



IP CREW

Cognitive Radio Experimentation World

TUB Testbed Infrastructure

Jan-Hinrich Hauer Brussels, September 14th, 2011



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TKN Wireless Indoor Sensor network Testbed (TWIST)

- 204 sensor nodes: 102 Tmote Sky & 102 EyesIFXv2
- Covers 3 floors (> 40 rooms) of an office building at the TU Berlin campus
- Can be accessed locally or remotely via web-interface

Mobile components

- Mobile robot (iRobot Roomba), which can be programmed to follow certain trajectories inside the TWIST building; various devices can be mounted on the robot
- A set of wearable sensor nodes (Shimmer2 platform) for BAN experiments
- A set of low-cost USB Spectrum Analyzers (spectrum sensors) for the 2.4 GHz ISM band.



TWIST Testbed



- Spans 3 floors of the TKN office building
 - More than 1500 m² of instrumented space
- Current configuration: 204 sensor nodes
 - 102 tmote sky102 eyesIFXv2



- 41 super nodes
- 51 USB hubs
- >1500m USB cabling





TWIST Architecture







Super node (NSLU2)



WSN Node (Tmote Sky)



TWIST Components











- Basic services
 - Node configuration
 - Network-wide re-programming
 - Out-of-band extraction of debug information
- Additional features
 - Support for heterogeneous platforms
 - Active power control
 - Support for hierarchical networks
- Built on open standards, open architectures, open source



Remote Access (1)



Web-interface: https://www.twist.tu-berlin.de:8000/

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Tkn Wireless Indoor Sensor network Testbed	
Login New ac	count
Welcome to the TWIST Web Interface	
Hi. Please select an action from the menu above	
More information about TWIST can be found at the TWIST Community Wiki site, including a Tutorial on using this web interf	
Make sure that coo	okies are enabled in your browser!

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- Web-interface services
 - Account registration
 - Job registration
 - Sensor node firmware installation
 - Active power control
 - Tracing of results (node output) to text file
- In addition there is a serial control channel to every sensor node via SSH tunnel (to TinyOS SerialForwarder)
- Tutorials available on CREW portal
- Several papers have been written with results obtained on TWIST (SenSys, IPSN, TOSN, EWSN, ...)



TWIST Demo









- TWISTbot: iRobot Roomba with a Microsoft Kinect sensor
- Can be programmed to follow certain trajectories in the TWIST building (scripted waypoints)
- CR Devices can be mounted on the robot, e.g. to record RF environmental maps, or perform experiments emulating body area networks





TWISTbot Demo





Wearable Sensor & Portable Spectrum Analyzers



8-16 Shimmer2 wearable sensor nodes

- Two radios: CC2420 transceiver and a Bluetooth radio
- Acceleration sensor and various medical sensor boards
- MiniSD Card (2GB) to store measurement traces
- We additionally provide a custom setup that allows to connect the BAN nodes via a digital I/O control channel (cabling).

Several WiSpy 2.4x USB Spectrum Analyzers

- Small, mobile, low-cost devices to scan RF noise in the 2.4 GHz ISM band
- We provide a customized software framework, which provides an experimenter with fine-grained control over the parameter setting (e.g. select only a subset of the entire 2.4 GHz ISM band)



