

# First Workshop on Global Sensor Networks (GSN '09)

March 6th, 2009

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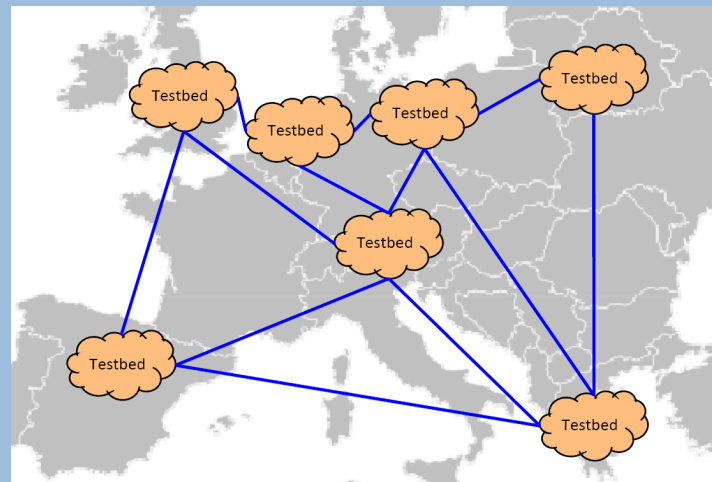
**A Secure Remote Authentication, Operation and  
Management Infrastructure for  
Distributed Wireless Sensor Network Testbeds**

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## EU FP7 Project WISEBED (Wireless Sensor Network Testbeds)



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- form a pan-european federation of wireless sensor network testbeds
- remotely conduct experiments
- share resources among federation partners
- get sensor data from testbeds all over europe

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## Testbed at University of Bern

- Currently operating a 30-nodes Wireless Mesh nodes (WMN) testbed (Alix Geode WRAP2.C/E) using IEEE 802.11a GHZ
- own very memory-optimized embedded Linux flavor ~ 10mb
- Setting up 20-30 TelosB nodes testbed
- Later integration of ~20 MicaZ nodes planned

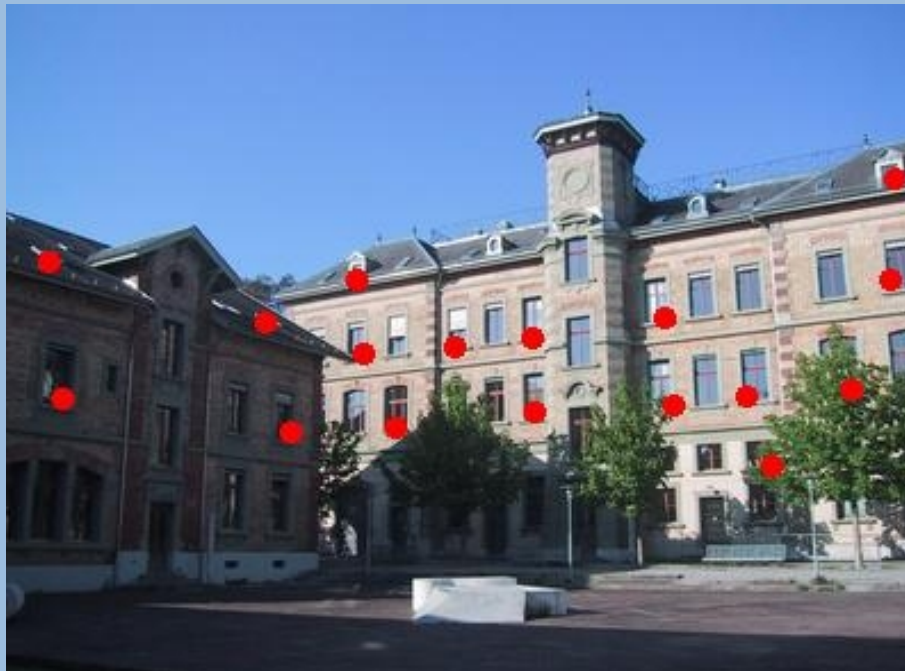
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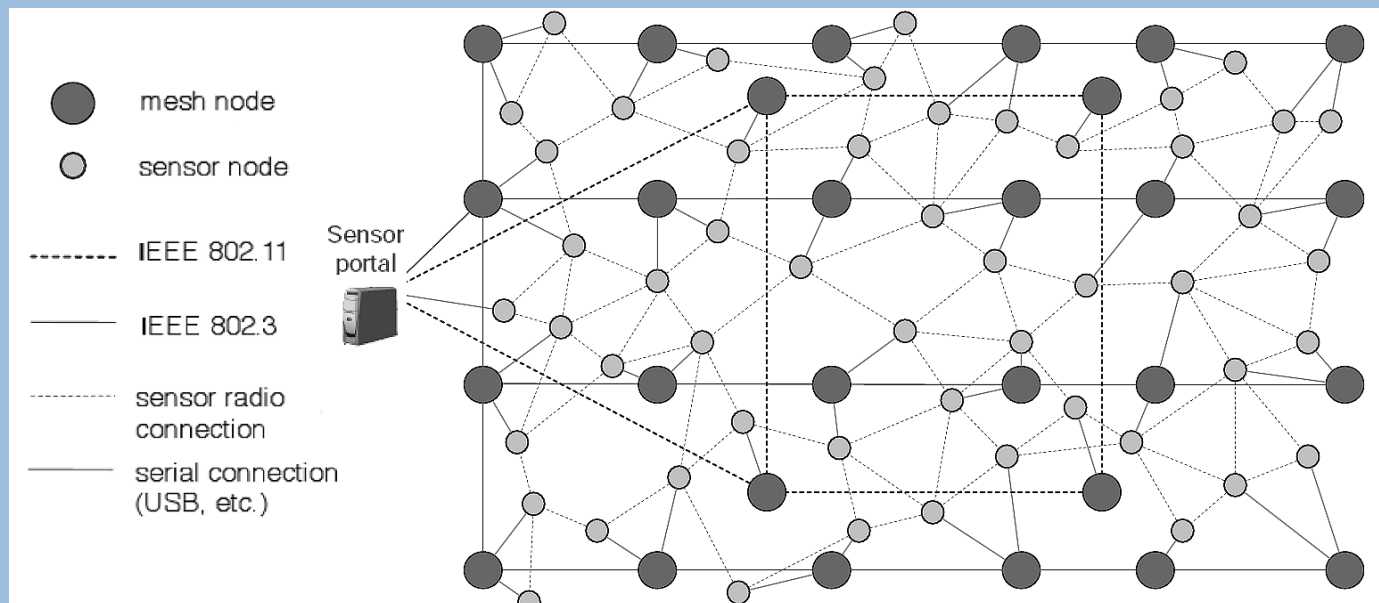
- current Mesh network across two buildings on campus
- Mesh network as backbone for wireless sensor network testbed



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- 2-tier architecture of the testbed with a sensor network portal
- Sensor Portal connects to Mesh nodes via Ethernet 802.3
- WSN nodes attached to Mesh nodes with USB cables



## 1.2 Hardware Installation

*Advantages of Mesh network backbone:*

- Mesh network shall remain “behind the scenes” when it comes to wireless sensor network experimentation
- wired remote shell access to every node
- obtain sensor nodes status information during experiments
- Fast and reliable code update and configuration
- remote hard-reset in case of node failures via usb power management ( libusb )

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## Secure Remote Authentication, Operation and Management Infrastructure

- Secure remote authentication and authorization
- Account management
- Scheduling ( Reservation System )
- Testbed Management



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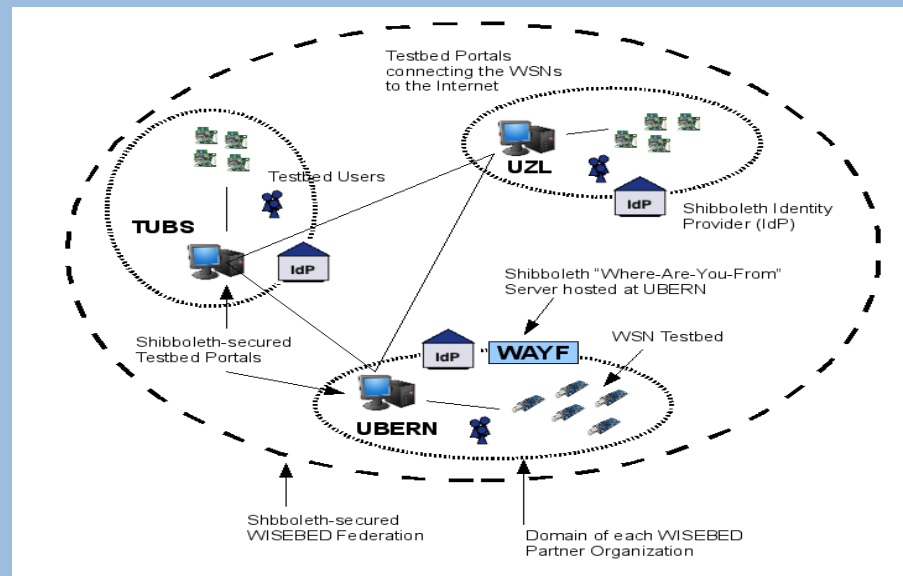
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## Secure Remote Authentication, Operation and Management Infrastructure

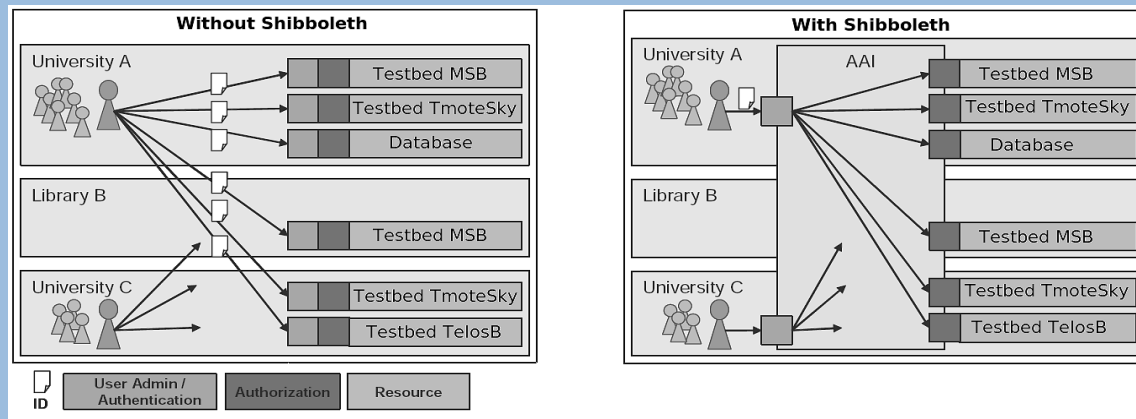
- Shibboleth Federation spanning across all partners
- PKI-based Authentication and Access Control System
- decentralized architecture: define users locally, use them globally



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- Single-Sign On (SSO) – enter credentials only once
- Use Shibboleth SSO to protect / manage sensor network testbed access and resources
- Idea: more and more testbeds shall join the federation, in analogy to PlanetLab



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## Secure Remote Authentication, Operation and Management Infrastructure



The image shows a screenshot of the WISEBED Portal login page. It features a logo on the left consisting of a cluster of black circles of varying sizes. To the right of the logo, the text 'WISEBED Portal' is displayed in bold. Below this, the word 'Login' is centered. A form box contains the text 'Select your Home Organisation' above a dropdown menu. The dropdown menu is currently set to 'UNIVERSITY OF LUEBECK / GERMANY'. Below the dropdown, there is a checkbox labeled 'Remember selection for this web browser session.' and a 'Select' button.

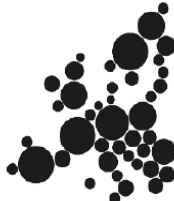
Testbed management system shall support:

- convenient secure remote access to a portal server of each testbed
- easy and fair resource allocation & scheduling
- remote online experiment configuration
- remote experiment operation and extraction of results

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## Testbed Reservation System



### Reservation System

⌘: Reservation choose other date

	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
Wed (19.11)	✓	✓	✓	✓	✓	✓	✓	✓
Thu (20.11)	✓	✗	✗	✗	✗	✗	✓	✓
Fri (21.11)	✓	✓	✓	✓	✓	✓	✗	✗
Sat (22.11)	✓	✓	✓	✗	✗	✗	✗	✓
Mon (23.11)	✓	✓	✓	✓	✓	✓	✓	✓

Testbed Reservation system

- users can schedule time slots during which they have unique access to the testbed
- “fair” resource allocation – definition of maximum maximum timeslots per user/week etc -> allocation problem