

Live Demonstration: Modular Multi-radio Wireless Sensor Platform with Plug&Play Modules Connection

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Abstract— The demo will present to the audience the new flexible research and development platform for Wireless Sensor and Actuator Networks (WSANs) and Internet of Things (IoT). The devices are built out of the hardware modules which are connected together in Plug&Play manner. The software modules are selected and optimized accounting for each node's structure. The platform enables wide variety of system-level experiments for future WSANs and heterogeneous communication systems.

Keywords—Wireless Sensors and Actuators Networks, IoT, Platform, Modular, Hardware, Software, Design, Tool, Experiment

I. INTRODUCTION

The Wireless Sensor and Actuator Networks (WSANs) are one of the corner stones for the Internet of Things (IoT), which is seen as the ecosystem of the future connecting people and machines alike. On one hand, the IoT landscape is characterized by high heterogeneity of the connected devices in terms of their structures, capabilities and targets. On the other hand, it needs to be truly dynamic and enable devices to operate efficiently and reliably provide high quality of service at all times. This imposes many novel challenges and raises myriads of new research and technical problems to be addressed by Academy and Industry in the coming years.

In the current demo we present the special development tool enabling fast and efficient prototyping and real-life experimentation with heterogeneous WSANs and IoT systems. In respect of hardware (HW), the new devices (i.e., nodes) are assembled out of the modules hosting the various peripherals, such as power supplies, processing units, transceivers, sensors and actuators, etc. Once a node is built, its main processing unit (MPU) automatically identifies all the connected peripherals, and optimizes the node's operation by picking up the software components to execute. The high flexibility and configurability as well as the possibility of adding the missing capabilities by adding the new modules – these are the features differentiating our system from the ones composing the state-of-the-art.

At a time more than ten various HW modules for our platform are already designed. They include: the MPU, two power supply options, example sensor and actuator modules, and five wireless communication interfaces (IEEE 802.15.4, 802.15.4a, 802.11b/g/n, 868/433 MHz ISM). The modules can be combined in various ways and the capability of attaching multiple identical modules or having multiple communication interfaces on a single node is supported. Although MPU is rich on resources, it is equipped with efficient voltage control system to enable use of the platform in low-power applications.

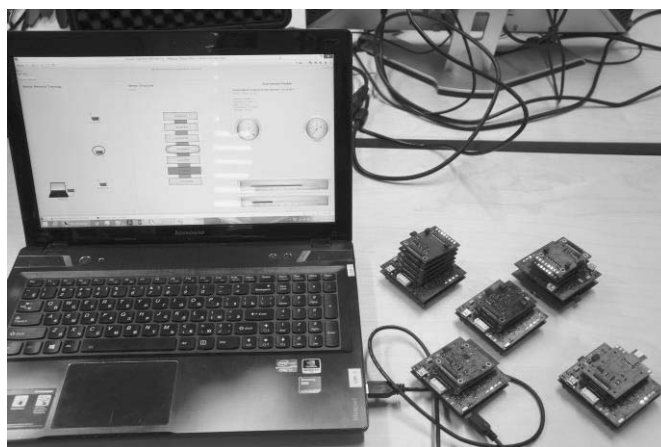


Fig. 1. Demo setup: nodes featuring different structure and communication interfaces and the laptop-based GUI displaying the network topology, structure of a selected node and the received data

II. DEMO SETUP

The example demo setup is depicted in Fig. 1. The demo equipment includes a laptop and a set of modules (sensors, actuators, power sources, communication interfaces, etc.) which enable building 5-6 different nodes. In the demo, the nodes which are not connected to the laptop become automatically end nodes and periodically report their structure and measured data via available means of communication. The node connected to the laptop acts as gateway. For each node, the structure and the reported data can be seen from the Graphical User Interface (GUI) application running on the laptop. Nothing but the table, pin wall (or poster stand) and a power plug is required to run the demo.

III. USER EXPERIENCE

In the demo we will demonstrate how a node with desired functionalities can be assembled out of the available modules. If desired, a user may change the structure of a node by attaching or detaching some modules on his/her own. Also a user may use the GUI application to explore the structure of the built nodes and respective measurement data, and to give commands and control the operation of the nodes. The additional information on the capabilities and limitations of the platform, the underlying HW and software technical solutions, and further developments, as well as the details of the current use cases will be provided verbally and listed in the brochures available from the stand.