Edu-hoc

https://github.com/crocs-muni/Edu-hoc

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Wireless sensor networks:

Distributed autonomous devices with sensors

Limited by CPU, memory, radio range, energy ...

Multi-hop mesh network with $10^2 - 10^6$ nodes

Specialized OS (TinyOS, Contiki OS)

Hop by Hop communication

Specialized OS with non usual language (e.g. NesC)

common tasks are not trivial

- Routing
- Security
- Intrusion detection
- Key exchange
- ...

Edu-hoc Solution

- Arduino based network
- simple C code
- set of exercises (scenarios)
- solve scenarios as attacker
- Fix code to prevent such attack

Figure: JeeLink node

5 scenarios

Each with different objective

Evaluation as percentage of messages

- captured
- delivered
- modified

1. Eavesdropping

Unsecured network

Global broadcast from each node

Capture as many messages as possible

2. Black hole

Network with dynamic routing

Initial phase of route establishment

Prevent as many packets from reaching BS

3. Sink hole

Deliver as many modified packets as possible

Capture, modify and send back

4. Jamming

Secured network with fixed routing

Prevent as many packets from reaching BS

No way to modify routes etc.

5. Relay attack

Network with dynamic routing

Initial phase of route establishment

Modify the routes to be longer or shorter

Network of approximately 20 nodes

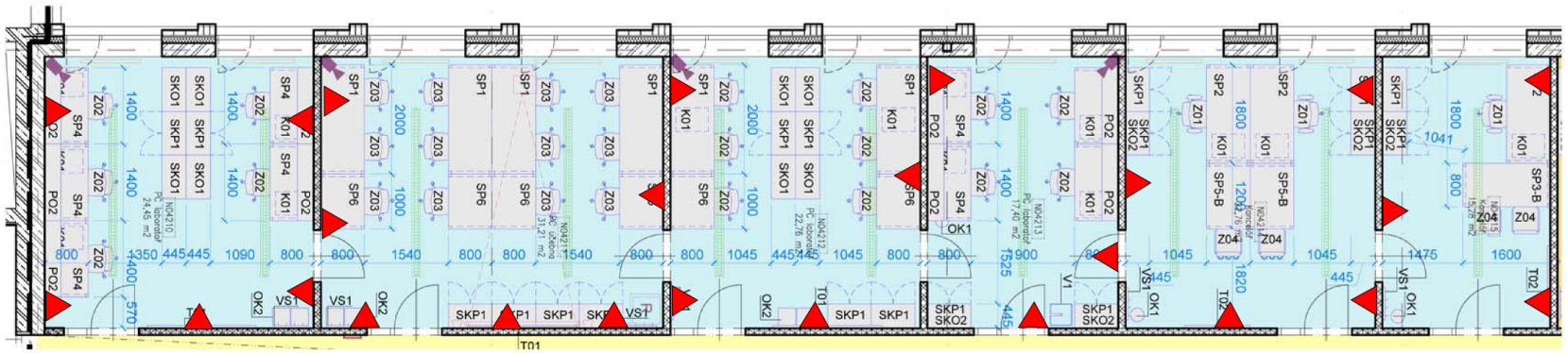

Figure: Network placement

Network of approximately 20 nodes

Impossible to be managed one by one

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Mass configuration for nodes

Mass communication (IN and OUT) with nodes

Unique message generator

Unique identifier for each participant

BS (computer with dedicated node) with capability to:

- show current network state on web page
- start scenario
- collect scenario results from nodes
- evaluate results and show them on web page
- assign results per participant (if applicable)

3 seminars dedicated to WSN hands on work

First and third scenarios used as homework

36 students

Submitted files evaluated manually

Implemented:

- Tools for network management
- 5 scenarios with solutions
- Example applications (Sniffer, . . .)
- Evaluation scripts (used manually or automatically)
- Web interface with network status
- Scenario deployment scripts (automated runs)

Remaining:

- Automated evaluation of submitted files via web interface

Thank you for your attention

Questions?