HEXA-X-II

A holistic flagship towards the 6G network platform and system, to inspire digital transformation, for the world to act together in meeting needs in society and ecosystems with novel 6G services

Deliverable D7.5
Impact to industry activities, standardisation and regulation – intermediate release

Date of delivery:	01/01/2024	Version:	3.0
Project reference:	101095759	Call:	HORIZON-JU-SNS-2022
Start date of project:	01/01/2023	Duration:	30 months

Document properties:

Document Number:	D7.5
Document Title:	Impact to industry activities standardisation and regulation – intermediate release
Editor(s):	Bahare M. Khorsandi (NGE)
Authors:	Bahare M. Khorsandi (NGE), Sylvaine Kerboeuf (NFI), Marten Ericson (EAB), Ahmad Nimr (TUD), Jeroen Famaey (IMEC), Aurora Ramos (ATO), Toon Norp (TNO), Efstathios Katranaras (SEQ), Rishikesh Chakraborty (VGS)
Contractual Date of Delivery:	01/01/2024
Dissemination level:	PU
Status:	Final
Version:	3.0
File Name:	Hexa-X-II_D7.5

Revision History

Revision	Date	Issued by	Description
V0.1	24.08.2023	Hexa-X-II WP7	First draft of ToC
V0.2	24.10.2023	Hexa-X-II WP7	First draft
V0.3	01.11.2023	Hexa-X-II WP7	Contributions from WPs added
V1.0	15.11.2023	Hexa-X-II WP7	Ready for internal review
V2.0	27.11.2023	Hexa-X-II WP7	Ready for GA review
V3.0	01.01.2024	Hexa-X-II WP7	Ready for submission

Abstract

This document presents the activities of Hexa-X-II project on standardization impact during the first-year activity of the project. It provides the intermediate project progress towards the fulfilment of its objectives and complete list of standardization contributions on various standardization bodies and industry fora.

Keywords

Hexa-X-II, Standardization, Industry fora

Disclaimer

Executive Summary

The Hexa-X-II standardisation and regulation document is to inform the project's audience about key areas of research, achievements, results and their impact on the various standardisation forums and Standard Developing Organisation (SDOs). This document is designed to be an intermediate result report of the project's achievement on standardisation goals and efforts. It covers all standardisation-related activities associated with the Hexa-X-II technical work packages in various standardisation bodies. The document reflects on the initial planning done in the previous deliverable (Hexa-X-II Deliverable D7.2 Planning for dissemination, exploitation, standardisation, and clustering) and will be updated once more at the end of the project in Deliverable D7.8.

Table of Contents

List of Tables

List of Figures

Acronyms and abbreviations

Term	Description
3GPP	The 3rd Generation Partnership Project
6G-IA	6G Smart Networks and Services Industry Association
BEREC	Body of European Regulators for Electronic Communications
DetNet	Deterministic Networking
ETSI	European Telecommunications Standards Institute
GSMA	Global system for Mobile Communications Association
ICT	Information and Communication Technologies
IETF	Internet Engineering Task Force
IRTF	Internet Research Task Force
ISG	Industry Specification Groups
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union
KPI	Key Performance Indicators
KVI	Key Value Indicators
NGMN	Next Generation Mobile Networks
nGRG	next Generation Research Group
RAW	Reliable and Available Wireless
SDO	Standards Developing Organisation
SNS JU	Smart Network and Services Joint Undertaking
URLLC	Ultra-Reliable, and Low-Latency Communications
WRC	World Radiocommunication Conference
ZSM	Zero touch network and Service Management

1   Introduction

Hexa-X-II is the 6G Flagship project under the European Union's Horizon Europe research and innovation program Smart Network and Services Joint Undertaking (SNS JU). The project is a holistic flagship towards the 6G platform and system to inspire digital transformation for the world to act together in meeting needs in society and ecosystems with novel 6G services.

This document is the fifth deliverable of Work Package 7 (WP7) – "Impact to industry activities, standardisation and regulation" and the second deliverable on the series of the Hexa-X-II impact report on the standardisation and regulation. This report includes an update on the planned contributions as well as the intermediate impact results of the Hexa-X-II project on the various standardisation bodies. The final results on the contributions will be reported in the next deliverable D7.8.

1.1   Project and Work package 7 set-up

Hexa-X-II is structured in 8 work packages, spanning a timeframe of 30 months: WP1 and WP2 are the main technical hubs of the project, where the first outputs are produced, and the results are collected and validated in the context of an end-to-end 6G system; WP3-WP6 are core technical work packages focused on the architecture and design of the technical enablers and components for 6G. WP7 and WP8 cover horizontal activities related to impact creation (with a special focus on clustering with other European Smart Networks and Services Joint Undertaking (SNS JU) projects) and project management, respectively.

Each WP has clearly defined objectives, each with a precise relationship with the overall project objectives. Furthermore, each task in each WP has a scope clearly related to one or more of the WP objectives. This structure ensures a tight and well-defined coherence across the whole project, from the overall goal to the specific objectives, research methodology, workplan objectives, single tasks, right up until the tangible results (deliverables).
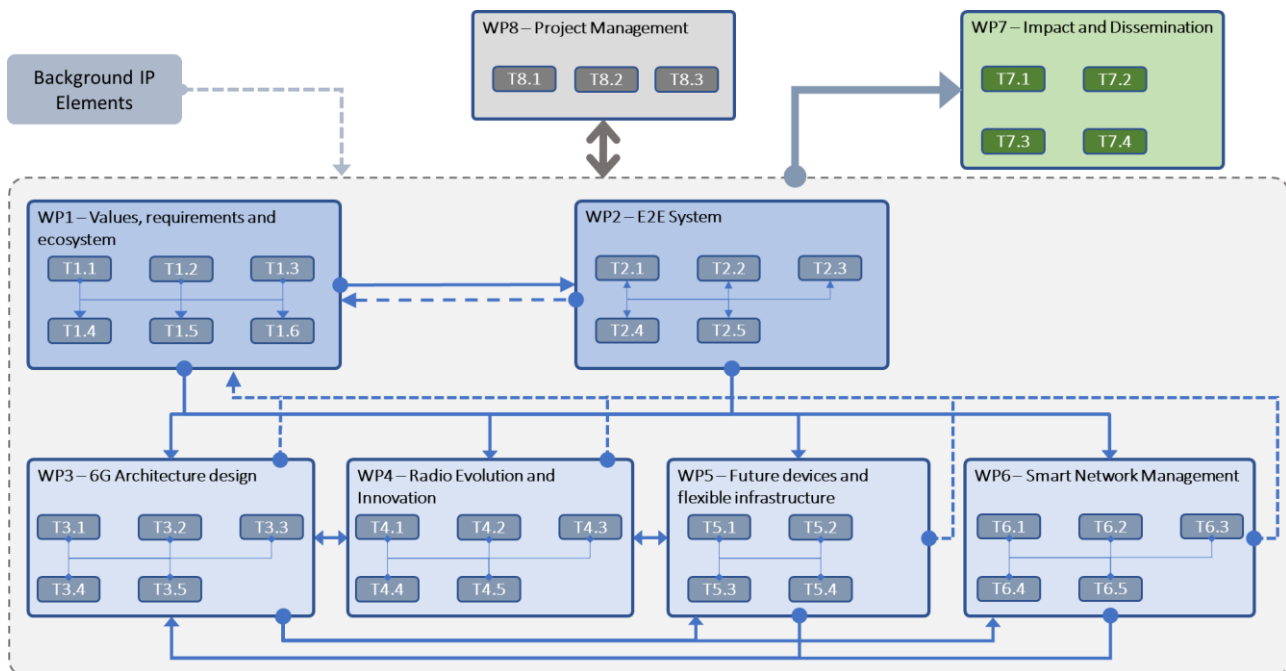
Figure 1-1: Hexa-X-II structure.

1.2   Structure and main objective of WP7/Task 7.3

WP7 is dedicated to collect project outcomes and promote them through dissemination, standardisation, and exploitation channels, to facilitate technology and know-how transfer to all stakeholders. The work package is also aiming to further enhance the collaboration with other EU and non-EU projects. WP7 aims to increase and facilitate the impact of the project and create awareness of the activities and its objectives. Research results developed in Hexa-X-II will be disseminated and exploited via WP7. To ensure the relevance and maximize

impact, WP7 will provide a top-down standardisation plan to guide the work in WP1–6 and then identify promising technologies provided by WP1–6 to promote in prominent standardisation development organisations.

Task 7.3 is dedicated to activities within industry, standardisation and regulation. This will be organized as 2 joint European SNS JU stream B workshops so as to communicate its results and support harmonisation across projects in assessing the performance of various concepts at the e2e system level. Stream B is about research for technology advancement toward 6G. The focus is on novel technologies that are expected to be adopted in commercial networks in a mid and/or long-term time period. Research topics considered in the 19 retained projects include, among others, novel 6G system architectures, advanced wireless and optical communication technologies, advances in Non-Terrestrial Networks, secure development of ultra-reliable, and low-latency communications (URLLC) applications. Moreover, Hexa-X-II will contribute to standardisation to exploit the impact of the project results and to justify the investments of the public funding of this project. This is approached in two ways: Firstly, Task 7.3 will strongly influence the activity of the relevant standardisation bodies and regulatory bodies. Secondly, through the 6G IA pre-standardisation working group and contributing to the 6G standardisation efforts, Hexa-X-II will analyse the standardisation gaps with respect to the SNS JU vision so that such gaps can be adequately addressed.

1.3   Work plan and deliverables

WP7 will provide the following deliverables:

- *D7.1: Online project presence* (delivered in M1). Project's website and social media channels developed from M1 and regularly updated.
- **D7.2 *Planning for dissemination, exploitation, standardisation, and clustering* (delivered in M4). Plan for dissemination (including scheduling of system-PoC demonstrations in M12, M21 and M30), exploitation (how key results can be identified, evaluated, exploited, and disseminated) and standardisation.**
- *D7.3: Dissemination, communication, and clustering - Intermediate release* (will be delivered in M12). It reports on dissemination and system-PoC demonstration results up to M12 and updated plan.
- *D7.4 Exploitation of key results - Intermediate release* (will be delivered in M12). It reports on key exploitable results up to M12 and updated exploitation plan.
- **D7.5 *(current document): Impact to Industry activities standardisation and regulation - Intermediate release* (will be delivered in M12) D7.5 report on results up to M12 and updated plan.**
- *D7.6: Dissemination, communication, and clustering – Final release* (will be delivered in M30). D7.6 provides the overview of the dissemination and demonstration results obtained.
- *D7.7: Exploitation of key results -Final release* (will be delivered in M30). D7.7 report on exploitation up to M30 and further plans.
- **D7.8: *Impact to Industry activities standardisation and regulation – Final release* (will be delivered in M30). It provides the overview of the results obtained**.

1.4   Structure of the document

The document is structured in the following way: Chapter 2 is dedicated to the 6G standardisation timeline as well as a demonstration of the updated plans for contributions from Hexa-X-II to various standardisation organizations. Chapter 3 describes the main topic from each of the Hexa-X-II technical work packages which contributed to standardisation and/or regulation bodies. The document concludes with the description of the planned next steps in Chapter 4.

2   Standardisation and industry group activities

This chapter is dedicated to the Hexa-X-II technical work packages planned contributions toward the different standardisation and regulation bodys.

2.1   6G standardisation timeline

The standardization timeline for 6G, also known as IMT-2030, has been outlined by the International Telecommunication Union (ITU-R) and is divided into three major stages:

- Stage 1 – IMT-2030 Framework: This stage was completed in June 2023 before the World Radiocommunication Conference 2023 (WRC-23).
  At this stage, the main goal was to reach a consensus on the global vision for IMT-2030 (6G), including identifying the potential user application trends and emerging technology trends, defining enhanced and brand-new usage scenarios and corresponding capabilities, as well as initial discussions on spectrum needs.
- Stage 2 – Requirements and Evaluation Methodology: This stage is expected to be completed in 2026.
- Stage 3 – Specifications: This stage is expected to be completed in 2030.

Figure 2-1 shows the 6G standardisation timeline estimated for 3GPP and ITU. As can be seen from the figure, ITU start the technical performance requirements study which will kick off pre-standardisation work for 6G, after WRC in November-December 2023 (WRC-23). Accordingly, the Release 21 could be the first release of the 6G standard. By then, initial 6G use cases and 6G requirement will be identified by the ecosystem which will be the foundation of 3GPP 6G technical study leading to 6G standards. After finalizing the "*IMT vision toward 2030 and beyond*" and after WRC-2023 has concluded, ITU will focus on technical performance requirements to provide a foundation for "IMT-2030" specification in line with the 2030 timeframe.
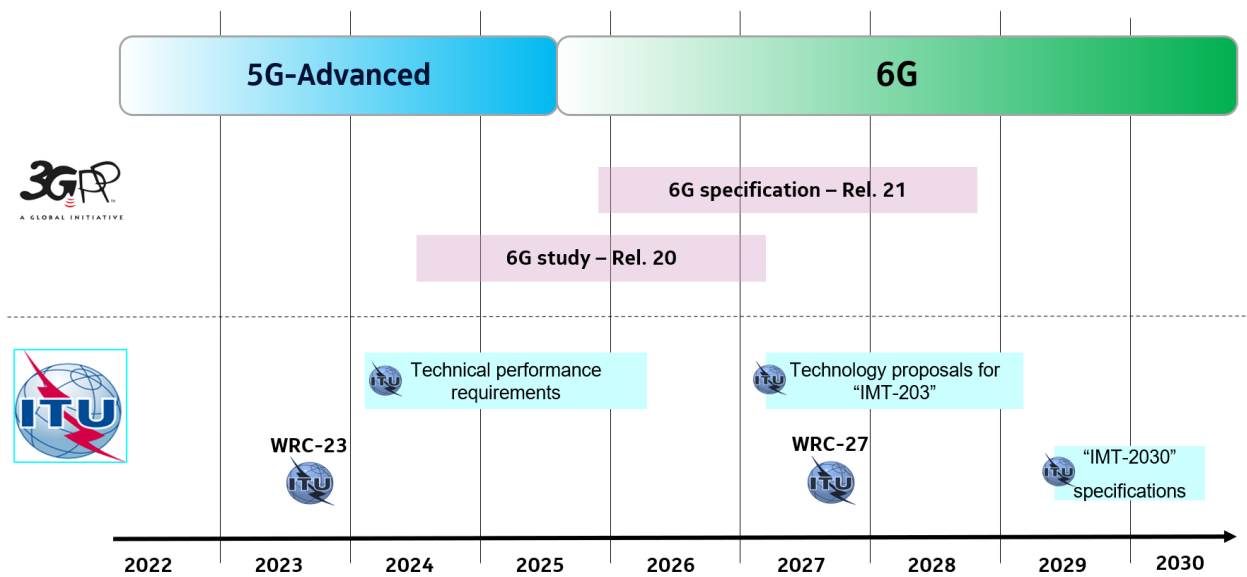
Figure 2-1: 6G standardisation timeline estimates for 3GPP and ITU/IMT (3GPP TSG#102 joint session December 12th, 2023 RP-233985)

3GPP has committed to develop 6G specifications. However, at the time of writing of this deliverable, the timing of 3GPP activities on 6G is not yet confirmed. It is expected that, similar to 5G, the specification of the first 6G standard will be a two-release endeavour. 3GPP Release 21 will contain the first 6G specifications by 3GPP. However, 3GPP studies on 6G will already start in Release 20. A 3GPP SA1 workshop on 6G use cases is planned in May 2024 to kick-off a 3GPP SA1 Release 20 study on 6G use cases, requirements and KPIs. In this workshop, various 6G research programs from around the world and vertical associations can present their

views on 6G use cases, which will then be used as input for the 3GPP SA1 work. The Hexa-X-II work on use cases will likely be the basis for the European input for this workshop. Expectations are that a RAN/SA 6G workshop in Q1 2025 will mark the start of Release 20 architecture and radio studies in 3GPP SA2 and 3GPP RAN later that year.

2.2 Update on Hexa-X-II planned contributions toward standardisation groups

The overall goal of Hexa-X-II is to enable a 6G platform for setting up new value creation opportunities while being trustworthy, inclusive, and sustainable. To achieve this, Hexa-X-II has defined six main objectives. As part of objective number 6: "*Impact creation towards a global and holistic 6G era*", Hexa-X-II will contribute to a holistic European view of 6G development and align with key stakeholders, with the aim of achieving globally harmonized standards. This will lead to paving the way for 6G systemisation and standardisation, through industry consensus and interactions with the scientific community. The activities of the project members toward achieving this goal will be measured in terms of the following metrics: the number of standardisation groups and European SNS JU working groups [6GSNS] addressed and contributions made, as well as the number of scientific publications, the number of contributions to whitepapers and position papers, etc. Table 2-1 represents the updated (from Deliverable D7.2) planned contributions from Hexa-X-II partners toward Standards Developing Organisations (SDOs) and similar organisations. The total number of submitted contributions as well as their details can be found in Section 3. The further details about those SDOs as well as key topic contributions from each technical work package can be found in the following sub sections.

Table 2-1: Hexa-X-II planned contributions to various SDOs and industry groups.

SDOs	Responsible Hexa-X-II WP/Task(s)	Topic scope
3GPP SA1	WP1 (T1.4)	Use cases, corresponding requirements and key performance/value indicators
3GPP SA2	WP2 (T2.1) WP3 (T3.4)	Develop the overall 3GPP system architecture and services including access network, core network Architecture modularisation, AI/ML usage, RAN-CN interface, UE-CN and CN-Application (e.g., network exposure) interfaces.
3GPP SA3	WP2 (T2.4)	Security and privacy threats, and their impact on system resilience, and the techniques to address them. Distributed and trustworthy AI, Quantum-safe crypto Distributed ledgers, Remote attestation, Context-awareness, etc.
3GPP SA5	WP2 (T2.3, T2.4) WP3 WP6	Intent reporting Intent conflict administration, 3rd party services. Trustworthy AI/ML-based control ML training and analysis Trustworthy management, zero-touch multiple closed loop coordination.
3GPP RAN (1,2,3,4)	WP2 (T2.1, T2.2) WP3	Radio interface architecture and protocols (e.g., MAC, RLC, PDCP, SDAP), the specification of the radio resource control protocol and the radio resource management procedures.

	WP4 (T4.1) WP5 (T5.1)	Intelligent radio air interface design, flexible spectrum access solutions, Non-Terrestrial Networks solutions, joint communication and sensing
		Evolution of cellular IoT, enhancement of RedCap devices (eRedCap), Ambient IoT (potential future topic)
ITU-R SG1	WP4	Spectrum management
ITU-R SG5	WP4	Terrestrial services
ITU-R WP 5D	WP1	6G vision and requirements.
ITU-T SG5	WP1 (T1.1, T1.3, T1.5)	Environment, climate action, sustainable digitalisation and circular economy.
	WP4	EMF D-MIMO
ETSI ZSM	WP2 (T2.3, T2.4, T2.5) WP6	Security and privacy threats Intent based management, digital twins, service management automation, smart contract based closed loop governance, closed loop governance.
		Programmability, zero-touch automation, AI-based network management and orchestration, trustworthy management and integration fabric, interdomain network and service management.
		Integration fabric (reference implementation), smart contract based closed loop governance.
ETSI MEC	WP2 (T2.4) WP3 (T3.5)	Security and privacy threats, the techniques to address them, and the use of NDT techniques to evaluate threats and mitigation strategies
		Edge computing, extreme edge computing
ETSI THz ISG	WP4	Channel modelling, sub-THz radio
	WP5	RF impairment modeling / sub-THz radio aspects
ETSI NFV	WP2 (T2.4) WP3 (T3.5)	Security and privacy threats
		Cloud evolution e.g., dynamic discovery and monitoring different extreme edge nodes, resource allocation
ETSI ISG SAI	WP2 (T2.4)	Understanding of the risks associated to widespread use and support to AI by networks, including the realisation of relevant proofs of concept
ETSI ENI	WP6	Integration fabric (reference implementation), smart contract based closed loop governance.
ETSI OSM	WP6	Management and orchestration
ETSI RIS	WP4 (T4.4)	RIS
NGMN	WP1 (T1.4)	Use cases and requirements

O-RAN nGRG	WP1 (T1.4)	Use case and requirements.
	WP2	Architectural aspects
GSMA	WP1 (T1.4)	Use cases and requirements
IETF DetNet	WP6	Deterministic network (data plane) and orchestration (control plane)
IETF RAW	WP6	Deterministic network (data plane) and orchestration (control plane)
IETF dmm	WP6	Mobility management
IETF Security Area	WP2 (T2.4)	On the application of attestation techniques, quantum-safe technologies, and automated certificate and key management procedures to improve security and privacy in next-generation networks.
IRTF NMRG	WP6	AI-based orchestration
BEREC	WP1 (T1.3)	Environmental sustainability

2.2.1   The 3rd Generation Partnership Project (3GPP)

3GPP is formed by seven regional/national standardisation bodies from Europe, Asia and North America. 3GPP produces specifications covering cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications [3GPP]. The 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with non-3GPP networks.

3GPP Service and System Aspects is responsible for the overall architecture and service capabilities of systems based on 3GPP specifications and, as such, has a responsibility for cross 3GPP TSG co-ordination.

3GPP Radio Access Network (TSG RAN) is responsible for the technical co-ordination of the specification work done in Radio Layer 1, 2, 3, eUTRAN, UTRAN/NG-RAN architecture and related network interfaces.

Hexa-X-II plans to contribute to the following working groups:

- *3GPP SA1 "service requirements"* group, which is responsible to consider and study new and enhanced services, features, and capabilities and identify any corresponding stage 1 requirements to be met by 3GPP specifications. Hexa-X-II, via partners in WP1 (Value, requirements, and ecosystem), can contribute results on forward-looking use cases, corresponding requirements and key performance and value indicators as well as new services and market technology enablers.
- *3GPP SA2 "system architecture and services"* group which is developing the overall 3GPP system architecture and services including user equipment, access network, core network, and IP multimedia subsystem (the radio access network architecture is under TSG RAN's responsibility). SA2 has a system-wide view and defines the main entities of the system architecture, and how these entities are linked to each other. SA2 also defines the main functionality and the information exchange between these entities. Partners in WP2 (E2E System) and WP3 (6G architecture design), of Hexa-X-II can contribute to particular topics such as architecture modularisation, AI/ML usage, RAN-CN interface, etc.
- *3GPP SA3 "Security and privacy"* group defining the requirements and specifying the architectures and protocols for security and privacy in 3GPP systems. SA3 also ensures the availability of cryptographic algorithms which need to be part of the specifications. Hexa-X-II has a dedicated Task 2.4 (Security, privacy, and system level resilience) which will characterise and

identify the security and privacy threats, and their impact on system resilience, and the techniques to address them. The active partners in T2.4 may be able to contribute to SA3.

- *3GPP SA5 "Management, orchestration and charging"* group currently responsible for management and orchestration which covers aspects such as operation, assurance, fulfilment, and automation, including management interaction with entities external to the network operator (e.g., service providers and verticals). Flexible network configuration and sustainable and trustworthy AI/ML-based control are two possible candidate topics from Hexa-X-II via its partners in WP2 T2.4 (Security, privacy, and system level resilience) and WP6 (Smart Network Management).
- *3GPP RAN (1,2,3,4)* is the *s*tandardisation groups in which Hexa-X-II experts in WP2 (E2E system),WP3(6G architecture design), WP4 (Radio evolution and innovation) and WP5 (Future devices and flexible infrastructure) can contribute towards the topics such as intelligent radio air interface design, flexible spectrum access, NTN solutions, as well as joint communication and sensing and evolution of cellular IoT such as NR, and RedCap devices.

2.2.2   International Telecommunication Union (ITU)

The International Telecommunication Union is a specialised agency of the United Nations responsible for many matters related to Information and Communication Technologies (ICT) [ITU]. ITU is at the very heart of the ICT sector, brokering global agreements on technologies, services, and allocation of global resources like radio-frequency spectrum and satellite orbital positions, to create a seamless global communications system that's robust, reliable, and constantly evolving.

The contribution toward ITU has been started in the previous project (Hexa-X) and will continue in Hexa-X-II in particular in following groups:

ITU Radiocommunication Sector (ITU-R) plays a vital role in the global management of the radio-frequency spectrum and satellite orbits that ensure safety of life on land, at sea and in the skies. The ITU-R study groups most relevant to Hexa-X-II work (WP4 (Radio evolution and innovation)) is Study Group 1 (SG 1) spectrum management as well as Study Group 5 (SG 5) terrestrial services. Working Party 5D (WP 5D) is also identified for the work in Hexa-X-II WP1 (Value, requirements, and ecosystem) on 6G vision and requirements.

ITU Telecommunication Standardisation Sector (ITU-T) assembles experts from around the world to develop international standards known as ITU-T Recommendations which act as defining elements in the global infrastructure of ICT. The most relevant ITU-T study group is Study Group 5 (SG5) electromagnetic field (EMF), environment, climate action, sustainable digitalisation and circular economy which is related to the work in Hexa-X-II WP1 (Value, requirements, and ecosystem).

2.2.3   European Telecommunications Standards Institute (ETSI)

ETSI is a European standards organisation, an independent, not-for-profit organisation in the field of information and communications technologies. It is a recognised regional standards body dealing with telecommunications, broadcasting and other electronic communications networks and services [ETSI]. ETSI is one of the standardisation organisations behind 3GPP. As for ITU, Hexa-X has contributed to the ETSI and planned to continue the activity through the lifetime of the Hexa-X-II project.

Hexa-X-II has identified the following Industry Specification Groups (ISG) to which the project can provide contributions:

Zero touch network and service management (ZSM) develops full end-to-end automation of network and service management which is an urgent necessity for delivering services with agility and speed and ensuring the economic sustainability of the very diverse set of services offered by digital service providers. Partners in Hexa-X-II WP6 (Smart Network Management) could be able to contribute in this ISG, in particular on the topics such as programmability, zero-touch network automation, AI-based network management and orchestration integration fabric and trustworthy management. Partners in WP2 in particular Task 2.5 and WP6 can also provide contribution toward interdomain network and service management for this ISG. Security and privacy threats are the possible topics which partners in Hexa-X-II WP2 T2.4 can contribute.

Multi-access Edge Computing (MEC) is focus on cloud computing capabilities and IT service environment at the edge of the network. To this end, partners in WP2 (E2E system) and in particular Task 2.4 may be able to contribute on the security and privacy threats, the techniques to address them, and the use of NDT techniques to evaluate threats and mitigation strategies. Partners in WP3 task 3.5 (cloud and virtualization evolution) can also provide contributions on the extreme edge and cloud computing aspects.

Terahertz technology (THz) provides the opportunity for pre-standardisation efforts on THz technology resulting from various collaborative research projects and being extended with relevant global initiatives, towards paving the way for future standardisation of the THz technology. Hexa-X-II WP4 (Radio evolution and innovation) active partners may consider this ISG for the contribution in topics of channel modelling, sub-THz radio, etc.

Network Function Virtualisation (NFV) has developed different specifications and reports for the virtualisation of network functions, with focus on management and orchestration of virtualized resources. This ISG has also studied VNF performance, reliability, and resiliency matters, analysed the security challenges related to virtualisation and has specified associated requirements. In Hexa-X-II, WP3 (in particular Task 3.5) may be able to place the outcome of the studies in NFV. Security and privacy threats are the possible topics which partners in Hexa-X-II WP2 T2.4 can contribute.

ISG on Securing Artificial Intelligence (SAI) focuses on three key areas: using AI to enhance security, mitigating against attacks that leverage AI, and securing AI itself from attack. WP2 Task 2.4 partners can contribute on topics on the application of attestation techniques, quantum-safe technologies, and automated certificate and key management procedures to improve security and privacy in next-generation networks.

ETSI Open-Source MANO (OSM) is developing an open-source Management and Orchestration (MANO) stack aligned with ETSI NFV. Active partners in Hexa-X-II WP6 (Smart Network Management) could target OSM for contribution on relevant topics in management and orchestration.

ETSI Environmental Engineering (EE) is a technical committee working on all the aspects of sustainability in the telecommunications arena and is in close cooperation with ITU-T SG5, mentioned above. Hexa-X-II has established liaisons both with ETSI EE and ITU-T SG5.

2.2.4   Next Generation Mobile Networks (NGMN)

The Next Generation Mobile Networks (NGMN) alliance is a mobile telecommunications association of mobile operators, vendors, manufacturers and research institutes [NGMN]. It was founded by major mobile operators in 2006 as an open forum, and its goal is to ensure that next generation network infrastructure, service platforms and devices will meet the requirements of operators and, ultimately, will satisfy end user demand and expectations. The vision of the NGMN Alliance is to provide impactful guidance (e.g., to the work plans in SDOs) to achieve innovative and affordable mobile telecommunication services for the end user. The main focus of NGMN is on supporting 5G's full implementation as well as highlighting 6G key trends across technology and societal requirements and use cases. Hexa-X started shaping NGMN activities in 6G dissemination e.g., NGMN's whitepaper on "6G use cases and analysis" [NGM22] contained Hexa-X results on 6G vision, use cases and key societal values. Hexa-X-II, via the involved partners will continue contributing to NGMN work.

2.2.5   O-RAN Alliance

O-RAN alliance is a world-wide association of mobile operators, vendors, research and academic institutions [ORAN]. The main mission of this alliance is to re-shape the radio access networks towards more intelligent, open, virtualized and fully interoperable mobile networks. O-RAN specifications target at enabling a more competitive RAN supplier ecosystem with faster innovation to improve user experience.

The next Generation Research Group (nGRG) is a research task force founded by the O-RAN alliance in June 2022 [nGRG]. The mission of this research group is to provide a forum to facilitate O-RAN related 6G research efforts and to publish research findings as well as to leverage industry and academic 6G research efforts. It determines how O-RAN will evolve to support 6G and beyond, considering regional research efforts, ITU-R, and 3GPP contributions through white papers and research reports. Hexa-X-II partners in particular in WP1

(Value, requirements, and ecosystem) and WP2 (E2E system) and WP3 (6G architecture design) can contribute to various O-RAN and O-RAN nGRG Research Streams such as architecture and management.

2.2.6   Global System for Mobile Communications Association (GSMA)

The GSMA is a global organisation aiming at unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change [GSMA]. GSMA vision is to unlock the full power of connectivity so that people, industry, and society thrive. GSMA is representing mobile operators and organisations across the mobile ecosystem and adjacent industries. The main focus of GSMA is threefold: industry services and solutions, connectivity for good, and outreach. Same as Hexa-X, the members of Hexa-X-II will continue monitoring the activities in GSMA as well as possibly provide input to influence the various discussions in the group.

2.2.7   Internet Engineering Task Force (IETF) and Internet Research Task Force (IRTF)

The IETF is the main standards development organisation for Internet related technology. It was founded in 1986 [IETF]. Quoting RFC 3935: *"the overall goal of the IETF is to make the Internet work better. Its mission is to produce high quality, relevant technical and engineering documents that influence the way people design, use, and manage the Internet in such a way as to make the Internet work better. These documents include protocol standards, best current practices, and informational documents of various kinds."* [RFC35]

The IETF has a sister organisation – the IRTF – focused on more long-term research problems. Standards produced by both IETF and IRTF have the form of Request For Comments (RFC).

Hexa-X-II has identified the following working groups and research groups to which the project can provide contributions:

Deterministic Networking (DetNet) and **Reliable and Available Wireless (RAW)** WGs which focus on mechanisms to enable deterministic networking at layer 3 over wired and heterogeneous wireless networks. The RAW WG actually extends the DetNet concepts focussing on the wireless aspects. Hexa-X-II partners can contribute with data and control plane extensions (WP3) devoted to enhancing deterministic connectivity and higher reliability, also benefiting from AI-based prediction-enabled orchestration (WP6).

Distributed Mobility Management WG is responsible of IPv6-based mobility work at the IETF. While this might not be the main focus of Hexa-X-II, there are some mobility under virtualisation environments (where it is not the end-user device which moves, but a function or a resource hosting a function) which might be of interest for the project (WP3 and WP6 potential scope).

IETF Security Area focused particularly on security protocols which provide one or more of the security services: integrity, authentication, non-repudiation, confidentiality, and access control. Partners active in Hexa-X-II WP2 Task 2.4 can identify topics for contribution such as the application of attestation techniques, quantum-safe technologies, and automated certificate and key management procedures to improve security and privacy in next-generation networks.

Network Management RG is a research groups belongs to the IRTF and it is looking at longer term research topics related to network management. One of the main areas being tackled currently is the application of AI to network management, which aligns naturally to WP6 topics.

2.2.8   Body of European Regulators for Electronic Communications (BEREC)

BEREC contributes to the development and better functioning of the internal market for electronic communications networks and services [BER23]. It does so by aiming to ensure a consistent application of the EU regulatory framework and by aiming to promote an effective internal market in the telecoms sector. Furthermore, BEREC assists the European Commission and the national regulatory authorities in implementing the EU regulatory framework for electronic communications. Active partners in WP1 in particular Task 1.3 (Economic sustainability) work toward contribution in BEREC on environmental sustainability topics.

3 Standard contributions of technical WPs of Hexa-X-II[1]

The overall achievements of Hexa-X-II during the first year are listed below in Table 3-1.

Table 3-1: Hexa-X-II standardisation and industrial impact during the first year.

Type	Targeted by the end of the project	Achieved
Standards and industry groups impacted	3GPP RAN, 3GPP SA, ITU, NGMN, ORAN nGRG, GSMA, BEREC, ETSI, TMFroum, IETF, IRTF	3GPP RAN, 3GPP SA, ITU, ETSI, IETF, IRTF
Total number of standards contributions by participants based on work in Hexa-X-II	More than 120	103

3.1 6G-IA pre-standardisation working group

The 6G Smart Networks and Services Industry Association (6G SNS-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 represents the private side in both the 5G Public Private Partnership (5G-PPP) and the SNS JU. In the 5G-PPP and SNS JU, the European Commission represents the public side. The 6G-IA brings together a global industry community of telecoms and digital actors, such as operators, manufacturers, research institutes, universities, verticals, SMEs and ICT associations. The 6G-IA carries out a wide range of activities in strategic areas including standardisation, frequency spectrum, R&D projects, technology skills, collaboration with key vertical industry sectors, notably for the development of trials, and international cooperation.

In particular the 6G-IA pre-standardisation working group has the following main goals:
- To identify standardisation and regulatory bodies to align with e.g., ETSI, 3GPP, IEEE and other relevant standards bodies, ITU-R (incl. WPs) and WRC (including e.g., ECC PT1).
- To develop a roadmap of relevant standardisation and regulatory topics for 6G: Evaluate existing roadmaps at the international level; Propose own roadmap for 6G being aligned at the international level.
- To influencing 6G pre-standardisation and related R&D: Potentially propose where topics should be standardised; Influence timing on R&D work programs (e.g., EC WPs)

Hexa-X-II seeks to use standardisation as a means to exploit the impact of the project results and to justify the investments of the public funding of this project. This is approached in two ways: Firstly, it will endeavour to strongly influence the activity of the relevant standardisation bodies and secondly, through the 6G IA pre-standardisation working group and contributing to its 6G standardisation efforts.

3.2 WP1 key standard contributions

WP1 aims to develop use cases, functional requirements, Key Performance Indicators (KPIs) and Key Value Indicators (KVIs). These can be provided as input for the 6G requirements work in 3GPP SA1. Particular the 6G use cases that WP1 is developing are expected to be the main element of the European input for the 3GPP SA1 use cases workshop 8-20 May in Rotterdam. WP1 participants, including the 3GPP SA1 chairman, are planning the start of 6G activities in 3GPP SA1 and the 3GPP SA1 use cases workshop. WP1 participants are also contributing to the coordination of the European input for this workshop. It is expected that there will be

---

[1] The method of contribution to SDOs and industry groups is purely through Hexa-X-II partners. Since Hexa-X-II, as an entity is not a member of such arenas, the active partners will contribute their results which they have developed in the project as a form of contribution and in some cases also cite the Hexa-X-II project.

a workshop in April to align the European input from Hexa-X-II, other SNS projects, and national 6G initiatives.

The concept of KVIs was introduced in ITU-R and in 3GPP SA1 as a new class of evaluation criteria.

Table 3-2: WP1 standard and industrial impact contributions.

Standard contributions title	Date	SDO	Hexa-X-II partners involved
R19-WP5D-C-17588Orange-multicompany!!MSW-E(002)	6/5/2023	ITU WP5D	ORA TIM TID
S1-232663 Process for SA1 Rel-20 work planning	21/8/2023	3GPP SA1	TNO
S1-233010 Process for SA1 Rel-20 work planning	13/11/2023	3GPP SA1	TNO
S1-233194 Addressing KVIs in SA1 Rel-20	13/11/2023	3GPP SA1	NFR

3.3   WP2 key standard contributions

WP2 aims to design a End to End (E2E) system blueprint aiming at a sustainable, inclusive, and trustworthy 6G platform, by consolidating the enablers developed in other WPs and determining the set of concepts to be integrated in the system. It also conducts studies on the design of the radio interface and protocols, on an intent-based E2E service management automation framework and on developing a validation framework, focused exclusively on security, privacy, and the associated resiliency issues (threat identification). WP2 participants have made several contributions related to intent-based management to 3GPP SA5 in particular on intent generic model and solutions in TS28.312. WP2 also contributed to ETSI-ZSM016 on the intent life-cycle and on the use of smart contracts for supporting the governance of intent-driven closed loops. The aspect related to capabilities exposure is of paramount importance for the 6G platform and several contributions have been issued to 3GPP SA5, related to NaaS and management services exposure. Related to security& privacy enablers, WP2 also made several contributions to 3GPP SA5 (TS28.908) in the scope of AI/ML trustworthiness.

Table 3-3: WP2 standard and industrial impact contributions.

Standard contributions title	Date	SDO	Hexa-X-II partners involved
Potential Solution on AIML trustworthiness indicators	2/27/2023	3GPP SA5	NGR
Potential Solution on AIML data trustworthiness	2/27/2023	3GPP SA5	NGR
Potential Solution on AIML training trustworthiness	2/27/2023	3GPP SA5	NGR
ZSM016 - Intent LCM	9/22/2023	ETSI ZSM	EAB EBY
S5-232537 "NaaS ecosystem and 3GPP SA5 work on capability exposure"	3/3/2023	3GPP SA5	TID

S5-232893: "SA5 way forward on capability exposure topic"	3/3/2023	3GPP SA5	TID
S5-232767: "New WID on intent-driven management service for mobile network Phase 2"	3/3/2023	3GPP SA5	NFI EBY TID
S5-232790: "pCR TR 28.912 Add conclusion and recommendations for issues related to collaboration with other SDOs"	3/3/2023	3GPP SA5	TID EAB
S5-234565: "pCR TR 28.824 Modify conclusions and recommendations for management capability exposure in normative work"	5/26/2023	3GPP SA5	TID
S5-234566: "pCR TR 28.824 Add conclusions and recommendations for NaaS ecosystem"	5/26/2023	3GPP SA5	TID
S5-236013: "Rel-17 CR TS 28.312 Correct use case for delivering a service at the edge"	8/25/2023	3GPP SA5	EAB TID
S5-236014: "Rel-18 CR TS 28.312 Correct use case for delivering a service at the edge"	8/25/2023	3GPP SA5	EAB TID
S5-235851: "Rel-18 CR TS 28.312 Add solutionn for intent driven approach for intent report and intent handling capability obtaining"	8/25/2023	3GPP SA5	TID EAB
ZSM(23)000162r3: "ZSM016 Using smart contracts to support the governance of intent-driven closed loops"	9/1/2023	ETSI ZSM	TID
URSPWI_04 Doc004 "pCR on traffic category publication by app store"	9/13/2023	GSMA URSPWI	TID
S5-236485: "Rel-18 CR 28.312 Intent Conflict Resolution Procedure"	10/13/2023	3GPP SA5	TID
S3-230409:"New Key issue on the security of the information transfer of the RAN AI/ML framework"	1/16/2023	3GPP SA3	EBY
S3-230443:"New solution for KI#2 to support authorization of participant NWDAFs in FL"	1/16/2023	3GPP SA3	EBY
S3-230510:"Adding conclusion on KI#3"	1/16/2023	3GPP SA3	EBY
S3-230575:"Draft TR 33.877 v0.5.0 Study on the security aspects of Artificial Intelligence (AI)/Machine Learning (ML) for the NG-RAN"	1/16/2023	3GPP SA3	EBY
S3-231497:"Conclusions to KI#2 "Authorization of selection of participant NWDAF instances in the Federated Learning group""	2/20/2023	3GPP SA3	EBY
S3-232151:"Resolution of EN related to encryption in KI#3 conclusion in eNA_SEC_Ph3"	4/17/2023	3GPP SA3	EBY
S3-233011:"AIML_NGRAN KI3 conclusion"	5/22/2023	3GPP SA3	EBY

S3-233251:"Resolution of EN in the conclusion for KI#3 "Security for AI/ML model storage and sharing""	5/22/2023	3GPP SA3	EBY
S3-233268:"Security for AI/ML model storage and sharing"	5/22/2023	3GPP SA3	EBY
S3-233363:"Draft TR33.877"	5/22/2023	3GPP SA3	EBY
S3-233393:"Cover sheet TR 33.877"	5/22/2023	3GPP SA3	EBY
S3-234814:"Resolution of one EN (storage request update) in Security for AI/ML model storage and sharing"	11/6/2023	3GPP SA3	EBY
S3-234818:"Clarify ADRF usage to be optional"	11/6/2023	3GPP SA3	EBY
S3-234960:"Resolution of one Editor's Note (Interoperability ID) for Security for AI/ML model storage and sharing"	11/6/2023	3GPP SA3	EBY
S3-235034:"Conveying the CCA of the source NF service consumer"	11/6/2023	3GPP SA3	EBY
S3-235035:"Conveying the CCA of the source NF service consumer"	11/6/2023	3GPP SA3	EBY
S3-235037:"Update flow of Nnwdaf_MLModelProvision"	11/6/2023	3GPP SA3	EBY

3.4   WP3 key standard contributions

The main standard contributions from WP3 are mainly to the SA groups for AI (SA5) and the RAN groups for NTN two different areas: The NTN work in Hexa-X-II relates to TN-NTN multi-connectivity and NTN architecture. However, the Rel-19 work in 3GPP is currently under development so it is still unclear exactly which Hexa-X-II topic that will be included here, but it is believed that at least some of the Hexa-X-II topics will be considered. There is also one WP3 activity related to the ETSI AI activity.

Table 3-4: WP3 standard and industrial impact contributions.

Standard contributions title	Date	SDO	Hexa-X-II partners involved
Potential Solution and evaluation on Measurement data correlation analytics for ML training	2/27/2023	3GPP SA5	NGR
Potential Solution and evaluation on Training data effectiveness analytics	2/27/2023	3GPP SA5	NGR
Potential Solution and evaluation on Training data effectiveness reporting	2/27/2023	3GPP SA5	NGR
Potential scope for a Rel-19 NR-NTN-evolution Work Item	RAN #102 meeting December 11-15, 2023	3GPP RAN1,2,3,4 topic	EAB SON

| ETSI Artificial Intelligence (AI) Conference - Status, Implementation and Way Forward of AI Standardization | 2/5/2024 | ETSI AI | EAB NXW TNO APP ICC |
| NG_18 Doc018 "E2E Slicing user story support [E2E-S]" | 10/26/2023 | GSMA NG | TID |

3.5 WP4 key standard contributions

In Release 18 of 3GPP, specification work on NTN has been taking place to define various enhancements towards 5G-Advanced. This work includes enhancements on topics such as coverage, deployment in above 10 GHz bands, network verified UE location, mobility and service continuity, and NTN-IoT. The NTN related specifications within 5G-oriented releases of 3GPP will become an important baseline for the design of TN-NTN integrated operation in early 6G systems. Our goal within WP4 for ubiquitous connectivity and seamless TN-NTN integration has driven us to focus especially on the topic of mobility and service continuity wherein we have been providing several proposals to help RAN2 specify low-overhead and forward compatible mechanisms that will enhance NTN-NTN and NTN-TN handover procedures.

Table 3-5: WP4 standard and industrial impact contributions.

Standard contributions title	Date	SDO	Hexa-X-II partners involved
NTN-NTN handover enhancements	5/22/2023 4/17/2023 2/27/2023	3GPP RAN2	SEQ
HO/CHO Signaling Overhead Reduction by NTN-config omission	4/17/2023 2/27/2023	3GPP RAN2	SEQ
R2-2304134 NTN-NTN handover enhancements	4/17/2023	3GPP RAN2	SEQ
R2-2304137 HO/CHO Signaling Overhead Reduction by NTN-config omission	4/17/2023	3GPP RAN2	SEQ
R2-2304147 Considerations on unchanged PCI solution	4/17/2023	3GPP RAN2	SEQ
R2-2306453 NTN-NTN handover enhancements	5/22/2023	3GPP RAN2	SEQ
R2-2306663 Correction on MIB configuration for NR NTN	5/22/2023	3GPP RAN2	SEQ
R2-2306517 "Unchanged PCI" solution vs "PCI change only" solution	5/22/2023	3GPP RAN2	SEQ
R2-2308753 "Unchanged PCI" solution vs "PCI change only" solution	8/21/2023	3GPP RAN2	SEQ
R2-2308755 Common signalling of HO common information	8/21/2023	3GPP RAN2	SEQ
R19-WP5D-C-1740!!MSW-E 100GHz	6/5/2023	ITU WP5D	EAB
R2-2311212 - Common signalling of HO common information	10/9/2023	3GPP RAN2	SEQ

A channel model modification for large arrays, large bandwidth, and near-field effects	14th Nov 2023	ETSI THz	Oulu University
R2-2311223 - "Unchanged PCI" solution vs "PCI change only" solution	10/9/2023	3GPP RAN2	SEQ
R2-2313475 - Unchanged PCI satellite switch considerations	11/13/2023	3GPP RAN2	SEQ
R2-2313481 - Support of NTN neighbor cell info in TN cell	11/13/2023	3GPP RAN2	SEQ
R2-2313554 - RP of epoch time for neighbor and target cells / RP of t-Service	11/13/2023	3GPP RAN2	SEQ

3.6   WP5 key standard contributions

WP5 studies, designs, and prototypes technological hard- and software enablers for future 6G devices and infrastructure. Starting from the characterisation of device classes derived from 6G use cases identified in WP1 (WPO5.1), we study hardware and RF transceivers (WPO5.2), specialized SoC connectivity solutions (WPO5.3), and energy- and cost-aware design methodologies (WPO5.4). Specifically, related to WPO5.4, WP5 studies how to integrate ultra-low-power (e.g., enhanced reduced capability (eRedCap), zero energy, or ambient IoT) devices into the 6G network architecture. This requires specific protocol and network architecture adaptations which are under consideration in 3GPP standardisation. WP5 participants have made several contributions to 3GPP standardisation related to both eRedCap (Rel-18), and Ambient IoT (Rel-19). For eRedCap specifically, we have been contributing to the Rel-18 work item "Enhanced support of reduced capability NR devices" (eRedCap) which targeted to cover the capability and cost gap between Rel-17 RedCap and LTE-based IoT device solutions, becoming fitting for the lower-end broadband IoT applications. We envisage RedCap/eRedCap UE overall specification design becoming an important baseline for future early 6G UE solutions to address cellular IoT.

Table 3-6: WP5 standard and industrial impact contributions.

Standard contributions title	Date	SDO	Hexa-X-II partners involved
R1-2303847 Considerations for Rel-18 eRedCap UE complexity reduction	4/17/2023	3GPP RAN1	SEQ
R1-2305868 Considerations for Rel-18 eRedCap UE complexity reduction	5/22/2023	3GPP RAN1	SEQ
R2-2311197 - Msg1 Early Indication for eRedcap	9/10/2023	3GPP RAN2	SEQ
On Rel-19 Ambient IoT	September 2023	3GPP RAN meeting#101	Ericsson LMF
On Rel-19 Ambient IoT	June 2023	3GPP RAN Release 19 workshop meeting#100	Ericsson LMF
Input to Study on Ambient IoT in RAN	September 2023	3GPP RAN meeting#101	Ericsson LMF
Input to Study on Ambient IoT in RAN	June 2023	3GPP RAN meeting#100	Ericsson LMF
Input to Study on Ambient IoT in RAN	March 2023	3GPP RAN meeting#99	Ericsson LMF

3.7   WP6 key standard contributions

WP6 is in charge of designing and implementing smart network management and orchestration enablers for 6G. One of the key works performed in WP6 is related with the evolution of so-called software networks technologies, this is related to the virtualisation of networks and how cloud plays a key role on 6G more that it was even in 5G, as well as Software Defined Networking (SDN). In this regard several contributions have been made to IETF on different aspects, e.g., new architectural SDN control plane with data awareness improvements as well as involving deterministic networking. Besides, several contributions have been performed to ETSI ZSM group which is a key reference regarding zero-touch management and one of the main objectives in WP6. Those contributions are related to intent-based management and the close loop governance specification to improve network automation.

Table 3-7: WP6 standard and industrial impact contributions.

Standard contributions title	Date	SDO	Hexa-X-II partners involved
Mobility challenges in virtualization environments (draft-bernardos-dmm-mobility-virtualization-02)	7/25/2023	IETF DMM WG	UC3
An Evolution of Cooperating Layered Architecture for SDN (CLAS) for Compute and Data Awareness (draft-contreras-coinrg-clas-evolution-02)	10/23/2023	IRTF COINRG	TID UC3
Deterministic Networking (DetNet) Controller Plane Framework (draft-ietf-detnet-controller-plane-framework-05)	9/22/2023	IETF DetNet WG	UC3
MIPv6 RAW mobility (draft-bernardos-detnet-raw-mobility-00)	9/11/2023	IETF DetNet WG	UC3
Intent-driven Closed Loops Introduction	22/05/2023	ETSI ZSM	EBY EAB
Intent-driven closed loop and additional services	31/08/2023	ETSI ZSM	EBY EAB
ETSI ZSM: Additional Services and Capabilities	05/06/2023	ETSI ZSM	EBY EAB
Intent-driven Closed Loop Governance Service	31/08/2023	ETSI ZSM	EBY EAB
S5-232907: "Rel-18 CR 28.541 Fix vague issues in EP_Transport with Federated network Modelling"	3/3/2023	3GPP SA5	NFI TID
S5-233058: "Proposed way forward for NSRULE isolation topic"	11/3/2023	3GPP SA5	TID
S5-233092: "DP on relationship between NEST, URSP and ServiceProfile"	3/3/2023	3GPP SA5	TID
S5-233896: "Add stage 3 for data type AvailabilityStatus"	5/26/2023	3GPP SA5	NFI TID EAB
S5-234586: "Add NetworkSliceController and NetworkSliceSubnetController IOCs to support asynchronous LCM operations"	5/26/2023	3GPP SA5	NFI TID EAB

S5-234587: "Update Procedure of Network Slice Instance Allocation to support asynchronous operations"	5/26/2023	3GPP SA5	NFI TID EAB
S5-234588: "Update Procedure of Network Slice Instance deallocation to support asynchronous operations"	5/26/2023	3GPP SA5	NFI TID EAB
S5-234589: "Update Procedure of Network Slice Instance Modification to support asynchronous operations"	5/26/2023	3GPP SA5	NFI TID EAB
S5-234590: "Update Procedure of Network Slice Subnet Instance Allocation to support asynchronous operations"	5/26/2023	3GPP SA5	NFI EAB TID
S5-234591: "Update Procedure of ne"twork slice subnet instance deallocation to support asynchronous operations	5/26/2023	3GPP SA5	NFI TID EAB
S5-234592: "Update Procedure of Network Slice Subnet Instance Modification to support asynchronous operations"	5/26/2023	3GPP SA5	NFI TID EAB
S5-234716: "InputToDraftCR Rel-18 28.533 on Access control for management service	5/26/2023	3GPP SA5	NFI TID
S5-234742: "Rel18 CR TS 28.541 Improve EP_Transport model to clarify connection point info	5/26/2023	3GPP SA	NFI EAB TID
S5-236015: "Rel-17 CR TS 28.312 Add missing stage 3"	8/25/2023	3GPP SA5	EAB TID
S5-236016: "Rel-18 CR TS 28.312 Add missing stage 3"	8/25/2023	3GPP SA5	EAB TID
S5-235664: "Discussion paper on GST version and Release"	8/25/2023	3GPP SA5	EAB TID
S5-236048: "Rel-18 CR TS 28.554 Correct reference and fix void section"	8/25/2023	3GPP SA5	TID
S5-236049: "Rel-17 CR TS 28.554 Correct reference and fix void section"	8/25/2023	3GPP SA5	TID
S5-236050: "Rel-16 CR TS 28.554 Correct reference and fix void section"	8/25/2023	3GPP SA5	TID
S5-235344: "pCR TR 28.836 Remove figure of how ServiceProfile can be represented by intent expectation components"	8/25/2023	3GPP SA5	TID
S5-237203: "DP on Service Management in SA5"	10/13/2023	3GPP SA5	TID EAB
S5-237047: "Rel-18 CR TS 28.533 Add example of RAN domain management capabilities mapped with ZSM"	10/13/2023	3GPP SA5	TID
S5-237174: "pCR 28.836 Enhance benefit description in 4.6"	10/13/2023	3GPP SA5	EAB TID

Network resource allocation for Gaming using MEC BandWidth Management service and TeraFlowSDN	9/26/2023	ETSI ZSM	CTT TID
S5-232948: "pCR TR 28.836 Add solutions for expresing service and slice profile requirements as intent expectations"	03/03/2023	3GPP SA5	TID
S5-234698: "Discussion paper on isolation and sharing"	05/26/2023	3GPP SA5	EAB TID

4   Conclusion

This deliverable provides a detailed report on the standardisation impact and industry body activities of the Hexa-X-II project during its first year. It provides an accurate description of the project achievements in various SDOs and industry bodies. In particular, this document highlights the standardisation contribution per technical work package. In the last deliverable D7.8, the planned contribution to SDOs and industry bodies will again be updated and the final report on the standardization contribution will be presented.

Appendix A: Hexa-X-II partner abbreviations

Part. No.	Participant organisation name	Part. Short name	Country
1	NOKIA SOLUTIONS AND NETWORKS OY	NFI	FI
2	ERICSSON AB	EAB	SE
3	AALTO KORKEAKOULUSAATIO	AAU	FI
4	ALCATEL-LUCENT INTERNATIONAL	NFR	FR
5	APPLE TECHNOLOGY ENGINEERING B.V. & CO. KG	APP	DE
6	ATOS IT SOLUTIONS AND SERVICES IBERIA SL	ATO	ES
7	ATOS SPAIN SA ES	ASA	ES
8	CENTRE TECNOLOGIC DE TELECOMUNICACIONS DE CATALUNYA	CTT	ES
9	CHALMERS TEKNISKA HOGSKOLA AB	CHA	SE
10	ERICSSON ARASTIRMA GELISTIRME VE BILISIM HIZMETLERI ANONIM SIRKETI	EBY	TR
11	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	ICC	EL
12	INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM	IMEC	BE
13	LULEA TEKNISKA UNIVERSITET	LTU	SE
14	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	TNO	NL
15	NEXTWORKS	NXW	IT
16	NOKIA SOLUTIONS AND NETWORKS DANMARK AS	NDK	DK
17	NOKIA SOLUTIONS AND NETWORKS GMBH &CO KG	NGE	DE
18	ONE REALITY	ONR	SE
19	OPTARE SOLUTIONS SL	OPT	ES
20	ORANGE POLSKA SPOLKA AKCYJNA	OPL	PL
21	ORANGE SA	ORA	FR
22	OULUN YLIOPISTO	OUL	FI
23	OY L M ERICSSON AB	LMF	FI
24	PROMOZIONE PER L INNOVAZIONE FRA INDUSTRIA E UNIVERSITA ASSOCIAZIONE	PIU	IT
25	QAMCOM RESEARCH AND TECHNOLOGY AB	QRT	SE
26	QUALCOMM COMMUNICATIONS SARL	QLC	FR
27	SAS IDATE	IDA	FR
28	SEQUANS COMMUNICATIONS SA	SEQ	FR

29	SIEMENS AKTIENGESELLSCHAFT	SAG	DE
30	SIEMENS AKTIENGESELLSCHAFT OESTERREICH	SAT	AT
31	SIEMENS INDUSTRY SOFTWARE OY	SIS	FI
32	SONY NORDIC (SWEDEN), BRANCH OF SONY EUROPE B.V. (NL)	SON	SE
33	TECHNISCHE UNIVERSITAET DRESDEN	TUD	DE
34	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	VTT	FI
35	TELECOM ITALIA SPA	TIM	IT
36	TELEFONICA INVESTIGACION Y DESARROLLO SA	TID	ES
37	TELENOR ASA	TNR	NO
38	UBIWHERE LDA	UBW	PT
39	UNIVERSIDAD CARLOS III DE MADRID	UC3	ES
40	VODAFONE GROUP SERVICES GMBH	VGS	DE
41	WINGS ICT SOLUTIONS INFORMATION & COMMUNICATION TECHNOLOGIES IKE	WIN	EL
42	BARKHAUSEN INSTITUT GGMBH	BI	DE
43	NXP SEMICONDUCTORS GERMANY GMBH	NXP	DE
44	TECHNISCHE UNIVERSITAET KAISERSLAUTERN	TUK	DE

References

[3GPP]	Available: https://www.3gpp.org/.
[6GSNS]	Smart Networks and Services Joint Undertaking (SNS-JU), Available: https://smart-networks.europa.eu/sns-phase-1/
[BER23]	Body of European Regulators for Electronic Communication (BEREC) Available: https://www.berec.europa.eu/en
[ETSI]	European telecommunications Standards Institute Available: https://www.etsi.org/
[GSMA]	Global System for Mobile Communication (GSMA) Available: https://www.gsma.com/
[HEX23-D71]	Hexa-X-II Deliverable D7.1, "Online project presence" Jan. 2023, [Online]. Available: https://hexa-x-ii.eu/
[HEX23-D72]	Hexa-X-II Deliverable D7.2, "Planning for dissemination, exploitation, standardization and clustering" April 2023, [Online]. Available: https://hexa-x-ii.eu/wp-content/uploads/2023/05/Hexa-X-II_D7.2_v.1.0.pdf
[IETF]	Internet Engineering Task Force (IETF) Available: https://www.ietf.org/
[ITU]	International Telecommunication Union Available: https://www.itu.int/en/Pages/default.aspx
[NGM22]	Alliance, N. G. M. N. "6G use Cases and Analysis." v1. 0, February (2022). Available: https://www.ngmn.org/wp-content/uploads/220222-NGMN-6G-Use-Cases-and-Analysis-1.pdf
[NGMN]	Next Generation Mobile Networks Available: https://www.ngmn.org/
[nGRG]	ORAN Next Generation Research Group, Available: https://www.o-ran.org/blog/o-ran-ngrg-workshop-complementing-o-ran-alliance-f2f-meetings-in-madrid-in-october-2022
[ORAN]	Open Radio Access Network Alliance (ORAN) Available: https://www.o-ran.org/.
[RFC35]	BCP 95 RFC 3935 Available: https://www.rfc-editor.org/rfc/pdfrfc/rfc3935.txt.pdf