MISSION 4
EDUCATION
RESEARCH

PROJECT TITLE: EXTENDABLE - NETWORK OF EXTENDED REALITY-ENABLED LABORATORIES FOR REMOTE PRACTICAL TRAINING

SCIENTIFIC REPORT

TIMEFRAME 01/12/2024 - 31/03/2025

Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

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NATIONAL RECOVERY AND RESILIENCE PLAN (NRRP) – MISSION 4 COMPONENT 2 INVESTMENT 1.1 – "Fund for the National Research Program and for Projects of National Interest (NRP)"

Project: P2022L2KTA CUP: E53D23014680001

Project Title: EXTENDABLE - network of EXTENDed reAlity-enaBLEd laboratories for remote practical training

Principal Investigator: Prof. Annalisa Liccardo

Timeframe: 01/12/2024 – 31/03/2025

SECTION 1 – GENERAL TRENDS OF THE PROJECT

With regard to the specific timeframe, it is below provided:

a) a brief summary of the project;

Practical exercises are crucial in STEM education, providing hands-on experience to reinforce theoretical knowledge. Access to laboratories is vital at all educational levels, but challenges like overcrowded classrooms or movement restrictions during pandemics have highlighted the need for remote solutions. A research team from the University of Naples Federico II, Sannio, and Calabria proposes a network of laboratories utilizing extended reality to enable remote execution of lab activities. This system allows students to conduct experiments from home using real devices, ensuring immersive and responsive interactions. Key tasks include scanning, reconstructing, and functionalizing lab instruments, as well as managing complex operations and communication interfaces to minimize delays. The prototype will initially focus on measuring instruments, a common subject in metrology courses, and set up specific experiments for engineering students at different locations. This initiative aims to validate the system and maintain high-quality practical training, ensuring that students can continue their education effectively, even remotely.

b) names of the operational units involved in the implementation of the project;

Research Unit (RU) University of Naples Federico II – led by the PI, Prof. Annalisa Liccardo

RU University of Calabria – led by Prof. Francesco Lamonaca

RU University of Sannio – led by Prof. Luca de Vito

c) description of the achievement of the objectives connected to the project and related outcomes;

The research groups have primarily continued to focus on WP2, which is dedicated to the design and

development of the AR learning system. This phase has largely revolved around the design and implementation of a virtual environment that facilitates remote learning. The main objective has been to create an immersive, interactive space where students can engage with educational content in a more dynamic and experiential way. A significant portion of the work has involved ensuring that the virtual environment supports effective teaching and learning by providing features such as interactive tools, 3D models, and immersive scenarios that enhance the educational experience. The groups have also focused on optimizing the usability of this virtual space to ensure accessibility for both educators and students, making it a suitable platform for various types of remote learning activities.

d) description of the carried out activities which are in compliance with the *DNSH, Open Access* principles as well as with *gender*, *generationa*l principles and with those of *Equal opportunities*

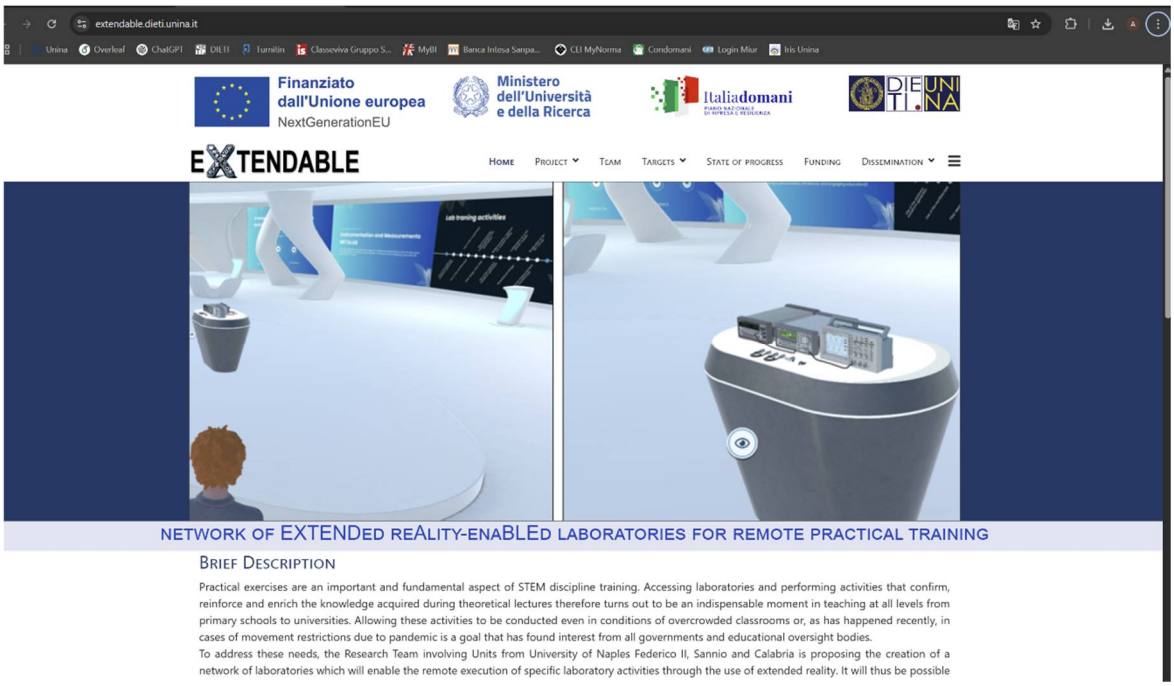
The project activities of the considered timeframe were mainly related to the definition and design of the different components of the distance learning system associated with the research units. This way, no specific compliance with the DNSH, Open Access principles as well as with gender, generational principles and with those of Equal opportunities has been experienced. Nevertheless, all the objectives in terms of inclusivity and discrimination reduction presented in the project proposal remain.

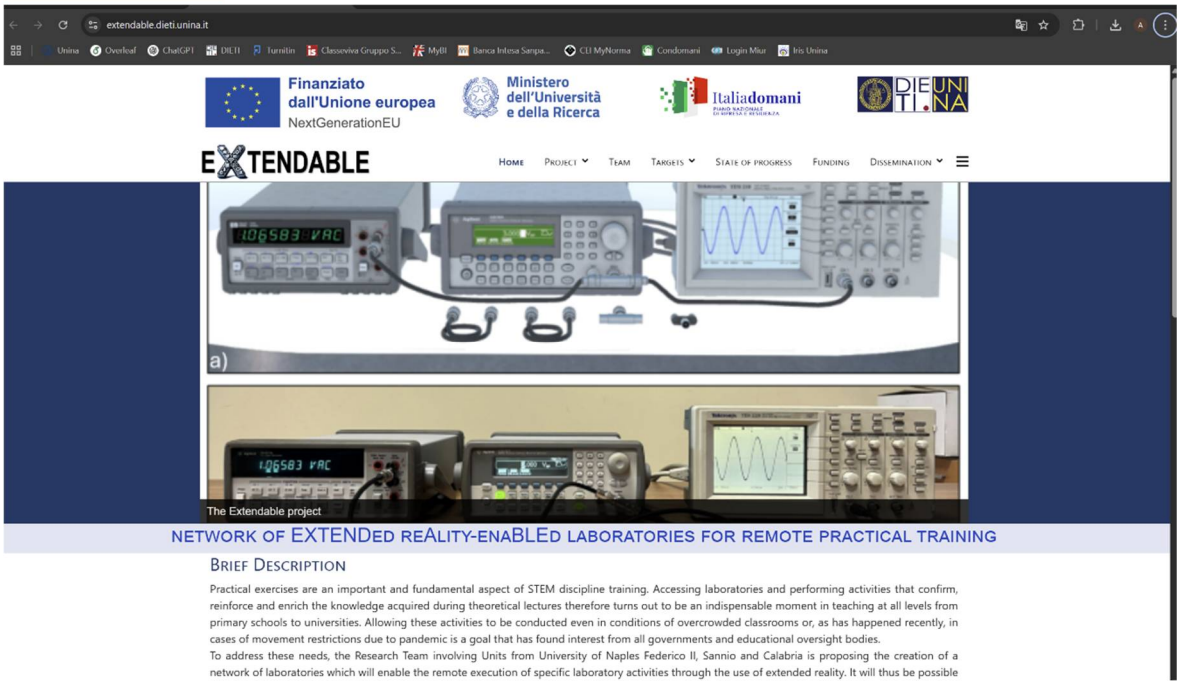
e) description of the actions aimed at informing and disseminating knowledge

One of the main actions performed in the considered timeframe has involved the update of the website of the project, that can be freely accessed at the link:

extendable.dieti.unina.it

In the homepage, new images demonstrating the last project achievement and the developed learning scene have been added.



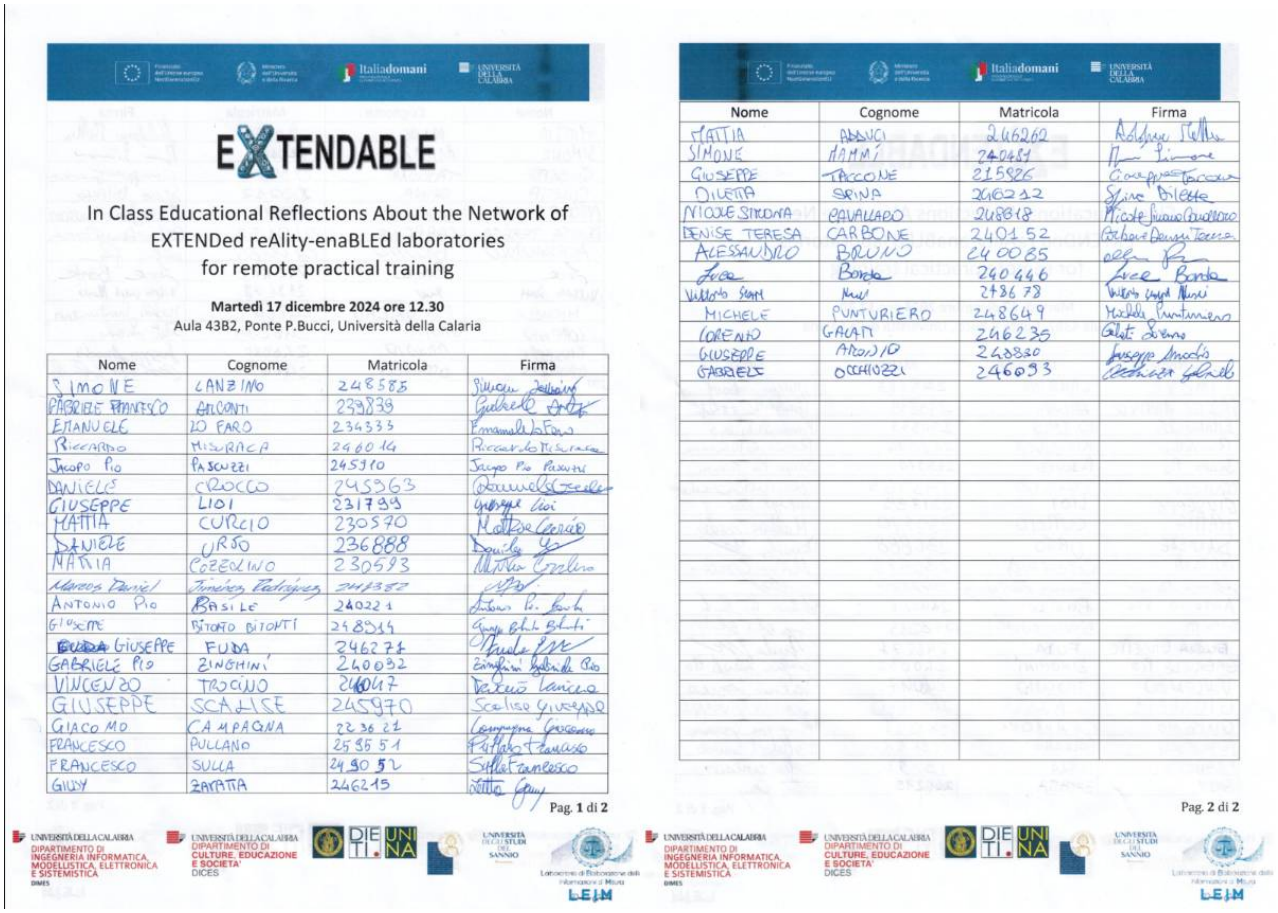


Furthermore, the dissemination section has been enriched, by inserting the publication list and the news about group meeting and presentation at conference of the project activities.

Further dissemination activities are the following.

On December 17th,2024 Prof. Lamonaca together with Prof. Giuseppe Spadafora have organized and held the seminar entitled “In Class Educational Reflections About the Network of EXTENDed reAlity-enaBLEd laboratories for remote practical training”. The Seminar was attended by many students of the course of Electronic Engineering of University of Calabria and colleagues. To the seminar participated also Prof. Teodora Pezzano, Associate Professor of general and special education at University of Calabria. Main of the students already attended the course of Electric and Electronic Measurements or other courses where the use of measurement instruments is of paramount importance. During the seminar, some practical didactical activities were discussed. From the discussion with the Colleagues and Students the importance of the project was confirmed so as the impact that the project results could have not only on STEM disciplines but also on the inclusivity and the democratic sharing of knowledge and opportunities among all students without distinctions of gender, culture, wealth.

Some pictures of the seminar organized at University of Calabria “In Class Educational Reflections About the Network of EXTENDed reAlity-enaBLEd laboratories for remote practical training”.



EXTENDABLE

In Class Educational Reflections About the Network of EXTENDed reAlity-enaBLEd laboratories for remote practical training

Martedì 17 dicembre 2024 ore 12.30
Aula 43B2, Ponte P.Bucci, Università della Calaria

Nome	Cognome	Matricola	Firma
SIMONE	LANZINO	248585	
GABRIELE FRANCESCO	ARCONTI	239839	
EMANUELE	LO FARO	234333	
RICCARDO	MISURACA	246014	
JACOPO PIO	PASCUZZI	245910	
DANIELE	CROCCO	245363	
GIUSEPPE	LIOI	231799	
MATTIA	CURCIO	230570	
DANIELE	URSO	236888	
NATHA	COZZOLINO	230593	
ANTONIO PIO	BASILE	240221	
GIUSEPPE	BITONTI BITONTI	248544	
~~FUDA~~ GIUSEPPE	FUDA	246271	
GABRIELE PIO	ZINGHINI	240032	
VINCENZO	TROCINO	240047	
GIUSEPPE	SCALISE	245970	
GIACOMO	CAMPAGNA	223621	
FRANCESCO	PULLANO	259551	
FRANCESCO	SULLA	249052	
GIULY	ZAPATTA	246215	

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Nome	Cognome	Matricola	Firma
MATTIA	ARBUCI	246262	
SIMONE	IAMMI	240481	
GIUSEPPE	TACCONE	215826	
OLIETTA	SPINA	246212	
NICOLE SIMONA	CAVALLARO	248818	
DENISE TERESA	CARBONE	240152	
ALESSANDRO	BRUNO	240085	
	Bonda	240446	
		243678	
MICHELE	PUNTURIERO	248649	
LORENZO	GALATI	246235	
GIUSEPPE	ARDIZIO	248830	
GABRIELE	OCCHIUZZI	246093	

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Signature of the students participating to the the seminar organized at University of Calabria “In Class Educational Reflections About the Network of EXTENDed reAlity-enaBLEd laboratories for remote practical training”.

Prof. Pasquale Daponte and Luca De Vito visited the Higher Institute of Maritime Studies (ISEM) in Casablanca, Morocco on February 19-21. The ISEM is a state-run training institution for higher executives in maritime-related companies and institutions. It is the only training institution for merchant navy officers in Morocco. Located in Casablanca, the Merchant Navy Officer training programs offered at ISEM include training in both the "Deck" and "Engine" sections, leading to the Lieutenant and Captain qualifications. The visit had the aim of disseminating the objectives and results of the EXTENDABLE project and investigating possible cooperation opportunities, in the field of remote laboratories. In particular, on February 19, a general meeting with the Director of the ISEM and a board of Professors was held, where general presentations about both the University of Sannio and ISEM were carried out. Then Prof. Luca De Vito introduced the EXTENDABLE project, its main objectives and the results achieved so far. He also highlighted the opportunity of cooperating with the EXTENDABLE partners by joining the laboratory network. The participants from ISEM were impressed by the project ideas and found it interesting to share also with other universities in the Northern Africa region some facilities of the institute such as ship simulators. Some pictures of the meeting and to the laboratory visit are attached.

On February 21st, a meeting with some students interested in International cooperation was held, where the EXTENDABLE project was again presented, by highlighting the opportunities for the students to cooperate to the development of the project.

Professor Lamonaca, Professor Spadafora, and Professor Liccardo are, moreover, involved in the organization of a specific thematic track at the conferences:

1) 2025 IEEE International Workshop on Metrology for Living Environment - IEEE MetroLivEnv 2025
2) 3rd IFToMM for Sustainable Development Goals, (I4SDG)

That will take place in June.

The special sessions are focused on innovative learning tools; during these sessions, the EXTENDABLE project will be presented, providing an opportunity to disseminate its results and to expand the network of collaborations both within Italy and internationally.

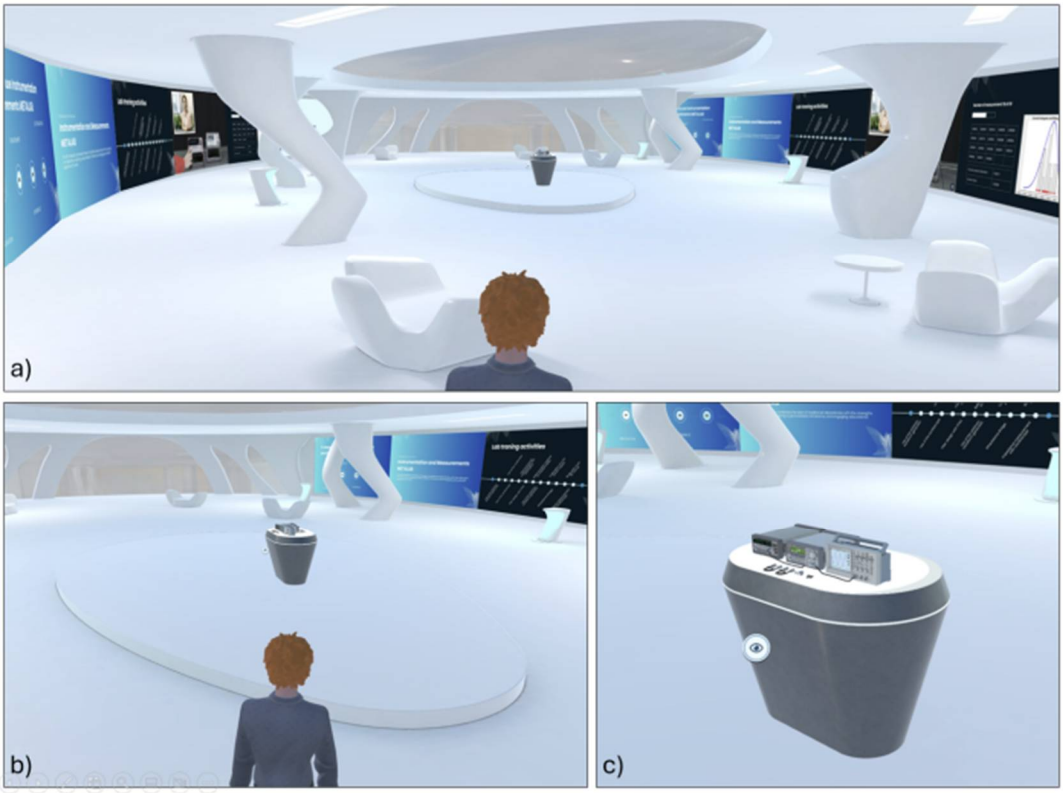
SECTION 2 – PROGRESS OF ACTIVITIES

With regard to the specific timeframe (bi-monthly/end of project activities), it is below provided:

a) detailed description of activities carried out by each operational unit with a focus on the timeframe for their implementation

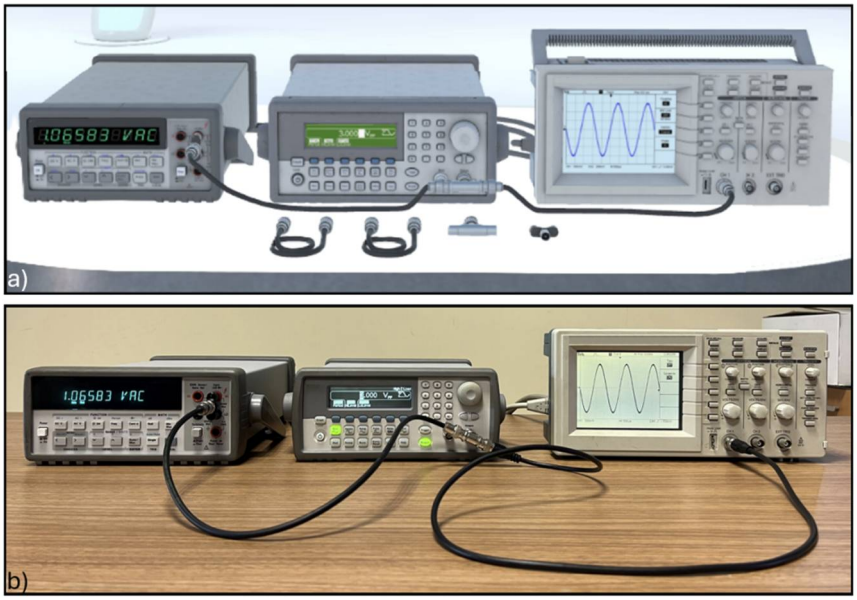
In continuity with the activities carried out during the previous four-month period, the Unit of University of Naples has continued to collaborate with GAV Project for the development of the

laboratory in the metaverse. To this end, GAV has created the learning scene, shown in the figure.



The quality and design of the scene in the Metaverse determine the level of immersion the user can experience. Detailed, realistic, and interactive environments help create a setting that users perceive as credible and engaging. To achieve this, a common approach in the field of virtual education is to recreate realistic virtual classrooms/environments that replicate traditional real-world settings (as shown in30 and31: square spaces and presence of traditional objects like tables, desks, chairs, etc.). However, within the Metaverse context, more creative and engaging VR designs can be introduced to facilitate collaboration and learning. Specifically, the Metaverse enables the creation of unconventional spaces and scenes: open, semicircular, with light, bright tones, smooth, minimalist, ergonomic lines, and large screens on the walls. This is the stylistic and design approach the authors adopted to create the virtual laboratory space proposed in the IM-MetaLAB.

At the center of the scene, the instruments are arranged to represent the digital twins of the actual laboratory equipment. We did not simply migrate the AR virtual instruments into the new context; but we further enhanced their graphics using the latest rendering techniques. As a result, the 3D models of the instruments for the Metaverse achieved a photorealistic quality so convincing that the difference between real and virtual becomes almost imperceptible (as shown in figure.).



To achieve this level of realism, particular attention was given to proportions, colors, and seemingly minor details during the digital reconstruction process. These details enhance the sense of realism, such as replicating the movement of buttons, the rotation of knobs on the front panel, and the updating of displays.

Compared to the previous AR application, additional graphical and functional features were introduced. First, virtual cables and connectors (such as BNC-BNC cables, T-shaped BNC connectors, and BNC-to-pin connectors) were created to connect the virtual instruments, enabling the configuration of a realistic test circuit as in a physical lab. The selection and movement of these cables and connectors occur through interaction between the user's physical controllers and the Metaverse environment.

The VR controllers are equipped with sensors that detect the controller's position, orientation, and movement in three-dimensional space, allowing the user's physical motions to be directly mapped into the virtual environment. In the proposed Metaverse, the user's controllers are represented by the Avatar's hands. For example, to connect two virtual instruments with a BNC cable, the user points to the cable and moves it toward the instrument using the controller. The environment detects this action as an interaction attempt. Once the cable is targeted, the user presses the trigger on the controller to grasp it. At this point, the cable's ends follow the controller's movement, allowing the user to move them within the Metaverse until reaching the input/output connectors on the instrument panels. When both BNC connectors are reached, the cable ends attach to them, connecting the two instruments; releasing the trigger disconnects the cable from the controller's movement.

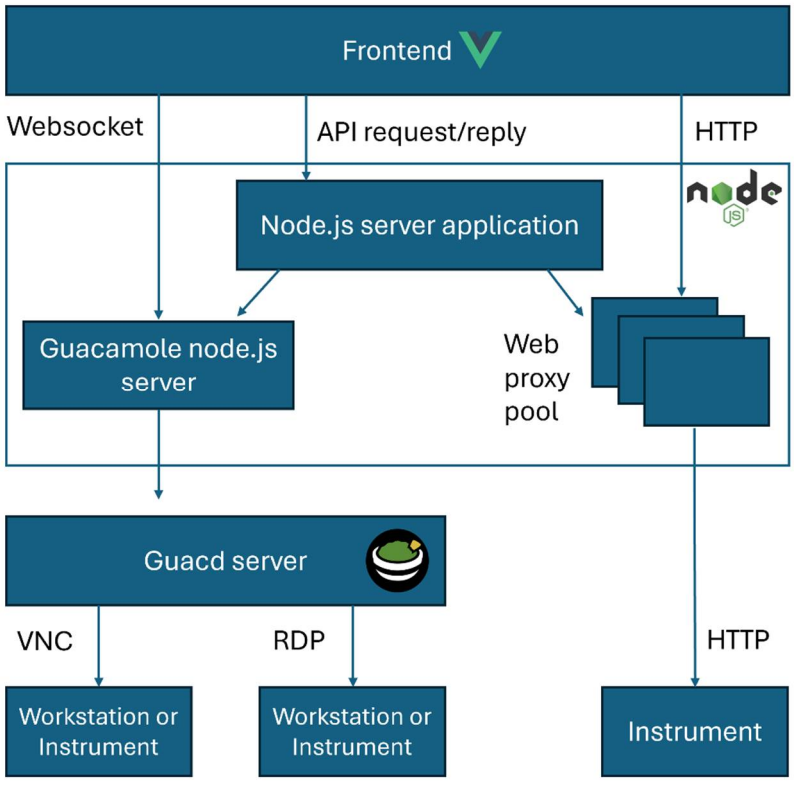
This ability to assemble a measurement circuit removes what could have been seen as the final barrier to fully replacing physical laboratories with digital ones (whether remote, in AR, etc.). This added functionality of the Metaverse laboratory thus provides essential hands-on training in the digital and remote setting, fostering the practical skills necessary for working with measurement instruments and electronic circuits.

The Research Units of Naples and Calabria, subsequently, carried out a detailed experimental evaluation of the time delays introduced by the GPIB-MQTT devices, which were specifically developed to enable remote access to laboratory instruments through an internet connection using the MQTT messaging protocol. To this end, a dedicated experimental station was set up, allowing for precise measurement of the time required by the board to process and forward each message. This

setup enabled the teams to analyze the system's performance under realistic usage conditions. Furthermore, special attention was paid to verifying that the overall message transmission times (from the remote user to the laboratory instrument and back) did not negatively affect the user experience. In particular, it was confirmed that the latency introduced did not compromise the perception of realism during the interaction, ensuring that no excessive response delays were perceived by the user.

Moreover, at University of Calabria the research is devoted to further extend the application of the project results to other disciplines and to other university at European and international level.
In particular, the investigation of the application of Extendable in psycometry is under investigation together with Prof. Eleonara Biltta. Contacts are occurring between Polytechnic of Turin and Ca'Foscari in Venice, so as a Erasmus+ Key Action 2 project was presented together with Unina and Unisannio to share the knowledge achieved with Extendable in Armenian, Georgian, Moldavian and Ukrainian Institutions.

The research activity at the University of Sannio was mainly concentrated on the development of a software environment based on HTML5, for the remote control of instrumentation.
The software environment will allow a seamless connection from any browser, without additional installed software on the client device, to real instrumentation, controlled by remote desktop, VNC, web interface or VXI-11.
By the time of preparation of this report, the software environment was implemented providing access to instrumentation equipped with remote desktop, VNC, or web interface, while the addition of VXI-11 support is still under development.
The software environment has the structure depicted in the figure below.

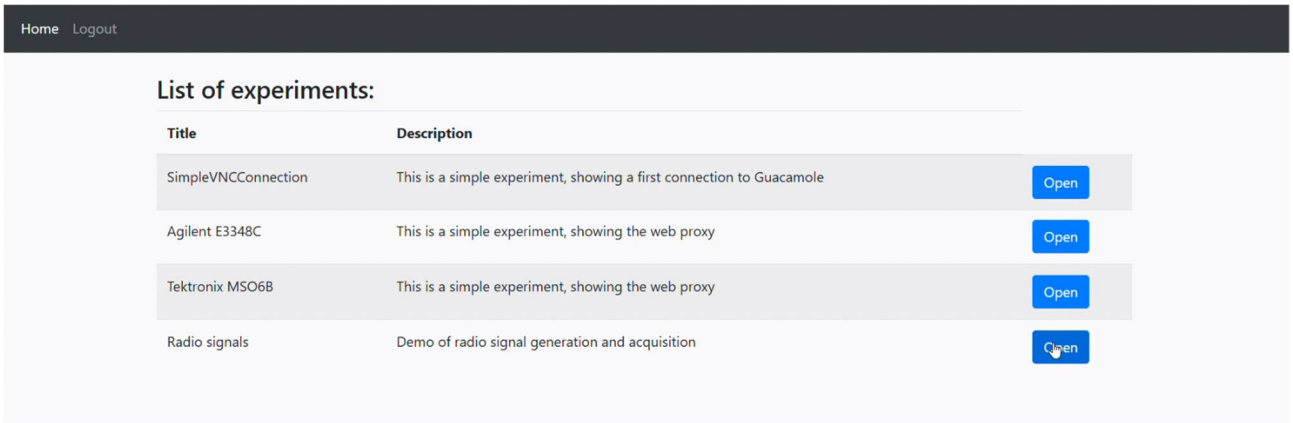


Starting from the top layer, the software environment consists of a frontend developed in Javascript,

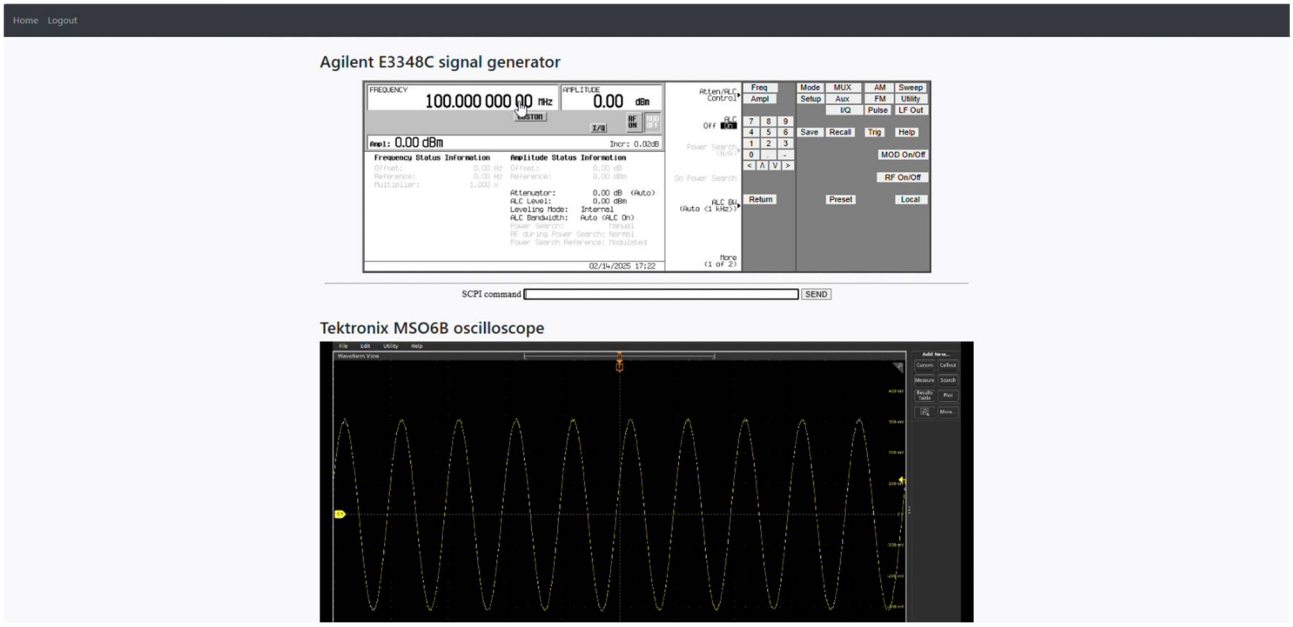
with the support of the Vue framework. The frontend will send requests to a backend realized again in Javascript, supported by the node.js runtime environment. The backend is in charge of:

- managing authentication by checking the provided user credentials and granting access to the experiment resources (see figure below);

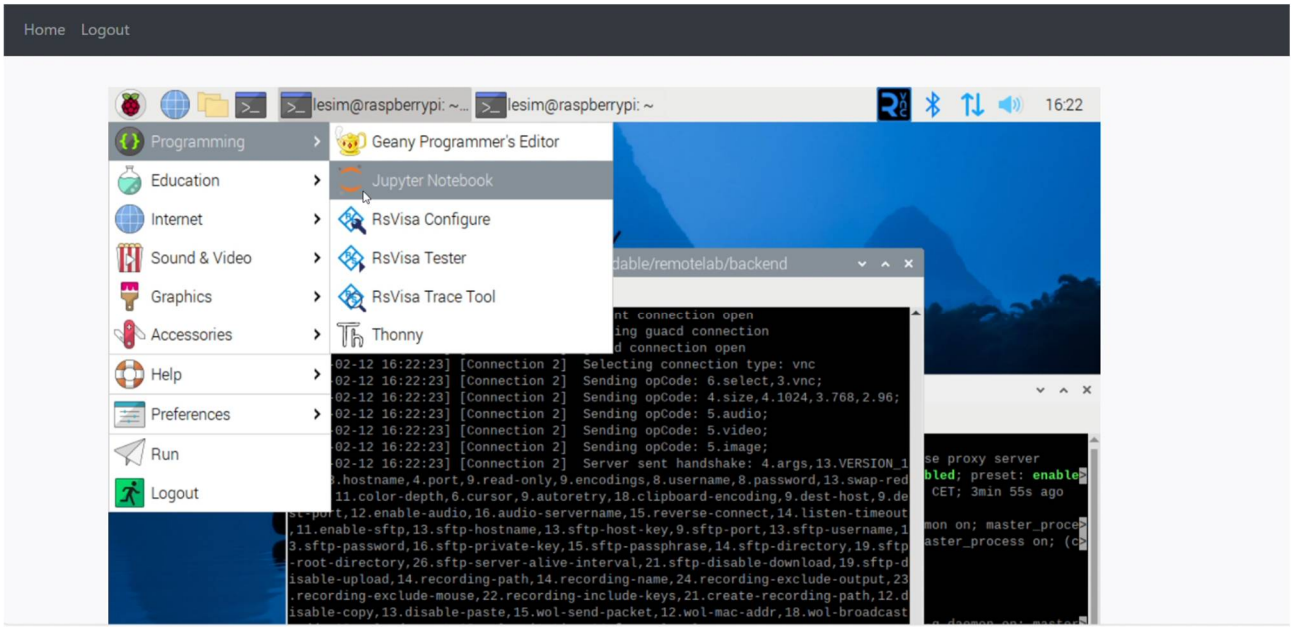
- list to the user the available experiments. For each experiment, a list of resources will be also provided, corresponding to the computers, instruments and devices involved in the experiment, which need to be controlled and monitored (see figure below)



- Retrieve the resource associated with a certain experiment. If the resource has a web interface, the backend will start a dedicated web proxy and provide the frontend with a single-use key the frontend will use to access the proxy to connect with the web interface of the instrument. It is worth noting that the web interface of the instrument will not be exposed to the user but the connection will be setup through the web proxy. Once the experiment is closed the web proxy is terminated.
  If instead the resource has a VNC or Remote desktop connection, the backend will provide a key the frontend will use to access a guacamole-lite server through websockets. The guacamole-lite server will then project the desktop of the required resource into a panel of the client browser. In the figure below a browser page is shown of an experiment providing access to a signal generator and to an oscilloscope simultaneously. In the same page it is possible to control both the instruments.



In the following picture, it is show instead the remote control of the desktop of a Raspberry Pi board.



The backend of the developed software environment can be deployed on a Raspberry Pi. In this case the Raspberry Pi can be able to manage all the experiment provided by a certain laboratory, working as a laboratory server.

The developed software environment is freely available on Github at the following link: https://github.com/lucadevito/remotelab

b) description of potential changes to what has been originally approved mentioning the impacts on the aim of the intervention, on the achievement of intermediate and long- term goals, on the proposed actions for improvement;

Building on the initially approved AR-based solution for distance learning, the project has been expanded to include a more advanced metaverse-based implementation of the remote laboratory. This new direction, as envisioned by the research team, is anticipated to offer a deeper sense of presence and interactivity, thereby enhancing student engagement and participation.

c) description of potential challenges encountered and of the proposed actions for improvement;

The research activities carried out during the reporting period did not present any specific challenges requiring further analysis and definition of appropriate solutions.

d) brief description of potential publications.

Publications are expected in the successive bimesters,

A. Liccardo, F. Bonavolontà, F. Lamonaca, D. Luca Carnì, G. Spadafora, E. Bilotta, A. M. Palermo, and A. Monaco, "Remote Control of a Digital Oscilloscope for Use in Distance Learning", 3rd International Conference of IFToMM for SDG, Villa San Giovanni, Calabria, Italy, 09-12 June 2025.

This paper presents the development of a remote laboratory system for distance learning applications, designed to replicate hands-on experiences in a digital environment. The system, based on the "miniverse" concept, allows students to interact with real instruments, such as the Tektronix TDS210 oscilloscope, through a client-server platform. It communicates using the MQTT protocol for reliability and scalability, and uses a GPIB interface supported by an ESP32 card for wireless connectivity. On the software side, the lab uses modern technologies such as Node.js and TypeScript to ensure stability and ease of use. This innovative approach bridges the gap between theory and practice in distance learning, providing an immersive and interactive experience. The system is a scalable solution for improving technical education, expanding its accessibility and quality, and opening new perspectives for science and engineering education.

F. Bonavolontà, A. Monaco, E. Caputo, A. Liccardo, "IM-MetaLAB: The First Digital Laboratory for Teaching the Fundamental Concepts of Instrumentation and Measurement in Metaverse", to be submitted to Nature Scientific Reports.

The paper will introduce IM-MetaLAB, a pioneering virtual laboratory for teaching foundational concepts in instrumentation and measurement within the metaverse. Addressing limitations of traditional online and remote labs, IM-MetaLAB will offer a fully immersive 3D environment where students interact with digital twins of actual lab instruments, achieving a realistic and dynamic learning experience. By leveraging IoT protocols, specifically MQTT, IM-MetaLAB will synchronize virtual and physical instruments in real-time, allowing students to operate lab devices with high fidelity through VR controllers that replicate real-world actions. The lab will provide flexible access, enabling both synchronous and asynchronous learning, thereby supporting diverse

learning schedules and increasing individual time with lab equipment, typically restricted in traditional labs due to limited stations. Beyond instrument interaction, the environment will facilitate group work, social engagement, and collaborative exercises, addressing isolation issues often associated with remote learning. Enhanced learning functionalities, such as wall screens for shared materials and interactive dashboards, will further support hands-on experience and foster critical skills, such as problem-solving and teamwork.

Ihtisham Ul Haq, Abdul Mohiz, Giuseppe Spadafora, Anna Maria Palermo, Eleonora Bilotta, Francesco Lamonaca, "Artificial Intelligence in the Network of Extended reality-enabled laboratories for STEM Education: Current Applications and Future Potential for Adaptive Learning",3rd International Conference of IFToMM for SDG, Villa San Giovanni, Calabria, Italy, 09-12 June 2025.

Artificial Intelligence (AI) integration into the Network of Extended Reality-Enabled Laboratories (NExRL) is a game changer in the field of STEM (Science, Technology, Engineering, and Mathematics) education. This novel and innovative framework utilizes virtual reality (VR), augmented reality (AR) and mixed reality (MR) to create immersive and adaptable environments that enable remote, hands-on experimentation. These laboratories enable inclusive and sustainable learning by overcoming key challenges such as socio-economic limitations, crowded classrooms and mobility restrictions due to the pandemic. AI boost the effectiveness of these networks since it can improve real time interaction, adaptable learning pathways and effective laboratory management. Key applications include dynamic scheduling for laboratory resource allocation, intelligent tutoring systems, behavior observation utilizing digital twins, and AI driven 3D instrument reconstruction. This study explores current uses of AI in the laboratory and its potential to improve STEM education through collaboration, initiative, and rapid feedback to students. The paper also discusses difficulties such as latency, data security and inclusiveness and presents AI driven solutions to these limitations. This overview would stimulate the research in the application of AI in enhancing NExRL laboratories in order to expand access to STEM education, improve learning outcomes, and promote lifelong interdisciplinary learning.

Ihtisham Ul Haq, Abdul Mohiz, Giuseppe Spadafora, Anna Maria Palermo, Eleonora Bilotta, Annalisa Liccardo, Francesco Lamonaca, "The Role of Network of Extended reality-enabled laboratories in Enhancing STEM Education: Bridging Theory and Practice in the Digital Classroom",3rd International Conference of IFToMM for SDG, Villa San Giovanni, Calabria, Italy, 09-12 June 2025.

Integrating practical training into Science Technology Engineering and Mathematics (STEM) education is critical for bridging the gap between theoretical concepts and real-world applications. Minimal accessibility, high operational expenses, and logistical constraints are some of the recurrent issues that traditional laboratory facilities face, especially in settings with minimal resources. This study evaluates the Network of Extended Reality-Enabled Laboratories (XR-enabled), an innovative system to create scalable, interactive, and immersive educational settings. A regulated survey comprising 200 participants, including academics, administrators, researchers, and students, assessed XR-ENABLED labs concerning many aspects of STEM education. Although technology accessibility and collaborative learning suggest areas for improvement, ANOVA analysis revealed significant variations in perspectives across positions, hence underscoring benefits such as enhanced

engagement, conceptual understanding, and motivation. The findings highlight the need for more research on long-term benefits, cost-effectiveness, and improvements in accessibility, demonstrating the transformative potential of XR-ENABLED laboratories in enhancing the inclusivity, flexibility, and practicality of STEM education

Francesco Felicetti , Elio Matteo Curcio, Stefano Rodinò , Luigi D'Alfonso , Emanuele Sgambitterra, Carmine Maletta, Carbone Giuseppe, Domenico Luca Carnì, Annalisa Liccardo, Giuseppe Spadafora, and Francesco Lamonaca, "Extended Laboratory for Biomedical Applications: Development and Validation of an Automated NiTiNol Thermo-Electro-Mechanical Characterization System", 3rd International Conference of IFToMM for SDG, Villa San Giovanni, Calabria, Italy, 09-12 June 2025.

Practical exercises are vital in STEM education, reinforcing theoretical knowledge through hands-on activities. Access to labs is crucial from primary schools to universities, even in crowded classrooms or during movement restrictions like pandemics. To meet these challenges, a research team from the Universities of Naples Federico II, Sannio, and Calabria proposes a network of labs enabling remote experiments via extended reality. Students or workers can perform real-device experiments from home at any time, ensuring access to critical training despite physical constraints. Each experiment is unique to an individual or group, preserving authenticity and quality. This paper presents the development of an automated measurement system designed to simultaneously measure and correlate the thermal, electrical, and mechanical properties of NiTiNol specimens. The importance of this didactical experience is highlighted by the increasing implementation of NiTiNol-based actuators in biomedical applications. In the immersive experience guaranteed by the proposal, the students will be able to acquire a comprehensive understanding of the NiTiNol complex thermo-electro-mechanical behavior.

M.Sinatra, L.Monacis, F.Bertachini, F.Demarco, F.Lamonaca, E.Bilotta, P.Pantano, "Digital Twins of Historical Psychotechnical Instruments: IoT-Driven Measurements for Medical Diagnostics, Research, and Education", submitted to IEEE MetroLivEnv 2025.

This paper presents a comprehensive laboratory project aimed at reconstructing and digitizing nearly 400 historical psychotechnical instruments as digital twins. These digital replicas will be integrated into an IoT-based medical system, enabling remote data acquisition, analysis, and reporting. The project involves the 3D virtual reconstruction of the instruments, followed by their physical realization through 3D printing, sensor integration, and circuit design. The digital twins will be optimized for computational use, allowing for remote interaction with human subjects wearing sensors. The system will simulate psychological processes, analyze collected data, and generate reports based on the specific metrics of each instrument. Additionally, the laboratory will develop a data platform that aggregates existing experimental data and new data from the digital twins. This platform will be integrated into a broader multi-omics medical project, facilitating cross-disciplinary research and enhancing the understanding of human cognitive and physiological processes. Furthermore, the digital twins will be made accessible to a wide audience, including students and the general public, through an interactive 3D environment. This environment will feature technical sheets detailing the history, constructors, and experiments associated with each instrument, offering an educational resource for understanding the historical roots of psychological and medical technology. This innovative approach bridges historical psychotechnical tools with modern IoT technology, offering new possibilities for psychological assessment, research, and education.

SECTION 3 – COMMON INDICATORS

Below the updates on the indicator RRFCI 8 – "*Number of researchers who work in research centres which are recipients of financial support (women; men; non-binary)*" – as per the description in the guidelines included in the n.34 MEF notification from the 17th of October 2022.

Common indicators (University of Naples)	*Planned value*	*Implemented value*
Researchers who work in research centers which are recipients of financial support (women)	0,28	0,32
Researchers who work in research centers which are recipients of financial support (men)	0	0
Researchers who work in research centers which are recipients of financial support (non-binary)	0	0

Common indicators (University of Calabria)	*Planned value*	*Implemented value*
Researchers who work in research centers which are recipients of financial support (women)	0,033	0,000
Researchers who work in research centers which are recipients of financial support (men)	0,393	0,212
Researchers who work in research centers which are recipients of financial support (non-binary)	0	0

Common indicators (University of Sannio)	*Planned value*	*Implemented value*
Researchers who work in research centers which are recipients of financial support (women)	0	0
Researchers who work in research centers which are recipients of financial support (men)	0,336	0,364
Researchers who work in research centers which are recipients of financial support (non-binary)	0	0

SECTION 4 – PREDICTIVE ANALYSIS AND FINAL COMMENTS

Below it is provided a description of the forecast scenario on the development of the project, any potential change which is deemed necessary for the future as well as comments on the document.

1) Predictive analysis

The research units will continue the development of the metaverse environment, further expanding its features and functionalities to support immersive and interactive remote laboratory experiences. No specific drawbacks or challenges are expected to be experienced in the successive months.

2) Final comments

Operational units are carrying out their activities according to the predicted timelines. At the moment, no specific concerns have been highlighted. Activities more related to active research started in the last four-month period, according to the project schedule.

Principal Investigator

(digital signature)

SECTION 5 – ATTACHMENT

The below documents are also attached to the technical – scientific report:

Att.1 – Declaration of compliance with DNSH principle and compliance with other principles as per the Environment code;