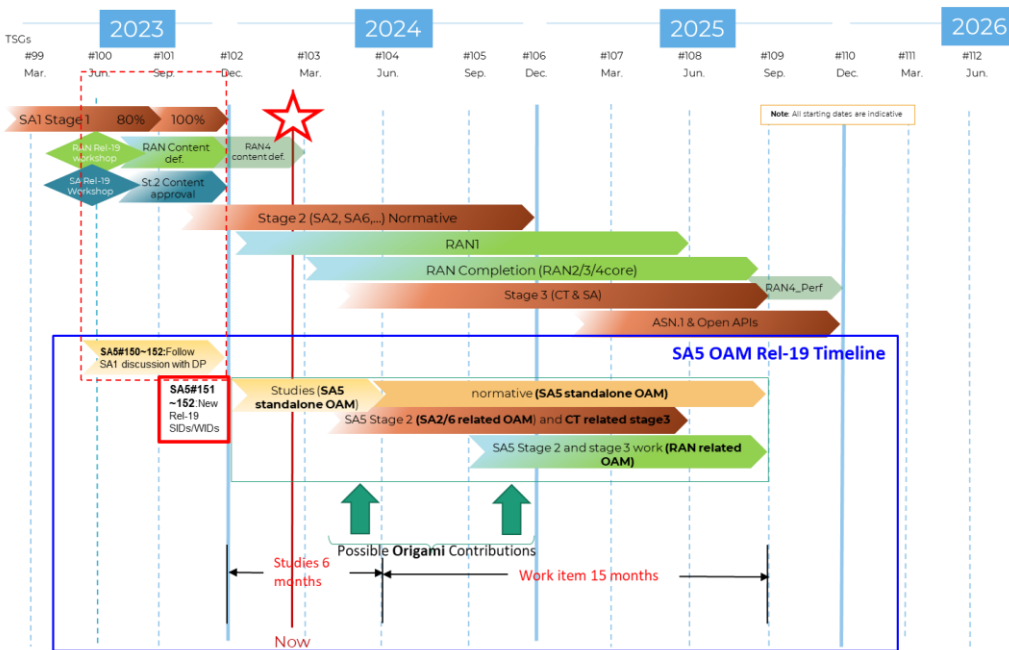


Figure 6. SA5 OAM Timeline for Release 19

Meeting	Start	End
S5-164	2025-11-17	2025-11-21
S5-163	2025-10-13	2025-10-17
S5-162	2025-08-25	2025-08-29
S5-161	2025-05-19	2025-05-23
S5-160	2025-04-07	2025-04-11
S5-159	2025-02-17	2025-02-21
S5-158	2024-11-18	2024-11-22
S5-157	2024-10-14	2024-10-18
S5-156	2024-08-19	2024-08-23
S5-155	2024-05-27	2024-05-31
S5-154	2024-04-15	2024-04-19
S5-153	2024-01-29	2024-02-02

Table 3. 3GPP SA5 meeting time plane

Meeting	Start	End
R3-130	2025-11-17	2025-11-21
R3-129-bis	2025-10-13	2025-10-17
R3-129	2025-08-25	2025-08-29
R3-128	2025-05-19	2025-05-23
R3-127-bis	2025-04-07	2025-04-11
R3-127	2025-02-17	2025-02-21
R3-126	2024-11-18	2024-11-22
R3-125-bis	2024-10-14	2024-10-18
R3-125	2024-08-19	2024-08-23
R3-124	2024-05-20	2024-05-24
R3-123-bis	2024-04-15	2024-04-19
R3-123	2024-02-26	2024-03-01

Table 4. 3GPP RAN3 meeting time plane

4.3.3 OPEN-SOURCE CONTRIBUTING STRATEGY

Along the line of facilitating network capability exposure and service consumption based on the as-a-service paradigm, the CAMARA project has been recently launched.¹¹ A joint initiative of the Linux Foundation and the GSMA, CAMARA is structured as a global partnership to provide consistent access to network service features across heterogeneous operator and cloud infrastructures. CAMARA is committed to develop an open, global, and accessible API solution with access to operator capabilities, allowing applications to run consistently on telco networks, independently of the chosen provider and geographic location. The ORIGAMI framework can be instrumental in support of future GSMA Operator Platform deployments and the evolution of the CAMARA initiative, in the line of what has been currently demonstrated in the PoC performed within ETSI ZSM.

ORIGAMI is in line with three sub-projects within CAMARA, which include TID as a direct active contributor.

- Identity and Consent Management¹² Sub-Project. Telco operator exposure platforms implementing CAMARA APIs should be built with a privacy-by-default approach to fully comply with data protection regulations, such as the GDPR regulation in Europe, which emphasizes on user privacy. These regulations note that some CAMARA APIs may require user consent to be accessed. This forces the operators to provide means and appropriate solutions to capture, store and manage this consent through its lifecycle. Otherwise, the scoped CAMARA APIs cannot be rolled out in production networks. Building such a solution also means bringing in scope the identity of the end user and/or the subscriber (as both could be different) and making sure that end user experience of using the API is not compromised while doing so.
- Carrier Billing Check-Out¹³ Sub-Project. It provides the customer with the ability to (a) trigger carrier billing payment request in one or two steps, and (b) follow up of payment processing using as Payment Method Carrier Billing, i.e.: the operator performs the billing of the goods.
- Blockchain Public Address¹⁴ Sub-Project. This API allows to manage a Blockchain Public Address associated to a phone number, i.e. to retrieve the blockchain public address(es) and to bind/unbind a Blockchain Public Address. The Blockchain Public Address is utilized as Decentralized Identifier (DID). With the proposed API, telco service providers have the opportunity to provide 3rd parties with the following capability: pairing phone number with Blockchain Public Address whenever this 3rd party wants to offer its customers a way to make transactions more easily based on the phone number instead of the Blockchain Public Address.

¹¹ <https://camaraproject.org/>

¹² <https://github.com/camaraproject/IdentityAndConsentManagement>

¹³ <https://camaraproject.org/carrier-billing-check-out/>

¹⁴ <https://camaraproject.org/blockchain-public-address/>

5 TARGET INDICATORS

The CoDEP of the ORIGAMI project defines a clear set of production KPIs that are associated with the activities of communication, dissemination and exploitation outlined in the previous sections of this document. The CoDEP also sets out corresponding targets for such production KPIs during the lifetime of the project, in full agreement with the DoA in the GA of the action. The CoDEP for the first year of the execution of ORIGAMI also identifies the partial targets that are expected to be achieved in the first 12 months of the action. The two sets of targets are discussed next.

5.1 TARGETS FOR THE PROJECT LIFETIME

The KPIs and overall associated targets defined by the ORIGAMI CoDEP are summarized in Table 5 below.

Nature	Community	KPI	Final target	Notes
Communication	General	Official project website	1	Online by M1
		Official project social media accounts	4 (channels)	Twitter/X, Mastodon, LinkedIn, YouTube
		Official project leaflet	1	Produced by M3
		Press releases	10	
		Videos of the project vision, solutions, and outcomes	5	
Dissemination	Academia	Scientific publications	80	20+ at top venues (CORE A*) and journals (JCR Q1)
		Edited special issues of international peer-reviewed scientific journals	2	
		Collaborations with other scientific projects	2	
		ORIGAMI scientific workshops	2	Co-located with main international conferences, 30+ attendees each
	Industry	In-presence participation in industry fora and events	10	Targets include MWC, FutureNet World, Telco AI Summit, World Summit AI, Cloud Native Telco Day, The AI Summit London, The Edge Event, Turing Fest, Connected Britain, Network X, NEC Open House, Telefonica Research Fair

		ORIGAMI industry workshops	2	30+ attendees each
	Academia Industry	Demonstrators	8	
Exploitation	Industry	Contributions to standards	10 (submitted)	Target SDOs include O-RAN, 3GPP, ETSI, IETF, ITU
		Patent applications	9 (filed)	
		Large open-source project contributions	2 (submitted)	Target is the CAMARA project

Table 5. ORIGAMI KPIs for communication, dissemination, exploitation during the whole project lifetime

The quantitative targets set by the project partners for the production KPIs in Table 5 will allow ascertaining the success of ORIGAMI in terms of communication, dissemination, and exploitation to the different audiences of general public, scientific community and industry actors. These KPIs are in line with the productivity of the researchers involved in ORIGAMI over the last 5 years and will provide a strong basis for ORIGAMI to achieve a substantial impact.

In particular, in line with the dissemination activities listed in Section 3.1, ORIGAMI will pursue a strategy of publishing results at top-tier venues. Based on the publication record of the ORIGAMI research team and the focus and innovations of the project, we estimate that at least 80 publications will result from the project. Notably, ORIGAMI will value the quality of the venues, and hence the target will be to publish at the highest quality conferences and journals in the field. Targets include top-tier venues like IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, IEEE INFOCOM, ACM MobiCom, or International Conference on Machine Learning (ICML). Note that participants in the project have a strong track record of publishing at renowned venues, with over 200 contributions to the journals and conferences listed previously in the past five years, which ensures the feasibility of attaining this target.

5.2 TARGETS FOR THE FIRST YEAR OF EXECUTION

During the first year of execution, the ORIGAMI CoDEP also indicates objectives for the partial fulfillment of the KPIs outlined in Section 5.1. These are in line with the overall expectations and also reflect the fact that the research activities will be necessarily slower at the start of the action due to the need for the partners to organize their work and establish new collaborations within the scope of the project.

The targets to be achieved by M12 of the project execution are listed in Table 6 below.

Nature	Community	KPI	Target at M12	Level of achievement
Communication	General	Official project website	1	Fully achieved
		Official project social media accounts	4 (channels)	Fully achieved
		Official project leaflet	1	Fully achieved
		Press releases	3	3/10
		Videos of the project vision, solutions, and outcomes	1 (project vision)	1/5
Dissemination	Academia	Scientific publications	20	20/80

		Edited special issues of international peer-reviewed scientific journals	0	0/2
		Collaborations with other scientific projects	0	0/2
		ORIGAMI scientific workshops	0	0/2
	Industry	In-presence participation in industry fora and events	2	2/10
		ORIGAMI industry workshops	0	0/2
	Academia Industry	Demonstrators	0	0/8
Exploitation	Industry	Contributions to standards	2	2/10
		Patent applications	0	0/9
		Large open-source project contributions	0	0/2

Table 6. ORIGAMI KPIs for communication, dissemination, exploitation during the first year of the project

6 EARLY ACHIEVEMENTS

The ORIGAMI project already accomplished a number of tasks related to the CoDEP outlined in the previous sections by the time this document is issued, i.e., within three months from the project start date. Next, we list these achievements, which prove how the action is well on track in terms of communication, dissemination, and exploitation from the very beginning.

6.1 COMMUNICATION ACTIVITIES

The ORIGAMI consortium has already carried out multiple communication activities directed to the general public, even if the project is still at an early stage. These include the opening of an official website and social media accounts, the preparation of communication material for the project, and the issuing of one press release.

6.1.1 OFFICIAL WEBSITE

The project website has been established at the beginning of the project and it is reachable at following URL: <https://sns-origami.eu/>. The landing page is reported in Figure 7.

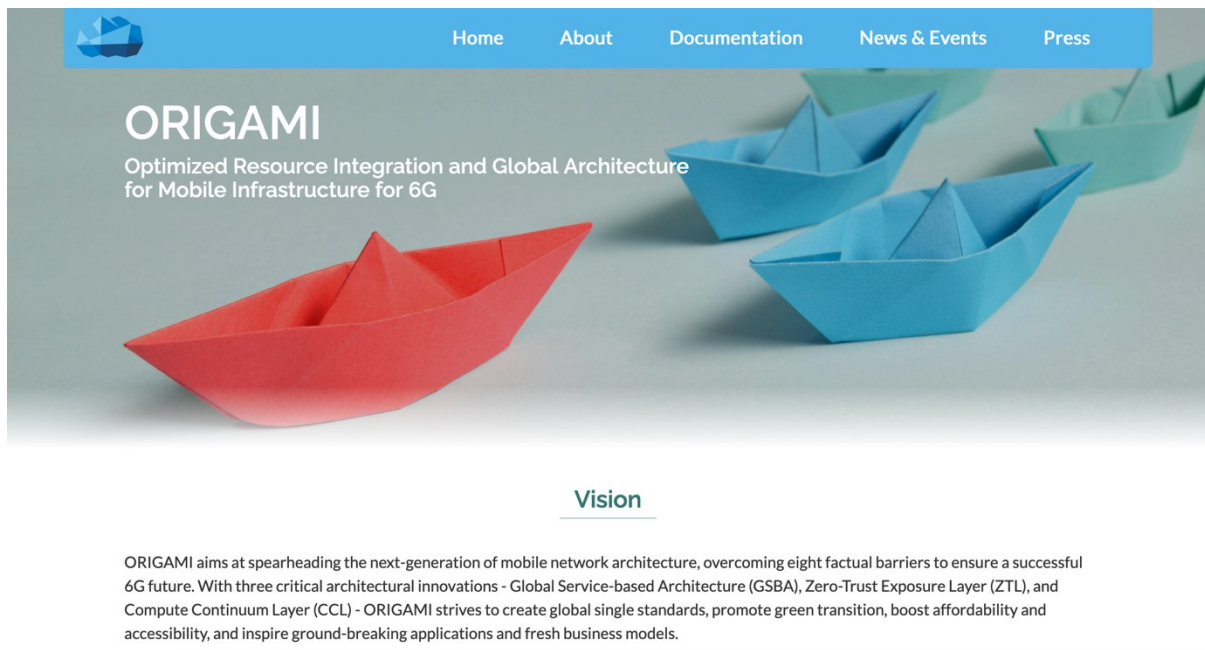


Figure 7. Screenshot of the landing page of the official ORIGAMI website

The project website map is organized in a structured way, and it clearly separates the following sections.

- **Home**. Conveys the overall vision of the project, and summarizes the main figures of the project, the consortium, the recent news and the contact points.
- **About**. Includes detailed information on the project objectives, expected impact, methodology and contributing partners.
- **Documentation**. Provides direct access to all resources produced in the project, including deliverables and different categories of scientific publications.
- **News**. Points to a complete list of recent and historical news related to the project.
- **Press**. Contains communication material, such as the project leaflet and the videos.

The website also features a section on ethics, where the approach of the project to the subject is outlined, including information on the ORIGAMI ethics management plan and on key associated figures like the Ethical Manager (EM) and the external Ethical Advisor (EA).

6.1.2 SOCIAL MEDIA ACCOUNTS

The project has established a presence on social media since the very start in January 2024, and has been active since then, issuing posts on its different initial activities. Specifically, ORIGAMI official accounts are available in the following platforms:

- Twitter: https://twitter.com/sns_origami
- LinkedIn: <https://www.linkedin.com/in/sns-origami/>
- Mastodon: https://mastodon.social/@sns_origami
- YouTube: <https://www.youtube.com/@sns-origami>

The profiles of these accounts are shown in Figure 8.

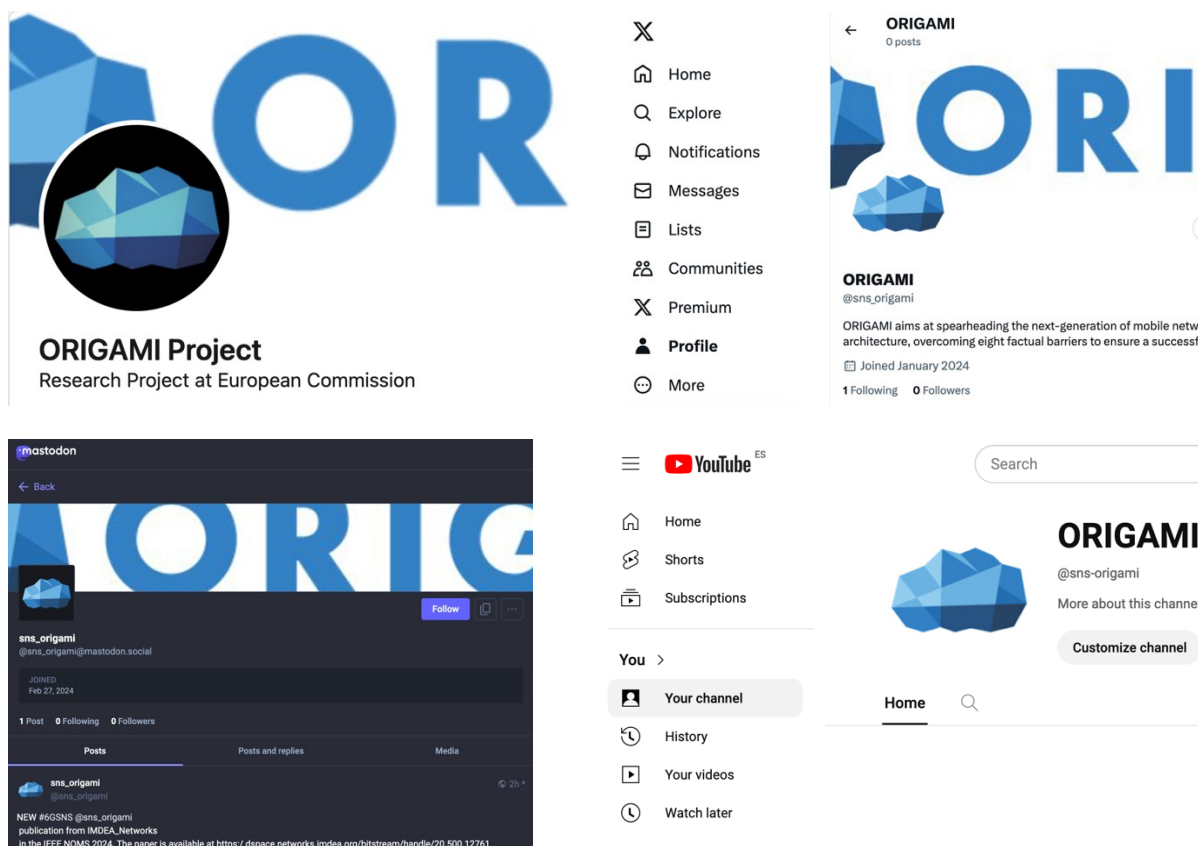


Figure 8. Profiles of the official ORIGAMI social media accounts

All these accounts are shared in the contact section of the official webpage, where Twitter and LinkedIn feeds are also displayed in real-time. In line with the “SNS JU Programme Online Communication Guidelines”, the ORIGAMI accounts in Twitter/X and LinkedIn follow those of the 6G SNS.

In line with the “SNS JU Programme Online Communication Guidelines”, messages published on Twitter/X and LinkedIn have tagged the relevant 6G SNS accounts using the #6GSNS hashtag or mentioning @SNSJU in all posts generated by the official ORIGAMI accounts.

6.1.3 COMMUNICATION MATERIAL

The project produced the official leaflet to be used during in-person events where the vision, results and impact of ORIGAMI can be communicated or disseminated to relevant communities. The three-fold leaflet is portrayed in Figure 9 and Figure 10.



Figure 9. Front view of the ORIGAMI leaflet

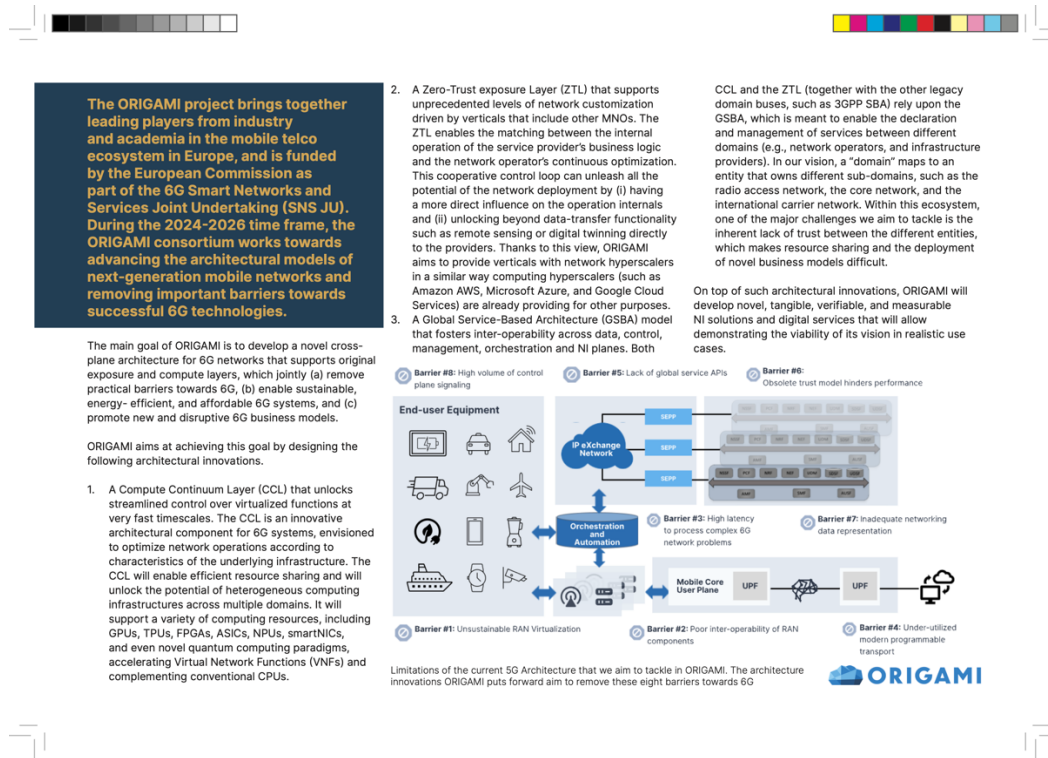


Figure 10. Internal view of the ORIGAMI leaflet

6.1.4 PRESS RELEASE

A joint press release¹⁵ has been generated in the last week of March 2024 to communicate about the start of the ORIGAMI project, its vision and objectives, as well as its expected impact. The press release was issued by IMDEA with contributions of the project coordinator TID. The press release is depicted in Figure 11.

IMDEA Networks · News · ORIGAMI: anticipating the future of more connected, efficient and sustainable telecommunication infrastructures

ORIGAMI: anticipating the future of more connected, efficient and sustainable telecommunication infrastructures

The project will contribute to the development of mobile networks with lower latency, higher throughput and higher reliability, which will significantly improve the daily activities of many public sectors and citizens

26 March 2024

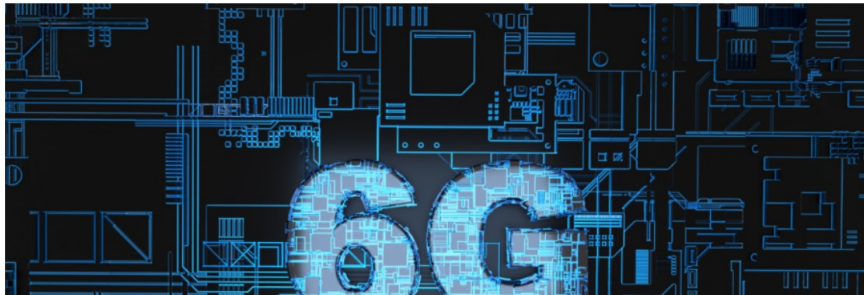


Figure 11. ORIGAMI Press Release

6.2 DISSEMINATION ACTIVITIES

The ORIGAMI consortium has already carried out dissemination activities towards the scientific and industry communities, even if the project is still at an early stage. Namely, several scientific papers that have been partially produced in the context of ORIGAMI have been accepted for presentation at major conferences in the networking and machine learning communities. Also, the project vision was already presented in a major forum for the industry such as Mobile World Congress 2024 in February 2024.

The project already set up its official Zenodo community¹⁶ as a first step to implement the result dissemination strategy outlined in Section 3.2. The first resources will be uploaded to the community as soon as the OpenAIRE record for ORIGAMI will become available, allowing the correct linking of Zenodo entries in the ORIGAMI community with the project OpenAIRE repository.

The project has also set out clear rules that partners shall follow in order to correctly implement actions in terms of dissemination. These are described in Deliverable D1.1 of ORIGAMI, and include, e.g., the acknowledgement to the European Commission funding that each and every resource produced by the action shall present.

6.2.1 EARLY DISSEMINATION TO THE INDUSTRY

ORIGAMI was present at Mobile World Congress (MWC) 2024 in Barcelona, Spain. This was a four-day event that took place from February 26 through February 29, and where two partners of the project,

¹⁵ <https://networks.imdea.org/origami-anticipating-the-future-of-more-connected-efficient-and-sustainable-telecommunication-infrastructures/>

¹⁶ <https://zenodo.org/communities/sns-origami/>

Net AI and Emnify, had stands where dissemination material about the ORIGAMI vision was displayed to the expert public from all major players in the global telco ecosystem.

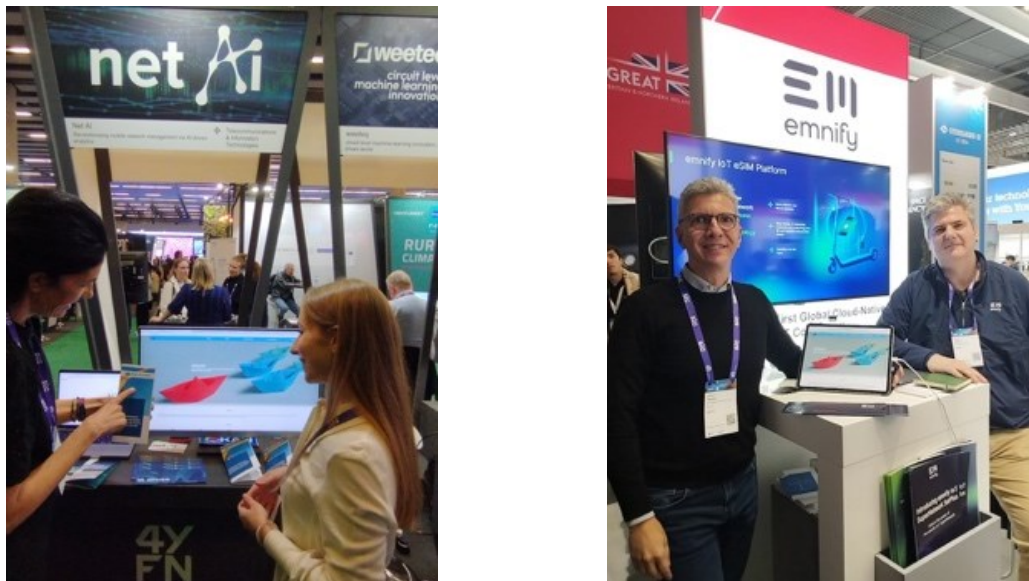


Figure 12. Pictures of the stands with ORIGAMI dissemination material at MWC 2024

6.2.2 EARLY DISSEMINATION TO THE SCIENTIFIC COMMUNITY

The project already generated a few scientific publications. We remark that these works were not entirely produced within the framework of ORIGAMI, which is very understandable as the project started just three months before the issuing of this document. All the works listed below are thus based on substantial background knowledge with respect to ORIGAMI. However, these papers are fully within the scope of the project and were largely edited during shepherding processes or camera-ready version processes that entirely happened within the framework of ORIGAMI. The project thus made it possible to complete the work started previously by the partners towards very early versions of the solutions that the DoA proposes to develop. The list of scientific publications produced by M3 is included below. For each record, we report the title of the paper, name of the conference, authors, their affiliations to project partners, the ranking of the conference according to CORE, and the relevant project tasks.

No.	Title/Conference	Authors/Partners	Ranking/Tasks
1	Risk-Aware Continuous Control with Neural Contextual Bandits	J. A. Ayala-Romero, A. Garcia-Saavedra, X. Costa-Perez	A*
	AAAI 2024	NEC	WP3
2	Mean-Field Multi-Agent Contextual Bandit for Energy-Efficient Resource Allocation in vRANs	J. A. Ayala-Romero, L. Lo Schiavo, A. Garcia-Saavedra, X. Costa-Perez	A*
	IEEE INFOCOM 2024	NEC, IMDEA, UC3M	T3.2
3	Encrypted Traffic Classification at Line Rate in Programmable Switches with Machine Learning	A.T.-J. Akem, G. Fraysse, M. Fiore	B
	IEEE NOMS 2024	IMDEA	T3.3
4	CloudRIC: Open Radio Access Network (O-RAN) Virtualization with Shared Heterogeneous Computing	L. Schiavo, G. Garcia-Aviles, A. Saavedra, M. Gramaglia, M. Fiore, A. Banchs, X. Costa-Perez	A*
	ACM MobiCom 2024	NEC, IMDEA, UC3M	T3.2

Table 7. List of scientific publications produced by M3

6.2.3 INITIAL LIAISON ACTIVITIES WITH 6G-IA

The ORIGAMI project already started participating in a number of activities supported by the 6G-IA within the first three months of its execution. Specifically, partners of ORIGAMI were involved in the following events.

- The ORIGAMI Technical Manager (TM), Andrés Garcia-Saavedra contributed with a presentation of the project concept to the SNS Webinar entitled “Introducing the Call 2 SNS project”, held virtually on March 7, 2024.
- The project contributed content about its vision, objectives, targeted use-cases and expected results to the 2024 edition of the SNS Journal, organized by SNS OPS project.
- The Project Coordinator (PC) of ORIGAMI, Javier Garcia Rodrigo, contributed to a questionnaire issued by 6G-IA.
- The Project Coordinator (PC) of ORIGAMI, Javier Garcia Rodrigo, along with the Technical Manager (TM), Andrés García-Saavedra contributed to a questionnaire issued by the SNS OPS CSA project and for the SNS JU Phase 2 R&I projects. The goal of this questionnaire was to get a better understanding of the work planned to be performed in ORIGAMI, the challenges being addressed and the expected outcomes
- ORIGAMI already named a fairly comprehensive list of project members to participate in many Working Groups (WGs) of 6G-IA, as listed in Section 3.3.2.

We stress that all these achievements were possible despite delays encountered by the project in formally joining the SNS-JU at program level. Indeed, upon submission of the present deliverable, the SNS collaboration agreement, which establishes a framework and covers areas where close cooperation and coordination among all SNS projects are orchestrated, is still underway for SNS Call 2 projects like ORIGAMI.

7 CONCLUSIONS

This deliverable outlined the communication, dissemination, and exploitation plan (CoDEP) of the ORIGAMI project and presents the initial steps towards the implementation of the same. To ensure that the results of ORIGAMI reach relevant communities and to spread the innovations produced by the project, the CoDEP outlines a comprehensive dissemination and communication strategy, by targeting different audiences and tailoring communication activities accordingly. It also set out the project strategy for exploitation of the results produced and their valorization, e.g., via standardization.

The document also presented the targets identified by the project consortium in terms of production KPIs that are associated with the activities of communication, dissemination and exploitation. These are reported both for the whole project lifetime as well as for the first year of execution.

Finally, early activities carried out by ORIGAMI by the date of issuing of the present deliverable, i.e., within the first three months of activities, were also reported.