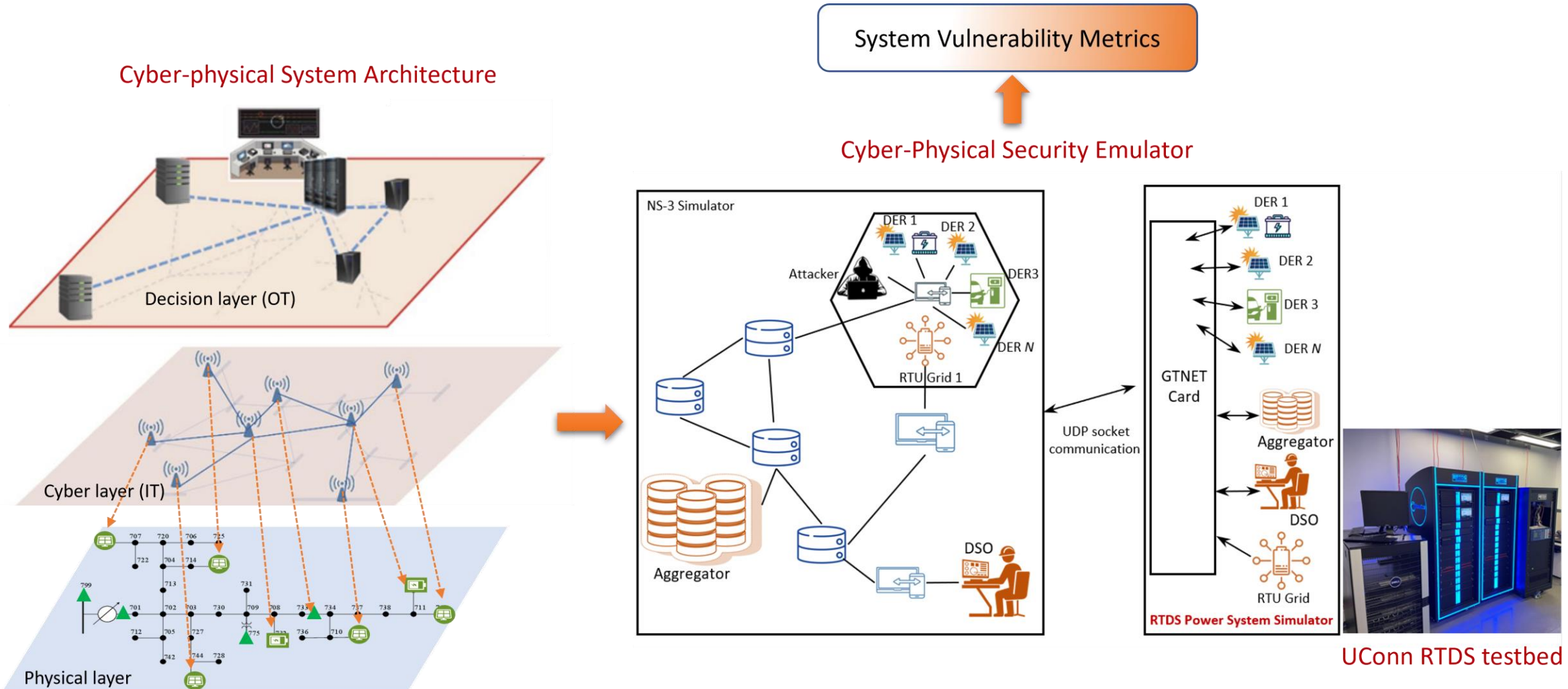# Project 2: Distribution System Cyber-Physical Security RTDS Testbed with High Penetration of DERs – **Junbo Zhao and Ankur Srivastava**
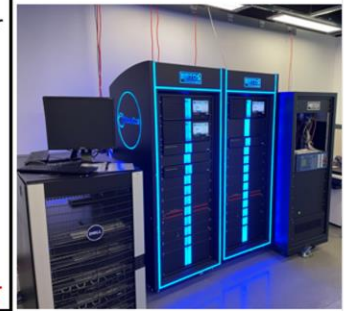
UCONN TECH PARK

➢ Cyber-physical co-simulation framework to emulate various types of attacks on distribution systems and identify the weak points of the system.

Cyber-physical System Architecture

Cyber-Physical Security Emulator

System Vulnerability Metrics

UConn RTDS testbed

Project 2: Distribution System Cyber-Physical Security RTDS Testbed with High Penetration of DERs – **Junbo Zhao and Ankur Srivastava**
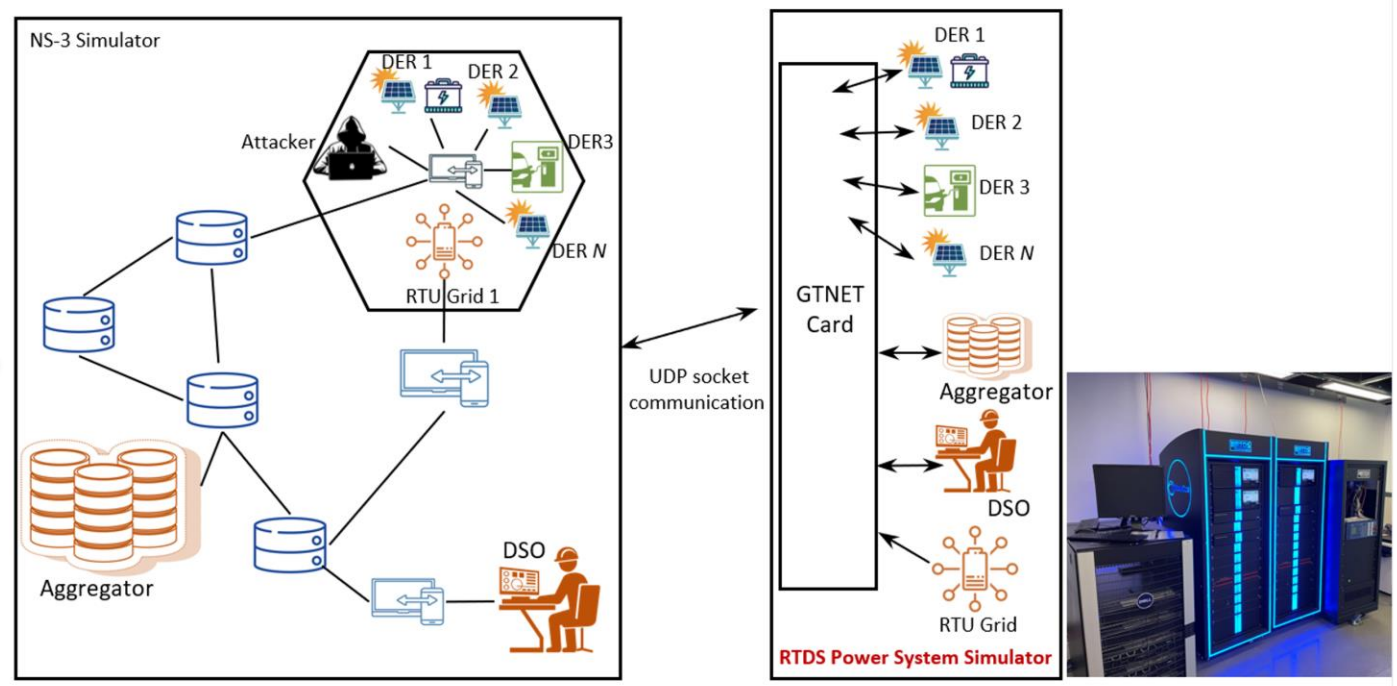
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- Development of a *cyber-physical security simulation testbed* for carrying out cyberattacks and analyzing its impact on distribution systems.

- Physical layer -- **RTDS** and Cyber layer -- **NS-3** network simulator.

- Testbed is designed to use the *Modbus* protocol for all communication, a commonly used protocol in industrial automation applications.

IEEE 13-bus Feeder System with 4 Distributed Energy Resources
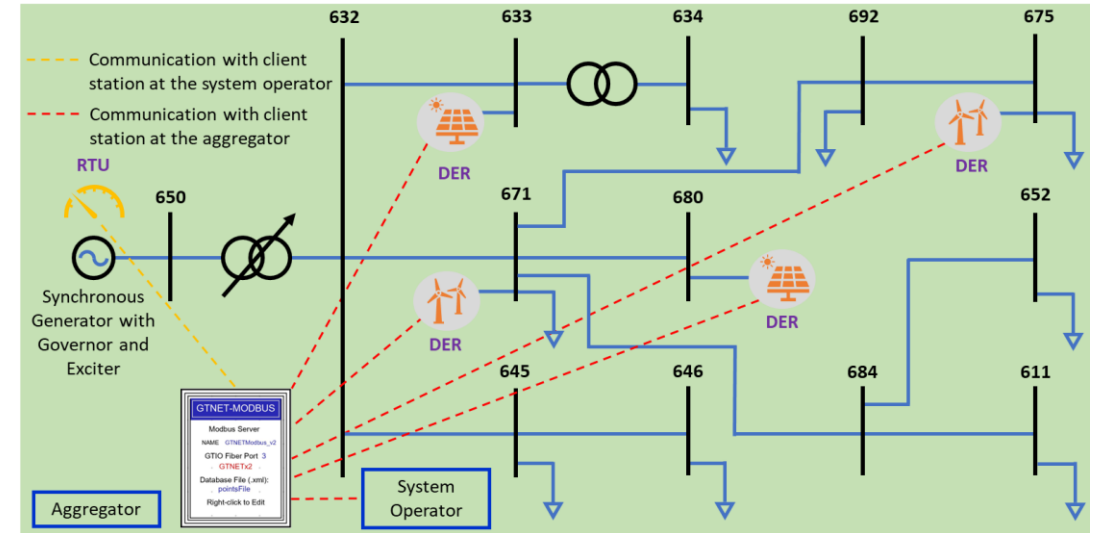
Experimental Setup
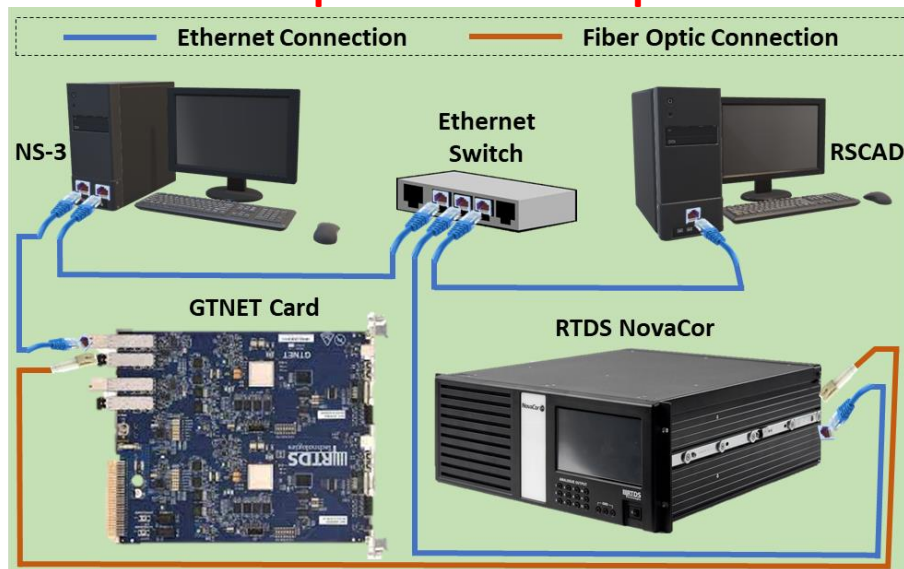
***Man-in-the-Middle* Cyberattack**

- On the communication channels between the aggregator and the DERs.
- Zero flexibility by DERs
- Imbalance in generation and load
- Frequency ↓↓