PRECINCT

Preparedness and Resilience Enforcement for Critical INfrastructure Cascading

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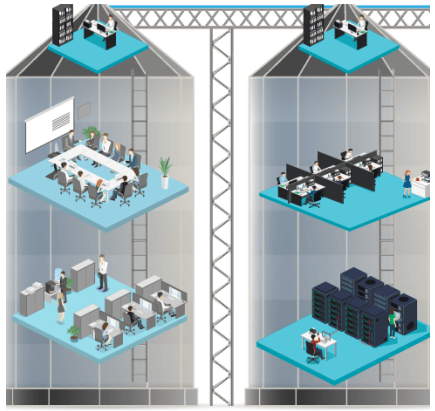
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 101021668.

The challenge

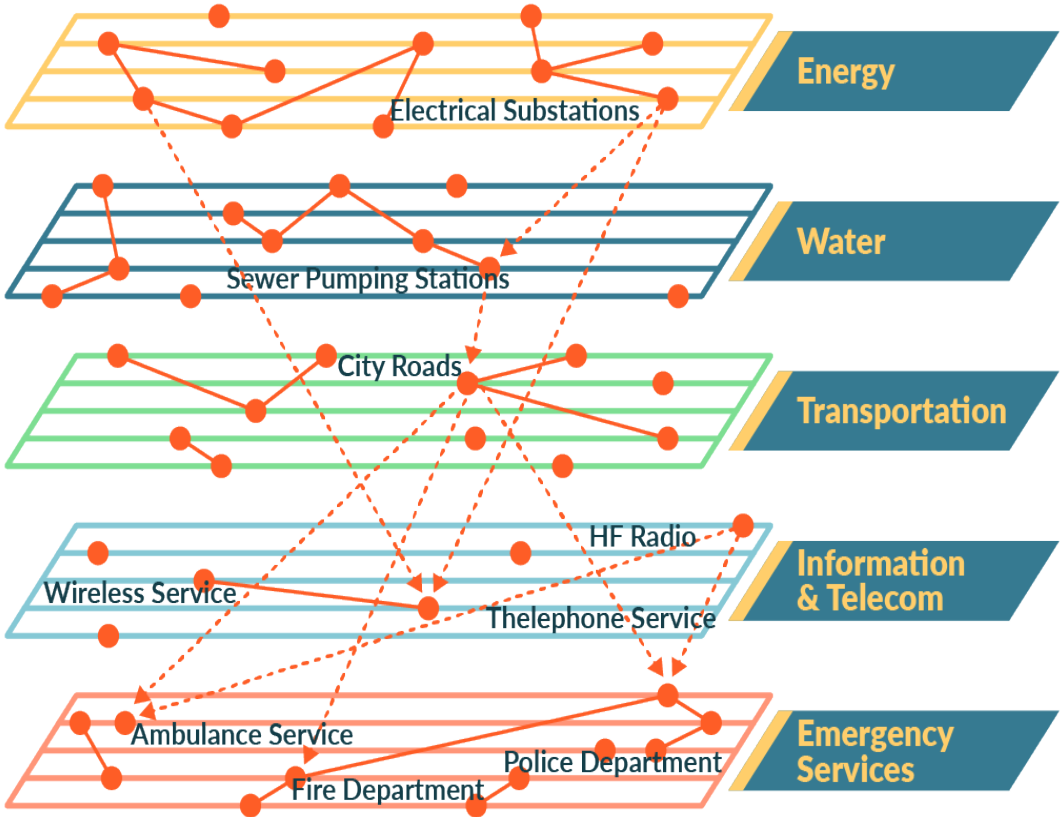
Lack of Information Connectivity across Critical Infrastructure systems

- Multiple stakeholders –> **siloed operations**
- Lack of **global situation awareness**
- Limited preparedness on **incident cascading effects** across systems



Information Silos

- Suboptimal **crisis management**
  - → Siloed operations prevent **timely and coordinated response actions**



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Industry perspective

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- New EU Directives
- Heightened Geopolitical Tensions and Threats
- Global Climate Change and Natural Disasters
- Market Fragmentation and Challenges for Integration

- Smart City and IoT Networks
- Citizen Awareness and Increased Accountability
- Government Funding
- Aging Infrastructure

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PRECINCT Vision

- PRECINCT aimed to **connect private and public CI stakeholders** in a geographical area to **a common cyber-physical security management approach** yielding **a protected territory** for **citizens and infrastructures**
- **Enable interdependent CIs and First Responders / Public authorities** to plan for, prevent, absorb, recover and adapt efficiently and effectively to the effects of cyber-physical and hybrid threats / attacks as well as **impede their cascading effects**.
- **PRECINCT CIs Coordination Centres**: explore collaboration and governance models that link CIs, first responders and other CI stakeholders **harmonising CIs emergency processes with command structures and data sharing, thus enabling the quantification and management of resilience** via identification and implementation of measures that **minimise the impact of cascading effects arising from the interdependencies between different types of critical infrastructures**
- **PRECINCT Digital Twins** to enable trusted, efficient, accurate and cost-effective operations for CCs by identifying and tracking events within the region over time, provide self-adapting cognition based on learned behaviours, learned corrections, learned patterns and learned interventions thus incentivising automated upgrading of interdependent CIs resilience

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The approach

- The overall project's technical objective is to establish an Ecosystem Platform for connecting stakeholders of interdependent CIs and Emergency Services to collaboratively and efficiently manage security and resilience by sharing
  - Data
  - Critical Infrastructure Protection models
  - New resilience services
- PRECINCT will implement Digital Twins and Serious Game approach to identify vulnerabilities and testing/validate new detection and mitigation models and associated services in a real-time real-life context.

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Fact File

PRECINCT
Preparedness and Resilience Enforcement for Critical Infrastructure Cascading Cyber-Physical Threats

2 year project
Start date: 1st October 2021
End date: 30th September 2023
Total budget: €9,472,739.05
40 Partners - EU

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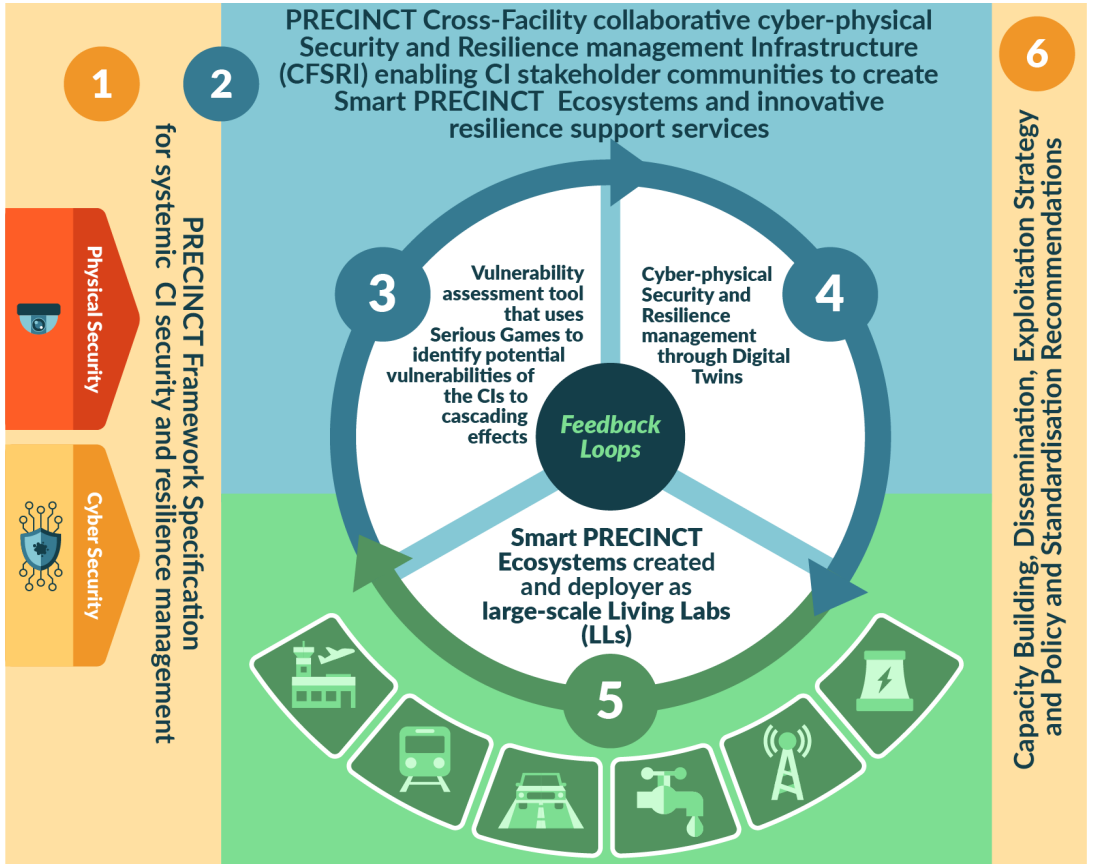
The key outputs

1. A PRECINCT Framework Specification for systematic CIs security and resilience management fulfilling industry requirements elicited with stakeholders within the LLs and integrating new insights from reference EU projects.
2. A Cross-Facility collaborative cyber-physical Security and Resilience management Platform enabling CI stakeholders to develop AI-enabled PRECINCT Ecosystems and enhanced resilience support services.
3. A vulnerability assessment tool that uses Serious Games to identify potential vulnerabilities of the CIs including cascading effects and to identify resilience enhancements for each CI and the coordinated measures.
4. Digital Twins to represent the CIs network topology and metadata corresponding to the relevant dependency profiles, applying closed-loop Machine Learning to detect anomalies and alert conditions and to provide optimised activation of response and mitigation measures and automated forensics.
5. Smart PRECINCT Ecosystems, deployed in four large-scale LLs and in transferability validation demonstrators, will provide measurement-based evidence of the targeted advantages.
6. Sustainability outputs including Capacity Building, Dissemination, Exploitation and Policy and Standardisation Recommendations.



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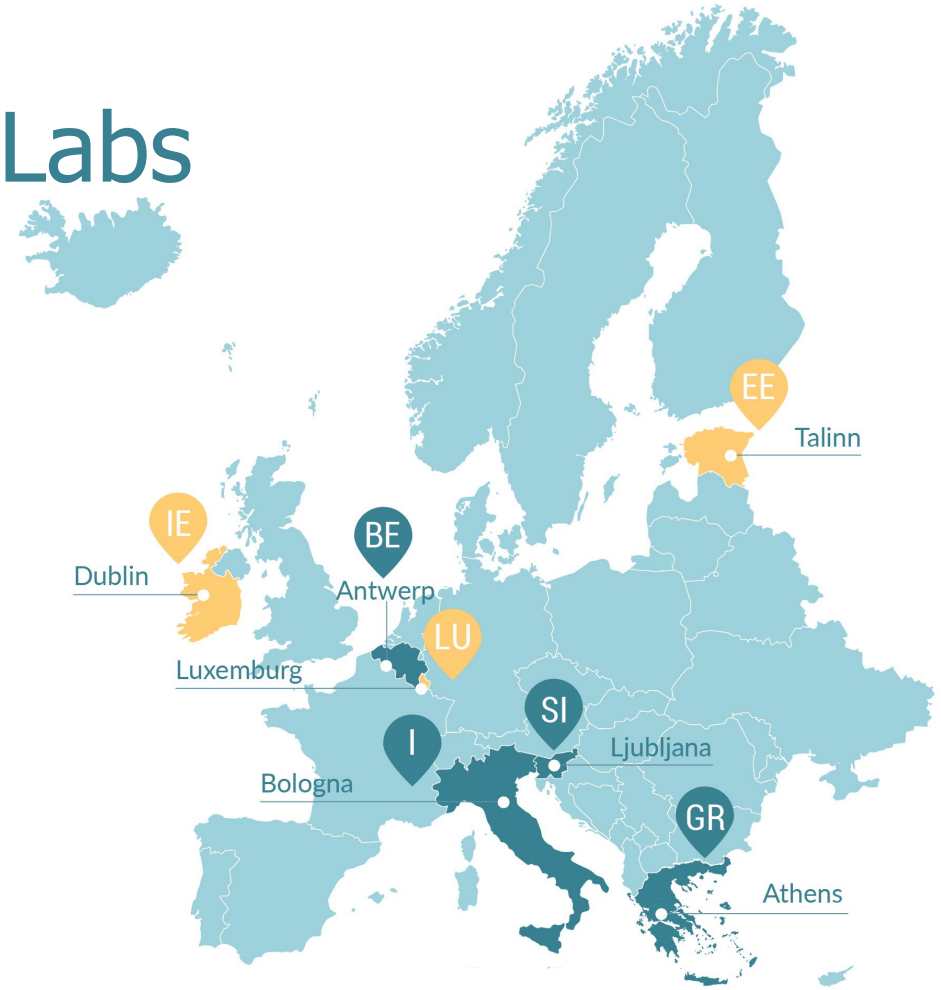
PRECINCT Living Labs



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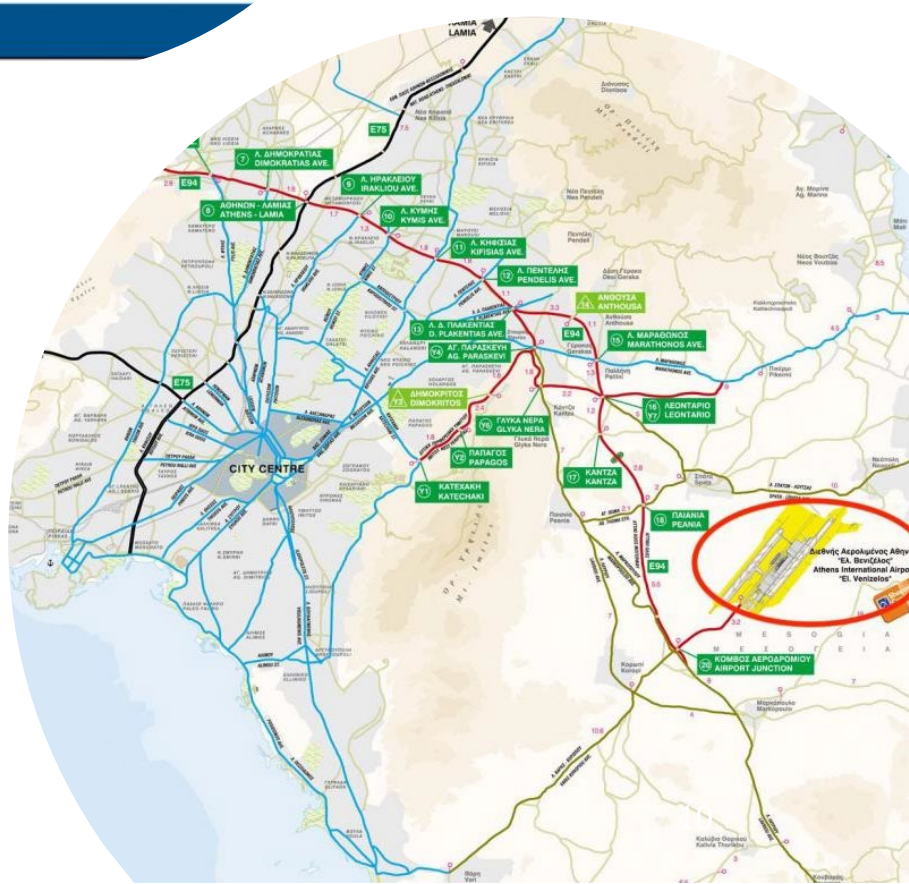
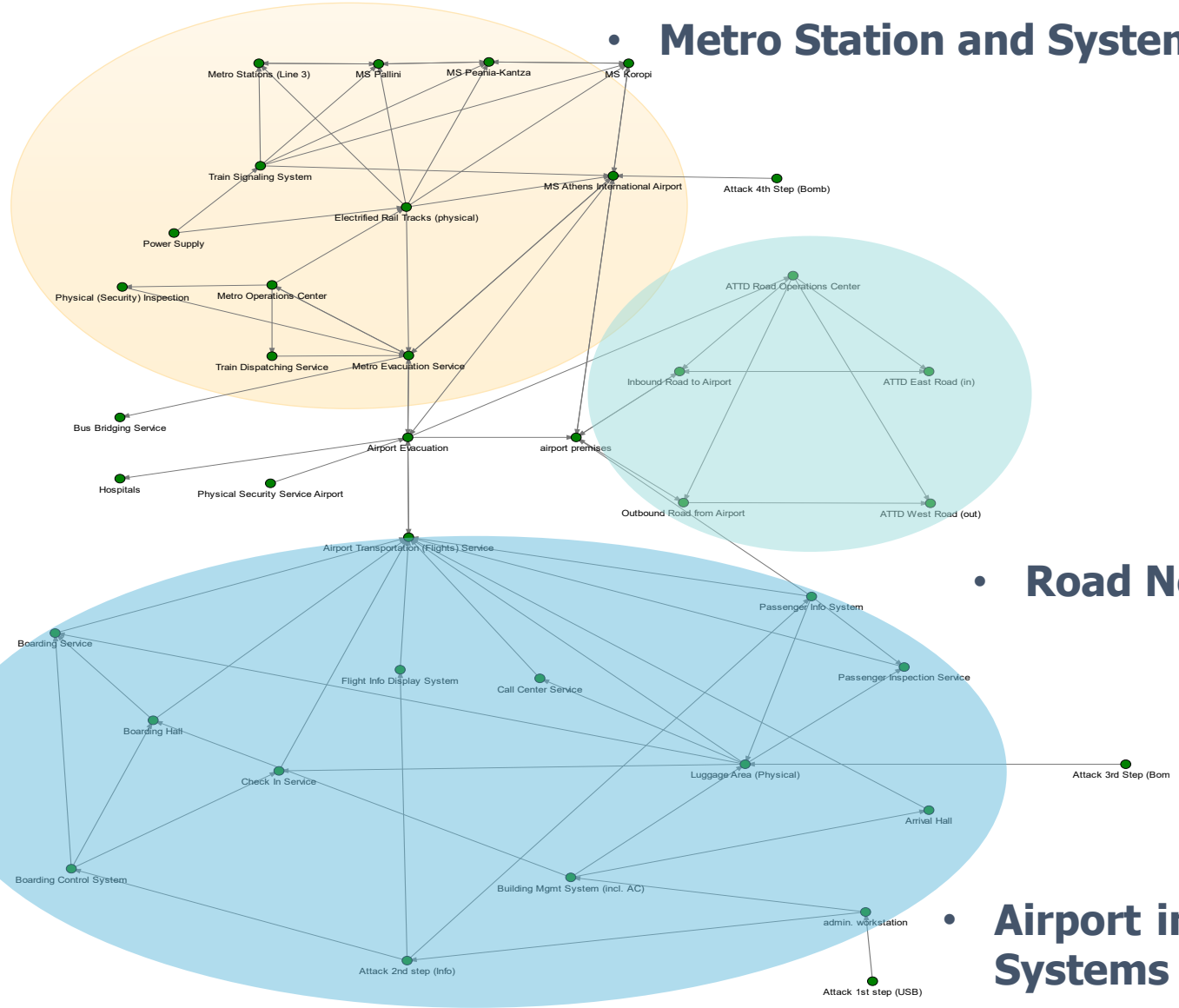
LL3 ATHENS

- Thematic Focus: **Athens Region Transport Resilience**
- **Critical Infrastructre:** Airport , Metro (AMETRO S.A), Road Operator
- **Coordination Center:** Center for Security Studies (KEMEA)

- **PRECINCT Living Lab 3 Objectives**
  - Apply PRECINCT's **Reference Framework** to establish dependencies between LL3 CIs and other CIs in the Network
  - **Support the exchange of information** achieve effective and timely communication with CIs operators/crisis management centers and first responders
  - Test the **PRECINCT Platform** in terms of **increasing the resilience** of **Critical Infrastructures**

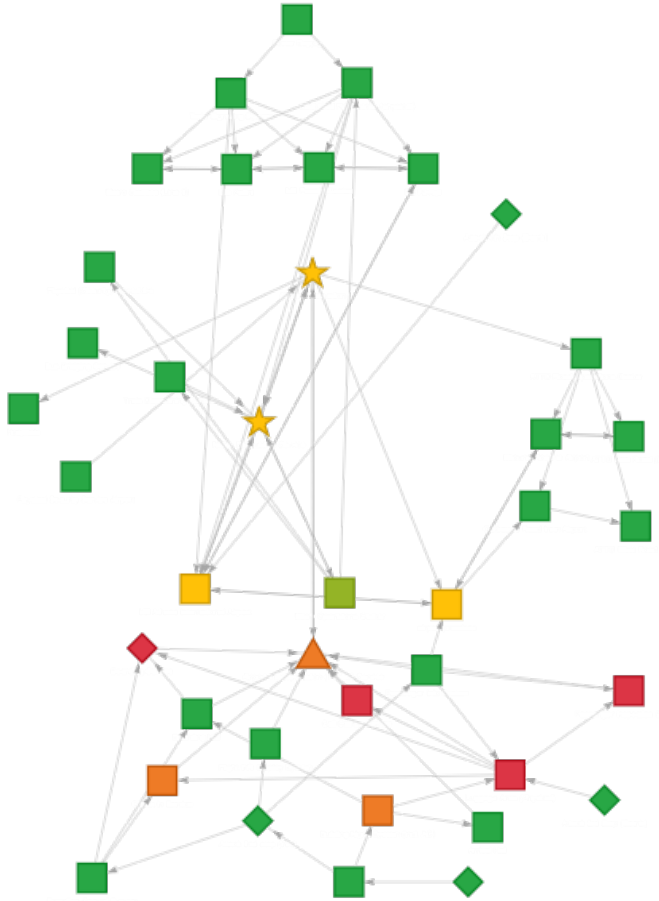


PRECINCT LL3 Interdependency Graph and Threats Simulations



- **Metro Station and Systems Nodes**
- **Road Network Nodes**
- **Airport infrastructure and Systems Nodes**

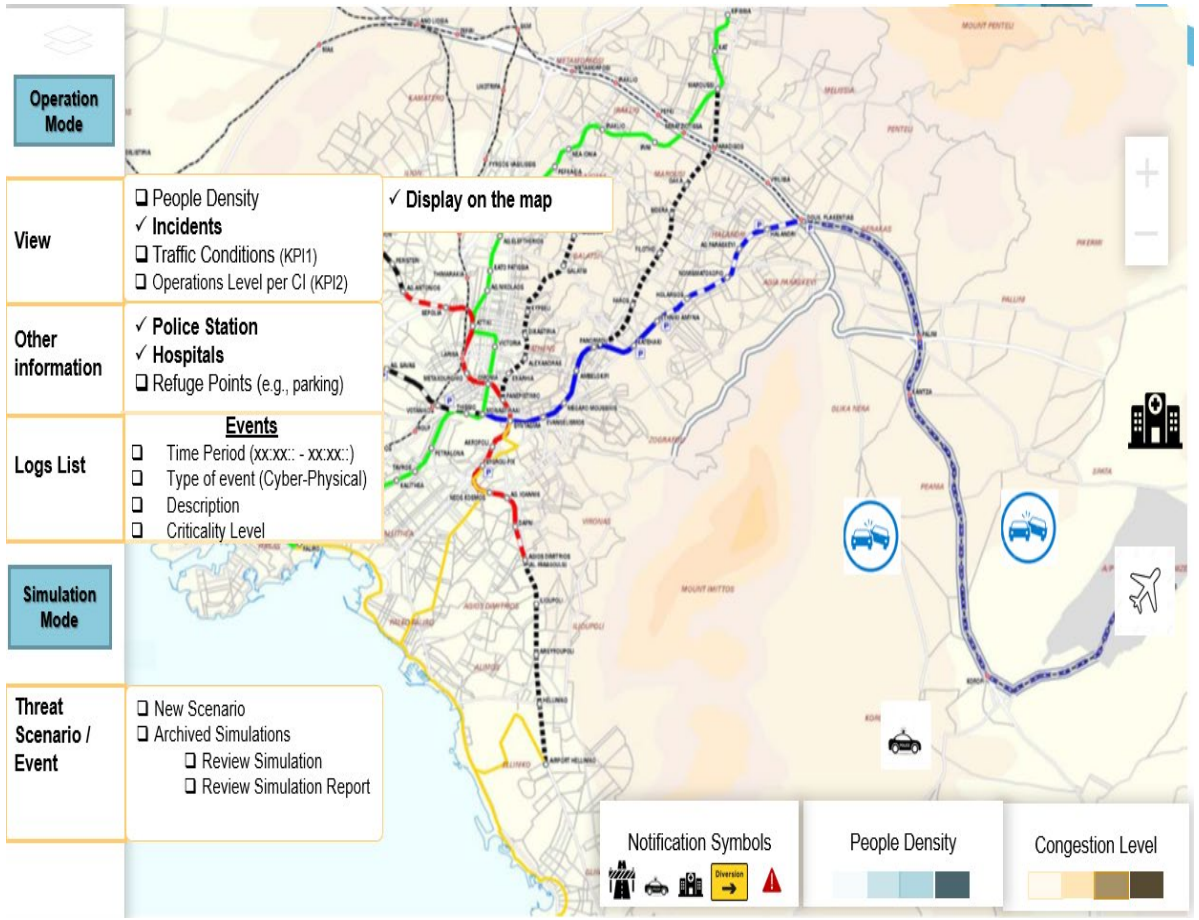
LL3 Network Status Threat Simulation



Digital Twin Goals

Build a software solution consolidating:

- ✓ Data across CIs in a **common representation**
- ✓ Inter-CI **incident dynamics**
- ✓ **Resilience** metrics
- ✓ **Incident detection & simulation** tools
- ✓ **Decision-support** for crisis management



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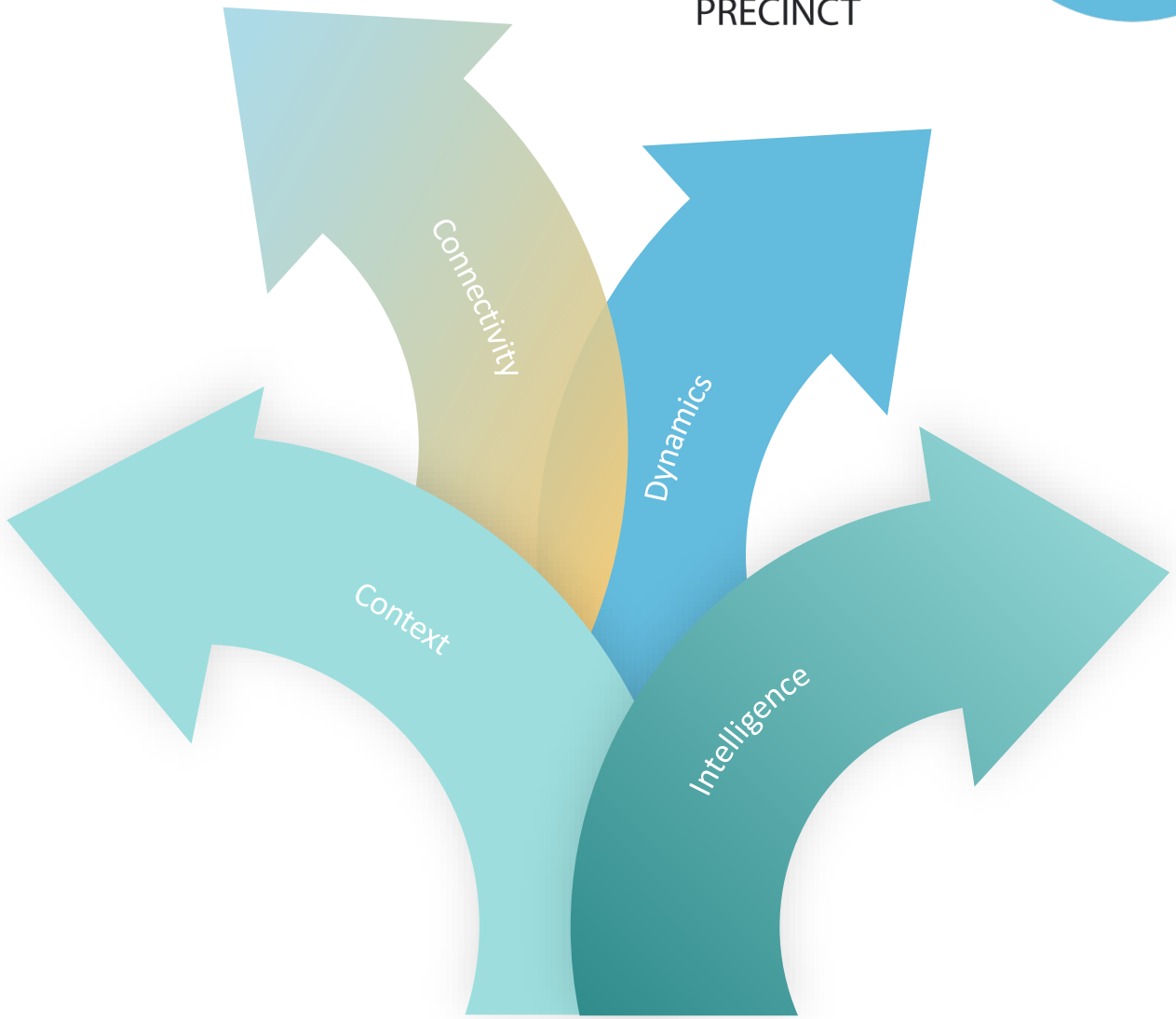
LL3 - Key Takeaways

- Significant value lies in **bridging the silos** and leveraging **inter-system dynamics**
- CI systems are **highly interconnected**; optimal **operational resilience** depends on achieving **connected intelligence**
- The **PRECINCT** project tackles the above by building a **unifying DT framework** for CIs, focused on **cyber-physical threats**



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PRECINCT Cyber-exercises

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Objective of the cyber-exercises:

- Awareness of the cybersecurity relevance in the Living labs and training to recognise potential **cyberattacks** that could be suffered in the LL and the **mitigation techniques** to avoid them.

Steps followed for definition of cyber-exercises:

Vulnerabilities identification

Kill chain definition

Architecture

Data Visualisation

Story line

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Serious Games - Post Game Analytics

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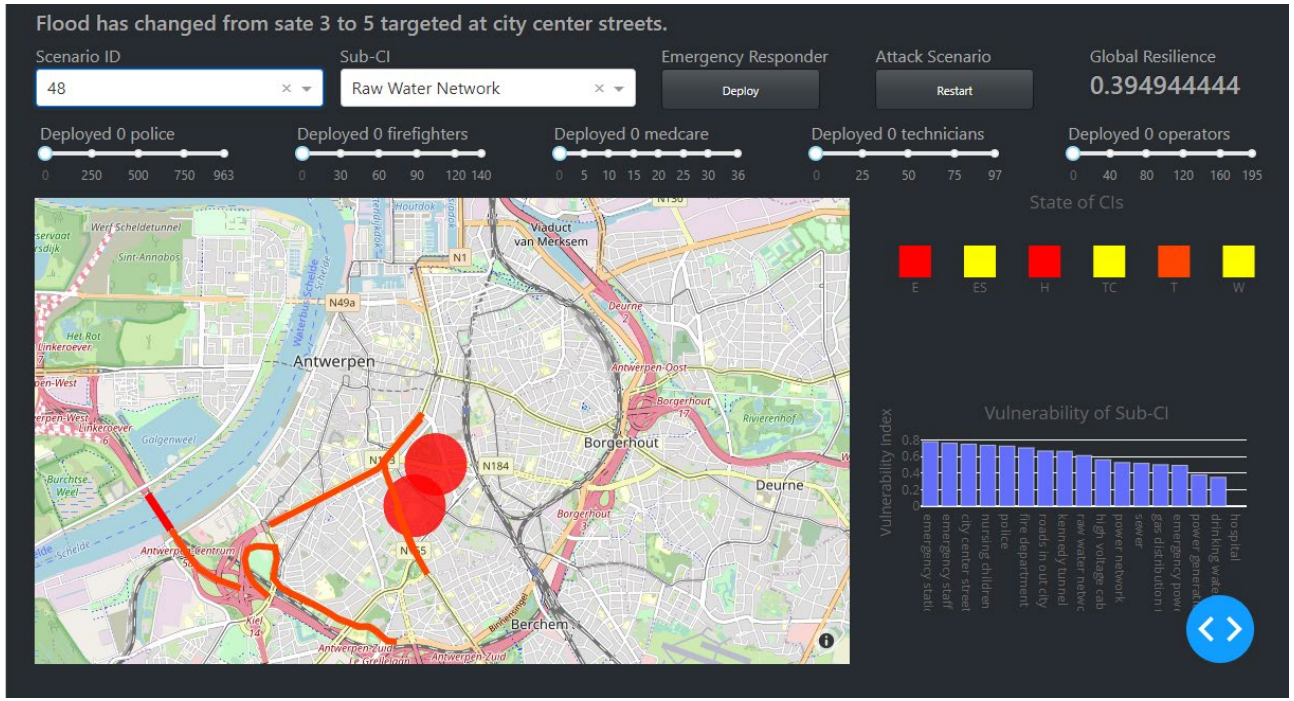
Components

Containing 50 attack scenarios,
A sub-CI selection and 5 emergency-responder sliders (police, firefighter, medicare, technician & operator)

Analysis

Providing attack information, geospatial analysis, vulnerability index, a global resilience index, and state for each CI (health, emergency service, energy, transportation, telecommunication & water)



Test the same scenario with different emergency responder numbers

Discover potential response solutions with various scenarios

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Evaluation of PRECINCT components

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GKPI 1	• *Improved capabilities of end users to manage cyber-physical threats more efficiently.*
GKPI 2	• *Improved operational resilience in the LLs*
GKPI 3	• *Improved accuracy in cyber-physical threats detection*
GKPI 4	• *Improved "Resilience Index"*
GKPI 5	• *Increased speed in mitigation and reaction.*
GKPI 6	• *Increased ROI estimated by economic models for specific CI types.*

BKPI 1	• Response and mitigation suggestions
BKI1 2	• Situational User Interface
BKPI 3	• Training of End-Users
BKIP 4	• Decision Support
BKPI 5	• Recognition of threats
BKPI 6	• Return to BAU
BKIP 7	• Minimising effects of specific consequences
BKPI 8	• Understanding cascading effects
BKPI 9	• Coordination standardization and regulation

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Evaluation of PRECINCT components

The user experience	• PRECINCT framework is approved by the system's intended end-users and met their expectations.
DT	• Performed all the tasks that it was designed for, supporting the operators in their further investigation and response actions in the context of the different LL threat scenarios
Operator Feedback	• PRECINCT is an acceptable solution to improve capabilities of end users to manage cyber-physical threats more efficiently
Cyber range exercise tool	• Has the potential to improve operators' readiness for cyber-attacks
Serious Game	• could be used as an interactive decision support system. Based on the feedback collected additional notifications should be provided during the gameplay to make it obvious to the end users how to address issues and the game's graphics could be improved in order to make the game more appealing to them.

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PRECINCT recommendations

- Centralised coordination – through creation of **Coordination centres**
  - Building Trust between stakeholders
  - Holistic Approach
  - Manage Complexity
  - Understand Accountability
  - Support Unified Vocabulary and Metrics
- Support market growth and development of tools for coordination centres
  - DT, SG, AI etc
- PRECINCT has had a city or region view but it is important to Consider Cross border Issues

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Thank you for your attention

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