Debugging Wireless Sensor Network Simulations with YETI and COOJA

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Debugging Wireless Sensor Networks

Motivation
Debugging sensor network applications is difficult and time consuming. User-friendly development tools are often missing. We present the integration of the COOJA network simulator into the YETI development environment.

WSN Development Phases
• Simulations
• Prototype experiments on the table (1-10 nodes)
• Testbed experiments (10-200 nodes)
• Deployment

1. Simulations
2. Desk Experiments
3. Testbed Experiments
4. Deployment

Development and Simulation Tools

YETI
http://tos-ide.ethz.ch

COOJA
http://www.sics.se/contiki/

COOJA is a network simulator:
• Part of the Contiki operating system
• Emulation of the MSP430 at the instruction level using MSPSim
• Event-based simulation of WSN networks
• Different radio propagation models
• Event timeline (radio, LEDs)
• Flexible plugin system

YETI is a TinyOS plugin for Eclipse:
• Integration with the TinyOS toolchain
• Syntax highlighting
• Code completion
• Error detection
• Component graph
• Debugging support using CDT

Connecting YETI and COOJA

Debugging Architecture

GNU Debugger (GDB) Remote Protocol
• Eclipse spawns a GDB instance for each node in COOJA
• Command/response protocol using TCP sockets
• GDB support already integrated in Eclipse CDT

Session Control Protocol
• YETI queries COOJA for information about the current simulation (e.g. number of nodes and binary images)
• Add/remove nodes to/from the debugging session

User Interaction

The user can attach YETI to a WSN simulation running in COOJA
• Insert/remove breakpoints for all nodes or on a per node basis
• Inspect/modify content of registers and memory

Read/write global variables

Read/write registers

References