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6LoWPAN mobile node for 802.15.4 wireless networks

The IPv6 technology makes it possible to address a lot more electronic devices than only computers. With that in mind the idea occurred to build „The Internet of things", where all electronic devices in a new household are addressable and can communicate with each other to make living easier and save energy at the same time.

Using the 6LoWPAN adaption layer, resource constrained devices (very limited CPU and memory resources) can be integrated into the IPv6 world. The objective of this bachelor thesis was to implement a mobile 6LoWPAN node around a Cortex M0 (newest ARM core). The M0 is designed for low power, and its low cost makes it a suitable candidate for consumer devices. The part used in this work is the LPC1114 from NXP.
A 6LoWPAN layer had to be implemented on the processor connected to a Microchip radio module to make it capable of communicating with other devices in "The Internet of things". Then a useful sample application had to be found and implemented on these devices. In parallel, the energy consumption should be kept low, to allow the device to run for a long time on a battery or an energy-harvesting module.

With the Contiki a good operating system and implementation of the 6LoWPAN stack was found. Contiki is highly portable and therefore was used as a basis for the implementation. The driver of the radio module was integrated in the existing structures of the Contiki system. For demonstration purposes a temperature control system was developed. It works with one sensing node, which sends its measurements to the control system. From there, orders are sent to the actuator node, which turns the heating on or off. Finally, the energy consumption of the nodes was optimized to allow an operation on a small solar panel. Measurements have shown that the system needs little energy, and can run on energy harvesting. To the best of our knowledge, this is the first implementation of 6LoWPAN on a cortex M0 core.

A processor like the ARM Cortex M0 with low power consumption and high performance allows devices to interact in a modern IPv6 network without wasting energy. This opens the door to the Interne to a large number of small devices. There are thousands of possibilities how to use this potential.
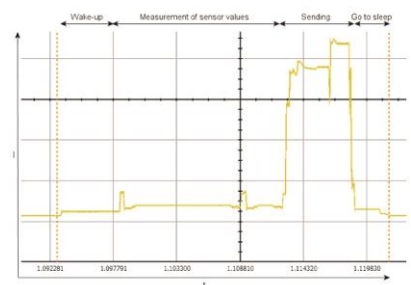
Diplomierende
Mathias Gugg
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Dozent
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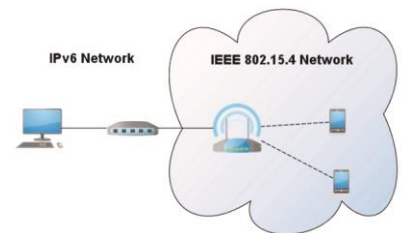
Sensor and actuator nodes communicating within the IEEE 802.15.4 network and are connected to the Internet by a gateway.

Sensor measurement and sending the IPv6 packet requires only 425 uJ of energy.