Coverage and exposure prediction tool

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WISE | WIreless Safety for Employees
An INTERREG IV Project for safe wireless communication in industrial and work environments: exposure and propagation
Interreg efface les frontières
Interreg doet grenzen vervagen

Outline

1) Introduction
2) Architecture and graphical user interface
3) Tool features

http://www.wica.intec.ugent.be/exposure-tool

Introduction

- **Goal**
  - Coverage and exposure prediction based on propagation models
  - Assist in wireless network planning
- **Tutorial**
  - Architecture of tool
  - Graphical user interface (GUI)
  - Prediction and optimization features

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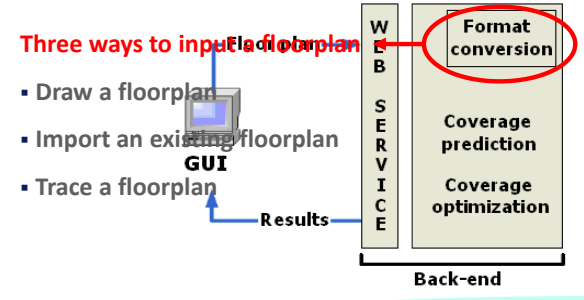
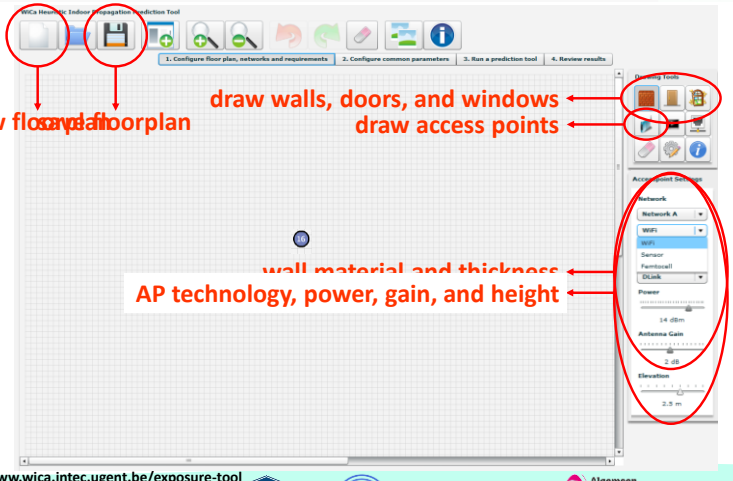
Architecture and GUI

- Implemented as a web service with a Java engine
- GUI for input and visualization
- Calculations/optimizations executed on the back-end server



Draw a floorplan



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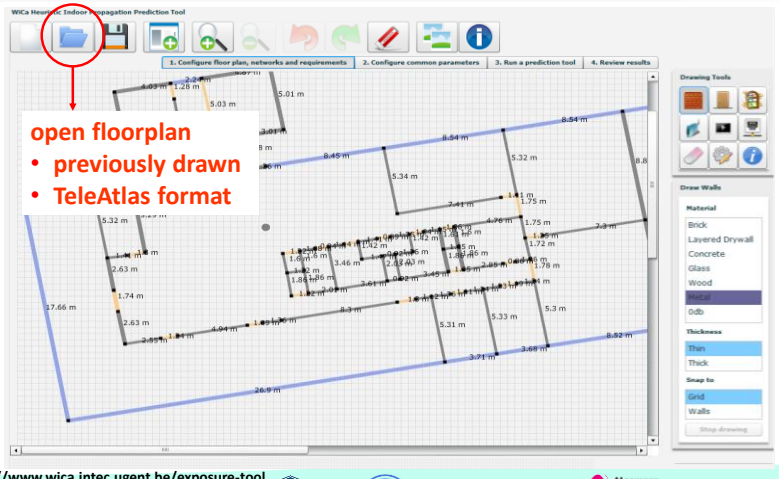
Import a floorplan



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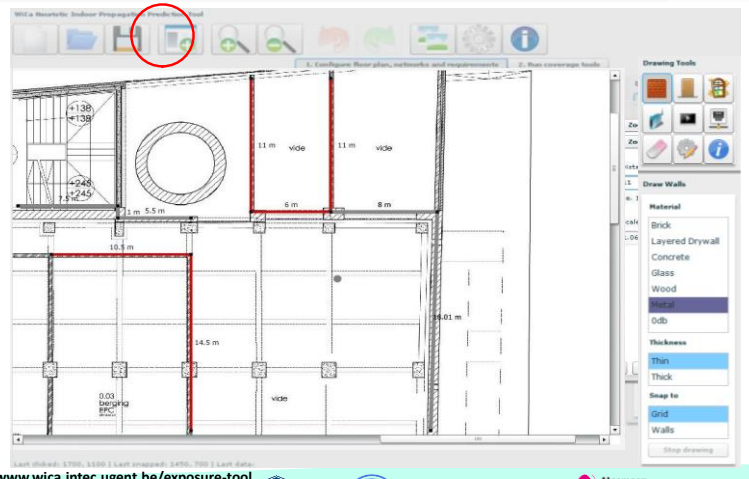
Trace a floorplan



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   a) Coverage and exposure
   b) Network size reduction
   c) Automated network design
   d) Exposure optimization

Coverage and exposure

- **Predicts the path loss, throughput, and exposure in the different rooms for a given access point configuration**

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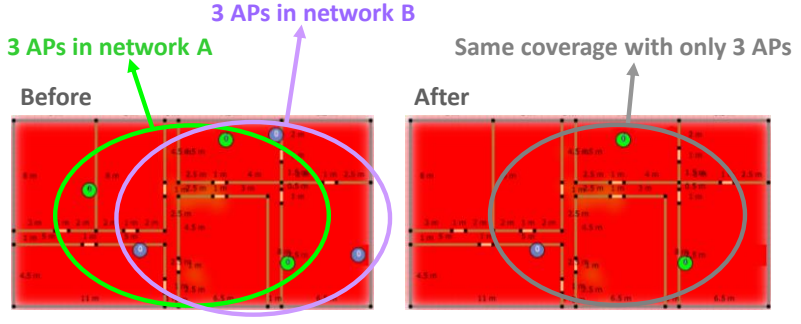
Network size reduction

- Reduction of the number of access points (APs) without affecting coverage



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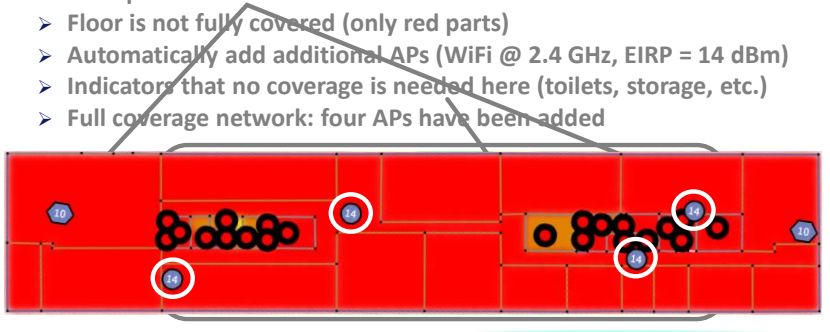
Automated network design

- Proposes a minimum set of transmitters to achieve full coverage on a building floor
  - Example: two femtocells on a floor
  - Floor is not fully covered (only red parts)
  - Automatically add additional APs (WiFi @ 2.4 GHz, EIRP = 14 dBm)
  - Indicators that no coverage is needed here (toilets, storage, etc.)
  - Full coverage network: four APs have been added



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Exposure optimization

- **Two approaches**
  - Exposure limitation
    - **Design a network that meets a predefined exposure limit (e.g., maximum electric field strength of 6 V/m)**
    - **Using a minimum number of access points**
    - **While still meeting the preset coverage requirements**
  - Exposure minimization
    - **Design a network of which the exposure is minimized**
    - **Requires more access points**
    - **While still meeting the preset coverage requirements**

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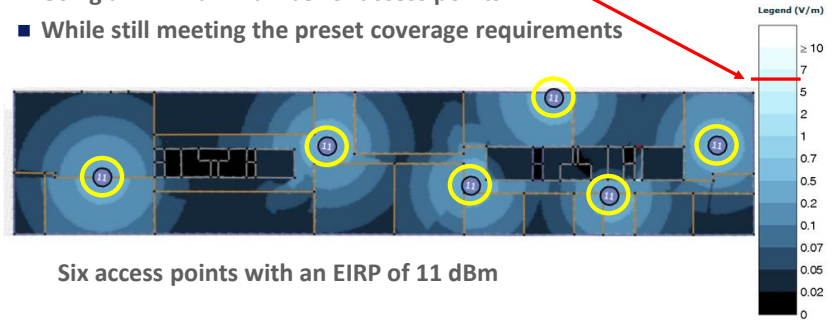
Exposure limitation

- Design a network that meets a predefined exposure limit (e.g., maximum electric field strength of **6 V/m (*)**)
- Using a minimum number of access points
- While still meeting the preset coverage requirements



Six access points with an EIRP of 11 dBm

(*) under the assumption of a minimum safety distance of 10 cm from the access point

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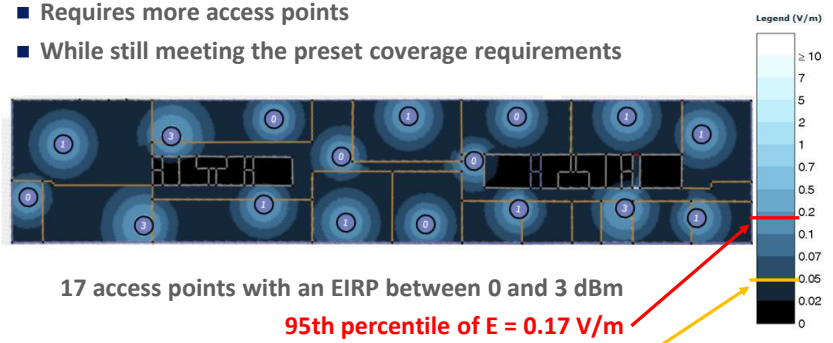
Exposure minimization

- Design a network of which the exposure is minimized
- Requires more access points
- While still meeting the preset coverage requirements



17 access points with an EIRP between 0 and 3 dBm

95th percentile of E = 0.17 V/m

50th percentile of E = 0.05 V/m

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Demo