

ALMA MATER STUDIORUM
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Digital twins for Industrial IoT networking

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IETF 112 – NMRG Session – Nov. 8, 2021

I4S Project objectives



- Innovative tools and methodologies for the analysis and objective measurement of the cyber risk level associated with connected production plants
- Analysis document related to the implementation of connected industrial plants characterized by a high level of resilience to cyber threats
- Technological solutions to improve the cybersecurity of connected production plants
- Implementation of an innovative system to emulate connected production plants, evaluation of their cybersecurity level and testing of technological solutions for the cybersecurity

Objective

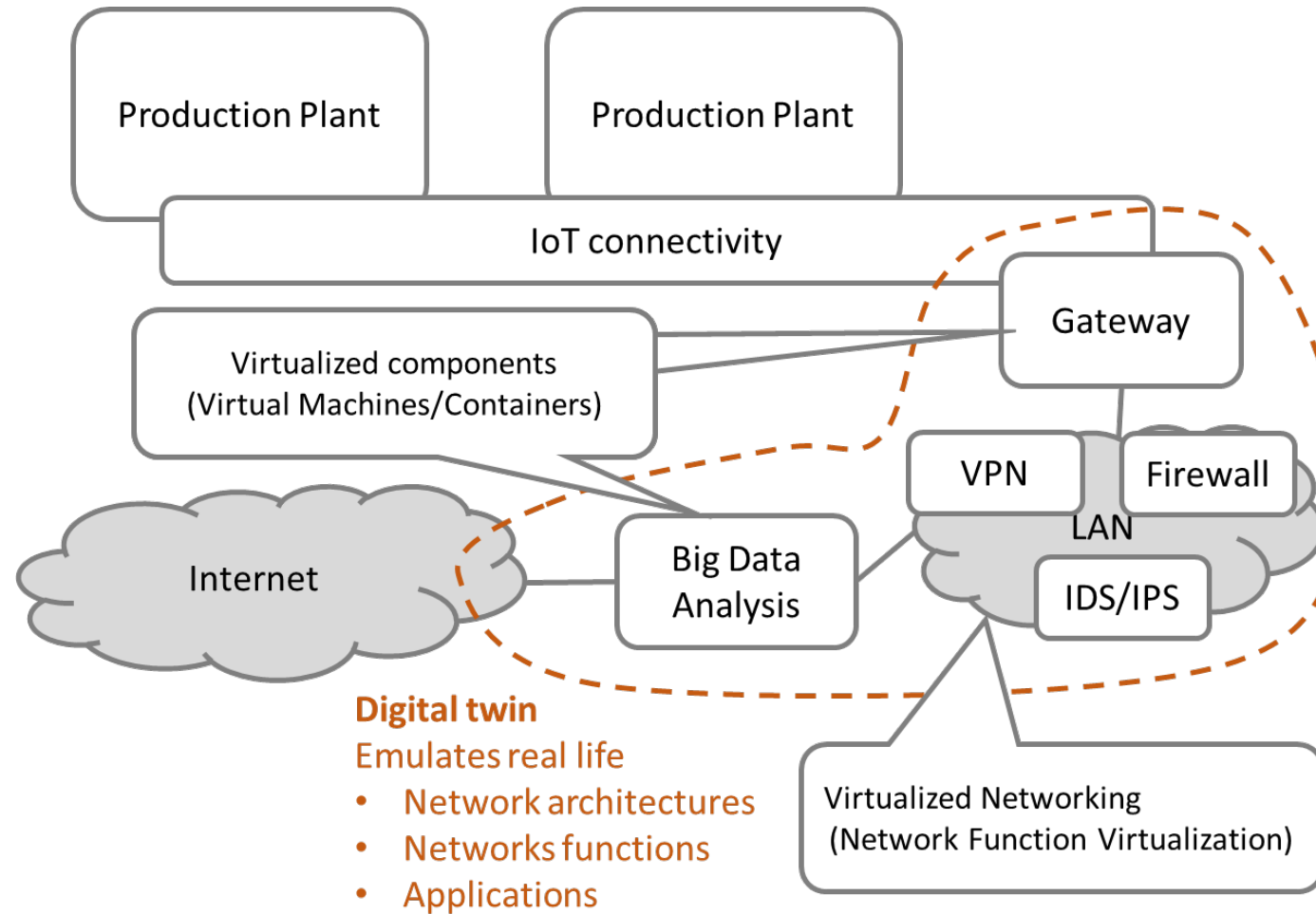
- Combine the principles of:
 - cyber-range
 - Environment for cybersecurity training and technology validation and testing
 - digital twin
 - Realistic virtual replica of a real system
 - The digital twin does not interfere with the «real twin»

- Implement a digital twin of a typical industrial network architecture to be used as cyber-range environment for training, risk analysis and testing

Principles

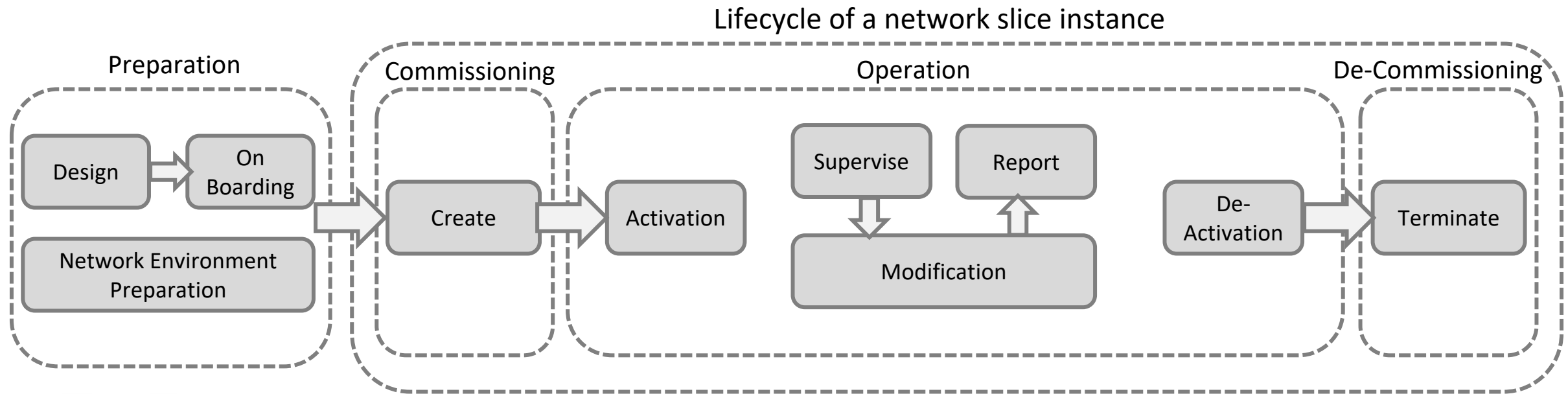
- Virtualization technologies and NFV, SDN paradigms
- ETSI Management and Orchestration (MANO)
 - Architecture design
 - «Building blocks» and topology description
 - Automated deployment process and configuration

Digital twin reference architecture



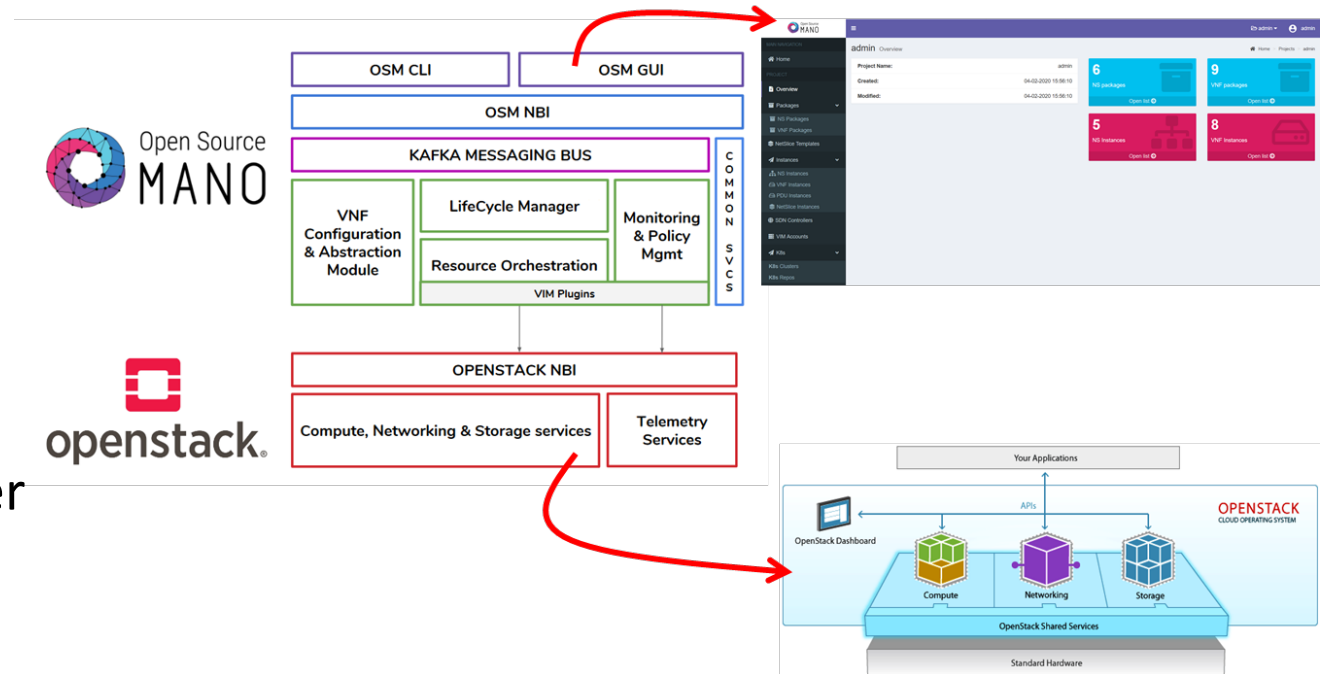
Digital twin lifecycle

- Inspired by Network Slicing concept and principles
 - Defined by 3GPP for 5G networks

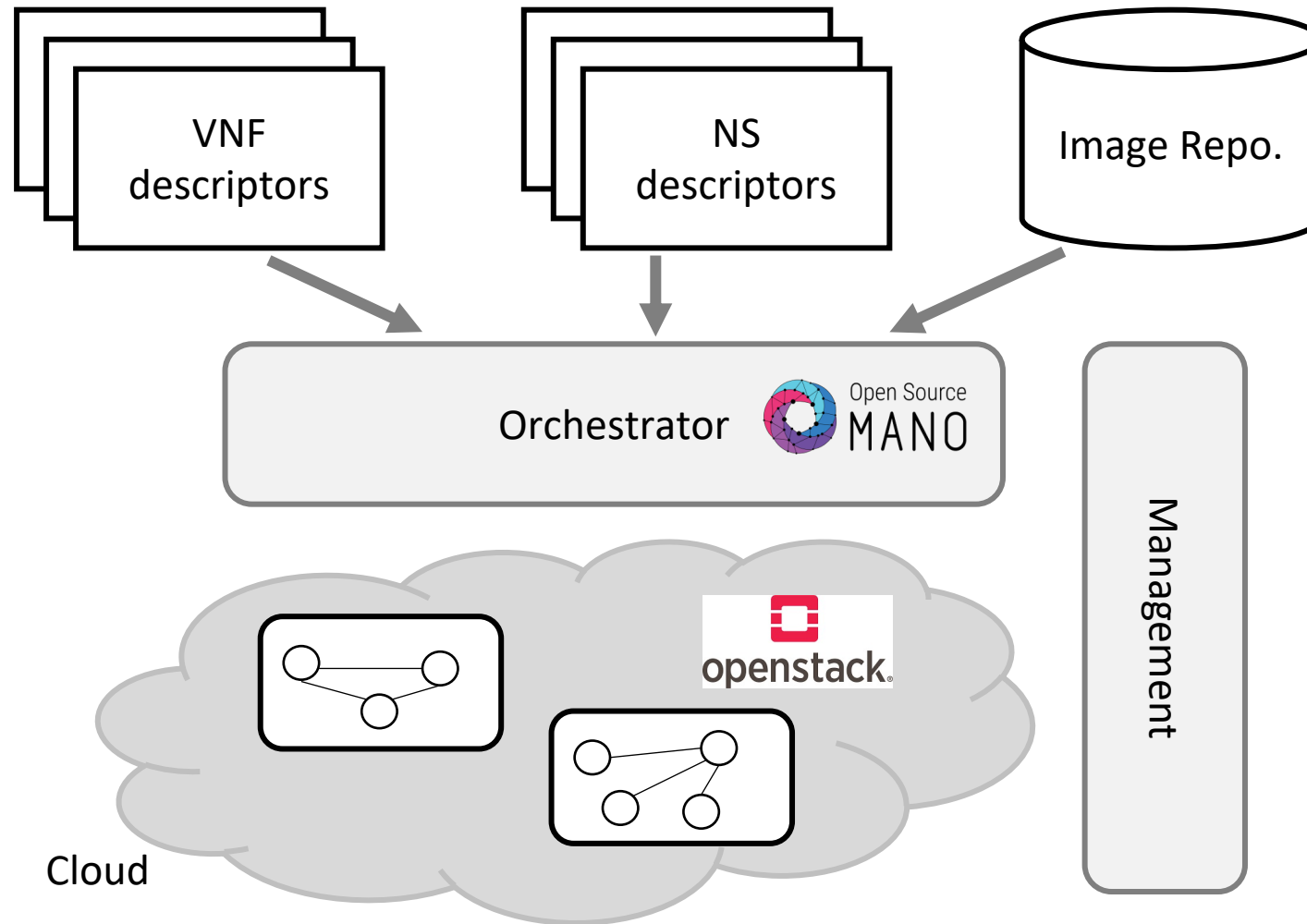


Software platforms

- Open Source MANO (OSM)
 - NFV-MANO platform
- OpenStack
 - Cloud IaaS platform
 - Virtualized Infrastructure Manager (VIM)



Management and Orchestration



Digital twin components

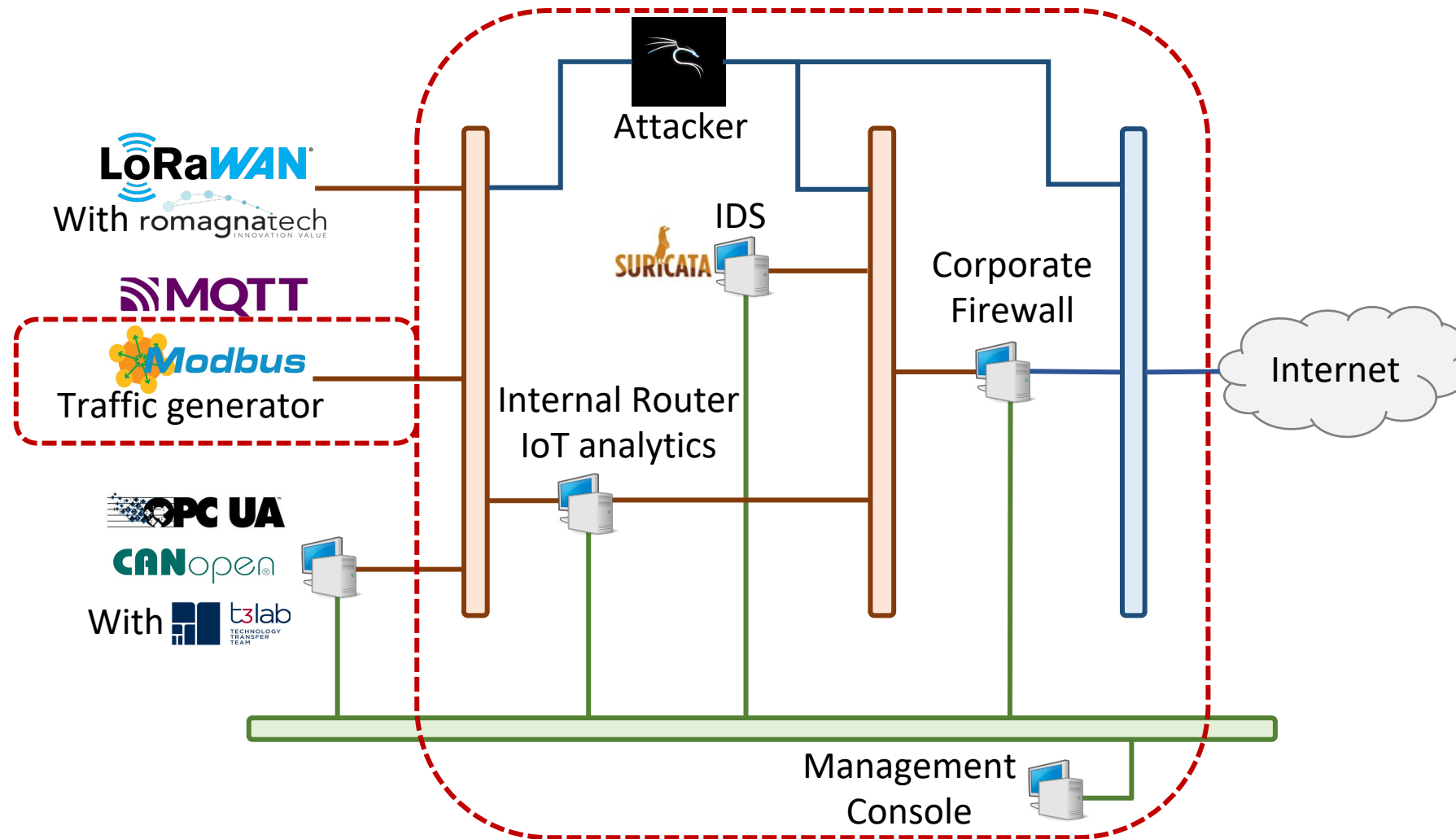
■ Virtual Network Functions:

- Deep Packet Inspector
- IPS/IDS
- Firewall
- Traffic shaper
- VPN server

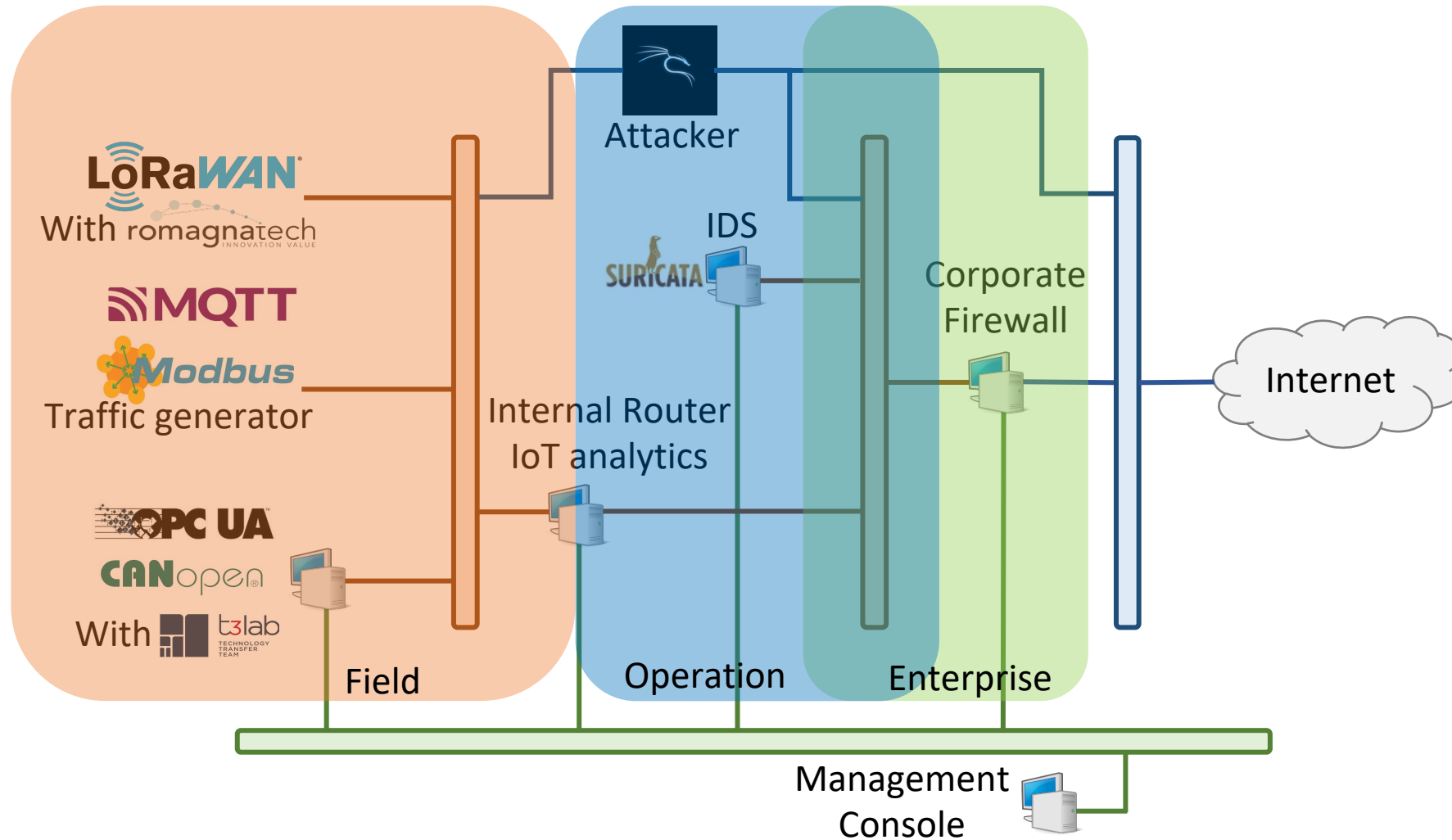
■ Virtual applications:

- CANopen gateway, OPC UA client
- MQTT broker
- Modbus traffic generator
- LoRa simulator

Current deployment



IEC 62443 model



Time for demo!

<https://drive.google.com/file/d/1AoLlp1p4AcUfWJPEyruYyUbWsuWeCAI2/view?usp=sharing>



Thank you for your attention!

<https://www.i4s-project.it>

