

Master Thesis Project:

Implementing optimized code deployment on wireless sensor networks

More and more wireless sensor networks (WSNs) are being deployed in areas, such as smart homes/buildings, environmental monitoring, industrial process monitoring, smart cities, and more. Some of them, such as the ones targeted for smart homes, will be offered off-the-shelf, ready to be installed and configured. In other situations, such as special installations, a good amount of tailoring is needed. In the latter, it becomes necessary to write programs for the WSN. However, current state-of-the-art WSN programming techniques are difficult to use and usually require a good knowledge in C, embedded programming, wireless communications, distributed systems, security, and fault tolerance, in addition to knowledge of the application domain (e.g., the industrial process).

The Dept. of Information Technology, Uppsala University, has been working with "Abstract Task Graphs" which allow the programmer of a WSN to specify properties like mapping constraints and dataflow on an abstract level (See Figure 1 or [1]). In a standard WSN application, sensors produce data that is sent to operative tasks that do some computing before passing the processed data to other operative tasks or to an actuator. We already have a platform that handles communication details and finds an optimal assignment of tasks to physical nodes[2].

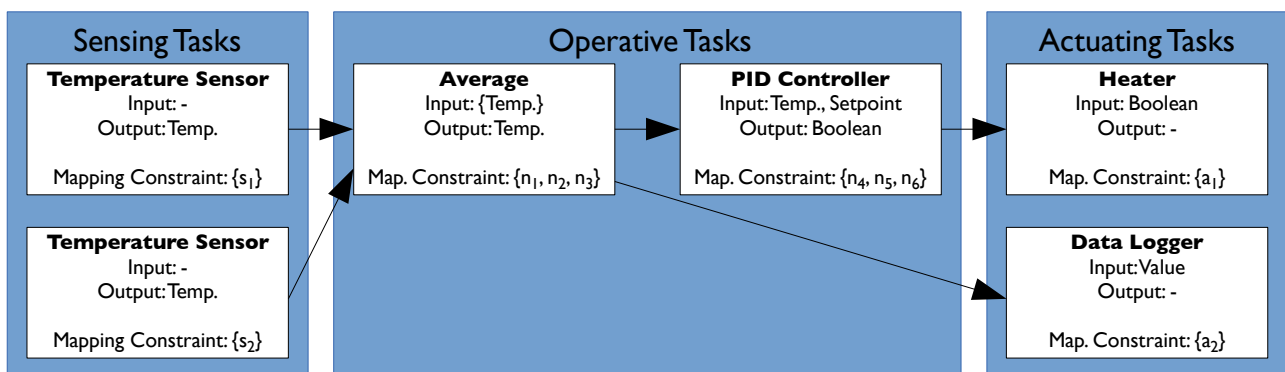


Figure 1: Example Task Graph of a WSN controlling and logging air temperature

In this project, the task is to implement such a system on a real WSN with real hardware. The student will work with the WSN operating system ContikiOS[3], wireless communication, compilers, and virtual machines (e.g. EmbedVM[4]). The resulting system should allow a programmer to specify a task graph and write code for each task, which is then deployed on a real WSN. We have a small WSN testbed at Polacksbacken, that can be used for development and testing the system.

The Candidate

We are looking for a master student that has a sound experience in C programming. Also knowledge in embedded systems and wireless communications is preferable.

Contact

For more information, and to apply, you may contact the following persons:

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[1] Srijan-toolkit, <http://code.google.com/p/srijan-toolkit/>

[2] Farshid Hassani Bijarbooneh, Pierre Flener, Edith Ngai, Justin Pearson, "Energy-Efficient Task Mapping for Data-Driven Sensor Network Macroprogramming Using Constraint Programming", 12th INFORMS Computing Society Conference (ICS2011), April 2011.
http://www.informs.org/content/download/249015/2351945/file/ICS-2011_Bijarbooneh.pdf

[3] Contiki-OS, <http://www.contiki-os.org/>

[4] EmbedVM, <http://www.clifford.at/embedvm/>