D1.1 Project management plan

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Control sheet

Version history			
Version	**Date**	**Modified by**	**Summary of changes**
V0.1	15/11/2021	Eirini Liotou	Draft for peer review
V1.0	30/11/2021	Eirini Liotou	Submitted version
V2.0	10/10/2022	Eirini Liotou	New version addressing the comments from the interim project review and some formatting changes

Peer review		
	Reviewer name	**Date**
Reviewer 1	Andrea Suárez García (VICOM)	22/11/2021
Reviewer 2	Dimitris Klonidis (UBI)	26/11/2021
Reviewer 3	Dimitris Klonidis (UBI)	12/10/2022

Legal disclaimer

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ABBREVIATIONS

Abbreviation	Definition
5G-PPP	5G Infrastructure Public Private Partnership
ACOV	Augmented Reality Content Delivery for Vehicular Networks
AF	Application Function
AI	Artificial Intelligence
AMD	Amendment
AOEP	Automotive Open Experimental Platform
API	Application Programming Interface
CCAM	Cooperative, Connected and Automated Mobility
DML	Distributed Machine Learning
DoA	Description of Action
EAB	External Advisory Board
EC	European Commission
FMEA	Failure Mode and Effects Analysis
GA	General Assembly
ICT	Information and Communications Technology
IPR	Intellectual Property Rights
MANO	Management and Orchestration
MCAD	Manoeuvres Coordination for Autonomous Driving
MEC	Multi-Access Edge Computing
ML	Machine Learning
MS	Milestone
NDA	Non-Disclosure Agreement
NF	Network Function
NSTAT	Network Status Monitoring
ORDP	Open Research Data Pilot

PC	Project Coordinator
PCDD	Parking Circulation & High Risk Driving Hotspot Detection
PESTLE	Political, Economical, Soci(Et)Al, Technical, Environmental, Legal
PM	Person Month
PU	Public
RMD	Remote Driving
RPN	Risk Priority Number
S&T	Science and Technology
SA	Stand Alone
SACBT	Situational Awareness in Cross Border Road Tunnel Accidents
SC	Steering Committee
SME	Small and Medium Enterprises
TC	Technical Coordinator
TM	Technical Manager
TMT	Technical Management Team
UC	Use Case
UCL	Use Case Leader
VBT	Virtual Bus Tour
VNF	Virtual Network Function
WG	Working Group
WP	Work Package
WPL	Work Package Leader

Executive Summary

The aim of 5G-IANA (the Project) is to provide an open and enhanced experimentation platform that will provide access to 5G network resources, on top of which third party experimenters (i.e., SMEs) in the Automotive-related 5G-PPP vertical will have the opportunity to develop, deploy and test their services.

The importance of the Project, in terms of innovation and the diversity of partners involved, call for a carefully designed management plan for the Project.

The present document fulfils the requirement of deliverable D1.1 – *Project Management Plan* – of 5G-IANA within WP1. Deliverable D1.1 lays out the organisational structure and the management procedures and processes that 5G-IANA will employ in order to ensure that the workflow is smooth and a good system of internal communication exists to ensure the efficient running of the Project. The plan described in this document has a direct bearing on the performance of Task T1.1 – *Administrative and financial coordination* and part of Task T1.2 – *Technical coordination, innovation and IPR management*.

Deliverable D1.1 is structured as follows:

Chapter 1 – *Introduction* – outlines the concept and approach of 5G-IANA. It elaborates the purpose of this deliverable as a plan for coordinating the Project, intended for Consortium members and the European Commission.

Chapter 2 – *Project overview* – outlines the Project's concept and approach, and describes the consortium mix, the Project work plan, including Work Packages as well as the main Deliverables and Milestones.

Chapter 3 – *Project management* – describes the management structure covering both operational and strategic management. The responsibilities of the different bodies and the role of the Technical Management Team are described. The chapter also details the management processes and procedures. The overall project management processes relate to progress reporting and evaluation of results, planning and implementation of changes, project administration and contract management, and project meeting procedures. The management procedures described have to do with conflict

resolution, resource use and payment rules. Finally, this chapter describes the technical management procedures regarding risk management.

Chapter 4 – *Project coordination and communication tools* – describes the various tools that are used for organising, monitoring, and controlling the whole Project as well as for communication purposes among the consortium members.

Chapter 5 is the *Conclusion.*

This deliverable draws substantially from the 5G-IANA Grant and Consortium Agreements and together with these documents will serve as a central reference for all project coordination issues.

1. INTRODUCTION

1.1. Purpose of the deliverable

Deliverable D1.1 – *Project Management Plan* – outlines the management strategy and tools that will ensure the effective execution of Task T1.1 – *Administrative and financial coordination* and Task T1.2 – *Technical Coordination, innovation and IPR management* (specifically the *Technical Coordination* sub-task, while D1.3 and D1.6 will deal with the remaining sub-tasks of T1.2). It describes the governance bodies, relevant meetings, and the internal rules and procedures relating to or complementing the Grant Agreement and the Consortium Agreement, and includes the Risk Management Procedures.

Deliverable D1.1 will be complemented by D1.2 – *Quality management plan*, D1.3 – *Innovation management plan,* D1.4 – *Data management plan, D1.5 – Data management plan V2,* and *D1.6 – Innovation management report*, to provide an overall strategy for organisation and execution of core tasks to achieve the objectives of the Project Coordination Work Package (WP1) in terms of both operational and technical coordination.

1.2. Status of the deliverable

The information used in the deliverable and the situation description of the Project management procedures is based on the consortium and project plan situation as in the Project amendment AMD-101016427-2. Nevertheless, a new amendment request will follow, so as to address recommendations and comments from the interim project review.

1.3. Intended audience

The dissemination level of D1.1 is 'public' (PU) and available to members of the consortium, the European Commission (EC) Services and those external to the Project. This document is primarily intended to serve as an internal guideline and reference for all 5G-IANA beneficiaries, especially the governance bodies such as the General Assembly, the Technical Management Team, and the External Advisory Board.

2. PROJECT OVERVIEW

2.1. 5G-IANA concept and approach

5G-IANA aims at providing an open 5G experimentation platform, on top of which third party experimenters, i.e., Small and Medium Enterprises (SMEs) in the Automotive-related 5G-PPP vertical will have the opportunity to develop, deploy and test their services. An Automotive Open Experimental Platform (AOEP) will be specified, as the whole set of hardware and software resources that provides the computational and communication/transport infrastructure as well as the management and orchestration components, coupled with an enhanced NetApp Toolkit tailored to the Automotive sector. 5G-IANA will expose to experimenters secured and standardized Application Programming Interfaces (APIs) for facilitating all the different steps towards the production stage of a new service. 5G-IANA will target different virtualization technologies integrating different Management and Orchestration (MANO) frameworks for enabling the deployment of the end-to-end network services across different domains (vehicles, road infrastructure, Multi-access Edge Computing (MEC) nodes and cloud resources). 5G-IANA NetApp toolkit will be linked with a new Automotive Virtual Network Functions (VNFs) Repository including an extended list of ready to use open accessible Automotive-related VNFs and NetApp templates, that will form a repository for SMEs to use and develop new applications. Finally, 5G-IANA will develop a Distributed Artificial Intelligence / Machine Learning (AI/ML) (DML) framework, that will provide functionalities for simplified management and orchestration of collections of AI/ML service components and will allow ML-based applications to penetrate the Automotive world, due to its inherent privacy preserving nature. 5G-IANA will be demonstrated through 7 Automotive-related use cases in 2 5G Stand Alone (SA) testbeds. Moving beyond technological challenges, and exploiting input from the demonstration activities, 5G-IANA will perform a multi-stakeholder cost-benefit analysis that will identify and validate market conditions for innovative, yet sustainable business models supporting a long-term roadmap towards the pan-European deployment of 5G as key advanced Automotive services enabler.

2.2. Consortium

5G-IANA Consortium comprises of 16 partners (including 10 SMEs) and 8 countries. The selection of partners of complementing multi-disciplinary

scientific and operational expertise secures a high-quality participation for addressing all aspects of the Project. The Consortium counts on major research organizations actively involved in national and EU 5G projects, telecom and IT organizations, a vendor, and highly expertized SMEs. These partners have not only the expertise to deal with 5G technologies and the Automotive-related services, but also the mandates for leading local and regional research and business development for this highly important 5G-PPP vertical. The 5G-IANA beneficiaries are presented at Table 1.

Table 1: 5G-IANA beneficiaries

No.	Short	Organisation name	Country
1	ICCS (Coord.)	INSTITUTE OF COMMUNICATION AND COMPUTER SYSTEMS	EL
2	NOKIA	NOKIA SOLUTIONS AND NETWORKS GMBH & CO KG	DE
3	UULM	ULM UNIVERSITY	DE
4	LINKS	LINKS FOUNDATION	IT
5	VICOM	FUNDACION CENTRO DE TECNOLOGIAS DE INTERACCION VISUAL Y COMUNICACIONES VICOMTECH	ES
6	TS	TELEKOM SLOVENIJE D.D.	SI
7	UBI	UBITECH LIMITED	CY
8	HIT	HIT HYPERTECH INNOVATIONS LTD	CY
9	BYL	BYLOGIX SRL	IT
10	FSCOM	FSCOM SARL	FR
11	NXW	NEXTWORKS SRL	IT
12	5COMM	5G COMMUNICATIONS FOR FUTURE INDUSTRY VERTICALS, S.L	ES
13	INC	INCITES CONSULTING SA	LU
14	O7	OSEVEN SINGLE MEMBER PRIVATE COMPANY	EL
15	COGN	COGNITIVE INNOVATIONS PRIVATE COMPANY	EL
16	ININ	INTERNET INSTITUTE, COMMUNICATIONS SOLUTIONS AND CONSULTING LTD	SI

2.3. Project work plan

Work on the 5G-IANA project will be carried out over a three-and-a-half-year period (42 months) starting on 1 June 2021 (M1) and ending on 30 November 2024 (M42) by the eight Work Packages (WPs) as described in Table 2 below. The actual technical work initiated on M3 with WP2.

Table 2: 5G-IANA work packages

WP	WP title	Lead	Start	End
WP1	Project management	ICCS	01	42
WP2	Specifications	LINKS	03	12
WP3	5G-IANA architecture development and integration	UBI	10	36
WP4	5G-IANA NetApps toolkit development	NXW	10	36
WP5	5G-enabled Automotive NetApps validation and demonstration	HIT	13	42
WP6	Market strategy, emergence of new actors and sustainability	INC	10	42
WP7	Dissemination, exploitation, standardisation and liaison activities	VICOM	01	42
WP8	Ethics	ICCS	01	42

To achieve the objectives of the Project, a work plan that reflects the different components and phases of development of 5G-IANA has been elaborated. WP2-WP5 are dedicated to development and innovation activities, while WP1 and WP6-WP8 are overarching support activities. Figure 1 shows a flow chart based on the Project's planned workflow and the expected interaction and interdependencies of the WPs.
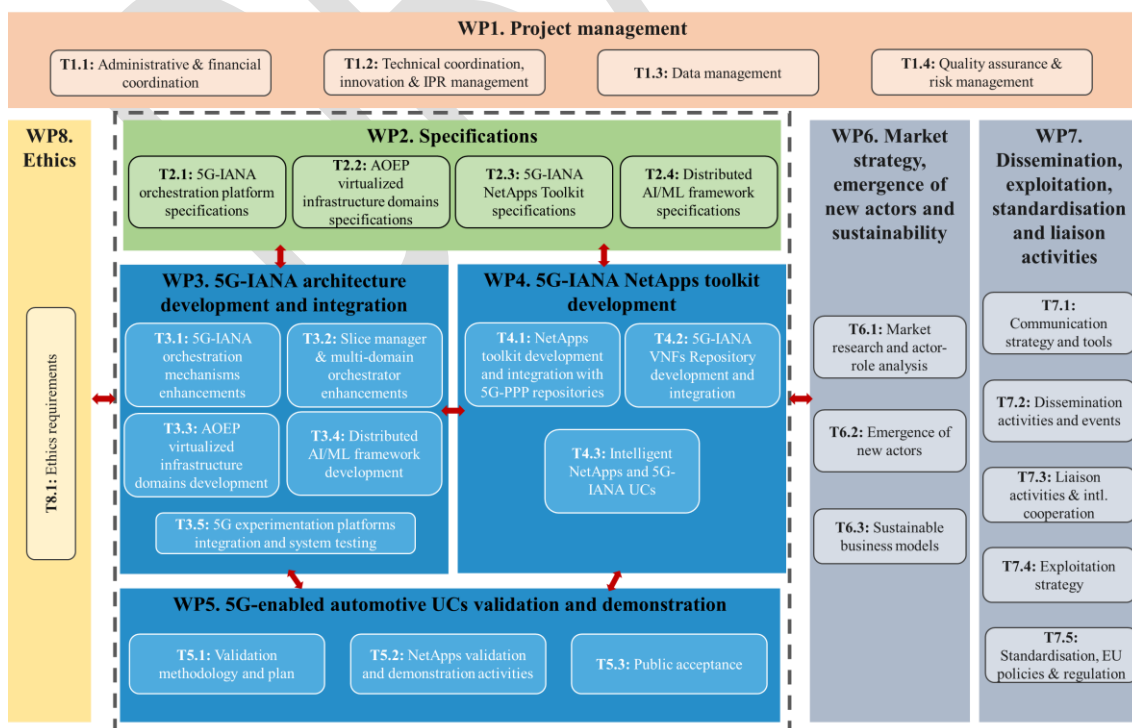
Figure 1: 5G-IANA project workflow

All WPs are divided into Tasks, with each one being responsible for delivering one or more deliverables referenced in the Description of Action (DoA) of the Grant Agreement. Each Task has a leader in charge of the overall coordination and completion of the Task, who will work in close coordination with the WP Leader (WPL). Task Leaders will conduct the first level of quality control before the deliverables are submitted for internal WP review (see D1.2 for more details).

2.4. Gantt chart

The project's work plan is broken down into tasks and displayed against a three-and-a-half-year time scale in Figure 2 (split in two pages for visibility purposes). The horizontal grey bars depict the duration of each task and show when the activity begins and ends. For each WP and Task, milestones and deliverables are indicated in the month in which they are due by means of green and yellow rectangles respectively.

A new amendment is currently under preparation, where most of the deliverables will change their status from Confidential to Public, in order to facilitate the third party experimenters (outside of the consortium) to become better acquainted with the development outcomes of the project (AOEP platform, NetApp repository, etc.).

5G-IANA — Project Gantt Chart

		Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
		Year 1												Year 2						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
WP1	**Project management**				MS1		MS2													
T1.1	Administrative and financial coordination						D1.1													
T1.2	Technical coordination, innovation and IPR management									D1.3										
T1.3	Data management plan (ORDP)									D1.4										
T1.4	Quality assurance and risk management						D1.2													
WP2	**Specifications**												MS5							
T2.1	5G-IANA orchestration platform specifications																			
T2.2	AOEP virtualized infrastructure domains specifications												D2.1							
T2.3	5G-IANA NetApps toolkit specifications																			
T2.4	Distributed AI/ML framework specifications																			
WP3	**5G-IANA architecture development and integration**																			
T3.1	5G-IANA orchestration mechanisms enhancements																			
T3.2	Slice manager and multi-domain orchestrator (core and on-vehicle) enhancements																			
T3.3	AOEP virtualized infrastructure domains development – On vehicle MANO																			
T3.4	Distributed AI/ML framework development																			
T3.5	5G experimentation platforms integration and system testing																			
WP4	**5G-IANA NetApps toolkit development**																			
T4.1	NetApps Toolkit development and integration with 5G-PPP repositories																			
T4.2	5G-IANA VNFs Repository development and integration																			
T4.3	Intelligent NetApps and 5G-IANA UCs																			
WP5	**5G-enabled Automotive NetApps validation and demonstration**																			
T5.1	Validation methodology and plan																D5.1			
T5.2	NetApps validation and demonstration activities																			
T5.3	Public acceptance																			
WP6	**Market strategy, emergence of new actors and sustainability**																			
T6.1	Market research and actor-role analysis																		D6.1	
T6.2	Emergence of new actors																			
T6.3	Sustainable business models																			
WP7	**Dissemination, exploitation, standardiztion and liaison activities**									MS13										
T7.1	Communication strategy and tools						D7.1													
T7.2	Dissemination activities and events								D7.2 & D7.4	D7.6										
T7.3	Liaison activities and international cooperation																			
T7.4	Exploitation strategy																			
T7.5	Standardisation, EU policies and regulations																			
WP8	**Ethics**																			
T8.1	Ethics requirements						D8.1													

...

	5G-IANA	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
				Year 2							Year 3											Year 4		
		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
WP1	Project management		MS3																					MS4
T1.1	Administrative and financial coordination																							
T1.2	Technical coordination, innovation and IPR management																							D1.6
T1.3	Data management plan (ORDP)		D1.5																					
T1.4	Quality assurance and risk management																							
WP2	Specifications																							
T2.1	5G-IANA orchestration platform specifications																							
T2.2	AOEP virtualized infrastructure domains specifications																							
T2.3	5G-IANA NetApps toolkit specifications																							
T2.4	Distributed AI/ML framework specifications																							
WP3	5G-IANA architecture development and integration		MS6															MS7						
T3.1	5G-IANA orchestration mechanisms enhancements																							
T3.2	Slice manager and multi-domain orchestrator (core and on-vehicle) enhancements		D3.1															D3.3						
T3.3	AOEP virtualized infrastructure domains development – On vehicle MANO																							
T3.4	Distributed AI/ML framework development																							
T3.5	5G experimentation platforms integration and system testing								D3.2									D3.4						
WP4	5G-IANA NetApps toolkit development						MS8											MS9						
T4.1	NetApps Toolkit development and integration with 5G-PPP repositories		D4.1															D4.3						
T4.2	5G-IANA VNFs Repository development and integration																							
T4.3	Intelligent NetApps and 5G-IANA UCs						D4.2											D4.4						
WP5	5G-enabled Automotive NetApps validation and demonstration			MS10																		MS11		
T5.1	Validation methodology and plan			D5.2																				
T5.2	NetApps validation and demonstration activities																						D5.3	
T5.3	Public acceptance																							D5.4
WP6	Market strategy, emergence of new actors and sustainability																							MS12
T6.1	Market research and actor-role analysis																							
T6.2	Emergence of new actors												D6.3											D6.5
T6.3	Sustainable business models					D6.2																		D6.4
WP7	Dissemination, exploitation, standardiztion and liaison activities																							MS14
T7.1	Communication strategy and tools		D7.3 & D7.5																					
T7.2	Dissemination activities and events																							D7.8
T7.3	Liaison activities and international cooperation																							D7.9
T7.4	Exploitation strategy			D7.7																				D7.10
T7.5	Standardisation, EU policies and regulations																							D7.11
WP8	Ethics																							
T8.1	Ethics requirements																							

Figure 2: 5G-IANA Gantt chart[1]

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[1] This GANTT shows the planning as of the most recent amendment.

2.5. Project deliverables

The Project has scheduled an extensive list of deliverables, in order to capture all project activities and technical progress (Table 3). During V2.0 of this document, the project has revisited the scope of all project deliverables and has decided to release all of them as Public, except for the ones related to exploitation or to techno-economical data. Therefore: D3.1, D3.2, D3.3, D3.4, D4.1, D4.2, D4.3, D4.4, D5.3, and D6.2 will become publicly available. D7.7 and D7.10 will remain Confidential. Also, D6.4 will stay Confidential since it will contain details regarding the costs and revenues prediction. An amendment will handle the official update of dissemination levels; however, this information is already included in Table 3 below (to be reviewed by the EC).

Table 3: List of deliverables

Del. No.	Deliverable Name	WP	Lead	Diss. level	Type	Delivery date
D1.1	Project management plan	1	ICCS	PU	R	M06
D1.2	Quality management plan	1	NOKIA	PU	R	M06
D1.3	Innovation management plan	1	UBI	PU	R	M09
D1.4	Data management plan	1	VICOM	PU	ORDP	M09
D1.5	Data management plan V2	1	VICOM	PU	ORDP	M21
D1.6	Innovation management report	1	UBI	PU	R	M42
D2.1	Specifications of the 5G-IANA architecture	2	LINKS	PU	R	M12
D3.1	Initial consolidated report on the 5G-IANA architecture elements	3	UBI	PU	R	M21
D3.2	Initial report on the integration of the 5G experimentation platforms	3	NOKIA	PU	R	M27
D3.3	Final consolidated report on the 5G-IANA architecture elements	3	UBI	PU	R	M36
D3.4	Report on the 5G experimentation platforms integration and testing	3	NOKIA	PU	R	M36
D4.1	First report on 5G-IANA NetApp Toolkit and VNFs Repository development	4	NXW	PU	R	M21
D4.2	First report on intelligent NetApps and 5G-IANA UCs development	4	HIT	PU	R	M25

D4.3	Final report on 5G-IANA NetApp Toolkit and VNFs Repository development	4	BYL	PU	R	M36
D4.4	Final report on intelligent NetApps and 5G-IANA UCs development and integration	4	HIT	PU	R	M36
D5.1	Initial validation KPIs and metrics	5	FSCOM	PU	R	M16
D5.2	Validation methodology	5	FSCOM	PU	R	M22
D5.3	Technical validation and demonstration of the UCs	5	HIT	PU	R	M40
D5.4	Public acceptance assessment	5	VICOM	PU	R	M42
D6.1	Market analysis and initial business models	6	INCITES	PU	R	M18
D6.2	Business models for 5G-enabled Automotive service provisioning	6	INCITES	PU	R	M24
D6.3	5G-IANA micro-projects integration report	6	ICCS	PU	R	M30
D6.4	Techno-economic analysis and sustainability of 5G-IANA business models	6	INCIT	CO	R	M42
D6.5	5G-IANA micro-projects services report	6	ICCS	PU	R	M42
D7.1	Brand identity and guidelines	7	VICOM	PU	DEC	M06
D7.2	Communication strategy and plan	7	VICOM	PU	R	M09
D7.3	Communication strategy and plan V2	7	VICOM	PU	R	M21
D7.4	Communication tools	7	VICOM	PU	DEC	M09
D7.5	Communication tools V2	7	VICOM	PU	DEC	M21
D7.6	Dissemination plan	7	ICCS	PU	R	M09
D7.7	Exploitation plan	7	INCIT	CO	R	M21
D7.8	Report on the dissemination activities	7	ICCS	PU	R	M42
D7.9	Report on international cooperation and liaison activities	7	LINKS	PU	R	M42
D7.10	Exploitation report	7	INCIT	CO	R	M42
D7.11	Standardisation activities, EU policies and regulations recommendations	7	FSCOM	PU	R	M42
D8.1	Ethics requirements	8	ICCS	PU	R	M06

2.6. Key milestones

In order to keep track of the overall project progress and ensure an effective monitoring plan, a list of milestones has been set, as shown at Table 4.

Table 4: List of milestones

MS No.	Milestone name	Lead	WP	Due	Means of verification
MS1	Project effective kick-off	ICCS	WP1	M04	Minutes of the kick-off meeting.
MS2	Risk and quality procedures established	ICCS	WP1	M06	All necessary documentation and procedures are finalised by the TMT and adopted by WPLs. D1.1 and D1.2 submitted.
MS3	Mid-term progress report	ICCS	WP1	M21	Every activity report and cost justification for the first half of the Project are delivered and consolidated in accordance with the quality procedures – Submitted to the EC.
MS4	Project successfully completed (Final progress report)	ICCS	WP1	M42	All activities are finished and all activity reports are finished for final review by the EC.
MS5	5G-IANA Specifications defined	LINKS	WP2	M12	All WP2 deliverables successfully submitted.
MS6	First version of the 5G-IANA architecture development completed	UBI	WP3	M21	D3.1 deliverable successfully submitted.
MS7	5G-IANA architecture developed and integrated to the 5G experimentation platform	UBI	WP3	M36	D3.3-D3.4 deliverables successfully submitted and all integration actions were successfully verified.
MS8	First version of the 5G-IANA NetApps toolkit development	NXW	WP4	M25	D4.3 deliverable successfully submitted (also D4.1-D4.2 om M21).
MS9	NetApps toolkit developed (incl. VNFs Repository)	NXW	WP4	M36	All WP4 (D4.3-D4.4) deliverables submitted and

MS No.	Milestone name	Lead	WP	Due	Means of verification
					all VNFs and NetApps were developed.
MS10	Validation methodology and plan ready	HIT	WP5	M22	D5.2 deliverable successfully submitted.
MS11	5G-IANA UCs validation results available and demonstrations completed	HIT	WP5	M40	D5.3 submitted. Demos are achieved and all associated data have been correctly collected to conduct final public acceptance assessment.
MS12	Sustainable business models ready	INC	WP6	M42	D6.5 deliverable submitted.
MS13	Communication and Dissemination Strategy ready	VICOM	WP7	M09	Strategy and plan for communication, dissemination and exploitation documented and adopted by the consortium D7.2, D7.4 and D7.6 submitted.
MS14	Final Event	ICCS	WP7	M42	The Final event is successfully organised.

3. PROJECT MANAGEMENT

3.1. Management structure and functions

3.1.1. Project Management overview

Coordinating the 5G-IANA consortium is a composite task that requires an efficient management structure and decision-making processes for the:

- Establishment of a unified view of the overall approach and objectives, at all times.
- Oversight and completion of objectives (within agreed calendar, budget and quality of deliverables) both internally (within the consortium) and externally (i.e., the EC).
- Early identification, management and mitigation of risks.
- Efficient and effective collaboration and synergistic effects between and among involved entities.

5G-IANA has put in place a cohesive management structure to address the challenge of coordinating a project with partners working in many different locations. The 5G-IANA management structure has been defined to:

- Ensure seamless and straightforward coordination of the consortium while fulfilling the EC contractual obligations through the **Project Coordinator (PC)**.
- Ease communication and coordination at the thematic levels of the WPs in the **Technical Management Team (TMT)**.
- Enable efficient and fair decisions about project resources and objectives by the **Steering Committee (SC)**.
- Secure the alignment of the Project activities with the industry and the EU political agenda with the help of an **External Advisory Board (EAB)**.

The illustration in Figure 3 represents the 5G-IANA organisational and management structure, which will be detailed in the sections that follow. As depicted in Figure 3, four Managers are responsible for the cross-WP coordination of horizontal issues being: **Technical & Innovation Manager** (who coincides with the **Technical Coordinator – TC** role), **Risk & Quality Manager**, **Data Manager & Protection Officer** and **Communication Manager**. These Four Managers have been assigned key tasks within the Project.

At the top level is the **PC** monitoring the progress of all WPs and Managers and leading the meeting agendas and discussions as well as deciding about the solutions to solve issues. Around the **TMT**, two entities are supporting the success of the 5G-IANA project coordination:

- The **External Advisory Board (EAB)**, supporting the alignment of the Project with the current research, societal and industry needs.
- 5G-IANA liaison with **5G-PPP** that exchanges information and coordinates the impact of all ongoing 5G projects. 5G-IANA has also initiated synergies with other ICT-41 projects, not only via the vehicles of 5G-PPP but also on a bilateral basis.
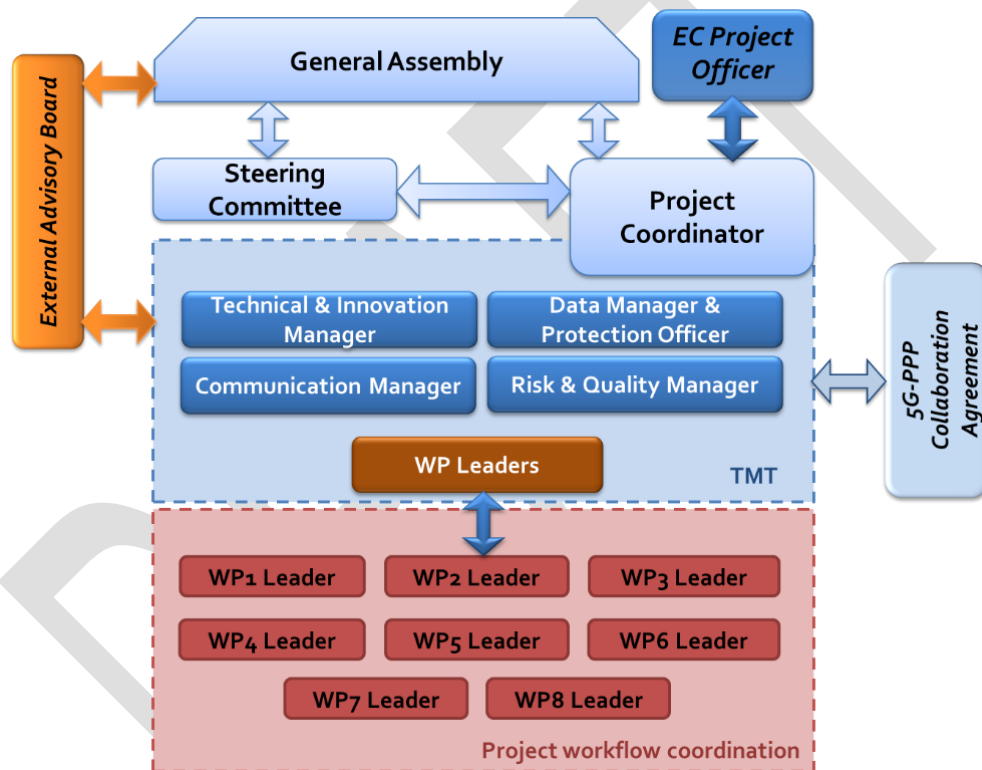

Figure 3: 5G-IANA organizational and management structure

The **General Assembly (GA)** is the body where all project beneficiaries are represented and, thus, can vote all decisions either relating to changes in the Project plans or decisions submitted by the **TMT**, in case of a lack of consensus. The **PC** chairs the meetings of the **TMT** and the **GA** and is the unique point of contact with the **EC**. The management functions within 5G-IANA will be performed at two levels:

1. The **operational level**: The **PC** and the **TMT** carry out the day-to-day project management responsibilities – the planning, steering, and controlling of the

work progress from WPs and Use Cases (UCs), as well as the overall quality of results and the management of risks. The **Technical Coordinator (TC)** contributes significantly to these matters, as detailed later.

2. The **strategic level**: The **GA** approves the **PC** and **TMT** decisions and, if necessary, changes project plans or consortium. The **EAB** provides non-binding recommendations and counsel on project functions and activities.

The following sections present in detail the different bodies.

3.1.2. Operational bodies

3.1.2.1. Project Coordinator (PC - ICCS)

The Project Coordinator for 5G-IANA is ICCS, represented by the primary Coordinator Contact, Dr. Angelos Amditis, ICCS Research Director and I-SENSE Group Director, who has a wide experience in project and technical coordination for the past 20 years. Dr. Eirini Liotou is Deputy PC, and performs day-to-day project coordination. The PC and deputy PC are responsible for the successful and smooth running of the entire project and shall coordinate the Project according to EC rules and the terms of the Grant Agreement and the Consortium Agreement of the H2020 Programme. In more detail, as chairman of all management bodies, the responsibilities of the PC include:

- Monitor the effective and efficient implementation of the Project.
- Ensure the proper execution and implementation of the decisions of the GA.
- Organize (methodologies, tools, knowledge management) and pilot at project level the Science and Technology (S&T) management carried out by the WP leaders on WP basis.
- Monitor the compliance by the partners with their obligations.
- Assess the compliance of the Project with the work plan and, if necessary, propose modifications to it to the GA.
- Resolve conflicts on technical, financial and strategic issues and consult the GA if needed.
- Prepare meetings with the EC and related data and deliverables.
- Prepare plenary meetings where the GA is represented.
- Collect and consolidate the contributions for the progress and financial reports.

- Provide the GA with critical analysis on the global technical performance of the Project especially through a close follow-up of the Project level indicators as well as summarize related recommendations.
- Ensure on a daily basis the communication among the different partners, as well as arrange recurring GA teleconferences (telcos).
- The PC is also taking active participation in the setting up of a "third party engagement plan", not only monitoring but also contributing to the efforts of:
  - Setting up a "Rules and Procedures" document for third parties' experimentation (to help ensure that any required conditions are met for the admission of third parties to the project testbeds).
  - Setting up guidelines for applicants of the open calls (i.e., calls for submission of proposals from third parties for experimentation on the AOEP), as well as the eligibility criteria for their selection.
  - Assist actively in the promotion of the 5G-IANA platform and the preparation of respective promotional material, the identification and solicitation of appealing SMEs, and the design of a third party engagement workplan (phases, dates, etc.), among others.
  - The PC is also closely monitoring activities related to the openness and reusability of the AOEP platform components and of the Application Functions/Networks Functions (AFs/NFs), to make sure that all project activities are complying to this scope, including the showcasing and demo activities.

The PC serves as the sole, legitimate intermediary between the 5G-IANA Consortium and the EC. He is responsible for monitoring the Project's progress, providing periodic reports to the Commission, and organising technical reviews. Some specific activities that ICCS will carry out concerning the EC are to:

1. Inform the EC about events likely to significantly affect or delay the implementation of the action or the EU's financial interests, and inform the EC of circumstances affecting the decision to award the Grant or the compliance with requirements under the Agreement.
2. Submit deliverables and reports (periodic and final) to the EC.
3. Coordinate reviews of the EC to the Project.
4. Receive EU funding payments from the EC and distribute them to the beneficiaries.

5. Collect and review to verify consistency before submitting reports, other deliverables (including financial statements and related certifications) and specific requested documents to the EC.

In compliance with the Consortium Agreement, the PC is also responsible for keeping the contact list of 5G-IANA partner beneficiaries and other contact persons updated and available. He shall organise and chair all meetings of the strategic management bodies described later, and is responsible for the preparation, distribution and recording of the meeting documentation such as agendas and minutes. The PC organizes a recurring GA telco, where TMT attendance is required.

3.1.2.2. Technical Coordinator (TC - UBI)

Given the importance of the Project, 5G-IANA has designated the leader of Task T1.2 – *Technical coordination, innovation and IPR management* – as the Technical Coordinator (TC) (or, often equivalently called, **Technical & Innovation Manager** or simply **Technical Manager - TM**) of the Project. This role has been assigned to Dr. Dimitris Klonidis of UBITECH, Cyprus. In keeping with T1.2 responsibilities, the TC will play a crucial and active role in the overall coordination of the technical activities, including monitoring of their compliance with the Grant Agreement, Project advancement and use of resources. The TC also needs to ensure that the solutions proposed, and UCs conducted by 5G-IANA are technically sound, viable and in line with standardization activities. The TC carries out the technical coordination with the support of the Technical Coordination task partners, and the PC.

Specifically, the TC will:

- Monitor the activities of all WPs and UCs with regular teleconferences.
- Monitor and guarantee timely execution of all Project tasks against the Project Gantt chart.
- Especially monitor the deployment plans at the testbeds, raise issues during the TMT calls and propose solutions to solve the issues.
- Moderate technical decisions and manage conflicting choices for technical developments.
- Generate close working cooperation between the Work Package Leaders (WPLs) and Use Case Leaders (UCLs) – refine and refocus any activity as necessary.

- In collaboration with the Task T1.1, organise and convene regular TMT meetings for productive interaction among all the leaders.
- Monitor and control the production of the content of the deliverables from a technical and consistency point of view.

In terms of innovation management, the role of the respective manager is to have constant awareness of the project status with respect to the identified innovative outcomes, to monitor activities with respect to potential innovations (including new innovations driven by market needs), and to identify the readiness to generate new innovation pathways potentially exceeding the project objectives.

Understanding that coordinating both technical and innovation-related activities is quite challenging, the project has setup an "Innovation Monitoring System" (adding this also as a Risk to be monitored in the Risk Registry). The Technical and Innovation Manager together with all WPL and Task Leaders form the core of an Innovation Monitoring Team which actively monitors the activities and participates in the exchange of the development status information, with respect to platform module developments, the UC (NetApp) components and the infrastructure set up and specificities. These members together form the innovation culture and facilitate innovation enabling factors to develop the Innovation Solutions determined successfully and also to come up with new ideas and Innovation Solutions. More details about innovation management are included in D1.3 – Innovation Management Plan.

3.1.2.3. Technical Management Team (TMT)

The TMT is collectively responsible for the operational management of the Project and provides a link between the WPLs and the GA.

Through regular (bi-weekly) meetings, the TMT will monitor risks and identify problems and delays early. This enables the TMT to proactively prevent conflict situations and anticipate deviations from the Project plan. In addition, the TMT will meet physically during the GA/Plenary meetings. During these meetings, updates are exchanged among the leadership of the Project and towards the PC regarding progress achieved, issues and challenges on a per UC level and on per WP/Task level, as reported by the respective leaders. These regular updates are more targeted towards a higher management level and aim to ensure that all UCs and WPs are following through with their technical tasks towards achieving their objectives on time. In case that the

need for a deeper technical session is identified, the matter is passed on to the TMT.

The following bodies are part of the TMT:

1. The **Work Package Leaders (WPLs)**: Each WP has a clearly identified leader responsible for coordinating the work within the WP (cooperating with the TMT) and for setting WP objectives and milestones. The WPL is also responsible for monitoring progress of Tasks within his/her WP, as well as for inter-WP liaison. Each task has a leader too, who reports to the respective WPL. The WPLs report to the TMT and SC. Task Leaders assist the WPLs in planning, managing and performing their tasks. The WPLs will represent issues of the UCs as well, on behalf of the UCLs, who are responsible to coordinate and carry out activities related to the analysis, preparation, and execution of each 5G-IANA UC, with the ultimate objective of successfully conducting the demonstration trials. This structure fits 5G-IANA complexity and ensures flexibility as the decision making is made at the appropriate level with a well-defined succession of responsibility. Most WPs will be active in parallel and frequent exchange of information/results is foreseen.

2. The **Technical & Innovation Manager** (UBI) (serving as **Technical Coordinator**), who leads the innovation activities (T1.2 - Technical coordination, innovation and IPR management), will ensure that the Project coordination develops favourable conditions for innovation and takes necessary actions to make certain that the innovations will be effectively exploited after the end of 5G-IANA. More details on this role are also included in Section 3.1.2.2 above.

3. The **Data Manager & Protection Officer** (VICOM), who leads the Data Management Plan Task (T1.3), will ensure Project coordination in terms of the validation data collection, storage and handling, as well as their publication as part of the Open Research Data Pilot (ORDP). This Manager/Officer raises potential issues and proposes solutions for dealing adequately with data privacy and data protection regulations, and will liaise with the partners who will perform the demonstrations and the testbed members to ensure proper application of the Data Protection policies at the national level. This Manager/Officer is responsible for ensuring that "openness" will be fulfilled in terms of data produced by the project, in diverse forms (Technical data, Evaluation data, Data on project outcomes

and studies, and Data for third party engagement). More details about this kind of data are included in D1.4 – Data Management Plan.

4. The **_Risk and Quality Manager_** (NOKIA), who leads the Quality Assurance and Risk Management Task (T1.4), will ensure high quality of deliverables and outcomes of the overall Project targets. This Manager also supports Project coordination in achieving the milestones by monitoring the production of deliverables and by executing the risk management process. He also has the authority to approach the GA directly to ensure that risks related to the TMT and PC can and will be discussed at the highest body for decisions.

5. The **_Communication Manager_** (VICOM), who leads the Dissemination, Exploitation, Standardisation and Liaison Activities WP (WP7) and Communication Strategy and Tools Task (T7.1), will ensure that the Project is well coordinated for achieving excellent outreach with public events, scientific publications, and presentations.

The main roles of the TMT are as follows:

- Communicate regularly to monitor WP and UC progress and to discuss potential issues. The TMT includes a subset of all Project partners (Table 5).
- Hold periodic Teleconferences, chaired by the PC on a bi-weekly basis, to:
  - Assess the status and progress of all the Project activities and results.
  - Discuss issues and try to reach a consensus about the decisions for finding solutions and adapting the Project plan as necessary.
  - Assess the needs for changing the allocation of resources.
  - Monitor the risks in the risk register and potential mitigation measures in place, and identify new risks.
  - Discuss about the dates of the GA and prepare the agenda and the presentations.
  - Prepare the review meeting with the EC as well as the presentations.
  - Prepare the meetings with the EAB.
  - Discuss feedback from the EC or the EAB and propose corrective actions.
  - Support the dissemination activities and in particular the preparation of events and demonstrations.
- All members of the TMT will attend the important coordination meetings of the Project, particularly the official review meetings with the EC.

- As necessary, the TMT may create and instruct task forces, particularly to efficiently solve cross WP issues.
- Act as intermediary in cases of conflicts that cannot be resolved at WP level.
- Assess and approve calls for extraordinary GA meetings (beyond the required meetings).

The current members of the TMT are as described in the following Table 5.

Table 5: 5G-IANA Technical Management Team (TMT)

Role	Beneficiary	Leader	Deputy
WP leaders			
WP1 - Project Coordination	ICCS	Angelos Amditis (project coordinator)	Eirini Liotou (Day to day project coordinator)
WP2 - Specifications	LINKS	Edoardo Bonetto	Daniele Brevi
WP3 - Architecture	UBI	Thanos Xirofotos	Dimitris Klonidis
WP4 - NetApps toolkit	NXW	Francesca Moscatelli	Giada Landi
WP5 - Validation and demos	HIT / 5COMM	George Karagiannopoulos	Manuel Fuentes
WP6 - Market strategy	INC	Theodoros Rokkas	Ioannis Neokosmidis
WP7 - Dissemination	VICOM / ICCS	Andrea Suárez García	Sevi Christoforou
WP8 - Ethics	ICCS / VICOM	Eirini Liotou	Andrea Suárez García
Managers			
Technical & Innovation Manager	UBI / ICCS	Dimitris Klonidis	Konstantinos Katsaros
Data Manager & Protection Officer	VICOM / ICCS	Andrea Suárez García	Sevi Christoforou
Risk & Quality Manager	VICOM / ICCS	Markus Wimmer	Eirini Liotou
Communication Manager	NOKIA / ICCS	Andrea Suárez García	Eirini Liotou

In terms of the technical expertise itself, eight main technical expertise domains have been identified in the Project, with their respective experts, as well as by the two Testbed owners (NOKIA in Ulm, Germany and Telecom Slovenia in Slovenia).

Moreover, UCLs will play an important role in the coordination and implementation of each UC trial. Technical work will, therefore, progress mainly through the daily communication and ad-hoc meetings held on a continuous basis throughout the Project (usually led by the respective UCL) among the experts possessing such technical expertise. More details are given in the two following subsections.

3.1.2.3.1. Use Case leaders

The WPLs described previously will work closely with the Use Case Leaders (UCLs), in order to successfully and uniformly materialise all seven UCs of the Project, respecting and taking full advantage of the 5G-IANA AOEP potential. The UCLs (UC experts) are presented at Table 6.

The main role of the UCLs therefore spans in the following project management procedures (as presented in Section 3.2):

1. Convening and chairing periodic meetings. All UCs have setup such regular "internal" UC calls, that take place on a bi-weekly or monthly basis. The periodicity is subject to change throughout the course of the project and some UCs switch from one periodicity to another based on the current needs. Specific UC mailing lists have been setup by the PC that facilitate this communication.
2. Assessing risks that arise within their UCs, and proposing plans to move forward with respect to the comments received during the project reviews, together with the assistance of the TMT.
3. Cross-UC efforts have also started, as recommended during the interim project review. The UCLs are therefore the contact points for such cross-UC collaboration and communication.

Experience up to the writing of this document (M16) has shown that UCLs are very often requested to report to WPLs (mainly to WP4 and WP5 leaders as well as to the PC/TC), while they are the first contact points as well for contributing to the living project inventories (e.g., AF/NF repository, AF/NF manual, etc.).

Table 6: Use Case experts

Use Case	Use Case Leader	Use Case Team
USE CASE 1 (UC1-RMD)	5COMM - Manuel Fuentes	LINKS, NOKIA, VICOM, FSCOM, NXW, UBI

USE CASE 2 (UC2-MCAD)	BYL - Claudio Russo	NOKIA, 5COMM, LINKS, NXW, UBI
USE CASE 3 (UC3-VBT)	HIT - George Karagiannopoulos	NOKIA, 5COMM, LINKS, NXW, UULM, UBI
USE CASE 4 (UC4-ACOV)	COGN - Fotis Foukalas	NOKIA, LINKS, NXW, UBI
USE CASE 5 (UC5-PCDD)	O7 - Petros Fortsakis	ICCS, NOKIA, 5COMM, LINKS, NXW, UBI
USE CASE 6 (UC6-NSTAT)	UULM - Amr Rizk	NOKIA, FSCOM, ICCS, NXW, UBI
USE CASE 7 (UC7-SACBT)	ININ - Rudolf Susnik	TS, NOKIA, LINKS, NXW, BYL, UBI

3.1.2.3.2. Technical domain experts

The technical domains and the people who have the most expertise on them are shown in Table 7. The main role of the Technical Domain experts therefore spans in the following activities:

1. Convening meetings with specialised topics of discussion, that may require cross-WP/UC participation, before taking them to the whole TMT meeting, when and if such a need arises. Some of these experts are actually WP leaders as well, which makes any following required synchronisation easy.
2. Playing the role of a "Risk Caretaker" as also demonstrated in the Risk Registry (Appendix I), where for instance testbed owners are responsible for monitoring the risks and challenges related to their infrastructure, even though they are not WPLs.

However, the technical experts' role is not "official" in terms of project management (for instance, there is no reporting or relative management structure entailed). Experience up to the writing of this document (M16) has shown that the technical domain experts are mainly the contact persons for questions regarding the identified domains of expertise, in order to resolve issues quickly and more directly on an ad-hoc basis (e.g., Skype, e-mail or phone call). Therefore, keeping such a list has facilitated all partners (especially in the beginning of the project, i.e., following the writing of V1.0 of this document on M06).

Table 7: Technical domains & domain experts

Domain of Expertise	Domain Expert
Overall architecture	Dimitris Klonidis, UBI
Application orchestration (NetApps)	Thanos Xirofotos, UBI

Network orchestration	Francesca Moscatelli, NXW
CCAM technology (OBU, RSU)	Edoardo Bonetto, LINKS
Distributed AI/ML framework	Konstantinos Katsaros, ICCS
Evaluation & KPI testing	George Karagiannopoulos, HIT
Slovenia testbed	Peter Zidar, TS
Ulm testbed	Steffen Schulz, NOKIA

3.1.3. Strategic bodies

In addition to the TMT, 5G-IANA will rely on three other strategic bodies that will perform a complementary role to guarantee transparency, accountability and expert topical knowledge: the General Assembly (GA), the Steering Committee (SC), and the External Advisory Board (EAB).

3.1.3.1. *General Assembly (GA)*

The GA is the ultimate decision making and conflict resolution body of the Project. It will be chaired by the PC and attended by one representative of each partner. The GA will be responsible for the overall strategic orientation and policy of the Project. It will make sure that the adopted strategy is respected in order to reach excellence. Its tasks include:

- Assessment/agreement on project progress and resources status and allocations.
- Changes of Grant Agreement & technical annex to be submitted for EC approval.
- Changes to the work programme and its timing.
- Modifications to Consortium Agreement notably to Background Included, additions to list of Third Parties for simplified transfer, additions to Identified Affiliated Entities.
- Evolution of the consortium: conditions of entry and withdrawal of parties, identification of breach by a party or defaulting party.
- Agreeing on external opportunities.
- Ensuring the leverage effect of the Project and achievement of expected impacts.

The GA is, therefore, the highest decision-making body of 5G-IANA where all partners of the Consortium are represented. Upon recommendations from the TMT, the Risk & Quality Manager and/or the PC, the GA takes final decisions on the overall policy of the Consortium, on proposals for modifications or

extensions of the Grant Agreement or of the objectives of the Project. Decisions are reached by a GA vote of two-thirds of the membership voting in favour. The PC chairs the GA, which will meet physically one time per year and one remotely, to report and discuss progress. Attendance at the GA is mandatory and requires at least one representative of each beneficiary to be present at the meetings. Therefore, all partner representatives are expected to participate in GA decisions; when a representative cannot attend a GA meeting, he/she may give power to another from the same organisation. The GA meeting will follow a written agenda.

3.1.3.2. Steering Committee (SC)

The Steering Committee (SC), will be responsible for the proper execution and implementation of the decisions of the GA. It will monitor the effective and efficient implementation of the Project. In particular, the SC will:

- Collect information on the progress, IPR, dissemination, communication, etc., and resources status of the Project.
- Examine information to assess the compliance of the Project with the work plan and, if necessary, propose modifications to it to the GA.
- Resolve conflicts on technical, financial and strategic issues and consult GA if needed.
- Support the PC in preparing meetings with the EC and in preparing related data and deliverables.
- Prepare the content and timing of press releases and joint publications by the consortium or proposed by the EC.
- Propose and set up internal quality processes, common templates and communication tools.

3.1.3.3. External Advisory Board (EAB)

The EAB will act as external reviewer and offer non-binding advice and recommendations to ensure that:

- The Project is aligned with market and stakeholder needs and is developing according to industry standards.
- The cross-border issues identified in the Grant Agreement that 5G-IANA will address also align with the EAB's views on market deployment needs (use case 7).

- The overall Project results contribute to 5G deployment for Cooperative, Connected and Automated Mobility (CCAM) and the 5G action plan.

The EAB formation has been open to stakeholders from the global telecommunications and mobility community. The 5G-IANA EAB members have been defined, with the objective to include regulation authorities, vehicle manufacturers, and telecom industry stakeholders involved in the development of 5G deployment scenarios for automated mobility. The added value of the EAB will be to offer insights from different links of the value chain, in order to create a sustainable and exploitable AOEP platform.

The EAB will have access to the Project deliverables (with confidentiality agreements in place) and be available to answer specific questions from Consortium members on their specialty topics.

All recruited EAB members have been approved by the GA and have been asked to sign a non-disclosure agreement (NDA). A travel budget will be managed by ICCS to cover the members' travel costs to participate in EAB meetings if needed.

The formulated EAB (at the time of V2.0) is:

Table 8: 5G-IANA EAB members

Expert	Position	Expertise
Tomasz Mach	Technology Manager - Principal Engineer at Samsung Research UK	Connected and Autonomous Vehicles, B5G Telecoms
Dimitris Varoutas	Vice President of the Greek National Regulatory Authority for the electronic communications sector	Communication systems, techno-economic evaluation of network architectures and services
Enrico Ghia	Senior Consultant at I3P (incubator of Politecnico di Torino)	Strategic consultant for start-ups of the industrial sector
Richard Bishop	AUVSI	Automotive Sector
Achille Montanaro	Sales Director - Arduino Pro at Arduino	Networks and communications, Hardware and FPGA Technology

3.1.3.4. *Participation to 5G-PPP*

The PC/Deputy PC participates in the periodic Steering Board (SB) meetings. The deputy PC, and TC (or Deputy TC) participate in the periodic Technology Board meetings (TB).[2]

Moreover, the project has appointed one representative per Working Group (WG), who is responsible to monitor the activities and discussions taking place in each WG, identify opportunities for contribution of 5G-IANA, and report on a regular basis to the GA telco. This procedure has led so far to the participation in several 5G-PPP White Papers and other joint activities.

The exact 5G-IANA participation to 5G-PPP WGs is presented in the next Table.

Table 9 Representation of 5G-IANA to 5G-PPP WGs

Working Group	5G-IANA Representatives	Other 5G-IANA involved members
Pre-Standardization	Peter Schmitting (FSCOM)	-
Trials	Manuel Fuentes (5COMM)	Nicola Ciulli (NXW) Peter Schmitting (FSCOM)
Vision and Societal Challenges: *Business Validation, Models, and Ecosystem SG / BVME SG*	Theodoros Rokkas (INC)	-
5G Architecture	Dimitris Klonidis (UBI)	Konstantinos Katsaros (ICCS)
5G for CAM	Edoardo Bonetto (LINKS)	Manuel Fuentes, David Martín-Sacristán (5COMM) Gorka Vélez (VICOM)
Software Networks	Thanos Xirofotos (UBI)	Francesca Moscatelli (NXW)
SME WG	Janez Sterle (ININ)	David Martín-Sacristán (5COMM)

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[2] The Deputy PC has significantly assisted in the organisation of the 5G-PPP Face-to-Face SB and TB meetings that were hosted by ICCS in Athens on 5-6 October 2022. Moreover, the Deputy PC and Deputy TC have prepared the ICT-41 reference figure.

		(Nicola Ciulli – WG Co-Chair) (NXW) Eirini Liotou (ICCS)
Test, Measurement and KPIs Validation (TMV)	Konstantinos Katsaros (ICCS)	Janez Sterle (ININ)

3.2. Management processes and procedures

5G-IANA's Project Management Plan puts in place certain project-management processes and procedures to ensure that the workflow is smooth and that the Project delivers high-quality outputs within the defined scope and time. These processes and procedures are intended to facilitate risk and quality management and to ensure that the innovation and deployment objectives of the Project are attained.

3.2.1. 5G-IANA administrative management processes

Three processes contribute to the efficient and dynamic management of the Project: Progress reporting and evaluation of results; Planning and implementation of changes; Project administration and contract management; Project management tools and services (the latter described separately in Chapter 4).

3.2.1.1. Project administration and contract management

The conditions and procedures for a Grant Agreement amendment are set in Article 55 of the Grant Agreement. Requests for amendments to the Grant Agreement and significant Project changes and deviations must be submitted in writing to the PC. The Project beneficiary or WPL requesting the change must indicate to the PC the reasons for the proposed amendment and its consequences in terms of budget, work programme, etc. The PC must be informed as soon as a potential need for amendment to the Grant Agreement or a change to the Project plan is identified. Examples of subjects for contract amendment include (list not exhaustive):

- Partners joining or leaving the Project.
- Re-allocation of budget.
- Incorporation of requirements from the EC.
- Extension of contract duration.

- Modification of DoA (Annex 1 to the Grant Agreement, Milestones, Deliverables' submission date, Partner tasks, etc.).

The amendment request must be approved by a GA vote. It will then be forwarded by the PC to the EC on behalf of the Consortium.

The PC is responsible for updating the amendments in the Participant Portal.

3.2.1.2. Planning and implementation of changes

The PC must be informed in writing of any request for change to the DoA of the Grant Agreement. The communication must include the following information:

- The proposed change.
- Whether status of the contract must be changed.
- Justifications for the change.
- Impact of the changes on the Project plan.

Minor changes such as slight adjustments or internal shift of resources will be dealt within the periodic reporting and do not require a Grant Agreement amendment. Such changes, however, must always be indicated to the PC and have the approval of the WPL involved.

3.2.1.3. Progress reporting and evaluation of results

5G-IANA is bound by the Grant Agreement to provide periodic reports on its progress towards the Project objectives. A Periodic Technical Report reflecting the progress until M21 and a Final Report for the end of the Project in M42 must be provided to the EC. To complement these reports, 5G-IANA will produce seven Internal Reports.

3.2.1.3.1. Internal Reports

These reports entitled *Project Coordination Internal Reports* (numbered IR1.1 - IR1.7) will be produced every six months[3] (M06, M12, M18, M24, M30, M36, M42) to provide the status of each WP in terms of:

- Objectives of the period.

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[3] The exact periods are dependent on the moments of the official reports to ensure that an internal report overlaps with an official (interim/final) report.

- Progress towards objectives in this period, including milestones and deliverables.
- Justification and impact of delays and objectives not achieved.
- The situation regarding personnel and other costs.
- Any changes or deviations in the use of project resources or organisation.

The Internal Reports will be used to detect any need for corrective actions and will also be the basis for preparing the EC periodic reports. A risk register will be presented to the EC as part of the periodic reporting process. Recommendations arising from project periodic reviews will also be added as items to be addressed in the following reporting period.

Except for these 6-monthly reports, the PC sends a monthly report in the form of an e-mail to the whole consortium, summarising the activities of the past month per WP, reminding the milestones and deliverables for the next six months, and setting an action plan for the next month. This activity has started on M04 of the project, immediately after the project's technical kick-off meeting.

WPLs will be responsible for compiling the reports on work done by collecting status reports from their Task Leaders. When the timing overlaps with the official periodic report, the official report will serve as internal report as well.

Recommendations arising from project periodic reviews will also be added to be addressed in the following reporting period.

3.2.1.3.2. Interim and final periodic reports for the EC

Article 20 of the Grant Agreement obliges the PC to submit technical and financial reports to the EC. As with the Internal Reports, WP Leaders will work closely with Task Leaders to produce complete records of their activities and achievements towards objectives as well as the contribution of all the partners involved, as required by the Grant Agreement. These reports will also serve to justify Person Month (PM) costs reported by the beneficiaries. The reports will be sent to the PC for submission to the EC.

Information for all project activities (per WP) will be provided to the Project Officer and EU experts (reviewers) before each project review, namely, even if there are no planned periodic reports available just before a review. The PC will provide reviewers the latest two weeks in advance of a review meeting the necessary reports of the project activities for the period under review. Reporting will include also information about any tasks whose work may not be reported in any deliverable during the period under review.

The relevant text of Article 20 is reproduced below and will be the basis of 5G-IANA's reporting management plan. Below text *cannot* be used as substitute for the official text in the Grant Agreement and is for information purpose only.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1   Obligation to submit reports

The coordinator must submit to the Commission (see Article 52) the technical and financial reports set out in this Article. These reports include requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).

20.2   Reporting periods

*The action is divided into the following '**reporting periods**':*

- RP1: from month 1 to month 21

- RP2: from month 22 to month 42

20.3   Periodic reports — Requests for interim payments

The coordinator must submit a periodic report within 60 days following the end of each reporting period.

*The **periodic report** must include the following:*

*(a) a '**periodic technical report**' containing:*

   *(i) an **explanation of the work carried out** by the beneficiaries;*

   *(ii) an **overview of the progress** towards the objectives of the action, including milestones and deliverables identified in Annex 1.*

This report must include explanations justifying the differences between work expected to be carried out in accordance with Annex 1 and that actually carried out.

*The report must detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated '**plan for the exploitation and dissemination of the results**'.*

The report must indicate the communication activities;

   *(iii) a **summary** for publication by the Commission;*

   *(iv) the answers to the '**questionnaire**', covering issues related to the action implementation and the economic and societal impact, notably in the context*

of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;

(b) a '**periodic financial report**' containing:

(i) an '**individual financial statement**' (see Annex 4) from each beneficiary and from each linked third party, for the reporting period concerned.

The individual financial statement must detail the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) for each budget category (see Annex 2).

The beneficiaries must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts which are not declared in the individual financial statement will not be taken into account by the Commission.

If an individual financial statement is not submitted for a reporting period, it may be included in the periodic financial report for the next reporting period.

The individual financial statements of the last reporting period must also detail the **receipts of the action** (see Article 5.3.3).

Each beneficiary must **certify** that:

- the information provided is full, reliable and true;

- the costs declared are eligible (see Article 6);

- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and

- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);

(ii) an **explanation of the use of resources** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary, for the reporting period concerned;

(iii) not applicable;

(iv) a '**periodic summary financial statement**', created automatically by the electronic exchange system, consolidating the individual financial statements

for the reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

In addition to the periodic report for the last reporting period, the coordinator must submit the final report within 60 days following the end of the last reporting period.

The **final report** must include the following:

(a) a '**final technical report**' with a **summary** for publication containing:

   (i) an overview of the results and their exploitation and dissemination;

   (ii) the conclusions on the action, and

   (iii) the socio-economic impact of the action;

(b) a '**final financial report**' containing:

   (i) a '**final summary financial statement**', created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the **request for payment of the balance** and

   (ii) a '**certificate on the financial statements**' (drawn up in accordance with Annex 5) for each beneficiary, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

Beneficiaries with accounting established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange rates published in the C series of the Official Journal of the European Union, calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the Official Journal of the European Union for the currency in question, they must be converted at the average of the monthly accounting rates published on the Commission's website, calculated over the corresponding reporting period.

Beneficiaries with accounting established in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

20.7 Language of reports

All reports (technical and financial reports, including financial statements) must be submitted in the language of the Agreement.

20.8 Consequences of non-compliance

If the reports submitted do not comply with this Article, the Commission may suspend the payment deadline (see Article 47) and apply any of the other measures described in Chapter 6. If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder, the Commission may terminate the Agreement (see Article 50) or apply any of the other measures described in Chapter 6.

3.2.2. 5G-IANA management procedures

5G-IANA has defined a set of procedures to support the coordination tasks and to ensure the above processes are run efficiently. These procedures relate primarily to conflict resolution, resource management, and quality and risk assurance.

3.2.2.1. Conflict resolution

Consensus will be pursued as the general principle in the decision-making processes of 5G-IANA. Decisions in the Project will generally be taken at the lowest organisational level possible, i.e., starting with the Task Leaders. The TMT will be the preferred entity to solve most of the issues in a consensus-based manner. If the conflict remains unresolved at the TMT level, the GA will be consulted and will vote a decision for resolving the issue.

3.2.2.2. Procedure for resource reporting and management

Project resources are managed by the PC based on the Grant Agreement. 5G-IANA will provide the periodic reports required by the EC and also generate an internal report every six months, as also discussed previously in section 3.2.1.3.1 about the progress of the work, the achievements, the risks, as well as an overview of the resources spent. These internal reports (IR1.1 to IR1.7) will help in monitoring and controlling the Project and will be the basis for the provision of the EC periodic reports. They will also help in mitigating

performance issues from participants or anticipating the need for updating the Project Plan, including the reorganisation of resources.

The internal reporting procedure will be based on the official periodic reporting requirements and include input from all Project beneficiaries. These reports will comprise two parts:

- Part A will contain resource management reports for the period.
- Part B will describe the work done during that period.

In more detail:

1. Towards the end of the reporting period (M01-M06, M07-M12, etc.), the PC, ICCS, will send out a request to all partners to provide input in the dedicated templates.
2. For Part A, each beneficiary partner will report their resource use for the period based on a per task estimation of expected resource use; a summary of the activities performed will be provided along with justification for deviations.
3. For Part B, WPLs will collect input from Task Leaders and other beneficiaries and report the progress made in the provided template. The contribution of all beneficiaries involved in the WP will be briefly summarised.
4. The PC will use this report to ensure that Project activities are on course and all beneficiaries are contributing as expected.
5. Corrective action may include shifting resources (PMs) from non-performing partners.

3.2.2.3. Project meetings procedures

The procedures for organising meetings are part of section 6.2 – *General operational procedures for all Consortium Bodies* – of the 5G-IANA Consortium Agreement. It is essential to follow these procedures closely to ensure the validity of all decisions and actions of the Consortium.

3.2.2.3.1.   Convening meetings

5G-IANA meetings will be convened at various representation levels from a GA to Task and WP level.

In order to create synergies, cooperate and organize activities, periodic meetings have been scheduled at the Tasks and WP levels. The frequency and

timing of these meetings is set by the Task and WP Leaders as needed by their activities.

Management meetings will be held periodically to review the overall status of the Project. Such meetings are meant to ensure that the Project is on the right track and that the pace of work is on schedule. The following meetings take place on a regular basis:

1. **GA telcos**: These are chaired by the PC. There meetings have taken place on a weekly basis up to the writing of this document (M16). From now on, these telcos will continue on a monthly basis, given that the number of TMT meetings has increased as explained next.

2. **TMT telcos**: These are chaired by the PC and TC. These meetings have started (M16) to take place on a bi-weekly basis, and they have been transformed to two-hour slots.

3. **WP telcos**: These are chaired by each WPL. They also occur on a regular basis. Specifically, their periodicity at the time of writing is the following (subject to updates in the course of time):
   o WP2 meetings weekly (concluded with the revised delivery of D2.1)
   o WP3 meetings weekly
   o WP4 meetings bi-weekly
   o WP5 meetings weekly
   o WP6 meetings weekly
   o WP7 meetings monthly.

4. **UC telcos**: These are chaired by each UC leader. They occur on a bi-weekly or monthly basis (more details in Section 3.1.2.3.1).

Ad-hoc meetings often occur, on demand, to discuss specific matters (some very indicative results: NOKIA's frequency related challenges, reshaping of UC5 (between PC, TC and O7), Distributed Machine Learning (DML) specific discussions (ICCS and UULM), etc.).

Moreover, as the project tries to form and maintain strong liaison activities with the overall community, participation to the following online meetings takes place:

5. **5G-PPP telcos**: The PC participates in the Steering Board (SB) meeting. The PC and TC participate in the Technology Board meeting (TB). Moreover, the 5G-PPP 5G-IANA representatives and PC (PC: subject to availability) participate at the regular Working Group telcos.

6. **Cross-ICT-41 telcos**: A liaison activity with other ICT-41 projects has been initiated, where 5G-IANA PC and TC participate.

7. **EAB telcos**: Meetings with the EAB take place on an ad-hoc basis. The TMT participates in these meetings.

3.2.2.3.2. Notice of a meeting

The chairperson of the Consortium shall give notice in writing of a meeting to each Consortium member as soon as possible and no later than the minimum number of days preceding the meeting as indicated in table 10. These notices apply to physical/virtual/hybrid plenary meetings.

Table 10: 5G-IANA notification of management meetings

Body	Ordinary meeting	Extraordinary meeting
General Assembly	30 calendar days	15 calendar days
Technical Management Team	14 calendar days	7 calendar days

3.2.2.3.3. Sending the agenda

The chairperson of the Consortium shall prepare and send each Consortium member a written (original) agenda no later than the minimum number of days preceding the meeting as indicated in table 11. This mainly applies to physical meetings.

Table 11: 5G-IANA agenda availability for management meetings

Body	Ordinary meeting	Extraordinary meeting
General Assembly	21 calendar days	10 calendar days
Technical Management Team	7 calendar days	7 calendar days

3.2.2.3.4. Adding agenda items

Any agenda item requiring a decision by the Consortium must be identified as such on the agenda. Any Consortium member may add an item to the original agenda by written notification to all of the other members up to the minimum number of days preceding the meeting as indicated below (Table 12).

Table 12: 5G-IANA agenda modifications for management meetings

Body	Ordinary meeting	Extraordinary meeting
General Assembly	14 calendar days	7 calendar days
Technical Management Team	2 calendar days	2 calendar days

During a meeting the Members of a Consortium Body present or represented can unanimously agree to add a new item to the original agenda.

3.2.2.3.5.   Representation in meetings

All Consortium members should be present or represented at any meeting. They may appoint a substitute or a proxy to attend and vote at any meeting. Virtual representation, when possible, is permitted. Consortium meetings may also be held by teleconference or other telecommunication means. A meeting may be recorded after the consensus of all participants, and the recording will be shared with the partners.

3.2.2.3.6.   Minutes of meetings

The PC shall produce written minutes of each meeting which shall be the formal record of all decisions taken. He shall send the draft minutes to all members within fifteen (15) calendar days of the meeting. This mainly applies to physical (plenary/review) meetings, while for online telcos the meeting minutes are prepared within the same or the next day.

The minutes shall be considered as accepted if, within ten (10) calendar days from sending, no member has sent an objection in writing to the chairperson with respect to the accuracy of the draft of the minutes.

3.2.2.4. Management of risks and quality assurance

The purpose of Quality & Risk Management is to guarantee the timely delivery of the Project results with high quality. In 5G-IANA, there is a specific quality management plan (deliverable D1.2) while Risk management is part of the Project Management Plan (this Deliverable).

Risk management with a thorough analysis of potential risks and close monitoring of the defined corrective actions is an important factor in the 5G-IANA Project Coordination Plan. This is not only important in order to reach the objectives of 5G-IANA within the given time, budget and with high quality, but also to achieve a maximum of synergies with related projects.

For above reasons, 5G-IANA will use the Failure Mode and Effects Analysis (FMEA)[4] as the basis for risk-management. Although this process is usually employed for high-risk projects (where loss of life may be an effect), this structured approach offers 5G-IANA tools for discovery of potential failures in the design and processes of the Project's activities. The process within 5G-IANA has been visualized in figure 4, and as shown risk management is a cyclic

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[4] Raymond J. Mikulak, Raymond J. et al. 2017. The basics of FMEA (2nd ed.), Taylor and Francis; ISBN: 9781439809617.

process. For 5G-IANA, the periodicity is related to the internal reports. As part of reporting, the risk management cycle will be executed as well. During the process, a dedicated risk session is held to identify and analyse the risks. A 'risk' is defined as a future event precluding the achievement of the objectives of a certain activity or task. Risks can be identified by any consortium member.

Within the risk management cycle the following steps are executed:

1. Identifying risks:

- WP and Task Leaders will identify the risks relevant to their activities or tasks and subsequently properly and promptly inform the Risk & Quality Manager who will add them to the risk register. For the identification, PESTLE[5] is used to extend the FMEA view adding behavioural and legal viewpoints.
- Identification of risks is performed continuously during the last step (monitoring and acting upon risks) and periodically in dedicated risk sessions.

2. Analysing risks:

- Analysing risks is performed during the dedicated risk sessions.
- During this step, all risks are assessed for their relevance. If a risk is no longer relevant it may be closed. An example is a risk related to the specifications phase when the specifications have already been delivered.
- Risks are assigned a risk owner/caretaker, being the *person* who will be able to detect and/or manage the risk best.

3. Evaluate risks:

- All risks are rescored using the FMEA scoring methodology. This methodology assesses Severity (S), Occurrence Probability (O) and Detectability (D) using pre-defined scales. The result is a Risk Priority Number (RPN).
- To facilitate scoring, a clean risk sheet is circulated amongst the partners with the request to score the risks. At least responses from all WP leaders and TMT members are necessary. The scores are averaged and consolidated.

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[5] Political, Economical, Soci(et)al, Technical, Environmental, Legal

- The risk register will be ordered using the RPN. For the top 5 risks, mitigating measures must be defined by the owner in cooperation with the TMT. Mitigating measures can be defined to influence cause, risk and/or effect.
- These elements are detailed in Appendix I.

4. Monitoring and acting upon risks:

- The top 5 risks are actively monitored during the TMT sessions.
- The top 10 risks will be actively managed. This means that any preventive mitigating measure will be put in place.
- When a risk occurs, the mitigating measure(s) will be put in place.

The risks are materialised in a Risk register, which is based on the FMEA risk register. The risk register is updated by the Risk & Quality Manager. The complete list of quality management procedures is documented in D1.2 – *Quality Management Plan*. By defining clear procedures and establishing deadlines for deliverable production, review and submission, the Risk & Quality Manager will ensure low exposure to risk and the highest possible quality of 5G-IANA outcomes.

Table 17 in Appendix II presents the risks identified at the time of submitting this deliverable, in their updated form as of October 2022, while the risks are included in a shared collaboration space (Redmine), where they will be continuously monitored and updated after this date.
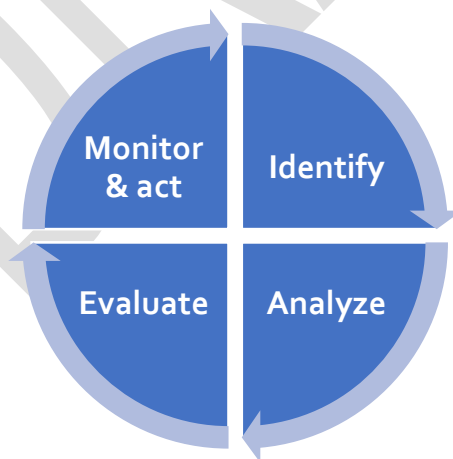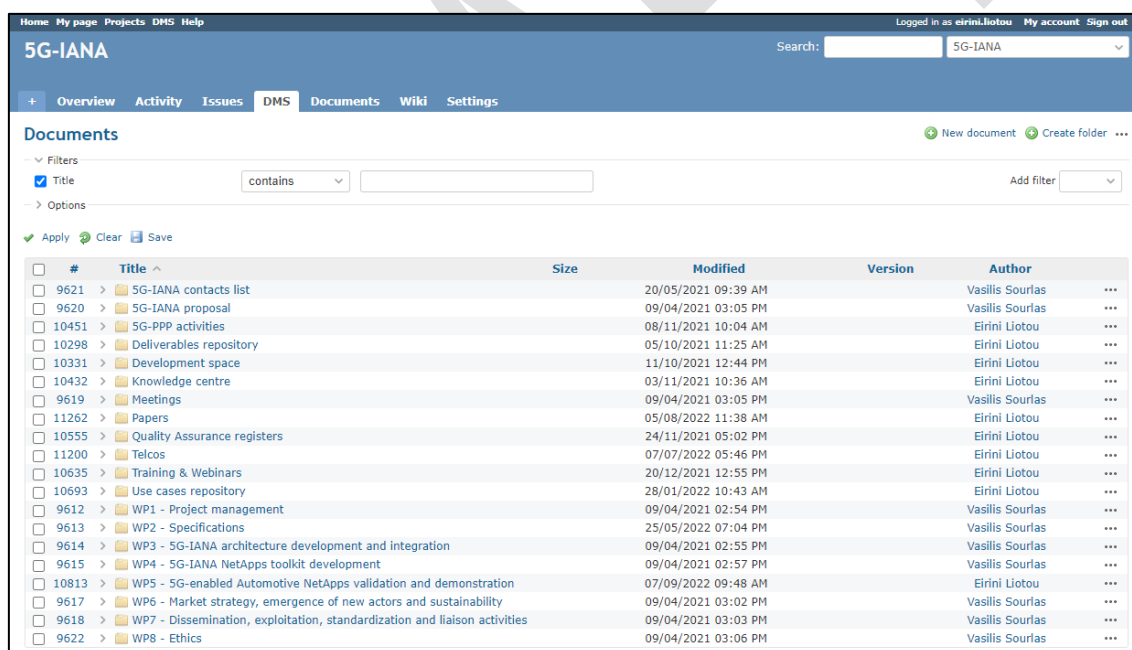
Figure 4: 5G-IANA risk management steps

4. PROJECT COORDINATION AND COMMUNICATION TOOLS

The successful execution of a project depends to a large extent on participants having good tools and services at their disposal to facilitate project-internal communication and streamline workflow. For a large project such as 5G-IANA such management tools are indispensable, and, thus, the Project has chosen a combination of tools for various purposes. The main ones are[6]:

- **Redmine**: The Project uses the Redmine web-based tool as a document repository and file exchange system, ensuring both safe storage of documents and supporting collaboration among partners (such as public deliverables, minutes and agendas, and for the various Project Registers) (Figure 5). Available at: https://redmine.iccs.gr/projects/5g-iana.

Figure 5: Root folders structure in Redmine for 5G-IANA (M16)

Moreover, the project uses Redmine-OnlyOffice as an online document collaboration tool, when the need to work collectively on a document arises (for instance, scientific papers, white papers, SW/AF/NF repositories, project workplan, collective monitoring of engagement plan, status of

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[6] The ClickUp tool (project management & planning tool) as well as the OpenProject (internal ICCS platform) reported in V1.0 of this document have been abandoned, in order to reduce the respective "micro-management" effort imposed (following the recommendations from the interim project review).

action points, to name a few). Some specific screenshots for such shared online documents are presented at Figure 6:

Figure 6: Indicative online documents in Redmine for 5G-IANA

- **GitLab:** GitLab is a web-based Git repository that provides free open and private repositories, issue-following capabilities, and wikis. It is a useful tool in order to perform various tasks, from project planning and source code management to monitoring and security. Furthermore, it allows teams to collaborate and build high-quality software. All appropriate developers

have been assigned per use case of 5G-IANA, based on the DoA, having the role either of a "maintainer" (with advanced privileges) or of a "developer" (Figure 7 and Figure 8). Available at: https://isense-gitlab.iccs.gr/5g-iana.
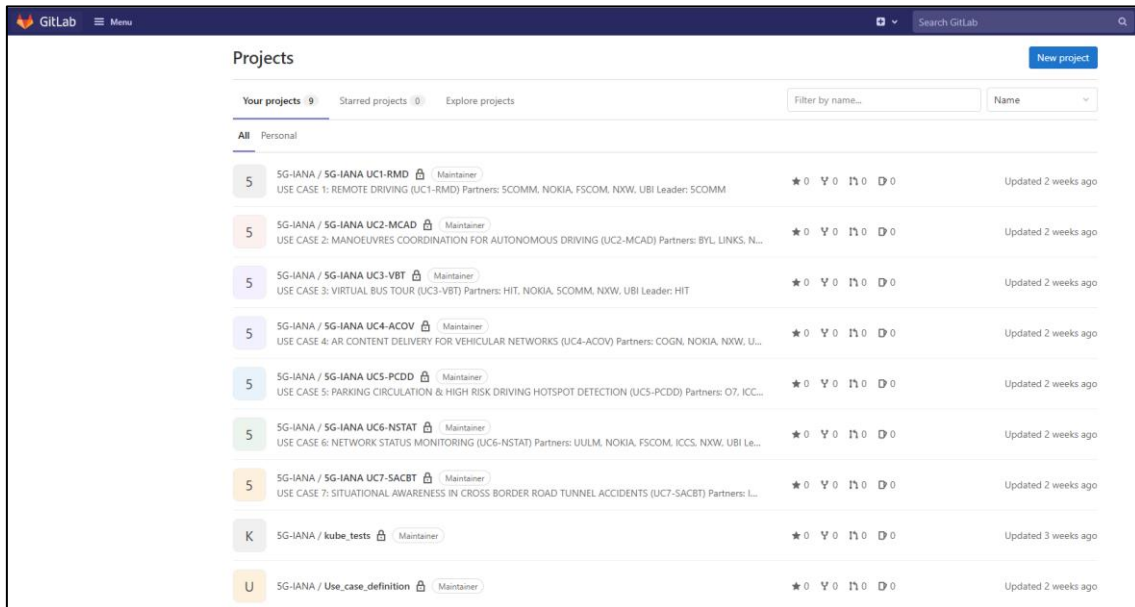
Figure 7: 5G-IANA GitLab projects
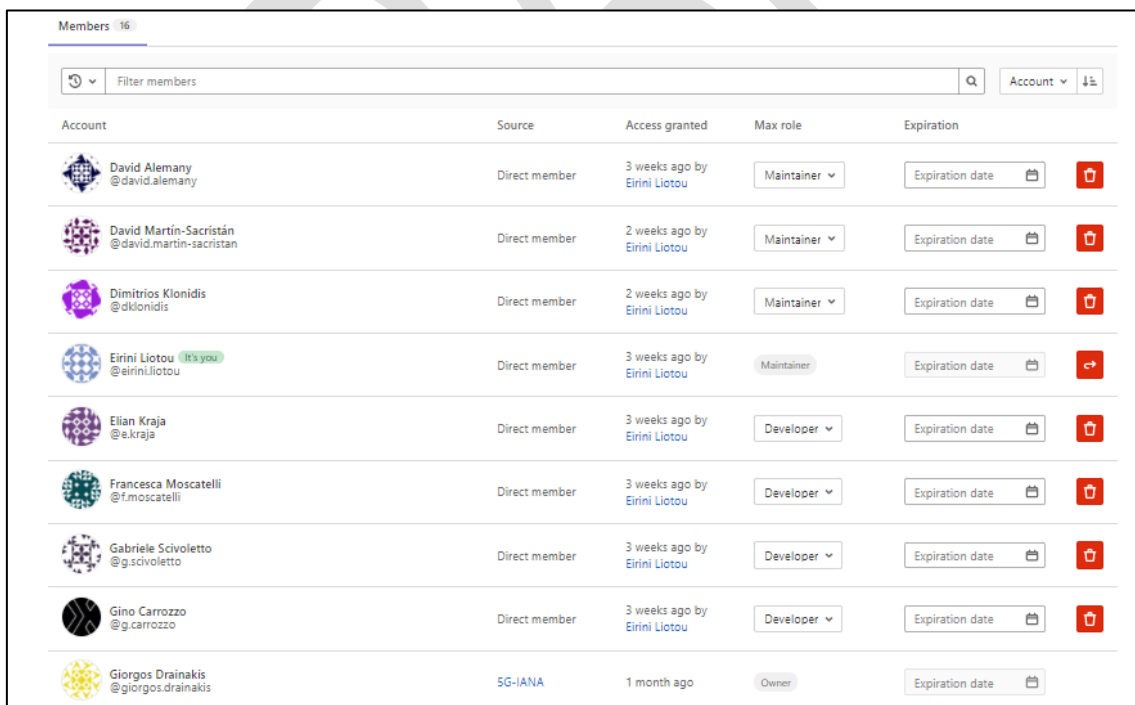
Figure 8: GitLab members for Use Case 1 (part)

- **Slack:** This is a workplace communication tool, "a single place for messaging, tools and files". This means Slack is an instant messaging

system, providing two methods of chat channels: group chat, and direct message (person-to-person chat). At the moment, there are eight Slack channels available, grouped thematically (Figure 9). Available at: https://slack.com/.
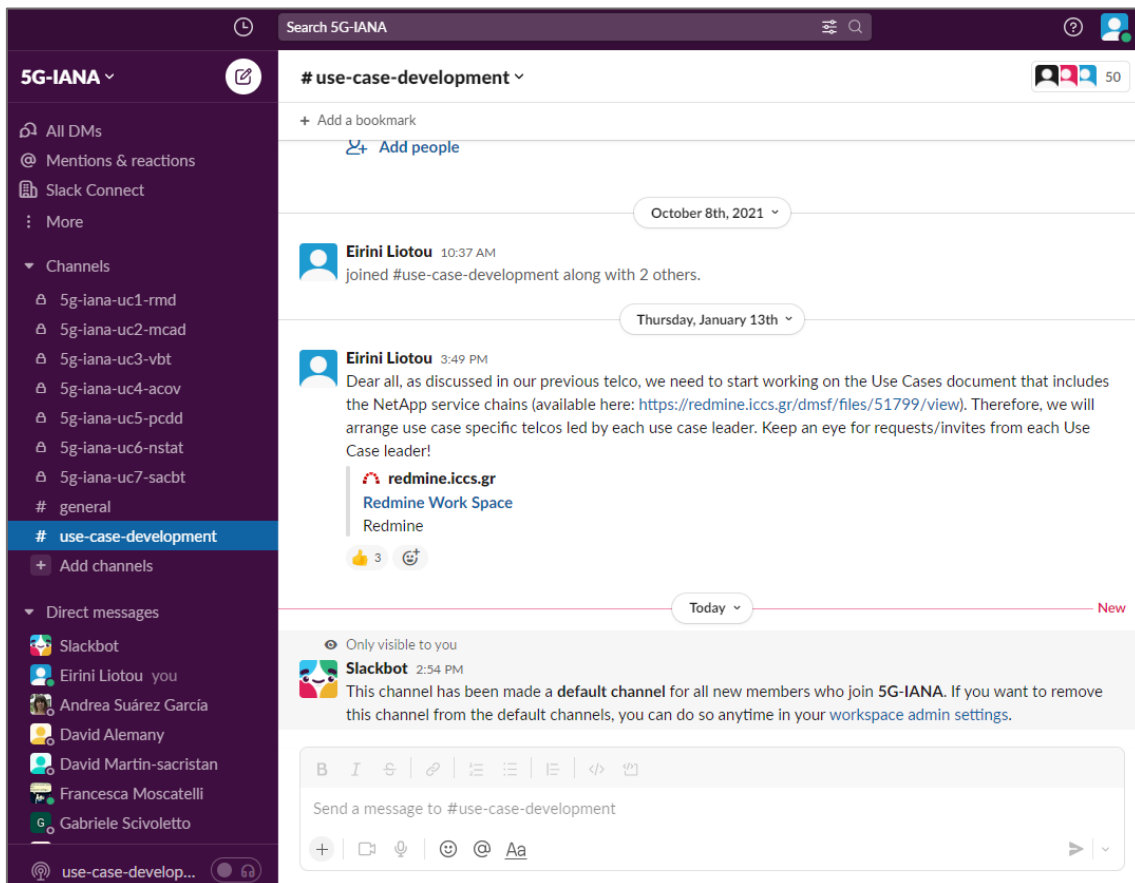
Figure 9: Slack channels

- **GoToMeeting:** This is the main platform used for the Project regular or on-demand telcos. Doodle is usually used in order to setup new meetings, so that all required attendees have the chance to vote their preferred timeslots (Figure 10). Available at: https://myaccount.logmeininc.com.
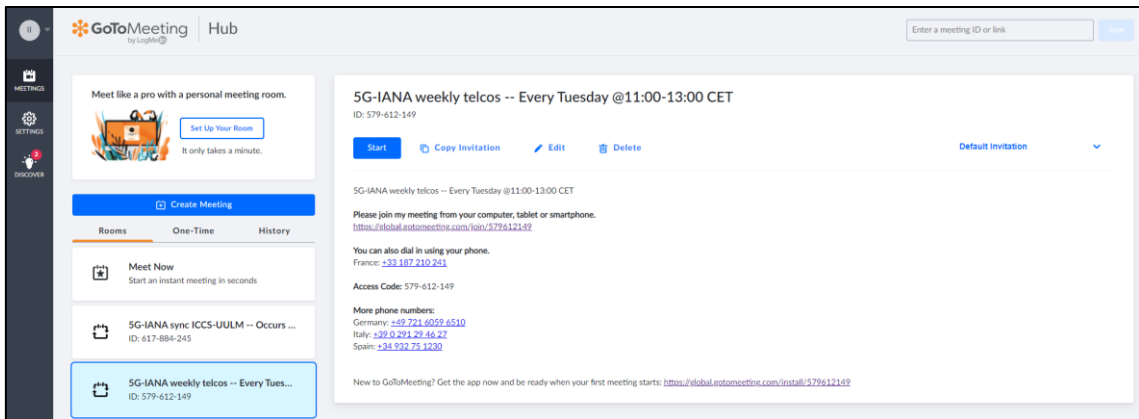
Figure 10: GoToMeeting hub (incl. 5G-IANA GA telco)

- **Website**: The main Project vehicle for communication and dissemination activities. Available at: https://www.5g-iana.eu/.

- **Sympa**: A listserv for targeted group-based internal communication (Figure 11). The [5G-IANA] tag is used in all communication. Available at: https://lists.5g-iana.eu/wws. The current mailing lists are consortium-wide, TMT-wide, WP-wide, and UC-wide (as well as one extra for admin-related issues). All lists are continuously updated when any partner requests so (e.g., new colleagues joining 5G-IANA).
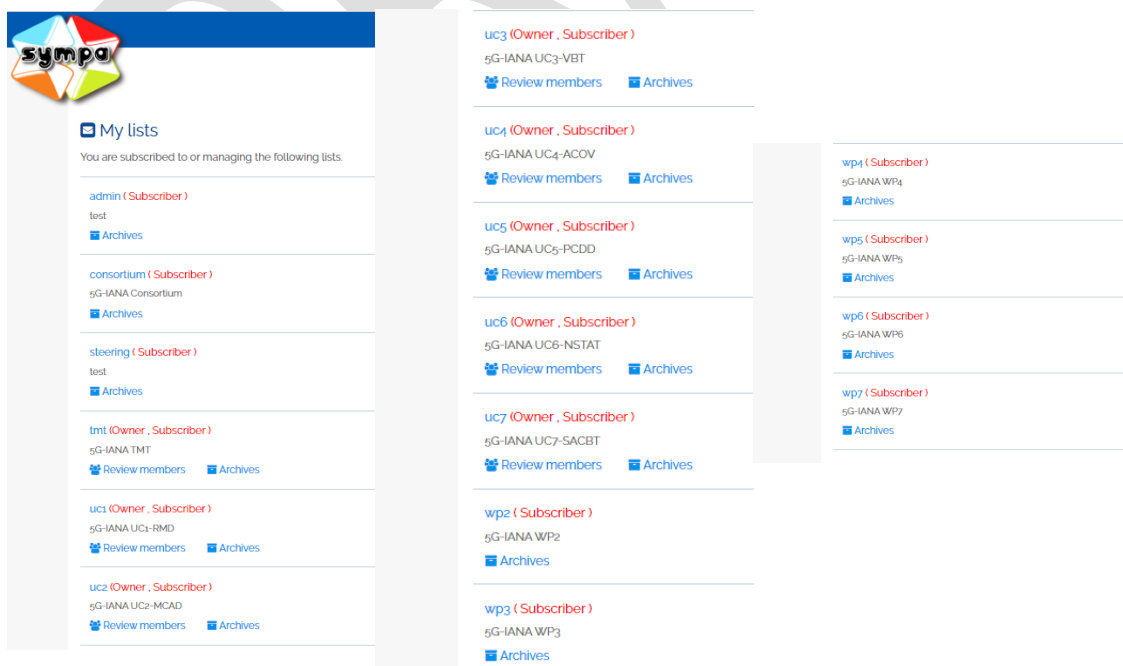
Figure 11: Sympa mailing lists in 5G-IANA

To ensure that the Consortium receives relevant information in a timely manner, without an excessive use of email, Project communication will reflect the structure of the Project and will target the smallest possible group of members (via email or listserv). Targeted information sharing will be based on the classification of internal communication as 1) communication related to *project activity execution*, or 2) communication related to *administrative matters*.

Communication relating to administrative matters (financial statements, signature of contracts, payments, etc.) will be targeted to the administrative staff of each organization, which is not necessarily involved in the execution of project activities. To make sure that the information reaches all the staff involved in the administrative management of the Project, the communication will be distributed to the contact persons identified as 5G-IANA contacts in the EC participant portal.

When the PC needs to communicate on administrative matters with the whole Consortium, he will address the list of contact persons downloaded from the EC participant portal. Therefore, in order not to miss any important administrative information, each partner has the responsibility to maintain this list up to date.

5. CONCLUSION

This document, deliverable D1.1 – *Project management plan*, is closely aligned with and takes as its starting point the Grant and Consortium Agreements of 5G-IANA. It details the roles and responsibilities of governance bodies as well as all beneficiaries and members of the Project Consortium. It describes the structures, tools, processes, and procedures that WP1 (*Project management*) has instituted to ensure that the Project runs smoothly and effectively and in accordance with the Grant Agreement.

An integral part of the *Project management plan* is 5G-IANA's risk management strategy based on the Failure Mode and Effects Analysis. It comprises these elements:

- Identification of risks, and registration of the identified risks in a Risk Registry available to all members.
- Estimation of the probability of the occurrence of the risk event.
- Estimation of the impact (i.e., the consequences) of the risk event.
- Definition of the mitigation strategy and risk response plan.
- Frequent updating and review of the Risk Registry by the Consortium management bodies, in particular through the regular TMT meetings.

D1.1 is specifically relevant for the execution of Tasks T1.1 (*Administrative and financial coordination*) and T1.2 (*Technical coordination sub-task*). This deliverable will be complemented by the other deliverables in WP1.

Together with the Grant Agreement and the Consortium Agreement, this document is to be regarded as a reference for the overall project management of 5G-IANA, to ensure good organisation of work effort and high quality of Project results.

APPENDIX I – RISK MANAGEMENT BY FAILURE MODE AND EFFECTS ANALYSIS

5G-IANA uses the Failure Mode and Effects Analysis (FMEA)[7] for its risk-management as a basis. This structured approach enables discovery of potential failures in the design and processes of the Project's activities. By analysing the harmful effects of failures, the FMEA can identify, prioritise and ultimately mitigate the failure modes.

The risk assessment procedure by way of FMEA comprises four main steps with sub-steps:

- Step 1 – Identification and definition of the risks
- Step 2 – Risk validation
- Step 3 – Assignment of Risk Prioritisation Number
- Step 4 – Identification of risk mitigation strategy

In section 3.2.2.4 the implementation within 5G-IANA is described.

Step 1 - Identification and definition of the risks

WP, UC and Task Leaders will identify the risks relevant to their activities or tasks and subsequently properly and promptly document them in the risk register. In addition to technical and organisational issues, possible risks will pertain to behavioural and legal issues as well. For each solution the following indicators should be provided:

- Risk identification → What is the risk associated with the implementation of this solution?
- Risk effect → What effect will the occurrence of this risk have?
- Risk cause → What could be a possible trigger for this risk?
- Risk detection and recognition → How would this risk be detected when it occurs?

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[7] Raymond J. Mikulak, Raymond J. et al. 2017. The basics of FMEA (2nd ed.), Taylor and Francis; ISBN: 9781439809617.

Step 2 - Risk validation

All risks will undergo a validation process to rank them and assess their priority. This step involves assessing each risk based on a severity, occurrence probability and detectability index.

- <u>Risk Severity (S)</u>

The severity levels for technical and organisational failures are presented in table 13.

Table 13: Unmitigated severity levels for risks

Rating	Severity (S)	Technical / Organisational issue
9 – 10	Disastrous	The most serious effect of the failure mode would result in Project failure.
7 – 8	Severe	The failure mode would result in disruption of one or more of the items in terms of the Project's scope/time/resource definition and require serious reorganisation.
5 – 6	Moderate	Failure mode would result in considerable delays, reworking or reorganisation. Some changes to roles and responsibilities may be required.
3 – 4	Slight	Failure mode would cause some minor delays or reorganisation.
1 – 2	Irrelevant	There would be no discernible effect in terms of the Project's end goal.

- <u>Risk Occurrence Probability (O)</u>

The occurrence probability index, presented in Table 14 below, provides a ranking based on the probability that all the risk causes related to the risk modes described in the analysis can occur.

Table 14: Risk occurrence indicator scale

Rating	Occurrence Probability (O)	Technical / Organisational issue
9 – 10	High	This failure mode is almost certain to occur.
7 – 8	Moderate	There is a moderate possibility for the failure mode to occur.
5 – 6	Occasional	There is a possibility of occasional occurrence of the failure mode.

| 3 – 4 | Remote | There is a slight probability that the failure mode will occur. |
| 1 – 2 | Improbable | It is unlikely that a failure mode will occur. |

- **Risk Detectability (D)**

Finally, the detectability index (table 15) describes the probability of detecting the occurrence of a risk mode identified in Step 1 of the methodology. Detection of a developing risk is crucial for overall risk management and early detection is a prerequisite for the effective application of mitigation strategies. Using additional sensors and processing along with monitoring and feedback throughout the Project are important tools for risk detection.

Table 15: Risk detectability indicator scale

Rating	Detectability (D)	Technical / Organisational issue
9 – 10	Low	It is impossible or improbable that the technical/organisational failure will be detected.
7 – 8	Fair	The issue is detected only in particular cases.
5 – 6	Moderate	It is probable that the technical/organisational issue will be detected.
3 – 4	Good	It is highly likely that the technical/organisational issue will be detected.
1 – 2	High	It is certain that the risk outcome will be detected.

Step 3 - Risk Prioritisation Number assignment

After each risk is classified based on the Severity (S), Occurrence Probability (O) and Detectability (D) indices, a Risk Priority Number (RPN) is assigned to it based on a straightforward formula:

$$RPN = S \times O \times D$$

Based on this equation, the RPN of each risk will vary from 0 to 1000 and fall into one of five categories: disastrous, severe, moderate, slight, or insignificant as shown in table 16.

Table 16: RPN and risk categorisation

Risk category	Risk Priority Number	Mitigation possibility
Disastrous	513 - 1000	Very High
Severe	217 - 512	High
Moderate	65 - 216	Medium
Slight	64 - 9	Low
Insignificant	0 - 8	Improbable

Step 4 - Mitigation strategies identification

The risk register will indicate the WPs or UCs implicated by the risk and assign a caretaker for each risk, who will follow its analysis and mitigation. Mitigation of the risks adverse effects will rely on a risk reduction strategy by way of an iterative process. Some ways to do this will include:

- Reducing the probability of the hazard occurring.
- Increasing failure detection speed and probability.
- Reducing the magnitude (severity) of the consequences of the potential hazard.
- Protecting against the risk-mitigating strategies to compensate for a failure (e.g., back-ups).

Table 17 presents the risks identified at the time of submitting this deliverable. As of November 2021, a risk register document in Redmine is continuously monitored and updated after this date.

APPENDIX II – RISK REGISTRY

Table 17: 5G-IANA critical risks and mitigation actions, sorted with descending RPN (M16)

Portal Id	Category	Potential failure mode (risk)	Potential effect of failure mode	Risk cause	Risk detection	S	P	D	RPN	Risk mitigation measures	Relevant WPs	Risk caretaker
21 (NEW)	Exploitation	Low number of third party experimenters express their interest and participate in the Open calls.	The AOEP platform is not validated effectively and sufficiently by experimenters out of the project's consortium.	1. Low interest from SMEs. 2. No successful promotion.	Close monitoring of the status of attracted SMEs.	8	4	4	128	1. Monetary awards will be given to the three top SMEs, as an extra incentive. 2. A detailed plan for increasing awareness of the open calls has been created. The open calls will be promoted through the project website and communication channels of the project and the individual partners. In addition, they will be promoted to all the project's liaisons with similar research topics.	WP6	WP6 Leader (INC)
											WP7	WP7 Leader (VICOM)
22 (NEW)	Exploitation	Engaging third party experimenters for using the 5G-IANA platform may be complex for SMEs in the automotive sector.	The AOEP platform is not validated effectively and sufficiently by experimenters out of the project's consortium.	Low incentive from SMEs to participate as they need to spend valuable resources in order to become "AOEP-compatible". Sometimes SMEs find it	Monitoring of the complexity of the process to validate the project-wide 7 UCs.	8	4	4	128	a) A plan for creating all required supporting material has been developed. It includes information about the 5G-IANA capabilities, the available resources and how can third parties use the platform. An education and preparation activity that is targeting to assist third parties before using the platform is also foreseen. Support will also be provided during the experimentation	WP3	WP3 Leader (UBI)
											WP4	WP4 Leader (NXW)

				challenging to devote PMs to such external activities.						phase. The feedback that will be received from participants in the first open call will be used to make the required changes for the second open call	WP5	WP5 Leader (HIT)
										b) Moreover, the project-wide UCs will be used as valuable feedback regarding complexity, so that the AOEP platform is updated wherever difficulties/complexities are encountered and reported by the UC teams.	WP6	WP6 Leader (INC)
15	Exploitation	Poor match between project outcomes and market needs, that can lead to poor adoption of project outcomes.	No further development of project outcomes.	Increased competition, project outcomes are not covering market needs anymore.	Input regarding the project results from end-users.	7	4	4	112	The market potential is high for the moment; the Technical & Innovation Manager will take input for market needs from WP6 and will guide the other WPs to match the market needs. The exploitation plan will be adapted to match the market needs.	WP6	WP6 Leader (INC)
12	Regulatory	Due the 5G roll-out of commercial operators, frequency resources granted to the Nokia On-Air testbed are no longer available, or available with significant restrictions. Consequently, significant restructuring of the testbed is required and ongoing, while its coverage area is shrinking. This requires careful planning where use cases can be executed in a meaningful manner within the remaining coverage area.	This may impact both the availability of carriers, and the available total bandwidth (i.e., max. available throughput rates).	German mobile operators.	NOKIA is in contact with mobile operators.	8	7	2	112	Band b38 (2570-2620 MHz, TDD), which was allocated to three German mobile operators, is currently not used by them. Nokia is negotiating with the mobile operators to use this band for testing purposes in Ulm. (At 07.09.2022, the use of 2580-2620 MHz has been granted for testing purposes until end of 2022. The permission to use the radio resources has to be renewed on a bi-annual or annual basis, depending on the operator.) One Radio Unit capable to operate on B38 was acquired, and installed at antenna site DRK. Two additional b38 radio units were ordered to upgrade other antenna sites in 2023 (delivery times between 3 to 6 months).	WP5	Testbed owner (NOKIA)

No	Category								Mitigation	WP	WP Leader
10	Regulatory	Legal/Institutional restrictions imposed in the execution of the trials.	Non-compliance with open road testing.	Use case requirements' description.	Regulatory and legal compliance.	7	3	5	105	Both, the data collection and the 5G-IANA trials will be handled in an ethical manner and based on the National and European legislation. The data collection procedure will be planned within 5G-IANA thoroughly by its GA.	WP5	WP5 Leader (HIT)
14	Exploitation	Business models will reveal poor sustainability.	Low commitment on exploitation plans; No further exploitation after the project ends.	Increased cost of developed solution; Low interest from end users.	Results from the techno-economic analysis.	6	4	4	96	Different variations from use cases will be examined, all roles and interactions will be evaluated and adapted based on realistic assumptions. Partners have experience and expertise in commercialization strategy.	WP6	WP6 Leader (INC)
9	Organisational	Validation trials are not successful/Data cannot be used.	Insufficient impact assessment.	Inadequate evaluation framework and experimental plans or wrong application of them across the sites. Failure in logging mechanisms.	While processing the collected data during field trials execution.	8	4	3	96	Multi-phase validation methodology. Trials and demos are implemented to ensure the data collected are according to expectations. Clear and comprehensive data management plan.	WP5	WP5 Leader (HIT)
16	Organisational (Dissemination &	Dissemination and communication have limited impact (stakeholders' engagement, publications, etc.).	Low or no user/stakeholder acceptance. Low awareness of the Project and the Project results.	Lack of Project beneficiaries' commitment to dissemination and exploitation activities. Delay in planning of dissemination and exploitation activities (e.g., workshop, demonstration event) due to delays in e.g., pilots' readiness, etc.	Low response rate / participation in the Project's dissemination channels & activities (newsletters downloads, webinars, social media followers, low interest of stakeholders especially towards the end of the project.	8	4	3	96	KPIs are clearly defined and monitored (updated after interim review). The Dissemination plan includes a sound selection of channels and planned activities to keep all stakeholders in the value chain informed on a regular basis. The plan will be re-evaluated periodically and updated as needed. Encourage the submission of papers around specific targeted events. Identify relevant deliverables that could be candidate topics. Use meetings as internal information channel for reminders.	WP1 / WP6 / WP7	WP7 Leader (VICOM)

20 (ɴᴇW)	Technical	The introduction of 5G Stand Alone (SA) proves to be very challenging, and several unforeseen factors are causing significant effort. For instance: 5G SA smartphone incorporate white-lists of PLMN IDs of common mobile operators, but not the PLMN IDs of the Nokia On-Air testbed allocated by the Bundesnetzagentur (German regulator), making them unsuitable for usage. Radio modules are still relatively unstable, require frequent firmware upgrades, und intensive testing in the testbed before they can "more or less" reliably deployed. We therefore expect more test iteration for the 5G-IANA than originally planned, which will bind additional resources.	Delays in the preparation of the NOKIA testbed and therefore in the integration of all use cases (project-wide and third parties).	Technical difficulties as this is a brand new deployment by NOKIA.	NOKIA is closely monitoring these issues.	8	6	2	96	For the smart phone OnePlus 9 Pro, which operates on 5G NSA, a software hack exists to configure the Nokia PLMN into its white list. For OnePlus 10 Pro and Nokia XR20, which operates on 5G SA, it is currently under investigation, if a similar solution works. For this purpose, a OnePlus 10 Pro phone was ordered. (Note: Those phones still cost more than 1000 Euros.) The OnePlus phones and Quectel modules are continuously and extensively tested with each 5G feature added to the Nokia testbed. The suitability of other smart phones and radio modules is checked periodically as well, as the maturity of 5G products is increasing over time.	WP5	Testbed owner (NOKIA)
4	Organisational /	Technical work diverges from the Project's initial goals.	Core technical items not adequately addressed to meet Project objectives.	Ineffective technical management / lack of coordination in deliverable development.	a) Through key project milestones / deliverables. b) Through project reviews.	1 0	3	3	90	a) All development activities will be closely monitored at various levels (Task, WP, TMT) to ensure that the proposed architectural components are delivered according to the precise specifications. B) The EC feedback from the interim project review has significantly helped direct the project to the appropriate objectives (openness of	WP1 / WP3	Technical Coordinator (UBI)

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#	Category	Risk	Effect	Cause	Mitigation description				Score	Action	WP	Responsible
										the platform, active and early engagement of third parties).	WP4	
											WP5	
11	Technical	No or partial testing permissions in the NOKIA's and TS's testbeds.	No on-air testing possible, or on-air testing highly restricted.	German regulation authorities.	Partners are in contact with regulation authorities.	5	5	3	75	Early contacts with authorities. Engagement from multiple sides (NOKIA, UULM, ININ, TS).	WP5	Testbed owners (NOKIA & TS)
13	Organisational	Conflicts of interest between partners on business/exploitation model.	Delay in delivery of results and / or not be able to draft a common exploitation model.	No common understanding of project goals; Different business strategies.	Limited contribution to deliverables; Partners intention as captured in exploitation workshops that will be held.	5	3	4	60	The Project Consortium was built with a variety of complementing stakeholders. All Project beneficiaries will have the possibility to contribute towards the development of a sustainable business model and list their interests. An IPR registry will be maintained to clearly list ownership and rights.	WP6	WP6 Leader (INC)
5	Technical	Technical challenges in the development of the architecture, the AOEP and the related VNFs/NetApps as well as the DML framework.	This risk may cause a replanning of the delivery roadmaps related to the AOEP, the VNFs/NetApps and the DML framework.	This risk may be caused by technical difficulties in meeting the specified functional/non-functional and performance requirements for the overall AOEP architecture, the VNFs/NetApps and the DML framework.	The initial analysis and specification of Use Cases and System requirements allows to detect potential difficulties in developing corresponding functionalities/capabilities in the AOEP, the VNFs/NetApps and the DML framework.	9	3	2	54	Although this is highly improbable to happen, since there is significant expertise in the consortium in this field and several supporting tools exist, it will be handled with additional iterations of the development cycle and with intermediate deliveries.	WP3	WP3 Leader (UBI)
											WP4	WP4 Leader (NXW)

6	Technical	Technical challenges in modelling VNFs requirements and constraints at the NetApp Toolkit composer for generating consistent NetApp graphs/topology in a multi-domain environment.	This risk may cause a replanning of the delivery roadmap for the different NetApp Toolkit expected functionalities.	This risk may be caused by technical difficulties in implementing a NetApp data-model capable of mapping information needed for building consistent NetApp graphs.	The initial analysis and specification of the NetApp Toolkit's functional and non-functional requirements allows to detect potential difficulties in developing corresponding functionalities/capabilities.	8	3	2	48	Although the consortium owns the needed technical knowledge to achieve the objective of developing full automated NetApp graph chaining procedures for hiding network complexity, if needed the developments will follow a roadmap based on incremental implementations/releases.	WP4	WP4 Leader (NXW)
19 (NEW)	Technical	Technical challenges in integrating NetApps in end-to-end service chains for the different UCs due to lack of interfaces or expected exposed functionalities.	This risk may cause a replanning of the delivery roadmap for the affected NetApps.	This risk may be caused by a lack of compatibility between NetApps that should communicate and exchange data/information within the end-to-end service chain.	Analysis of NetApps; two cycle development process.	8	3	2	48	In the case at a first stage the developed NetApps won't provide/expose all the expected functionalities, the consortium will keep working on the implementation of the missing functionalities and their consequent integration within the UC service chain as needed. Otherwise, a backup solutions will be investigated to replace the missing functionality with a different component or temporary emulating it's expected behaviour to be able to progress with the integration.	WP4	WP4 Leader (NXW)
23 (NEW)	Technical	Technical challenges in integrating AOEP platform modules due to the number of interfaces required for the targeted platform functionalities.	This risk may cause a replanning of the delivery roadmap of the overall 5G-IANA solution/framework.	This risk may be caused by interoperability issues due to interfaces' misalignments.	Close monitoring of the project workplan.	8	3	2	48	The core interfaces are very well defined (e.g., in the project workplan in D5.1 as well as in D2.1) and potential issues are only expected for the newly defined interfaces, which will not affect the main platform functionality.		

7	Technical	Technical challenges in integrating VNFs components into NetApps due to lacks in interfaces.	This risk may cause a replanning of the delivery roadmap for the affected VNFs.	This risk may be caused by a lack of compatibility between VNFs that should communicate and exchange data/information within the NetApp's Service Function Chain.	The initial analysis and specification of the different VNFs, as well as a continuous integration process allow to detect potential issues related to VNFs' integration.	8	3	2	48	a) A detailed manual with all VNFs provided by the project is being prepared (description, input required, output provided, examples of communicating AFs/NFs, etc.) b) In the case it won't be possible to integrate some VNFs into a NetApp at a first iteration, the consortium will keep working on the integration by enhancing interested interfaces as needed or will provide backup solutions like a replacement of the baseline software or a temporary emulation of the expected behaviour in order to not block the NetApps integration and development process.	WP4	WP4 Leader (NXW)
8	Technical	Inadequate integration of software components and mechanisms.	This risk may cause a replanning of the delivery roadmap of the overall 5G-IANA solution/framework.	This risk may be caused by interoperability issues due to missing functionalities.	The initial analysis and specification of functional/non-functional and performance requirements starting from the UCs down to the system's components, along with a continuous integration process allow to detect potential integration issues.	8	3	2	48	An overall project workplan has been prepared to facilitate the development and integration process and to identify any dependencies. An extension will be evaluated if the technical results fail to be delivered on time so as to deliver a fully functional platform to the demonstrators.	WP3 / WP4 / WP5	WP3 Leader (UBI) / WP4 Leader (NXW) / WP5 Leader (HIT)
17	Economical,	Delays due to external factors (e.g., another pandemic lockdown).	Inability to deliver (parts of) the project, within the budget and/or on time impacting demos, results, and achievement of objectives.	COVID-19 and related restrictions.	Monitoring of (internal) milestones & quality (see D1.2), specific agenda items in meetings (at least the TMT) and reporting.	5	3	3	45	During the proposal preparation, the consortium partners experienced lockdown in several EU countries. However, they were still able to telework from their homes, thus minimising the risk. A potential small extension in the duration of the project to accommodate further unforeseen integration delays.	All	Project Coordinator (ICCS)

24 (NEW)	Organizational	The Technical Manager and Innovation Manager is the same person, which is challenging in terms of effort and time required to fulfil both roles.	Low identification of innovation opportunities from the project.	Both roles are very critical and demanding.	Through an Innovation Monitoring System.	6	2	3	36	The project has setup an "Innovation Monitoring System" and team: The Technical and Innovation Manager together with all WPL and Task Leaders form the core of an Innovation Monitoring Team which actively monitors all respective activities. Also, D1.3 - Innovation Management Plan already includes valuable reference information.		
18	Technical, Organizational	Dependencies on the developments of other projects linked to 5G-IANA.	Propagation of delays for specific components. Duplication of work risk.	Risks declared in these other projects (not clearly identified here).	Careful monitoring the respective projects.	3	3	4	36	a) Already planned slow start to take on board delayed developments of other EU and regional projects and potential small extension in the duration of the project to accommodate further unforeseen delays. b) Close monitoring and documentation of artefacts/assets from other projects is performed to ensure no duplication of work.	WP3 / WP4 / WP5	WP3 Leader (UBI) / WP4 Leader (NXW) / WP5 Leader (HIT)
1	Organisational	Discrepancies in the technical visions: Project delays, etc.	Incompatibility at integration level; Project delays.	Lack of common understanding of Project objectives.	During GA/WP/TMT meetings (telcos); throughout the development phase of the Project.	9	2	2	36	Frequent communication within WPs (through meetings, telcos, etc.) and at the GA/TMT level to resolve issues. Good cooperation between PC, TMT and the Consortium.	WP1 / WP3	Project Coordinator (ICCS)

													WP4	
2	Technical	Specifications and requirements of 5G-IANA architecture are not ready on time.	Delays in the initiation of the rest of the technical works within WP3-WP4-WP5.	Lack of coordination or common understanding; Insufficient templates used for collection.	During WP2 & TMT meetings (telcos); throughout the development phase of the Project.		O	O	O	O	The 5G-IANA architecture is already well defined and commonly agreed among partners. The specification activities will be continuously monitored through periodic conference calls to check possible issues and delays.		WP2	WP2 Leader (LINKS)
3	Technical	Specifications and requirements of 5G-IANA not adequate for the development phase.	Delays in the initiation of the rest of the technical works within WP3-WP4-WP5.	Poor coordination, monitoring or common understanding; Insufficient templates used for collection.	During WP2 and TMT meetings (telcos); throughout the development phase of the Project.		O	O	O	O	The specification activities and the development activities are planned with a partial time overlap in the scheduling. This will allow interaction among the two activities and ease the identification of possible not adequate aspects in the specifications.		WP2 / WP3 / WP4	WP2 Leader (LINKS)