

# Sensor Network Research Testbed

Dwarf: Downscaled Wireless Ad-hoc Network Research Platform

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# Sensor Network Testbed

## ▶ Motivation:

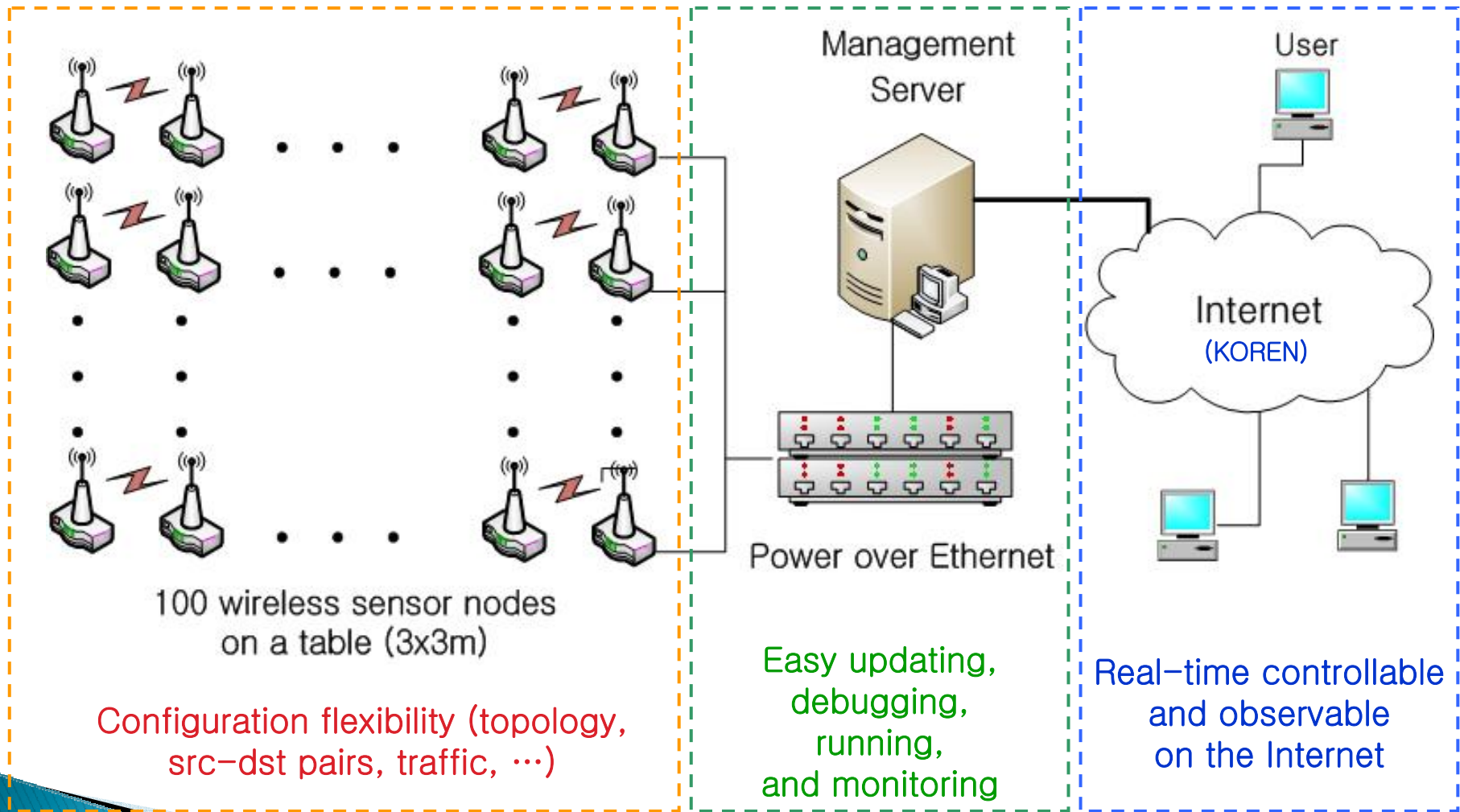
- Until now, most WSN research has been carried out through computer simulations.
  - Inaccurate models of network components.
  - Unexpected implementation issues.
- Research on sensor networks really deployed in outdoor environment.
  - inadequate for debugging codes and testing unreliable protocols.

## ▶ Goal:

- To facilitate and expedite the development and evaluation of new network protocols and algorithms in real networks of wireless nodes with real RF components, embedded hw/sw, and so on.

# Overview

Dwarf: Downscaled Wireless Ad-hoc Research PlatForm\*



\* Under construction and expected to be completed in late 2007

# Features

- ▶ Indoor wireless sensor network testbed
  - In indoor environment, empirical evaluation of new network protocols and algorithms on real wireless sensor networks with RF components.
- ▶ Configuration flexibility
  - Various scenario generation with the use of xml script.
  - Topology, traffic pattern, RF physical layer parameters, ...
- ▶ Remote control
  - Online upload of scenario files and application files on wireless nodes.
  - Remote execution of scenario files.
  - Trace streaming over the Internet.
- ▶ Automation of experiment process
  - Auto distribution of new applications to 100 wireless nodes at the same time through Ethernet.
  - Auto collection of traffic traces and debugging messages.

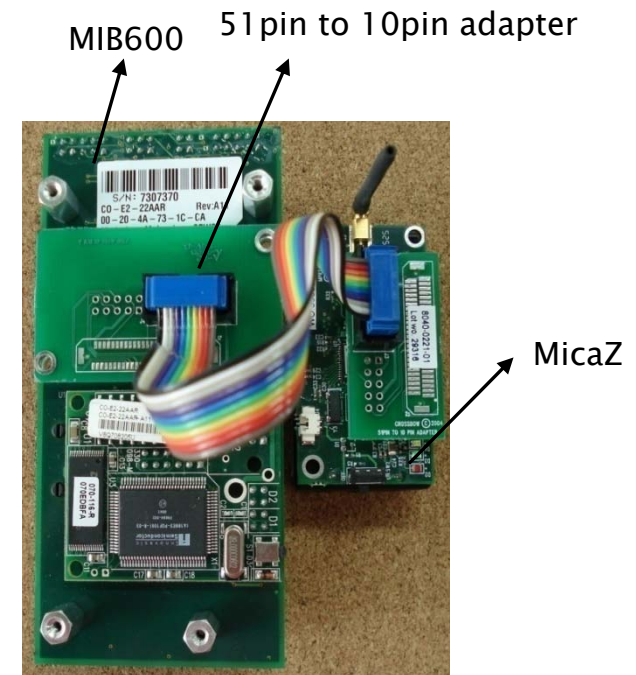
# Dwarf Specification

## ► Deployment

- 4<sup>th</sup> Floor of the department building, Dept. of Information and Communications, GIST.
- 100 wireless nodes in square area (3m x 3m).
- Transmission range of nodes with the minimum transmit power  $\approx$  25cm.

## ► Wireless Node

- MicaZ: 7.3MHz ATmega128L processor, 128KB flash memory, 4KB data memory, TinyOS, CC2420 radio chipcon.
- MIB600: Ethernet port programming, Power over Ethernet.
- MTS300: Sensor board (light, temperature, acoustic).



# Research Topics over Dwarf

- ▶ Physical parameter adaptation of wireless devices
  - RF power control.
  - CS threshold control.
  - Transmit rate control.
- ▶ Contention over wireless channel
  - CSMA/CA.
  - Hidden/exposed terminal problem.
  - Intra/inter flow interference problem.
- ▶ Routing
  - Ad-hoc routing, routing for inter-wired/wireless networks, routing for mesh networks.
- ▶ Applications
  - Localization and tracking, time-synchronization.
  - Power saving protocol, topology control.
  - Multimedia traffic support (with QoS requirements).
  - RFID integrated sensor networks.