

# Overlay or Overkill?

## Improving Overlay Networks in Modular Industrial Plants

### Masterthesis

This thesis aims to improve an existing OT-compatible overlay network implementation and critically evaluate alternative overlay designs.

### Motivation

The convergence of IT and OT networks in industrial automation systems increases security requirements, particularly for authentication and trust management. Traditional hierarchical Public Key Infrastructures (PKIs) assume stable system boundaries and centralized administration, which conflict with the dynamic nature of modular industrial plants where production modules are frequently added or exchanged. Certificate management under these conditions requires significant manual effort, contradicting the plug-and-play principles of modular automation.

Overlay networks (ONs) provide self-organizing logical communication structures without central coordination and are thus promising for decentralized certificate management. However, originating from IT-centric use cases, ONs may introduce unnecessary complexity when applied to resource-constrained and deterministic OT systems. This thesis improves an existing OT-compatible overlay implementation and evaluates whether more complex overlay designs deliver practical benefits for modular industrial environments.

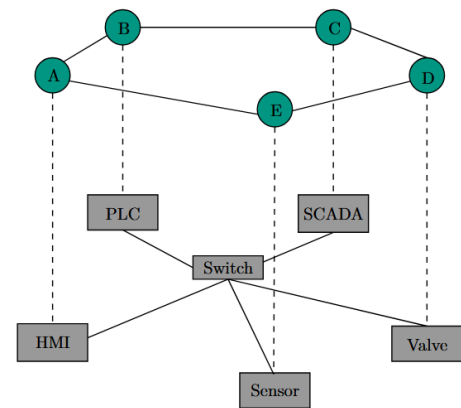


Figure 1: Structure of an Overlay Network

### Goals

- Consider more complex overlay networks for the demonstrator
- Design proximity awareness and load balancing mechanisms
- Optimize runtime to match OT requirements

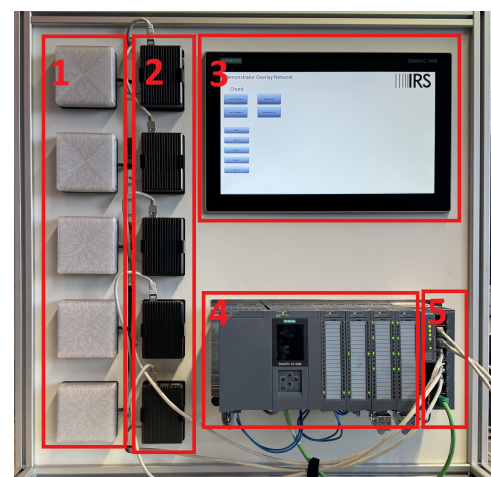


Figure 2: Current Overlay Demonstrator

### Interests and Helpful Prior Knowledge

- 🔧 Basic Understanding of Industrial Automation
- 🔌 Interest to get familiar with Overlay Networks



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