AUTONOMOUS IPv6 BASE STATION FOR WIRELESS SENSOR NETWORKS WITH ROUTING CAPABILITIES

SUPERVISOR: Prof. Joel Rodrigues

ABSTRACT:

Wireless sensor networks [1] can be composed of up to thousands of very small smart sensors (motes) for environmental monitoring, home automation, building monitoring, and biofeedback, among others. The smart sensors collect sensing data and cooperate to send data to one of the network sink nodes.

Recently great interest is drawn on IPv6-enabled wireless sensor networks [2-6], namely with two major players on the operating systems side: ContikiOS [7] and TinyOS [8]. Most network designs rely on only one of the approaches, typically posing compatibility issues when both types are present.

On several research papers authors refer to the base station as a network node with more processing power than a smart sensor, reaching the “ideal vision” of a personal computer. Although very convenient in terms of processing power, this solution is by no means appropriate.

The Crossbow Imote2 [9] processing board features a PDA-grade processor from the ARM architecture (Marvell PXA 27x), with 32MB of RAM and 32MB Flash ROM, powered by an 3xAAA battery. The Stargate gateway from Crossbow features IEEE 802.15.4 and Ethernet connectivity, suited for LAN/Internet data publication.

This work aims at developing firmware for the Imote2 platform from Crossbow, able to process both ContikiOS and TinyOS enabled hardware, without specific user configuration. Since the board is supported by TinyOS, this work will be majorly conducted with this operating system. However the work must also include implementation over ContikiOS motes.

OBJECTIVES:

This work is focused on the implementation of a operating system-agnostic base station, on which one can pinpoint the following objectives:

- Testing and implementation of ContikiOS and TinyOS implementations of IPv6, namely through 6LoWPAN specification over IEEE 802.15.4
- Testing and implementation of the base station to consume
- Data dissemination on a LAN through a stargate gateway
TASKS:
- T1 – Technological background study and state-of-the-art
- T2 – Implementation and testing of ContikiOS and TinyOS motes with IPv6
- T3 - Implementation of the base station with TinyOS-only motes and respective testing
- T4 – Implementation of the base station with ContikiOS-only motes and respective testing
- T5 – Joint approach with application layer adaptation and LAN connectivity through stargate gateway
- T6 – The writing of the dissertation

EXPECTED RESULTS:
This work of engineering and research is expected to produce the desired base station firmware.

TIMELINE:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REFERENCES:


