IOTWeek | Dublin
June 20-23, 2022

“ELECTRON

rEsilient and seLf-healed EleCTRical pOwer Nanogrid

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101021936

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Project Identity & Consortium

Project Identity

- **Name:** ELECTRON - rEsilient and seLf-healed EleCTRical pOwer Nanogrid
- **Type of Action**: Innovation Action
- **Call Identifier**: H2020-SU-DS-2020
- **Topic**: SU-DS04-2018-2020 - Cybersecurity in the Electrical Power and Energy System (EPES): an armour against cyber and privacy attacks and data breaches
- **Duration**: 1 November 2021 to 30 September 2024 (36 months)
- **Overall Budget**: 10.207.562,50 €
- **EU Contribution**: 7.998.887,01 €
- **Grant Agreement ID**: 101021936
- **Project Coordinator**: Netcompany-Intrasoft
- **CORDIS Link**: https://cordis.europa.eu/project/id/101021936

Consortium Map

33 Partners

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ELECTRON Consortium

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33 Partners

Energy Providers, TSO, DSO, Utilities, Manufacturers, Prosumers, Technology Providers

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Business Logic & Architecture

ELECTRON Business Logic

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Main Innovation Points

- Post Quantum Privacy Preserving in EPES
- Honeypot as a Service (HaaS)
- Federated AI Detection
- Proactive Islanding based on SDN/NFV
- Dynamic Certification & Authentication
- EPES Threat Intelligence

Four Main Pillars

Risk Assessment & Certification

Collaborative Risk Assessment, Honeypots As Service, Dynamic & Continuous EPES Asset Certification & Authentication

Intrusion Detection & Privacy

Federated Learning intrusion detection, post quantum privacy preserving, ELECTRON Threat Intelligence

Mitigation and Energy Optimization

Proactive Islanding, SDN/NFV-based Network Isolation and Recovery, electrical grid restoration, ELECTRON Energy Trading Framework

Personnel Training and Certification

AR/VR based EPES personnel training and certification

BORDER

CYPER

BRIDGE

PRINCE

ELECTRON

ELECTRON Platform

Integrated solution for enhancing the EPES resiliency, combining a plethora of technologies, such as Honeypots, Federated Learning, Visual Analytics, Post quantum cryptography, SDN/NFV, AR/VR, Crawling, MISP, SIEM, Blockchain, Mixed-integer linear programming, Deep Learning-based Islanding

ELECTRON Architecture

8-Layer Architecture

ELE-L: Electrical Layer

Physical and virtualized EPES assets/devices, e.g., RTUs, PLCs, smart meters, PMUs, PDCs, EPES Honeypots

SDN-L: SDN Layer

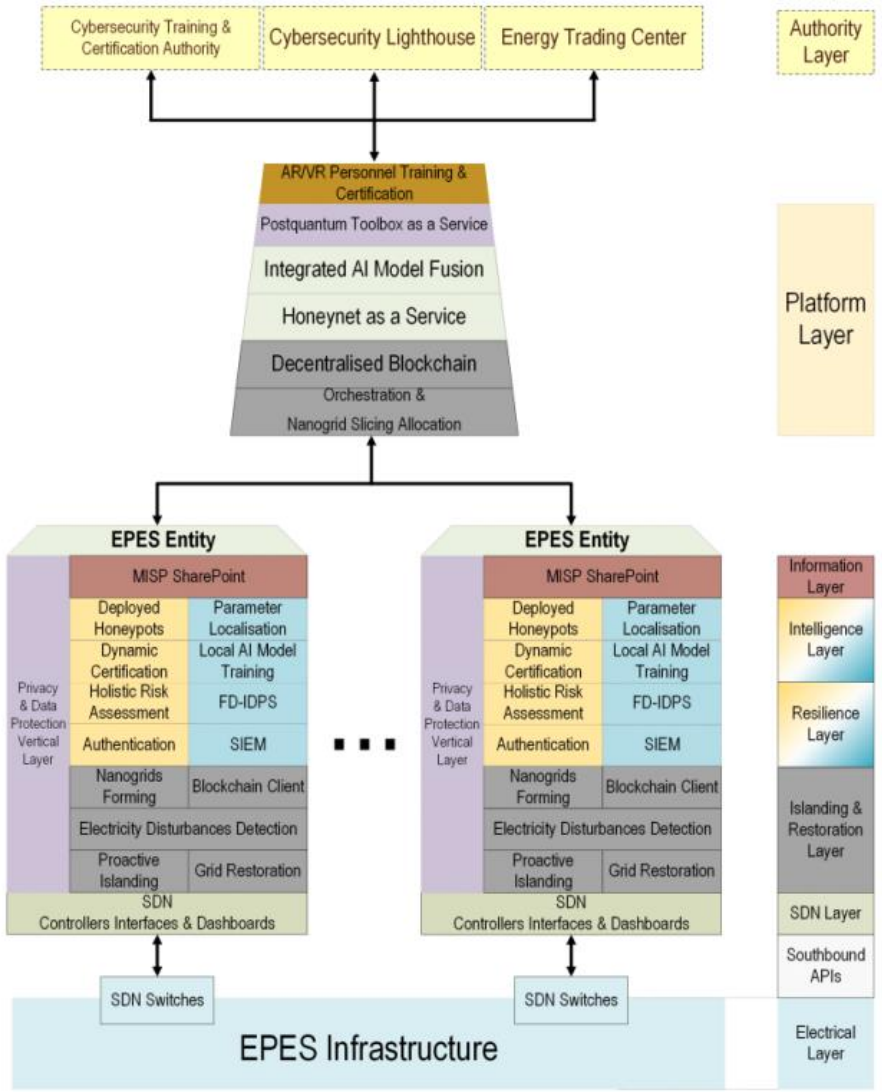
SDN Control, southbound interfaces, northbound interfaces

IS-RE-L: Islanding and Restoration Layer

ISODINE(Intentional iSOlation anD IslaNding modulE), ELISE (Electrical Grid Restoration Module), NIRO (Network Isolation and Recovery mOdule)

RES-L: Resilience Layer

ARMY (Collaborative Risks Assessment), DARCY (Cybersecurity Certification), STRONGBOX (post quantum privacy preserving), EDAE (Electric Data Analysis Engine), Network Isolation and Recovery mOdule (NIRO)



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ELECTRON Architecture

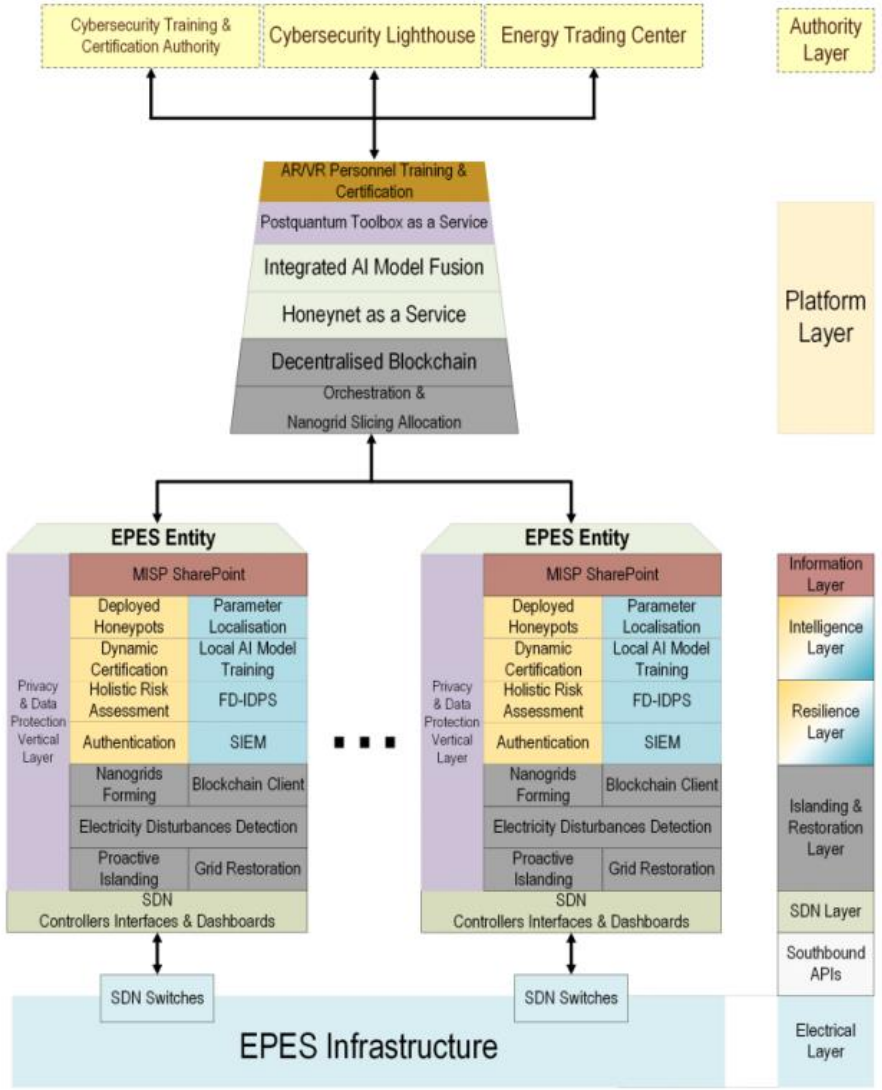
8-Layer Architecture

Intelligence Layer
Honeypot as a Service, Federated Learning-based IDPS, XL-SIEM +, ELECTRON APT Shield

Information Layer
MISP-based ELECTRON Sharepoint, ELECTRON Threat Explorer

Platform Layer
Honeypot as a Service, Federated Learning-based IDPS, Network & Application Orchestrator

Authority Layer
ELECTRON Cybersecurity Lighthouse, Energy Trading Centre, AR/VR Cybersecurity Training, Certification Authority



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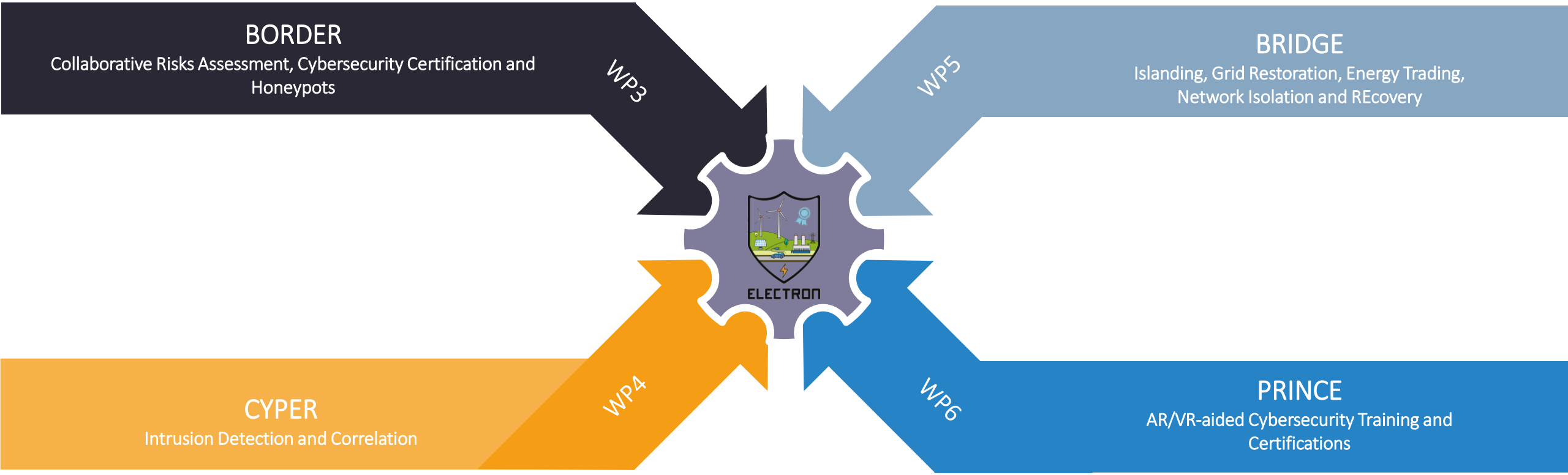
ELECTRON Architectural Frameworks

Architectural Frameworks and Relation with other technical WPs



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ELECTRON Use Cases

Use Case #1: Shielding the EU borders: Addressing and Mitigating Cyberattacks and Data Leaking in Ukraine

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5 Scenarios

Involved Actors

CSDFC (Technology Provider), JSC (Ukrainian DSO), PIMEE (Ukrainian End User & Technology Provider), ENERGOATOM (Nuclear Plant Generator/Operator), and DTEK (Ukrainian Operator, generator, and DER)

Scenario #1 – Spear Phishing

Preventing Spear Phishing via AR/VR Training

ELECTRON Components: PRINCE

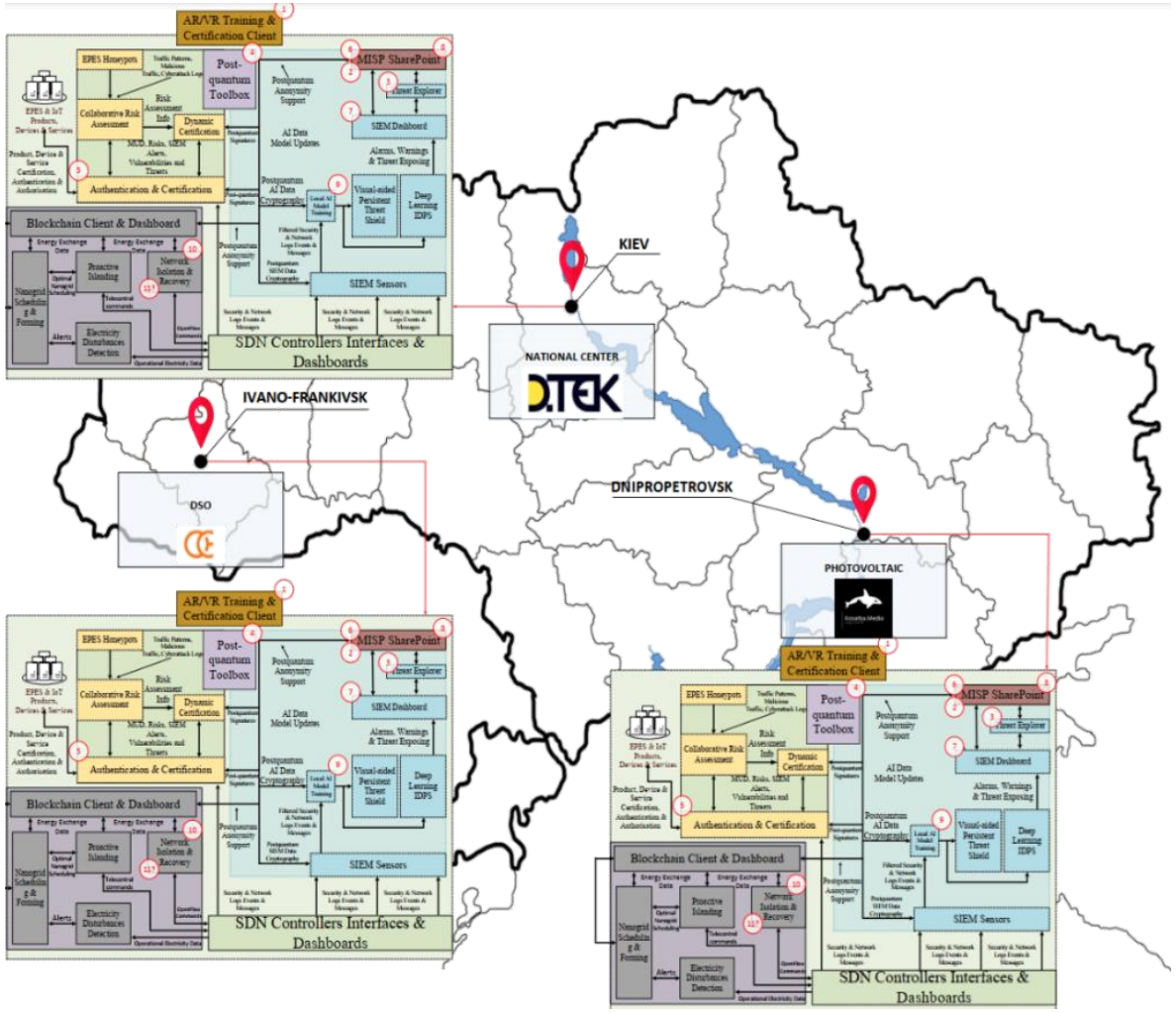
KPIs: Participation percentage of the total energy personnel > 90%, . Percentage of certified energy personnel after running PRINCE > 95%.

Scenario #2 – Malware

Detecting and Mitigating Malware

ELECTRON Components: ELECTRON SIEM, ELECTRON Sharepoint, ELECTRON Threat Explorer (Patch identification)

KPIs: Malware threat detection and prevention: 99.9%, Time needed to detect and prevent the malware threat: < 10 ms



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Use Case #1: Shielding the EU borders: Addressing and Mitigating Cyberattacks and Data Leaking in Ukraine

ELECTRON

5 Scenarios

Scenario #3 – SCADA Control Units Hijacking

Detecting and mitigating Man In the Middle attacks

ELECTRON Components: STRONGBOX

KPIs: MitM attacks detection and prevention: 99.9%, Time needed to detect and prevent the malware threat: < 10 ms

Scenario #4 – Unauthorised Access Attacks

Using VPN access to get authorised and authorisation for taking control of the inner ICS systems

ELECTRON Components: ARMY and DARCY

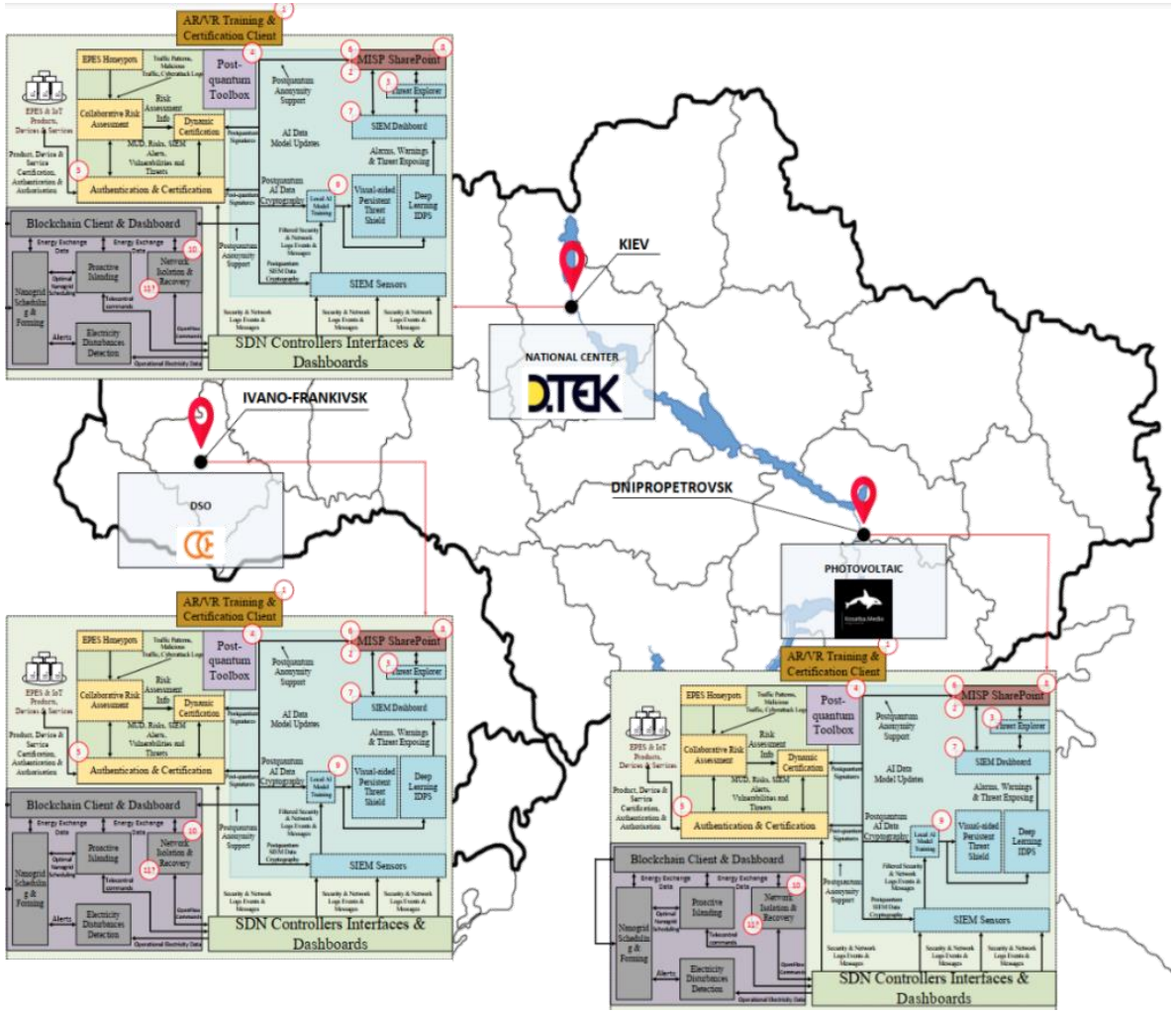
KPIs: Authentication & authorisation denial of the custom VPN: 99.9%, Time to detect & prevent the malware/threat: < 10 ms

Scenario #5 – DoS and DDoS attacks

Detecting and Mitigating DoS and DDoS Attacks

ELECTRON Components: ELECTRON SIEM, FL-IDPS, ELECTRON Sharepoint, NIRO, SDN Controller

KPIs: DoS and DDoS attack detected and mitigated: 99.9%, Time needed to restore the nanogrid under the attack: < 100 ms



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Use Case #2: Providing a Resilient Electric Vehicle Ecosystem

4 Scenarios

Involved Actors

PPC, IPTO

Scenario #1 – Uncertified SCADA Assets

Blocking access to uncertified SCADA assets

ELECTRON Components: DARCY, ARMY, XL-SIEM, ELECTRON Sharepoint, SDN Controller

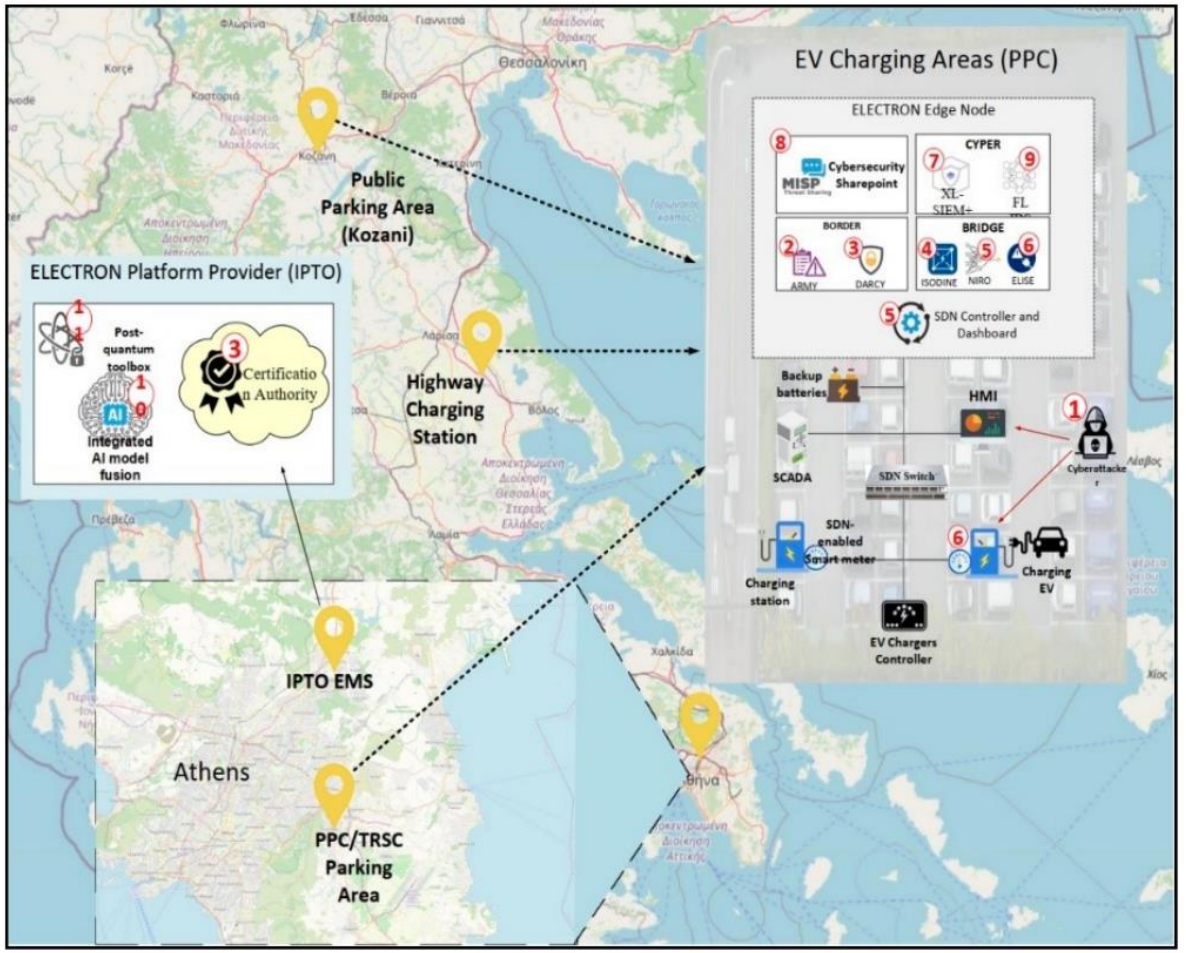
KPIs: Accuracy of ELECTRON to identify the vulnerabilities of the HMI: > 99%, Time needed to determine the certification status of the HMI: < 10 ms

Scenario #2 – FDI Attacks against PPC Electrical Vehicles (Evs)

Detecting and Mitigating False Data Injection Attacks

ELECTRON Components: ELECTRON SIEM and its detectors, ISODINE, NIRO, SDN Controller, ELISE

KPIs: Detection accuracy of the upcoming fault: > 95%, Restoration time of the nanogrid: < 100 ms



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Use Case #2: Providing a Resilient Electric Vehicle Ecosystem

Involved Actors

PPC

Scenario #3 – DoS Attacks against PPC EV Charging Stations

Detecting and Preventing DoS attacks

ELECTRON Components: ELECTRON SIEM, FL-IDPS, Threat Explorer, ELECTRON Sharepoint

KPIs: Malware threat detection and prevention: 99.9%, Time needed to detect and prevent the malware threat: < 10 ms

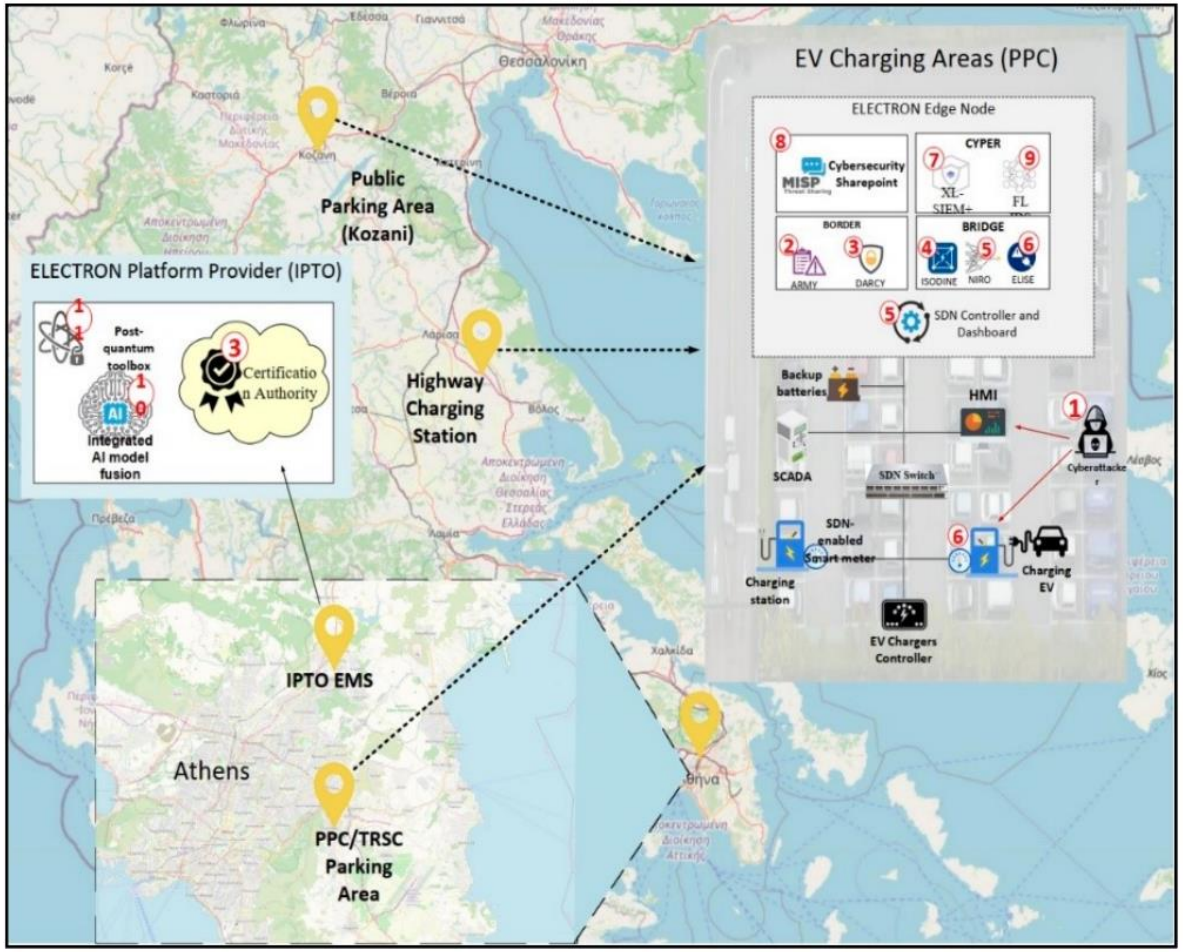
Scenario #2 – MITM Attacks against PPC Electrical Vehicles

Detecting and Preventing MITM attacks

ELECTRON Components: ELECTRON SIEM and its detectores, ELECTRON Sharepoint, NIRO, SDN Controller, STRONGBOX

KPIs: MITM attacks detection and prevention: 99.9%, Time needed to detect and prevent the malware threat: < 10 ms.

4 Scenarios



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Use Case #3: Protecting the Renewables Energy Chain from Cyberattacks and Data Leaking

Involved Actors

Enerfin (Operator/Generator), SCHF & SCHE (Manufacturer), Isotrol (Technology provider/Scada Manufacturer), Tecnalia (Research Centre), TUVSPAIN (Certification/Industry).

Detecting a number of cyberattacks against Enerfin Wind Farm

ELECTRON Components: FL-IDPS, ELECTRON SIEM, ELECTRON SP (MISP), ELECTRON APT Shield, ARMY

AR/VR-based Cybersecurity Training

ELECTRON Components: PRINCE

Relevant KPIs

KPI#1: Number of critical cybersecurity vulnerabilities detected in assessments and penetration tests; KPI#2 Number of actions proposed for acting in monitoring and control infrastructures in current and in legacy systems; KPI#3 Number of pattern-based detection rules based on IT and OT with alert to control centers; KPI#4 Number of employees trained and certified on the IEC 62443 standard

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Use Case #4: Proactive Islanding Meets Efficient Threat Detection: Addressing & Mitigating Cyberattacks in the Romanian Energy Chain

Involved Actors

Transelectrica (Romanian TSO), Electrica SA (Romanian DSO), UPB (Technology Provider)

Scenario #1 – FDI Attacks against Transelectrica and Electrica SA

Detecting and Preventing False Data Injection Attacks

ELECTRON Components: FL-IDPS, ELECTRON SIEM, ELECTRON SP (MISP), ARMY, NIRO, DARCY, SDN-C, STRONGBOX

KPIs: Detection accuracy > 90%, 2 Detection False Positive Rate < 20%, Intrusion Mitigation Time < 1 min, Certification accuracy > 90%

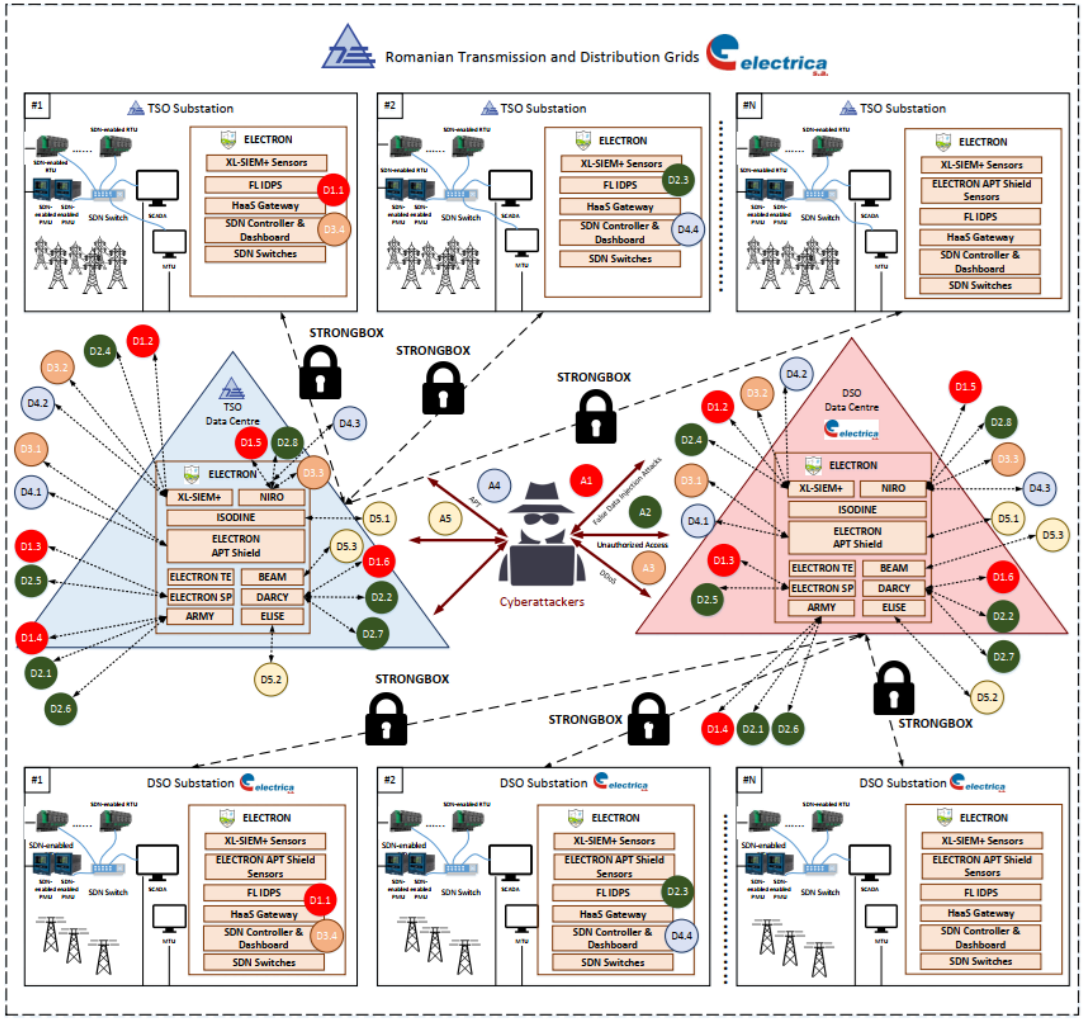
Scenario #2 – Unauthorised Attacks against Transelectrica and Electrica SA

Detecting and Preventing Unauthorised Access Attacks

ELECTRON Components: ARMY, DARCY, ELECTRON SP, ELECTRON Threat Explorer, FL IDPS, ELECTRON SIEM, NIRO, SDN-C, STRONGBOX

KPIs: Detection accuracy > 90%, 2 Detection False Positive Rate < 20%, Intrusion Mitigation Time < 1 min, Certification accuracy > 90%

5 Scenarios



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Use Case #4: Proactive Islanding Meets Efficient Threat Detection: Addressing & Mitigating Cyberattacks in the Romanian Energy Chain

Scenario #3 – DDoS Attacks against Transelectrica and Electrica SA

Detecting and Preventing DDoS Attacks

ELECTRON Components: APT Shield, HaaS (EPES Honeypots), ELECTRON SIEM, NIRO, SDN-C, STRONGBOX

KPIs: Detection accuracy > 90%, 2 Detection False Positive Rate < 20%, Intrusion Mitigation Time < 1 min, Certification accuracy > 90%

Scenario #4 – APTs against Transelectrica and Electrica SA

Detecting and Mitigating Advanced Persistent Threats

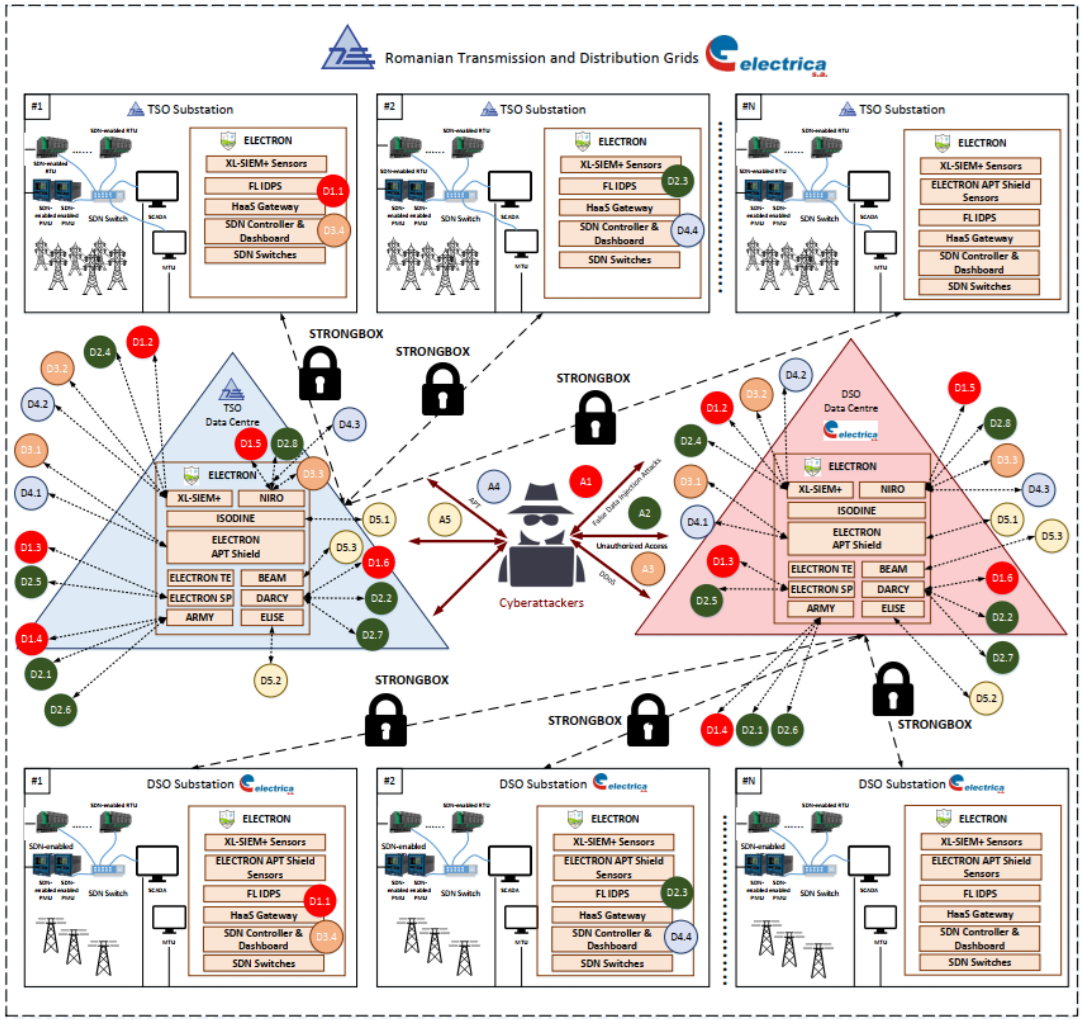
ELECTRON Components: APT Shield, ELECTRON SP (MISP), ELECTRON SIEM, ELECTRON Threat Explorer, NIRO, SDN-C, STRONGBOX

KPIs: Detection accuracy > 90%, 2 Detection False Positive Rate < 20%, Intrusion Mitigation Time < 1 min, Certification accuracy > 90%

Scenario #5 – Islanding Schemes and Nanogrid Management Actions - Electrica SA

Applying Islanding Schemes and Nanogrid Management Actions

ELECTRON Components: ISODINE, ARMY, ELISE, BEAM, STRONGBOX, KPIs: Intrusion Mitigation Time < 1 min, Verifiability of the data integrity up to 100% due to the smart contract mechanism, Traceability, accountability, and non-repudiation of the critical actions in the system will increase up to 80%, Support of turing completeness as regards the business logic of the Information Sharing mechanism will reach 90%



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Thank You & Q/A

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Thank You

Q/A ?

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