

Connected 5G-IoT Cyber Range for Training and Secure Operation

Project Coordinator

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Project Details

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EC Contribution: 101145872

The NITRO consortium has now successfully submitted key deliverables detailing the project's progress, including the complete design of the cybersecurity training exercises and the implementation of the gamification strategy.

Building on these achievements, the consortium is now focused on enhancing the platform through ongoing integration efforts, further development of training content, and refinement of the user experience. Work Package 3 (Cybersecurity Training Exercises) and Work Package 4 (Scoring System and Gamification) continue to evolve, with active contributions toward expanding exercise complexity, improving system interoperability, and aligning technical components. The consortium is also in the process of finalizing the NITRO architecture in WP2, marking a major milestone toward the full operational deployment of the platform.

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NITRO project has received funding from the European Union's DIGITAL JU SME Support Actions under the grant agreement No. 101145872.

Enhancing Engagement and Realism through Gamification

The NITRO 5G-IoT Cyber Range integrates an advanced gamification framework as part of its mission to develop practical cybersecurity skills across 5G, IoT, and networked systems. The design goes beyond traditional training approaches by embedding pedagogically grounded game mechanics into the core of the learning experience. This promotes not only participant engagement but also measurable skills development aligned with real-world cybersecurity demands.

The range implements a multi-layered gamification strategy aimed at maximizing participant motivation, retention, and real-world preparedness:

Key Features:

1. Scoring & Adaptive Progression

Participants earn points for completing missions, detecting attacks, and mitigating incidents. A dynamic difficulty adjustment mechanism tailors the experience to the user's current skill level, ensuring **optimal cognitive load** and a **personalized training path**. Points unlock advanced challenges, while badges and certifications highlight specific achievements.

2. Scenario-Based Narrative Missions

All training takes place within a structured narrative involving the protection of critical 5G infrastructure against sophisticated cyber threats. This story-based format **increases user immersion** and **reinforces situational awareness and decision-making under pressure**.

3. Real-Time Feedback and Leaderboards

Participants benefit from **immediate feedback through dashboards, performance visualizations, and real-time leaderboards**. These elements support self-assessment and team benchmarking without compromising the integrity of learning outcomes.

4. Integration with Threat Intelligence and Detection Tools

Scoring and progress are based not only on completion but on intelligent evaluation of how users detect and respond to threats. The system uses real-time SIEM logs, MITRE ATT&CK mappings, and Indicators of Compromise (IOCs) to simulate professional SOC environments and evaluate incident response quality.

5. Structured Learning Support

Users of all skill levels are **supported with interactive tutorials, in-game documentation, and hints**. The system encourages experiential learning while providing scaffolding to guide participants through increasingly complex tasks.



NITRO 5G Cyber Range: A Competency-Driven, Learner-Centric Approach

The NITRO Cyber Range's gamification model is carefully aligned with the **competency development goals of cybersecurity education and workforce training** in Europe.

Pedagogical Highlights:

- **Performance-Based Learning:** Rather than relying on superficial gamification (e.g., points for clicks), each action is evaluated for its strategic value—promoting the development of analytical, procedural, and decision-making skills.
- **Flow-Oriented Design:** The system keeps participants within a productive "flow" zone, neither too easy nor too difficult, maintaining engagement and challenge throughout the experience.
- **Motivational Mechanics:** Features such as scenario unlocks, bonus rounds, and progressive complexity encourage continued participation without fatigue or distraction.

Credentialing & Recognition:

- Participants can earn **skill-specific digital badges** (e.g., DDoS Responder, 5G Threat Analyst), as well as full scenario-based certifications reflecting their proficiency in defending against realistic threats.
- These credentials are **competency-aligned** and **verifiable**, supporting future employment opportunities and lifelong learning pathways.

The gamified design of the NITRO 5G Cyber Range represents a cutting-edge fusion of education, simulation, and cybersecurity operations, positioning it as a valuable instrument in strengthening Europe's cyber resilience and skills development agenda.



NITRO News & Events



NITRO presentation in the 1st Student IT Conference at Ionian University



NITRO presentation at the General Hospital of Corfu in Greece for raising security awareness



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NITRO presented at Bright
Minds AI Summer Camp
2025



Showcasing the NITRO 5G-IoT
Cyber Range at IPICS 2025



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Upcoming Deliverables and Future Activities

NITRO researchers are working on deliverables and tasks in order to fulfill all the main objectives which will lead toward the completion of the project.

In the next months, researchers will work on the following deliverables:

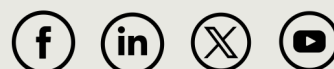
- D4.2: NITRO Infrastructure Integration - first version
- D2.4: NITRO cyber range architecture, testing and validation plans - second version



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Website: nitro-project.eu

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