

IMAGINE-B5G

Advanced 5G Open Platform for Large
Scale Trials and Pilots across Europe

Stream B/D Joint Workshop on KPIs and KVIs

May 16, 2024

Carles Navarro (Keysight), Arturo Torrealba (Telefónica), George Darzanos (AUEB)



Co-funded by
the European Union

6GSNS

Grant Agreement No.: 101096452
Call: HORIZON-JU-SNS-2022

IMAGINE-B5G

Introduction

Carles Navarro (Keysight)



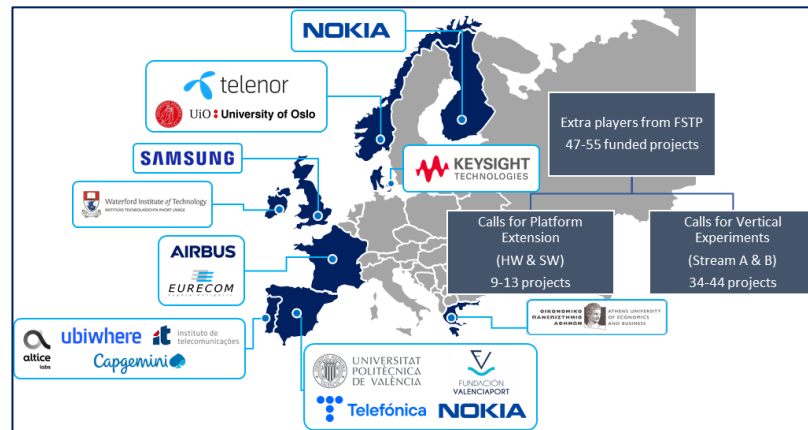
Co-funded by
the European Union

6GSNS

Grant Agreement No.: 101096452
Call: HORIZON-JU-SNS-2022

IMAGINE-B5G – Partners & Objectives

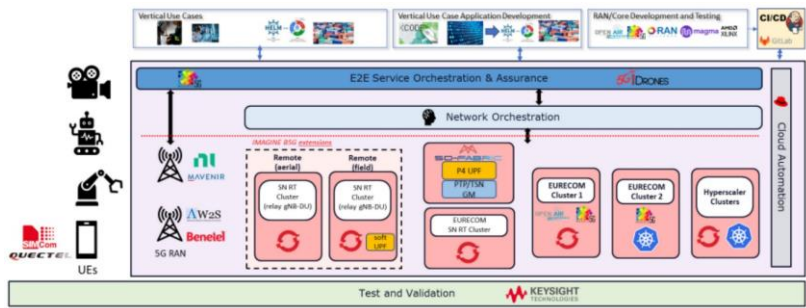
#	Objective
1	To identify KPIs and KVLs and define novel business models in the context of advanced 5G vertical use cases
2	To build a secure, large-scale end-to-end advanced 5G facility to on-board innovative vertical use cases
3	To develop well-defined APIs towards 3 rd parties and developers with the aim of creating an open testbed
4	To develop open-source advanced 5G tools and modules
5	To attract innovative partners for the platform validation and vertical use case on-boarding
6	To perform advanced 5G large-scale trials, pilots and showcases with verticals
7	To validate the IMAGINE-B5G platform and core technologies across application, management, and societal domains
8	To maximise the impact of advanced 5G solutions with the aim of widespread adoption



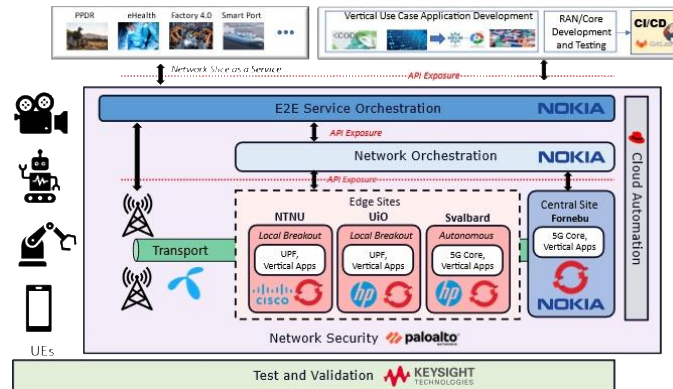
Grant agreement ID: 101096452
Start date: 1 January 2023
End date: 31 December 2025
Total cost: € 12 394 183,04
EU contribution: € 11 011 735,63
Coordinated by: UNIVERSITAT POLITÈCNICA DE VALÈNCIA (UPV)

IMAGINE-B5G Facilities

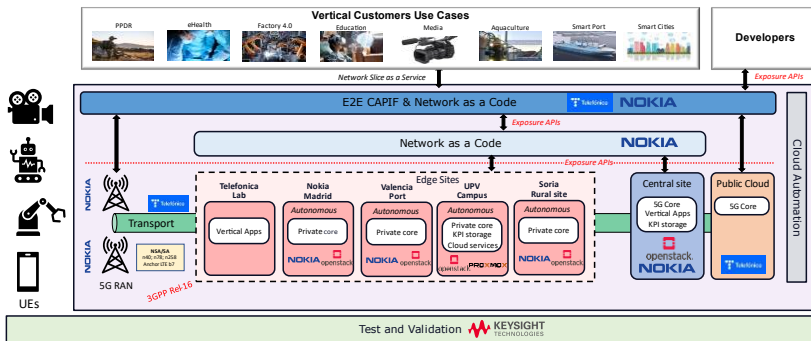
France Facility



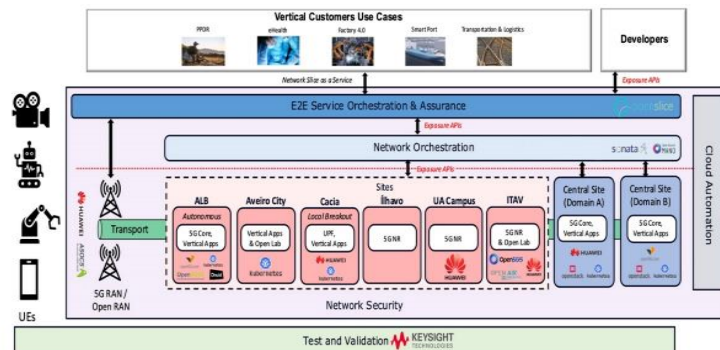
Norway Facility



Spain facility



Portugal Facility



IMAGINE-B5G Platform KPIs and Benchmarking

Carles Navarro (Keysight)



Co-funded by
the European Union

6GSNS

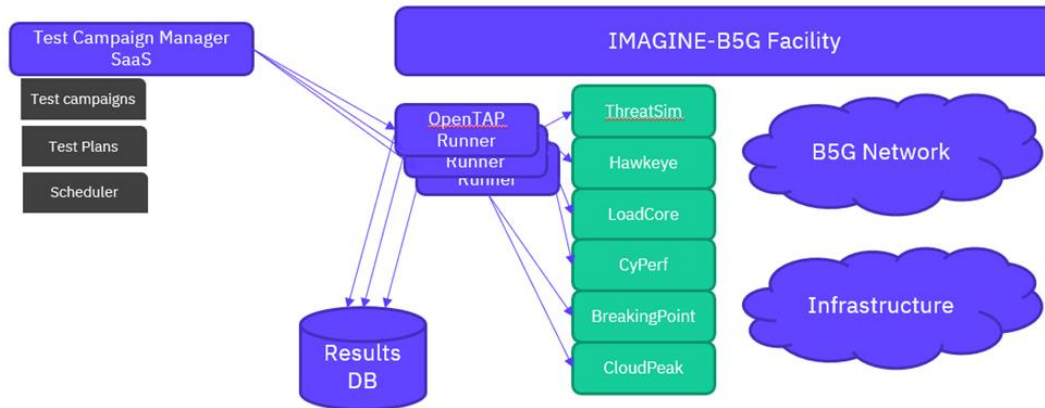
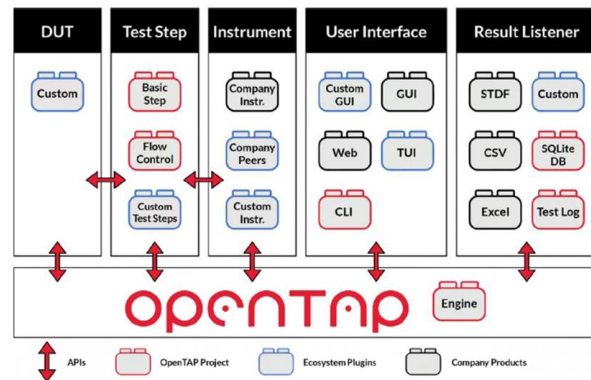
Grant Agreement No.: 101096452
Call: HORIZON-JU-SNS-2022

IMAGINE-B5G Test & KPI Measurement Methodology

The project will leverage testing tools by Keysight Technologies.

The open-source tool OpenTAP will be used as automation engine for test plans:

- A campaign manager, deployed in the cloud, orchestrates the tests
- OpenTAP runners, deployed at facilities, communicate with testing tools and DUT using OpenTAP plugins
- Measurements are automatically processed and results stored in a database.



IMAGINE-B5G Platform KPIs

KPI Family	High-level KPI (WP1)	Detailed KPIs / Parameters (WP4)	KPI Family	High-level KPI (WP1)	Detailed KPIs / Parameters (WP4)	
Capacity	User Capacity	User experienced Data Rate	Latency	Network Latency	C-Plane Latency	
	Network Capacity	Peak Data Rate			U-Plane Latency	
		Area traffic capacity			Delay deviation / Jitter	
		Connection density		Service Provisioning Time		
Channel	Spectral Efficiency	Peak Spectral Efficiency		Orchestration Latency	Slice Provisioning Time	
		5th percentile user spectral efficiency			E2E Latency	E2E App Latency
		Average Spectral Efficiency		E2E Service Latency		
	Received Signal Quality	Received Signal Quality (SINR)		Reliability		Session Reliability
		Reference Signal Receive Quality (RSRQ)	Packet Loss & Frame Loss Rate			
		Reference Signal Receive Power (RSRP)	Service Availability	Service Availability	Service Availability	
Compute	Resource Utilization (cloud / edge)	CPU usage			Service safety, maintainability	
		RAM usage		Localization	Localization Availability	
		Availability	Location Accuracy			
Energy	Energy efficiency	Network energy Efficiency	Localization acquisition time			
		Device Energy Efficiency				
		NFV Energy Efficiency				

IMAGINE-B5G Vertical Experiments and apps KPIs

Arturo Torrealba (Telefónica)




Co-funded by
the European Union

6G SNS

Grant Agreement No.: 101096452
Call: HORIZON-JU-SNS-2022

IMAGINE-B5G Vertical Experiments

Vertical	Use Case	Leader	OC Project
PPDR	Firefighting and Forest surveillance	Airbus	No Project
	Critical surveillance and inspection at a maritime port	FVP	ETRAER + XR
	IoT platform for critical management	Ubiwhere	SAFER - FLOW
	Multi-functional remotely operated boat	FVP	No Project
	Critical services for NDMA	Telenor	5G Neptune
Media	Holographic communication	UPV	Binethol/Democrats
	Robust and flexible remote production	Telenor / NRK	5G Neptune
eHealth	Enhanced care facilities	IT Aveiro	DCA
	Drone Care Angel: Mobile health monitoring as a service	IT Aveiro	No Project
	Remote care over B5G networks with immersive media facilities	Telenor	LEOSED
Education	Content Distribution	Eurecom	No Project
	Immersive remote education	UiO and UPV	ALMA (UIO) / Binethol (UPV)
Transport and logistics	Improved localization mechanisms for transportation and logistics	Capgemini / IT Aveiro	No Project
	AGV remote driving	Nokia Spain / UPV	No Project
Industry 4.0	Industrial infrastructure automation	Telenor/ABB	ALMA
	Ultra Low Latency M2M Communications for 5G enabled Fabrication Systems	IT Aveiro	ULTRA-FAB5G
Agriculture and Forestry	Smart agriculture in rural areas	Nokia Spain	QAMPO
	Forestry connectivity and monitoring	Telenor	AI4forest

 Pending to find a partner in 2nd open call

 Ongoing Vertical Experiment

IMAGINE-B5G Apps KPIs

APP KPIs	
Control UAV latency	Patient waiting time
Accuracy	Percentage of Successful API Calls/Requests
Precision	API Data Error Rate
Vital Sign Accuracy	Percentage of Authenticated API Requests
Real-Time monitoring Reliability	Number of Unauthorized Access Attempts Blocked
Message delay	Percentage Uptime of CAMARA API
Drone response time	Accuracy of the ML computer vision algorithm
Drone reliability	Proximity Discovery Success Rate
Video streaming quality	Proximity Discovery Success Rate
Multimedia average processing delay	Reliability of Direct Communication
Multimedia average freezes duration	Proximity Service Availability
Multimedia total freezes	Interference Management Effectiveness
Multimedia frames dropped	User Satisfaction and Adoption Rates
End-to-End Multimedia Latency	Direct communication establishment time
Multimedia Quality of Experience (QoE)	Viewing distance
AR Frame Rate	viewing angle
AR Reliability	AI Accuracy
AR Quality of Experience	AI Inference Speed



Category	
Drones/UAVs	Control UAV latency
	Accuracy
	Precision
	Drone response time
	Drone reliability
Media	Video streaming quality
	Multimedia average processing delay
	Multimedia average freezes duration
	Multimedia total freezes
	Multimedia frames dropped
	End-to-End Multimedia Latency
AR/VR	AR Frame Rate
	AR Reliability
	AR Quality of Experience
AI/ML	AI Accuracy
	AI Inference Speed
	Accuracy of the ML computer vision algorithm
API	Percentage of Successful API Calls/Requests
	API Data Error Rate
	Percentage of Authenticated API Requests
	Percentage Uptime of CAMARA API
User Experience	Vital Sign Accuracy
	Real-Time monitoring Reliability
	Patient waiting time
	User Satisfaction and Adoption Rates

IMAGINE-B5G KVIs

George Darzanos (Athens University of Economics and Business)



Co-funded by
the European Union

6GSNS

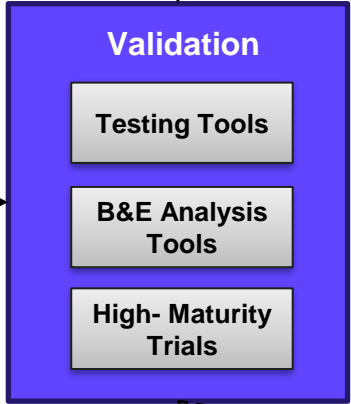
Grant Agreement No.: 101096452
Call: HORIZON-JU-SNS-2022

KVIs Methodology

UN SDGs,
EU Green Deal, ...

- Inputs**
- IMAGINE platforms
 - UCs owners
 - Open call projects
 - Business models

Societal Values



IMAGINE-B5G
Objectives

Target Value

Formulation

Planning

Execution

Metrics

KPIs

Societal Values and IMAGINE Societal-level Goals

- **Environmental sustainability.** B5G infrastructure and Vertical Use Cases that are sustainable for the environment in terms of energy consumption and CO2 emissions.
- **Economic Growth.** Profitable and economically sustainable B5G solutions, business models and vertical markets.
- **Innovation.** Development of novel B5G infrastructures, solutions and vertical applications.
- **Security and Trustworthiness.** B5G solutions that ensure the security of users and the trustworthiness of platform.
- **Inclusiveness.** B5G solutions and applications that lowers the entry barriers for vertical stakeholders and end-users.
- **Privacy and Confidentiality.** B5G solutions and applications that enables the secure exchange of information.
- **Good health and safety.** B5G solutions and applications that improve the level of health and the quality of healthcare of individuals and their safety in public, work or home environments.
- **Well-being and entertainment.** B5G solutions and applications that facilitate the everyday life of people and provide enhanced entertainment experience.
- **Quality education.** B5G solutions, tools and applications that ensures access to education and improve its quality.

Platform KVs

- Relevant KPIs**
- Energy Efficiency

Identified 14 Platform KVs

Societal Value	KVIs	
Environmental Sustainability	<ul style="list-style-type: none"> • Platform energy efficiency • Platform CO2 emissions 	<p><i>Metric:</i> Ratio of services delivered per energy unit consumed in a specific time window.</p>
Economic Growth	• Platform cost efficiency	<p><i>Metric:</i> Ratio of service load per cost</p>
	• Stakeholder profitability	<p><i>Metric:</i> Internal Rate of Return (IRR) in a specific time window</p>
	• Platform ecosystem economic sustainability	
Innovation	• Vertical customer engagement	
	<ul style="list-style-type: none"> • Platform service portfolio enrichment • Platform novel features development • Open collaboration 	<p><i>Metric:</i> Number of B5G features validated in a specific time window.</p>
Inclusiveness	• Vertical stakeholders onboarded	
Security and trustworthiness	<ul style="list-style-type: none"> • Platform security assurance • Platform consistency • Platform resilience 	<p>Relevant KPIs</p> <ul style="list-style-type: none"> • Service Availability • Reliability
Good health and safety	• EMF exposure impact	<p><i>Metric:</i> Incident power density (radiation power/human body kilograms)</p>

Vertical Ecosystems

Identified **8** generic KVIs for verticals

Generic KVIs

Societal Value	KVIs
Environmental Sustainability	<ul style="list-style-type: none">• Vertical solution energy efficiency• Vertical solution CO2 emissions
Economic Growth	<ul style="list-style-type: none">• Vertical solution cost efficiency
Innovation	<ul style="list-style-type: none">• Vertical solutions portfolio enrichment
Inclusiveness	<ul style="list-style-type: none">• Coverage of vertical solutions• Access of people to the vertical solutions
Security and trustworthiness	<ul style="list-style-type: none">• Vertical solution reliability• Vertical solution availability

Vertical Ecosystems (II)

Identified more than **31** sector-specific KVs

Selected sector-specific KVs

PPDR

Societal Value	KVs
Environmental Sustainability	<ul style="list-style-type: none">• Physical environment preservation• Climate preservation
Good health and Safety	<ul style="list-style-type: none">• First responders' efficiency• Operational efficiency of interventions in remote partial covered or out-of-coverage areas• Ensuring high levels of protection of people in danger• Ensuring high levels of protection of PPDR personnel• Reducing wildfires and their impact
Privacy and Confidentiality	<ul style="list-style-type: none">• Highly secure exchange of selected information among national/international agencies
Security and trustworthiness	<ul style="list-style-type: none">• Confidence and efficiency of using advanced digital devices, systems and services in critical mission scenarios

Measurement and Validation

Identified metrics will be collected:

- Automatically through facility tools
- Manually through forms and questionnaires

Validation methods

- Test and experiments relying on testing Tools
- Techno-economic analysis for business and economic related KVIs
- High-maturity trials involving verticals from open call projects

Thanks!

Website: <https://imagineb5g.eu/>

LinkedIn: <https://www.linkedin.com/showcase/imagine-b5g/>

Twitter/X: <https://twitter.com/B5gImagine>