6G SNS OPS

SNS OPS – Supporting the SNS JU Operations

D4.3: Stakeholder Involvement and Interaction: Final Report

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Abstract

The document presents the key activities and achievements of the SNS stakeholder strategy from April 2024 to March 2025. It contains the SNS stakeholder ecosystem map and outlines the engagement strategies implemented for different stakeholders, including verticals and complementary domains as well as relevant partnerships, initiatives, programmes and organisations. Updates on the pre-standardisation activities and the Standards Tracker are provided. The involvement of SMEs through the NetworldEurope SME WG and the status of entrepreneurship in the SNS domain is also documented. In addition, it details the coordination efforts between SNS, 6G IA, and NetworldEurope Working Groups and the overall support provided alongside their main activities and accomplishments.

[End of abstract]

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Executive Summary

This document presents key activities and achievements of the Smart Networks and Services (SNS) stakeholder involvement and interaction strategy from April 2024 to March 2025. It outlines the SNS stakeholder ecosystem and the engagement strategies for key stakeholders and contains updates on pre-standardisation activities and the Standards Tracker. The report highlights the involvement of SMEs involvement through the NetworldEurope SME WG and provides an overview of entrepreneurship in the SNS domain. In addition, it documents the support and coordination efforts dedicated to the SNS, 6G IA, and NetworldEurope Working Groups

The comprehensive update of the SNS stakeholder map offers a clearer depiction of the actors and their interactions in the provisioning, user, and enablers & facilitators layers of the ecosystem. The refined map facilitates the identification and engagement of relevant stakeholders, ensuring their roles, needs, and contributions are accurately represented, thereby fostering more effective collaboration within the SNS community.

Five new Impact Assessment and Facilitation Actions (IAFAs) were organised, fostering collaboration and knowledge exchange with relevant initiatives for the SNS community. These targeted stakeholders in strategic domains such as photonics, non-terrestrial networks (NTN), security, wireless communication technologies and signal processing, and cloud and service provision. IAFAs were also organised with the New European Media (NEM), the 5G Alliance for Connected Industries and Automation (5G-ACIA), and the Alliance for AI, IoT and Edge Continuum Innovation (AIOTI).

The Standards Tracker continues to be a central tool for streamlining European involvement in the global standardisation landscape. It now contains over 1,000 contributions from 40 SNS JU projects, enhancing the visibility and impact of European standardisation efforts and the European Union's commitment to maintaining a leading role in the development and standardisation of next-generation telecommunications technologies.

The involvement of small and medium-sized enterprises (SMEs) in the SNS ecosystem remains a priority. Analysis of SME participation in SNS JU calls shows a positive trend, with SMEs accounting for 26.3% of the total budget in the SNS 2024 call. The SME WG has continued to advocate for their interests and to promote their involvement and visibility within the SNS ecosystem. The "European SME Expertise in 5G and Beyond 2024" brochure was launched with a remarkable success.

The status of the entrepreneurship in the SNS domain has exposed important challenges that require further examination. The sustainability and competitiveness of the SNS ecosystem will depend on its ability to define strategies and incentives that foster the creation of new businesses.

The support to the SNS WGs ensures the effective implementation of a multifaceted SNS JU programme. The knowledge created within the SNS JU is streamlined and build upon in the WGs, which have reverted valuable insights to the broader SNS community.

The SNS community is now stronger and more resilient. The consolidation of the SNS JU identity has reinforced its ability to leverage collaboration, innovation, and strategic partnerships, further strengthening its impact. Cultivating a dynamic environment that supports both established stakeholder and emerging players and fostering collaboration across the SNS ecosystem and with complementary initiatives will be critical to strengthen Europe's competitiveness and technological sovereignty.

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Abbreviations

3GPP	Third Generation Partnership Project
5G	5th Generation Wireless Systems
5G PPP	5G Public Private Partnership
5GAA	5G Automotive Association
5G-ACIA	5G Alliance for Connected Industries and Automation
6G-IA	6G Industry Association
AENEAS	Association for European NanoElectronics ActivitieS
ADAS	Advanced Driver Assistance Systems
AI	Artificial Intelligence
AINN	AI-Native Networks
AIOTI	Alliance for AI, IoT and Edge Continuum Innovation
API	Application Programming Interface
ARES	International Conference on Availability, Reliability and Security
ASMS	Advanced Satellite Multimedia Systems Conference
B2B	Business to Business
BDVA/DAIRO	Big Data Value Association/Data, AI and Robotics
BSCW	Basic Support for Cooperative Work
CAM	Connected and Automated Mobility
CCSA	China Communications Standards Association
CEF	Connecting Europe Facility
CEPT	European Conference of Postal and Telecommunications Administrations
CFP	Calls for Projects
CMOS	Complementary Metal-Oxide-Semiconductor
CSA	Coordination and Support Action
CSCN	Conference on Standards for Communications and Networking
CVC	Corporate Venture Capital
DEP	Digital Europe Programme
DIH	Digital Innovation Hub
E2E NS	End-to-End Network Security
EAG	Expert Advisory Group
EC	European Commission
ECSO	European Cybersecurity Organisation
EDIH	European Digital Innovation Hub
EEN	European Enterprise Network
EIB	European Investment Bank
EMF	Electromagnetic fields

ENS	Emerging Network Security
EPO	European Patent Office
ESCS-FAU	Electrical Smart City Systems-Friedrich-Alexander-Universität
ETP	European Technology Platform
ETSI	European Telecommunication Standards Institute
EuCNC	European Conference on Networks and Communications
Euro-NCAP	European New Car Assessment Programme
FDSOI	Fully Depleted Silicon on Insulator
FinFET	Fin Field-Effect Transistor
FNWF	Future Networks World Forum
G5GE	Global 5G Event
GAA	Gallium Arsenide
GaN	Gallium Nitride
GSM	Global System for Mobile communication
GSMA	GSM Association
H2020	Horizon 2020
HT	Hardware Technologies
IA	Innovation Action
IAFA	Impact Assessment and Facilitation Action
ICT	Information and Communication technology
ICTON	International Conference on Transparent Optical Networks
IEEE	Institute of Electrical and Electronics Engineers
IMT	International Mobile Telecommunications
InP	Indium Phosphide
IoT	Internet of Things
IPR	Intellectual Property Rights
ISAC	Integrated Sensing and Communication
ISG	Industry Specification Group
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union Radiocommunication Sector
ITU-T	International Telecommunication Union Telecommunication Sector
KPI	Key Performance Indicator
KVI	Key Value Indicator
MANO	Management and Orchestration
MoU	Memorandum of Understanding
MWC	Mobile World Congress
NEM	New European Media

NESSI	Networked European Software and Services Initiative
NGMN	Next Generation Mobile Networks
NSA/SA	Non-Stand Alone/Stand Alone
NTN	Non-Terrestrial Networks
PCG	3GPP Project Coordination Group
PIMRC	Personal, Indoor and Mobile Radio Communications
PoC	Proof of Concept
PSM	Pre-Structuring Model
R&D	Research and Development
R&I	Research and Innovation
RAN	Radio Access Network
RIA	Research and Innovation Action
RIT	Radio Interface Technology
RTO	Research and Technology Organisation
S&T	Science and Technology
SA2	(3GPP) Service and System Aspects WG2
SAE L4	Society of Automotive Engineers Level 4
SB	Steering Board
SCoDIHNet	Smart Connectivity Digital Innovation Hub Network
SDG	Software Development Group
SDGs	Sustainable Development Goals
SDO	Standards Development Organisation
SB	Steering Board
SCoDIHNet	Smart Connectivity Digital Innovation Hub Network
SDG	Software Development Group
SDO	Standards Development Organisation
SLA	Service Level Agreement
SME	Small and Medium Enterprise
SNS	Smart Networks and Services
SNS JU	SNS Joint Undertaking
SNS4SNS	Software and Standards for Smart Networks and Services
SNS-I	SNS Initiative
SPSC	Signal Processing for Space Communications Workshop
SRIA	Strategic Research and Innovation Agenda
T&M	Test and Measurement
T&Ps	Trials & Pilots
TB	Technology Board

TC-SES	Technical Committee Satellite Earth Stations and Systems
TF	Task Force
THz	TeraHertz
ToR	Terms of Reference
TSDSI	Telecommunications Standards Development Society, India
TTO	Technology Transfer Offices
UC	Use Case
UKRI	United Kingdom Research and Innovation
UN	United Nations
V2X	Vehicle to Everything
VSC	Vision and Societal Challenges
WCNC	(IEEE) Wireless Communications and Networking Conference
WeInTel	Women In Telecommunication and Optical Networks
WG	Working Group
WiTaR	Women in Telecommunications and Research
WRC	World Radio Conference
XaaS	Everything as a Service

1   Introduction

This document contains the final report on the Smart Networks and Services (SNS) Stakeholder Engagement Strategy and Action Plan. It provides a detailed overview of all activities, developments and outcomes of the tasks encompassed in the strategy, including those addressing verticals and complementary domains, pre-standardisation, small and medium enterprises (SMEs) engagement and entrepreneurship promotion and support, and Working Group (WG) support.

1.1   Main objectives and status

The main goal of the stakeholder involvement and interaction strategy is to build a solid SNS community, fostering the engagement and cooperation of all stakeholders involved to facilitate the uptake of advanced 5G and new 6G technologies by the European industry.

The specific objectives are listed below.

- To **identify and engage all relevant SNS stakeholders** by means of implementing a specific set of actions with respect to verticals and complementary domains, SMEs and relevant Partnerships, Initiatives and Associations**.**

- To **foster knowledge exchange across SNS JU verticals, complementary domains and peer partnerships**, promoting alignment on specific sector needs.

- To **support SNS JU projects and their researchers implementing their standardisation roadmaps,** helping them to maximise the impact of their activities and therefore, contributing to a strong European impact at future downstream 6G standardisation stages.

- To **promote entrepreneurship in 6G** and other related SNS domains.

- To **support market growth/change in the advanced 5G and 6G ecosystem** and related SNS domains and prepare the adoption of 6G technologies by the European Industry.

- To **handle the Impact Assessment and Facilitation Action (IAFA)** events by defining and strengthening interaction with adjacent Partnerships, Initiatives and relevant Associations to ensure relevance and synergies in both directions.

- To **facilitate the community discussions through Working Groups (WGs)** and to document achieved outcomes in the form of white/position papers or other types of documents.

1.2   Main activities

The purpose of this document is to report the activities and results of the tasks encompassed in the SNS Stakeholder Engagement Strategy and Action Plan during the past year (SNS OPS M16 – M27) and how these contributed to the overall objectives.

The document is structured along the main tasks as shown hereafter:

- **Chapter 1 - Introduction** presents the objectives of the SNS OPS stakeholder engagement strategy and a summary of the main activities.

- **Chapter 2 - SNS Stakeholder Strategy** describes the main activities and accomplishments in the SNS OPS stakeholder engagement strategy. In addition to the mapping of relevant SNS stakeholders, it details the new IAFA events completed during this period as well as the outcomes and follow-up actions of previous IAFAs. It also provides a brief description of the SNS market forecast, which is fully available in D1.4 Second Period Assessment and Planning Report.

- **Chapter 3 - Verticals and complementary domains,** depicts the verticals and complementary domain engagement. Focusing on standardisation, mainly orchestrated around the 6G-IA Pre-Standardisation WG and the Standards Tracker, it details the efforts dedicated to facilitating the alignment of European research and innovation with the global standardisation of 5G and 6G.

- **Chapter 4 – SME engagement, support and entrepreneurship promotion,** contains the different support actions implemented in the NetworldEurope SME Working Group to foster engagement and boost SME's visibility, strengthening their positioning in the SNS JU ecosystem. It also presents an analysis on state of the art of entrepreneurship in the SNS JU community, including a set of recommendations for the future. Lastly, it details different activities with SME-focused initiatives, particularly the Smart Connectivity Digital Innovation Hub Network (SCoDIHNet).

- **Chapter 5 – Working Group coordination,** describes the efforts dedicated to the coordination of and support to the SNS JU, 6G Industry Association (6G-IA) and NetworldEurope Working Groups in the reporting period.

- **Chapter 6 - Conclusions** outlines the main outcomes of the SNS OPS project stakeholder engagement strategy. The interaction with relevant players has been critical for reinforcing Europe's competitiveness and technological sovereignty while fostering an ecosystem that promotes cooperation across stakeholders, domains, areas of expertise and much more, ultimately consolidating Europe's leadership in shaping the future of communication networks.

The tasks were performed in close cooperation with the whole SNS OPS consortium, ensuring the alignment between Work Packages (WPs) and an efficient and effective progress towards common objectives.

1.3   Coordination with other projects

The handover of WP4 activities from the 6GStart Coordination and Support Action (CSA) to the SNS OPS CSA was concluded for all tasks, except the elaboration of the SME Brochure 2023, in December 2023. Therefore, all the activities described hereafter were exclusively carried out in the context of SNS OPS. Nevertheless, it is important to note that the activities and achievements related to the stakeholder engagement strategy build upon previous work.

2   SNS Stakeholder Strategy

The SNS Stakeholder Engagement Strategy follows the Agile Stakeholder Management Framework. The key element of the Framework is its flexibility defined by its ability to effectively respond to the evolving needs of the SNS ecosystem. It allows to integrate new elements and swiftly shift plans based on the learnings obtained during the implementation of the different actions, enabling a continuous improvement of the support provided to stakeholders.

This chapter outlines the mapping and engagement of a wide range of SNS stakeholders through the IAFA events in Year 2 and Year 3. It also comprises a brief overview of the market analysis for 6G.

2.1   Main objectives and status

The central goal of the SNS Stakeholder Engagement Strategy is the identification of the main SNS players to gain a better understanding of their roles, needs and contributions. This information serves as a basis to facilitate the design and implementation of tailored engagement approaches for each actor and group, enabling the conditions for close cooperation.

The specific objectives and their status are described below:

- **Update the SNS stakeholder identification performed in 6GStart.**

  The final version of the SNS stakeholder map with an accompanying glossary was completed, depicting a comprehensive picture of all relevant players in the SNS ecosystem and their primary role in it.

- **Better identify and engage the newly formed and evolving SNS ecosystem** and make sure that coordination among all relevant initiatives is as effective as possible.

  Besides the SNS stakeholder map, which depicts the most up-to-date representation of the key players in the SNS ecosystem, SNS OPS continued to organise IAFA events. Five new IAFAs, some of which included several events, were organised since March 2024, making a total of nine IAFAs during the course of the project.

- **Demonstrate that the 5G/6G SNS capabilities will pre-empt great market changes and growth** as the new capabilities are exploited.

  To optimise the resources of SNS OPS, this activity was carried out in the context of the "Monitoring & Analysis Framework" task in WP1.The full results are reported in D1.4 Second Period Assessment and Planning Report.

The objectives were accomplished with positive results. The latest SNS stakeholder map constitutes a stepping stone to continue to engage the key players in the community in the most effective manner. Likewise, the IAFAs are one of the main highlights in the engagement strategy. The events were an essential instrument to solidify existing ties within the SNS community whilst fostering the collaboration with new initiatives, programmes, projects and organisations working in SNS and other relevant areas. Many of the IAFAs have already materialised in concrete outputs and have led to follow-up actions to continue the cooperation.

2.2   Identification of stakeholders in the SNS ecosystem

This activity focused on the identification of SNS stakeholders to build a comprehensive map of the SNS ecosystem that reflects all relevant players and captures the existing interplays amongst them. The exercise largely built on previous maps; the last one published in the first quarter of 2024.

Given the complexity of the SNS ecosystem and its ever-evolving nature, a consultation process combining a bottom-up and top-down approach was implemented to guarantee that an ample range of stakeholders could provide their inputs. The consultation was launched in October 2024 (M22) and finalised in January 2025 (M25).

The bottom-up approach targeted the SNS projects. Contributions were requested via the SNS Steering Board (SB) and the process was presented to project coordinators during the SNS SB meeting held in October 2024. Some 41% SNS projects from phase 1 (2022 call) and phase 2 (2023) participated in the exercise. The top-down approach consisted of two stages: the first one targeted 6G-IA full member associations and the NetworldEurope SB, while the second stage involved SNS OPS partners. It entailed revising the new additions, addressing contradictions and overlaps, and overall ensuring the quality and relevance of the map.

Lastly, all the inputs were consolidated, the glossary was updated, and the design of the map was revised. The aim of the new visuals was to illustrate the SNS stakeholder ecosystem in a clear and reader-friendly format. This design was also purposefully thought to be displayed in different media for dissemination.

The SNS stakeholder map maintains its division in three ecosystems according to the main roles of the players involved, Figure 1.

Figure 1: SNS stakeholder ecosystem

It is important to note that some stakeholders are present in more than one ecosystem. For example, a stakeholder can be in the provisioning ecosystem while also being a user and even an enabler. To preserve the clarity of the SNS map, these overlaps were minimised, placing the stakeholders in the ecosystem where their role is understood to be most prominent.

Specific national and regional stakeholders as well as stakeholders such as individual companies, universities and similar were not included. This keeps the map manageable and ensures the fairness of the information depicted, preventing overrepresentation in one hand and missing key information in the other.

2.2.1   SNS provisioning ecosystem

Figure 2, Figure 3 and Figure 4 illustrate the provisioning ecosystem, which includes stakeholders involved in the development, deployment, and maintenance of 5G/6G infrastructure, technology, and services, such as network operators or equipment vendors. These stakeholders play a crucial role in the implementation of 5G/6G technology by developing and delivering the necessary hardware, software, and network infrastructure to support the deployment of these advanced networks and enabled services.

The SNS stakeholders in the provisioning ecosystem are divided in four categories, namely:

- 5G/6G Telecommunications Industry
- 5G/6G Complementary Industry
- 5G/6G Related Associations
- 5G/6G Research

The "5G/6G telecommunications industry" and the "5G/6G complementary industry" categories were restructured compared to previous editions of the map, with additional subcategories to classify new stakeholders.

Figure 2: SNS provisioning ecosystem

Figure 3: SNS provisioning ecosystem main categories and stakeholders
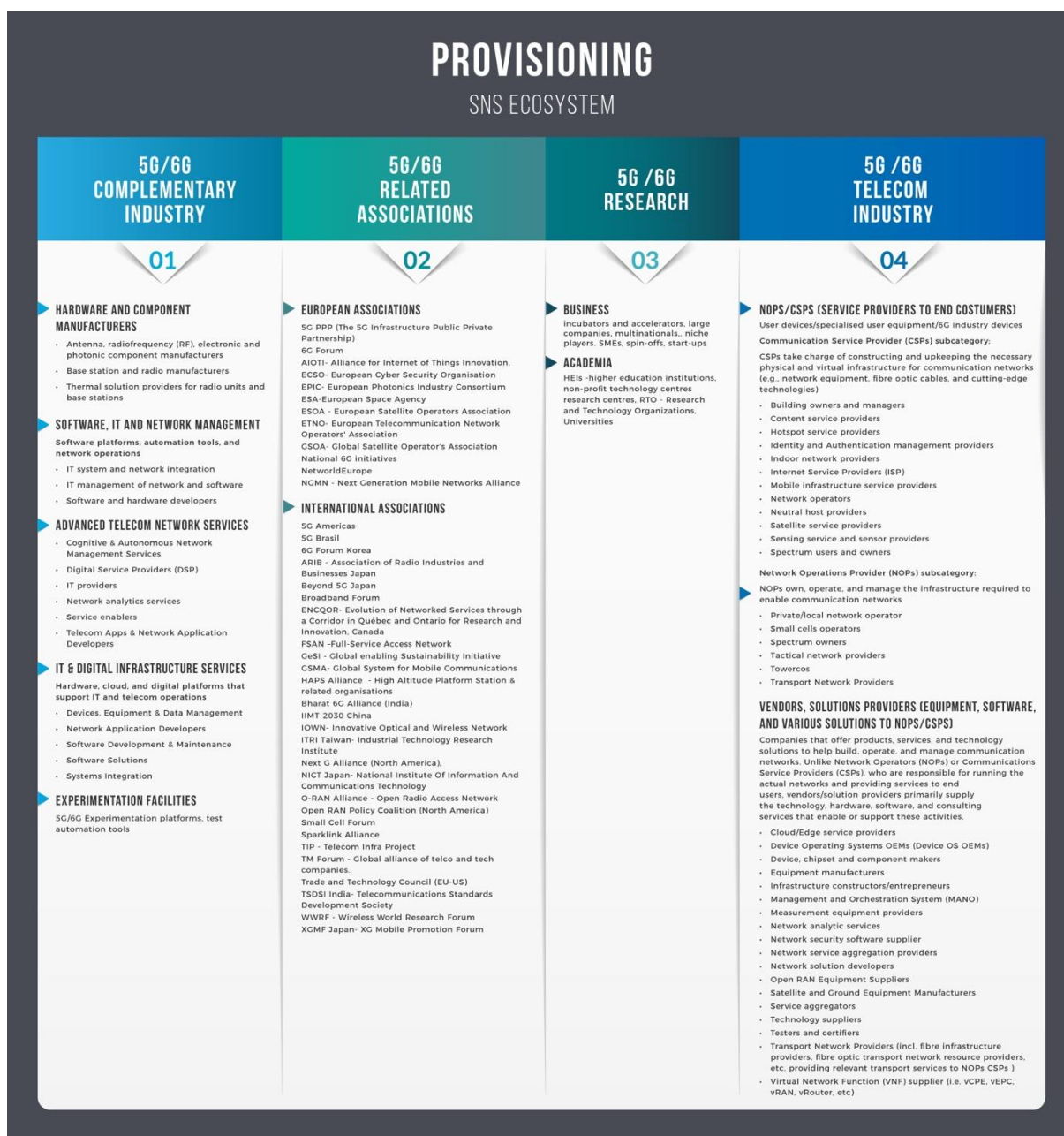
Figure 4: SNS provisioning ecosystem in detail

2.2.2   SNS user ecosystem

Figure 5, Figure 6 and Figure 7 showcase the user ecosystem with different levels of granularity. The user ecosystem includes stakeholders who benefit from the deployment of 5G/6G technology, including those who use 5G/6G networks and services to deliver specific applications and services, such as healthcare providers, transportation companies, and smart city developers.

The SNS stakeholders in the user ecosystem are divided in four categories, namely:

- Vertical Industry & Research
- Complementary Domains Industry & Research
- Vertical Associations
- Complementary Domain Associations

The SNS user ecosystem has expanded significantly. The efforts to engage new vertical sectors and complementary domains, one of the priorities of SNS JU, have been very fruitful, with more stakeholders aware of the SNS technologies and what value these can bring to their activities.

The IAFA events targeted many of the stakeholders mapped, including those in microelectronics, photonics, cybersecurity or IoT. This laid the foundations for a close cooperation that has resulted in common roadmaps, a series of joint workshops to prepare the next work programmes, etc. More details can be found in section 2.3.1.

The main differences in the user ecosystem with respect to previous editions is the reorganisation of the "Complementary domains industry and research" category in various subcategories that better match the stakeholders.

Figure 5: SNS user ecosystem

Figure 6: SNS user ecosystem main categories and stakeholders
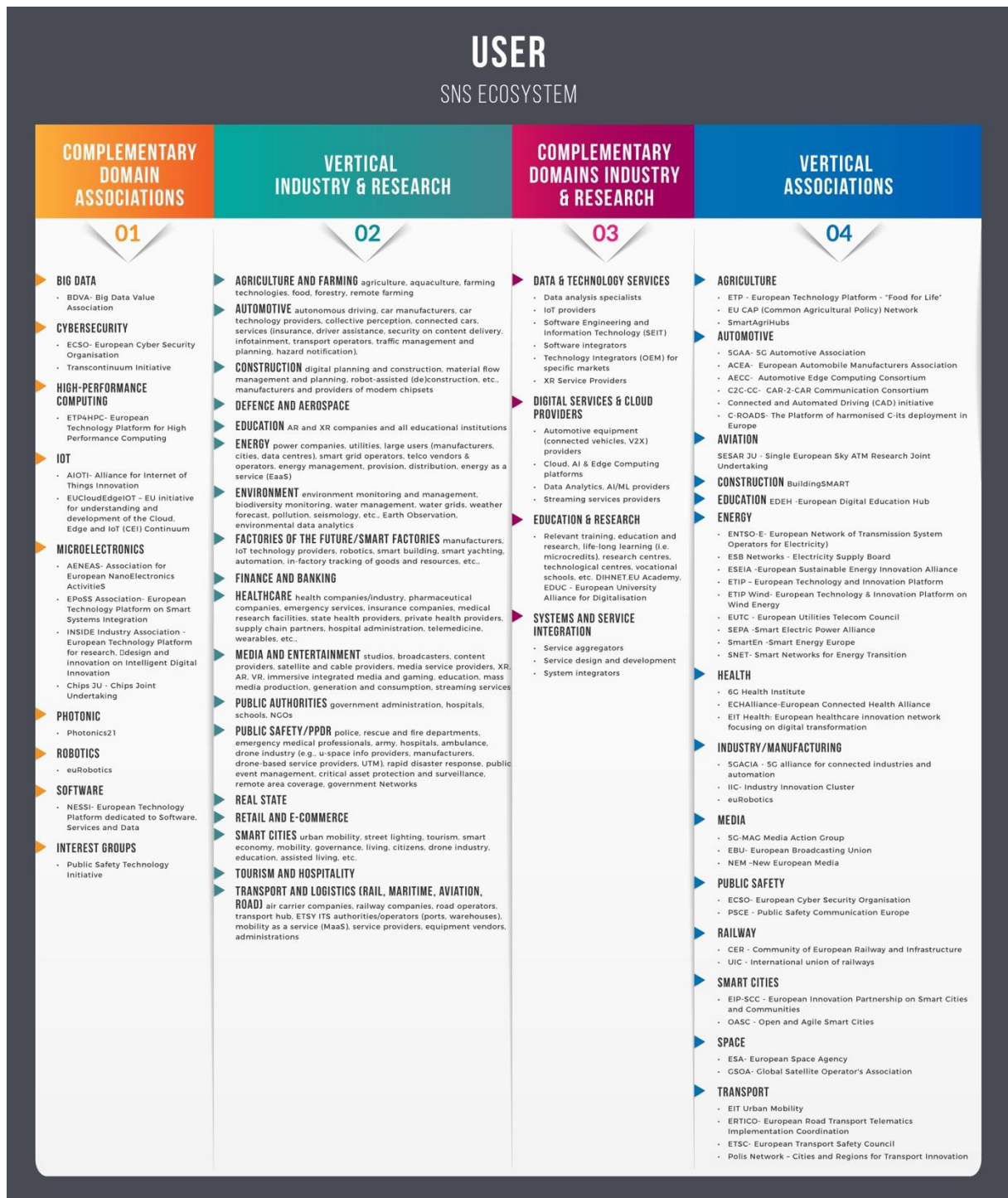
Figure 7: SNS user ecosystem in detail

2.2.3   SNS enablers & facilitators ecosystem

Figure 8 and Figure 9 contain the SNS enablers & facilitators ecosystem. It includes stakeholders who provide a variety of support services that enable and facilitate the provisioning and use-case ecosystems to operate effectively.

The SNS stakeholders in the enablers & facilitators ecosystem are divided in five categories, namely:

- Policy, Funding and Regulation

- Standard Development Organisations & Open-innovation Organisations

- Innovation and Technology Enablers

- Businesses, Community & Digitalisation Facilitators

- Conferences & Fairs

The SNS Enablers & Facilitators ecosystem has been substantially restructured in comparison to previous versions. Policymakers, funding sources and Standard Development Organisations (SDOs) are now placed in this ecosystem instead of the provisioning and user ones. The category encompassing SDOs and open-source stakeholders was renamed and restructured to better reflect its content and the difference between both types of players.

Figure 8: SNS enablers & facilitators ecosystem
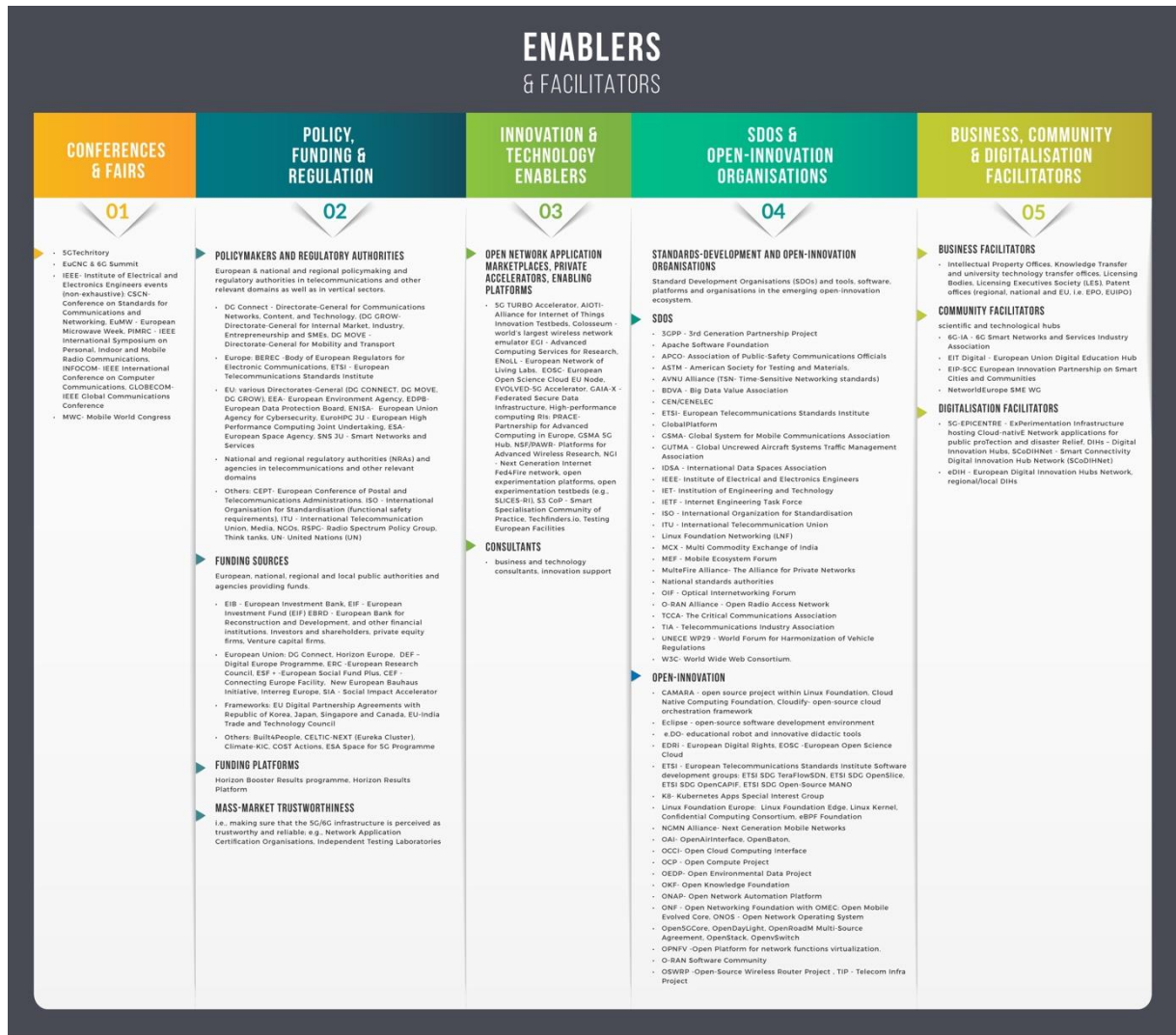
Figure 9: SNS enablers & facilitators ecosystem in detail

The SNS stakeholder ecosystem map glossary can be found in Appendix A.

2.3   Engagement of stakeholders in the SNS ecosystem

Following SNS stakeholder map and the Agile Stakeholder Management Framework principles, a tailored plan was developed to effectively involve each identified category of stakeholder. This approach seeks to facilitate the integration of newcomers into the ecosystem whilst consolidating the existing community, continuing to foster a conductive and inclusive ecosystem for a dynamic cooperation between the different actors across the value chain.

2.3.1   Impact Assessment and Facilitation Actions

The Impact Assessment and Facilitation Actions (IAFAs), one of the novel elements of the Strategy, have been central to establishing a cooperation framework with different partnerships, initiatives, verticals, programmes and organisations of relevance for the SNS community.

In addition to raising awareness about the SNS JU work and facilitating interaction with different stakeholders, the IAFAs intend to collect information to assess the impact of the different activities carried out in the scope of the SNS JU within the SNS community and beyond. IAFAs are key to better understanding whether SNS JU contributions fulfil the expectations of the ecosystem, ultimately helping to guarantee the relevance of its work within the wider European context.

SNS OPS organised a total of seven IAFAs, some with various events, since the start of the project. Four of those took place since April 2024. In addition, this section provides the latest updates following

IAFA#3 "6GSEC CP²" as well as the preparations for the "Future services" event.

2.3.1.1   IAFA#4 Standardisation

The workshop series **"IAFA events on pre-standardisation"** took place online on the 12th of March, 9th of April and 14th of May 2024. The workshops were organised as a joint effort of the SNS OPS and the Horizon Standardisation Booster (HSBooster.eu)[2] EU-funded project, in collaboration with the European Telecommunications Standards Institute (ETSI).

The three events of the series touched upon the following topics:

- **6G research and vision**[3] provided information on the initial phase of 6G technology, highlighting the latest research and the future goals for 6G while considering lessons learned from 5G deployments and service evolution.

- **6G standardisation and requirements**[4] delved into emerging 6G standardisation requirements and identified actions intended to harmonise efforts between research and development (R&D) projects and SDOs, with specific input on European SDOs.

- **6G trials & testing**[5] explored the relationship between 6G pre-standardisation and large-scale trials, already a central topic of R&D projects under the SNS JU Phase I, specifically from Stream C (SNS Experimental Infrastructure) and Stream D (Large-Scale SNS Trials and Pilots), Figure 10.

Figure 10: 6G Trials & Testing Event visual

The events brought together key stakeholders from strategic 5G/6G technical and vertical domains and experts from the policy and standardisation sectors. The workshops aimed to foster collaboration among different sectors and ecosystems, exchange ideas, and drive consensus on current technological challenges and standardisation gaps.

The main objective of the three online workshops was to provide specific overviews and experiences in standardisation, coming from experts and project representatives of the SNS JU community, discussing

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[2] HSBooster.eu website: https://hsbooster.eu/

[3] "6G research and vision" agenda and recording available at: https://smart-networks.europa.eu/event/iafa-event-on-pre-standardisation-4-1-first-step-6g-research-and-vision/

[4] "6G standardisation and requirements" agenda and recording available at: https://smart-networks.europa.eu/event/iafa-event-on-pre-standardisation-4-2-interim-steps-6g-standardisation-requirements/

[5] "6G trials & testing" agenda and recording available at: https://smart-networks.europa.eu/event/iafa-event-series-4-3-third-event-on-pre-standardisation-next-steps-6g-trials-and-testing/

potential solutions to fostering the development of standards and the different mechanisms to accelerate this process. These discussions will support the work and next steps in 6G pre-standardisation.

In brief, the key takeaways from the workshop series, especially with reference to standardisation topics, are listed below:

- *Key message #1* **Early Engagement and Standardisation** - Emphasise the importance of early engagement in standardisation activities to align 6G research with industry standards services such as the HSBooster.eu for effective collaboration.

- *Key message #2* **Advanced Native Features and AI Integration** - Focus on the challenges of integrating advanced native features and AI into 6G architectures to enhance network efficiency and sustainability, requiring a shift in network solution development and standardisation.

- *Key message #3* **Industry-Specific Solutions and Sustainability** - Highlight the need for 6G research to be tailored to specific industry needs, addressing the unique challenges of each sector with a strong emphasis on sustainability and energy-efficient technology development.

- *Key message #4* **Multidisciplinary Collaboration and Global Standards** - Foster multidisciplinary collaboration across various fields, such as AI and cybersecurity, and enhance engagement with global stakeholders to harmonise standards and promote international interoperability.

- *Key message #5* **Regulatory Support and Infrastructure Development** - Advocate for comprehensive regulatory frameworks that support developing and deploying 6G technologies, ensuring safety, efficiency, and global competitiveness while encouraging innovation through supportive policies.

All results are available in the **"6G Pre-standardisation: Challenges, requirements and future steps"** report[6].

2.3.1.2   IAFA#5 6G-IA series of strategic workshops

Following the very successful workshop on Microelectronics that took place in October 2023, and the resulting Position Paper **"Research Priorities on Microelectronics for 6G Networks R&I Activities"** (January 2024)[7], endorsed by the Association for European NanoElectronics ActivitieS (AENEAS) association, the following strategic workshops were organised:

- **Research Priorities on Photonics** – 10.04.24

- **Research priorities on Non-Terrestrial Networks (NTN)** – 11.04.24

- **Research priorities on 6G for Security** – 12.04.24

- **Research Priorities on wireless communication technologies and signal processing** – 15.04.24

- **Research Priorities on Cloud and Service Provision** – 16.04.24

The workshops made it possible to involve the wide community of experts to collectively discuss and define a three-year roadmap for key R&D priorities in relevant 6G related scientific and technological areas. More than 100 experts from key stakeholders from the private side, along with representatives from the Directorate-General for Communications Networks, Content and Technology (DG CONNECT), the SNS Office and related European Commission (EC) partnerships and associations (e.g., Chips JU, Photonics 21), worked together to elaborate these R&D roadmaps. Moreover, these played a key role in the formulation of the SNS priorities by including them in the two consultations with the 6G-IA members. The outcomes were compiled in a series of dedicated publicly available

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[6] de Majo, C., Giuffrida, M., Elkotob, M., Dagiuklas, T., & Boswarthick, D. (2024). 6G Pre-standardisation: Challenges, requirements and future steps (1.0). Zenodo. https://doi.org/10.5281/zenodo.11402318

[7] 6G-IA, Position Paper "Research Priorities on Microelectronics for 6G Networks R&I Activities", January 2024, available at: https://6g-ia.eu/wp-content/uploads/2024/02/6g-ia-position-paper_microelectronics-final.pdf?x29393

reports[8].

Follow-up calls with the experts took place during November 2024, to inform them about how their views were adopted in the SNS planning. Moreover, it has been agreed to repeat this exercise during Spring 2025 to further validate and fine-tune the roadmaps, based also on the recently NetworldEurope Strategic Research and Innovation Agenda (SRIA)[9] that was released in December 2024.

2.3.1.3   IAFA#6 New European Media (NEM)

The **15th edition of the NEM Summit**, under the topic "Emerging virtual worlds for a new digital society", was organised in Brussels on 23-24 October 2024. SNS OPS partners SETU and Nokia were able to collaborate with the organisers of this prestigious annual event to promote the work and opportunities in SNS to the NEM community and, vice versa, to gather significant contributions from the NEM Community to SNS activities.

Indeed, it was underlined that media is a vertical of significance and highlighted as a main vertical in the four SNS Stream D projects – FIDAL, TrialsNet, IMAGINE-B5G and Target-X - that are implementing large-scale SNS trials and pilots with specific verticals of high economic and societal importance.

In preparation for the event, the SNS OPS team did a deep dive on all the SNS projects funded through the Financial Support to Third Parties (FSTP) open calls launched by the aforementioned Stream D projects. The results of the research were shared with the keynote speaker Volker Ziegler (Nokia), who presented an inspirational keynote entitled "Path to 6G era platform and XR future" and promoted the interactive map[10] of all information on opportunities available for the event participants on the running SNS Open call projects.

The main highlights of the analysis are available in Appendix B.

2.3.1.4   IAFA#6 5G Alliance for Connected Industries and Automation

The **32nd 5G Alliance for Connected Industries and Automation (5G-ACIA) Plenary Meeting**[11] was held on the 3-5 of December 2024 in Nuremberg, Germany. During the meeting, 5G-ACIA members discussed various topics and deliberated on the ongoing activities of the working groups.

Building on previous engagements between SNS OPS, led by Didier Bourse (Nokia, ALUI/NNF) and the 5G-ACIA Board leadership - General Chair Andreas Müller (Bosch) and General Vice-chair Afif Osseiran (Ericsson) – the SNS JU was presented by Didier Bourse in a dedicated one-hour session titled "Presentation on Industry/Manufacturing in 5G / 5G-PPP and the Way Forward in 6G SNS JU".

In addition, targeted onsite interactions were organised throughout the three-day event to explore further collaboration and synergies between SNS JU, 6G-IA and 5G-ACIA. A set of potential joint actions, including webinars, was initiated and is currently under further discussion.

Some topics of mutual interest include Trials and Pilots, Use Cases and Business Cases and ICAS. The first online workshop is tentatively planned for May 2025. Furthermore, SNS OPS (CO-OP) aims to enhance engagement through additional face-to-face interactions with 5G-ACIA members, including participation in the upcoming 5G-ACIA meeting scheduled for June 2025.

2.3.1.5   IAFA#7 "How Advanced Communications Can Support Sustainability Goals"

On the 21st of January 2025, NetworldEurope and the Alliance for AI, IoT and Edge Continuum Innovation (AIOTI) organised a joint webinar **"How Advanced Communications Can Support**

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[8] 6G-IA Strategic Consultation Workshops, available at" https://6g-ia.eu/strategic-consultation-workshops/

[9] NetworldEurope (2024), "NetworldEurope Strategic Research and Innovation Agenda", available at: www.networldeurope.eu/public-consultation-networldeurope-strategic-research-and-innovation-agenda-2024/

[10] The SNS Open Call projects interactive map is available at: https://smart-networks.europa.eu/interactive-map-of-sns-projects/

[11] Information available at: https://smart-networks.europa.eu/sns-ju-december-2024-newsflash/

Sustainability Goals"[12] exploring the transformative potential of advanced communications to drive sustainability. The event brought together leading experts from academia, industry, and policymaking to exchange perspectives, share cutting-edge research, and discuss actionable solutions to pressing environmental challenges.

The workshop created a collaborative space to examine current practices and future visions for integrating sustainability into advanced communication systems. Participants were encouraged to discuss how innovations in telecommunications, Internet of Things (IoT), and AI can be leveraged to reduce carbon emissions, optimise resource efficiency, and foster a greener digital economy.

The event began with welcoming and opening remarks from Rui Aguiar, Chair of the NetworldEurope SB, and Damir Filipovic, Secretary General of AIOTI. Both highlighted the importance of collaboration in advancing sustainability through technology.

Chiara Mazzone, Programme Officer at SNS JU, delivered an insightful keynote address centred on balancing exponential growth in data with finite global resources. She discussed how Europe's 6G development aligns with the UN Sustainable Development Goals (UN SDGs) by addressing critical sustainability challenges, such as the ICT sector's growing carbon footprint.

Mazzone emphasised the importance of embedding circular economy principles, life cycle assessments, and recycling processes into digital infrastructure. She also highlighted that advancements like energy-efficient networks and edge computing as well a standardised framework to assess the environmental impact of ICT are crucial in mitigating these challenges. Her keynote concluded with a call to action for the industry to adopt end-to-end sustainability approaches, develop benchmarks, and integrate green innovations into the design and deployment of future 6G systems.

The webinar featured two panels. Moderated by Rui Aguiar, the first panel on **"Advanced Communications Contributing to Sustainability"** addressed the role of advanced communication networks in reducing environmental impact. It concluded with a Q&A session, where participants explored whether 6G can achieve lower energy consumption, how sustainability concerns can be integrated into future telecom standards, and methods to measure sustainability benefits of advanced systems.

In the second panel "**AI, IoT, and Edge Continuum improving the performance of digital society**", moderated by Damir Filipovic, speakers examined how AI, IoT, and edge computing can enhance sustainability efforts. During the concluding session, topics discussed included how to develop full-cycle sustainable ICT systems and whether there is a clear understanding of how sensors, batteries, and devices currently produced are being used. Participantts also explored how to measure and highlight the environmental and economic sustainability of specific use cases effectively. These discussions provided actionable insights on addressing sustainability gaps in ICT through advanced technologies

Rui Aguiar concluded the webinar by summarising key insights and emphasising the need for cross-sector collaboration to harness advanced communications for sustainability. He emphasised the potential of technology to drive meaningful change toward a greener digital future.

2.3.2   Additional activities

2.3.2.1   IAFA#3 6GSec Common Path and Cardinal Points "6GSEC CP²" follow-up

Following the successful "6Gsec CP²" event[13] held at the Cyber Campus in Paris on January 23rd, 2024, the IAFAs have significantly amplified efforts to bridge the cybersecurity community with the Smart Network and Services (SNS) ecosystem. This event served as a crucial catalyst, fostering a collaborative environment that has since yielded tangible progress[14].

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[12] The "How Advanced Communications Can Support Sustainability Goals" webinar recording, slides and report are available at: www.networldeurope.eu/workshop-how-advanced-communications-can-support-sustainability-goals-21-january-2025/

[13] 6GSEC CP² event: https://smart-networks.europa.eu/event/6gsec-common-path-and-cardinal-points-6gsec-cp%C2%B2-save-the-date/

[14] de Majo, C., Carneiro, J., & Dotaro, E. (2025). 6Gsec Common Path and Cardinal Points "6Gsec CP2" (1.0). Zenodo. https://doi.org/10.5281/zenodo.14723479

A key achievement has been the intensified common work and discussions between the European Cyber Security Organisation Working Group 6 (ECSO WG6) and NetworldEurope. These interactions are strategically aimed at cross-fertilising their respective Strategic Research and Innovation Agendas (SRIAs). By aligning perspectives and identifying synergies, we are ensuring that cybersecurity considerations and required skills are deeply embedded within the development of next-generation communication technologies. This collaborative approach is vital for building robust and resilient future networks. The discussions have led to concrete suggestions for joint research initiatives and the identification of potential gaps in current research strategies.

Furthermore, the IAFAs have facilitated active participation in the ECSO Days 2024[15], in close collaboration with SNS Office representative. This joint presence allowed for enhanced visibility of cybersecurity challenges and solutions within the broader SNS framework. These engagements have provided invaluable opportunities for knowledge exchange and the establishment of crucial partnerships.

Looking forward, the IAFAs are actively pursuing further collaboration and knowledge dissemination. Plans and proposals are being developed for participation in upcoming workshops under the Polish Presidency of the Council of the European Union. Additionally, we are exploring opportunities to engage with the European Union Agency for Cybersecurity (ENISA) events, leveraging their expertise to contribute to the development of cybersecurity vision, standards and best practices.

2.3.2.2   Future Services

SNS-OPS has initiated an IAFA activity with focus on "Future Services" and how to facilitate, strengthen, and engage with the so-called "SNS Provisioning ecosystem", with special attention to the network service provider stakeholders (NSPs, including incumbent telcos, or Communication Service Providers, CSPs). Some initial activities have addressed relevant topics, such as engaging in the "Operator's perspective" session at the FUSECO FORURM 2024 event in Berlin, Germany.

The activity will be handed over to the SNS CO-OP CSA, with a focus on aligning the relevant 5G/6G SNS industry stakeholders to drive developments of the common and standardised future multi-stakeholder interoperable smart network services and service enablers (cf. 3CN, and more), including capturing insights on current stumbling blocks, pain-points, and challenges. This can include facilitation activities for needed alignment amongst the relevant stakeholders, on topics suggested above, such as common assessment of key outcomes of the SNS JU projects, and how the outcomes and results match with and can be taken up by the industry, and in particular by the CSP/NSP community, considering various actor roles in this space. As a result, feedback to the SNS JU project community can be provided.

One approach to be considered is to further evolve these IAFA activities into a permanent European Ecosystem Forum on Interoperable Networks and Services Provisioning, facilitated by or in collaboration with the suitable SNS JU CSA.

2.4   Impact of SNS technologies in Europe: a market perspective

The SNS OPS project team has conducted two questionnaires, in 2023 and 2024, targeting the projects awarded in the SNS 2022 and 2023 calls, respectively. Alongside the Technical and Vision sections, a dedicated section on Market aspects was included in both questionnaires to gain an in-depth understanding of the projections and expectations of the projects regarding the evolution of the 6G market over the next years.

The purpose of this work was to enable the SNS JU to understand whether the subject and work of the projects are aligned with the expected developments of the market, where the potential challenges may lie and overall, will feed into the SNS vision and strategy.

The market section of the questionnaire comprised nine questions, mixing multiple choice and free text, addressing a variety of topics related to the SNS market, namely: key technologies and innovations for 6G, main market trends in the advent of 6G, impact of 6G in different vertical sectors, vertical sectors

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[15] ECSO Days 2024, see at: https://ecs-org.eu/events/the-ecso-days-2024/

expected to be impacted by 6G, methods used in the validation of business opportunities, main obstacles to the development of 6G, novel markets for 6G development, Key Exploitable Results (KERs) and Technology Readiness Levels (TRLs), and SME participation.

This work was carried out in close cooperation with WP1. A detailed analysis of the responses for the 2023 questionnaire can be found in D1.2: First Period Assessment and Planning Report and for the 2024 questionnaire can be found in D1.4: Second Period Assessment and Planning Report.

For this deliverable, only a summary of the key insights gained from the two questionnaires, with a focus on the valuable conclusions in relation to key technological trends, market trends, opportunities, challenges, and stakeholders' expansion expected that will shape the 6G landscape will be presented.

Key technologies and innovations

Integration and openness will be central to 6G development. For instance, open and interoperable solutions will enable seamless integration of terrestrial (TN) and non-terrestrial networks (NTN), ensuring transparent connectivity and enabling services across multiple industries. The shift towards open architectures will promote industry-wide adoption, supporting business growth through B2B and B2B2C models while fostering digital innovation and value creation across multiple sectors.

AI-driven solutions will reshape the telecommunications landscape, enabling more efficient and adaptive networks. Likewise, wireless solutions will see increased adoption for critical applications, transitioning from mission-critical to life-critical services as trust in wireless reliability improves. Time-Sensitive Networks (TSNs) will enhance predictability and efficiency, reducing energy consumption and operational failures.

Security and privacy will be paramount in 6G ecosystems, requiring robust security measures to build and sustain user trust and safeguard communications. As the demand for interconnected digital services increases, service providers must prioritise advanced cybersecurity solutions and intelligent automation to effectively mitigate risks. In this respect, Zero Trust Security frameworks ensure robust authentication, encryption, and threat mitigation mechanisms.

Sustainability will be a key driver, with energy-efficient 6G solutions as well as green technologies playing a crucial role in minimising environmental impact while ensuring economic viability. By replacing wired connections and optimising network architectures, 6G will provide cost-effective and energy-efficient connectivity. Enhanced flexibility in wireless technologies will enable industry stakeholders to adopt greener and more adaptive networking strategies.

By delivering ubiquitous coverage, 6G will bridge connectivity gaps, expanding access to underserved regions and reducing socioeconomic inequalities. This enhanced accessibility will contribute to improved quality of life, economic inclusion, and industrial transformation.

Market trends, verticals and challenges

The expansion of cloudification and edge computing will further enhance scalability, efficiency, and overall network performance solidifying 6G as a transformative force in the digital economy. As data-intensive processes increasingly move from centralised data centres to the network edge, the demand for high-speed wireless connectivity will rise, further accelerating the adoption of edge computing.

The exponential growth of connected devices, including IoT sensors, autonomous vehicles, robots, and drones, will generate vast amounts of digital data, necessitating advanced connectivity solutions. The interplay between human augmentation (Internet of Senses) and digital-physical fusion (IoT and Digital Twins) will drive emerging applications such as holographic telepresence. Immersive environments, such as extended reality (XR) and virtual reality (VR), will see also increased adoption.

The integration of AI will be instrumental in unlocking new market opportunities. For instance, AI-driven automation and advancements in sensing technologies will be crucial in enhancing industrial productivity, particularly in Industry 4.0, transport and logistics.

Industries including public protection and disaster relief (PPDR), automotive, energy, industrial manufacturing, healthcare, media, and public safety will undergo significant digital transformation. This market expansion will create new opportunities, particularly for knowledge-intensive small enterprises, which can leverage the openness of 6G networks to drive innovation.

The lack of demand for specific 6G services and high deployment costs are primary challenges for 6G deployment. Concerns about security and privacy are becoming more pressing making secure and trusted services a major competitive differentiator. Spectrum availability is another critical concern.

SME Participation and Market Expansion

SMEs play a crucial role in the 6G ecosystem, driving innovation and contributing with their expertise in diverse domains. SMEs are particularly well-positioned to develop localized and sustainable 6G solutions, enhancing job creation and economic impact. Their ability to rapidly adapt to evolving market demands ensures that they remain central to the ethical and sustainable deployment of 6G technologies.

Overall, the transition to 6G will reshape the telecommunications landscape. Enhanced connectivity, AI-driven solutions, and open network architectures will drive new business models and industry growth. However, security, privacy, and spectrum-related challenges must be addressed to ensure seamless adoption.

The role of SMEs, sustainable energy-efficient solutions, and AI integration will be critical in determining the success of 6G. As the technology progresses, continuous collaboration among industry stakeholders will be critical in ensuring that 6G achieves its full potential, fostering innovation, economic growth, and global connectivity.

The project team is organising an Impact Assessment and Facilitation Action (IAFA) session entitled SMEs on the spotlight: driving innovation in next generation of communication networks to be held during EUCnC in June 2025. The objective of the session is to present an overview of the role of SMEs in the SNS/6G landscape, highlighting their contribution to European research in the topic and their success stories. It will also serve as a platform to discuss the current challenges affecting SMEs and how to encourage a greater visibility and participation in the ecosystem.

The Digital Innovation Hubs, which are local clusters of digital SMEs, are also facilitating adoption of innovative technologies. SCoDIHNet has the objective to support the operation of the DIHs specialised on Smart Connectivity to push 6G technologies to end users and also to collect requirements to feed 6G roadmap.

3   Verticals and complementary domains engagement

Chapter 3 outlines the verticals and complementary domains engagement activities between M16 and M27. It focuses on the pre-standardisation work, in collaboration with the 6G-IA Pre-Standardisation WG, and the updates to the Standards Tracker, aiming to align European R&I with global 5G and 6G standardisation.

3.1   Main objectives

The main goal of this task is to drive engagement across vertical sectors and complementary domains, ensuring requirements from industry verticals feed into 5G standardisation by encouraging the community to embrace verticals, optimally capture end-user requirements and support contributions to the standardisation process. It provides support to SNS JU RIA projects mapping their common requirements and standardisation processes and helping them maximise their impact of their efforts despite limited resources.

Between M16 and M27, activities have further developed the efforts initiated between M1 and M15. These were mainly orchestrated around the 6G-IA Pre-Standardisation WG and the Standards Tracker[16], playing a central role in ensuring the alignment of European R&I with global standardisation efforts for 5G and 6G.

The Pre-Standardisation WG has facilitated collaboration with key organisations such as 3GPP, ETSI, IETF, and ITU, supporting the development of a structured roadmap that integrates emerging research with evolving regulatory and technological requirements. At the same time, the Standards Tracker has served as a crucial tool for monitoring and organising standardisation contributions, providing a structured repository of relevant telecommunications standards and enabling researchers to navigate the complex landscape of global standardisation.

These efforts are essential for reinforcing Europe's competitiveness and technological sovereignty while fostering an ecosystem that promotes interoperability, regulatory alignment, and collaboration across industry sectors. By ensuring active engagement in international standardisation discussions and supporting a data-driven approach to tracking contributions, these initiatives have helped strengthen Europe's leadership in shaping the future of communication networks. The transition of both activities to the SNS CO-OP CSA project will ensure their long-term sustainability and continued impact on European and global standardisation efforts.

3.2   Pre-standardisation activities and trends analysis

The 6G-IA Pre-Standardisation WG plays a key role in aligning European R&I efforts with the global standardisation roadmap for 5G and 6G. Building upon its work in the 5G PPP, the group fosters collaboration with major standardisation bodies such as ETSI, 3GPP, IEEE, ITU-R, and WRC, ensuring that European technological advancements contribute effectively to international communication standards. Its primary goal is to establish a structured roadmap that supports ongoing 5G standardisation efforts while preparing for the emergence of 6G technologies.

This roadmap is crucial for addressing the evolving needs of European communication networks and ICT systems, ensuring competitiveness and technological sovereignty in line with European Commission (EC) policy objectives. By fostering an ecosystem that promotes interoperability and regulatory alignment, the WG helps shape the global standardisation landscape. Its efforts are closely integrated with the Single Basic Act on Joint Undertakings[17], ensuring cooperation across various levels of industry, research, and regulatory frameworks. This enables the SNS JU standardisation roadmap to remain in sync with key international developments, further strengthening Europe's position in next-

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[16] Standards Tracker, available at: https://sns-trackers.sns-ju.eu/standards-tracker

[17] Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02021R2085-20230921

generation connectivity.

3.2.1　Trends analysis

The standardisation efforts across SNS JU projects demonstrate a clear focus on technology solutions and requirements development, aligning with evolving industry needs and standardisation roadmaps. Over the past year, technology and solution-based contributions have dominated, with 140 recorded contributions, followed by issue/problem identification (30), requirements definition (27), software component contributions (5), and new study or work item proposals (1). This indicates that European projects are prioritising the practical implementation and refinement of 5G and 6G technologies rather than initiating entirely new study areas.

In terms of engagement with standardisation bodies, SNS JU projects have directed their efforts mainly toward 3GPP (130 contributions), ETSI (32), IETF (6), and ITU (3), ensuring that European research remains influential in shaping international telecommunications frameworks. Contributions within 3GPP have primarily focused on network slicing, Radio Access Network (RAN) enhancements, and service-based architecture refinements. Engagement with ETSI has been concentrated on Network Function Virtualisation (NFV), Multi-access Edge Computing (MEC), and AI-driven automation, reflecting the growing importance of these areas in next-generation networks. Contributions within IETF have targeted network security, transport protocols, and resource allocation mechanisms, while work with ITU has addressed high-level regulatory and spectrum management aspects for emerging communication technologies.

The distribution of contributions across these bodies highlights a strong European presence in critical standardisation discussions, ensuring that SNS JU projects continue shaping the global 5G and 6G standardisation landscape. Several projects are actively contributing to refining existing standards rather than creating entirely new frameworks, a trend showcasing the transition from 5G to 6G while addressing key industry challenges such as interoperability, security, and energy efficiency. Going forward, continued engagement with global standardisation bodies will be critical in maintaining this momentum and ensuring that the European ICT sector remains at the forefront of global advancements.

3.3　Standards Tracker

The Standards Tracker[16] was developed as an online platform designed to serve as a unified access point for SNS JU R&I projects, enabling them to contribute to pre-standardisation processes.[18] Additionally, the tool functioned as a repository of selected telecommunication standards, helping researchers navigate the evolving standardisation landscape and stay informed about relevant developments reported by standardisation committees. Ultimately, the platform aims to support the creation of a European standardisation roadmap, assisting EU researchers involved in SNS JU in formulating and implementing their standardisation roadmaps.

The tool provided insights into their contributions' timing, methodology, and rationale, ensuring they were strategically organised for maximum impact. By incorporating the latest updates from SDOs and the SNS JU R&I community, the Standards Tracker also facilitates gap analyses and impact reports, aligning with the objectives of SNS JU and the Commission while also supporting vertical industries and 5G/6G-related associations.

The tool facilitated navigation through complex standardisation processes, defined technical requirements, and maximised the impact of contributions. The development of the Standards Tracker was informed by earlier pre-standardisation activities conducted by the Pre-Standardisation WG during the 5G PPP initiative. This final iteration incorporated the latest updates in the transition from 5G PPP to SNS JU, ensuring its continued relevance and effectiveness.

As part of efforts to improve the functionality of the Standards Tracker, an application for expert consultancy was submitted through the EU-funded project HSbooster.eu's premium service. Once this phase was completed, the second module focused on curating a selection of relevant telecommunication

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[18] Standards Tracker available at: https://sns-trackers.sns-ju.eu/standards-tracker.

standards to populate a key section of the platform.

Following this iterative design and development process, and after multiple validation phases with the SNS OPS consortium—comprising diverse stakeholders including service providers, R&D actors, and SMEs—the final version of the Standards Tracker was officially launched in September 2024. The consortium's diverse perspectives contributed to refining the tool, ensuring its adaptability to different user needs and making it a more effective resource for the European standardisation community (Figure 11).
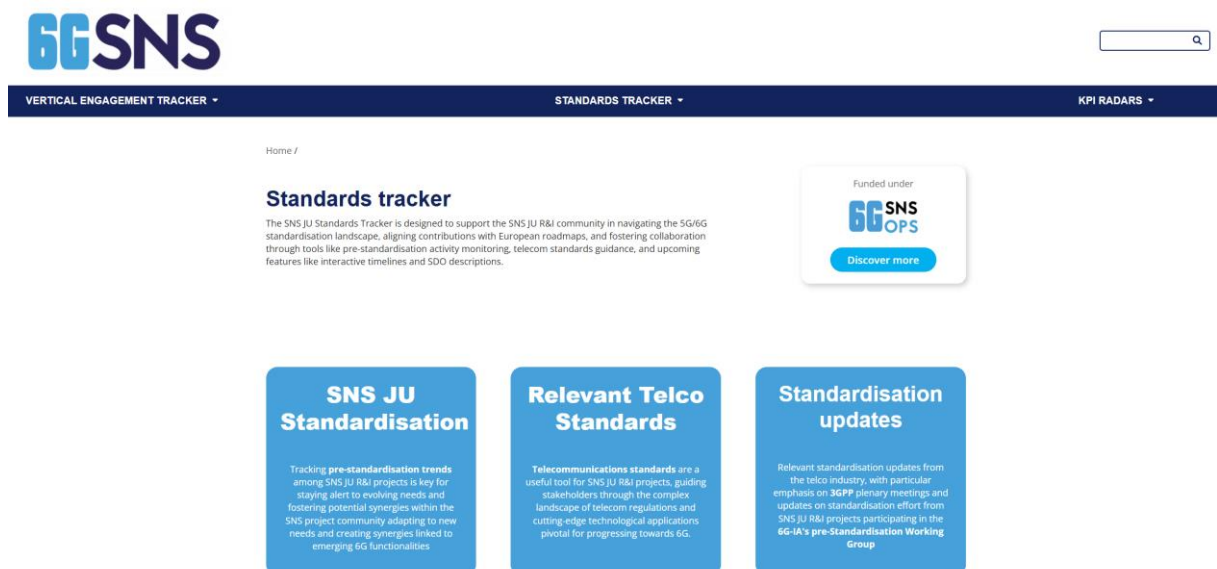
Figure 11: Standards Tracker Homepage

As such, the Standards Tracker tool is essentially a catalogue collecting different online solutions useful to guide and support SNS JU R&I processes in pre-Standardisation and standardisation processes. Resources are organised through a set of taxonomies and structured in three different sections, each one of them leveraging information gained through the SNS OPS consortium's specific know-how and experience in different standardisation WG and bodies. These are described in the sections below.

3.3.1   SNS JU standardisation

The SNS JU Standardisation page provides an online catalogue collecting inputs tracking R&I progress, particularly in pre-standardisation efforts of SNS JU projects for beyond 5G and 6G. It helps stakeholders stay informed about the activities of SNS JU projects in providing inputs for different SDOs in terms of relevant telecommunications standards. Dedicated taxonomies and search functions make it easier for different users to find relevant updates.

This approach ensures that SNS JU R&I projects align with industry and research needs while encouraging collaboration among various sectors. By connecting technological research with industry requirements, the page helps integrate new developments into standardisation frameworks. This supports a smoother adoption of emerging technologies and strengthens Europe's role in shaping future communication networks.

In March 2025, a revamped version of this section has been completed and over 1,000 contributions from 40 SNS JU projects have been uploaded to this webpage. The new data was made available through the synergic and close alignment between the SNS OPS consortium and the SNS Office. Therefore, all standardisation inputs reported by SNS projects via the Sygma portal to date have been systematically collected and incorporated into the Standards Tracker tool.

The data visualisation features of this revamped page allow users to filter and analyse information based on multiple dimensions including:

- Project name - to view standardisation activities associated with specific SNS projects.

- Type of standardisation activity - to filter by categories such as elaboration of new standards, revision of existing standards, participation in technical groups, or workshop agreements.

- Involved SDO - to identify which standardisation bodies (e.g., 3GPP, IETF, ETSI, ITU, IEEE) received contributions.

- Type of involved SDO - to distinguish between international, European, and other types of SDOs.

Figure 12 shows the SNS JU Standardisation page, featuring the project contributions to SDOs.

Figure 12: SNS JU Standardisation page

Moreover, the webpage provides summary charts to illustrate key trends highlighting which SDOs are most engaged, the nature of standardisation efforts, project-level contributions, and the balance between international and European standardisation work, Figure 13.

standard contributions of SNS projects by SDO
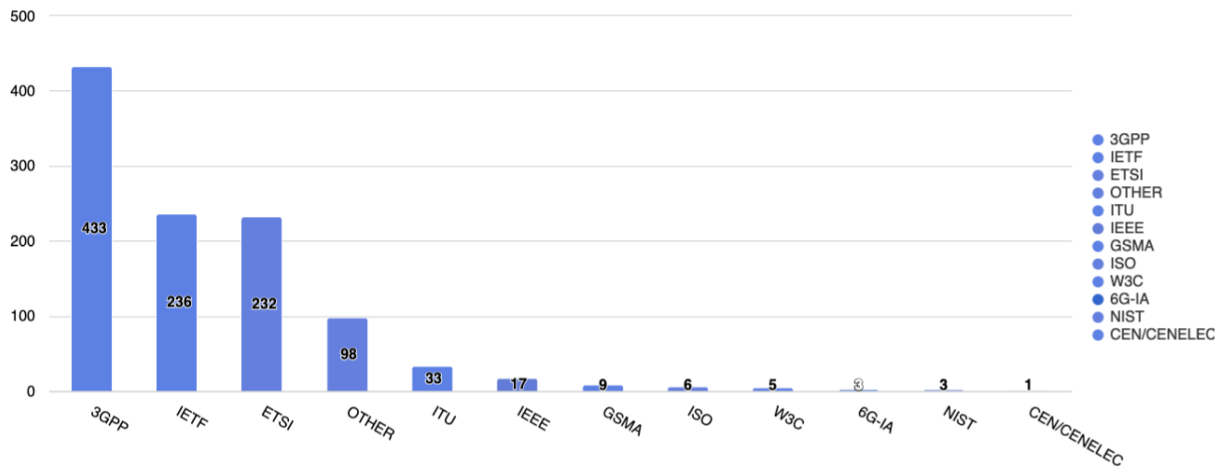
Figure 13: Standard contribution by SDO

In terms of total contributions of the mapped projects by relevant SDO, the dominance of 3GPP (433 recorded entries), IETF (236) and ETSI (232) is aligned with the focus on wireless communication, network protocols, and regulatory frameworks, reinforcing a strategic effort to shape global telecom and networking standards.

Regarding standardisation contributions based on activity type, Figure 14 provides insights into how SNS projects engage with SDOs. In this case, the high volume of new standard creation and revisions is a good sign, suggesting that SNS projects are proactively shaping the 6G standardisation process, rather than just aligning with existing frameworks.

type of standardisation activities contributed by SNS projects
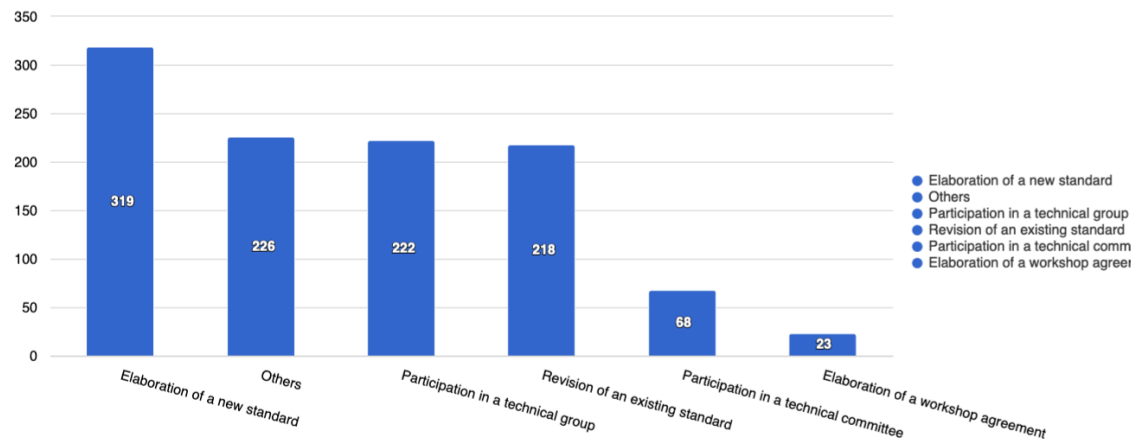
Figure 14: Type of standardisation activities

The emphasis on international SDOs shown in Figure 15 aligns with Europe's strategy to exert influence beyond the continent, ensuring that 6G and advanced networking technologies are shaped with European input at the global level. However, the relatively lower engagement with European SDOs also suggests an opportunity to strengthen regional frameworks for 6G standardisation.
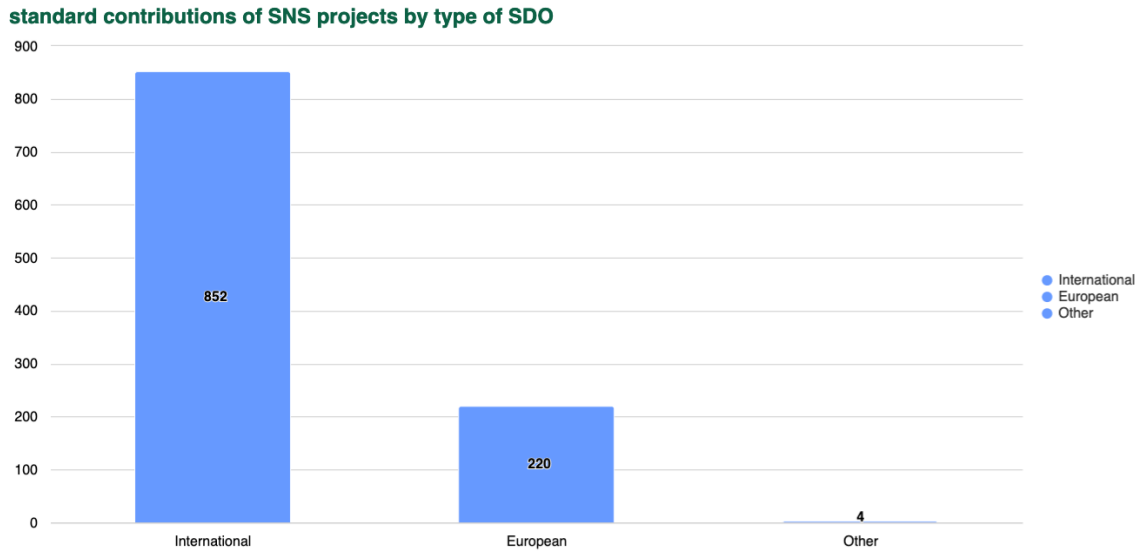
Figure 15: Standard contributions by type of SDO

Finally, looking at the projects that have made the most standardisation contributions, ACROSS (140 contributions), Hexa-X-II (109), and ROBUST-6G (98) are the top contributors, demonstrating leadership in shaping 6G-related standards. The next tier includes iTrust6G (82), 6G-SANDBOX (58), and RIGOUROUS (50), which have also contributed significantly. A long tail of projects with fewer contributions suggests that some SNS projects focus more on technology development and research rather than direct standardisation, Figure 16.
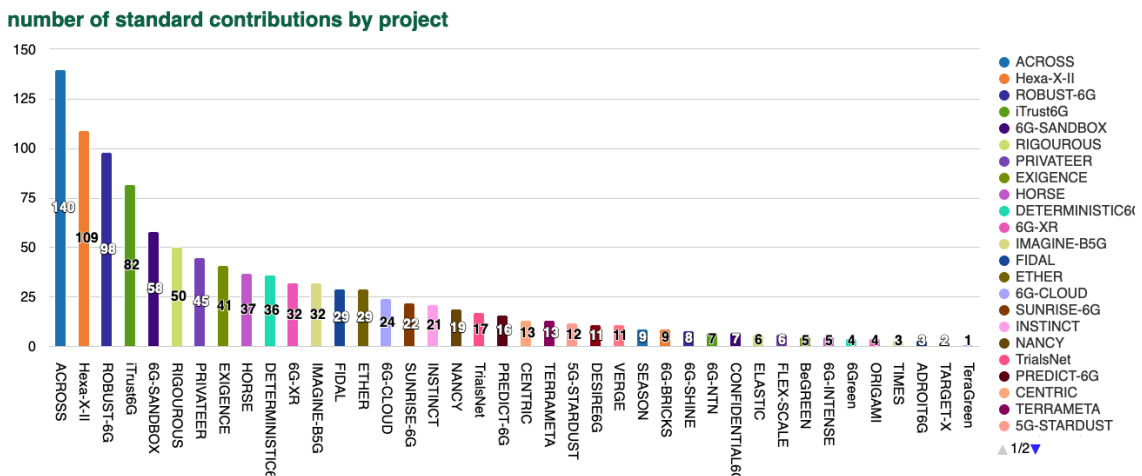
Figure 16: Number of contributions by project

This section of the tool will continue to be updated as new contributions are collected from the already mapped projects as well as other SNS projects that have not submitted any contributions yet. This effort will be taken over by SNS-OPS follow-up CSA, SNS CO-OP.

3.3.2   Relevant telecommunication standards

This webpage provides a catalogue of resources for SNS JU R&I projects, offering guidance on telecommunications standards that shape the transition from 5G to 6G. The telecommunications standards catalogue, selected through the HSbooster.eu consultancy service, helps stakeholders navigate telecom regulations and technological advancements by simplifying complex technical and regulatory processes. By focusing on ongoing 5G standardisation efforts led by organisations like 3GPP and related industry groups, the platform lays the groundwork for future 6G standards.

The page supports the definition of technical requirements, optimises resource use, and ensures a well-prepared transition toward 6G, creating an environment where innovative solutions can grow within the SNS JU framework.

To enhance accessibility and relevance, the platform utilises a structured taxonomy system that categorises standards based on several key dimensions, Figure 17.

- The **Use Case/Application Type** taxonomy includes categories such as Federation-based Use Cases, Green/Energy Saving Use Cases, Networked Cloud, Telco Cloud, and various slice-based applications (eMBB, MMTC, URLLC).

- The **Technology Tier classification** differentiates between Core, Edge, Enterprise, Metro, RAN, Transport, and User/Terminal/IoT technologies.

- The **Research Contribution Type** taxonomy further refines entries by distinguishing between empirical contributions (data collection, analytics, experiments, validation), practical contributions (software tools), system designs (architecture, protocols, systems), and technical contributions (algorithms, analysis, frameworks, models).

- The **Standards Landscape Stitch** helps categorise standards based on their alignment with developments such as 3GPP R16 & R17 SBA, 5G NR mechanisms, private/campus networks, SA mechanisms, and beyond 5G enhancements.

This structured approach enables users to find relevant information more efficiently and align their work with ongoing standardisation efforts.

Figure 17: Relevant telco standards page

3.3.3   Standardisation updates

This webpage provides relevant updates on standardisation activities within the telecommunications industry, with a focus on developments from 3GPP plenary meetings and contributions from SNS JU R&I projects engaged in the 6G-IA Pre-Standardisation WG, Figure 18. Keeping track of evolving standards is essential for aligning research efforts with industry needs, ensuring that emerging technologies contribute effectively to the development of 6G.

To facilitate organisation and accessibility and help users efficiently access information relevant to their research and industry needs, the platform categorises standardisation updates using two main taxonomies.

- The timeline taxonomy structures updates by quarter and year, covering 2023 (Q2, Q3, Q4) and 2024 (Q1, Q2, Q3, Q4), which will be constantly updated and expanded to the following years.

This allows stakeholders to track standardisation progress over time and identify relevant updates in their respective periods.

- The common requirements taxonomy aligns updates with key 3GPP releases, including Rel-17, Rel-18, Rel-19, and Rel-20, providing insights into how each development stage contributes to the evolving telecommunications landscape.
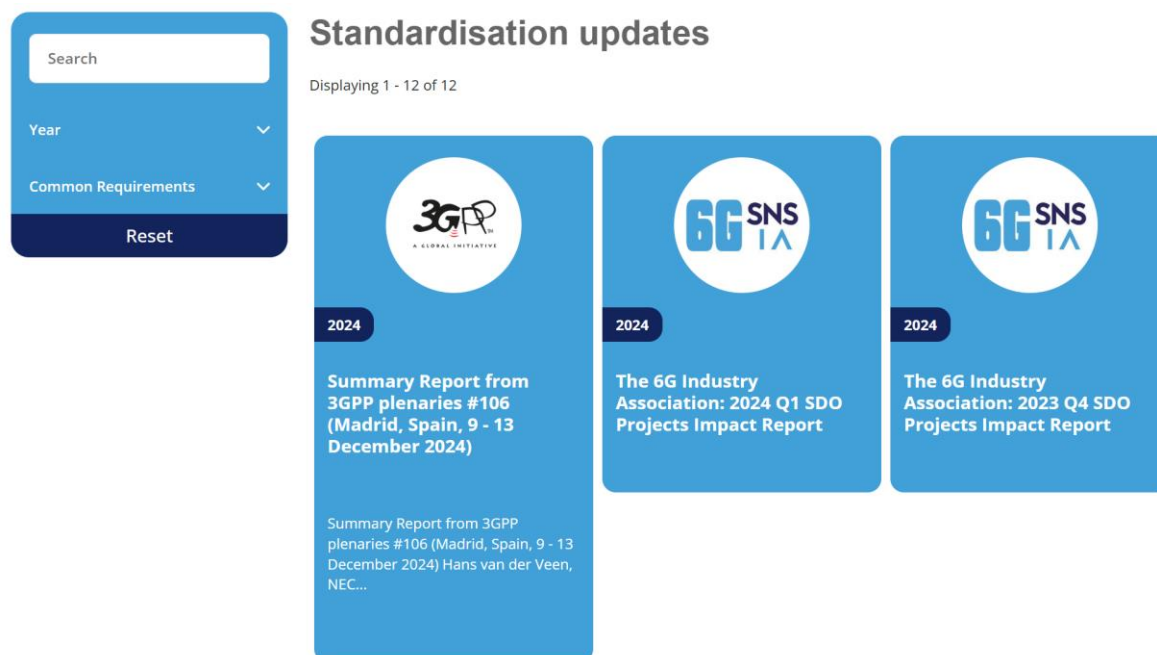
Figure 18: Standardisation updates

3.3.4　　Sustainability strategy and transition to SNS CO-OP

The activities of the 6G-IA Pre-Standardisation WG and the Standards Tracker will transition to the new CSA project SNS CO-OP, ensuring the continuity and long-term sustainability of these initiatives. The ongoing updates and coordination of the Pre-Standardisation WG will be maintained through the continued engagement of consortium partners occupying the vice-chair position, guaranteeing a steady flow of relevant insights and contributions. This will help sustain the alignment of research efforts with standardisation developments.

Similarly, the Standards Tracker will remain an active and evolving tool under the SNS CO-OP framework, with its sustainability supported by Task 4.2 Online Presence & Maintenance, Monitoring, and Social Media Channels. This task will ensure the continuous upkeep of the tool, integrating valuable datasets on SNS JU R&I projects' use cases, enabling trend analyses of growing standardisation efforts and submissions (Standards Tracker) within the SNS JU community, strengthening its role as a key resource for tracking and supporting European standardisation initiatives in 6G research.

4   SME engagement, support and entrepreneurship promotion

Chapter 4 presents the different actions addressing SMEs entrepreneurship in the SNS JU since April 2024. It provides an overview of the SME participation in the SNS JU calls, the actions implemented within the NetworldEurope SME WG and the liaison with SME-focused initiatives. It also includes the results of a study on the state of entrepreneurship in the SNS ecosystem.

4.1   Main objectives

The central objective is to boost the SME engagement in the SNS community by providing them with the best support possible, including the necessary assistance to overcome specific SME-related challenges, and promoting entrepreneurship.

The specific objectives and their status are described below.

- **Analyse SME involvement in the SNS JU calls for projects**

   The SNS JU recommended a 20% SME participation in terms of budget. In the SNS 2022, 2023 and 2024 calls, SMEs accounted for 18.3%, 27%, and 26.3% of the total budget, respectively. This shows a positive trend in the involvement of SMEs in SNS JU activities.

- **Support and expand the NetworldEurope SME Working Group**

   The SME WG continued to receive operational support. Significant efforts were dedicated to promoting the WG, its activities and members to boost their visibility in the SNS ecosystem and attract new SMEs. Furthermore, the WG was actively involved in the SNS community to help voicing and advocating for the interests of SMEs.

- **Revise the strategy for promoting the skills and expertise of SMEs** within the SNS ecosystem to find new avenues to gain SMEs' visibility.

   The promotion of the competences and experience of the SMEs remained a priority. The SME WG reinforced its social media presence to effectively disseminate relevant information for its members as well as to promote their skills, expertise and achievements to a wider audience. The new brochure edition and its respective promotional campaign were the highlight in 2025.

- **Strengthen the engagement with SMEs involved in vertical sectors and in complementary domains** (in liaison with Task 4.2), as well as **manage specific interactions with European SME initiatives** such as SCoDIHNet, as well as **relevant international actions supporting SMEs** in the SNS domain (in liaison with SNS ICE).

   The various IAFAs, the standardisation tracker and related activities, and the work with SCoDIHNet and the SME WG have all contributed to reinforcing the involvement of SMEs in vertical sectors and complementary domains.

4.2   Identify and engage SMEs new to the SNS ecosystem

This section contains the analysis of the SME participation in the last SNS JU call as well as a comparison across all calls.

SME participation in the SNS JU call 2024 (Phase 3)

In 2024, the SNS JU launched its third call for proposals, awarding funding to 16 projects encompassing 301 beneficiaries across 25 countries. SMEs represented 19% (55) of those beneficiaries and accounted for 26.3% of the total earmarked budget. Only two out of the 16 projects did not have any SME involved.

Greece and Italy, both with seven beneficiaries and a total of 13 and 12 projects respectively, have the highest number of projects. France, Germany and Spain are tied in second place with five SMEs, although the number of projects varies slightly, with six, five and seven projects. Cyprus, with three SMEs and five projects, and Ireland, with two SMEs and four projects, are worth mentioning, Figure

19.
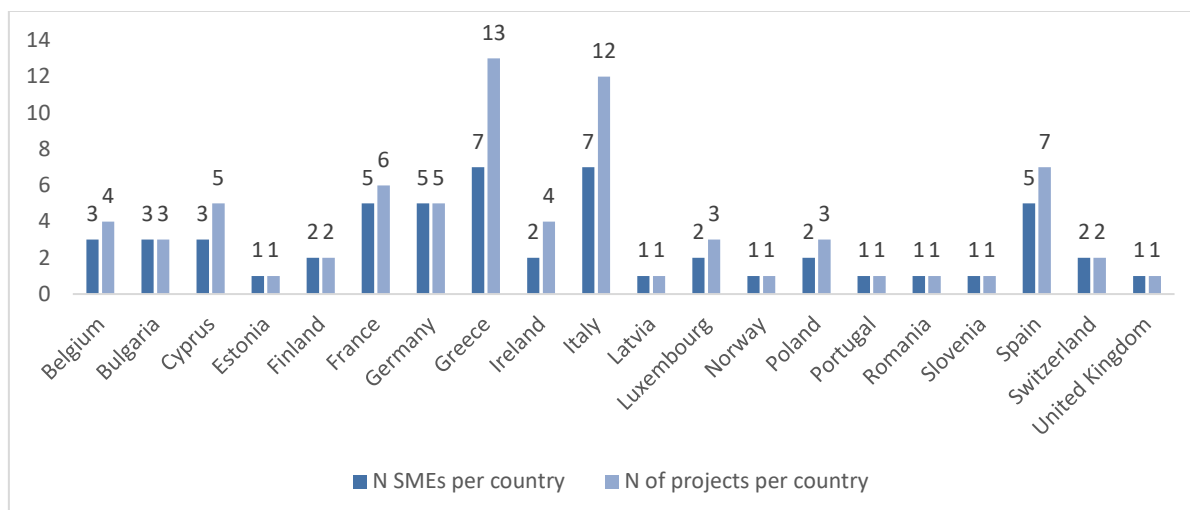
Figure 19: Number of SMEs and number of projects per country

The average number of SMEs per country was 2.75 and the average of projects was 3.8. Even though the total number of countries participating in the call is 25, only 20 of those have SMEs as beneficiaries. Southern European countries seem more involved in comparison to Northern and Eastern Europe.

As illustrated in Figure 20, most SMEs participate in one project whilst the remaining 12 are partners in more than one, totalling 76 project participations. The highest number of projects by one SME is five. Six SMEs were awarded three projects each and five SMEs obtained two projects each.
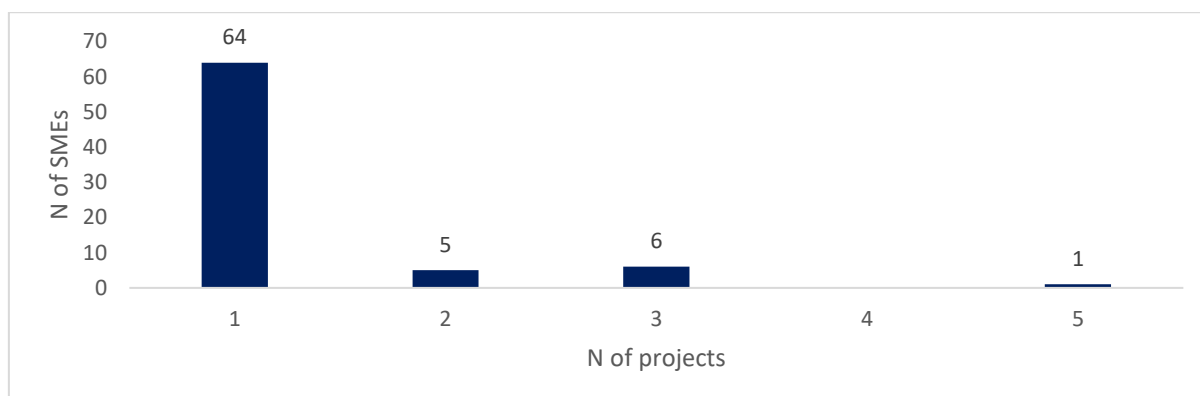
Figure 20: Number of projects per SME

SMEs received 26.3% of the total budget. On average, each SME received EUR 611,098.55. The highest funding received by a SME amounted EUR 2,314,750 m across five projects, which is also the highest number of projects awarded to one SME in the 2024 call.

Greece accounted for approximately 20% of the SME total funding, receiving EUR 6,607,771.25, Figure 21. Italy followed with 13% amounting to EUR 4,462,126.25 m. Despite having the same number of SMEs and only one project less, the difference between Greece and Italy is notable, with the former attracting over EUR 2 million more. French SMEs obtained 11% (EUR 3,556,875.00) in funds while Spanish ones received 10% (EUR 3,462,431.25).

Belgium, Cyprus and Germany surpassed the EUR 2 million mark. Contrariwise, Estonia, Latvia, Norway, Romania and Slovenia were below EUR 500,000. These countries only have one SME and one project each. This is also the case for Portugal and the United Kingdom, but they were able to attract more funds.
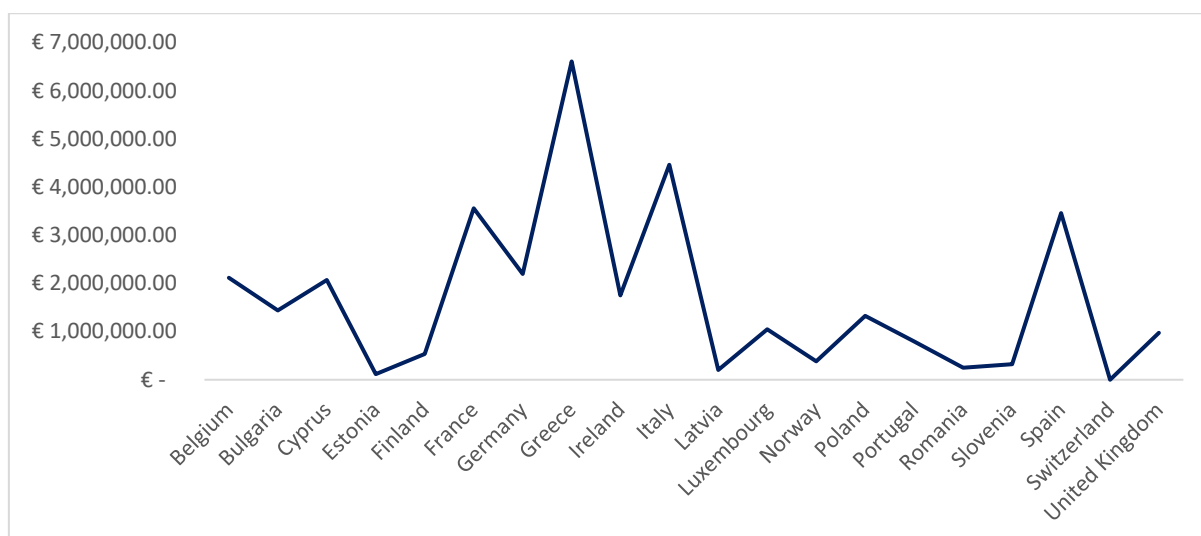
Figure 21: SME funding per country in the SNS JU 2024 call

Overall, the funding was rather concentrated with over 50% allocated in only four countries, namely: Greece, Italy, France, and Spain. Moreover, in most countries, a substantial portion of the funding was also allocated to a few SMEs that are beneficiaries of various projects.

The case of Italy is noteworthy. Approximately 52% of the funds were attracted by one SME (five projects) and 15% were obtained by another SME (two projects). The remainder 33% funds were distributed amongst four SMEs, with one project each. Yet, there is an important difference between these, with funding ranging from EUR 102,222.50 to EUR 471,750.00. On the other hand, Germany is one of the exceptions, with the funding distributed rather equally.

Comparison of the SME participation in the 2022, 2023 and 2024 SNS calls.

The SNS 2022 call funded 35 projects, including two Coordination and Support Actions (CSAs). Considering the Research and Innovation Actions (RIAs) and Impact Actions (IAs), 88 SMEs were beneficiaries. These accounted for 18.3% (EUR 44,070,384.13) of the total funding. The SNS JU 2023 call awarded 27 projects, including one CSA, with 75 SMEs involved. Their funding represented 27% of the total budget. For the SNS 2024 call, 55 SMEs are participating across the 16 awarded projects, accounting for 26.3% (EUR 33,610,420.00) of the total funding.

Even though the budget allocated to each call and its intended distribution across streams and specific projects was different from year to year, limiting direct comparisons, the funding secured by SMEs reflects a positive trend regarding their engagement in the SNS JU over the past years.

In total, SMEs from 30 countries participated in the SNS JU, with most having SME representation across all three calls. Some notable exceptions are Austria, Denmark, Hungary, Macedonia, Norway, Slovakia and Turkey, which only had SMEs participating in one call.

Greece led the three calls, consistently featuring the highest number of SMEs. France and Spain also maintained a remarkable presence across the years. Notably, France increased its SME participation in 2023 compared to the first call, whereas Spain saw a sharp decline during the same period. By 2024, the gap among the two countries was minor, see Figure 22.
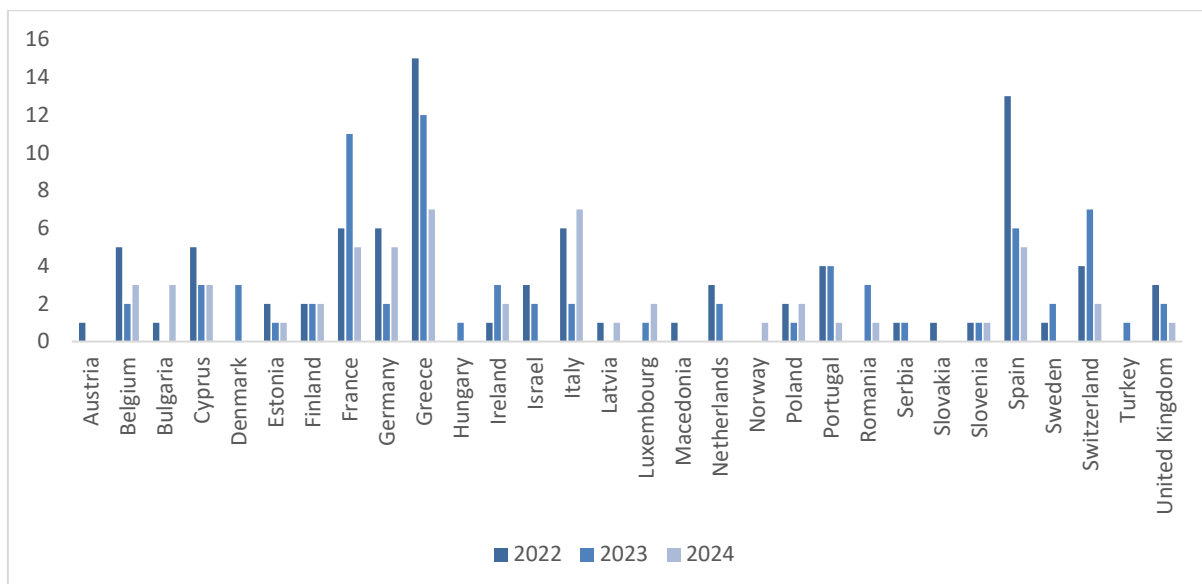
Figure 22: Number of SMEs in SNS projects, per country 2022 - 2024

Greece also ranked first in number of projects in the three calls despite the decrease over the years, particularly between the 2022 and 2023 calls. In total, the country secured 55 projects. France, Spain and Italy were also among the top beneficiaries with 32, 30 and 28 projects respectively. The difference between the top-ranked country – Greece - and the second-ranked – France - is substantial, exceeding 20 projects, Figure 23.

Despite their participation dwindling in 2024, Cyprus (23 projects) and Switzerland (19 projects) were major recipients. Similarly, Belgium, Germany and Portugal were actively involved with 15, 14 and 12 projects. However, half of the participating countries (15 in total) were awarded five or fewer projects.
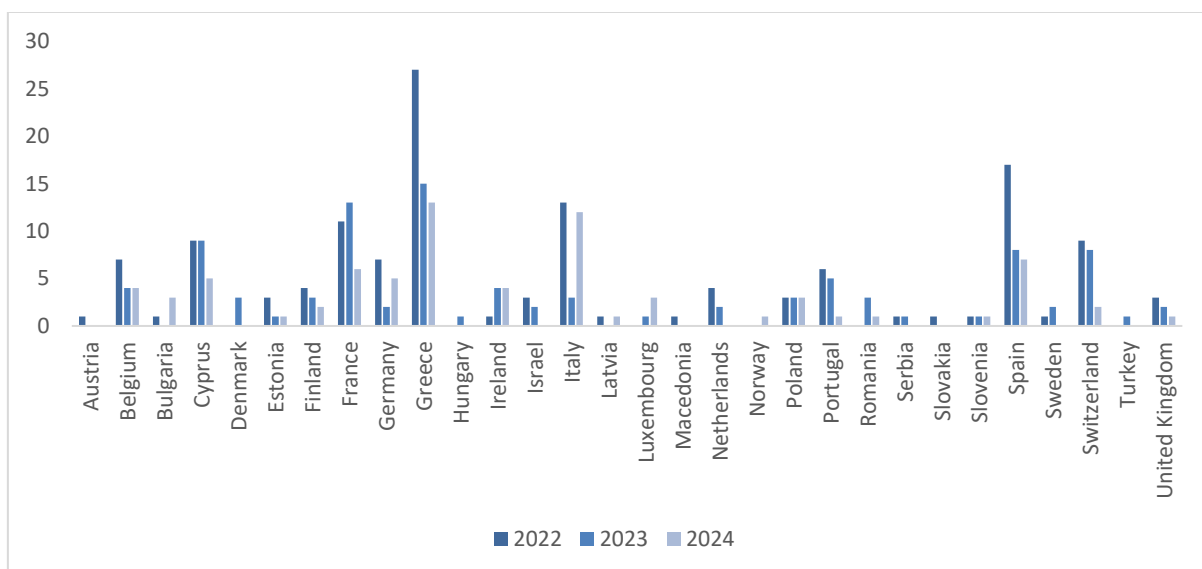
Figure 23: Number of SNS projects per country 2022 - 2024

The SME funding in the three SNS calls amounts to EUR 117,054,787.54. Greece accounted by almost 20% (EUR 22,315,109.78) of that funding. Second to it is Spain, with 11% of the total SME funding or EUR 13.389.733,25. The 20 project participations difference translated in over EUR 10 million in funding, indicating a significant concentration of SMEs, projects and funds in Greece that is worth analysing in-depth. France follows rather close having attracted 10% of the SME funding amounting to EUR 12.016.172,88, Figure 24.

Belgium (EUR 7.748.037,50), Cyprus (EUR 9.115.393,00) and Italy (EUR 8,562,163.50) are also amongst the top recipients of funds. It is worth mentioning the case of Estonia, which participated in the three editions, but attracted less funds than countries such as Denmark or Hungary, with only one SME

partaking in one call.
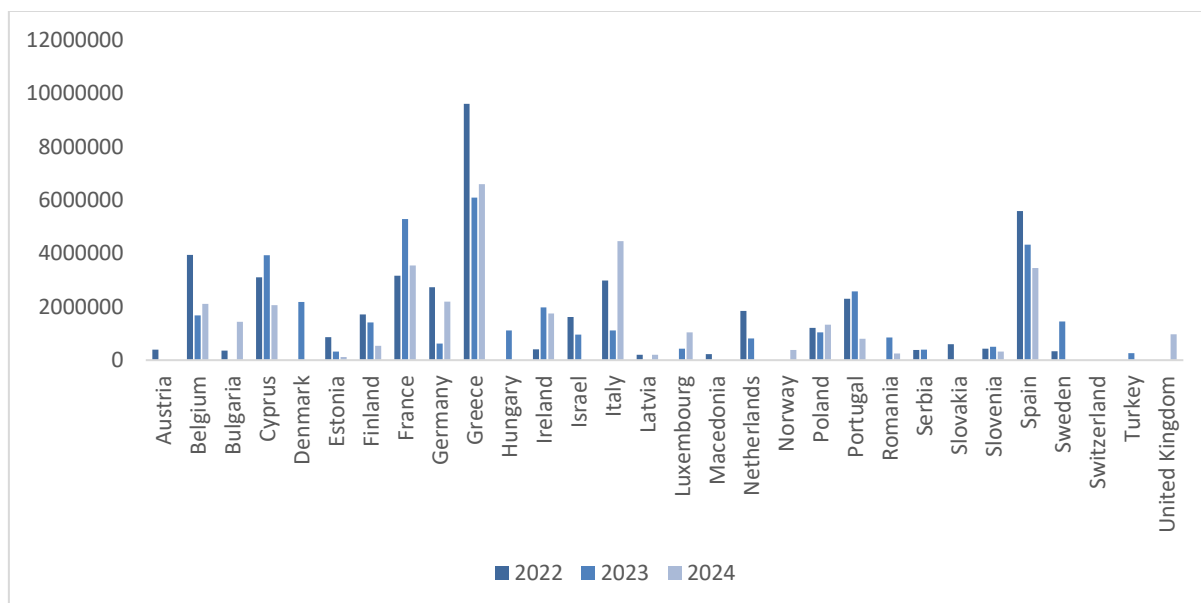
Figure 24: SME funding per country 2022 – 2024

SMEs from 30 countries participated in some of the SNS calls launched between 2022 and 2024. Whilst this indicates a positive participation across the EU Member States and associated countries, there is also a clear concentration of SMEs, projects and funds in only a few countries. There is also a significant concentration of projects and funds in a reduced number of SMEs. Thus, even when looking at countries that have obtained an important part of the funding, that is distributed only among a handful of companies.

In some specific cases, such as that of Scandinavia, the general consensus seems to point that the lower participation of SMEs is due to strong national innovation ecosystems where funds can be matched to the European ones, with less competition. In the case of United Kingdom, the inconsistent participation may be explained by the national circumstances that affected the involvement in Horizon Europe.

Ensuring a more balanced geographical representation could be beneficial to encourage participation from countries that are less represented. It would also bring new perspectives to the ecosystem, opening it to new players, fostering innovation and competitiveness, and prevent to a certain extent the widening of the digital divide.

4.3   The NetworldEurope SME Working Group

The SME WG is central to the SNS engagement strategy relative to SMEs. After the handover from 6GStart in December 2023, SNS OPS continued to provide operational support to the WG and its members to fulfil its mandate.

4.3.1   Overview of the SME WG

Since April 2024, the WG held seven meetings addressing different topics of importance for the members. Overall, all meetings followed a similar structure: introduction, update of the WG status and its activities, information about cascade funding in SNS and other relevant areas in telecommunications as well as other programmes and initiatives, and an overview of the latest publications, events and news. Projects and initiatives invited include: the European Cluster Collaboration Platform (ECCP), Stand.ICT.eu, PQ-REACT, 6G4Society, FIDAL, aeROS, and IMAGINE-B5G. The participation averaged 20-25 WG members.

To strengthen the position of the SMEs in the SNS ecosystem, the WG participated in various meetings, workshops and events. Information is shared via the SME WG mailing list and its social media channels, offering an easy and quick access to the latest news and opportunities. The use of social media has proved to be very successful in boosting the visibility of the WG members' skills, expertise, activities

and accomplishments as well as to build the community.

The management of the SME WG membership has continued smoothly. As of March 2025, there are 221 members, encompassing 192 SMEs, 25 research organisations, three industry members, and one association.

Representation and publications

The SME WG attended the SNS SB meeting on the 10 of October 2024. Likewise, it also attended the NetworldEurope Steering Board meeting on the on the 14 of October 2024 and the NetworldEurope General Assembly meeting on the 16 of December 2024. These meetings were an opportunity to present the activities of the WG and its members and highlight the importance of SMEs to the whole community.

Other relevant events include the IAFA Event Series#4-2: Second event on pre-Standardisation - Steps: 6G Standardisation Requirements[4] in April 2024. The WG presentation focused on the involvement of SMEs in standardisation. The basis of this presentation was a questionnaire launched in the WG that showed standards are not a priority for SMEs thus far. Only a few follow SDOs, namely: ETSI, IEE, GSMA, CAMARA, CEN-CENELEC, 3GPP, ITU-R, WRC, UNINFO. In terms of trends, the most popular ones are development of high-capacity, low latency communication solutions; AI in network management and security; and user-centric network designs.

The SME WG also attended the **"EuCNC & 6G Summit "6G: from vision to reality",** on 3-6 June 2024, Antwerp, Belgium. Many of the WG members were present at the event with project booths, workshops, special sessions and other activities. The WG encouraged and supported their participation by disseminating information about the event and the different calls available and launching a campaign in social media to promote those members that would attend, Figure 25.

Figure 25: Visual used in the campaign promoting the WG members participation in EuCNC.

During the event, the WG distributed hardcopies of the **"2023 European SME Expertise in 5G and Beyond"** brochure as well as cards with the WG details and a QR code to download the brochure. Various testimonials with SMEs in attendance - Simon Pryor (Accelleran), Israel Koffman (RunEl), Fotis Foukalas (COGNINN) and Vaios Koumaras & Vasilis Mavrikakis (INFOLYSIS) - were recorded and uploaded to the WG channel in YouTube[19]. Moreover, the SME WG Chair was invited to be one of the speakers in the WiTaR convened session, with a presentation titled "Gender Equality in small companies".

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[19] SME WG EuCNC video, available at: www.youtube.com/watch?v=FTcN-hHQ6-Y

In February 2025, the **"European SME Expertise in 5G and Beyond 2024"[20]** brochure was released. It features over 80 company profiles, 25 success stories, and editorials by Jessica Carneiro and Nicola Ciulli, Chair and Vice-Chair of the SME Working Group (WG), respectively; Rui Aguilar, Chair of NetworldEurope; and Colin Wilcock, Chair of the 6G IA Governing Board, Figure 26. The brochure's design was also updated for a more engaging and modern presentation.

Figure 26: Brochure cover and first page of editorials.

The development of the SME Brochure followed a structured approach to data collection. The process began with an outreach phase in September 2024, inviting SME WG members to submit their company profiles and success stories via a standardized form. This was followed by a rigorous review and approval process to ensure high-quality content, editorial consistency, and an appealing design.

The brochure is available for download on the **"Find My SME webpage"**[21] of the NetworldEurope website, where individual success stories[22] can also be accessed separately.

A strong promotional effort has been put in place to maximise the visibility of the publication, with a dedicated social media campaign actively promoting the brochure and its success stories that will continue for the next three months, Figure 27.

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[20] NetworldEurope SME WG, "European SME Expertise in 5G and Beyond 2024", available at: https://bscw.sns-ju.eu/pub/bscw.cgi/d528659/sme-brochure-2025-final.pdf

[21] NetworldEurope "Find my SME webpage", available at: www.networldeurope.eu/find-the-sme-you-need-new-page/

[22] NetworldEurope SME Success Stories 2025, available at: www.networldeurope.eu/find-the-sme-you-need-new-page/#SUCCESS_STORIES
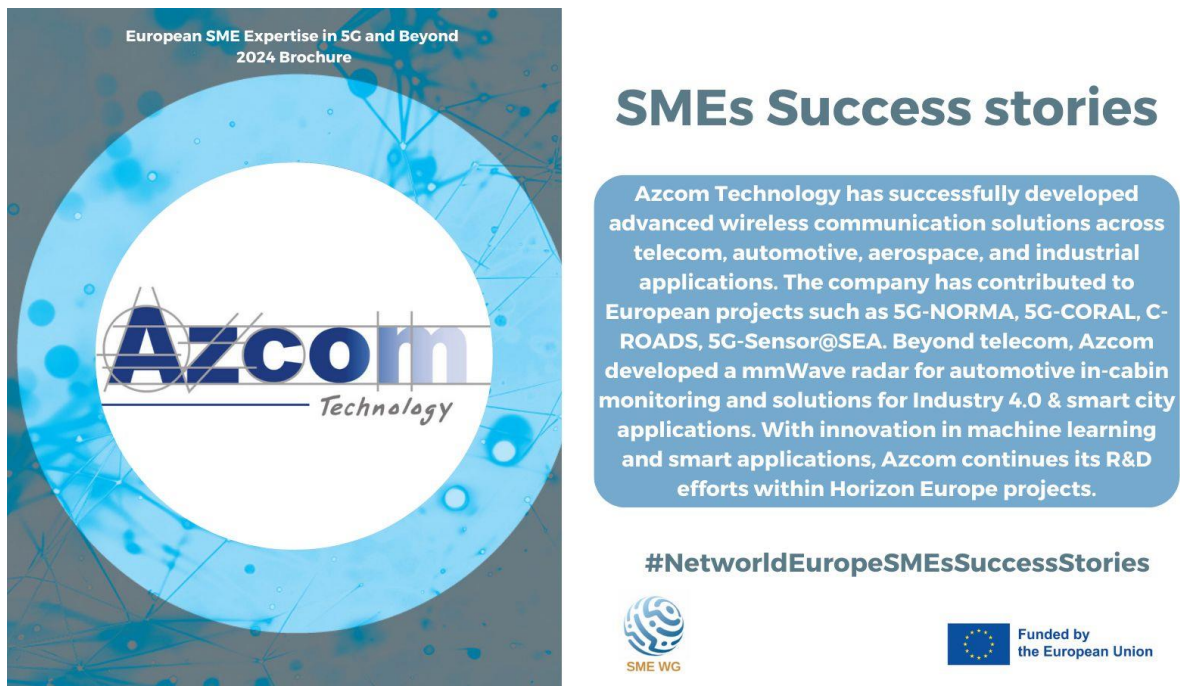
Figure 27: Visual for one of the SMEs success stories.

Beyond social media, the publication has been featured in newsletters from AUSTRALO and AIOTI, included in the SNS JU Newsflash, and distributed via the 6G IA mailing list. Additional visibility has been ensured through a press release on My Newsdesk[23] and EU Agenda[24]. To further enhance engagement, a professional video and compelling graphics have been produced and widely disseminated through various channels, including YouTube, LinkedIn and Bluesky.

As of March 2025, the 2025 SME Brochure had been downloaded 189 times via the BSCW platform and 173 times via the NetworldEurope website, for a total of 362 downloads, making it the most downloaded element in the NetworldEurope website. The success stories had been downloaded a total of 108 times across both platforms.

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[23] My Newsdesk article, available at: www.mynewsdesk.com/australo/pressreleases/european-sme-expertise-in-5g-and-beyond-2024-brochure-published-3371308

[24] EU Agenda article, available at : https://euagenda.eu/publications/european-sme-expertise-in-5g-and-beyond-2024-brochure

DOWNLOAD URL	▼ UNIQUE DOWNLOADS	DOWNLOADS
⊟ bscw.sns-ju.eu	911	1,054
/pub/bscw.cgi/d528659/sme-brochure-2025-final.pdf	159	189
/pub/bscw.cgi/d95685/Member organisations.pdf	119	130
/pub/bscw.cgi/d111258/sme-brochure-02-2024.pdf	98	109
/pub/bscw.cgi/d95660/SRIA-2022-WP-Published.pdf	95	105
/pub/bscw.cgi/d95695/White Paper1_WG_Enabling_Technologies_final.pdf	82	92
/pub/bscw.cgi/d95665/SRIA 2022 Technical Annex Published.pdf	78	88
/pub/bscw.cgi/d387222/Technical Annex to SRIA 2024 v0.31 for consultation.pdf	63	78
/pub/bscw.cgi/d561811/Workshop Report- web site.pdf	21	23
/pub/bscw.cgi/d94709/Annex v2.3 - Public.pdf	16	19
/pub/bscw.cgi/d116359/sme-success-story-acceleran.pdf	14	23
/pub/bscw.cgi/d111804/sme-success-story-ebos.pdf	11	13
/pub/bscw.cgi/d111797/sme-success-story-cyberethicslab.pdf	10	11
/pub/bscw.cgi/d111762/sme-success-story-trustitservices.pdf	9	9
/pub/bscw.cgi/d111769/sme-success-story-wings.pdf	9	12
/pub/bscw.cgi/d111776/sme-success-story-acta.pdf	9	11

Figure 28: NetworldEurope website's most downloaded links 01 April 2024 to 20 March 2025

The SME WG Chair also contributed to the **"SNS Journal 2025"**, which will be released later this year. The article highlights the SMEs contributions to the SNS JU as well as their accomplishments in research and innovation, particularly in SNS projects.

Various articles on topics being addressed in the SME WG were published in the **SNS newsflashes**.

Website and social media

The SME WG social media strategy, aligned with WP2, has been carefully designed to prioritise community engagement and foster meaningful discussions around 6G technology and SME innovation. Through consistent updates, industry news, and key event promotions, we have successfully cultivated an active online community of nearly 1,500 members across platforms.

On LinkedIn, the SME WG experienced steady growth increasing the follower base by 68.1%, from 257 to 433 followers, in one year. Engagement levels have also been strong, with 21,583 impressions generated through posts and discussions and 870 reactions.

Engagement was achieved entirely through organic activity - no sponsored content was used - with an average engagement rate of 7.8% and consistent visibility across the year. Organic reach totalled 11,779 members, with noticeable peaks in both impressions and reactions during May and February.

The audience was highly relevant to the SME and research ecosystem. According to LinkedIn's demographic breakdown, 22.2% of visitors were from research, followed by 17.1% in programme and project management, and further representation from business development, IT, engineering, and communication. Geographically, the community was concentrated in key European innovation hubs, with top locations including Athens (6%), Paris and Madrid (each 3.5%), Brussels (3.2%), and several other cities such as Barcelona, London, Dublin, and Nicosia.

These insights confirm LinkedIn as a critical channel for reaching and engaging with a targeted community of professionals in 6G, digital innovation, and SME development.

On X (formerly Twitter), SME WG reached 1,066 followers before the strategic decision was made in January 2025 to gradually transition away from the platform in favour of Bluesky, a decentralised platform built on the AT Protocol, which offers greater transparency, user control, and interoperability.

While still in its early stages, our presence on Bluesky is steadily growing as we establish engagement within this emerging network.

Beyond social media, our presence on the NetworldEurope website remains strong. The "Find the SME you need"[21] page received 1,474 pageviews, with 1,037 unique pageviews and an average time on page of 1 minute and 26 seconds, Figure 29. It is the most viewed page on the website after "Home" and the one in which users spend more time on average.

The SME WG page was the most viewed page, receiving 492 pageviews, with 418 unique pageviews and an average time on page of 51 seconds.

PAGE URL	PAGEVIEWS	▼ UNIQUE PAGEVIEWS	BOUNCE RATE	AVG. TIME ON PAGE	EXIT RATE	PAGE LOAD TIME
☑ /index	3,787	3,212	69%	00:00:31	74%	5.55s
⊞ find-the-sme-you-need-new-page	1,474	1,037	70%	00:01:26	92%	9.19s
⊞ early-notice-workshop-autonomous-network-for-future-ai-vertic...	903	778	58%	00:01:16	94%	10.01s
⊞ early-notice-workshop-future-core-new-potential-to-connect-ev...	875	731	74%	00:00:59	94%	7.19s
⊞ sria-and-whitepapers	660	568	57%	00:01:18	74%	4.47s
⊞ satcom-wg	528	475	88%	00:00:29	91%	7.69s
⊞ sme-wg	492	418	53%	00:00:51	59%	5.22s
⊞ our-members	395	331	55%	00:00:57	48%	2.32s
⊞ european-sme-expertise-in-5g-and-beyond-2024-brochure-now...	372	329	47%	00:01:11	85%	3.79s
⊞ event	310	285	88%	00:00:43	67%	6.48s
⊞ sme	259	246	88%	00:00:07	93%	3.61s
⊞ overview	278	245	72%	00:00:55	44%	2.74s
⊞ page	214	205	97%	00:00:16	66%	4.12s
⊞ events	244	204	53%	00:00:27	32%	3.56s
⊞ news	243	201	67%	00:00:45	39%	3.22s

Figure 29: NetworldEurope website's most visited pages from 01 April 2024 to 20 March 2025

The YouTube SME WG channel[25] 12 videos (one of those a "short"), which accumulate 265 views.

As we continue refining our strategy, our goal remains clear: to expand SME WG's reach, facilitate collaboration, and drive innovation in the evolving landscape of 6G and beyond.

4.3.2   The SME WG perspective on the SNS JU

The SME WG carried out its second annual questionnaire with the trifold objective of gaining understanding of the SMEs' situation in the telecommunications sector, focusing on the SNS ecosystem, and the overall research and innovation ecosystem, as well as their feedback on the functioning of the WG.

A total of 22 SMEs answered the questionnaire. Due to the low response rate, the results of the analysis cannot be extrapolated to the whole WG. Nevertheless, these are still valuable to identify common topics of relevance for SMEs. It is important to note that the SMEs that participated in the questionnaire are all active members of the WG.

The respondents originated from 11 countries: Finland (1), France (4), Israel (1), Italy (4), Poland (1), Portugal (1), Romania (1), Spain (2), Switzerland (2) and United Kingdom (1). Of those, 13% of the respondents were micro-SMEs, 83% were small companies and 4% were medium-sized companies.

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[25] YouTube SME WG channel at: www.youtube.com/@NetworldEuropeSMEWG

SNS JU participation

A 45% of the respondents applied for all the SNS JU calls launched, 41% applied for two calls and 5% applied for one call. Only 9% of the respondents did not apply for any SNS call. Of those SMEs that applied for funding, 23% (5) acquired funding for all the calls applied whilst 23% (5) did not obtain any. Approximately 41% (9) of the SMEs were awarded funding in two calls and the remainder 13% (1) got funding in one call. In terms of projects, 71% of the WG members got more than one project funded, Figure 30.
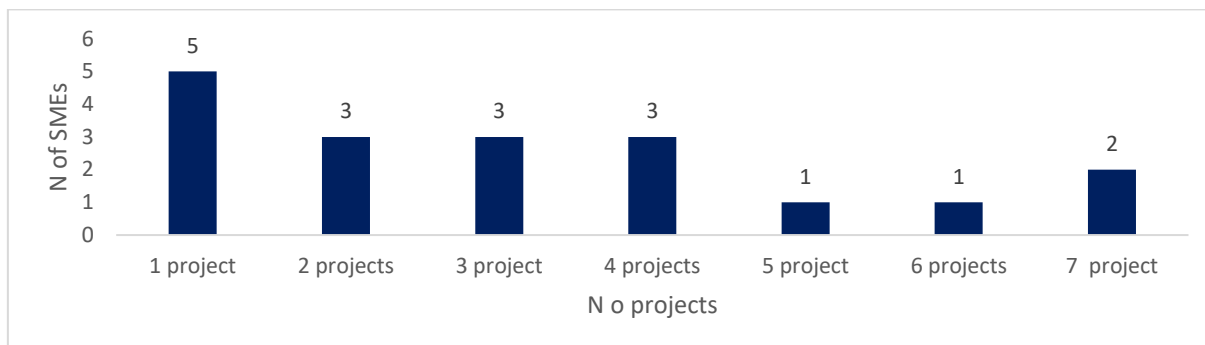
Figure 30: Number of projects awarded per SME

Figure 32 showcases the projects awarded to the 18 SMEs that participated in the questionnaire. The presence of SMEs is more prominent in Ether and Origami.
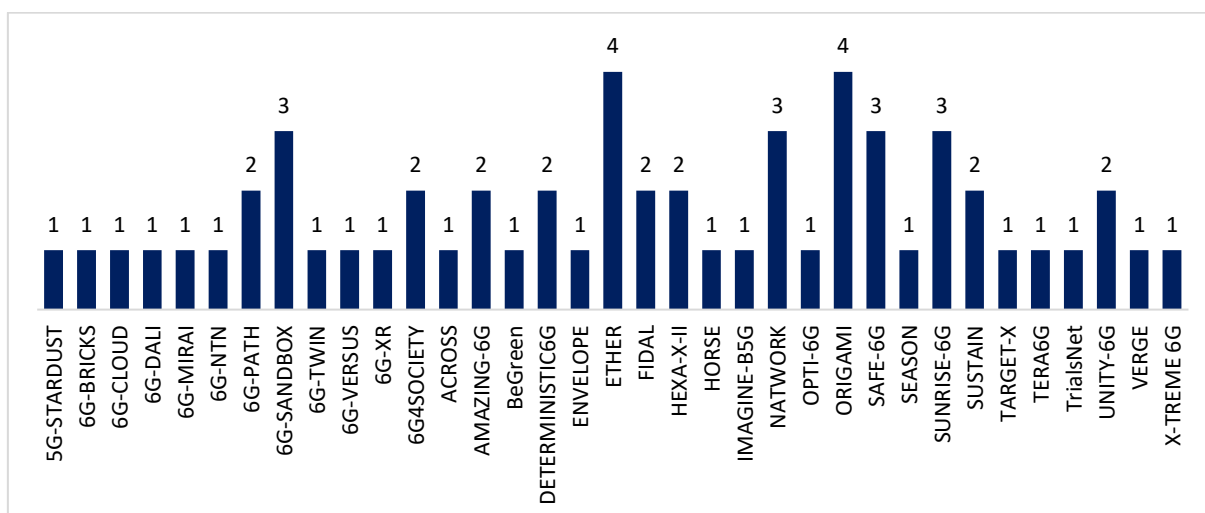
Figure 31: WG SMEs involved in each SNS project

Respondents highlighted various benefits from participating in the SNS JU but also noted significant challenges. Overcoming these obstacles is essential to fully realise the innovation potential across the SNS value chain and to ensure that the work done within the SNS JU is transferable, marketable, and sustainable. Below is a summary of the key benefits and challenges mentioned.

Key benefits

Access to **research funding and testing facilities** is highlighted as one of the main benefits of participating in the SNS JU, as it directly supports R&I efforts, minimising risks in early research, contributing to the latest technological advancements, and accelerating technology validation.

Engaging in SNS projects that align with their innovation roadmap ensures that SMEs **build on existing expertise and experience**, strengthening their position in innovation and advancing their strategic objectives. Participation in SNS also exposes SMEs to new topics and pioneering work in **cutting-edge research**, allowing them to develop new tools, techniques, and infrastructure. Knowledge transfer and cross-fertilisation across projects are perceived as a key advantage.

The opportunity to partner with industry and academic leaders, expanding their network and strengthening their relationships with key ecosystem stakeholders, is also highly valued. Being part of

the community also helps SMEs to gain a better understanding of the EU-funded R&D landscape, enabling them to navigate complex technological environments more efficiently.

Being at the forefront of technological evolution, provides SMEs with a **significant competitive advantage**. It enhances their visibility and credibility, which leads to new business opportunities, driving growth and fostering long-term success.

Key challenges

Entering consortia is the main obstacle for SMEs seeking to participate in SNS projects, particularly for new or smaller players, due to closed networks favouring existing partnerships. In this respect, identifying reliable partners, aligned with both commercial and technical (R&I) objectives, is also a significant challenge. In addition, a well-defined business case is required to demonstrate value and secure participation, which is not always easy for SMEs.

Ensuring proposals are clear, well-structured, appealing and aligned with strategic goals, balancing technical and business aspects, and harmonising contributions from all partners is key to success. However, many SMEs struggle to navigate the process. In fact, given its highly competitive nature and the substantial time and resources it demands, coupled with the unpredictability of return on investment, many SMEs perceive it as not worth the effort to apply for calls.

Furthermore, the funding model is not well-suited to SMEs, particularly for micro and smaller ones. Constraints on reusing previously funded equipment limit cost-efficiency, while insufficient financial incentives hinder investment in advanced technologies and cutting-edge equipment.

Effective coordination and communication among project partners, coordinators, and stakeholders are seen as critical for successful project implementation. However, SMEs do not always know how to manage all these aspects. Moreover, the administrative burden associated with project reporting is often complex and time-consuming.

Some additional challenges concern the integration of social considerations in technology development; keeping pace with rapid technological advancements; the limited user acceptance due to a lack of awareness and understanding of emerging technologies; and, the absence of necessary infrastructure that further hinders the deployment of beyond 5G/6G use cases.

Social considerations in technology development need to be better integrated and understood, and keeping pace with rapid technological advancements remains a challenge. Additionally, user acceptance is often limited due to a lack of awareness and understanding of emerging technologies such as B5G and 6G. The

SMEs were asked to assess the five key dimensions of the SNS JU such as openness to SME participation, alignment of interests, governance representation, funding, and impact of incentives, highlighted in the WG position paper released in 2020. Each aspect was rated on a five-point scale ranging from "Very Poor" to "Very Satisfactory," and the following observations have been derived from the calculated averages, Figure 32.
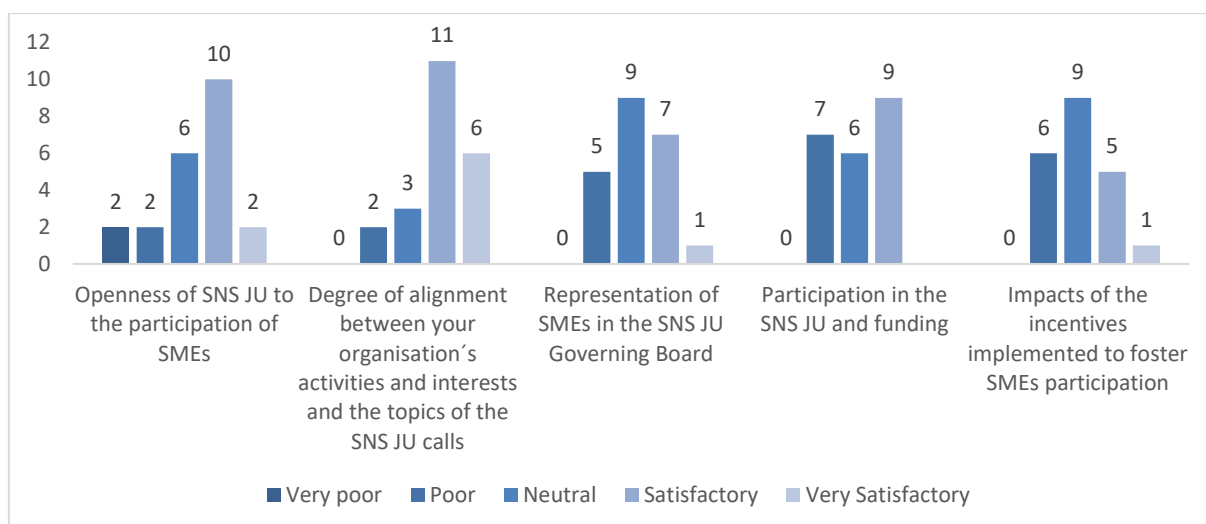
Figure 32: Assessment of the targets set in the SME WG 2020 position paper.

Openness of SNS JU to SME participation

The SNS JU's openness to SME participation received a moderate rating, averaging 3.36. Although most respondents found this aspect satisfactory, a significant number had concerns, with four rating it as "Very Poor" or "Poor." This suggests that while efforts to include SMEs are acknowledged, accessibility should improve.

Degree of alignment of SME interests with SNS JU topics

This dimension received the highest average rating of 3.95, indicating strong alignment between SME activities and SNS JU call topics. Many respondents found the alignment to be "Satisfactory" or "Very Satisfactory," showing that the thematic focus of SNS JU initiatives aligns well with SME interests, encouraging their active participation.

Representation of SMEs in the SNS JU Governing Board

The representation of SMEs on the SNS JU Governing Board received a rating of 3.27, with many respondents grading it as "Neutral" or "Poor." The responses indicate that SMEs may feel their influence limited.

Participation in SNS JU and funding

Participation in SNS JU and access to funding was rated at 3.14, indicating mixed perceptions. Although many respondents rated it "Satisfactory," a notable portion of SMEs found it "Poor" or "Neutral." This suggests that SMEs may encounter barriers in accessing funding opportunities likely due to administrative challenges, competition, or eligibility criteria.

Impact of incentives implemented to foster SME participation

The lowest-rated dimension was the impact of incentives for SME participation, with an average score of 3.09. While SMEs acknowledge the incentives, their effectiveness in encouraging SME engagement appears to be limited. Many respondents expressed neutrality or dissatisfaction, indicating a need for further improvements.

Overall, the findings suggest that SMEs are aware of the relevance of the SNS JU and recognise its benefits. However, concerns persist regarding the governance representation, funding access, and the effectiveness of incentives. Streamlining the participation processes for SMEs and addressing the barriers that hinder their access to funding would facilitate their involvement.

It is also important to continue to improve the communication efforts to attract new potential participants and actively promoting a more inclusive ecosystem. Understanding why the current incentives do not yield the expected results and strengthening the representation of SMEs in decision-making bodies is a priority for future initiatives.

SME participation in SNS JU cascade funding projects

A total of 21 SMEs participated in the questionnaire section covering the participation in SNS JU cascade funding projects[26]. Figure 33 shows that 57% of the respondents applied to some open call launched by SNS projects 6G-BRICKS, IMAGINE-B5G, TARGET-X, 6G-XR, TrialsNet, and FIDAL.
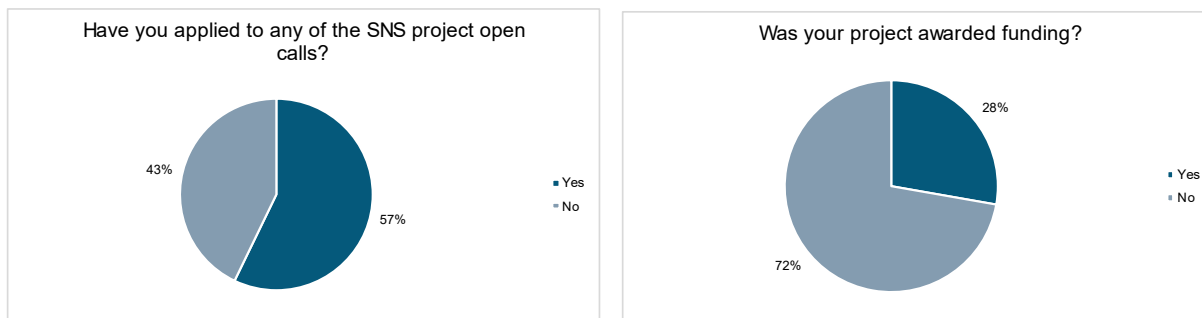
Figure 33: SME participation in SNS JU projects featuring open calls (WG questionnaire)

Of those SMEs that applied, 28% were awarded funding. In particular, WG members obtained one project in IMAGINE-B5G, 6G-XR and FIDAL, and five SMEs were awarded projects in the TrialsNet open calls.

The benefits of cascade funding align closely with those mentioned in the SNS JU calls, including access to research funding, strengthening technical know-how and gaining experience, and opportunities to cooperate with industry leaders and renowned research institutions. Among the additional benefits of cascade funding, SMEs emphasise a better alignment between projects and SMEs innovation roadmaps, facilitating early testing and validation, as well as an easier application process and quicker feedback.

The challenges are also similar to those of SNS JU calls: difficulty to join a consortium and stringent co-funding requirements for small businesses. Moreover, the varying proposals formats across cascade funding projects are perceived as an important burden, especially those more complex.

SME WG involvement in EU Research & Innovation beyond SNS JU

Most SMEs (82%) are active in R&I beyond SNS JU. The responses can be divided in verticals and specific programmes and initiatives. The former includes AI & Data, cybersecurity and security, industry, digitalisation, IoT, Cloud and Edge. The later includes EUCloudEdgeIoT, Marie Skłodowska-Curie Actions (MSCA), Horizon Europe Clusters 4 and 5, Chips JU, CEF Digital, IPCEI-CIS, ADRA, and European Defence Fund (EDF).

Boosting the impact of the SME WG

Suggestions to enhance the impact of the SME WG include:

- Increasing face-to-face meetings to improve collaboration.

- Fostering synergies within WGs and strengthen the sense of community in SNS and 6G-IA.

- Organising workshops, webinars, and physical networking events (2-3 days) to promote SME contributions and facilitate connections with telcos and industries.

- Hosting dedicated sessions at major events like EuCNC & 6G Summit and Infodays to provide SMEs with visibility and recognition in front of the SNS JU GB.

- Helping new SMEs entering projects with tailored guidance and support to boost their success.

- Increasing support at the proposal stage and advocate for SME-focused calls within SNS JU.

SME WG plans for 2025

Based on the outcomes of the questionnaire and the discussions held in the WG, the 2025 workplan is being fine-tuned. Some highlights are the participation in the 2025 EuCNC & 6G Summit with a session

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[26] Note: one SME did not respond to this section of the questionnaire.

focused on SMEs, the drafting of a position paper informing on the WG stance regarding the SNS JU and the role of SMEs in it, as well as the upcoming EU framework programme for 2031.

4.4   Promotion of entrepreneurship in the SNS ecosystem

The objective of this section is to outline the role of startups in the SNS ecosystem and explore opportunities that may arise in the future. The study examines the state of the art and lessons learnt from the 5G experience and the potential offered by ongoing developments in beyond 5G and 6G technologies, identifying best practices and possible actions by consulting different stakeholders.

More than 60 interviews were conducted, including startups active in 5G and 6G, participants in open calls, but also investors and venture capital (VC), open innovation programmes, national digital agencies and others. In addition, the project carried out desk research, analysing official resources available online, such as the Draghi report.

4.4.1   Challenges for startups in Europe

Entrepreneurship in the SNS ecosystem is part of a broader context. The Draghi report part B[27] highlights the main challenges faced by the European Union (EU) to maintain its competitive edge in R&I, particularly in critical areas such as AI and digital technologies. **Key issues include low R&D spending, a small venture capital (VC) market, and the different regulations across Member States (MS).** While the EU generates a comparable number of start-ups to the United States of America (USA), these drawbacks hinder their growth.

According to the Draghi report, EU household savings reached EUR 1,390 billion in 2022, compared to EUR 840 billion in the US. This indicates that **EU savings are not effectively flowing into productive investments within Europe**, pointing to inefficiencies in financial intermediation. Notably, EU's private R&D spending is lower compared to its global competitors, at 1,3% of GDP compared to 2,4% in the US and 1.9% in China, whereas EU's public R&D spending is higher, but it is fragmented and poorly coordinated across MS, reducing its overall effectiveness, see Figure 34.
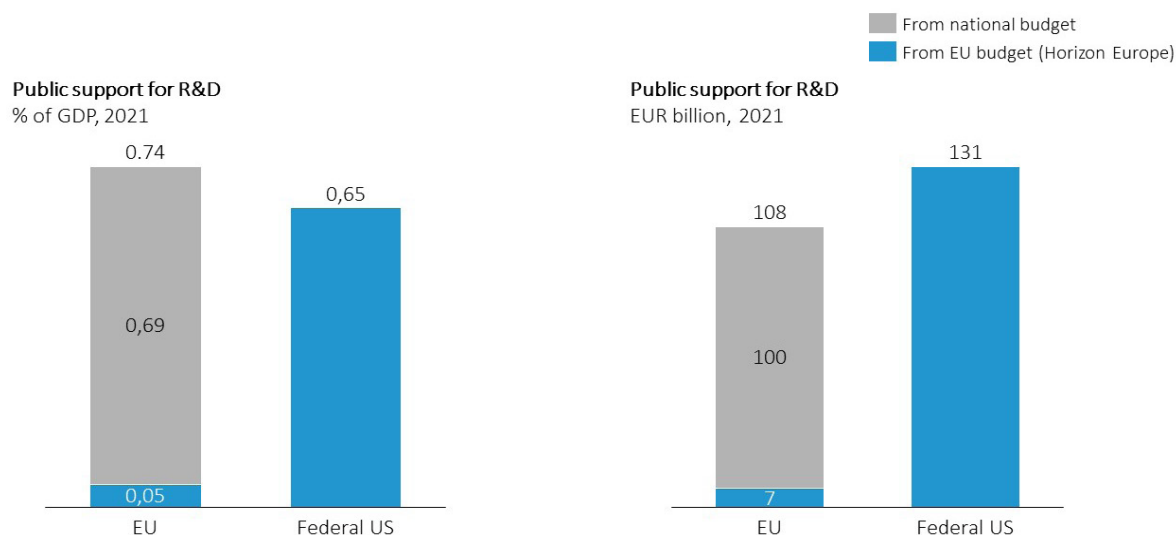
Figure 34: State versus federal source of R&D funding in the EU and the US

The EU's innovation ecosystem is geographically dispersed, lacking economies of scale and cooperation among researchers, innovators, and businesses. This fragmentation manifests in the underdevelopment of world-leading innovation clusters, with most EU clusters focused on traditional industries. In fact, the only European cluster featured in the Global Ranking of Science & Technology (S&T) Clusters Top 20 is the Paris one. Looking at the Global Top 50, China and the USA have almost

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[27] The future of European competitiveness: Report by Mario Draghi (2024), at: https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en?prefLang=fr#paragraph_47059

double the Science & Technology (S&T) clusters.

In addition, **the EU's VC market is rather immature**, with limited equity financing and a weak ecosystem for scale-up financing, making it difficult for innovative companies to grow and compete, as illustrated in Figure 35.
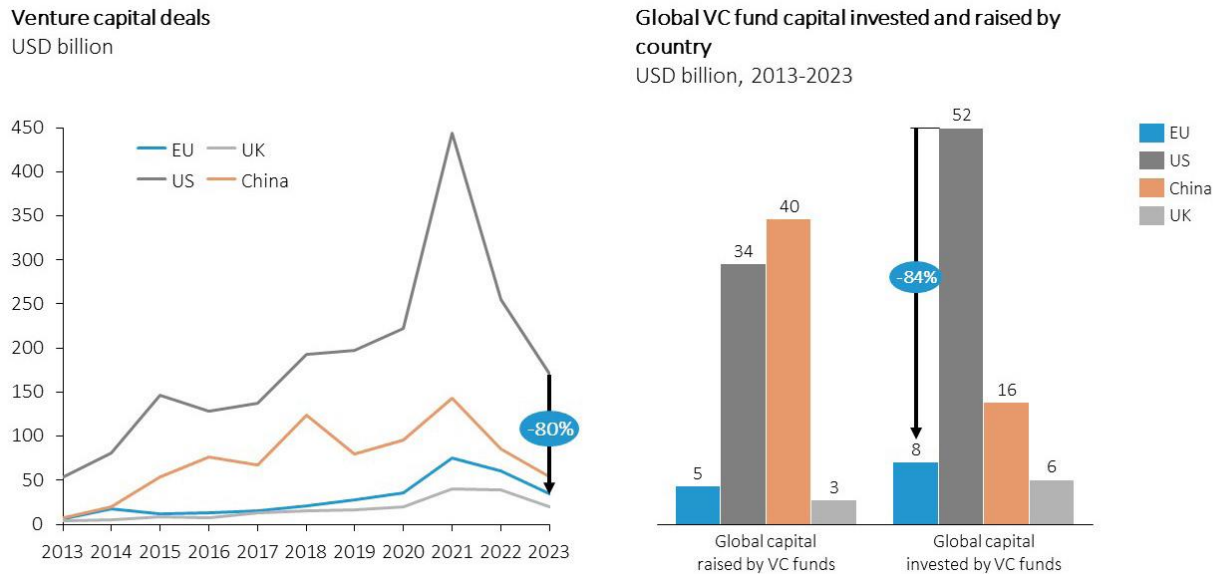
Figure 35: Venture capital investment

Regulatory, fiscal, and legal differences across MS further limit the ability of EU startups to scale up efficiently. European startups struggle to secure funding, particularly in later stages (Figure 36). While improving, the EU lags in the availability of angel investors who provide not only capital, but also essential mentorship and guidance.
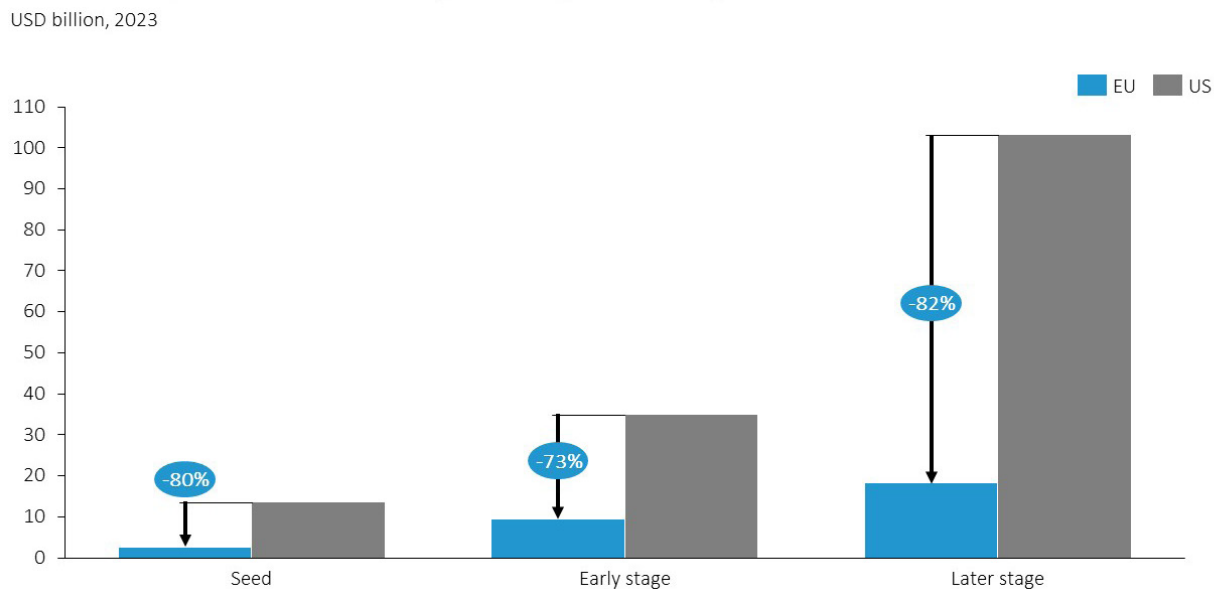
Figure 36: Venture capital investment by development stage

The commercialisation of research results in the EU is lacking, with only about one-third of patented inventions being commercially exploited; the talent pool is limited, with highly skilled professionals drawn overseas by higher salaries; and the collaboration between academia and industry is reduced. Improving the management of intellectual property rights (IPR) is also necessary. As a result, the EU lags far behind the US and China in fostering the development of ground-breaking start-ups and scale-ups, as illustrated in Figure 37.
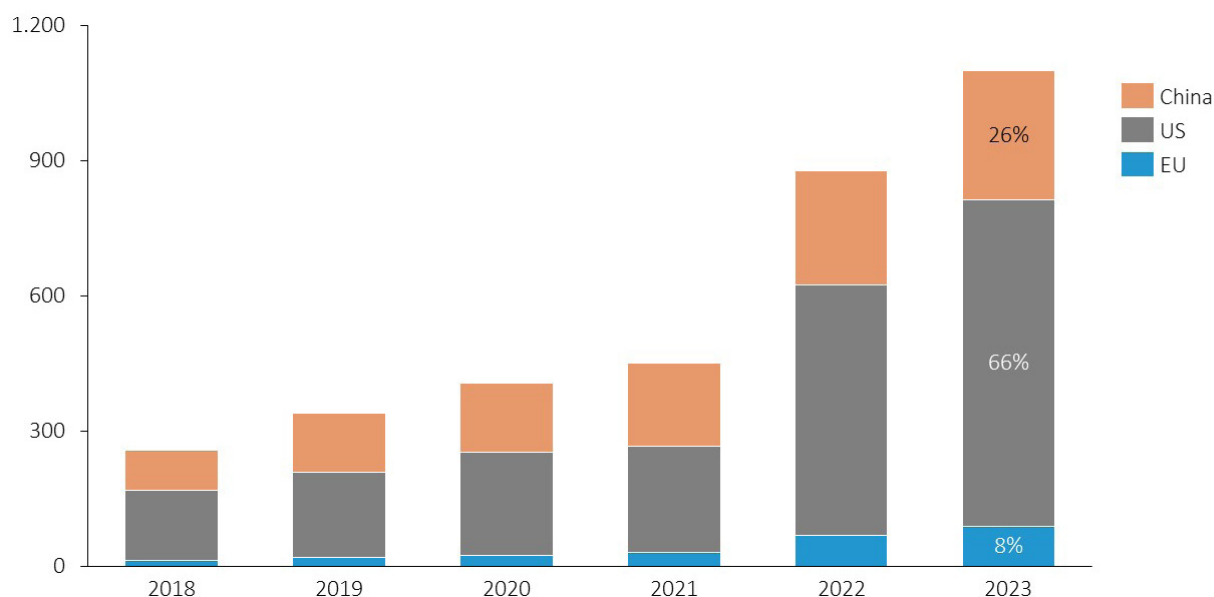
Figure 37: Active unicorns

The telecommunication industry faces similar challenges and additional ones specific to it. **The Draghi report points out that the profitability of the telecommunications sector is declining, which could pose a threat to European industrial and service companies at a time when state-of-the-art infrastructures are critical to their development**[27]. Several sectors are mentioned, such as manufacturing automation, logistics optimisation, enterprise resource planning, quantum technologies, green technologies, advanced manufacturing, automotive, AI, robotics, or cybersecurity. They will require faster, lower latency, more ubiquitous and secure business-to-business (B2B) connections with very competitive Service Level Agreements (SLAs).

The report also underlines that the telecommunication equipment and software sector is critical for the EU's cyber-resilience, security of strategic infrastructures, and protection of citizens' and business data. In fact, *the High-speed/capacity broadband networks* sub-section is placed in first position in the *Digitalisation and advanced technologies* section, ahead of other strategic verticals (i.e., computing and AI, semiconductors, energy-intensive industries, clean technologies, automotive, defence, space, pharma, and transport).

4.4.1.1   Challenges for startups in SNS

The development of SNS start-ups faces significant challenges. In 2021, the Innovation Finance Advisory, part of European Investment Bank (EIB), published the report "Accelerating the 5G transition in Europe: How to boost investments in transformative 5G solutions"[28], addressing the 5G transition in Europe, with a focus on access to funding for SMEs in 5G[29].

Startups should leverage 5G/6G through the development of multiple new applications in a more open market, leveraging softwarisation and cloudification. However, **there is a significant funding gap, ranging from EUR 4.6 to EUR 6.6 billion annually**, for 5G-related businesses compared to the USA and China[28], especially at the early stage of development of 5G-enabled businesses.

According to DealRoom[30], nearly USD six billion[31] have been invested in 5G-related startups by VCs since 2010, for a cumulated enterprise valuation of USD 15 billion in late 2024. Investment surged during the 5G launch and peaked in 2021 partly due to the COVID-19 pandemic, as illustrated in Figure

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[28] EIB, Report 2021, "Accelerating the 5G transition in Europe: How to boost investments in transformative 5G solutions" prepared for the EC, available at: www.eib.org/attachments/thematic/accelerating_the_5g_transition_in_europe_en.pdf

[29] Implicitly in the EIB report, SMEs are start-ups

[30] DealRoom.eu, available at: https://app.dealroom.co/sector/tag/5G/overview

[31] More than USD 100 billion for Generative AI or IoT for the same period, most of it since 2021 for GenAI.

38 and Figure 39.
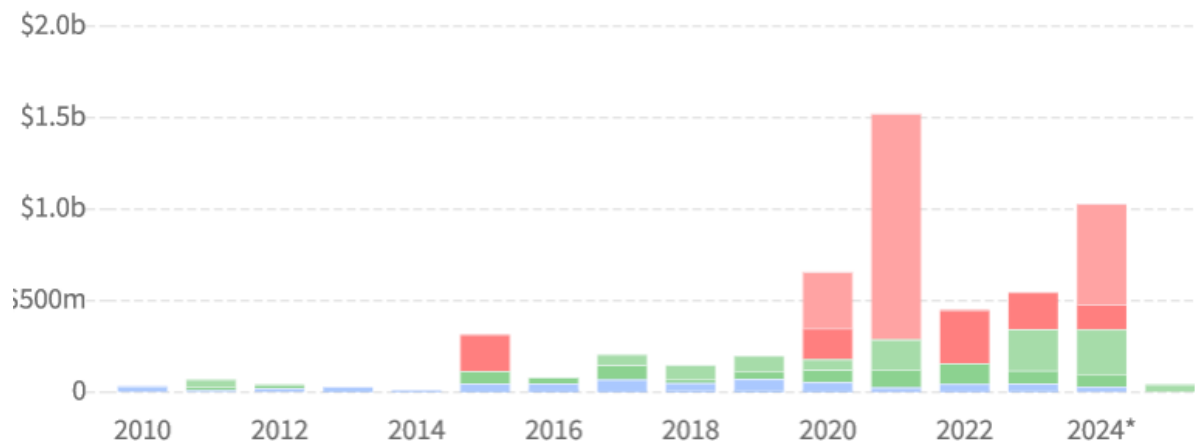
Figure 38. VC investment (source: DealRoom)
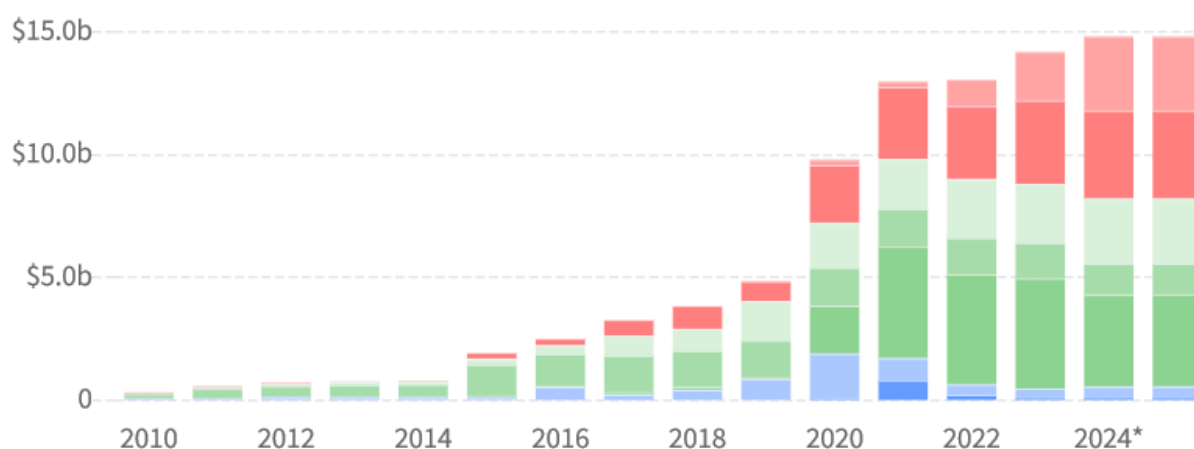
Figure 39: Combined enterprise value (source: DealRoom)

This challenge is not specific to SNS, it applies to all *deeptech* technologies. Immediate action is required to bridge this gap to enhance Europe's ability compete globally.

Europe has few DeepTech start-ups and especially spinoffs in Europe, according to BPI France and Business Finland. For instance, The France 2030 programme[32], launched in 2021 to accelerate innovation in key industries, aims to support 500 startups embracing disruptive technologies. As of 2024, it had supported 300 startups.

As reported during the interviews, Member States (MS) such as France, Sweden, Finland, and Spain have a bottom-up (i.e. open to topics proposed by the applicants) generalist deep tech funding programme. Nevertheless, there are generally limited actions to attract startups into top-down systems.

Calls for projects (CfP) launched by national agencies around a topic like SNS are one the most used mechanisms. Most leverage regional thematic and/or geographic clusters through newsletters and webinars but also bottom-up early-stage innovation programmes (i.e., iLab and idemo for France, Young Innovation Company and Tembo in Finland). In these, the most promising startups are identified and then managed by an account manager.

4.4.2   Identifying SNS startups

The SNS JU funding could attract startups, but the current format is not appealing. Cascade funding partly bridges that gap. However, unlike for SMEs, there is no tagging of startups in projects and thus,

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[32] France 2030 programme, available at: www.info.gouv.fr/grand-dossier/france-2030-en

data concerning the startup involvement in the SNS JU is not accurate and it should be read with caution.

Tagging of startups around 5G or 6G is very rare. The only exceptions identified are within Business Finland and tools like Dealroom. The same can be said for most national projects, but the number of involved startups or even SMEs is not an objective in such programmes, dedicated to the emergence of national/European SNS solutions and ecosystems.

4.4.3   Specific barriers for entrepreneurship around SNS

The process around Research and Innovation Actions (RIAs) and Innovation Actions (IAs) is viewed by most interviewees as very bureaucratic and too 6G-centric. Most startups are looking to commercialise within the next year and the 6G-focus has seen so far limited market growth outside of a few market niches around IoT, private networks or, more recently, Non-Terrestrial Networks (NTN). Moreover, startups lack the time and administrative resources to bid in the calls, needing to partner with big companies and laboratories. The simplified procedures in open calls are a first step towards the right direction.

At EU-level, the programme definition is top-down, with government and large industries (i.e., vendors and operators) playing a major role. There is no specific focus on startups, which may explain the limited participation. In comparison, most national programmes are fully or partly bottom-up, allowing a diversity of topics. The involvement of the VC and the spin-off communities, amongst others, could have a positive impact in the programme definition.

The issues of the programme definition can be extended to the whole structure of R&D in telecom, heavily dominated by a few giants backed by countries with strong economies, a large pool of talent, and huge command on standardisation. Although talent is still relatively available within large SNS companies, students are increasingly embracing popular disciplines such as AI, reducing the number of potential entrepreneurs in traditional SNS. This will likely have a negative impact in the number of start-ups, except for spin-offs from labs. Otherwise, innovation is often too incremental. For instance, most SNS startups in Finland originate from specialised universities such as the University of Oulu or the University of Tampere or from ex-employees of Nokia.

Beyond the SNS-funded projects, **procurement and demand remain major issues**. To partake in research, start-ups need the security of a contract, in the case of SNS, with telcos. The situation is very similar for startups across domains. European procurement organisations are risk averse compared to US public administration such as DARPA or NASA, being more inclined to buy or contract than fund. In the case of SNS, **this often means staying at the proof-of-concept level for several years**. The access to market, especially for consumers, is also a hurdle, with often only long-term reach due to standards. The wait to monetise has a highly negative impact in start-ups.

More generally, **the capacity to demonstrate market potential and growth is essential to attract investors**. The 2021 European Investment Bank (EIB) report mentions a low interest for 5G investment due to the low-market visibility and uncertainty of the value of future 5G-based use cases[28]. In 2024 interviews, VCs expressed their preference for limited investments; short delivery times; reasonable exit timelines, typically eight years; and, good returns, in the range of 3-4 times of the investment. This is inconsistent with investments in SNS infrastructure and remains challenging for vertical applications, especially due to numerous pilots and PoCs.

The current time-to-market in SNS is a major hurdle for startups. The technology complexity and the standards are some of the elements impacting the length of the process. In the meantime, startups need to rely in other sources of income to survive, such as grants, which are very competitive, and consulting services.

The Anything as a Service or XaaS model has clearly captured the attention of VCs, which are trying to replicate it with AI. Yet, the XaaS model is hard to implement in SNS. VCs rely on 18-24 months cycles of funding after which new funds are necessary. This requires having some results to showcase by the end of the cycle or at least a finalised product and/or service[33]. This is rather troublesome for any technology, including SNS.

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[33] As a consequence, VCs active around digital technologies tend to focus on SaaS, AI, apps/platforms and FinTech

However, fostering entrepreneurship in the SNS ecosystem goes beyond the SNS-funded projects. It requires attracting startups through both public funding, such as Horizon Europe, and private equity. To encourage investments, it is crucial to explore mechanisms and initiatives that can reduce the high-risks profile associated to SNS business

4.4.3.1　　Additional barriers for entrepreneurship around spin-offs

Due to the nature of telecom R&D, **the most promising sources for startups in SNS are universities and national research institutions**, especially during early-stage development. Spin-offs, called spinouts in the UK,[34] are a "legal entity formed by a parent organisation (PO) to leverage its intellectual assets."[35]. Universities and research organisations often establish spin-offs to capitalise on the knowledge generated, enabling the commercial exploitation of their assets. This strategy is common in high-tech and low TRL domains like SNS.

It should be noted that **academia is a large contributor to research without necessarily translating into entrepreneurship**[36], with monetisation rather coming from intellectual property (IP). The telecom sector is the most represented in Europe regarding indirect academic applications. Vendors like Ericsson, Nokia and Huawei are in the Top 8 applicants for indirect academic applications by country of inventor's university as illustrated in Figure 40[37].

		AT	BE	BG	CH	CZ	DE	DK	ES	FI	FR	UK	HU	IE	IT	NL	NO	PL	PT	RO	SE
CEA (FR)	PRO			42							1.438										
Ericsson (SE)	MNE						43			50				46	42						597
Fraunhofer Institutes (DE)	PRO	3			2		463			5									3		
Nokia (FI)	MNE		2				20	107		294		20	22	2	6						
Siemens (DE)	MNE	21	2		12		262					5	15	3			5	4			16
Philips (NL)	MNE						8							3		251					2
CNRS (FR)	PRO						3				136										
Huawei (CN)	MNE	4					242	3		6	11	7				7	10		2		
Sony (JP)	MNE						24							3							128
IMEC (BE)	PRO		131																		
Volvo (CN-SE)	MNE																				124
Bosch (DE)	MNE					4	75				3			2		10		10			
Evonik (DE)	MNE	6			5		74					4			3						3
Knorr Bremse (DE)	MNE						19						74								
Max Planck Institutes (DE)	PRO				1		79					1			2						4
Siemens Energy (DE)	MNE	5					17	27			35										
BASF (DE)	MNE	4	9		2		60		4												
Novozymes (DK)	MNE						2	70													
Volkswagen (DE)	MNE				2	7	62														
ST Microelectronics (FR-IT)	MNE										25	7			36						
ABB (SE-CH)	MNE				22	2	5			21		3			3						12
Henkel (DE)	MNE	6	2				49	2	4			2									
Nestlé (CH)	MNE				37			2	8			8				2		5			3
Helmholtz Institutes (DE)	PRO						61														
Bayer (DE)	MNE						53		2			3									2

Figure 40: Top 25 applicants for indirect academic applications by country of inventor's university 2015–2019 (source: EPO)

During its interview, CEA (Commissariat à l'Energie Atomique) stated "entrepreneurship around hardware remains very difficult due to the initial ticket for design, development and initial production." Research institutions generate more revenues from outsourcing research personnel (staff placement) to

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[34] Tracey, I., Williamson, A., (November 2023) "Independent review of university spin-out companies", Department of Science, Innovation and Technology and HM Treasury, UK Government, at: www.gov.uk/government/publications/independent-review-of-university-spin-out-companies

[35] European Commission: European Innovation Council and SMEs Executive Agency, Commercialising intellectual property – Spin-offs, Publications Office of the European Union, 2024, https://data.europa.eu/doi/10.2826/929316

[36] The role of European universities in patenting and innovation - A study of academic inventions at the EPO, available at: https://link.epo.org/web/publications/studies/en-the-role-of-european-universities-in-patenting-and-innovation.pdf

[37] EPO, "The role of European universities in patenting and innovation: A study of academic inventions at the EPO", October 2024, available at: https://link.epo.org/web/publications/studies/en-the-role-of-european-universities-in-patenting-and-innovation.pdf

network vendors than for IP royalties or technologies themselves. Open software-based networks have been so far more attractive to developers, around Open APIs (Open Gateway from GSMA), app stores, and networks for AI and AI for networks, offering quicker routes for start-ups.

According to more than 600 spin-offs recently surveyed in the UK, **the main barriers encountered were support, finance and deal negotiation**[38]**.** Finding investment remains difficult, even more than finding public grants. Support from universities or Technology Transfer Offices (TTOs) to transform a lab invention to a business is also limited. Finally, the spin-out deal with the university, in both financial and legal terms, is considered very challenging.

Challenges for scaling the company remain essentially the same as other startups, with the biggest obstacles mentioned in the survey being the team, the finance and the market. Recruiting adequate workers and improving the skills of the existing workforce is a major obstacle. Securing demand is also a common market barrier.

This is aligned with the conclusions drawn in VIADUCT project analysis report of 2024[39], based on a survey of 277 organisations active in research, of which around half come from universities and R&D public centres across Europe. In particular, it emphasises the following bottlenecks:

- Low entrepreneurship culture among researchers, where career orientation favours research and academic careers.

- Lack of business skills among researchers and research managers.

- Regulations that do not support knowledge transfer through spin-off companies.

- Limited access to funding due to a lack of tangible evidence for securing financing.

- High business risk and market uncertainty due to the disruptive nature of products or services.

The abovementioned points were echoed by the stakeholders interviewed in relation to SNS.

4.4.4 Current initiatives to promote entrepreneurship in SNS[40]

It is hard to assess the number of startups related to SNS[41]. Interviews with the French and Finnish national innovation agencies identified 5-10 startups and 10-15 in their respective countries. Only a few are active in the SNS JU programme.

Support from national agencies and SNS JU was highly valued by SNS startups during interviews. Funding, mainly through collaborative projects in CFP or grants for young companies, was noted by most interviewees to be vital in a context of long-time to market.

Some initiatives have been launched at regional, national and European level. Many are not specific to SNS, like the development of business accelerators and incubators, which are being intensively used for any high-tech startups. The SNS specific initiatives remain relatively limited. Some have even worsened since the launch of 5G. This is the case of Corporate Venture Capital (CVC)[42].

4.4.4.1 Initiatives for disseminating information

Dissemination efforts regarding 5G-related information are significant, with many webinars and reports,

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[38] Tracey, I., Williamson, A., (November 2023) "Independent review of university spin-out companies" Annex D, Department of Science, Innovation and Technology and HM Treasury, UK Government, available at: https://assets.publishing.service.gov.uk/media/6549fdbf2f045e001214dcb2/independent_review_of_university_spin-out_companies_annex_d.pdf

[39] Interreg Europe (2024, "Research-based spin-off creation: Viaduct Interregional Analysis Report 2024", available at: www.interregeurope.eu/sites/default/files/2024-03/Interregional%20Analysis%20Report_fv.pdf

[40] Note: the information presented in this section was mainly collected through interviews.

[41] DealRoom lists a total of 150-160 5G-related startups worldwide, see at: https://app.dealroom.co/sector/tag/5G/overview (last accessed 24 March 2025)

[42] Cambridge Dictionary defines corporate venturing as (1) he activity of a large company investing money in a smaller company in return for a share of its profits; (2) the fact of a large company creating a new business within the existing structure of the company, see at: https://dictionary.cambridge.org/dictionary/english/corporate-venturing

especially around Horizon Europe[43]. Nonetheless, these do not reach the entire SNS ecosystem, as the audience is primarily composed of SMEs and start-ups already aware of the programme.
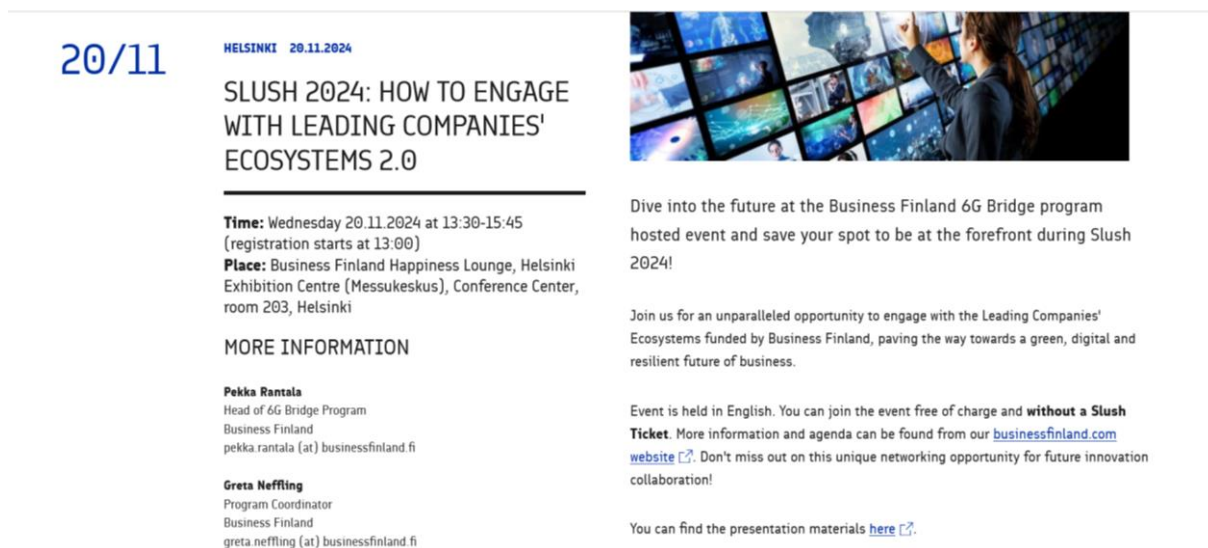
Similar events are organised at the national level. For instance, the CSF[44] event led by the Direction Générale des Entreprises (DGE) in France presents the SNS JU open calls, featuring SNS OPS team members among the top speakers. Numerous webinars are also organised.

The abundance of information on calls and ways to interact with the SNS JU contrasts with the limited information about SNS technologies and their applications, as noted by interviewees. Investors mentioned that, having a limited technical expertise, prefer investing invest in business related applications over tech-centric solutions.

Events including a focus on SNS startups are quite rare, but all SNS JU events are fully open to startups. Most SNS-centric events, such as the EuCNC & 6G Summit, have had no specific programme for startups. However, the 2025 edition of will grant five startup awards and a corresponding pitching session in the upcoming agenda. Startups can also benefit from matchmaking programmes available to all participants.

According to the 6G World event organisers, there is very limited presence of startups in publications and events due resource constraints. Therefore, most do not have dedicated sessions for startups, which can still be found in specific parts of the programme such as panels. The low participation is also explained by the limited participation of investors, as the audiences are mainly constituted of academics and commercial researchers.

Slush in Finland[45] is a good example of a large VC-centric event that promotes SNS startups, with 56/6G being explicitly part of the communication as illustrated in Figure 41.

Figure 41: Slush 2024

In particular, the event features a matchmaking side event with five-minute pitches between startups and large companies like Nokia or ABB. Bringing together investors and start-ups during events is challenging due to the very large number of players involved. Organised in parallel to Mobile World Congress (MWC), the 4 Years from Now (4YFN) has been mentioned as another good example of such event with more than 2,000 founders, 1,000 investors and close to 1,000 exhibitors. It should be noted

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[43] EC, Horizon Europe work programmes, website available at: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/horizon-europe-work-programmes_en

[44] French Ministry of Economy, Direction Générale des Entreprises, "*Les comités stratégiques de filière (CSF)*" https://www.entreprises.gouv.fr/secteurs-dactivite/industrie/les-comites-strategiques-de-filiere

[45] Business Finland, "Slush 2024: How to Engage with Leading Companies' Ecosystems 2.0", see at: www.businessfinland.com/events/2024/how-to-engage-with-leading-companies-ecosystems-2/

that there are no direct programmes related to 5G/6G, but rather to associated technologies, such as AI, or to specific verticals, such as health.

The IEEE conferences are considered a good format to engage researchers, startups and investors beyond SNS. IEEE has organised eight events around 5G and 6G in 2024, with a major event in Dresden (Germany) in May 2024. While the programme of said event involved mainly academics and large enterprises, a specific startup call was released[46], inviting them to take part in the event within the exhibition area and for top applicants to deliver a three-minute pitch during the plenary session. Specific training for an effective pitch was offered by HighTech StartBahn before the event.

4.4.4.2   Support initiatives

Support programmes from **business accelerators or incubators** are highly relevant. Except for those led by SNS largest stakeholders, i.e., operators and vendors, these usually are rather generic. Most large European operators are running such support services. For instance, Orange Ventures[47] supports selected start-ups to develop their business and to strengthen their management, building commercial partnerships with Orange's market lines and the market lines of major group partners. There are similar programmes like the one run by Deutsche Telekom, which incubated 20 companies in 2021[28].

A programme focused on innovation in 5G network services and infrastructure "5G Orange Fab Acceleration Programme"[48] was organised in 2020 and 2022 as illustrated in Figure 42.

Figure 42: Orange Fab France

Each edition of the programme selected 13 startups, out of typically 50 candidates. The associated efforts hindered the capacity to recruit more. As for most CVC, **the focus is on rather mature startups,** with a commercialised or marketable solution that can be easily integrated.

Benefits for startups include collaboration with Orange in labs and PoCs (paid PoCs are covered by Orange) and exposure in Orange's booths (e.g., Vivatech) or events (e.g., Orange's event OpenTech).

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[46] IEEE 6G Summit, Startup Call, Dresden 2024, available at: www.5gsummit.org/dresden/6G_Summit_StartUp_Call.pdf

[47] Orange Ventures, Portfolio Companies, available at: ventures.orange.com/portfolio/

[48] Fab France, "5G Orange Fab Acceleration Programme, season 2", see at: https://orangefabfrance.fr/en/5g/

Promotion is also done through alian[49], an alliance of "12 major global telecommunications companies with the mission of reinventing the industry by discovering the most disruptive startups". In some cases, this will also open the door to a Group contract or promotion with Business Units (typically key account managers and technical account managers at Orange Business) for external sales. Avoiding creating economic dependency of a client is crucial. It should be noted that there are no plans to run a new season of the programme for 5G/6G. The focus is more on transversal topics intersecting with SNS like NTN

Support may also be provided by matchmaking platforms. Such platforms are quite common, including in SNS ecosystem, to prepare collaborative projects, but they can also extend to matchmaking for investment like Euroquity[50], supported by BPI France.

4.4.4.3   Initiatives around funding: Open calls

While precise data on startups is lacking, their involvement in SNS RIAs and IAs appears to be low. For most startups, the timeline of projects, up to a year for selection followed by a two-three years project, is unfeasible. In this context, open calls are considered excellent tools for securing funding with minimal risks, low commitment and fast processes. Even though the timeline is still seen as long and too resource-intensive, startups that have participated in open calls view cascade funding in a positive manner and often apply to other open calls afterwards.

More than EUR 12 million have been allocated to open calls in SNS projects over a total of 11 calls[51] (IMAGINE-B5G, FIDAL, 6G-BRICKS, 6G-XR[52]) thus far. The Open Call Task Force reported that five out of the 25 recipient awards from FIDAL Call 1 were start-ups. These accounted for EUR 620,000, nearly a third of the EUR 2 million distributed in that call. If these numbers are extrapolated, startups would have acquired close to EUR 4 million through open calls. While managing open calls requires significant effort from consortia, particularly in administrative and legal aspects, this format is the most suitable for startups among the available options.

More than 12 startups have been awarded grants in the first two open calls run by SNS projects. While more applicants are generally expected for these open calls, identifying startups and SMEs can be challenging. Additional constraints, such as the preference against already EU beneficiaries via other projects, may impact the process. The SNS JU dedicates important efforts to promote these calls. The SNS projects leverage multiple channels, including their own network of known startups, national and regional networks, manual mapping, and public repositories for European startups like Y Combinator[53] or lists from organisations like IEEE.

Selected candidates have highlighted that the primary benefits of open calls include the funding itself, as well as technical support through biweekly webinars and direct assistance via mailing lists and dedicated mentoring calls. Some also offer business support, for example 5G-IANA provides consultant for Business Model Canvas and SWOT analysis training, along with business learning through concrete use cases. It is crucial for startups to develop a solid business model, especially in the emerging field of Network Applications in 5G, rather than focusing solely on vertical markets or applications. Startups in verticals often have limited knowledge of the telecom industry.

4.4.4.4   Initiatives around funding: national funding programmes

In addition to European funding, there are also some **national funding programmes focused on SNS**. These include call for projects that target not only startups, but also traditional SMEs, large enterprises and academia. BPI France leads such calls for projects (in French *AAP*) in 5G, at national level. However, the participation of startups has been very limited, with approximately 10 startups applying[54].

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[49] alaian website, available at: https://alaian.com/

[50] Euroequity website, available at: www.euroquity.com/en/companies

[51] SNS JU website, List of Open Calls Cascade Funding Opportunities from SNS JU Projects Running, available at: https://smart-networks.europa.eu/open-calls-from-sns-projects/

[52] This does not include projects that created open calls ex-post like 5G-IANA

[53] Y Combinator website, available at: www.ycombinator.com/

[54] Some interesting ones have emerged like Firecell, Airnity, Greenerwave or Spectronite, generally around market niches

SNS stakeholders generally use only SNS-centric CFP, but large players may go beyond, i.e., in transport or healthcare for instance, or less frequently AI.

In Finland, the approach is partly similar, but more bottom-up in nature. The strategy is to accelerate the development at the national level before joining EU programmes through initiatives like the 6G Bridge Programme[55]. The numbers are similar than in France, unless adjacent areas such as space are also considered.

Nonetheless, **the purpose of CFPs is not to promote the emergence of start-ups, but to accelerate the industry**. They aim to foster R&I by facilitating the collaboration between industry and academia, with industry leaders acting as catalysts. Yet, CFPs, especially in deep tech programmes[56] are considered efficient for startups. In addition to direct short-term subsidies, they also helped to raise funds later from private equity. Even though there are some dedicated funding mechanisms for startups - "Concours Innov" and iLab in France, Young Innovators in Finland, and Innovative Startups in Sweden[57] - these are not topic specific.

Countries such as France, Germany, UK and, to a certain extent Finland, have national SNS programmes, but they are the exception. In fact, despite being telecom heavyweights, Sweden or Spain have no such programmes.

Vinnova, Sweden's innovation agency, offers technology-agnostic programmes like "Advanced Digitalisation"[58], which aims to speed up the adoption of technologies through collaborative calls or Competence Centres. These Centres focus on advancing knowledge for low TRLs technologies and supporting academic spin-offs through five-year programmes, enabling long-term investments. Six of these Swedish Competence Centres are dedicated to 6G technology. This approach is seen as highly effective and is anticipated to foster the creation of spin-offs.

In Spain, the national innovation agency, CDTI, offers generic bottom-up programmes such as NEOTEC[59] and INNVIERTE[60]. Local developments are primarily driven by Telefonica through Wayra, which focuses on open innovation and investment programmes.

Some national agencies support the participation in EU-funded projects. This support can include funding for specific needs like travel or application writing. The goal is to mitigate the resource demands associated with the preparation of such projects. SMEs (and startups) may sometimes favour national programmes over EU ones due to the easier access with still an attractive budget.

The German landscape is rather different with four coordinated initiatives, called 6G Research Hubs, supporting the development of startups in connection to 6G. All are linked to the efforts made around the 6G platform[61], Figure 43.

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[55] Business Finland, 6G Bridge Programme, at: www.businessfinland.fi/en/for-finnish-customers/services/programs/6g-bridge

[56] Business Finland, Deep Tech Accelerator Funding Call, available at: www.businessfinland.fi/en/whats-new/calls/2024/deep-tech-accelerator-funding-call

[57] Vinnova, Innovative Startups, available at: www.vinnova.se/en/calls-for-proposals/innovative-startups/

[58] Advanced Digitalisation, available at: www.avanceraddigitalisering.se

[59] Spanish Ministry of Science, Innovation and Universities, Neotec, available at: www.cdti.es/en/ayudas/neotec

[60] CDTI, INNVIERTE, available at: https://www.cdti.es/en/node/889

[61] 6G Platform, available at: https://www.6g-platform.com/#home
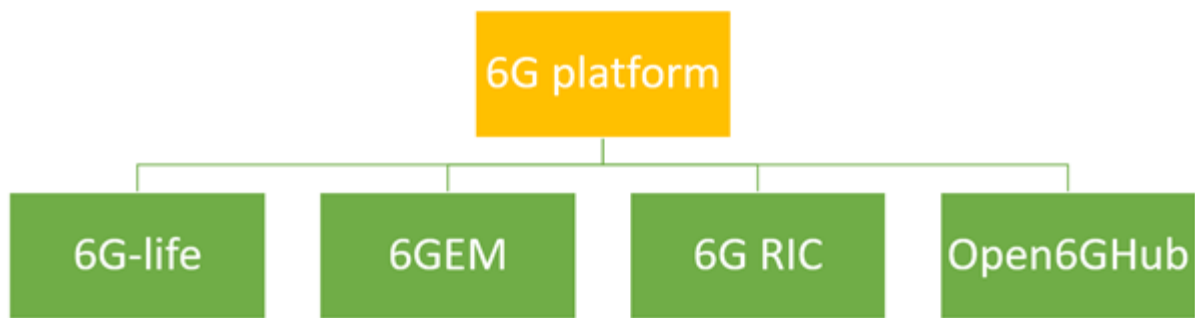
Figure 43: 6G platform Germany

This platform aims to ensure Germany's technological sovereignty in 6G by defining and implementing standardisation and security requirements. It engages a wide range of stakeholders, including startups, to identify leading 6G applications and requirements. The platform creates opportunities for societal and industrial participation, ensuring that even user groups not actively involved in mobile communications research can contribute to the development of 6G.

The four 6G Research Hubs are the 6GEM hub[62], the 6G-RIC hub[63], the 6G-life hub[64] and the Open6GHub[65].

- The 6G-life research hub focuses on human-machine collaboration and aims to drive research for future 6G communication networks. It supports the industry with innovative and sustainable concepts and plans to involve 30 start-ups and help to create 10.

- The 6GEM hub focuses on building a flexible network infrastructure, and to create an open ecosystem for innovation. It has initiated an incubator called the 6GEMcubator focusing on logistics, production, rescue robotics, autonomous driving, and healthcare. It offers advice, coaching, mentoring, and networking services.

- The 6G Research and Innovation Cluster (6G-RIC) is a research hub focused on laying the scientific and technical foundations for 6G technologies, and brings together leading research institutions, industry partners, and start-ups, providing access to advanced research facilities and expert knowledge.

- The Open6GHub develops a 6G vision for sovereign citizens in a hyper-connected world from 2030. It fosters an open innovation system by involving SMEs and start-ups.

A list of start-ups involved in these initiatives is available online.

6G-life hosts Launchhub42, which already involves about twenty start-ups[66]. These start-ups focus on various aspects, including O-RAN compatible small cell solutions, advanced robotics, wireless mesh networks, content distribution. They are also involved in developing low-latency, high-reliability communications systems, and software for efficient communication via goal-oriented data compression. However, most develop technology or services that will rely on advanced networks, and will contribute indirectly to developing 6G features, such as physiotherapy, digital twins, smart gloves, haptic interactions, high-performance computing platforms, Wi-Fi, LIFI or massive IoT.

Another initiative worth mentioning is the xG-Incubator[67], which supports start-ups in the 6G field by offering access to advanced facilities, expert guidance, and financial backing. It provides up to EUR 800,000 in equity-free funding, workshops with industry leaders, and access to state-of-the-art labs and testbeds. It features two programmes: the Evaluation Programme, which supports technical evaluation

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[62] 6GEM, available at: https://www.6gem.de

[63] 6G-RIC, available at: https://6g-ric.de/

[64] 6G-life, available at: https://6g-life.de/

[65] Open6GHub, available at: www.open6ghub.de/

[66] LaunchHub42, available at: https://launchhub42.com/our-startups/

[67] xG-Incubator, available at: www.xg-incubator.com/our-startups/

and business model development over a maximum of 12 months, and the Incubation Programme, which focuses on market readiness and securing follow-up financing over a maximum of 24 months. Three start-ups are so far promoted on their website: focusing on next generation of wireless communications and sensing, O-RAN implementation services and software solutions, and developing 5G features.

By involving start-ups in the early stages of the 6G roadmap, Germany is aiming to create an ecosystem that could demonstrate its full capabilities once 6G is launched.

4.4.4.5   Initiatives for Equity

A short review in late 2024 of major tech-oriented VCs revealed that SNS technologies are rarely tagged and specific funds for SNS are scarce. The only identified fund is 5G Ventures[68] in Greece, indirectly supported by the national Growth Fund, focused on 5G infrastructure deployment for large enterprises.

Generalist VCs struggle to understand the SNS underlying technologies and business models, which perceive its current commercial development as incompatible with the way they function. They need more information to be persuaded of the SNS market potential and timeline.

One of the suggestions of the EIB report[28] was to rely more on CVC, combining VC and strategic activities from vendors and telcos. In 2019, Qualcomm established a specific 5G fund with USD 200 million, featuring 14 companies in its portfolio. Comparatively, 5G was the smallest category with XR/Metaverse and significantly smaller than AI, cloud, automotive or IoT. Qualcomm noted that this is no longer a dedicated fund and that 5G startup candidates were rare, despite clear visibility.

Vendors like Nokia and Ericsson have also a few companies in their equity portfolio under the Next Generation Networks category, primarily focusing on network technologies, with no significant startups identified for specific use cases. In early 2022, Nokia committed USD 400 million to NGP Capital Fund V, which includes 5G and other technologies[69]. The fund aims to support companies developing emerging 5G use cases for industrial and business transformation, aligning with Nokia's technology vision and its efforts to maximise the value shift towards cloud. There is no specific 5G tag in the NGP portfolio to assess the fund's impact.

Many telecom operators have established CVC funds, adopting a generalist tech VC approach that focuses on cloud/XaaS and AI, primarily targeting Series B or late-stage investments. Few, like KPN, have taken a strategic approach by investing in network-centric startups. Ericsson noted limited market opportunities for 5G-only solutions, especially in stability-critical areas. Like other funds, Ericsson's and Qualcomm's CVC activities prioritise AI and ongoing cloud investments. Financial considerations are prioritised over strategic ones and there are no corporate mandates to specifically focus on SNS.

4.4.4.6   Initiatives to provide more attractiveness for startups through alliances

There are many national initiatives to strengthen the SNS ecosystem, but they barely include a focus on SNS. Probably more interesting are alliances of peers designed to focus on start-ups, not necessarily just around SNS, such as *alaian*[49], *6G Finland*[70], *or FrameXG*[71].

Established in 2022, *alaian* is a follow-up to the Go Ignite initiative focusing on open innovation and, to a lesser extent, investment. Led by Telefonica, through its Wayra operations, *alaian* includes KPN, Orange, NOS and Telecom Italia as well as operators in Middle East.

Beyond networking at closed events focused on open innovation, telcos share their startup scouting efforts through individual databases and collective calls (two-three per year), with specific calls for 5G in 2023 or indirectly covered through xR. The alliance covers all areas of interest, not just SNS, with 100-150 new startups participating annually.

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[68] 5G Ventures, at : www.5gventures.gr/ and https://growthfund.gr/en/sector/technology-innovation/5g-ventures-phaistos/

[69] Nokia, "Nokia commits $400m to NGP Capital for investments in game-changing growth companies" press release, at: https://www.nokia.com/about-us/news/releases/2022/02/03/nokia-commits-400m-to-ngp-capital-for-investments-in-game-changing-growth-companies/

[70] 6G Finland website: https://6gfinland.fi/

[71] Frame XG, at: https://framexg.fr/

Representing 1.5 billion customers, the alliance is very attractive for startups. Top startups are collectively interviewed by all telcos and then engaged individually for potential contracts. Collective PoCs are under discussion but have not yet materialised. Telcos are willing to collaborate to avoid being the sole client for a startup. In a few cases, operators use *alaian* for co-investment with their CVC operations, as seen with Airalo. This is primarily done for core telco activities and is unlikely to interest startups in adjacent fields.

Figure 44 shows *alaian*'s calls from 2023.
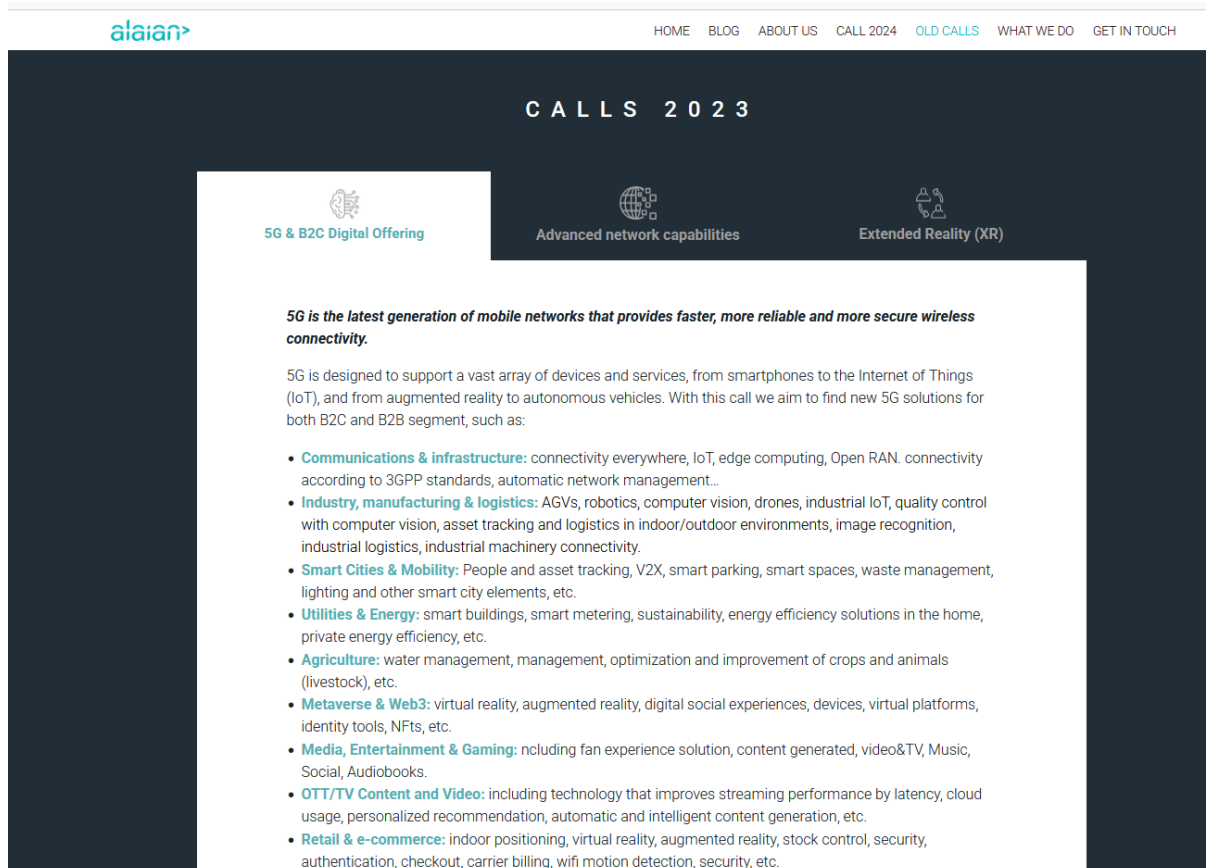
Figure 44: ALAIAN calls 2023

6G Finland is a coalition of Finnish 6G R&D organisations, mostly universities, to collaborate on 6G Research. Combined efforts will likely facilitate the creation of start-ups, even if the focus is so far more about knowledge/content.

FrameXG is a French telco consortium driven by Institut Mines Telecom (IMT) and Ouest Valorisation SATT. With an earmarked budget of EUR 12 million, it funds both early-stage and mature 5G projects. Its goal is to increase the presence of French and other European actors in patent filings, emphasising public-private partnerships and spin-off creation within the France 2030 framework and future networks acceleration strategy[72]. Supported by Orange, Nokia and Ericsson, the programme brings together 17 players in telecommunications R&D. It focuses on generating standardised telecommunications technologies, technology transfer and company creation in 5G/6G networks.

Regarding entrepreneurship, the programme supports spin-offs by providing resources, mentorship, and funding opportunities. FrameXG nurtures collaboration between academia, industry, and research institutions to develop 6G technologies and bridge the gap between research and commercialisation. It has strong ties with universities, working closely with nearly all (11 out of 13) technology transfer

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[72] French Ministry of Economy (2024), "France 2030: stratégie d'accélération 5G et futures technologies de réseaux de télécommunications", available at: www.entreprises.gouv.fr/priorites-et-actions/autonomie-strategique/soutenir-linnovation-dans-les-secteurs-strategiques-de-2

acceleration companies (SATTs[73]) dedicated to universities.

Ten projects have been funded to date. Two are related to standardisation and will result in patent transfers to hardware companies. The other eight projects received up to EUR 60,000 for pre-maturation or pre-seed stages[74],[75]. The funding includes mentoring, expert guidance, connections to experienced entrepreneurs, access to research infrastructures, and networking opportunities with startups, research institutions, and industry partners. In the subsequent maturation phase, projects aim to receive around EUR 300,000 to increase their TRLs.

FrameXG suggested collaborating with similar programmes in Europe and the UK and considering the launch of a European-level initiative. This would help to overcome the limited telecommunications market size.

4.4.5   Additional initiatives to support the promotion of entrepreneurship

The most urgent issue is to break the vicious circle currently affecting entrepreneurship in SNS. With no clear additional demand, investors have remained cautious in SNS investments, leading to limited startup initiatives, which partly explains that the market has not demonstrated its innovation potential.

As mentioned earlier, especially due to standardisation but also to infrastructure roll-out, time to market remains a challenge, especially compared to other technologies. Demonstrating value to attract both investors and to generate demand from vertical players, with strong leaders in many non-tech industries in Europe), remains a priority.

Many solutions were also proposed in the 2021 EIB report[28], especially for funding, but a discussion with EIB showed that most suggestions beyond large investments in infrastructure, have not been implemented.

4.4.5.1   Closer relationships between research and industry

The Tracey-Williamson report[3434] provides recommendations for better development of spin-offs. Many of these recommendations can be extrapolated to other contexts, particularly the SNS community.

The links between research and business need to be developed both ways. Among the main suggestions, the authors encourage the development of venture funds affiliated with universities. The success of UK-leading universities, such as Oxford and Cambridge, is meant to inspire smaller institutions, Figure 45.

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[73] *Sociétés d'Accélération du Transfert de Technologies*, available at: www.satt.fr/en/

[74] The pre-seed stage is the starting point of the entrepreneurial activity in which, once the business opportunity has been identified, the entrepreneur begins the search to give shape to the idea with which to develop the product or service

[75] Telefonica, "Phases of a startup: stages from pre-seed to exit", available at: www.telefonica.com/en/communication-room/blog/phases-of-startups/
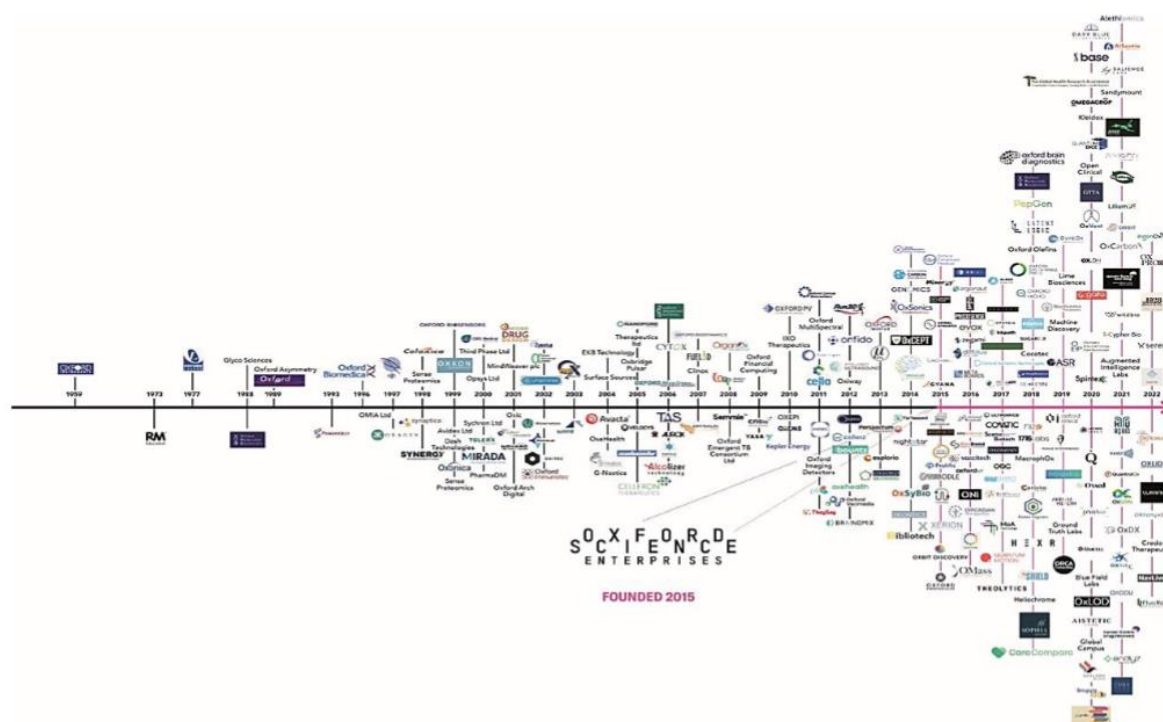
Figure 45: Number of spin-out companies of the University of Oxford before and after the founding of Oxford Science Enterprises[76]

This model has already been developed in other parts of the world like Japan. In France, IMT is looking at creating something similar with IMT Ventures Lab by late 2025. It has been noted by TU München, also offering such activity, that it may call for quicker exits than traditional VCs, as new investors may not want to invest with academia-centric funds.

As also emphasised by some consortium around open calls, expanding education of academia, and especially of PhD in areas like business and entrepreneurship would be a better framework for future developments, in addition to soft skills in general.

Finally, the **porosity between academia and industry could be reconsidered,** with a better access for academia to expertise tools from the industry and with easier possibilities for researchers venturing into startups to return later to academia[77]. In the latter case, due to the risks associated with both losing a position and the startup potentially failing, especially in the complex context of 5G/6G, some researchers do not wish to engage into entrepreneurship to focus on IP licensing.

CEA is encouraging researchers to initiate startups. Its MAGELLAN programme[78] allows researchers to get free time, from six to eight months, to develop a PoC and then an option for up to three years of unpaid leave to launch the startup, with the possibility to come back.

When organised in networks, universities can also leverage their geographical footprint to provide granular support. Acceleration support is quite widespread, but **university accelerators** like IMT in France **can leverage more assets, closer to researchers**, i.e., access to talent, in the form of internships for students or leveraging alumni with matching skills; small funding programmes to encourage researchers or small sponsorship to conferences (e.g., Vivatech) around technology identified in university labs.

The question of talent and qualified human resources is central. The alternative approach offered by

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[76] Dickinson, A., edited by Nixon, A., Venturing Out, the case for a new wave of university partner funds, p. 15, Research Note, available at: www.ukonward.com/wp-content/uploads/2024/08/Venturing-Out-Onward.pdf

[77] This is one of the five measures in the UK government final response, available at: https://assets.publishing.service.gov.uk/media/655e0bf7046ed400148b9e34/independent_review_of_university_spin-out_companies_government_response.pdf

[78] CEA, Magellan Programme, available at: www.cea.fr/Pages/innovation-industrie/soutien-creation-essaimage-start-up.aspx

CEA is the development of a **common lab** between a private company and the research institution, which corresponds somehow to outsourcing research to the CEA. Around two new labs are created following this model each year, some of them with startups like Spectronite or Sigfox. The CNRS has a model that supports the creation of 100 TRL3 start-ups per year for 20 years, with a 70% survival rate after 10 years. The CNRS interviewee was not aware of any start-ups related to the development of 5G or 6G.

The VIADUCT survey also emphasised the **interest in education related to entrepreneurship**, tailored to the specific needs of researchers, and networking with businesses, Figure 46.
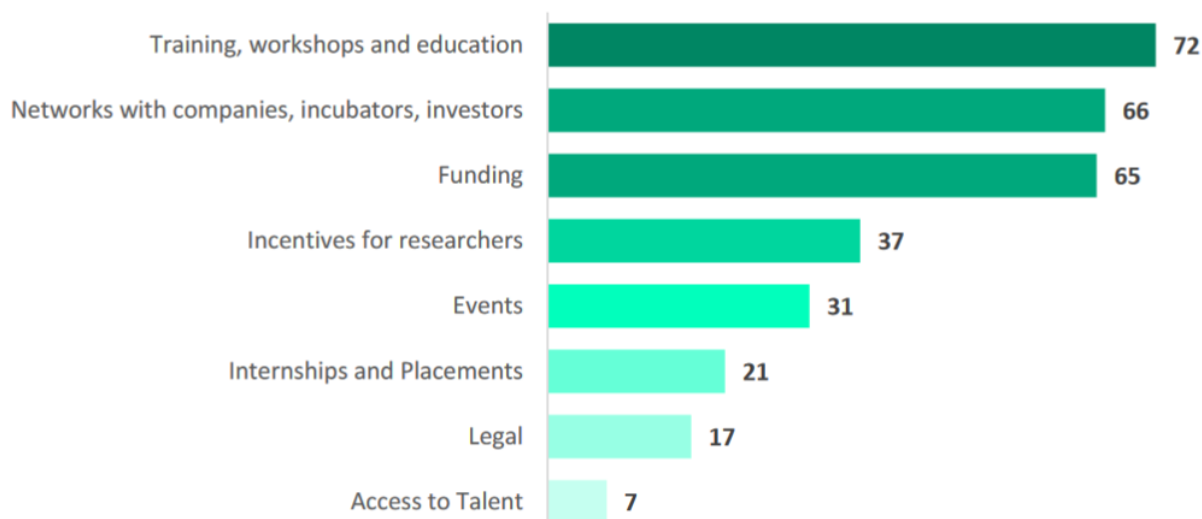
Figure 46: Suggestions of public tools and initiatives (number of replies by category)

It also underlined the importance of providing additional support to funding to gain practical experience, which could include placements, part-time involvement or mentorship. Strategy, followed by sales and negotiations, leadership and team management, and finance are the areas in which surveyed participants expressed the greatest need for training, provided, directly from past entrepreneurs.

Setting incentives for researchers to start a business, including direct economic incentives and the option to allocate working time to spin-off activities are cited as the most significant motivating factors by researchers in the VIADUCT survey. Researchers would welcome special status that would allow them to balance their research activity with their work at the company. Numerous interviewees highlighted the cultural risk aversion compared to USA. This is **a** classical cultural issue, with different intensity depending on countries. For instance, Sweden stakeholders mentioned that this is not an issue for them.

Mentoring of SNS startups by large industrial players is also considered as a powerful approach. There are already some successful developments outside of SNS, as seen in Sweden for instance.

4.4.5.2   Tagging

To accelerate the promotion of entrepreneurship in SNS, **initiatives specifically targeting SNS startups should be developed.** Identifying a target group is essential to design and implement meaningful actions with a measurable impact. A first step would be to be able to tag SNS startups within and outside of EU projects. Only the SME status is available so far in CORDIS system and associated tools. Defining a few objective criteria could help to create a startup status. An additional spin-off status may also be created.

Business Finland already separates startups, defined as being five years old or less, from other SMEs. They get access to additional funding and support programmes. Startups represent 12% to 15% of organisations getting support from Business Finland. Startups (and SMEs) are also monitored in their different initiatives, including within SNS JU programmes by account managers.

4.4.5.3   Incentives for startups and projects

Considering the participation of startups as a metric could encourage their involvement in SNS. This could be done by extending or replicating the SNS JU criteria recommending that SMEs should

account for 20% of the available funding.

An additional target dedicated to startups could be considered, especially for late-stage sections of the work programme and/or through open calls. Involving more startups could come from either obligatory evaluation criteria, at least for projects involving demonstrators, or a system of bonus points. This is already being done by UK Research and Innovation (UKRI) and InnovateUK, the latter focusing on TRL 6 to 9.

While the previous measure is partly equivalent to a quota, **the incentives could also take the form of financial contributions**. In France and Finland, and likely in other countries, all participants in collaborative projects in national CFP get a bonus if SMEs (including startups) have a participation, as authorised by European rules. This is typically 10% to 15% bonus on top of funding of 25-60% depending on company size and status. The overall goal is to nurture ecosystems. In Finland, the ecosystem will typically get 2.5 times the amount allocated to Nokia in projects.

4.4.5.4   Better access to real-life information

Another approach to accelerate the development of SNS technologies and therefore startups is **to offer the opportunity to use SNS facilities,** without necessarily having funding associated, to ensure startups can test in real conditions. This has been already offered in large scale pilots, 5G PPP projects (i.e., 5G-VINNI, 5G-EVE, etc.), in pilots conducted within many national 5G programmes and even by some operators in their labs. The access needs to be more systematic, long-term and with fair administrative processes, enabling startups to interact with the ecosystem and to test/demonstrate their solutions to attract customers and investors.

Additional (marginal) initiatives are organised around open calls. For example, non-funded applicants of 5G-IANA (5G Intelligent Automotive Network Applications)[79] open calls could benefit from the project like a sandbox. None used this option due to difficulty to scale.

A testbed will be offered in Spring 2025 in Finland for 6G technologies. Moreover, UK launched the Federated Telecom Hubs 6G Research Partnership Funds[80], intended to showcase 6G trials and experiments. A Joint Open Infrastructure for Networks Research (JOINER)[81] is being developed to support collaborative experimentation and experimentation at scale across the Hubs' research ecosystem and beyond. The initiative was presented in January 2025 at the SNS JU, Figure 47and Figure 48[82].

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[79] 5G-IANA website, available at: https://www.5g-iana.eu/

[80] UKRI, Federated Telecoms Hub 6G Research Partnership Funds (THRPF), available at: www.federated-telecoms-hubs.org/

[81] University of Bristol, Smart Internet Lab, available at: https://www.bristol.ac.uk/research/groups/smart/

[82] UK Experimental Networks, at: https://smart-networks.europa.eu/wp-content/uploads/2025/01/6gia-webinar_dimitra.pdf p6
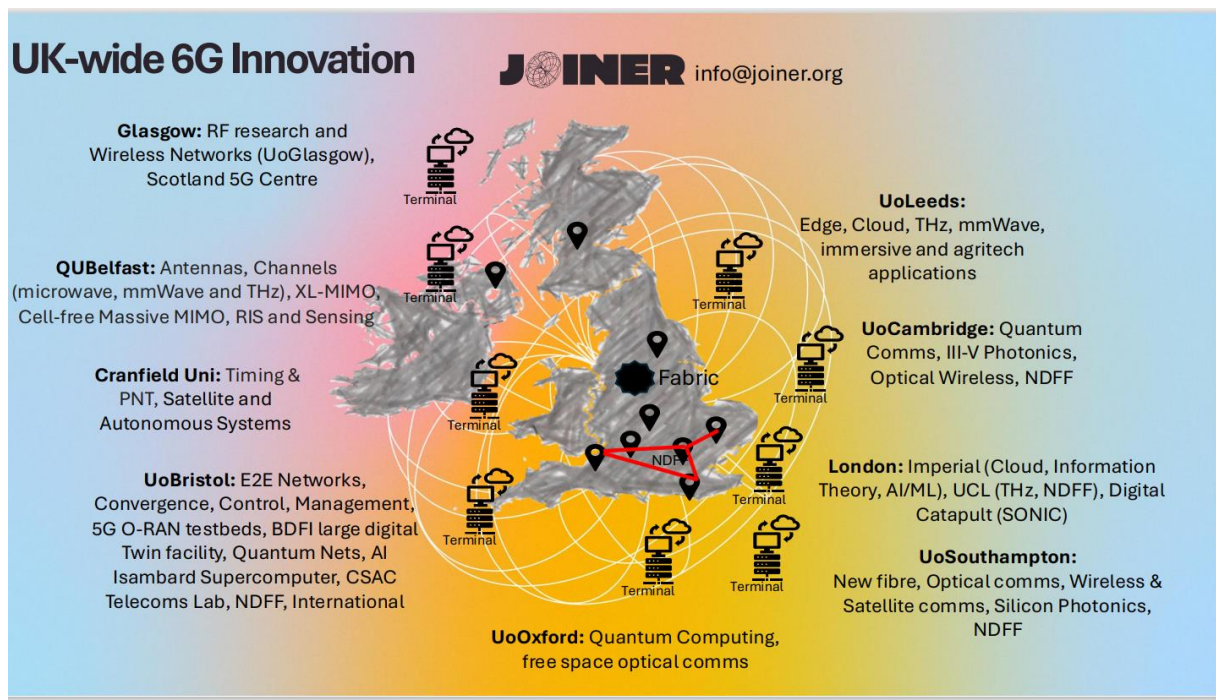
Figure 47: UK-wide 6G innovation

Figure 48: JOINER

Other UK programmes include UK Telecoms Lab (UKTL)[83], focused on telecoms security and resilience, and SONIC Labs[84], a joint programme between Digital Catapult and Ofcom to accelerate the introduction of open network products, starting with Open RAN, with some facilities to test indoor and outdoor.

This may **go beyond facilities or sandboxes with faster access to knowledge.** Driven by Nokia, Hexa-X-II created in late 2023 a "Get Involved" section on its webpage to encourage exchanges with SMEs. There were 10 to 20 requests through the page, mostly at the launch of the initiative.

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[83] National Physical Laboratory, UK Telecoms Lab, available at: www.npl.co.uk/uk-telecoms-lab

[84] SonicLabs website at: https://www.soniclabs.com/

Thanks to the support of EU funding, Telenor has developed the I-CORA platform[85] to enable experimentation for the whole ecosystem, including startups. The first results are expected by 2025. Telenor expressed the importance of opening up in understandable terms, i.e. non-technical non-telecom terms which are barely known by startups outside the telecom industry).

4.4.5.5   Better support from funding

For startups, especially early-stage ones, SNS JU projects are hard to join. However, there are other European programmes for young innovating companies. As mentioned earlier, such programmes already exist at the national level, in deep tech programmes but also in fully open/bottom-up ones. Special earmarking in these programmes could be considered for early stage, especially when close to technology release, while ecosystem projects remain the most attractive for startups in a second stage.

Existing funds at the EU level could also be used more intensively for SNS, with specific calls. This is the case of European Innovation Council (EIC) Accelerator[86], a programme quite similar to those at national level, which exists in two formats: Open to any field of technology and 2. Challenges in predefined areas. SNS startups can apply in the Open format, in which any field of technology is considered, but most are not eligible for Challenges[87], which is limited to areas in which 5G is not core focus, e.g., sustainable mobility. Other EIC programmes like Pathfinder[88] may be of interest.

Part of the funding provided through other programmes such as Digital Europe Programme (DEP) could also be redirected towards SNS. Currently, it focuses on supercomputing, cybersecurity and AI, with a smaller focus on digital skills and usage, covering partly SNS among other technologies through the Digital Innovation Hubs (DIHs).

Specific funding efforts have also been developed in Europe in the form of **fund of funds,** for instance, with the AI and Blockchain Technology Funds[89] providing access to finance, including equity, to innovative companies in these domains[90]. The European Fund for Strategic Investments (EFSI), InvestEU, and the European Investment Fund are the main funding stakeholders involved. The fund is adding an additional private VC investment with an average leverage effect of 4-5. In l2020, the first six AI and Blockchain Technology Funds, backed by InnovFin, had raised a total of EUR 700 million, of which EUR100 million were EU funds. This could serve as a model for SNS. Funds combining EU funds, national public funds and/or European private funds, especially from CVC, could also be considered.

4.4.5.6   European Research Council (ERC) grants

ERC[91] grants to highly qualified researchers in the EU amount to a few million per researcher to develop their project. Researchers like the flexibility of this mechanism, which helps them to become part of an ecosystem often beyond academia. According to statistics, the average grant is EUR 2 million per researcher, which can be redistributed to their team. More than 6,700 research projects have already been funded, with a total value of EUR 13.3 billion[92].

One interviewee suggested to either extend ERC grants or to create a similar instrument to foster the creation of startups. This would entail a strict selection process and the provision of diverse business-

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[85] emblasoft, "i-CORA – leading the way in developing and testing 5G SA services and uses cases in Europe, 14 December 2023", available at: https://emblasoft.com/blog/i-cora-leading-the-way-in-developing-and-testing-5g-sa-services-and-uses-cases-in-europe

[86] EIC Accelerator, available at: https://eic.ec.europa.eu/eic-funding-opportunities/eic-accelerator_en

[87] EIC, Work Programme 2025, available at: http://eic.ec.europa.eu/document/download/5e1eb75f-e437-477f-9ee9-ef54ff6387fd_en?filename=EIC%20Work%20Programme%202025.pdf

[88] EIC Pathfinder, available at: https://eic.ec.europa.eu/eic-funding-opportunities/eic-pathfinder_en

[89] EC, First six Artificial Intelligence and Blockchain Technology funds backed by InnovFin raise a total of EUR 700m, available at: https://ec.europa.eu/commission/presscorner/detail/it/ip_20_1991

[90] Similar initiatives also exist for Space and Blue Economy (marine/maritime)

[91] ERC grants, available at: https://erc.europa.eu/apply-grant

[92] ERC, Mapping ERC frontier research, available at: https://erc.europa.eu/projects-statistics/mapping-erc-frontier-research

related support actions.

4.4.6   Specific challenges faced by women entrepreneurs

The startup-focused initiatives, Women TechEU[93] and Orange's "*Femmes Entrepreneuses*"[94], were interviewed to discuss the entrepreneurship challenges specific to women. The major obstacles reported concerned availability issues, from maternity leave to childcare, discomfort in a predominantly male setting, and limited opportunities, including funding. Women TechEU reported that in the manufacturing sector, women seeking funding to start or grow a business are three times less likely to be offered funding than men.

The role of Women TechEU in supporting women entrepreneurship

Women TechEU aims to support women in deep tech to create startups. Part of Horizon Europe, it consists of four open calls over two years offering grants up to EUR 75,000 equity-free. It also provides a comprehensive 6-month support programme including mentoring, webinars, training in business development, investment readiness and pitch preparation, with backing from the EIC Women Leadership Programme[95]. **A total of 160 start-ups will be selected by the end of the programme**.

Starting in 2023, the first two calls have awarded 80 prizes. Among them, three are categorised under the section "Communications and Networks, including 5G/6G", but only one is related to the field of networks: Digital Signal Processing[96]. Many are evolving in the healthcare sector. Pilot editions were held in 2021 and 2022, resulting in the selection of 184 startups. Of those, only four are in areas related to networks, namely: quantum-based cybersecurity protocols, radar sensor systems, technology for audio transfer, and innovative nanostructured aluminium composite that could be used in 5G networks[97,98].

To promote its initiative, Women TechEU engages in communication activities and uses events and social media for outreach. They are well known in the women's community and have received very positive feedback. Yet, attracting women to technical fields such as 6G remains a challenge, as evidenced by the number of winners (startups selected) in network related fields. Strengthening links with WiTaR (Women in Telecommunications and Research)[99] could be a game changer.

Reinforcing the link between Women TechEU and WiTaR

The WiTaR initiative was established to promote gender diversity in the telecom sector. It evolved from an informal network known as "Women in HEXA-X" to a recognised WG within the 6G-IA. With over 112 members, WiTaR aims to increase female representation in telecommunications, particularly in leadership roles.

The WiTaR WG activities 2024 report[100] states that despite significant progress, **the ICT industry continues to face a remarkable gender gap, with women under-represented at all levels, from technical roles to leadership positions, making up less than 30% of the global workforce and less than 1 in 10 inventors.** Women researchers accounted for **less than 19% of the researchers in 53 5G PPP projects[101] and in the first SNS JU call, only one out of 33 project coordinators, was a woman**.

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[93] Women TechEU website: https://womentecheurope.eu/

[94] Orange initiative, "Femmes Entrepreneuses", focuses on scale-ups with no connection to 5G or 6G, at : www.orange.com/en/femmes-entrepreneuses

[95] EIC, Women in Leadership Programme, available at: https://eic.ec.europa.eu/eic-funding-opportunities/bas/eic-women-leadership-programme_en

[96] Women TechEU participants, available at : https://datahub.womentecheurope.eu/participants/

[97] EISMEA, Women TechEU 2022/2023 – Selected companies and organisations, available at: https://eismea.ec.europa.eu/system/files/2023-04/Women%20TechEU%202022%20companies_final.pdf

[98] EIC, Women TechEU pilot - Selected companies and organisations, available at: https://eic.ec.europa.eu/system/files/2022-02/Women%20TechEU%20Ranking%20List.pdf

[99] WiTAR: https://6g-ia.eu/witar/

[100] WiTaR WG activities 2024, available at: https://6g-ia.eu/wp-content/uploads/2025/01/witar-yearly-report-2024.pdf

[101] In "First Year Activities of WiTaR - Women in Telecommunications and Research"

These figures remain similar when looking into leadership positions within individual projects. For instance, in the lighthouse project HEXA-X-II, only one out of eight work packages (WPs) is led by a woman, The underrepresentation of women not only affects social equity, but reduces the economic and innovation potential of the sector.

To address these barriers, WiTaR initiated actions such as promoting female role models, organising skill-building workshops, and networking events. Implementing minimum quotas for women in 6G SNS projects, especially in WP leadership roles, through incentives could help women's empowerment, especially after their projects are over.

WiTaR could complement its actions by raising awareness among its members on how to start a business with the support of Women TechEU. This could lead to the creation of a continuum between WiTaR and Women TechEU that nurtures the creation of female led startups.

4.4.7 New opportunities ahead

Recent technical developments…

The Draghi report[27] presents a comprehensive set of proposals to enhance Europe's global competitiveness, with an emphasis on the telecommunications industry. It outlines general recommendations for the telecom market such as increasing private investment in digital networks; consolidating players and infrastructures; reforming EU's regulation and competition stance; harmonising EU-wide spectrum licensing, including satellite connectivity; and, extending licenses durations. Among the proposed technological advancements, the adoption of edge computing and the expansion of network capabilities to third-party developers and innovators through standardised APIs, constitute valuable strategic opportunities.

…lead to new opportunities for the emergence of start-ups in beyond 5G and 6G

These developments, combined with network softwarisation, could act as a catalyst for the emergence of new startups and spin-offs while supporting the development of the strategic sectors identified. Although this section does not explicitly focus on startups, it highlights these technological developments as essential to sustaining innovation and cooperation among EU players, as well as to strengthening the EU's competitiveness in advanced industrial manufacturing.

Whilst it is still too early to assess the future success of these recommendations, they are already being discussed and tested. For instance, telco APIs are being harmonised through the CAMARA open-source initiative[102] promoted by GSMA[103] operators such as Deutsche Telekom, Orange, Vodafone, Telefonica, Telenor, ATT, Verizon, and Microsoft, and hardware companies such as Nokia and Ericsson. Edge computing is also a topic being addressed in SNS JU projects such as Verge, Elastic, Dedicat-6G, Deterministic6G, or HEXA-X-II.

The initiative regarding telco APIs was highlighted by several interviewees as very promising. The solution may come from partnerships and greater integration with the strategic verticals. This proposal is in line with one of the recommendations of the McKinsey study published in December 2024 [104], which advocates for developing strategic partnerships with ecosystem players (suppliers, systems integrators, enterprise developers) to create innovative offerings, particularly around network APIs.

The total value of the network APIs market is estimated by STL to USD 22 billion in 2028 and USD 34 billion in 2030 at a Compound Annual Growth Rate (CAGR) of 34%, as shown in Figure 49.

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[102] CAMARA, APIs enabling seamless access to Telco network capabilities, available at: https://camaraproject.org/

[103] GSMA, GSMA Open Gateway API Descriptions, available at: https://www.gsma.com/solutions-and-impact/gsma-open-gateway/gsma-open-gateway-api-descriptions/

[104] McKinsey & Company, The future of telcos: Mapping the routes to renewed success, 18 December 2024, available at: https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-future-of-telcos-mapping-the-routes-to-renewed-success#/

Mobile network API revenue opportunity, 2022-2028, worldwide
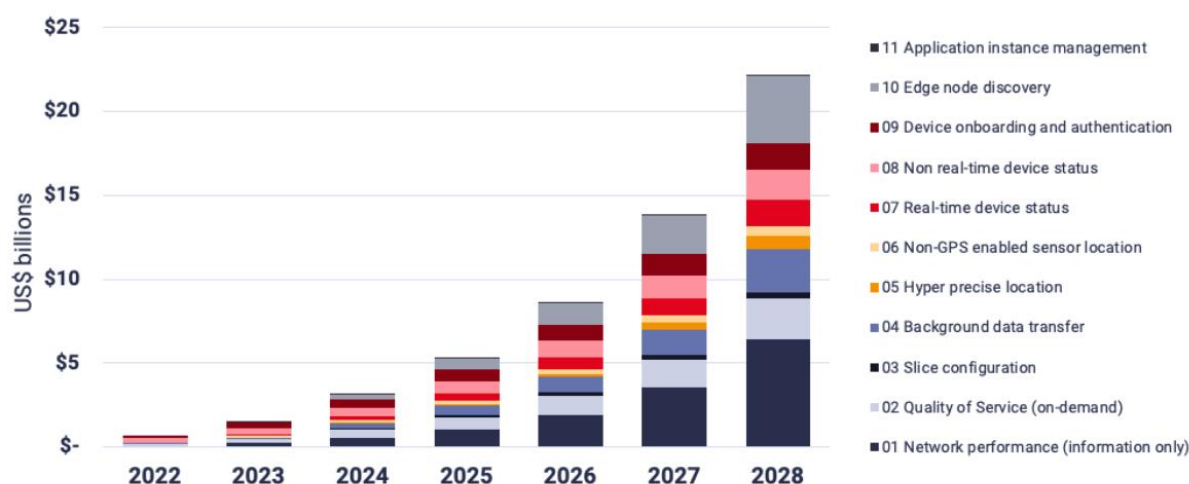
Source: STL Partners, TELUS

Figure 49: Mobile network API revenue opportunity, 2022-2028, worldwide

Nonetheless, these figures should be treated with caution, as mentioned at the Orange Open Tech roundtable "From Telco to Techco: Transforming Networks Through APIs"[105] in November 2024. To reach this objective, STL notes that start-ups and scale-ups will require a better understanding of network APIs and their capabilities[106].

This momentum is being accompanied by initiatives such as a joint venture to aggregate and sell network APIs on a global scale to drive innovation in digital services, launched by a group of world-leading telecom operators in September 2024[107]. A developer platform will accelerate the monetisation of this new activity. Although it is still too early to assess the success of this enterprise, the convergence of edge computing, open-source, network APIs, softwarisation, and AI opens up new opportunities for start-ups to emerge or scale-up.

Examples related to this nascent market can be seen on the Deutsch Telekom Network APIs for Developers[108] or on the Orange Network APIs developer portal[109]. This last initiative was accompanied by a network APIs hackathon in November 2024 where 12 teams submitted their projects to imagine how network APIs can enable their use cases. Among the three finalists were two start-ups: Certificall founded in 2022 and Petnow, a South Korean startup founded in 2018.

Telco APIs will serve a variety of use cases across verticals, encompassing different areas such as messaging, network slicing, network statistics, fraud protection, payments, geolocation, real-time device monitoring, remote patient monitoring, real-time tracking, energy auditing, traffic prioritisation, or people density. These APIs can be applied to individuals, but also to devices, vehicles, and industrial machines. To maximise their potential, Telco APIs must be offered as-a-service with pay-as-you-go billing models, providing sufficient granularity to meet diverse customer needs. For telecom operators,

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[105] Orange Open Tech Roundtable, From Telco to Techco: Transforming Networks Through APIs, available at: www.youtube.com/watch?v=58eFLT1sgKU

[106] STL Partners Webinar, Capturing the $34 billion market: how can telcos drive developer adoption of network APIs?, 26 September 2024, available at: https://stlpartners.com/wp-content/documents/Webinars/2024-09-26%20STL%20%26%20Red%20Hat%20September%20network%20API%20full%20webinar%20deck%20v2.pdf

[107] Deustche Telekom, Global telecom leaders join forces to redefine the industry with network APIs, 9 December 2024, available at: www.telekom.com/en/media/media-information/archive/global-telecom-leaders-join-forces-to-redefine-the-industry-with-network-apis-1077720

[108] Deutsch Telekom Network APIs for Developers, at: https://developer.telekom.com/en/products

[109] Orange Network APIs developer portal at: https://developer.orange.com/products/network-apis/

this represents a shift toward a service-oriented business model that could attract startups and foster innovation. To facilitate their development, a comprehensive approach integrating technical, business, and financial support—including VC funding—will be essential. A strong vertical strategy to assess market opportunities and identify early success stories could be the subject of future exploration.

4.5 Engagement with relevant SME initiatives

This section describes activities developed with SME initiatives in order to facilitate collaboration and business development in the Smart Connectivity domain. At the end, a catalogue encompassing Technology providers, Technology users (verticals), DIHs and other relevant organisations facilitating the development of innovation at local level was developed.

This activity has been conducted in closed relation with the NetworldEurope SME WG, 6G-IA SMEs and AIOTI SMEs.

4.5.1 Enterprise Europe Network

The Enterprise Europe Network (EEN)[110] helps businesses innovate and grow on an international scale. It is the world's largest support network for SMEs with international ambitions. The Network, active worldwide, brings together experts from member organisations that are renowned for their excellence in business support.

Digitalisation can bring several benefits to SMEs business, including higher efficiency and lower costs. EEN can guide SMEs on how to integrate digital technologies into business processes and on how to tailor digital solutions to business needs.

EEN can assess SME digitalisation needs through effective methodologies and ready-to-use tools. Based on this thorough assessment of the SME needs and challenges, EEN can provide tailored advice and help them find innovation partners, market-ready digital technologies and solutions, or market opportunities for digital solutions. EEN can also support SME in getting digitalisation projects funded through different available EU and national/regional funding programmes, schemes, and measures.

SCoDIHNet and EEN officialised its collaboration in a MoU, with the objective to share information and to facilitate collaborations at local level by members of the two organisations.

4.5.2 European Cluster Collaboration Platform (ECCP)

The ECCP[111]'s mission is to be the European online hub for cluster stakeholders (cluster organisations, policymakers and other related stakeholders from the cluster ecosystem) and the reference one-stop-shop for stakeholders in third countries aiming to set up partnerships with European counterparts.

SCoDIHNet is a member of this initiative, which objective is to develop cooperation with other related European clusters. Each cluster organisation encompasses a broad range of players in its ecosystem, including SMEs, to strengthen cooperation at regional and local level. The ECCP was also invited to the SME WG to present the different opportunities available to them, from matchmaking to training, if they were to join a cluster organisation.

4.5.3 Digital Innovation Hub Networks

There are several DIH networks. One encompasses the European Digital Innovation Hubs (EDIHs)[112] under the control of the Digital European Programme and the Digital Decade policy framework, while other networks oversee all type of DIHs, typically covering a specific vertical sector or technical domain.

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[110] EEN website: https://een.ec.europa.eu

[111] ECCP website: www.clustercollaboration.eu

[112] European Digital Innovation Hubs, available at: https://digital-strategy.ec.europa.eu/en/activities/edihs

4.5.3.1   EDIH network

Through the EDIH network, the Commission wants to build a vibrant community of hubs and other stakeholders fostering networking, co-operation, and knowledge transfer activities between EDIH, SME and mid-caps, the public sector and other relevant stakeholders and initiatives. The Digital Transformation Accelerator (DTA) is supporting the achievement of this goal managing the web presence of the network and hosting appropriate software platform and tools, including the online catalogue of EDIHs[113].

The EDIH network web portal includes tools to assess the performance of the EDIH network, gauging the impact that EDIHs have on the digital maturity of the organisations they support. The Joint Research Centre (JRC) of the European Commission has developed a Digital Maturity Assessment[114] tool which must be used by all EDIHs to measure the progress of Digital Maturity of their customers.

SCoDIHNet is an associated member of the EDIH network and is cooperating with the Smart Connectivity Thematic WG in order to align their activities.

4.5.3.2   Digital Maturity Assessment tool

The European Digital Innovation Hubs (EDIHs) launched a Digital Maturity Assessment (DMA) tool that will help SMEs to identify their company's digital maturity and indicate areas where improvements can be made.

Based on a questionnaire that checks digital maturity against a series of criteria, the tool covers six areas:

- Digital Business Strategy
- Digital Readiness
- Digital Skills and Empowerment
- Data Management
- Automation & Intelligence
- Green Digitalisation

This tool is a valuable resource for Smart Connectivity SMEs, enabling them to assist their customers in better understanding the steps required for digitalising their processes and operations. However, access to the tool is restricted to registered EDIHs. SCoDIHNet actively promotes the DMA tool (see section 4.5.4)

4.5.3.3   Thematic EDIH Working Groups

Since the beginning of the EDIH initiative, thematic working groups (TWG) have been created in order to coordinate activities in specific domains.

The DTA also provides supports and services to EDIHs in the development of these working groups. This needs to be considered to position the team support with the official EDIHs network coordinator. The objective of this initiative is to organise ourselves and coordinate our respective services to EDIHs with regards to the DTA offer.

The action plan to be discussed should be:

- Raison d'être
- Service offered to EDIHs
- Connection to related partnerships (JU, PPP, ETP)
- Thematic Group ToR
- Sustainability of Thematic WGs

The WG focus and address sectors such as Photonics, Robotics, Big Data, Smart connectivity, AI, Microelectronics, Smart Systems, Cybersecurity, HPC, Agriculture & Food and Manufacturing.

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[113] EDIH Catalogue, available at: https://european-digital-innovation-hubs.ec.europa.eu/edih-catalogue

[114] EC, Digital Maturity Assessment (DMA) tool, available at: https://european-digital-innovation-hubs.ec.europa.eu/dma-tool

SMEs can also become members of these different thematic working groups (TWG) and it is important to coordinate the service offering from this project, but it is also a way to facilitate cooperation to develop a service, since EDIHs need to involve several technologies.

Each Thematic working group must develop an action plan for each year, so it would be prudent for SNS OPS to ensure that one of these items on the action plan is linked to the project.

SCoDIHNet is an associated member of the EDIH network and is cooperating with the Smart Connectivity Thematic working group to align our activities.

ENTIRE (Ireland) are a Seal of Excellence EDIH and they are the chair of the TWG for Agrifood and keep the SNS OPS project updated on any advances in this working group.

4.5.4   Digital Innovation Hub - SCoDIHNet

SCoDIHNet is a DIH Thematic network focusing on Smart connectivity (5G/6G, IoT and edge computing), Supported by AITI and the 6G-IA, SCoDIHNet's objective is to support DIHs addressing these technologies, feeding DIHs with new technologies and collecting end user needs to feed the SNS JU research agenda

SCoDIHNet is offering a set of services to DIHs which are supported by 2 platforms:

- Collabwith, which facilitates cooperation between stakeholders and provides information on EU funding calls
- DIHIWare, which is a marketplace providing all catalogues developed by SCoDIHNet (Platforms, Technology providers, use cases, African DIHs, ...)

Each DIHs has set up a local ecosystem with SMEs, these SMEs could take advantage of SCoDIHNet to reach technology providers contributing to SNS JU projects.

4.5.4.1   Technology provider catalogue

One of the key catalogues developed by SCoDIHNet encompasses most of the technology providers belonging to European platforms such as NetworldEurope, 6G-IA, AIOTI, GAIA-X. It contains more than 600 organisations which are positioned on a map in order to facilitate cooperation at local/regional level with DIHs. With such catalogue, DIHs could easily find the most relevant local technology providers to develop innovative solutions for end users, Figure 50.
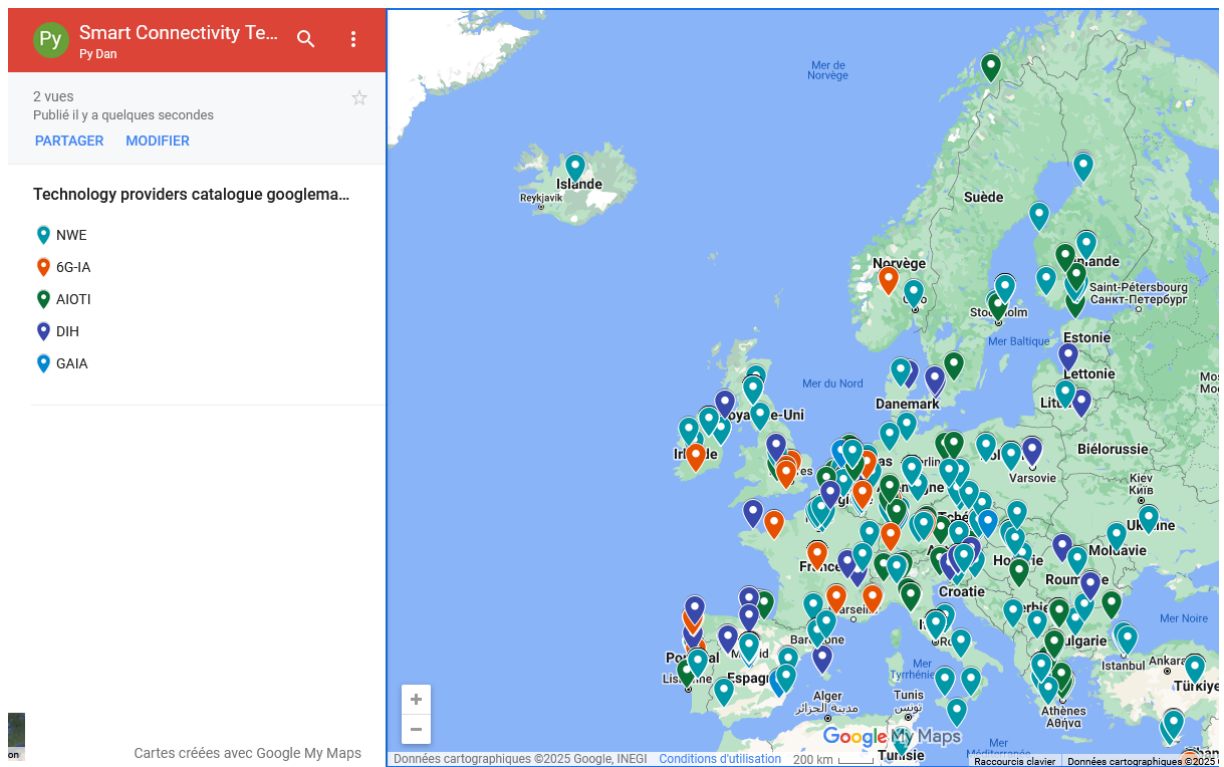
Figure 50: Smart Connectivity technology providers map

4.5.4.2   Technical platform and experimental facilities catalogue

This catalogue provides a useful list of technical platforms and experimental facilities that DIHs could use to develop innovative use cases using the most recent technologies. It gives the location of each of these platforms so DIHs could easily find the closest one able to provide the relevant service, Figure 51.
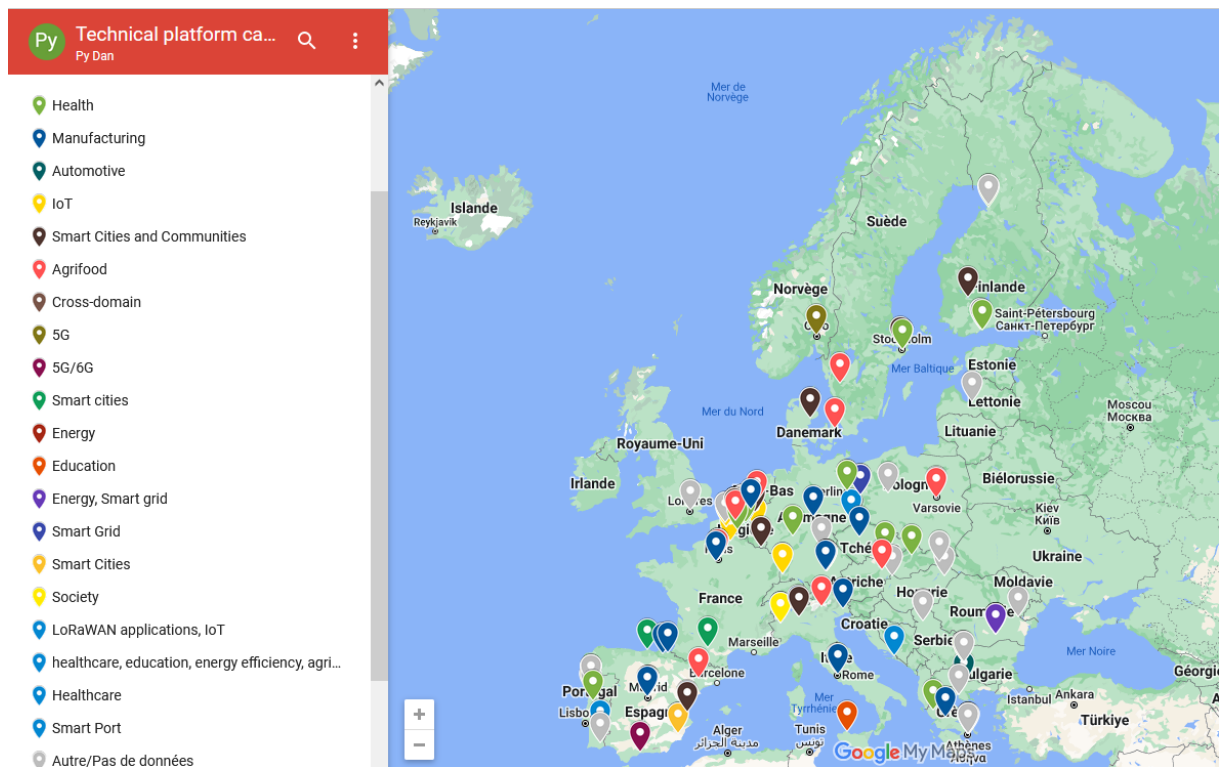
Figure 51: Technical platforms and experimental facilities map

This catalogue encompasses more than 140 platforms coming from:

- Commercial platforms used and implemented by DIHs

- 5G PPP experimental platforms

- SNS JU Stream C experimental platforms

- AIOTI Test beds

- CEF 5G for Smart Communities platforms

- CEF 5G Corridors platforms

- Testing European Facilities

These platforms are usually operated by academics, RTOs and SMEs, and represent an opportunity to develop cooperation between smart connectivity stakeholders at regional level.

5 Working Group coordination

This section documents the activities of SNS OPS in supporting the various WGs of the SNS JU, 6G-IA, and NetworldEurope. This reporting saw the finalisation of the transition from 5G PPP to SNS JU, with complete migration to the use of new electronic infrastructure supplied by SNS OPS and approval of revised Terms of Reference (ToR) of the WGs.

In addition to *documenting the activities of the SNS OPS project in supporting the WGs* of the SNS JU, 6G-IA and NetworldEurope, for which we are responsible, this deliverable *also documents the scope and key activities/achievements of each of the WGs* for the reporting period. However, it must be clarified that *this last task is outlined solely in the interest of the reader* – the SNS OPS project is only active in providing support to the WGs and it is not responsible for the activities and content of the outputs of the WGs.

5.1 Introduction to Working Groups

The WGs have the following ambitions:

- To mobilise the community on strategic issues for 6G and SNS

- To facilitate community discussions and document achieved outcomes in the form of white/position papers or other types of publications.

- To proactively work with the community to establish roadmaps for key 6G technologies

- To proactively work with the community to identify requirements for experimental facilities

- To consider horizontal issues identified by the 6G international initiatives, including the SNS JU projects

- To ensure standardisation issues for 6G networks are progressed within the SNS JU

Under the SNS JU, there are three categories of WGs, plus the NetworldEurope WGs:

- **6G-IA initiated WGs** are open to member organisations of 6G-IA, as well as to member organisations of projects participating in SNS JU on an ad hoc/invitation basis

  o The current 6G-IA initiated WGs are: 5G/6G for Connected and Automated Mobility (CAM); Open Smart Networks and Services; Pre-Standardization; Security; Spectrum; Trials; Vision and Societal Challenges; and Women in Telecommunications and Research (WiTaR).

  o Although not strictly a WG, SNS OPS also provides *infrastructure support* to the Verticals Engagement Task Force of the 6G-IA as if it were a WG. Assistance in *directly performing the activities* of the task force is supplied by the SNS ICE CSA project (e.g. running the Verticals Tracker). Since the outcomes of the groups are presented in this document as a service to the reader, not a claim of achievements by the SNS OPS project itself, a short report on the task force is included here.

- **SNS JU project initiated WGs** are proposed by SNS JU projects where a need is foreseen and are open to SNS JU projects.

  o The current SNS JU project initiated WGs are: 6G Architecture; Hardware Technologies; Test, Measurement, and KPIs Validation (TMV); and Reliable Software Networking.

  o The Hardware Technologies WG is a new WG proposed by the SNS JU projects, with no precedent under the 5G PPP. SNS OPS has supported its creation and will continue to supply ongoing support as the work commences.

- A third category of **"Strategic" WGs exists** within the SNS JU. These are determined by the SNS GB, in which the EC is also represented, enabling the EC to suggest the formation of WGs to work on aspects for which some coordination appears required or beneficial from their point

of view

- o These WGs are confidential and potentially of a sensitive nature, hence are not discussed further within this public deliverable

- **NetworldEurope WGs**. The previous good relations continue between 6G-IA/SNS JU and NetworldEurope, and SNS OPS offers support to NetworldEurope WGs, namely Enabling Technologies for Future Vertical Ecosystem Transformation; Expert group; Satcom; and SME.

5.2   General support provided to Working Groups

A number of general support actions have been offered to all WGs and provided to those who require them. Specific activities have also been required to support the transition from 5G PPP to SNS JU.

- **Communications infrastructure**

- **Document repository**

- **Publication Service.**

  During the reporting period, all WGs have been fully migrated to the new SNS JU electronic infrastructure. Additional infrastructure has been set up to support the new Hardware Technologies WG, and the renewed Spectrum WG.

- **Audio and Video conference/WebEx/webinar facilities**

- **Election/Voting Support**

  During the reporting period, SNS OPS has supported the election of officers for the new Hardware Technologies WG, as well as providing the facilitator for the re-launch of the Spectrum WG, as well as natural turnover of personnel (e.g. Pre-Standardization co-chair).

- **Organising and hosting Consultations (stakeholder, public etc.)**

- **Organising and hosting Workshops, Meetings and Webinars**

- **Collection, collation and distribution of regular activity/achievement updates and future plans** from the WGs to enable coordination between WGs and strategic oversight by the 6G-IA, SNS JU Steering Board and SNS JU Technology Board and, to a certain extent, with NetworldEurope

  The existing reporting procedure had been in place since the beginning of 5G PPP, initially run by the 5G-IA office before being transferred to the Euro-5G CSA project. It was agreed that the procedure was no longer optimal for the SNS JU, and SNS OPS and the SB chair developed a revised procedure which was put for consultation to the WG chairs and recipients/users of the reporting. Following revision after the consultation feedback, a new procedure was approved by the SB at the end of 2024. The first reporting under the new procedure was carried out in Q1 2025, receiving 100% response rate from the WG chairs.

- **Create and initiate a review of the WG Terms of Reference (ToRs).** The CSA projects are responsible for ensuring that the appropriate governing body reviews the ToRs of WGs regularly.

  During the reporting period, the revision and approval of WG ToRs to align with the transition from 5G PPP to SNS JU was completed. The exception to this is the renewed Spectrum WG, which has internally agreed objectives and temporary working methods, but will formally develop its ToR following the appointment of an ongoing WG chair.

- **Onboarding of new projects to WGs**

  SNS OPS has enabled the onboarding of SNS JU projects to the WGs, both through promoting the WGs to the projects and providing mechanisms for projects to indicate their interest and join the WGs.

In many WGs, SNS OPS supports document preparation and news announcements. In some cases, SNS

OPS organisations supply the chair for the group, as well as chairing several Sub-Groups/Task Forces/work streams within WGs. During the reporting period, representatives of SNS OPS member organisations acted as chair/vice-chair for the following WGs:

- 6G Architecture (chair)

- Pre-Standardization (vice-chair)

- Security (co-chair)

- SME (chair)

- Spectrum (Facilitator)

- Vision and Societal Challenges (vice-chair)

- Women in Telecommunications and Research (co-chair)

Although it is outside of the remit of SNS OPS to drive the content of work carried out within WGs, providing Chairs and other key personnel with WGs has been proven to be very beneficial in ensuring that the WGs are well directed along the roadmap of the SNS OPS, and are motived to contribute in a timely and constructive manner towards the overall goals.

This deliverable comes at the end of the SNS OPS project. The support for WGs will be taken over by the SNS CO-OP project. The organisation which has led this support since the 5G PPP will not be active in SNS CO-OP, and the organisation leading the activity within SNS CO-OP has not been present in the previous CSA projects. In order to ensure a smooth transition between the projects there have been meetings and email discussions between the respective partners and handover of various materials, best practices, suggested procedures etc. Where useful, this cooperation will continue beyond the formal handover of responsibilities.

5.3   Working Groups reporting

As described earlier, the role of the SNS OPS CSA project is to provide support to the WGs to enable them to carry out their activities in an efficient, productive and impactful manner. It does not directly contribute to the direction, content and outputs (barring the presentation of the outputs) of the WGs.

However, as a courtesy to the interested reader, this section provides an overview of the key activities and outputs of the WGs during the reporting period.

5.3.1   SNS Project WGs

SNS JU Project WGs are proposed by SNS JU projects where they see a benefit or need to collaborate on particular cross cutting topics. SNS JU project WG creation, and dissolution, is approved by the SNS JU Steering Board, to whom the WGs also report. Membership of the SNS JU project WGs is open to SNS JU projects, rather than individual organisations. During the reporting period, one new SNS JU project WG has been created, on the topic of Hardware Technologies. The SNS JU project WGs active during the reporting period were:

- 6G Architecture

- Hardware Technologies

- Reliable Software Networks

- Test, Measurement and KPIs Validation.

5.3.1.1   6G Architecture

Chair: Ömer Bulakci (Nokia)

Vice-Chair: Xi Li (NEC)

Introduction

The goal of the 6G Architecture WG is to serve as a common platform to facilitate the discussions among the SNS JU projects developing 6G architectural concepts and components and validating them, and to attain a consolidated European view on the overall 6G architecture design. The WG disseminates the results primarily via White Papers and international conferences/workshops, as well as bilateral/multilateral workshops with global stakeholders.

Objectives of the WG

The main objectives of the WG are to:

- Collect, analyse and consolidate information from relevant projects (SNS JU, other global projects and initiatives) on architecture research solutions and results (e.g. requirements for architecture in the 6G era and architecture solutions to meet those requirements)

- Liaise back the discussion findings to relevant SNS JU projects

- Facilitate consensus building on the 6G architecture, roadmap and migrations strategy

- Collaborate with other WGs on relevant subjects (e.g., Pre-Standardization WG to liaise with relevant architecture standardisation bodies like 3GPP RAN, 3GPP SA2, ITU-R, ETSI, and industry associations like NGMN, whenever relevant and agreed by both WGs)

- Issue white papers and arrange events, e.g., workshops and webinars, to disseminate the findings to attain a global footprint

Key activities and achievements

In order to address its key goal of attaining a consolidated European view on the overall 6G architecture design, the 6G Architecture WG works on a 2-year cycle of publishing a White Paper with the latest architecture, then letting projects study and use this architecture, and ultimately revising in accordance with the feedback and evolution of technologies and requirements.

Having published the previous Architecture White Paper in 2023 in February 2023, under the 5G PPP, the WG has spent 2024 developing and documenting the latest update of the architecture in response to experiences of 5G PPP and SNS JU projects. The first White Paper documenting an SNS JU 6G Architecture "Towards 6G Architecture: Key Concepts, Challenges, and Building Blocks" will be released for consultation towards the end of Q1 2025.

The WG has disseminated its work and architectural developments at a number of events, including:

- 9th Edition of the international WS on 5G/6G Architecture, successfully held at WCNC 2024

- 10th Edition of the international WS on 5G/6G Architecture, successfully held at GLOBECOM 2024

- The WG has contributed to the 6G-IA 6G vision White Paper as well as the associated webinar, where the WG has led and provided the chapter on the 6G Architecture vision

- EuCNC 2024
    - SB/TB Workshop "EU Collaborative Research & Innovation Focal Points in the SNS JU" → Presentation & Panel
    - Hexa-X-II Workshop "The 6G series workshop by Hexa-X-II" → Presentation & Session Chairing
    - Arch WG WS "Architectural Considerations Enabling the IMT 2030 Framework by European 6G R&D Activities" → Organising & Chairing & Panel

Operationally, the WG has updated its ToR and had these updates approved by the SB. It onboarded the Call 2 projects while collecting technical input from the Call 1 projects towards the updated architecture.

The WG has proposed a Special Session on 6G Architecture at EuCNC 2025, by which time the results of the consultation on the new architecture will have been received and assimilated. This is also part of a Workshop proposal for EuCNC, along with Hexa-X-II. The WG previously collaborated with Hexa-

X-II on a joint book "Towards Sustainable and Trustworthy 6G: Challenges, Enablers, and Architectural Design".

5.3.1.2 Hardware Technologies

Chair: Alexios Birbas (University of Patras)

Vice-Chair: Luis Manuel Pessoa (INESC TEC)

Introduction

The WG focuses on Hardware Technologies that are investigated within the activities of the SNS JU and comprises representatives from the selected Actions related with advanced physical layer technologies, funded under Streams A, B and C (e.g. "Communication Infrastructure Technologies and Devices", "Wireless Communication Technologies and Signal Processing" and "Microelectronics"). The Hardware Technologies WG (HT-WG) encompasses all interested projects that target research and innovation in the areas of systems, components, materials and chipsets, which are fundamental for the development of 6G networks. Among the goals is to set up joined actions, common events, and issuing position statements, such as White Papers.

The HT-WG has been setup in 2024. Its ToRs have been approved by the SNS-I Steering Board on 3 June 2024.

Objectives of the WG

- Objective 1: Collect, analyse and consolidate research findings from relevant projects (SNS JU, other global projects and national initiatives) on 6G hardware solutions, components, trends and results.

- Objective 2: Foster agreements and facilitate the consensus-building process on a roadmap that will enable massive adoption of hardware solutions for 6G by the telco industry.

- Objective 3: Collaborate with other SNS JU and 6G-IA WGs on relevant subjects, e.g., Architecture, Pre-Standardization and/or Trials WGs.

Key activities and achievements

- After the WG got formally approved, the preparatory actions were undertaken in the second half of 2024 for launching the actual WG activities.

- Election of the WG Chair and Vice-Chair: Following a Call for candidates, 2 candidatures have been received: The candidates have been confirmed for their positions by the WG members.

- SNS JU projects have been contacted to check for their interest to join the WG activities. 23 projects have expressed their interest to participate.

- A kick-off meeting has been prepared and was organised on 10 February 2025.

Plans for 2025

- The WG will create a full membership catalogue within March 2025 and is planning to hold monthly meetings with a specific prepared agenda for this purpose.

- A first action point was undertaken concerning the preparation of a Hardware Technologies related Worksop proposal which was submitted to the EuCNC 2025 Conference.

- A series of questionnaires will be forwarded to the participants which will enable the collection of a taxonomy of technologies, interests, expertise and targets of the participants individually and the WG as a whole.

- An effort will be undertaken in order to establish a permanent hardware-related technical session at the EuCNC conferences.

- The WG sets as a priority to establish connections and be aligned with the CHIPS JU projects and pilot lines. Participating organisations (which participate or relate to the CHIPS JU activities) will contribute to this effort.

During the kick-off meeting and taking into account that new architectures and technologies are being developed, which might be also essential for the future development of SNS and especially 6G communications (e.g. for improving the bandwidth and data transmission rate, while exhibiting lower latency and lower power consumption: (i.e. FDSOI CMOS, FinFET and GAA-style CMOS-GaN-InP devices, production beyond the 2 nm node, 3D-integration), a set of six detailed actions were proposed for further processing.

5.3.1.3   Reliable Software Network Working Group (SN WG)

Chair: David Artuñedo Guillén (Telefonica)

Vice-Chair: Dimitris Tsolkas (Fogus Innovations & Services P.C.)

Objectives

There are three objectives of the SN WG:

- Objective 1: Collect, analyse and consolidate research findings from relevant projects (SNS JU, other global projects and national initiatives) on software solutions, components, interfaces, layers, trends or results.

- Objective 2: Foster agreements, facilitate the consensus-building process on a roadmap that will enable massive adoption of software solutions for 6G by the telco industry.

- Objective 3: Collaborate with other SNS JU and 6G-IA WGs on relevant subjects, e.g., Architecture, Pre-Standardization and/or Security WGs.

Key activities and achievements

- SN WG participated in EUCNC 2024 (June 2024) - SNS JU SB/TB Workshop, Special Session: "AI-empowered Cloud Continuum for 6G: Challenges, Initiatives and Directions", Special Session on ETSI SDGs, and running a panel on Edge Computing Landscape.

- SN WG supported the organisation and participated in the SNS4SNS event from ETSI, in Nov12-14 2024 (many SNS JU projects presented their work there, highlighting the fact SN WG brings closer ETSI SDGs and SNS JU projects).

- The SN WG meets biweekly to discuss relevant open issues, address action points and agree on the way forward under the leadership of the appointed chairperson. The WG has run a total of 16 online meetings for SN WG coordination, where the majority of SNS JU CALL 1 projects presented their work. Silvia Almagia, Director of Software and Standards in ETSI, was invited to a meeting.

- SN WG released for TB/SB review the first White Paper coming out from an SNS JU WG (December 2024). The White Paper is entitled "**Network & Service Management Advancements – Key frameworks towards open Intelligent and reliable 6G networks**"[115].

- SN WG submitted a Workshop proposal to EuCNC 2025.

- Collaborations with other Working Groups during 2024 involved SN WG Chair and Vice Chair have contributed (being section editors) to the White Paper coordinated by the SNS JU TB on AI (to be published).

- SN WG members participating in SNS JU projects are leading 4 ETSI SDGs for OpenSlice, TeraflowSDN, OpenCAPIF and OSM producing Software (open source) that is helping many SNS JU projects to use standardised open solutions.

- SN WG interfaces with SNS JU SB and TB.

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[115] SMS SN WG (2024) "Network & Service Management Advancements – Key frameworks towards open Intelligent and reliable 6G networks" Whipe Paper, available at: https://ezywureyi7i.exactdn.com/wp-content/uploads/2025/03/softnet-whitepaper2024-v1.0_final.pdf.

Plans for 2025

- Run elections for Chair and Vice Chair to renew positions in 2025.

- Onboard projects from Call 3 of the SNS JU on the SN WG activities.

- Obtain structured contributions from Call 2/3 projects of the SNS JU.

- Strengthen collaboration with Architecture WG and potentially with 6G-IA WG OpenSNS for getting a better alignment.

- Brainstorming for another whitepaper has started in January 2025.

5.3.1.4   Test, Measurement and KPIs Validation WG (TMV WG)

Chair & Test Data Reusability sub-WG: Michael Dieudonne (Keysight)

Vice Chair and KVI sub-WG: Ioannis Patsouras (WINGS ICT)

KPI sub-WG Chair: Ioanna Mesogiti (COSMOTE Mobile Telecommunications S.A.)

Introduction

The Test, Measurement, and KPIs Validation (TMV) WG focuses on developing and sharing best practices for 6G testing, monitoring, and analytics. The TMV WG aims to promote common methodologies across projects, support 6G trial Use Cases (UCs), and ensure a unified European vision for the 6G network lifecycle. A key objective is the definition and validation of performance KPIs.

Objectives

The SNS JU TMV WG is one of the three SNS JU WGs – following up 5G PPP TMV WG activities. Its core objectives are the following:

- Focus on promoting commonalities across SNS JU projects that have strong interest in Testing & Monitoring (T&M) methodologies.

- Include the development of test and measurement methods, test cases, procedures as well as the KPI/KVI formalisation and validation to the greatest possible extent,

- Ensure a unique European vision on how the entire lifecycle of the 6G network, ranging from R&D to actual deployed environments, can be supported.

The TMV WG Topics under the ToRs include:

- KPI definition, KPI sources, collection procedures and analysis.

- Testing frameworks (requirements, environment, scenarios, expectations, limitation) and tools.

- Testing methodologies and procedures.

- KPI/KVI validation methodologies.

- Testing lifecycle (i.e., testing execution, monitoring, evaluation and reporting).

- Analysis of SNS trials results and generation of insights.

- Common information models for 6G Test and Measurement (6G T&M).

- Data reusability in SNS (standards for experimental data storage and labelling for EU projects to ensure data reuse, standards for experiment, methodology, data and result description).

- Electromagnetic fields (EMF) related topics (KPIs, methodologies, analysis and evaluation).

Key activities and achievements

- 6G KPI definition and monitoring and test data reusability in SNS was kicked off in March 2024.

- 6G KVI estimation was kicked off in April 2024.

- Analysis of SNS Trial results has started in the second half of 2024 as it relates to the testing

and demo phases of SNS JU projects.

- Worked on a White paper entitled "6G KPIs – Definitions and Target Values: a White Paper from the Test, Measurement, and KPIs Validation Working Group"[116], published in February 2025. Based on the input of 17 projects, this White Paper consolidates 6G KPIs from SNS JU projects, providing definitions, target values, and context to shape the 6G vision. Furthermore, the TMV WG promotes common collection procedures, validation methodologies, and analysis of KPI metrics. Various SNS JU projects provided the KPIs, which drive their technical developments.

- Three subgroups are currently active (KPI, KVI, test data reusability in SNS). Further planned subgroups - Analysis of trial results and EMF – have not started yet.

    o KPI Subgroup focuses on KPI definition, sources, collection procedures and analysis.

    o KVI Subgroup focuses on KVI estimation and how to measure it. There was some discussion about KVIs, e.g. who defines the KVIs, how this activity is linked to the Vision WG, etc. The TMV WG collects the definitions from projects but is not itself defining them. The topic might be forwarded into an ITU-R activity to adopt a KVI definition in standards, but ITU might not be interested in including a definition if it is not clear how to measure the respective KVIs. The measuring seems also very use-case-specific.

    o Test data reusability Subgroup seems to be converging towards leveraging the SLICES approach.

Plans for 2025

- KVIs have been collected by more than 10 projects (as reported in December 2024 so the number has probably risen). Ongoing discussion on how and when to publish a brochure or White Paper on KVIs. A publication is targeted for within 2025.

- Finishing the KVI survey and working on a White Paper on KVI validation and values.

- Data reusability: continue the investigation of the SLICES RI solution as a possible baseline for data storage and sharing for SNS JU.

- Future work within the TMV WG will put emphasis on further analysing, refining, specifying definitions especially for the new capabilities and contextual KPIs as well as on harmonising and contextualising the corresponding targets. Efforts will also focus on defining and cross validating relevant measurement methodologies for these KPIs.

5.3.2   6G-IA WGs

The Board of 6G-IA has the power to establish and close WGs. 6G-IA WGs are open to the Members of the Association and potentially to members of some running SNS JU projects by invitation.

The 6G-IA WGs active during the reporting period were:

- 5G/6G for Connected and Automated Mobility (5G for CAM)

- Open Smart Networks and Services

- Pre-standardisation

- Security

- Spectrum

- Trials

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[116] SNS TMV WG, "6G KPIs – Definitions and Target Values: a White Paper from the Test, Measurement, and KPIs Validation Working Group", February 2025, available at: https://ezywureyi7i.exactdn.com/wp-content/uploads/2025/03/white-paper-kpis_7_3_2025_with-disclaimer.pdf.

- Vision & Societal Challenges

- Women in Telecommunications and Research (WiTaR)

In addition to the above, the Verticals Engagement Task Force has also received infrastructure support from SNS OPS in a manner similar to the WGs, although strictly speaking, it is not one.

5.3.2.1   5G/6G for Connected and Automated Mobility (CAM)

Chairs: Jesús Alonso Zarate (i2Cat), Markus Dillinger (Huawei)

Introduction

The "5G/6G for CAM WG" was established as a means of supporting 5G/6G for CAM activities funded under EU Programmes covering both R&I and deployment activities in two work streams under one chair until the end of 2023. The Deployment Group was transferred to SNS JU whereas the R&I group remains under 6G-IA since beginning of 2024. The goal of the R&I stream is to establish a knowledge base and facilitate the exchange of information on ongoing R&I activities in the field. Relevant findings should be disseminated e.g. in the form of White Papers.

Key activities and achievements

In 2024, the WG has had regular bi-weekly meetings along the year, except for the summer period, when only a monthly meeting was held. The meetings account with an average of 10-20 attendees regularly, including participation from both representatives from the 6G-IA Board and the European Commission. During these meetings, several outgoing 5G PPP projects presented their results and insights gained from their work over the previous years with regards to the application of 5G in CAM services and stressed the remaining challenges that should be addressed by the incoming SNS JU projects addressing CAM services.

Similarly, SNS JU projects addressing CAM use cases and scenarios had the opportunity to present their approach and envisioned roadmap towards the evaluation of beyond 5G and 6G technologies when applied to the CAM domain. Several invited speakers, such as from the CCAM association or the 5GAA, were also invited to the meetings, to establish collaborations and to ensure synchronisation between the SNS JU researchers and the CAM field experts.

The R&I group has organised many workshops and presentations for projects like 5G-Routes, 5G-Blueprint, 5GMED, 5Grail, 5G-IANA, Vital-5G, 5GMETA, Target-X to present key achievements and conclusion. The projects investigated how the integration, 5G NSA/SA, short range technologies, edge cloud and central cloud systems have successfully demonstrated to improve traffic efficiency and reduction of accident fatalities.

One of the key items that the WG worked on during 2024, was the update and publication of a new version of its previous White Paper (WP) entitled "From 5G to 6G Vision - A Connected and Automated Mobility (CAM) perspective, which was published in June 2022. WG members agreed that the initial structure of the paper should cover the latest advances and challenges on 5GA/6G (3GPP, IMT2030, 5GAA, 6G-IA), regulatory topics and latest H2020 project outcomes related to CAM services. The 6G roadmap of 3GPP has started mid 2024 with SA1 and this WP envisions key topics important for the upcoming 3GPP process. It should also outline the importance of mobility for society and how smart, digital technologies are essential for achieving efficient, secure, inclusive, green, and smart mobility solutions. Connectivity should be highlighted as a key component in the digitalisation of mobility, enabling the exchange of information among all elements involved in mobility to create a dual green and digital society.

The White Paper will address how the new technical components will improve or enable existing CAM use cases, and the outline was agreed as follows:

- Market trends and 5G data requirements for connected cars

- Status 6G in IMT2030/3GPP

- Status EU regulation for connected cars (SAE L4, Euro-NCAP, road connectivity)

- EU CAM research summary and conclusions

- Vision for 6G CAM (higher transportation sustainability, efficiency, safety, enabled by massive sensor sharing, network computation, communication and sensing, ADAS and V2X interworking)

All WG activities are currently on hold (since the end of 2024) due to the ongoing process to nominate new chair and vice-chairpersons for all 6G-IA WGs (according to their Terms of Reference), which are expected to conclude by March 2025. All activities will resume after March 2025, with the drafting and publication of the White Paper being treated as a priority.

5.3.2.2 Open Smart Networks and Services

Introduction

The Open SNS WG promotes and supports the evaluation, adoption, deployment, and evolution of open, disaggregated, intelligent and fully interoperable networks as a key technology for future mobile networks (5G/6G and beyond). For this, the WG is aiming to bridge the open initiatives in the industrial domain with the ongoing or planned R&D and standardisation work, bringing together subject matter experts from the academy (university, research institutes, etc.) and industry (operators, vendors, SMEs, verticals, etc.), aiming to accelerate the development of a EU wide open ecosystem of technologies that will include hardware equipment and software-defined, virtualised, and automated solutions.

Different open network domains will be considered as part of this WG, e.g., RAN, Transport Networks, NTN, where different members will have the capability to debate and interact on the specific topics that those domains may have.

The following whitepapers were published:

6G-IA: Open Networks and Services Whitepaper (May 2024)[117]

This whitepaper is a product of 6G-IA Open SNS WG. The main target audience for this White Paper are vendors, operators, and solution architects who want to use open platforms in their networks. The whitepaper investigates the opportunities of open ICT platforms as an enabler for next generation disaggregated network deployment, provisioning and operation. For this purpose, it provides an overview of most prominent open ICT platforms that support implementation of open networks such as ONAP, Openstack, and Kubernetes as well as a taxonomy and classifications of their openness, features, and complexity. One key finding is that existing open platforms are becoming mature enough for mass adoption. Further, this document includes recommendations for vendors as well as operators to use open platforms to enable cross compatibility, energy conservation, resource efficiency, as well as application/data readiness of the network. Vendors and operators should also endorse and support open network initiatives enabling large scale adoption of open platform technologies.

6G-IA: Open RAN and 6G Future Networks Development Whitepaper (May 2024)[118]

The development of 6G networks represents an exciting opportunity to advance the capabilities of wireless communications. The design and deployment of these networks will require new approaches to network architecture that can efficiently accommodate the diverse needs of different deployment strategies and use cases in the future. Open (in the sense of opening new interfaces) and disaggregated network architectures promise flexibility in selecting and optimising network functions and services. This White Paper explores the potential benefits and challenges of such architectures in the context of radio access networks (RAN).

5.3.2.3 Pre-Standardization

Chairs: Riccardo Trivisonno (Huawei), Veronica Vuotto (Trust-IT Services)

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[117] 6G- IA, Open Networks and Services Whitepaper, December 2023, available at: https://6g-ia.eu/wp-content/uploads/2024/05/6g-ia-open-sns_open-networks-status-and-future-development_platforms-final.pdf

[118]6 G- IA, Open Networks and 6G Future Networks Development" March 2024, available at: https://6g-ia.eu/wp-content/uploads/2024/05/6g-ia-open-sns_open-networks-status-and-future-development_ran-final.pdf

Introduction

The main objectives of the Pre-Standardization WG focus on aligning with key standardisation and regulatory bodies, such as ETSI, 3GPP, IEEE, and ITU-R. The WG aims to identify these entities to ensure coherence and alignment in the standardisation process, particularly for the emerging 6G technology. To this end, the group is tasked with developing a comprehensive roadmap that addresses relevant standardisation and regulatory topics specific to 6G. This involves evaluating existing international roadmaps and proposing a new, aligned roadmap tailored to the 6G framework.

Additionally, the Pre-Standardization WG plays a crucial role in influencing the pre-standardisation landscape of 6G, as well as related research and development efforts. This includes proposing topics for standardisation and impacting the timing of research and development work programmes, such as those under the European Commission's Work Programmes (EC WPs). Through this strategic approach, the WG aims to ensure that European stakeholders maintain a leading position in the global standardisation process, which is vital given the fast-paced evolution of 6G technology.

Key activities and achievements

- The Pre-Standardization WG maintains the Standards Tracker, which collects and publishes information on:
    - SNS JU Standardisation
    - Relevant Telco Standards
    - Standardisation Updates

- The WG collects and analyses data on SNS JU projects' contributions to SDOs on a quarterly basis. During 2024, the WG recorded 140 SNS JU contributions to SDOs, primarily in 3GPP.

- The WG contributed to the EUCNC&6G Summit 2024 Special Session "How to accelerate 6G research through global standards"

- The WG had specific liaison activities with:
    - ETSI ISAC ISG – Integrated Sensing and Communication - Invited presentation by ETSI ISG Chair, A. Mourad (Interdigital)
    - ITU-T AINN - AI Native for Telecommunication Networks - Invited presentation by ITU-T FG Chair, B. Bilgin (Turkcell)
    - IEEE CSCN - Special Session "Enablers for ISAC in industrial environments", TIMES, TERRAMETA, 6G-SHINE

- The WG also contributed the 6G Vision White Paper chapter on Standardisation Landscape

Further information on the Pre-Standardization WG outcomes can be found in sections 3.2 and 3.3.

5.3.2.4 Security

Chairs: Pascal Bisson (Thales), Antonio Skarmeta (Univ. of Murcia)

Objectives of the WG

The purpose of the group is to foster the development of a 5G/6G Security Community made of 5G/6G security experts and practitioners who pro-actively discuss and share information to collectively progress and align on the field. This while:

1. Organising specific communications and events (e.g. Whitepapers, Workshops …)

2. Interacting with other SNS JU and IA WGs whenever Security input is needed

3. Developing liaison with other interested/interesting Security communities (e.g. ETPs, other PPP/JUs such Cyber Security/ECSO, …).

Overarching objectives are threefold:

1. Work in a coordinated manner on 5G/6G Security with a clear focus on areas of shared interest (e.g. 5G/6G Security architecture, 5G/6G threats and the solutions to tackle them, 5G/6G security automation …) fostering new concepts and paradigms (e.g. Software-defined Security, Security as a service) while taking advantage of recent advances in all relevant disciplines (e.g. AI).

2. Exchange ideas on the design of the security solutions (also relevant Standards and/or SDOs that apply) with the aim to get them agreed and made interoperable.

3. Work on validation and/or adoption of the security solutions (in terms of usage to date and/or to come).

Key activities and achievements

- Workshop preparation at FNWF2025, where a presentation of different SNS JU projects were involved within the Symposium on Security in future Networks

- Workshop in ARES ENS 2024: 7th International Workshop on Emerging Network Security

- White paper "Innovative Approaches for 6G Security"[119]

- Monthly meetings of the WG

- Presentation of all security projects

- Started liaison with ECSO for collaboration on roadmap definition of 5G/6G security aspects. Within WG6 of ECSO there has been discussion on Work programme 2026 / 2027 and possible related topics like synergies with Zero-trust enabler from 6G security and the continuum

- Contribution to WP discussions: participation in the RESEARCH PRIORITIES ON 6G SECURITY Workshop organised by the 6G-IA association in Brussels to discuss the future trends where some point where highlighted like

Plans for 2025

- The WG will continue with the monthly meetings to discuss the evolution of the projects and propose some interactions between them

- In that line, a proposal Workshop within the EuCNC 2025 Conference has been organised with several of the security related projects. Additionally, a conveyed session has been proposed with other stakeholders

- Another important activity will be to involve projects coming from the 3rd Call and have presentations from their expected work

- A second iteration over the White Paper on project enablers and security challenges is ongoing

- Increase the collaboration with other stakeholders related to security in 6G. In that sense a first meeting and presentation with 2 external stakeholder is scheduled:

    o ECSO Roberto Cascella to present their work on Security for 5G/6G

    o Hekma Chaari ESCS-FAU Erlangen Germany about 6G Security Initiative in Germany

- As of perspective of Gaps filling, here are items (non-exhaustive) to be considered:

    1. Integration of 5G Security toolbox and the certification in the lifecycle of 6G products

    2. Native security on component deployment

    3. Reconfiguration and self-healing of the network and reliable services

    4. Reaction to hybrid attacks at different layers and with different time constraint

    5. Multi-stakeholder and domain coordination with information shared schemes

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[119] 6G-IA, Security WG, (2025). Innovative Approaches for 6G Security: Challenges, Solutions, and Impact. Zenodo. https://doi.org/10.5281/zenodo.14619619

6. Cyber-awareness orchestration

7. Privacy deployment and enforcement over the multi-stakeholder E2E NS lifecycle.

5.3.2.5   Spectrum

Facilitator: Werner Mohr (6G-IA) [Note that as of late March 2025, Maria Teresa Aparicio Peña (Telefonica) has been announced as the ongoing Chair of the WG].

Introduction

Following a dormant period of the Spectrum WG, it was re-started by the 6G-IA in August 2024, with Werner Mohr as facilitator in order that the 6G-IA can input to the ongoing ITU processes on defining requirements and evaluation methodologies for IMT-2030 ("6G"). Dr Mohr previously led the 5G-IA IMT-2020 Evaluation WG.

Objectives of the WG

During discussions in the first meetings of the renewed WG, the priority objectives agreed on were:

- To assess the impact of ITU-R (IMT-2030) targets for R&I on system design and necessary bandwidth by considering data-hungry use cases and multi-operator scenarios for competition or single-operator only.

- To consider how these targets for research and innovation fit to available IMT spectrum, potentially additional spectrum according to WRC 2027 Agenda Item 1.7 (mid band), which KPIs can be supported with these bands, and how much additional frequency spectrum would be needed to support ITU-R targets for research and innovation?

- To help the 6G-IA Board to make decisions on whether and how to contribute to ITU-R discussions on the ITU-R Recommendation on "Technical Performance Requirements" by beginning of 2026 and which performance KPIs should be promoted

These priority objectives do not preclude the WG from also looking at topics such as THz and spectrum for Integrated Sensing and Communication.

Key activities and achievements

In October 2024 6G-IA received a "Liaison Statement to External Organisations: Minimum requirements related to technical performance for IMT-2030 radio interface(s)" with the opportunity to contribute to the definition of minimum requirements. RIT (Radio Interface Technology) candidates will be evaluated by ITU-R against such minimum requirements. The 6G-IA Board decided to prepare a contribution as response to this Liaison Statement for the WP5D meeting in February 2025.

The Spectrum WG collected input from SNS JU projects and 6G-IA members on their foreseen requirements and synthesised a draft common contribution on behalf of the 6G-IA. This was approved by the 6G-IA Board and submitted to the ITU-R WP5D meeting in February 2025.

Based on the outcome of that ITU-R meeting a second contribution is planned and decided by the 6G-IA Board on target values for the different minimum requirements for the ITU-R WP5D meeting in June/July 2025.

The Spectrum Working Group also collaborated with the TMV Working Group on the collection of material on considered frequency ranges for 6G and performance KPIs in SNS JU projects, where information from several SNS JU projects is incorporated. It is planned to continue a good collaboration between these two groups.

5.3.2.6   Trials

Chair: Carles Anton Haro (CTTC)

Stream Leaders:

- 5G Private Trials / Observatory, led by Didier Bourse (Nokia) and Carole Manero (IDATE).

- 5G and Towards 6G Verticals, led by Valerio Frascolla (Intel).

- 5G Trials Cities, led by Jyrki Huusko (VTT).

- 5G International Cooperation, led by Mir Ghoraishi (Gigasys Solutions).

- The Smart Connectivity Digital Innovation Hub Network - SCoDIHNet, led by Pierre-Yves Danet (6G-IA).

Introduction

The Trials WG was launched in September 2016 after the publication of the 5G Manifesto of the industry in Europe and in the context of the 5G Action Plan of the EU Commission. According to the 5G Manifesto, industry in Europe was expected to develop a European trial roadmap on technology trials and Pan-European trials with vertical sector use-cases. Consequently, the 5G Infrastructure Association (now the 6G Infrastructure Association) decided to launch this WG to provide a neutral place for such discussions to take place. Due to the broad nature of the objectives of this WG, its activities are organised in several Streams. Streams are created and removed, according to the activities that are required by the overall WG, but they are quite stable (usually six or more months of operations). Each Stream is chaired by a Champion who steers and coordinates its activities, convenes telcos and meetings, produces the contributions of his/her Stream to the yearly workplan and periodic activity reports, and acts as the editor of the documents produced. The Trials WG organises regular plenary online meetings on a quarterly basis. The Trials WG also organises face-to-face meetings when needed. The Streams also organise meetings as required. The Trials WG Leadership Team is meeting online on monthly basis.

Objectives

Through its concerted efforts, the Trials WG plays a pivotal role in accelerating the development and adoption of cutting-edge technologies in the 6G landscape.

The overall objectives of the Trials WG are as follows:

- To develop a 5G Advanced and 6G European Trial Roadmap and leverage on the knowledge gained for upcoming trial roadmaps for beyond 5G/6G systems to be addressed in the context of Smart Networks and Services (SNS) partnership in Horizon Europe.

- To facilitate the involvement of verticals in the Trials roadmap.

- To discuss and define business principles underpinning the economic viability of trials.

- To consider and coordinate the activity on trials and verticals with other relevant initiatives at international level.

- To investigate and propose how to link trials to upcoming calls for project proposals to be addressed in SNS JU.

- To increase the visibility of the trials and pilots carried out by 6G SNS Initiative, with emphasis, but not only, in Stream C and D projects.

- To keep track and disseminate to the broadest possible audience the work on verticals done by SNS JU- and other EU-funded projects.

- To support the development of European strategic research and innovation agenda and liaise preparation of SNS Work Programmes in relation to trials and experimentations.

- To facilitate transfer of the developed and experimented solutions to the market using the Digital Innovation Hub (Digital Europe Programme (DEP)).

Key activities and achievements

The main activities in the different WG Streams are listed below:

Private Trials / Observatory Stream

By leveraging insights gathered from the trials and engaging in knowledge-sharing activities, such as workshops, webinars, and key case studies (with the selection of 4 sets of Top 10 key T&Ps in the different brochures), the Stream aims to enhance the understanding of 5G technology's capabilities and potential applications in private settings. Through its efforts, the Stream seeks to accelerate the adoption

of 5G technology in private sectors, drive innovation, and promote the development of use-cases tailored to the specific needs of private enterprises and industries:

- Up-date/grade the clever/valuable interface between the 5G Private Trials Stream and the EU 5G Observatory and define the actions that could be developed in the Stream to complement the contractual actions developed in the 5G Observatory (e.g., potential contribution to the definition of the deployment new KPIs, bearing in mind current KPIs deficiencies to monitor network development, QoS, user experience).

- Synchronise with 5G Observatory colleagues on the forecasted/contractual development of the 5G Observatory.

- Provide feedback and potential up-dates/grades and/or recommendations towards 5G Observatory colleagues on e.g., 5G and 6G Verticals Trials & Pilots and forthcoming 5G/6G Verticals deployment, private Trials & Pilots, PPP Trials & Pilots Brochures and/or 5G Observatory Quarterly Reports.

- Monitor/contribute to/participate in activities or annual events organised by the 5G Observatory.

5G and towards 6G Verticals Stream

The 5G and Towards 6G Verticals Stream plays a pivotal role within the Trials WG, focusing on exploring and advancing the integration of 5G and future 6G technologies across various vertical industries. Recognising the transformative potential of 5G and its evolution towards 6G, this Stream collaborates closely with vertical sectors such as healthcare, automotive, manufacturing, and smart cities to identify use cases, requirements, and challenges unique to each industry:

- Strengthen synergies with the other Streams of this WG, with forthcoming WGs of 6G-IA / SNS and other relevant activities, e.g., the Vertical TF, to avoid overlaps and maximise joint impact.

- Establish periodic alignments and devise common plans with WGs/Associations outside of 6G-IA, e.g., NetworldEurope, AIOTI, BDVA/DAIRO, Trans-Continuum Initiatives, etc., dealing with vertical domains-related topics.

- Contribute to all dissemination activities (White Paper, workshops, special session, panels, brochures, etc.) to international venues to increase the visibility of the work of the Stream.

- Liaise with the SNS JU CSAs and their activities in what concerns 5G/6G verticals.

Trials Cities Stream

The Trials Cities Stream is a pivotal component of the Trials WG, focused on advancing the deployment and testing of 5G technologies within urban environments.

- Strengthen the liaison between 5G Trials WG/6G-IA and Smart City initiatives in Europe (including e.g., EUROCITIES).

- Align and synchronise with the "5G and towards 6G verticals" Stream especially on Smart City verticals.

- Increase the awareness and visibility of Smart City trials in Europe and provide an information exchange channel for Smart City related application use-case requirements and 6G-IA/5G PPP.

International Cooperation Stream

The International Cooperation Stream serves as a vital platform within the Trials WG, dedicated to fostering collaboration and knowledge exchange on 5G technologies at an international level:

- Align with 6G-IA on potential role of the International Cooperation Stream.

- Check with relevant international bodies, e.g., Beyond 5G Promotion Consortium (Japan), IMT2030 (China), 5G Forum (Korea), 5G Americas (USA) and TSDSI (India), on interest for collaborative activities.

- Identify the interests of European players in the International Stream and their willingness to be active in it.

- Encourage the engagement of SNS JU Stream C and D projects in the International Stream activities.

- Organise dissemination activities to exchange views, success stories, best practices in the execution of T&P, benefits/values of test-focused international collaboration with participation of stakeholders/bodies from other regions in the world.

- Liaise with the SNS-ICE CSA and their activities in what concerns international Trials & Pilots.

SCoDIHNet Stream

The Smart Connectivity Digital Innovation Hub Stream has the objective to support the Digital Innovation Hubs (DIH) that have an expertise in the Smart Connectivity domain (5G/5G, IoT, Security). The DIHs have the objective to facilitate the digitalisation of the European Industry, they are supported by the Digital Europe Programme (DEP) and the Member States (/Regions). Specifically, the goals of this Stream are as follows:

- Facilitate the transfer of SNS use case/solutions from Trials and Pilots to the market via the DIHs.

- Liaise the WG with the Digital Europe Programme.

- Feed the SNS SRIA with end user requirements coming from DIHs.

- Synchronise with the Digital Transformation Accelerator.

- Cooperate with the 5G4Smart Community projects to share with DIHs the access to the 5G infrastructures.

- Facilitate collaborations with other DIH Thematic networks.

- Foster cooperation among DIHs.

- Cooperate with Enterprise Europe Network and Europe Startup Nation Alliance in what concerns the activities of the Trials WG.

- Support DIHs in their day-to-day operational work.

Some of the key achievements of the Trials WG in 2024 are listed below (not exhaustive list):

- Elaboration of the PPP Trials and Pilots (T&Ps) Summary Brochure[120] released in April 2024. The Summary Brochure leveraged the experience from the previous Brochures[121] and analysed/summarised the 322 T&Ps developed during the full PPP programme. The Brochure presents a high-level view of the achievements of the project portfolio, this including key figures such as the number of use-cases addressed per call or year, or their geographical distribution for the whole duration of the programme. The Brochure also includes a number of tables with the names of the T&Ps and use-cases, vertical sectors addressed, locations and dates. This information is fully synchronised with that in the PPP Verticals Cartography.

- Further interactions with the 5G Observatory team. 5G private trials are no more collected by the 5G Observatory. However, the team tracks private 5G networks all over Europe. The 5G Observatory team will be highly interested in the WG helping to track 6G trials. Interactions with 5G Observatory Team. By actively participating in such collaborative initiatives, the Trials WG plays a vital role in nurturing ongoing dialogue and cooperation, ultimately driving progress

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[120] 5G Infrastructure PPP Trials and Pilots Summary Brochure 2024, available at: https://5g-ppp.eu/5g-ppp-trials-and-pilots-summary-brochure-2024/

[121] Previous brochures are available for download here:

N°1: The 5G PPP Infrastructure -Trials and Pilots Brochure is out! ‹ 5G-PPP

N°2: The 5G PPP Infrastructure -Trials and Pilots Brochure N°2 is out ‹ 5G-PPP

N°3: The 5G PPP Infrastructure Trials and Pilots brochure #3 is out ‹ 5G-PPP

N°4: The 5G PPP Infrastructure Trials and Pilots brochure #4 is out ‹ 5G-PPP

and innovation in the field of telecommunications.

- Contribution to the organisation of one specific Trials Workshop[122] during EuCNC & 6G Summit 2024 in Antwerp. This Workshop was very successful and attended by 30+ participants.

- Progress of the Collabwith and DIHWare platforms to support the services to the DIHs: Market place, catalogues, news, best practices.

- Development of the map of DIHs ecosystem stakeholders to facilitate cooperation at local/regional level.

- Further inclusion in the replicability catalogue of the use cases/solutions from 5G PPP and SNS JU projects.

5.3.2.7   Vision and Societal Challenges

Chair: Artur Hecker (Huawei)

Vice-Chair: Håkon Lønsethagen (Telenor)

SNSV SG Co-chairs: Artur Hecker (Huawei), Carlos J. Bernardos (Univ. Carlos III, Spain)

BVME SG Chair: Hanne-Stine Hallingby (Telenor)

SNVC SG Chair: Gustav Wikström (Ericsson), until May 2024

SNVC SG Co-chairs: Marja Matinmikko-Blue (Univ. Oulu), and Stefan Wunderer (Nokia), from May 2024

MSI SG Chair: Carles Antón-Haro (CTTC)

Introduction

The 6G-IA VSC WG develops a comprehensive scientific, technological and socio-economic vision, first for the 5G PPP, and now for the Smart Network and Services Joint Undertaking in general and for the upcoming next generation mobile system in particular. The VSC WG maintains a high-level technology roadmap, formulating a holistic view of the future networks, systems, and their typical environments. It engages the expert communities within the 6G-IA, in the running SNS JU research projects, and also from partner organisations like NetworldEurope, NESSI and AIOTI. In other words, in addition to the technology development as such, a particular accent of the work in the VSC WG lies on the socio-economic interactions between the actual technological system and its ecosystem.

Objectives of the WG

The main objectives are:

1. Develop a vision for Smart Networks and Services beyond 2030, covering both advanced research and societal challenges. This includes harmonisation of visions stemming from different sources and representing different points of view.

2. Stimulate the liaison with member state initiatives on 5G, 6G and on Smart Networks and Services.

3. Enable visions and validations of current, and, as far as possible, future technology (5G, 6G, etc.) value propositions, business models and ecosystems.

4. Stimulate discussion on value-driven research and value-related considerations for 6G, and channel a needs and value-based European view on 6G technologies for the 2030 timeframe, considering global challenges.

Sub-Groups and Main Activities

While the WG identifies relevant open research topics paving the way to the realisation of the formulated vision and service concepts, the WG also considers key performance indicators (KPIs) for the functional

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[122] EuCNC 2024, Workshop 9 "Trials, Pilots and Demos for Selected Verticals: the Experimental Way Forward towards 6G" , available at: www.eucnc.eu/2024/www.eucnc.eu/programme/workshops/workshop-9/index.html

and, whenever possible, extra-functional properties. It studies suitable economic models for all realisations and services, validate the latter as the technology matures over time and try to understand the value of the proposed system to the society as a whole. Moreover, the WG approaches further analyses on societal acceptance on the one hand and develop methodology for defining and assessing key values and key value indicators (KVIs) on the other, i.e. hypothesis and (social science based) estimation of the anticipated future value of the technology and services in use for specific sectors (verticals) and the society, considering relevant uncertainties for future potential evolutions.

Through its work the VSC WG directly contributes to the SNS JU work programmes for the different phases. To be aware of and to be able to handle potential overlaps with national research initiatives within the EU member states, we involve a network of rapporteurs and produce a yearly report on the relevant research activities in each member state (research, validation, platforms, trials).

The Vision WG main activities are organised into sub-groups. There are 4 Sub-groups, namely:

- **Smart networks and services vision sub-group (SNSV SG**) develops the technological vision of the future mobile communication system. It analyses new technologies, approaches and methods, promising for the 6G research at large. For this reason, SNSV often interacts with the expert community of the NetworldEurope ETP.

- **Business Validation, Models, and Ecosystem sub-group (BVME SG**) is working on business validation, modelling and economical aspects of the existing and future technologies; it studies and analyses impact of (new) technologies on the economic aspects within the current business ecosystem and vs., i.e. how economics can help technology, how changes in business would be beneficial, etc.

- **Societal Needs and Value Creation sub-group (SNVC SG)** looks for how 6G will be beneficial for all other players on the market, including the society at large. SNVC analyses societal acceptance on the one hand and develops key value indicators (KVIs), i.e. estimation of the value of the technology for the society, on the other.

- **MS Initiatives in 5G/6G sub-group (MSI SG) regularly** verifies which important aspects of 6G research are covered and to what extent (and how) within the research programmes and initiatives of the Member States. It produces yearly member state report.

The VSC WG Leader-team (WG chair, vice-chair, and chair / co-chairs of the SGs) managed and coordinated the activities at an overall level, and also managed the transition of chairs for the SVNC SG.

Key activities and achievements

To embrace a large diversity of views, the VSC WG has worked in close alignment with other SNS JU and 6G-IA WGs and other organisations, most notably with the large expert community of NetworldEurope ETP, both through direct exchanges and through contributions to common White Papers or the development and updates of an agreed SRIA.

Through the results and outcomes from its various subgroups (SGs), the VSC WG has shed light on the complex required interplay of technological, economic and societal developments.

The following specific activities and achievements were conducted and obtained in 2024:

- Organised & held **EUCNC'24 workshop on Sixtainability** (i.e., Sustainability of 6G).

- Published the **KVI framework** in the Journal of Telecommunications Policy.

- Published 6G R&I Activities in Europe at EUCNC'24.

- Presented a talk at 5G Techritory '24 on Opportunities for synergies between the SNS JU and National Initiatives on 6G.

- Published **6G-IA Vision White Paper v2.0**: "6G-IA Vision WG White Paper: European Vision for the 6G Network Ecosystem"[123], November 2024. Recording and slides available.

- Finished **SRIA 2024 contributions**. The SRIA 2024 "Tech Annex" is ready.

- The 6G-IA Sustainability WP: "6G-IA Vision WG White Paper: Sustainability of 6G: Ways to Reduce Energy Consumption"[124] was released in January 2025.

- The 6G-IA Vision WG: Business Validation, Models, and Ecosystem sub-group (BVME SG) published the White Paper: Emerging 5G and Beyond Ecosystem Business Models[125] in February 2025.

Plans for 2025

The VSC WG will assess the latest and ongoing work in all the SGs, including all the latest achievements by the WG. There will be a WG Chair handover process in March – April as well. Based on this an update of the workplan for 2025 will be made and shared at the earliest.

5.3.2.8   Women in Telecommunications and Research (WiTaR)

Chairs: Bahare Masood Khorsandi (Nokia) and Marie-Helene Hamon (Orange)

Introduction

The "Women in Telecommunications and Research (WiTaR)" Working Group (WG) focuses on promoting gender equality, inclusion and empowerment in the 6G Research & Innovation (R&I) community.

This WG was initiated as part of the European-funded flagship project Hexa-X in February 2021 and then was expanded for the participation of the whole 5G Infrastructure PPP community in June 2021. Due to high importance of this initiative and high willingness to join forces from various projects, in Autum 2023, WiTaR took a standalone identity and became a 6G-IA WG.

The key purpose of this WG is to step forward into closing gender gaps and increasing women participation in as many social fields as possible in the 6G R&I community. The road to close gender equality is still a very long one. According to the International Women's Day organisation report[126], with the current rate of progress, it will take until year 2158 to reach a full gender parity. This clearly captures the European industry and academia needs for a major change in relation to their policies that should be implemented in direction of closing the gender gap. By fostering a supportive and inclusive environment, WiTaR seeks to break down barriers and inspire the next generation of women leaders in telecommunications and research. Through its efforts, WiTaR aims to catalyse positive change and create a more equitable and diverse workforce in these vital sectors.

Objectives

The five main objectives of the WiTaR WG are the following ones:

- Become a "reference" point in the SNS JU Programme and develop awareness across the overall SNS JU Members/Community to ensure a gender-balanced approach in European R&I activities.

- Promote visibility of women and their achievements and encourage them in engagement in leadership positions.

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[123] 6G-IA, Vision WG, "6G-IA Vision WG White Paper: European Vision for the 6G Network Ecosystem", available at: https://6g-ia.eu/wp-content/uploads/2024/11/european-vision-for-the-6g-network-ecosystem.pdf

[124] 6G-IA, Vision WG, "Sustainability of 6G: Ways to Reduce Energy Consumption", available at: https://doi.org/10.5281/zenodo.13986789

[125] Hallingby, H. K., Frizzell, R., Mesogiti, I., Darzanos, G., Frascolla, V., Gavras, A., Lyberopoulos, G., Lønsethagen, H., Matinmikko-Blue, M., Mohnani, P., Parangoni, G., Petrache, A., Suciu, G., Suciu, V., & Theodoropoulou, E. (2025). Emerging 5G and Beyond Ecosystem Business Models. Zenodo. https://doi.org/10.5281/zenodo.14756405

[126] Available at: www.internationalwomensday.com/Theme

- Support role models for both soft and hard skills of junior researchers and students, in order to contribute to 6G-IA and SNS JU actions related to ICT Skills, ensuring that ICT missing Skills in EU also systematically address missing ICT women skills.

- Contribute to engage more women in 6G research in various technical topics in particular Sustainability – Societal work. This includes participation to panels, interviews, etc. as well as contributing to the definition of 6G use-cases ensuring the minimisation of bias and enriching the set of identified use-cases.

- Interact with SNS JU and 6G-IA members, analysis of potential gender reported issues and contribution to solving these issues.

Key activities and achievements

The activities of the SNS JU WiTaR WG started in Fall 2023 (following previous 5G Infrastructure PPP and SNS JU activities and achievements in the 5G Infrastructure PPP Hexa-X and SNS JU Hexa-X-II projects context) and further developed during 2024. The WG members meet on monthly basis, discuss relevant open issues, address action points and agree on the way forward under the leadership of the appointed chair and vice-chairperson. Among the different activities:

- The WG collects and spreads relevant information by questionnaires, information meetings, workshops, webinars…

- The WG organises informal online meetings with inhouse or invited speakers on the relevant topics with the target of awareness and education of its members.

- The WG also organises specific sessions, possibly with physical attendance, in events or conferences, to share information, collect feedback and stir discussion.

- The WG disseminates and promotes some of its key findings in the form of Newsletters, social media posts and campaign (LinkedIn) and online articles published in 6G-IA website.

Since the official WG start in Fall 2023, the key achievements are the following ones:

- Establishment of few sub-groups focused on various topics e.g., digital presents, member expansion, identification of main community issues, events and workshops…

- Development of the SNS JU WG and establishment of the WG digital presence, e.g., set up WiTaR webpage, social media presence in particular LinkedIn. Few WG Members are responsible to regularly publish up-dates based on the progress of the WG, informative news on various topics, celebrate achievements of the members.

- Expansion of the WG in terms of members. The main goal is to increase the members by 30% and expand to all projects and members in 6G-IA and SNS JU. In 2024, the WG attracted around 60 participants within a year, and the group count around 140 participants. The WiTaR LinkedIn group has 248 followers, as of March 13th.

- Identification of the main issues of the community by getting feedback directly or through some tailored questioners. Target is to set up workshop series (with invited speakers) on the highlighted topics.

- Organisation of dissemination events and series of workshops with goal of spread the awareness and educate on particular topics.

Specific achievements can be highlighted for 2024 and Q1 2025, including (not exhaustive list):

- International Women's Day (IWD) campaign: On 8th of March 2024 and 2025, WiTaR WG released its specific WiTaR postcard for the International Women Day[127], showing its support toward the theme of IWD: embracing equity. The WG has done this since its establishment. A postcard accompanied with a special session on 8 of March 2025 has also been released. This postcard has been disseminated throughout all WiTaR social channels as well as 6G-IA.

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[127] WiTaR: https://6g-ia.eu/witar/

- On 4th June 2024, WiTaR WG organised the 3rd Convened Session in EuCNC & 6G Summit 2024 in Antwerp[128]. This session was very successful and attended by 40+ participants. During the conference, WiTaR chair Bahare M. Khorsandi was interviewed to present WiTaR activities. Two other WiTaR members, Pooja Mohnani and Ishita Mishra, were also interviewed and underlined the importance of gender diversity. Videos of the interviews are available on EUCNC YouTube channel.

- Ada Lovelace Day campaign (October 8th, 2024): A campaign was conducted on LinkedIn from October 1st to October 8th, with a series of polls, with questions published on a daily basis, to engage followers, and publication of the results on Ada Lovelace Day on October 8th. The initiative was successful, enabling WiTaR to gain 50 new followers.

- Organisation of a joint WiTaR and Women In Telecommunication and Optical Networks (WeInTel) during the 24th International Conference on Transparent Optical Networks ICTON 2024 held in Bari (Italy), to highlight research initiatives from women engaged in optical communications and networks, including a panel session and a survey.

- Organisation of a special session "Bridging Gaps: Female Researchers in Mobile Radio Communications at Industry and Academia" during IEEE PIMRC 2024 conference, jointly organised by COST CA20120 INTERACT & IEEE ComSoC WICE & 6G-IA Women in Telecommunications and Research (WiTaR).

- Organisation of a joint event "Shifting the balance" with SNS ICE and Riga TechGirls at 5G Techritory 2024, on the 30 of October 2024.

- On 10th January 2025, WiTaR WG released its WiTaR 2024 Report of Activities, showcasing the impactful work the WG has undertaken to advance gender balance in the 6G-IA and SNS JU. This Report was widely disseminated thanks to the communication from 6G-IA Office to all 6G-IA Members, SB, TB, WGs and EC (https://6g-ia.eu/wp-content/uploads/2025/01/witar-yearly-report-2024.pdf).

- WiTaR pre-launched the "Lunch Salon" initiative in the last quarter 2024. It is a monthly platform to fostering dialogue and engagement on gender diversity and inclusion. This program invites volunteers from across projects to share their insights, experiences, and best practices on topics ranging from workplace challenges and success stories to strategies for creating inclusive environments. Each session will feature a presentation followed by interactive discussions, encouraging active participation and the exchange of ideas. In 2025, this initiative will be fully started.

It has to be noted that WiTaR WG will organise the 4th Convened Session during EuCNC & 6G Summit 2025 to be organised on 03-06.06.25 in Poznan.

5.3.2.9   Verticals Engagement Task Force

Chair: Raffaele de Peppe (TIM)

Introduction

The Vertical Engagement Task Force plays a strategic role in fostering collaboration between the SNS JU and key vertical sectors. Its mission is to enhance mutual understanding, ensure the alignment of R&I with vertical needs, and promote visibility and uptake of advanced connectivity technologies across industries. The task force operates through targeted outreach, structured mapping, strategic partnerships, and high-impact dissemination outputs.

Key activities and achievements

In 2024, the Task Force consolidated its strategic framework and laid the foundation for broader vertical uptake and alignment. A key achievement was the updated Vertical Cartography, which mapped vertical use cases across more Phase 1 projects, offering a clear visualisation of sectoral relevance in areas such

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[128] EuCNC & 6G Summit 2024, WiTaR: Women in Telecommunication and Research, available at: www.eucnc.eu/2024/www.eucnc.eu/programme/special-sessions/convened-session-1/index.html

as health, manufacturing, mobility, energy, and agriculture. This cartography remains a cornerstone of engagement efforts, now being further extended with Phase 2 project contributions and enriched metadata to better classify use case maturity and innovation potential.

The Partnership Tracker was significantly expanded, with over 25 vertical organisations now engaged in regular exchange with the SNS community. These collaborations form the basis for joint activities in 2025, including co-branded webinars, focused workshops, and new input mechanisms to better capture vertical priorities in future research calls.

A White Paper on Agriculture, developed with AIOTI, and the Vertical Trends Analysis Paper, released in early 2024, provided valuable insight into evolving sectoral requirements, sustainability concerns, and innovation gaps. Together, these publications set the analytical basis for 2025 work, particularly in connecting technical research with real-world sectoral trends.

Plans for 2025

Looking ahead, the Task Force is prioritising:

- New vertical cartographies including Phase 2 and emerging use cases
- Dedicated whitepapers in areas such as health, energy, and manufacturing
- Stronger involvement of vertical partners in flagship events and standardisation dialogues
- Refinement of the partnership strategy
- A new iteration of the Vertical Trends Report, capturing cross-sectoral signals and preparing the ground for input into SNS JU Phase 3

The Task Force continues to act as a key enabler for making vertical engagement a systematic and evidence-driven component of the SNS JU, with a view to long-term impact and real-world technology adoption.

5.3.3   NetworldEurope WGs

NetworldEurope is the European Technology Platform (ETP) for communication networks and services. Enabling the interaction between users, communication networks and services fulfils society's requirements for interconnection. As such, NetworldEurope gathers almost 1,000 players across the whole sector value chain: industry leaders, innovative SMEs, and leading academic institutions.

There are four WG linked to the ETP, namely:

- Enabling Technologies for Future Vertical Ecosystem Transformation, which explores the potential cooperation with any kinds of stakeholders, from any research, technology or industrial sector, from any geographical region
- Expert Advisory Group, which advises NetworldEurope from a scientific perspective and advocates for the interests of the research community
- SatCom, which focuses on satellite communication systems
- SME, which represents the interests of SMEs in the sector.

5.3.3.1   Enabling Technologies for Future Vertical Ecosystem Transformation

Chair: Maziar Nekovee (University of Sussex)

Vice-Chair: Xulei An (Huawei)

Introduction

The Enabling Technologies for Future Vertical Ecosystem Transformation WG provides a forum for NetworldEurope to engage with stakeholders from vertical sectors, i.e. to

- focus on roadmaps, future/long-term requirements, technology and research aspects rather than prototypes and products

- extend the discussion and engagement globally
- focus on technology enables disruptive business transformation aspects

The scope of the WG encompasses:

- Technology aspects
  - development of vision on enabling technologies and architecture
  - exchange/sharing of long-term roadmaps from the vertical domains versus the communication domain with the view also to evolution beyond 5G and 6G
  - elicitation/exchange of user/functional requirements
  - compatibility/integration and transformation of architectures
  - blueprints for common reference points and interfaces
- Economic aspects
  - contributions for consideration of restructuring of business models in the telco and vertical ecosystem
  - future challenges and markets in the vertical sectors and relationships with communication domain stakeholders
  - sustainability, societal, economic and environmental aspects

The WG has two internal Task Forces

- TF 1 on Techno-economics and telco and verticals business disruption/evolution aspects
- TF 2 on Enabling technologies for (vertical) ecosystem transformation and federation

Key activities and achievements

The WG organised and ran a Special Session on "Unlocking 5G-Advanced and 6G for Verticals Through Service Based Architecture, Network Exposure and Beyond" at the IEEE Conference on Standards for Communications and Networking 25–27 November 2024, in Belgrade, Serbia[129]. This included speakers from 6G-IA, GSMA and ETSI.

Plans for 2025

A White Paper on this topic is under development, and a proposal has been made for a Special Session at EuCNC 2025 also on this topic.

5.3.3.2 Expert Advisory Group

Chair: Jyrki Huusko (VTT)

Vice-Chair: Artur Hecker (Huawei)

Introduction

The NetworldEurope Expert Advisory Group (EAG) is composed of about 250 experts in all the individual fields related to communication networks technology, mainly from academia and industry but also from SMEs.

Objectives of the WG

The main objectives and responsibilities of the Expert Advisory Group are:

- to consult and give advice to NetworldEurope from a scientific perspective and
- to advocate for the interests of the research community

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[129] IEEE Conference on Standards for Communications and Networking, November 2024, Belgrade, Serbia, available at: https://cscn2024.ieee-cscn.org/special-sessions-0

Hence, this group mainly represents R&D centres and the academic domain.

Key activities and achievements

The primary activity of the EAG is the development of the NetworldEurope Strategic Research and Innovation Agenda (SRIA). The previous release of this document was in 2022. During 2024, the EAG finalised the drafting of an updated version of the SRIA. This has been done in conjunction with various of the SNS JU and 6G-IA WGs and other bodies. This was released for public consultation in December 2024.

The SRIA is being revised during early 2025 according to the feedback from the consultation, and will be released following the revision. A workshop on the SRIA has been proposed for EuCNC&6G Summit 2025.

The EAG co-hosted the NetworldEurope "Enablement for Connected Vehicles" workshop on the 28 of February 2024, during Barcelona MWC'24[130]. The EAG has also organised a similar event to be held in parallel with MWC'25, on "Autonomous Network for Future – AI, Vertical Oriented New Business Services", which is to be arranged on 5th of March 2025[131].

The EAG also supported the organisation of a workshop on "Future Core – New Potential to Connect Everything Intelligently" held in Shanghai in collaboration with CCSA on 19th of September[132].

5.3.3.3   SatCom

Chair: Alessandro Guidotti, Inter-University Consortium for Telecommunications (CNIT)

Vice-Chair: Joan A. Ruiz-de-Azua, i2CAT Foundation

Vision Task force leader: Alessandro Vanelli-Coralli (University of Bologna)

Policy & promotion sub-group leader: Matthieu Dollon (Airbus DS)

Standardization & regulatory sub-group leader: Nicolas Chuberre (Thales Alenia Space)

Introduction

The Satellite Communication (SatCom) Working Group's mission is to develop the concept of "SatCom resources for Smart and Sustainable Networks and Services" and define the corresponding SatCom positioning in the 2020-2030 timeframe.

The structure of the Working Group is as follows:

- Vision task force
    - To define Vision for SatCom-related research topics, among other things, fostering fixed/mobile satellite network convergence with 5G networks and beyond
    - Define and prioritise the SatCom-related research topics
    - Communicate the SatCom WG proposed inputs to the H2020 research plan to European and national bodies such as DG Connect, DG Enterprise, ESA and national space agencies, Eurospace and ESOA (objective is communication, endorsement by public bodies and duplication avoidance)
- Research strategy sub-group
    - Define and Prioritise the SatCom-related research topics
    - Communicate the SatCom WG proposed inputs to the H2020 research plan to European and national bodies such as DG Connect, DG Enterprise, ESA and national space

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[130] https://www.networldeurope.eu/event/workshop-enablement-for-connected-vehicles-28-february-2024/

[131] https://www.networldeurope.eu/early-notice-workshop-autonomous-network-for-future-ai-vertical-oriented-new-business-services-barcelona-5-march-2025/

[132] https://www.networldeurope.eu/event/workshop-future-core-new-potential-to-connect-everything-intelligently-19-september-2024/

agencies, Eurospace and ESOA (objective is communication, endorsement by public bodies and duplication avoidance)

- Policy & promotion sub-group

    o Promote the need for financial support for the European SatCom industry's research and innovation activities towards the European institutions

    o Analyse the EC policies/communication related to SatCom R&D and develop and convey the sector position to the EU stakeholders

- Standardization & regulatory sub-group

    o Foster the link between SatCom Research and standards (support related policy)

    o Support the standardisation activities carried out within 3GPP in the context of Non-Terrestrial Networks (NTN)

    o Liaise with ETSI and other Standardisation bodies whenever relevant (e.g.TC-SES/ETSI)

Objectives of the WG

The main objectives carried out by the Working Group are as follows:

- To define Vision and priorities for SatCom-related research topics: Among other fostering Fixed/mobile Satellite network convergence with 5G/6G network

- To analyse the EC policies and communications related to SatCom R&D, develop and convey the sector position towards the EU stakeholders

- To interface with European (such as DG Enterprise) and national organisations and other ETPs for space-related matters

- To foster the link between Research and standards (support related policy)

- To interface with the New-ETP Steering Board for harmonisation and coordination

- To define the positioning of SatCom within future smart networks, where innovations are required to develop techniques/technologies to ensure also sustainable ICT

Key activities and achievements

- The SatCom WG lead the development of the NTN chapter for the SRIA.

- The WG organised the 2025 editions of IEEE Advanced Satellite Multimedia Systems Conference (ASMS) and Signal Processing for Space Communications Workshop (SPSC), to be held in Sitges, February 2025[133].

- The WG is working on a position paper on NTN in 6G.

5.3.3.4   SME WG

Chair: Jessica Carneiro (Australo)

Vice-Chair: Nicola Ciulli (Nextworks)

Introduction

The NetworldEurope SME WG advocates for SMEs in the telecommunications sector. Comprising more than 300 stakeholders, the WG supports SMEs promoting their competences and experience, enhancing their visibility, voicing their interests and fostering their involvement in collaborative research and innovation with key industry players and leading research organisations.

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[133] https://www.asmsconference.org/

Key activities and achievements in 2024

The SME WG continued to meet bimonthly to share information on relevant topics for its members including funding opportunities, workshops, events and industry news. In fact, the WG hosted various projects with cascade funding targeting SMEs, including but not limited to SNS projects.

SMEs also used the meetings to pitch their organisations and find potential synergies with their peers. There was a second "Igniting innovation: SME R&I strategies" roundtable, in which various WG members shared their experiences in applying for and implementing European R&I projects.

The "European SME Expertise in 5G and Beyond 2024"[134] brochure was released in February 2025, with more than 80 SMEs profiles and 20 success stories. A social media campaign is being carried out to promote the brochure.

The WG produced two internal reports containing an analysis of the SMEs participation in the SNS JU as well as their perspectives on the functioning of the SNS JU. The later were collected through a questionnaire inquiring about WG members participation in SNS JU calls and SNS projects featuring open calls and their experiences.

The Chair of the SME WG also participated in various meetings on its behalf, including SNS JU Steering Board meetings, NetworldEurope General Assemblies and Steering Board meetings, and 6G-IA General Assemblies.

Significant efforts were dedicated to build the SME community, strengthening the WG presence in social media. In addition to disseminating the information in an accessible and real-time format, the WG attracted an important number of new followers beyond the WG members that interact with the community.

A proposal for a convened session focused on SMEs and their specific experience was submitted to the EuCNC & 6G Summit 2025.

Plans for 2025

The annual questionnaire supported the collection of feedback that will be used to steer the upcoming work with SMEs. The need to find new avenues to continue to boost the impact of the WG is one of the main takeaways.

The drafting of a SME WG position paper was initiated in January 2025. The release is expected by May 2025 to allow for briefly presenting it during the EuCNC convened session. The paper addresses various topics such as the role of SMEs in R&I, the representation of SMEs in the SNS JU governing bodies, the current funding model and so on.

The WG will keep its bimonthly meetings, with the next one to take place in May 2025. Information about funding opportunities will remain a key point of the meetings alongside the exchange of knowledge among members. Moreover, the SME WG expects to establish a cooperation with the other WGs.

The preparation of the new brochure edition is planned for September 2025.

In March 2025, the SME WG held new elections. The current chair and co-chair will remain in their respective roles for the next two years.

Detailed information about the SME WG activities can be found in section 4.3.

5.4   Summary of WG coordination

In this deliverable, we have summarised the support activities provided by SNS OPS to the WGs of SNS JU, 6G-IA, and NetworldEurope, as well as providing an overview of the activities of the WGs for the reporting period. The main progress and achievements of SNS OPS during the period have been:

- Finalising the transition of WGs from 5G PPP to SNS JU

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[134] Available at: https://bscw.sns-ju.eu/pub/bscw.cgi/d528659/sme-brochure-2025-final.pdf

- o Complete migration to new electronic infrastructure

- o Driving the creation and approval of new/revised WG ToRs

- o Assisting the onboarding of SNS JU projects to WGs

- Supporting the creation of new SNS JU project WG on Hardware Technologies

- Supporting the renewal of the 6G-IA WG on Spectrum

- Updating and implementing a new procedure for internal reporting of WG activities

- Preparing the handover of WG support from SNS OPS to SNS CO-OP

6   Conclusions

The SNS stakeholder strategy made significant progress in driving engagement and collaboration within the SNS ecosystem from April 2024 to March 2025.

The comprehensive mapping of SNS stakeholders provided a clear, structured framework for targeted engagement actions, considering the role, needs and contributions of each player. The three-layers of the ecosystem - provisioning, user and enablers & facilitators – was thoroughly reviewed to accurately reflect the interplay among them. This approach facilitates the effective engagement of stakeholders, further enhancing the cooperation within the SNS community.

The IAFA events have been instrumental in establishing a collaboration framework with relevant partnerships, initiatives, verticals, programmes and organisations, fostering knowledge exchange, and increasing the visibility of SNS JU. The convergence of R&D roadmaps in relevant 6G related scientific and technological areas, setting a solid basis for future research activities, attested to its success.

The pre-standardisation activities, in particular the Standards Tracker, have been crucial to enable the strategic organisation of contributions from SNS JU projects, ensuring a cohesive approach to standardisation and facilitating the alignment of European R&I with global standardisation trends. The Standards Tracker, in its function as repository, helps users to navigate the complex landscape of telecommunications standards.

The SME participation in the SNS JU projects reached 26.3% in the 2024 call. Continued monitoring is necessary, with particular focus on the funding distribution. The support provided to the SME WG has been noteworthy. The WG has been key in addressing specific challenges faced by SMEs, promoting their involvement, and enhancing their visibility within the SNS community. The publication of the "2024 European SME Expertise in 5G and Beyond" brochure was one of the highlights.

The analysis of entrepreneurship shows that meaningful initiatives targeting startups should be developed. Exploring mechanisms that can reduce the high-risk profile associated to SNS business is fundamental to encourage investment. In this respect, leveraging platforms like SCoDIHNet and other SME initiatives in smart connectivity, can expand the SMEs' market presence, facilitate collaboration at regional level and drive business growth. The Digital Assessment Tool and the Technology Provider Catalogue are valuable tools.

The coordination of SNS WGs under SNS JU, 6G-IA, and NetworldEurope has been successful. These WGs have played a vital role in advancing research, fostering collaboration, and ensuring alignment with industry needs and standards.

Moving forward, it is essential to build upon these achievements to strengthen the SNS ecosystem and steer the efforts in telecommunications towards the same objectives. By fostering collaboration, the SNS community can continue to thrive, ensuring Europe's leadership in the future of communication networks.

Appendix A   SNS Stakeholder Map Glossary

Term	Description	References
3GPP	The 3rd Generation Partnership Project (3GPP) unites seven telecommunications Standard Development Organisations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as "Organisational Partners" and provides their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies.	http://www.3gpp.org/
5G-ACIA	5G-ACIA (5G Alliance for Connected Industries and Automation) is the central global forum for shaping 5G in the industrial domain. On one platform, various industries from all over the world jointly create a new ICT and OT ecosystem and set the frameworks for a highly attractive emerging market.	https://5g-acia.org/
5G Americas	5G Americas is an industry trade organisation that represents the wireless communications industry in the Americas. Established in 2011, it focuses on promoting and advocating for the deployment, evolution, and adoption of 5G and other wireless communication technologies in the Americas.	https://www.5gamericas.org/
5G Brasil	5G Brasil is an industry-led initiative in Brazil that was launched in 2015 to promote the development of 5G technology in the country. The initiative is comprised of various stakeholders, including telecommunications companies, government agencies, and academic institutions.	https://5g-ppp.eu/global-5g-actions/
5G - 6G Forum Korea	The 6G Forum provides an open platform where diverse participants of the industry can join various areas of 5G/6G R&D.	www.6g-forum.com
5G MAG	5G-MAG (5G-Media Action Group) is an initiative funded by the European Union under the Horizon 2020 program that aims to support the development and testing of 5G technologies in vertical industries such as automotive, manufacturing, and healthcare. The initiative brings together industry players, research organisations, and public authorities to build and operate 5G infrastructure that can support the needs of these industries.	www.5g-mag.com/
5GAA	The 5G Automotive Association (5GAA) is a global cross-industry association that brings together leading companies from the telecommunications and automotive industries to develop and promote connected and automated mobility (CAM) solutions based on 5G and other advanced technologies.	5GAA
5G-ACIA	The 5G Alliance for Connected Industries and Automation (5G-ACIA) is an industry-led initiative aimed at promoting the development and deployment of 5G communication technologies in the context of industrial automation and control systems (IACS).	https://5g-acia.org/
	5G Experimentation Infrastructure hosting Cloud-nativeE Network applications for public protection and disaster Relief. It aims to lower barriers to 5G adoption and market entry for European SMEs, providing an open, federated, end-to-end experimentation facility to conduct rigorous experimentation of their products and applications aimed at the public safety market	www.5gepicentre.eu/
5GMF Japan - XGMF Japan	The 5G Mobile Forum (5GMF) in Japan is transitioning towards the XGMF, which aims to address the evolution of communication technologies beyond 5G, paving the way for 6G and future advancements in mobile telecommunications.	https://5gmf.jp/en/

Term	Description	References
5G-PPP	The 5G Infrastructure Public Private Partnership (5G PPP) is a joint initiative between the European Commission and European ICT industry (ICT manufacturers, telecommunications operators, service providers, SMEs and researcher Institutions).	https://5g-ppp.eu/
5GTechritory	Techritory – a Connectivity and Digitalization Ecosystem with Real-World Value. Techritory is an ecosystem for the global connectivity and digitalization community, where leaders gather, discuss, and support collaboration across sectors, borders, and industries – far more than just an event.	www.techritory.com
5G TURBO Accelerator	The 5G Turbo Accelerator will support up to 20 start-ups to address key challenges in urban mobility with a focus on developing 5G technologies and services to improve traffic efficiency and traffic management, smart parking options, and road safety solutions, among others. The programme will use the existing online open community of Impact Connected Car, a European project where industry, cities, and future mobility stakeholders already engage at an international level.	www.eiturbanmobility.eu/projects/5gturbo-accelerator/
6G Health Institute	The 6G Health Institute is a privately and publicly funded research institute that aims to combine communication electronics and medical technology. In addition to developing and testing new technologies, the focus is on research and networking. Key innovations include the development of a 5G-capable Mobile Patient Health Interface Adapter (FHIRPHI) and the construction, testing and validation of an EHDSL (European Health Data Slice).	https://6ghi.info/en/
6G-IA	The 6G Smart Networks and Services Industry Association (6G-IA) is the voice of European Industry and Research for next generation networks and services. Its primary objective is to contribute to Europe's leadership on 5G, 5G evolution and SNS/6G research. The 6G-IA brings together a global industry community of telecoms & digital actors, such as operators, manufacturers, research institutes, universities, verticals, SMEs and ICT associations.	https://6g-ia.eu/
ACEA	The European Automobile Manufacturers' Association, or ACEA, unites Europe's 16 major car, truck, van and bus makers. We are the voice of the auto industry: a technological world leader and the backbone of the EU economy.	www.acea.auto
AECC	Automotive Edge Computing Consortium (AECC) is an international consortium focused on developing best practices for the automotive industry's data and communications needs, particularly as they relate to connected vehicles and emerging services.	https://aecc.org/
AENEAS	AENEAS stands for "Association for European NanoElectronics Activities" and it is a non-profit organisation that represents the European nanoelectronics community. The association was established in 2006 and its members include research institutes, universities, and industry partners who are involved in the development of nanoelectronics technologies.	https://aeneas-office.org/
Agri-EPI Centre	Supports smart agriculture tech and IoT in the UK and EU. Pioneering innovation, technology and precision engineering in UK farming for increased productivity, profits and sustainable growth.	https://agri-epicentre.com/

Term	Description	References
AIOTI	AIOTI stands for the Alliance for Internet of Things Innovation, which is a European Commission-backed organisation that brings together stakeholders from various sectors to promote the development and deployment of the Internet of Things (IoT) in Europe. The AIOTI was established in 2015 as part of the European Commission's Digital Single Market strategy. The alliance comprises of industry leaders, policymakers, academic researchers, and other relevant actors who work together to advance the adoption of IoT technologies across different sectors.	https://aioti.eu/
APCO	APCO International (Association of Public-Safety Communications Officials) is a non-profit organisation that represents public safety communications professionals, including emergency dispatchers, call centre personnel, and other professionals who work in the field of public safety communications. APCO was founded in 1935 and has over 30,000 members in the United States and internationally.	https://en.wikipedia.org/wiki/Association_of_Public-Safety_Communications_Officials-International
ARIB	The Association of Radio Industries and Businesses (ARIB) is a Japanese standardisation body responsible for setting technical regulations and specifications related to radio and telecommunications in Japan.	www.arib.or.jp
ASF	Apache Software Foundation, Software for the Public Good. ASF's open-source software is used ubiquitously around the world with more than 8,400 committers contributing to more than 320 active projects.	www.apache.org
ASTM	ASTM International, formerly known as American Society for Testing and Materials, is an international standards organisation that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services. Some 12,575 ASTM voluntary consensus standards operate globally.	https://www.astm.org/
AVNU	AVNU Alliance is an industry consortium focused on certifying and advancing Time-Sensitive Networking (TSN) standards for real-time, high-performance communications.	https://avnu.org/
BDVA	BDVA- Big Data Value Association is an industry-driven research and innovation organisation with a mission to develop an innovation ecosystem that enables the data-driven and AI-enabled digital transformation of the economy and society in Europe.	https://bdva.eu/about/
BEREC	Body of European Regulators for Electronic Communications (BEREC) is an agency aiming to ensure consistent application of EU regulations and to contribute to the development of the internal market for electronic communications.	https://www.berec.europa.eu/en/
Beyond 5G Japan	Beyond 5G Promotion Consortium aims to achieve the early and smooth introduction of Beyond 5G and to strengthen the international competitiveness of Beyond 5G in order to realise the strong and vibrant society expected in the 2030s.	https://b5g.jp/en/
Bharat 6G Alliance	The Bharat 6G Alliance is a collaborative initiative focused on advancing India's position in the development of 6G technologies. It brings together industry leaders, research institutions, and policymakers to innovate and implement strategies for next-generation communication networks. The alliance emphasises developing indigenous technologies and strengthening India's presence in global telecommunications.	https://bharat6galliance.com/

Term	Description	References
Broadband Forum	The Broadband Forum is a non-profit industry consortium dedicated to developing broadband network specifications and accelerating broadband innovation.	https://www.broadband-forum.org/
BuildingSMART	buildingSMART is the worldwide industry body driving the digital transformation of the built asset industry. It is committed to delivering improvement by the creation and adoption of open, international standards and solutions for infrastructure and buildings.	www.buildingsmart.org/
Built4People	A European partnership focusing on innovation in the built environment to achieve sustainability and climate goals.	https://built4people.eu/
C2C-CC	The "Car-2-Car Communication Consortium" aims at assisting towards accident-free traffic (vision zero) at the earliest possible date. It further aims at supporting the highest safety level at improved traffic efficiency anywhere, anytime at the lowest cost to the end user and the environment.	www.car-2-car.org
CAD initiative	The Knowledge Base on Connected and Automated Driving (CAD) stands as the ultimate repository consolidating knowledge and experiences related to Cooperative, Connected and Automated Mobility (CCAM) in Europe and worldwide. Originally created as part of the Horizon 2020 ARCADE Support Action, it is currently maintained by the Horizon Europe FAME project, in line with the European Partnership on CCAM vision to support harmonisation of European R&I efforts to accelerate the implementation of innovative CCAM technologies and services.	https://www.connectedautomateddriving.eu/about/
CAMARA open-source initiative	CAMARA is an open-source project within Linux Foundation to define, develop and test the APIs. CAMARA works in close collaboration with the GSMA Operator Platform Group to align API requirements and publish API definitions and APIs. Harmonization of APIs is achieved through fast and agile created working code with developer-friendly documentation. API definitions and reference implementations are free to use (Apache2.0 license).	https://camaraproject.org/
CEF	Connecting Europe Facility is a European Union funding instrument aimed at promoting growth, jobs, and competitiveness through targeted infrastructure investment at the European level, including in the telecommunications sector. It supports the development of infrastructure for transport, energy, and digital connectivity, enhancing the EU's integration and competitiveness.	ec.europa.eu/inea/en/connecting-europe-facility
CELTIC-NEXT	CELTIC-NEXT is an industry-driven programme promoting collaboration in next-generation communication technologies, such as 5G/6G, AI, and IoT, across Europe and beyond.	https://www.celticnext.eu/
CEN / CENELEC	The European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC) are two distinct private international non-profit organisations. A variety of stakeholders are involved in CEN and CENELEC work, amongst others business, industry and commerce, service providers, public authorities, regulators, academia and research centres, European trade associations and interest groups representing environmentalists, consumers, trade unions as well as SMEs, and other public and private institutions.	https://www.cencenelec.eu/european-standardization/cen-and-cenelec/

Term	Description	References
CEPT	The European Conference of Postal and Telecommunications Administrations - CEPT - was established in 1959. Original members were the monopoly-holding postal and telecommunications administrations. CEPT's activities included co-operation on commercial, operational, regulatory and technical standardisation issues. Today 46 countries are members of CEPT.	https://www.cept.org/cept
CER	The Community of European Railway and Infrastructure Companies (CER) brings together close to 70 railway undertakings, their national associations as well as infrastructure managers and vehicle leasing companies.	https://www.cer.be/
CHIPS JU	Chips Joint Undertaking (Chips JU) aims to bolster Europe's semiconductor industry by fostering collaboration between the EU, member states, and private sector. Focused on research, innovation, and manufacturing, Chips JU seeks to position Europe as a leader in semiconductor technology, enhance digital capacity, and address global challenges such as sustainability. The initiative aligns with European policy goals to ensure the continent's technological and industrial leadership.	https://www.chips-ju.europa.eu/
Climate-KIC	Europe's largest public-private innovation partnership focused on climate innovation to mitigate and adapt to climate change.	https://www.climate-kic.org/
Cloud Native Computing Foundation	The Cloud Native Computing Foundation (CNCF) hosts critical components of the global technology infrastructure. We bring together the world's top developers, end users, and vendors and run the largest open-source developer conferences. CNCF is part of the nonprofit Linux Foundation.	https://www.cncf.io/
Cloudify	Cloudify is an open-source multi-cloud and edge orchestration platform. Cloudify allows organisations an effortless transition to public cloud and Cloud-Native architecture by enabling them to automate their existing infrastructure alongside cloud native and distributed edge resources. Cloudify also allows users to manage different orchestration and automation domains as part of one common CI/CD pipeline.	https://docs.cloudify.co/
Colosseum	Colosseum is the world's largest wireless network emulator designed to support research and development of large-scale, next generation radio network technologies in a repeatable and highly configurable Radiofrequency (RF) and traffic environments.	https://openrangym.com/experimental-platforms/colosseum
Confidential Computing Consortium	The Confidential Computing Consortium is a community focused on projects securing data in use and accelerating the adoption of confidential computing through open collaboration. The Confidential Computing Consortium (CCC) brings together hardware vendors, cloud providers, and software developers to accelerate the adoption of Trusted Execution Environment (TEE) technologies and standards. CCC is a project community at the Linux Foundation	https://confidentialcomputing.io/about/
COST Actions	COST (European Cooperation in Science and Technology) is a funding organisation for research and innovation networks. Our Actions help connect research initiatives across Europe and beyond and enable researchers and innovators to grow their ideas in any science and technology field by sharing them with their peers. COST Actions are bottom-up networks with a duration of four years that boost research, innovation and careers.	https://www.cost.eu/

Term	Description	References
C-ROADS	C-ROADS is a European initiative aimed at promoting the deployment of cooperative intelligent transport systems (C-ITS) across different countries and regions in Europe. The initiative brings together public authorities, road operators, and automotive and technology companies to develop and deploy C-ITS solutions that improve road safety, traffic efficiency, and environmental sustainability.	https://www.c-roads.eu/platform.html
DAIRO	DAIRO (Data-intensive Applications Improvement for theRO Industry) is a project that was funded by the European Union's Horizon 2020 program and was part of the BDVA initiative. The project aimed to develop a platform that would enable the optimization of industrial processes through the use of big data analytics. The project's focus was on four key industrial sectors: energy, automotive, manufacturing, and construction.	https://bdva.eu/DAIRO/
DIGITAL	The Digital Europe Programme (DIGITAL) is an EU funding programme focused on bringing digital technology to businesses, citizens and public administrations.	https://digital-strategy.ec.europa.eu/en/activities/digital-programme
DG Connect	DG Connect is an EU Commission department focusing on policies for digital economy, cybersecurity, media, and innovation. It promotes digital inclusion and cutting-edge technologies.	https://ec.europa.eu/dgconnect
DG Grow	The Directorate General for Internal Market, Industry, Entrepreneurship and SMEs is the Commission department that works to support an open, seamless and resilient Single Market, with open borders and free flow of goods and services.	https://single-market-economy.ec.europa.eu/index_en
DG MOVE	The Directorate-General for Mobility and Transport develops the EU-policy regarding transport and mobility and is responsible for the programmes that financially support trans-European networks, technological development and innovation.	https://transport.ec.europa.eu/index_en
eBPF Foundation	The eBPF Foundation focuses on advancing the state of the art for eBPF by directing upstream development, promoting the use of the technology and its benefits, and improving the security and robustness of eBPF.	https://ebpf.foundation/
e.DO	e.DO is a new way of learning and teaching STEM subjects, robotics and coding, developed by the Italian company Comau and derived from the combination of an educational robot and innovative didactic tools.	www.comau.com
EASA	EASA stands for the European Union Aviation Safety Agency. It is an agency of the European Union responsible for developing and enforcing safety regulations for the civil aviation industry in Europe.	https://www.easa.europa.eu/en
EBRD	European Bank for Reconstruction and Development - an international financial institution supporting projects in over 30 countries, aiming to foster transition towards open and sustainable market economies.	https://www.ebrd.com/
EBU	The European Broadcasting Union (EBU) is a not-for-profit organisation that represents public service media organisations across Europe. The organisation has over 100 members in 56 countries, including national broadcasters such as the BBC, ARD, and France Télévisions.	https://www.ebu.ch

Term	Description	References
EC	The European Commission (EC) has various funding sources available to support a wide range of initiatives and projects in the European Union (EU) and beyond.	https://commission.europa.eu/index_en
ECHAlliance	The European Connected Health Alliance (ECHAlliance) is a not-for-profit organisation that connects stakeholders in the health and social care sectors across Europe and beyond. It aims to facilitate the development and deployment of connected health solutions to improve health outcomes.	echalliance.com
Eclipse	Eclipse is an open-source software development environment that provides a framework for developing software applications in a variety of programming languages. It is a community-driven project that is managed by the Eclipse Foundation, a non-profit organisation that supports the growth and development of the Eclipse community.	www.eclipse.org/
ECS	In the 5G industry, ECS stands for Edge Cloud Services, which refers to a cloud computing infrastructure that is positioned closer to the end-users and devices at the edge of the network. The Edge Cloud Services are designed to provide low-latency and high-bandwidth computing resources, which are essential for supporting the high-performance applications and services that are expected to be delivered over 5G networks.	Edge computing - Wikipedia
ECSO	The European Cyber Security Organisation (ECSO) is a European, cross-sectoral membership organisation that contributes to developing cybersecurity communities and building the European cybersecurity ecosystem. ECSO federates the European Cybersecurity public and private sector, including large companies, SMEs and start-ups, research centres, universities, end-users and operators of essential services, clusters and associations, as well as the local, regional and national public administrations across the European Union Members States and the European Free Trade Association (EFTA).	Home - ECSO (ecs-org.eu)
EDPB	The European Data Protection Board (EDPB) is an independent European body with legal personality. It ensures that the General Data Protection Regulation and the Law Enforcement Directive are applied consistently and ensures cooperation, including on enforcement.	https://www.edpb.europa.eu/edpb_en
EDEH	European Digital Education Hub: An online collaborative community that connects education enthusiasts across Europe, aiming to overcome fragmentation in digital education policy, research, and implementation practices.	https://education.ec.europa.eu/focus-topics/digital-education/action-plan/european-digital-education-hub
EDRI	European Digital Rights (EDRi) is an association of civil and human rights organisations from across Europe, dedicated to defending rights and freedoms in the digital environment.	https://edri.org/
EDUC	European University Alliance for Digitalisation (EDUC) is an alliance of European universities collaborating to advance digitalisation in education and foster academic exchange through digital technologies.	https://www.educalliance.eu/

Term	Description	References
EEA	European Environment Agency - an agency providing independent information on the environment, helping those involved in developing, adopting, implementing, and evaluating environmental policy, as well as the general public.	https://www.eea.europa.eu/en
EIB	EIB stands for European Investment Bank. It is the lending arm of the European Union, which was established in 1958 under the Treaty of Rome. The EIB is the largest multilateral borrower and lender in the world and is owned by the EU member states.	www.eib.org
EIF	European Investment Fund (EIF) is part of the European Investment Bank Group and supports SMEs by facilitating access to finance through investments in venture capital and guarantees for innovative projects.	https://www.eif.org/
EIP-SCC	European Innovation Partnership on Smart Cities and Communities - The European Innovation Partnership for Smart Cities and Communities is an initiative supported by the EC combining Information and Communication Technologies (ICT), energy management and transport management to come up with innovative solutions to the major environmental, societal and health challenges facing European cities today.	https://smart-cities-marketplace.ec.europa.eu/sites/default/files/EIP_Brochure.pdf
EIR	The East Indian Railway Company, operating as the East Indian Railway (reporting mark EIR), introduced railways to East India and North India, while the Companies such as the Great Indian Peninsula Railway, South Indian Railway, Bombay, Baroda and Central India Railway and the North-Western Railway operated in other parts of India.	https://en.wikipedia.org/wiki/East_Indian_Railway_Company
EIT	The European Institute of Innovation and Technology (EIT) is an EU body created to strengthen Europe's innovation capacity by integrating higher education, research, and business to develop innovative solutions for societal challenges.	eit.europa.eu
EIT Digital	A European Union digital education hub offering specialised programmes in ICT and network technologies to support innovation and entrepreneurship in the digital economy.	https://www.eitdigital.eu/
EIT Health	EIT Health is a network of best-in-class health innovators backed by the European Institute of Innovation and Technology (EIT). It collaborates across borders to deliver new solutions that improve healthcare delivery and enable healthier lives.	eithealth.eu
EIT Urban Mobility	EIT Urban Mobility is the largest innovation community for urban mobility in Europe. Founded in 2019 as an initiative of the European Institute of Innovation and Technology (EIT), EIT Urban Mobility is committed to accelerating the transition to sustainable mobility by providing established businesses, startups, universities, research institutes and the public sector with access to markets, talent, funding and knowledge.	https://www.eiturbanmobility.eu/
ENCQOR	ENCQOR (Evolution of Networked Services through a Corridor in Québec and Ontario for Research and Innovation) is a collaborative platform for the development and testing of next-generation communication technologies, including 5G. It is a public-private partnership between the governments of Canada, Quebec, and Ontario, as well as academic institutions, industry partners, and other organisations.	Welcome - ENCQOR
ENISA	European Union Agency for Cybersecurity (ENISA) supports the EU in achieving a high level of cybersecurity, advising member	https://www.enisa.europa.eu/

Term	Description	References
	states, businesses, and institutions. It focuses on resilience, cyber capacity building, and fostering secure technologies.	
ENoLL	The European Network of Living Labs iVZW (ENoLL) is an international non-profit association, which aims to promote and enhance user-driven innovation ecosystems, more precise the Living Labs concept globally. ENoLL focuses on facilitating knowledge exchange, joint actions, and project partnerships among its historically labelled +480 members, advocating for and promoting EU policies, promoting Living Labs and enabling their implementation worldwide	https://enoll.org/
ENTSO-E	ENTSO-E, the European Network of Transmission System Operators for Electricity, is the association for the cooperation of the European transmission system operators (TSOs). The 40 member TSOs representing 36 countries are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.	https://www.entsoe.eu/
EO	Earth Observation (EO) refers to the collection of information about Earth's physical, chemical, and biological systems via satellites or remote sensing technologies. It supports climate monitoring, disaster response, and sustainable development initiatives.	https://joint-research-centre.ec.europa.eu/jrc-science-and-knowledge-activities/earth-observation_en
EOSC	European Open Science ClouG- Providing 1.8 million European researchers and 70 million professionals in science and technology a virtual environment with open and seamless services for storage, management, analysis and re-use of research data, across borders and scientific disciplines.	https://eosc.lt/
EPIC	European Photonics Industry Consortium (EPIC) is the largest photonics industry association, connecting companies and organisations across Europe to drive innovation in areas such as telecommunications, manufacturing, and energy.	https://www.epic-assoc.com/
EPO	The European Patent Office (EPO) is responsible for examining and granting European patents, ensuring innovation and intellectual property protection across its member states.	epo.org
EPoSS Association	EPoSS is the European Association leading the development and integration of intelligent and green Smart Systems technologies and solutions for a sustainable society.	https://www.smart-systems-integration.org/
ERC	European Research Council (ERC) funds groundbreaking research across Europe, supporting talented researchers in exploring innovative and ambitious ideas.	https://erc.europa.eu/
ERTICO	ERTICO (European Road Transport Telematics Implementation Coordination) – ITS Europe is a multi-sector, public-private partnership dedicated to the development and deployment of intelligent transport systems (ITS) and services across Europe. It brings together more than 120 stakeholders from the transport industry, including automotive manufacturers, mobility service providers, technology companies, and public authorities.	https://ertico.com/
ESA	The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space	https://www.esa.int/

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	capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world.	
ESB Networks	The Commission for Regulation of Utilities (CRU) has given ESB the responsibility for managing Ireland's electricity networks. This means ESB is in charge of both the power lines that carry electricity around the country (transmission), and the lines that bring electricity to individual homes and businesses (distribution). ESB's team that handles this work is called ESB Networks.	https://www.esbnetworks.ie/
ESEIA	European Sustainable Energy Innovation Alliance (ESEIA) is a Network of organisations promoting sustainable energy innovations and fostering collaboration between research, education, and industry sectors in Europe.	https://eseia.eu/
ESF+	European Social Fund Plus (ESF+): The EU's main instrument for investing in people, supporting jobs, education, and skills, and aiming to reduce social disparities across Europe.	https://european-social-fund-plus.ec.europa.eu/en
ESOA	European Satellite Operators Association (ESOA) represents the satellite industry in Europe, advocating for satellite communication's role in global connectivity, particularly in bridging the digital divide and enabling secure communication.	https://www.esoa.net/ https://www.copernical.com/organisations-public/item/7087-european-satellite-operators-association-esoa
ETIP/SNET	European Technology and Innovation Platform (ETIP) - Smart Networks for Energy Transition (SNET) is a platform that guides research, innovation, and competitiveness in the field of smart networks for energy transition in Europe.	https://smart-networks-energy-transition.ec.europa.eu/home
ETIPWind	European Technology & Innovation Platform on Wind Energy	https://etipwind.eu/
ETP "Food for life"	European Technology Platform (ETP): Industry-led stakeholder fora recognized by the European Commission as key actors in driving innovation, knowledge transfer, and European competitiveness. The inclusion of a food-themed ETP as an important element in the EU innovation ecosystem is justified by the challenging opportunities for improving welfare and wellbeing in the EU through research and innovation in the food area.	https://etp.fooddrinkeurope.eu/
ETP4HPC	ETP4HPC – the European Technology Platform (ETP) for High-Performance Computing (HPC) - is a private, industry-led and non-profit association. Our main mission is to promote European HPC research and innovation in order to maximise the economic and societal benefit of HPC for European science, industry and citizens. Our main task is to propose research priorities and programme contents in the area of HPC technology and usage, by issuing a Strategic Research Agenda (SRA). This SRA is used by the EuroHPC Joint Undertaking (JU) to define the contents of the HPC Technology Work Programmes.	https://www.etp4hpc.eu/
ETSC	European Transport Safety Council ETSC is a Brussels-based independent non-profit making organisation dedicated to reducing the numbers of deaths and injuries in transport in Europe.	https://etsc.eu/

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ETSI ITS	ETSI ITS stands for "European Telecommunications Standards Institute Intelligent Transport Systems". It is a European standardization organisation that focuses on the development of standards for intelligent transport systems (ITS) in Europe. ITS refers to the use of information and communication technologies in transport systems to improve safety, efficiency, and sustainability.	ETSI - ITS
ETSI SDG OpenCAPIF	ETSI Software Development Group OpenCAPIF (SDG OCF) is developing an open source Common API Framework, as defined by 3GPP, allowing to expose and consume APIs in a secure and consistent way. The group liaises with relevant standards bodies and projects working on network transformation such as the 3GPP, TM Forum, ETSI ZSM, ETSI NFV, ETSI MEC, OpenSourceMANO, TeraFlowSDN and OpenSlice.	https://ocf.etsi.org/
ETSI SDG OpenSlice	The ETSI Software Development Group for OpenSlice (SDG OSL) is developing an open-source service based Operations Support System (OSS) to deliver Network as a Service (NaaS).	https://osl.etsi.org/
ETSI SDG Open-Source MANO	Open-Source Mano is an ETSI-hosted initiative to develop an Open Source NFV Management and Orchestration (MANO) software stack for production-ready Multi-Cloud Telco Orchestration. OSM approach takes as starting point the architectural framework of ETSI NFV, including its NFV Orchestrator and VNF Manager functionalities, as well as additional layers, such as service orchestration or infrastructure management, which are also required for operators to enable NFV services.	https://www.etsi.org/technologies/open-source-mano
ETSI SDG TeraFlowSDN	The ETSI Open-Source Group for TeraFlowSDN (OSG TFS) is developing an open-source cloud native SDN controller enabling smart connectivity services for future networks beyond 5G.	https://tfs.etsi.org/
EU CAP Network	Optimising the flow of information about agriculture and rural policy within the EU is what the EU's Common Agricultural Policy (CAP) Network is all about. The Network is a forum through which National CAP Networks, organisations, administrations, researchers, entrepreneurs and practitioners can share knowledge and information (e.g. via peer-to-peer learning and good practices) about agriculture and rural policy.	https://eu-cap-network.ec.europa.eu/about/eu-cap-network_en
EuCNC & 6G	The EuCNC & 6G Summit builds on putting together two successful conferences in the area of telecommunications: EuCNC (European Conference on Networks and Communications), supported by the European Commission, and the 6G Summit, originated from the 6G Flagship programme in Finland, one of the very first in its area	www.eucnc.eu
EUCloudEdgeIOT	The EUCloudEdgeIoT.eu initiative aims to realise a pathway for the understanding and development of the Cloud, Edge and IoT (CEI) Continuum by promoting cooperation between a wide range of research projects, developers and suppliers, business users and potential adopters of this new technological paradigm.	https://eucloudedgeiot.eu/
EU-India Trade and Technology Council	This council facilitates collaboration between the EU and India in trade, technology, and sustainable development. It focuses on key areas such as 5G/6G, semiconductors, AI, and supply chain resilience to enhance shared economic and technological capabilities.	https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2625

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EUIPO	The European Union Intellectual Property Office (EUIPO) is the European Union (EU) agency responsible for managing the European Union trademarks (EUTMs), the registered European Union designs (RCDs), the geographical indications (GIs) for craft and industrial products and the European and international cooperation in the field of intellectual property (IP), as well as the European Observatory on Infringements of Intellectual Property Rights.	https://www.euipo.europa.eu/en
EuMW	The 28th edition of the European Microwave Week (EuMW 2025) will come to Utrecht to continue the annual series of highly successful microwave events that started back in 1998. EuMW 2025 comprises three co-located conferences:	https://www.eumw.eu/general-information/
EuRobotics	EuRobotics is a non-profit organisation based in Brussels, Belgium, that aims to promote robotics research, development, and innovation in Europe. The organisation brings together robotics stakeholders, such as researchers, engineers, robotics companies, and end-users, to collaborate and address key challenges facing the robotics industry.	https://eu-robotics.net/
EuroHPC JU	EuroHPC JU is a joint initiative between the EU, European countries and private partners to develop a World Class Supercomputing Ecosystem in Europe. The EuroHPC JU allows the European Union and the EuroHPC JU participating countries to coordinate their efforts and pool their resources to make Europe a world leader in supercomputing.	https://eurohpc-ju.europa.eu/index_en
European Digital Society	An organisation focused on promoting digital rights and ensuring that technology serves the public interest in Europe.	https://www.cencenelec.eu/areas-of-work/cen-sectors/digital-society-cen/
EUTC	The European Utilities Telecom Council (EUTC) is a non-profit organisation that represents the interests of utility companies in the telecommunications sector. The organisation works to promote the deployment of advanced telecommunications infrastructure and services to support the needs of utility companies across Europe.	EUTC
Evolved-5G	EU H2020 5G-PPP Research project (ICT-41-2020) on Experimentation and Validation Openness for Long-term evolution of VErtical inDustries in 5G era and beyond.	https://evolved-5g.eu/accelerator-program/
FSAN	Full Service Access Network (FSAN) is an industry working group dedicated to developing standards and specifications for broadband access networks, particularly focusing on Passive Optical Network (PON) technology.	fsan.org
GAIA-X	Gaia-X strives for innovation through digital sovereignty. Our goal is to establish an ecosystem, whereby data is shared and made available in a trustworthy environment. Our intention is that we give the control back to the users by retaining sovereignty over their data. Our outcome will not be a cloud. It is a federated system linking many cloud service providers and users together in a transparent environment that will drive the European data economy of tomorrow.	https://gaia-x.eu/
GeSI	Global Enabling Sustainability Initiative (GeSI) is an organisation that brings together leading companies and	https://www.gesi.org/

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	organisations to achieve sustainable development objectives through digital solutions.	
Global Platform	GlobalPlatform is a consensus-driven technical standards organisation. Its members are focused on enabling the efficient launch and management of innovative, secure-by-design digital services and devices, which deliver end-to-end security, privacy, simplicity interoperability and convenience to users. Our Mission? To empower stakeholders across industries with standardized technologies and certifications for trusted digital services and devices that address their business, security, regulatory and data protection needs.	https://globalplatform.org/about-globalplatform/
GSMA	The GSMA (Global System for Mobile Association) is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Industry Services and Solutions, Connectivity for Good, and Outreach.	https://www.gsma.com
GSOA	GSOA provides a platform for collaboration between satellite operators globally and a unified voice for the sector. Their vision is to help policymakers improve the state of the world by continuously bridging digital, education, health, social, gender and economic divides across diverse geographies and across mature and developing economies.	https://gsoasatellite.com/
GUTMA	The Global UTM Association (GUTMA) is a non-profit consortium of worldwide Uncrewed Aircraft Systems Traffic Management (UTM) stakeholders. Our purpose is to foster the safe, secure and efficient integration of drones in national airspace systems. We support and accelerate the transparent implementation of globally interoperable UTM systems.	https://gutma.org/
HAPS Alliance	The mission of the HAPS (High Altitude Platform Station) Alliance is to unlock the stratosphere to enhance connectivity and sensing services for civilian and government applications globally. To bring connectivity to more people, places, and things worldwide. We unite companies from telecommunications, technology, aviation, and aerospace industries in the education, regulation, and promotion of high-altitude platform stations (HAPS) in the stratosphere.	https://hapsalliance.org/
HEIs	HEIs, or higher education institutions, are educational institutions that offer degree programs beyond the high school level. HEIs often have a strong focus on research and innovation, and they play an important role in advancing scientific knowledge and developing new technologies.	What is Higher Education Institutions (HEIs) | IGI Global (igi-global.com)
Horizon Europe	Horizon Europe is the EU's key funding programme for research and innovation. Following the Multiannual Financial Framework Midterm Review (MTR) decision, the indicative funding amount for Horizon Europe for the period 2021-2027 is EUR 93.5 billion. It tackles climate change, helps to achieve the UN's SDG and boosts the EU's competitiveness and growth.	https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

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Horizon Results Booster	The Horizon Results Booster is an initiative from the European Commission providing a set of services to EU-funded projects, free-of-charge, to help navigate the complexities of dissemination and exploitation. One of the main challenges researchers are facing is converting their findings into valuable outcomes. Booster takes on this challenge by offering free professional and customised support to increase the added value of Research & Innovation projects and bring them into the world.	https://www.horizonresultsbooster.eu/
HORIZON Results Platform	A tool for beneficiaries in disseminating their Key Exploitable Results, for stakeholders to engage with beneficiaries, directly or through NCP, and for the EC to learn from project results.	https://horizoneuropeencpportal.eu/store/horizon-results-platform
HPC (High-performance computing)	High-performance computing (HPC) refers to the use of advanced computing resources, such as supercomputers, clusters, grids, or cloud computing, to solve complex computational problems that are beyond the capabilities of traditional computing systems. HPC involves the use of parallel processing techniques, where large amounts of data are divided into smaller parts and processed simultaneously by multiple processors or computing nodes.	High-performance computing - Wikipedia
IDSA	The International Data Spaces Association (IDSA) is on a mission to create the future of the global, digital economy with International Data Spaces (IDS), a secure, sovereign system of data sharing in which all participants can realize the full value of their data. IDS enables new "smart services" and innovative business processes to work across companies and industries while ensuring that the self-determined control of data use (data sovereignty) remains in the hands of data providers.	https://internationaldataspaces.org/
IEEE	Institute of Electrical and Electronics Engineers (IEEE), is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. The IEEE covers technology areas ranging from aerospace systems, computers and telecommunications to biomedical engineering, electric power and consumer electronics.	https://www.ieee.org
IEEE CCSN	Standards play a key role in the success of the communications industry, as enablers of global systems inter-operability. IEEE CSCN aims for closing the gap between researchers, scientists and standards experts from academia, industry and different standardization bodies. It will serve as a platform for presenting and discussing standards-related topics in the areas of communications, networking and related disciplines, facilitating standards development as well as cooperation among the key players. IEEE CSCN will deliver high-quality technical as well as visionary papers, which will be reviewed and selected by an international Technical Program Committee (TPC) representing both academia and industry, with a strong standardization background.	https://cscn2024.ieee-cscn.org/
IEEE GLOBECOM	The 2025 IEEE Global Communications Conference (GLOBECOM) will be held in the lively and picturesque city of Taipei, Taiwan, from 8 to 12 December 2025. Themed "Sustainable Communications for Ubiquitous Intelligence," this flagship conference of the IEEE Communications Society will	https://globecom2025.ieee-globecom.org/

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	feature a comprehensive high-quality technical program including 12 symposia and a variety of tutorials and workshops.	
IEEE INFOCOM	IEEE INFOCOM is a top-ranked conference on networking in the research community. It is a major conference venue for researchers to present and exchange significant and innovative contributions and ideas in the field of networking and closely related areas. IEEE INFOCOM covers both theoretical and systems research. For INFOCOM 2025, the conference includes a main technical program, a number of workshops, a keynote speech, panels, a student poster session, and demo/poster sessions.	https://infocom2025.ieee-infocom.org/
IEEE PIMRC	PIMRC is one of the flagship conferences of IEEE Communications Society with a special focus on the cutting-edge wireless technology research and innovations. The IEEE PIMRC 2025 edition will be composed of high quality keynotes, technical sessions, panels, workshops and tutorials. The conference welcomes contributions reporting original research results in all areas of wireless technology as well as in applications, services, and business.	https://pimrc2025.ieee-pimrc.org/
IET	The Institution of Engineering and Technology (IET) is a multidisciplinary professional engineering institution. The IET was formed in 2006 from two separate institutions: the Institution of Electrical Engineers (IEE), dating back to 1871, and the Institution of Incorporated Engineers (IIE) dating back to 1884. Its worldwide membership is currently in excess of 168,000.	https://www.theiet.org/
IETF/IRTF	The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. The Internet Research Task Force (IRTF) focuses on longer term research issues related to the Internet while the parallel organisation, the Internet Engineering Task Force (IETF), focuses on the shorter-term issues of engineering and standards making. The IRTF promotes research of importance to the evolution of the Internet by creating focused, long-term Research Groups working on topics related to Internet protocols, applications, architecture and technology.	https://www.ietf.org/
IIC	The IIC Innovation Cluster is a consortium of over 70 organisations from across Europe, including companies, universities, research organisations, and other stakeholders in the manufacturing industry. The aim of the cluster is to promote innovation, competitiveness, and sustainability in the manufacturing sector by fostering collaboration between its members.	Industry Innovation Cluster (IIC) - EIT Manufacturing
IMT-2020 - IMT 2030	IMT-2020 (International Mobile Telecommunications-2020) is a set of technical specifications developed by the International Telecommunication Union (ITU) for the fifth generation (5G) of mobile communication networks. IMT-2020 is the global standard for 5G, and it defines the requirements and capabilities that 5G networks must meet to be considered compliant with the standard.	https://www.6gworld.com/exclusives/imt-2030-understanding-the-itus-vision-for-a-global-6g-standard/

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INSIDE	INSIDE is the Industry Association and technology platform that strives for a leading position of Europe in Intelligent Digital Systems and their applications.With over 270 members, from 28 European and associated countries, spanning the entire Electronic Components, Software and Systems value chain, from semiconductors to key application domains, INSIDE fosters collaboration between European industry and academia to secure funding for innovative, competitive, and sustainable solutions.	https://inside-association.eu/about/
Interreg Europe	Interreg is an essential instrument of the European Union that strengthens cooperation between regions and countries within the EU. It plays a vital role in promoting regional development, cohesion and reducing economic disparities.	https://www.interregeurope.eu/
IOWN	Innovative Optical and Wireless Network - A global movement. Companies and organisations from around the world work together to develop photonics-based network and computing solutions which will revolutionize every aspect of our lives.	https://iowngf.org/
ISO/IEC	The International Organisation for Standardization (ISO) is an international standard-setting body composed of representatives from various national standards organisations. Founded on 23 February 1947, the organisation promotes worldwide proprietary, industrial, and commercial standards. It is headquartered in Geneva, Switzerland, and works in 164 countries. It was one of the first organisations granted general consultative status with the United Nations Economic and Social Council.	https://www.iso.org/ ; https://www.iec.ch/
ISP	ISP (Internet Service Provider) technologies refer to the various methods used by internet service providers to deliver internet services to users.	Internet service provider - Wikipedia
ITRI Taiwan	ITRI - Industrial Technology Research Institute - is a world-leading applied technology research institute with more than 6,000 outstanding employees. Its mission is to drive industrial development, create economic value, and enhance social well-being through technology R&D.	https://www.itri.org.tw/english/
ITU	ITU- International Telecommunications Union- is the United Nations specialized agency for digital technologies (ICTs). The Organisation is made up of a membership of 194 Member States and more than 1000 companies, universities and international and regional organisations. Headquartered in Geneva, Switzerland, and with regional offices on every continent, ITU is the oldest agency in the UN family – connecting the world since the dawn of the telegraph in 1865.	https://www.itu.int/en/about/Pages/default.aspx
K8- Kubernetes	Kubernetes, also known as K8s, is an open-source system for automating deployment, scaling, and management of containerized applications. It groups containers that make up an application into logical units for easy management and discovery. Kubernetes builds upon 15 years of experience of running production workloads at Google, combined with best-of-breed ideas and practices from the community.	https://kubernetes.io/
LFEdge	LF Edge is an umbrella organisation that establishes an open, interoperable framework for edge computing independent of hardware, silicon, cloud, or operating system. By bringing together industry leaders, LF Edge creates a common framework for hardware and software standards and best practices critical to sustaining current and future generations of IoT and edge devices.	https://lfedge.org/

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LFNetworking	The Linux Foundation Networking (LF Networking, LFN) is the largest set of open-source networking projects in the world formed by a broad industry coalition with the goal of fostering a commercial-ready networking ecosystem that embraces open, emerging and evolving technologies.	https://lfnetworking.org/
LFE	Linux Foundation Europe is an extension of the Linux Foundation, promoting open-source collaborations across cloud and edge networks in Europe.	https://linuxfoundation.eu/
MCX	The Multi Commodity Exchange of India Limited (MCX), India's first listed exchange, is a state-of-the-art, commodity derivatives exchange that facilitates online trading of commodity derivatives transactions, thereby providing a platform for price discovery and risk management. The Exchange, which started operations in November 2003, operates under the regulatory framework of Securities and Exchange Board of India (SEBI).	https://www.mcxindia.com/about-us
MEF	The Mobile Ecosystem Forum is a global trade association. Our members are companies whose products power mobile services such as messaging, content, advertising and IoT. Join MEF to advance in mobile.	https://mobileecosystemforum.com/
Multifire Alliance	The Alliance for Private Networks is championing the global industry adoption of private networks by educating the ecosystem and providing publicly available tools that ease deployment. The Alliance is a 3GPP Market Representation Partner.	https://www.mfa-tech.org/about/
Murata	Murata is a Japanese electronics company specialising in the development of advanced electronic components, sensors, and wireless communication modules.	https://www.murata.com/
MWC	MWC Barcelona is the one time of year where everyone who's anyone, in the world of connectivity, comes together under one roof. Tens of thousands of senior leaders from top global companies, international governments and trailblazing tech businesses converge to connect and create the future.	https://www.mwcbarcelona.com/
NEBI	New European Bauhaus Initiative - a creative and interdisciplinary movement connecting the European Green Deal to our living spaces, aiming to make them more beautiful, sustainable, and inclusive.	https://new-european-bauhaus.europa.eu/index_en
NEM	The New European Media (NEM) Initiative is a European Technology Platform (ETP) that brings together stakeholders from the media, creative industries, and ICT sectors to promote innovation in the media industry. The initiative aims to foster collaboration and networking between industry players, research organisations, and public authorities to develop innovative media technologies and services that can drive economic growth and societal benefits.	https://nem-initiative.org/
NESSI	Networked European software and services initiative - NESSI's mission is to promote R&D&I in the field of software, data and digital services in order to strengthen the competitiveness of European industry in this field, and to represent industry and other organisations active in this field.	https://nessi.eu/
NetworldEurope	NetworldEurope is the new incorporation of the European Technology Platform (ETP) for communications networks and services, the follow-up of NetWorld2020 to follow the European changing policies as stated in Horizon Europe. Communications networks and services enable interaction between users of various	www.networldeurope.eu

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	types of equipment, either mobile or fixed, to fulfil society's requirements for interconnection. They are the foundation of the Internet and of our digital society.	
NetworldEurope SME WG	The NetworldEurope SME Working Group is the voice of the NetworldEurope SME community, as well as the networking place for the NetworldEurope SME community. Since its inception, SME Working Group activities have been mostly focusing on promoting the skills and expertise of SMEs in the telecommunications domain, especially towards larger companies and research organisations, and on supporting the engagement of SMEs in collaborative projects and cooperation with those players, via networking and exchange of information amongst SME representatives.	https://www.networldeurope.eu/sme-wg/
Next G Alliance	The Next G Alliance is a bold initiative to advance North American mobile technology leadership over the next decade through private sector-led efforts. With a strong emphasis on technology commercialization, the work will encompass the full lifecycle of research and development, manufacturing, standardization and market readiness.	https://nextgalliance.org/faqs/
NGMN	The Next Generation Mobile Networks (NGMN) Alliance is a global association of leading mobile network operators, vendors, and research institutions that work together to define and develop the next generation of mobile networks.	NGMN – We make better connections
NGI	The Next Generation Internet (NGI) is a European Commission (EC) initiative that aims to shape the development and evolution of the Internet into an Internet of Trust. An Internet that responds to people's fundamental needs, including trust, security, and inclusion, while reflecting the values and the norms all citizens enjoy in Europe.	https://ngi.eu/about/
NGOs	A non-governmental organisation (NGO)) is an organisation that generally is formed independent from government. They are typically nonprofit entities, and many of them are active in humanitarianism or the social sciences; they can also include clubs and associations that provide services to their members and others. NGOs can also be lobby groups for corporations, such as the World Economic Forum. NGOs are distinguished from international and intergovernmental organisations (IOs) in that the latter are more directly involved with sovereign states and their governments.	https://en.wikipedia.org/wiki/Non-governmental_organisation
NICT	National Institute of Information and Communications Technology. As Japan's sole National Research and Development Agency specialising in the field of information and communications technology, NICT is charged with promoting ICT sector as well as research and development in ICT, which drives economic growth and creates an affluent, safe and secure society.	https://www.nict.go.jp/en/about/organisation.html
OAI	The OperAirInterface Software Alliance (OSA) is a non-profit organisation, home of OpenAirInterface, an open software that gathers a community of developers from around the world, who work together to build wireless cellular Radio Access Network (RAN) and Core Network (CN) technologies.	https://openairinterface.org/
OASC	Open & Agile Smart Cities (OASC) is a non-profit organisation whose members are cities and communities around the world. Its ambition is to leverage technology to improve the quality of life	https://oascities.org/

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	of citizens. Currently, 155 cities are members, in 31 countries from Argentina to Finland and Japan.	
OCCI	OCCI (Open Cloud Computing Interface) is an open standard for cloud computing that provides a standard interface for managing cloud infrastructure and services. It is a RESTful API that defines a set of protocols and interfaces for interacting with cloud resources such as compute instances, storage, and network resources.	Open Cloud Computing Interface - Wikipedia
OCP	Open Compute Project - a collaborative community focused on redesigning hardware technology to efficiently support the growing demands on compute infrastructure.	https://www.opencompute.org/
OEDP	The Open Environmental Data Project (OEDP) leverages the spirit of collaboration to create multi-sector strategies that strengthen the role of data in environmental and climate governance. Through pilots, workshops, research, and narrative building, OEDP works to [re]build trust between communities, government, civil society, and science.	www.openenvironmentaldata.org
OIF	The Optical Internetworking Forum (OIF) is an international industry forum that promotes the development and deployment of interoperable networking solutions and services for optical networking products.	https://www.oiforum.com/
OKF	The Open Knowledge Foundation (OKF) is a global, non-profit network that promotes and shares information at no charge, including both content and data.	https://okfn.org/en/
ONAP	6.1.1.1 ONAP is a comprehensive platform for orchestration, management, and automation of network and edge computing services for network operators, cloud providers, and enterprises. Real-time, policy-driven orchestration and automation of physical and virtual network functions enables rapid automation of new services and complete lifecycle management critical for 5G and next-generation networks.	Home - ONAP
ONF	The Open Networking Foundation (ONF) was a non-profit operator-led consortium. It used an open-source business model aimed at promoting networking through software-defined networking (SDN) and standardizing the OpenFlow protocol and related technologies. The standards-setting and SDN-promotion group was formed out of recognition that cloud computing will blur the distinctions between computers and networks. The initiative was meant to speed innovation through simple software changes in telecommunications networks, wireless networks, data centres and other networking areas. In December 2023, ONF announced it was merging with the Linux Foundation (LF).	Open Networking Foundation
ONOS	ONOS (Open Network Operating System) is an open-source software-defined networking (SDN) platform designed to enable the development of scalable, high-performance, and resilient network control applications. It is built on top of the Java Virtual Machine (JVM) and provides a distributed and modular architecture that supports a wide range of network applications and services.	https://opennetworking.org/onos/
Open DayLight	The OpenDaylight project is an open-source platform for Software Defined Networking (SDN) that uses open protocols to	https://www.opendaylight.org/

Term	Description	References
	provide centralised, programmatic control and network device monitoring.	
Open5GCore	Open5GCore aims at providing support and speeding up research, by facilitating the know-how transfer from Fraunhofer FOKUS towards customers. It serves as a consistent basis for 5G testbed deployments for trials and pilots, and for the further development of new beyond-5G and 6G standard-oriented functional features.	https://www.open5gcore.org/
Open Ran Policy Coalition	The Open RAN Policy Coalition represents a group of companies formed to promote policies that will advance the adoption of open and interoperable solutions in the Radio Access Network (RAN) as a means to create innovation, spur competition and expand the supply chain for advanced wireless technologies including 5G.	https://www.openranpolicy.org/
OpenRoadM Multi-Source Agreement	OpenROADM (Open Reconfigurable Optical Add-Drop Multiplexer) is a Multi-Source Agreement (MSA) that defines open standards for optical transport networks (OTN). It provides a common framework for interoperability between different vendors' network equipment and is designed to enable the development of open and programmable optical networks.	http://openroadm.org/
OpenStack	OpenStack is an open-source cloud computing platform that provides a set of software tools for building and managing public and private clouds. It provides a framework for deploying and managing virtual machines, containers, and network services, as well as for managing storage, security, and other cloud infrastructure components.	https://www.openstack.org/
Open vSwitch	Open vSwitch (OVS) is an open-source software switch that is designed to enable virtualized network environments. It provides a virtual switch implementation that can be used to create virtual network infrastructure for use in virtualized environments such as cloud computing.	Open vSwitch
OPNFV	OPNFV (Open Platform for NFV) is an open-source project that provides a reference platform for Network Functions Virtualization (NFV) infrastructure. It is designed to facilitate the development and deployment of NFV-based solutions by providing a common framework for testing and validating virtualized network functions (VNFs) and NFV infrastructure (NFVI) components.	Home - OPNFV
O-RAN Alliance	O-RAN (Open Radio Access Network) is a global initiative that aims to promote an open and interoperable approach to the design, deployment, and operation of 5G mobile networks. O-RAN is based on the principles of virtualization, open interfaces, and software-defined networking (SDN).	https://www.o-ran.org/
O-RAN SC	O-RAN Software Community - a collaboration aimed at developing open-source software for the Radio Access Network (RAN) industry.	https://o-ran-sc.org/
PAWR	The Platforms for Advanced Wireless Research program is enabling experimental exploration of new wireless devices, communication techniques, networks, systems, and services that will revolutionize the nation's wireless ecosystem while sustaining US leadership and economic competitiveness for decades to come.	https://advancedwireless.org/about-pawr/
PECHalliance	PCHAlliance is a non-profit organisation that aims to promote the adoption of connected health solutions to improve healthcare outcomes.	https://www.pchalliance.org/

Term	Description	References
Photonics21	Photonics21 is a European Technology Platform (ETP) focused on advancing research and innovation in the field of photonics. Photonics refers to the science and technology of light, and its applications range from telecommunications to medical devices, from manufacturing to energy, and from defence to environmental monitoring.	https://www.photonics21.org/
Polis Network	A network of European cities and regions working together to develop innovative technologies and policies for local transport.	https://www.polisnetwork.eu/
PRACE	PRACE as Research Infrastructure was founded in 2004 to provide world-class computing resources to European researchers. Through its collaboration with member countries, PRACE has played a key role in advancing scientific discovery and engineering research.	https://prace-ri.eu/prace-research-infrastructure/
PSCE	PSCE, the Public Safety Communications Europe Forum was established as a result of a European Commission funded project in 2008. Since then, PSCE has evolved into an independent forum, where representatives of public safety user organisations, industry and research institutes can meet to discuss and exchange ideas and best practices, develop roadmaps and improve the future of public safety communications. PSCE is a permanent autonomous organisation, working to foster excellence in the development and use of public safety communication and information management systems by consensus building.	https://www.psc-europe.eu/
Public Safety Technology Initiative	The purpose of the IEEE Public Safety Technology Initiative is to become the global Centre of Excellence for public safety agencies, suppliers, practitioners, researchers, and all industry participants to discuss and exchange ideas on how emerging technologies can help public safety personnel be more effective in their work and support their sustained health and wellness. A Centre of Excellence is a team, a shared facility or an entity that provides leadership, best practices, research, support and/or training for a focus area.	https://publicsafety.ieee.org/
RSPG	The Radio Spectrum Policy Group (RSPG) is a high-level advisory group that assists the European Commission in the development of radio spectrum policy. The RSPG is established under Commission Decision of 11 June 2019. The RSPG provides advice to the European Commission in the form of opinions and reports.	https://radio-spectrum-policy-group.ec.europa.eu/index_en
RTO	Research and Technology Organisations (RTOs) are institutions or organisations that focus on applied research, innovation, and technology transfer. These organisations are often funded by public or private sources and work to develop new technologies and products that can be commercialized and brought to market.	House of Commons - Technology and Innovation Centres - Science and Technology Committee (parliament.uk)
S3 CoP	The Smart Specialisation Community of Practice (S3 CoP) is the central node on guidance, networking, support and peer-learning on S3, covering its conceptual development and its implementation. The community builds on the decade-long experience on S3 and brings it forward with a fresh approach. It provides practitioners with a broad set of strategic services, by	https://ec.europa.eu/regional_policy/policy/communities-and-networks/s3-community-of-practice_en

Term	Description	References
	understanding their needs and co-designing solutions on any relevant S3 aspect.	
SCF	Small Cell Forum is the world's leading advocacy and standards development organisation dedicated to driving sustainable digital transformation through agile, scalable, shared communications infrastructure.	https://www.smallcellforum.org/
SCoDIHNet	Smart Cities and Communities Digital Innovation Hub Network is a network of Digital Innovation Hubs supporting smart cities and communities with digital solutions to enhance sustainability and urban innovation.	https://aioti.eu/scodihnet/
SEPA	The Smart Electric Power Alliance (SEPA) is a nonprofit organisation that envisions a carbon-free energy system that is safe, affordable, reliable, resilient and equitable. Our mission is to accelerate the electric power industry's transformation to a modern energy future through education, research, standards, and collaboration.	https://sepapower.org/
SESAR JU	SESAR (Single European Sky ATM Research) is a collaborative program between the European Union (EU) and Eurocontrol, aimed at modernizing and harmonizing air traffic management (ATM) across Europe. The program is supported by multiple partners from the aviation industry, including air navigation service providers (ANSPs), airports, airlines, and manufacturers.	https://www.sesarju.eu/
SIA	Social Impact Accelerator - a pan-European public-private partnership providing equity financing for social enterprises.	eif.org/index.htm
SLICES-RI	SLICES is a flexible platform designed to support large-scale, experimental research focused on networking protocols, radio technologies, services, data collection, parallel and distributed computing and in particular cloud and edge-based computing architectures and services.	https://www.slices-ri.eu/
SmartAgriHubs	A European initiative aiming to realize the digitization of European agriculture by fostering an agricultural innovation ecosystem dedicated to excellence, sustainability, and success.	https://www.smartagrihubs.eu/
SmartEn	Smart Energy Europe - an association advocating for the digital and decentralized energy solutions necessary for the transition towards a climate-neutral Europe.	https://smarten.eu/
SNS JU	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. The SNS JU funds projects 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.	https://smart-networks.europa.eu/missions-and-objectives/
Sparklink Alliance	SparkLink Alliance is an industrial alliance committed to promote next-generation wireless short-range communication technology innovation and industry ecosystem, and support applications in smart cars, smart homes, smart terminals, and smart manufacturing with extreme performance requirements.	http://sparklink.org.cn/en/
TCCA	TCCA (The Critical Communications Association) is a global non-profit organisation that brings together stakeholders in the field of critical communications, including public safety organisations, network operators, manufacturers, and regulators. TCCA aims to promote the use of standardized critical	The Critical Communications Association - TCCA

Term	Description	References
	communication technologies and ensure interoperability between different systems, with a focus on mission-critical voice and data communications.	
TIA	The Telecommunications Industry Association (TIA) is at the centre of ensuring optimum performance, security and sustainability of next-generation Information and Communications Technology (ICT) by bringing together communities of interest to shape solutions that touch all aspects of the digitally connected world. Through TIA's Technology Programs, Standards Development, QuEST Forum and Government Advocacy, TIA offers a neutral ground for the industry to collaborate and solve common challenges.	https://tiaonline.org/products-and-services/buy-standards/
TIP	Telecom Infra Project (TIP) is a global community of companies and organisations working together to accelerate the development and deployment of open, disaggregated, and standards-based solutions for telecommunications networks.	https://telecominfraproject.com/
TM Forum	TM Forum (Global alliance of telco and tech companies) is a global industry association for service providers and their suppliers in the telecommunications industry. Members include communications and digital service providers, telephone companies, cable operators, network operators, cloud providers, digital infrastructure providers, software suppliers, equipment suppliers, systems integrators and management consultancies.	www.tmforum.org
EU-US Trade and Technology Council	The Trade and Technology Council (TTC) is a transatlantic political body which serves as a diplomatic forum to coordinate technology and trade policy between the United States and European Union. It is composed of ten working groups, each focusing on specific policy areas. The early agenda focused primarily on US-EU cooperation in technology, strategic sectors, market access, trade, democratic values and rule of law in the digital world, supply chain resilience, the global trade order and the EU's developing regulatory agenda like Digital Services Act, Data Act and Cloud Rules.	https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/eu-us-trade-and-technology-council_en
Transcontinuum Initiative	To pursue and extend the collaborative work started around HPC in the Digital Continuum for the fourth edition of our Strategic Research Agenda, ETP4HPC is coordinating the TransContinuum Initiative (TCI). TCI is a horizontal collaboration between 8 European associations and projects involved in IT technology, application and services provisioning for the Digital Continuum.	https://www.etp4hpc.eu/transcontinuum-initiative.html https://6g-ia.eu/wp-content/uploads/2020/12/tci-vision15-10-2020-web.pdf
TSDSI	TSDSI (Telecommunications Standards Development Society, India) is a not-for-profit organisation that is responsible for developing and promoting standards for the telecommunications industry in India. TSDSI was founded in 2014 with the goal of advancing the development of telecommunications technology in India and ensuring that it is aligned with global standards.	https://tsdsi.in/
UIC	UIC, the worldwide railway organisation is a professional association representing the railway sector and promoting rail transport. UIC leads an innovative and dynamic sector, helping Members find continuing success and opportunities. UIC is the association for technical cooperation amongst railways, and coordinates the sector's position as it negotiates its evolving relationship with the supply industry and research and develops	https://uic.org/about/about-uic/

Term	Description	References
	needs in order to draw full advantage of potential interest to railway companies	
UNECE WP29	UNECE WP29 (World Forum for Harmonization of Vehicle Regulations) is a working party under the United Nations Economic Commission for Europe (UNECE) that develops international regulations for the safety and environmental performance of vehicles.	https://unece.org/wp29-introduction
W3C	World Wide Web Consortium - an international community that develops open standards to ensure the long-term growth of the Web. It develops standards and guidelines to help everyone build a web based on the principles of accessibility, internationalisation, privacy and security.	https://www.w3.org/
WWRF	The Wireless World Research Forum is the place where the global wireless research community meets to explore and develop the research challenges that confront us as we look beyond current 5G deployments. The ongoing effort to roll out 5G technologies, and the ongoing debate on how to meet the requirements of the various vertical industries that will make use of 5G are also being studied, with WWRF members closely involved in all these discussions, and publications such as our Outlook series are a good guide to them.	https://wwrf.ch/

Appendix B   SNS projects funded through the FSTP open calls

The results of the revision carried out by the SNS OPS team on all the SNS projects funded through the Financial Support to Third Parties (FSTP) open calls launched by the Stream D projects are presented hereafter.

B.1   FIDAL (Field Trials Beyond 5G)

FIDAL[135] is targeting the augmentation of human capabilities, allowing Media & PPDR vertical industry players to perform advanced technological and business validation in large-scale field trials of highly innovative and advanced applications, that exploit Evolved 5G technologies.

Example FIDAL Open call projects funded in Media include **5G EVEARA**, which aims to develop a live music streaming service that utilises FIDAL's 5G network capabilities to deliver high-fidelity audio with ultra-low latency to users, using the current SaaS EVEARA platform. Additionally, it aims to validate the use of 5G technology in enabling real-time, distributed music production and to quantify the benefits in terms of production efficiency and creative outcomes.

The **5G-SmartDriveApp** project shall make available to FIDAL experimentation a pilot infrastructure that is a manoeuvring track testbed which is used for driving exam qualifications as well as for general driving training. The testbed is already qualified with cameras and sensors, but the real-time fusion of these raw data mandates the use of a high-speed wireless network first to collect and then to deliver in real time the streams for further processing.

MC-SEAL aims at integrating and evaluating a monitoring system that is able to support different video sources (Mission Critical Video (MCVideo), CCTV and UAV) and provide a multi-agency communication system for rescue operation is done following an open service-enabler northbound API approach (SEAL - Service Enabler Architecture Layer for Verticals - in 3GPP TS 23.434 1) and the execution of publishing and invoking actions using a common API framework (CAPIF in 3GPP TS 23.222 2).

AI-HOLOCOM aims to provide portable and easy-to-access holographic experiences relying on an affordable setup and leaning on the features of beyond 5G networks to compensate for other technical limitations, whilst **INFOCOM** envisions an autonomous and flexible Robotic Cell empowered by 5G connectivity, which allows a seamless and immersive remote-control experience through an Augmented Reality (AR) interface.

RescueSync envisions revolutionising emergency response and PPDR coordination through the power of Augmented Reality (AR). By leveraging the capabilities of Beyond 5G, RescueSync aims to provide a seamless, real-time, and immersive communication platform that bridges the gap between on-site field officers and Command and Control (C2) operators.

The **MBBPT** project innovatively combines virtual reality (VR) technology, haptic technology, and 5G connectivity to elevate surgical training. MBBPT introduces a specialised training application simulating the intricate Bakri balloon placement procedure. Addressing challenges in current VR surgical training (no interactions via users' hands and fingers), the project offers a highly immersive learning experience for medical professionals.

The objective of **ISAFECO** is to first aggregate intelligence from multiple video-capturing sources, including heterogeneous sources as Body-Worn Cameras (BWC), User Equipment (UE) from FRs responding to the incident, deployed surveillance cameras and other video capturing and streaming devices. ISAFECO will leverage on both existing equipment (such as surveillance cameras) and equipment that will be bought for the proposed project.

B5GVideoNet is a B5G/6G platform for providing live video uplink & sharing services, mainly for media sports and news creators as well as for PPDR in both daily and emergency times. Live video is the cornerstone for sports and news productions. 5GVideoNet offers remote production as a service over B5G via new LiveU portal for the media customers based on the FIDAL UoP testbed via the TMF APIs.

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[135] FIDAL website at: https://fidal-he.eu/

TiFi aims to combine the best capabilities/features that the next generation wireless network (5G and beyond) can offer along with the DT at the local operator end to achieve high TI fidelity (TiFi), i.e. to make TI-enabled teleoperation over long distances a reality.

AI-ARMORS aims to set-up and carry out experiments related to V2X (Vehicle-to Everything) communications for road safety use case by enabling the involved stakeholders in road traffic environments to communicate and synchronise to avoid accidents or manage them in the best possible way using on site information from cameras.

The goal of *VideoGee* is to explore and quantify the added value of key enabling technologies, namely 5G, AI and AR, integrated in the 5G testbed of Patras5G/p-NET facility, where the actual trials will take place. The foreseen use case addresses two of the main areas identified by FIDAL, namely: Media, since VideoGee is based on video streaming and analysis; and, Entertainment, since the targeted events may be related to entertainment activities.

B.2   IMAGINE-B5G (Imagine Beyond 5G)

IMAGINE-B5G[136] brings together four advanced 5G experimental facilities, in Norway, Spain, Portugal and France, as an incubator, facilitating technology innovations and a diverse set of advanced 5G applications, services and ecosystem developments in verticals, including Media.

Example IMAGINE-B5G Open call projects funded involving Media include **N-TourXP5G** (Enhanced Touristic Experiences with 5G), which seeks to transform touristic experiences on-the-go, when tourists are overwhelmingly connected to a cellular network, through the revolutionary potential of 5G technology, the innovative project.

ProSe, a server-based practical deployment project, will enable direct device-to-device communication based on proximity. Primarily serving public safety and commercial discovery, ProSe utilises proximity awareness to actively/passively seek value in physical/virtual proximity. While currently limited on mobile phones, ProSe is crucial during network downtime or out-of-coverage scenarios. Despite being defined in 3GPP, it is not yet available in telecom equipment. The project suggests deploying ProSe, independent of 5G implementation, leveraging existing 5G and WiFi Direct capabilities. This solution, aligned with Open5GLab and O-RAN, aligns with IMAGINE-B5G goals, offering flexibility and programmability within a disaggregated RAN framework.

IMAGINE-B5G **srsRAN Platform** has the main goal to extend IMAGINE-B5G facility in Portugal with a complete multicell Open RAN deployment based on the srsRAN solution. Furthermore, the idea is to complement this extension with 5G RAN positioning features including NRPPa positioning protocol and 5G Positioning Reference Signals (NR PRS). Additionally, the project intends to showcase flexible deployable RAN solutions using srsRAN.

BiNetHol[137], which stands for Bidirectional education system based on holographic cabins through 5G Networks: To analyse the necessary technical characteristics of 5G networks to enable bidirectional holographic transmission, assessing the impact of these characteristics on the quality and authenticity of the experience through use case scenarios (unidirectional and bidirectional), and comparing the improvements with current bidirectional video-based learning systems.

Volograms for Academia is an innovative application of volumetric video and WebAR to bring immersive educational content closer to a wider audience. Utilising Volograms' AI-powered volumetric video technology and leveraging the high-speed capabilities of 5G networks, it aims to enable educators to create, share, and access immersive educational experiences with unprecedented ease and accessibility.

DEMOCRATS[138] (eDgE platforM fOr dynamiC xR applicATionS) conducted experiments with novel edge/cloud-based XR platform providing essential features for future XR applications and analyses the user experience in a specific multi-user XR application built on the platform. The project highlights the

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[136] IMAGINE-B5G website at: https://imagineb5g.eu/

[137] https://imagineb5g.eu/binethol-in-imagine-b5g-open-call-1/

[138] https://netsoft.gsuite.tmit.bme.hu/projects/democrats

advantages of split rendering and the challenges of occlusion support in dynamic environments. In addition, it showcased different solutions for occlusion support, reveal pros/cons of the approaches, analysed their feasibility in different application areas and propose tailor-made warp techniques for the specific B5G network environment, which can hide the impact of dynamically changing transmission characteristics.

B.3   TrialsNet (Trials Supported by Smart Networks Beyond 5G)

TrialsNet[139] will deploy full large-scale trials to implement a heterogenous and comprehensive set of innovative 6G applications based on various technologies such as cobots, metaverse, massive twinning, Internet of Senses, and covering three relevant domains of the urban ecosystems in Europe identified by i) Infrastructure, Transportation, Security & Safety, ii) eHealth & Emergency, and iii) Culture, Tourism & Entertainment.

Example TrialsNet Open call projects funded involving Media include "**Connected Rails: Evaluating 5G for Autonomous Tram Operations**" in Florence, which aims progressing towards enabling and accelerating tramways to operate as autonomous systems supporting LoA2, backed with technologies to increase the situational awareness of trams.

5GS3 aims to build on top of the provisions of the TrialsNet infrastructure elements to validate a reference implementation of an airport surveillance and patrolling 5G-enabled application that is based on the collaboration of electric robots over an experimental private 5G network at the location of security and safety events.

The main goal of the Stadium use case trials will be to collect, store, analyse and distribute real-time and near-real-time data (KPIs and KVIs) created in the stadium B5G network during the formal football events. The trials will be executed in the Petach-Tikva Stadium in Israel.

A trial based on cloud gaming user devices (both commercial and prototype/pre-commercial) and a cloud gaming platform to provide cloud gaming services, as well as ancillary platforms and services. It aims to assess capabilities of 5G and beyond technologies for latency and bandwidth challenging scenarios in both standard and "hot spot" crowded environments.

Expanding Torino's touristic offerings also through the fruition of digital content in VR/AR in a number of locations across the city. Offer its citizens and cultural tourists an AI powered, tailor-made, cultural proposal, exploiting the full potential of 5G and augmented.

Design and Realisation of an Enhanced AR& Metaverse-based platform to improve public park visiting experience, focusing on the case study of the Valentine PARK in Turin.

The objective of the experimentation is to create a VR game that can help raise awareness among the new generation of students about the need for a collective effort so that the communities in which we live can be truly inclusive and foster the full participation of people with disabilities.

Project related to the conceptualisation, the development and the trial of the tour for the UNESCO historic centre of Naples using Augmented Reality (AR). Tourists will be able to access the tour directly from their mobile devices by scanning a QR Code and connecting to a WEB APP.

MediVision-5G provides a ready-to-deploy and transportable, preconfigured 5G network + edge computing platform that requires seconds to be operational and zero knowledge from the operator. The solution proposed offers the user a simple and affordable system to deploy, operate, manage, and decommission an all-in-one 5G-enabled AR application.

Under the TrialsNet Use Case 13 project, the MAUTO museum in Turin aims to engage a distinct audience compared to traditional art or historical museums. The project will stress the 5G network for throughput and latency, evaluate the effectiveness of a MR experience, and enhance its appeal through game thinking strategies, such as applied games and gamification.

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[139] TrialsNet website at: https://trialsnet.eu/

B.4   TARGET-X (Trial platform for 5G evolution cross-industry on large scale)

TARGET-X[140] envisions accelerating the digital transformation of key verticals: energy, construction, automotive, and manufacturing using large-scale trials in multiple testbeds. Examples of Target-X open call projects in media include **SBPath-5G**, that combines SkyBlue tech and 5G to enhance welding via AR, offering real-time point cloud processing and dynamic welding path generation for seamless manufacturing. **CO-PARKNET** integrates Flash Park's smart 5G NBIoT parking sensor network for connected and automated vehicles with cooperative perception by enabling real-time data exchange for seamless parking and enhanced mobility.

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[140] TARGET-X website at: https://target-x.eu/