ONGOING RESEARCH IN H-C3 SCOPE

TWIST: A Scalable and Reconfigurable Wireless Sensor Network Testbed for Indoor Deployments

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Introduction

What is TWIST?

The **TKN Wireless Indoor Sensor network Testbed (TWIST)** is a scalable and flexible testbed architecture for indoor wireless sensor network deployments developed by the Telecommunication Networks Group at TU Berlin

In addition to the basic testbed services like:
- network-wide programming and node configuration
- out-of-band extraction of debug data
- application data forwarding and storage

The TWIST architecture provides support for:
- heterogeneous sensor node platforms
- active power-supply control of the nodes
- evaluation of flat and hierarchical deployments

The self-configuration capability, the use of standardized hardware and open-source software make TWIST scalable, affordable, and easily replicable!

TWIST as H-C3 Asset

The design, implementation and evaluation of WSN applications, middleware and communication protocols is a complex task:

- simulation is useful in the early design steps but frequently forces artificial assumptions about connectivity, traffic, failure patterns and topologies
- a testbed makes it possible to create, modify and observe the target configuration in its whole complexity including nodes, communication protocols, middleware and application

Thanks to its scalable architecture, TWIST enables instrumentation of large indoor spaces (whole buildings) at acceptable cost.

This extensive coverage makes TWIST an indispensable platform for evaluating the complex interactions between the human behavior and the different wireless technologies (body-area networks, infrastructure sensor networks) at scales and fidelity previously not possible!

For more information please visit www.twist.tu-berlin.de

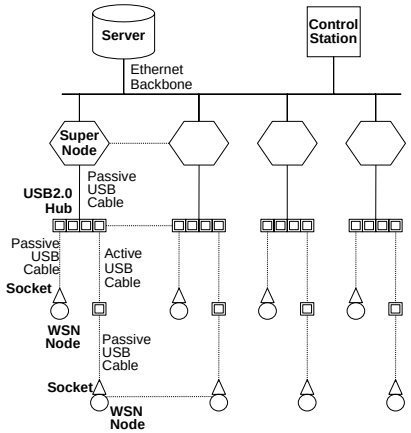
Architecture

Scalable and Reconfigurable

Super Nodes
- increase the scalability of the architecture by supporting distributed testbed processing or evaluation of hierarchical networks
- detect node-socket binding events for auto-configuration

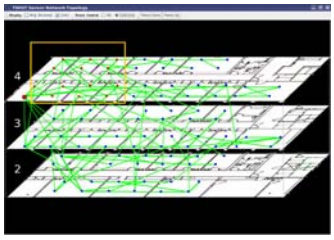
USB 2.0 Hubs
- multiplexers for reducing costs of installation
- actuators providing per-port binary power-control capability

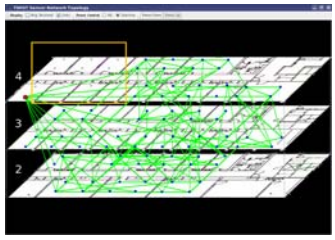
Sockets
- enable separation between node identifiers and points of installation
- provide a-priori geographical information



Dynamic Experiments

The powerful power-supply control capabilities enable:
- easy transition between USB and battery powered experiments
- dynamic selection of topologies
- controlled injection of node-failures in the system

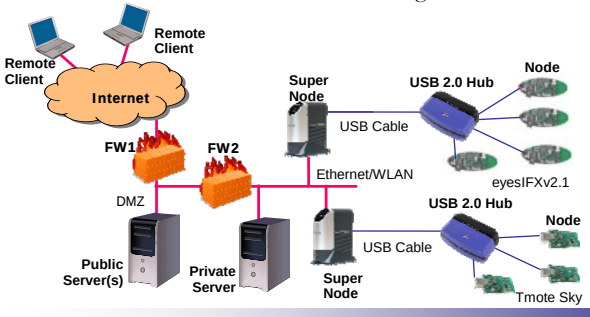




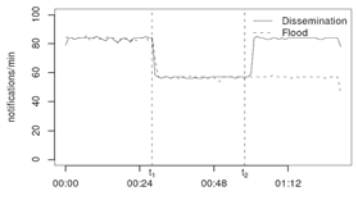
Instance at TU Berlin Campus

Quick Facts

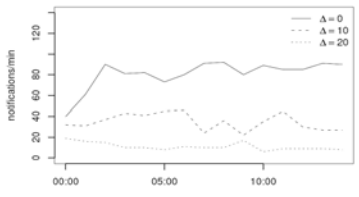
One of the largest indoor WSN testbeds in Europe:
- 3D deployment, spanning 3 floors of the TKN office building
- 1500 m² instrumented space
- **204 installed sensor nodes**
  - 102 Tmote Sky
  - 102 eyesIFXv2.1
- 40 super nodes
- 60 USB 2.0 hubs and 1200 m USB cabling



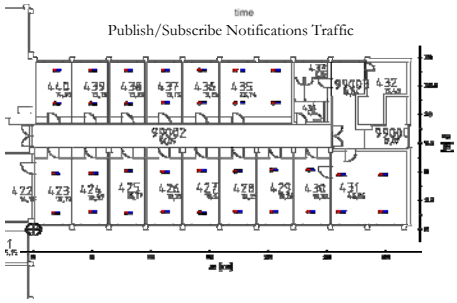
Usage Examples

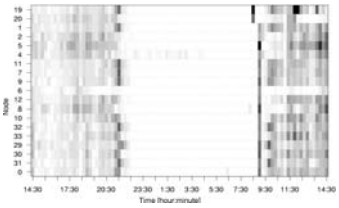


Publish/Subscribe Notifications Traffic



Send-on-delta filtering





Traffic intensity matrix