Demo Abstract: Efficient Building Management with IP-based Wireless Sensor Network

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***Abstract*—We present WSN-BMDS, an IP-based wireless sensor network building monitoring and diagnostic system. The main focus of WSN-BMDS is to obtain much higher degree of information about the building operations than current BMSs are able to provide. Our system integrates a heterogeneous set of wireless sensor nodes with IEEE 802.11 backbone routers and the Global Sensor Network (GSN) web server. Sensing data is stored in a database at the back office via UDP protocol and can be access over the Internet using GSN. Through this demonstration, we show that WSN-BMDS provides accurate measurements of air-temperature, air-humidity, light, and energy consumption for particular rooms in our target building. Our interactive graphical user interface provides a user-friendly environment showing live network topology, monitor network statistics, and run-time management actions on the network. We also demonstrate actuation by changing the artificial light level in one of the rooms.**

I. System Architecture

The WSN-BMDS test-bed is a 3-tiered framework with the following components:

1. IEEE 802.15.4 sensor nodes forming 6LoWPAN network

For sensing purposes, we use Tyndall [6] and TMote Sky [7] sensor nodes. The Tyndall board is equipped with an Atmega1281 MCU and EM2420 radio chip and the TMote Sky features a MSP430 MCU with CC2420 radio chip. Both platforms include sensors for monitoring air-temperature, air-humidity and light. Moreover, we utilize recently developed sensor boards for the Tyndall platform that incorporate electricity meters as well as the interface for controlling (on/off) an AC load. Both platforms run the recently released b6LoWPAN stack [4].

2. IEEE 802.11 gateways as 6lowPAN/IPv6 routers

Soekris embedded PC boards [5] with Atheros CM9 Wi-Fi cards and a single IEEE802.15.4 node form a backbone network spanning all three floors of the ERI building [2], our experimentation environment.

3. User-end PC for presenting network variables

The network data is gathered from the first and ground floor to the local PC in the basement. The sensor readings are processed and stored by the GSN [8]. An interactive network monitoring and management tool is used to collect and display statistics from the 6lowPAN network.

II. Demonstration

We will demonstrate the operation of the WSN-BMDS system as deployed in the ERI building [2], which presents a base line for research in the area of wireless sensor and actuator networks for wireless building performance management. The demonstration will provide a real-time view and historical measurements of air-temperature, air-humidity, light, and energy consumption from wireless sensors. Through the system, users will be encouraged to control the lighting level in a room with immediate feedback using cameras recently deployed in the ERI. The possibility to connect directly to any node within the network using IP-compatible applications such as ping or netcat will be also demonstrated.

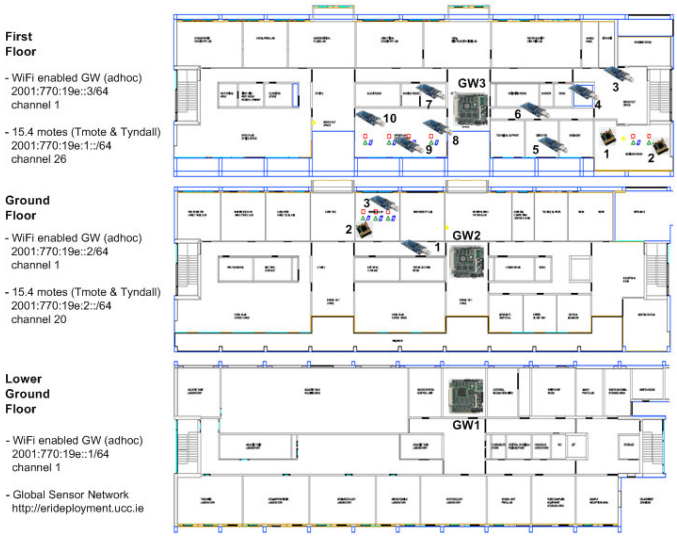

Fig. 1: The WSN-BMDS deployed in the ERI, spans three floors of the ERI building.

III. Conclusion and Future Work

We show how the WSN-BMDS can facilitate the objectives of the BuildWise [1] project towards a comprehensive understanding of complex building management and control operations. The system will also provide an experimental facility to conduct research in indoor wireless sensor and actuator networks. More specifically, we make a contribution to the recently released b6lowPAN stack by interfacing it with our new IEEE802.15.4 compatible MeshMAC [4].

Please refer to http://erideployment.ucc.ie/ for the current status of this demonstration.

References

[1] BuildWise Project Website http://zuse.ucc.ie/buildwise
[2] Environmental Research Institute building http://zuse.ucc.ie/buildwise/eri/e_overview.html
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[4] b6lowPAN Project Website http://smote.cs.berkeley.edu:8000/tracenv/wiki/b6loWPAN
[5] Soekris Embedded Boards: http://www.soekris.com/net4826.htm
[6] Tyndall Platform http://www.tyndall.ie/mai/25mm.htm
[7] TMote Sky Platform http://www.sentilla.com/moteiv-transition.html
[8] GSN Middleware http://gsn.sourceforge.net