Title: Internet of things laboratory

The Internet of Things laboratory is a fully equipped facility for rapid prototyping and testing of smart systems. It includes embedded platforms (Microchip, STM, ARM), over 300 sensors, communication modules (LoRa, GSM, Wi-Fi, Bluetooth, ZigBee), and digital fabrication tools like a 3D printer and CNC laser engraver. Advanced instruments such as Red Pitaya, oscilloscopes, and function generators support detailed measurement and analysis. The lab enables real-time data acquisition and system integration, ideal for developing and validating IoT solutions.

Infrastructure / Equipment Overview Table

	Details
Partner	INNOFEIT - Centre for technology transfer and innovations
Equipment type	Internet of Things laboratory
Target Group	Startups, industry companies and researchers
Key Technology	Communication technologies, Embedded systems
Status	Available to use
Requirements for Participation	Relevant project or need, basic technical knowledge

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Description of Available Infrastructure and Equipment

A dedicated laboratory space is equipped to support the full cycle of prototyping, testing, and validation of digital technologies, with particular emphasis on Internet of Things (IoT) applications. The infrastructure is optimized for practical experimentation, rapid development of proof-of-concept (PoC) systems, and integration of heterogeneous hardware and software components.

The laboratory contains four individual electronics workstations designed for concurrent development and testing. Core digital fabrication capabilities are supported through a Creality Ender V6 3D printer and a 5W CNC laser cutting/engraving machine, allowing for fast production of customized enclosures, mechanical components, and interface elements for embedded systems.

Instrumentation includes Red Pitaya STEM kits—multifunctional programmable units with capabilities such as oscilloscope, logic analyzer, spectrum analyzer, signal generator, and PID control, configurable via open-source software. Additional test and measurement equipment includes precision digital multimeters, digital oscilloscopes (up to 100 MHz bandwidth), function generators, variable DC power supplies, and ESD-safe soldering stations, complemented by full mechanical and electrical toolsets.

The lab supports embedded system development on a wide range of hardware platforms including Microchip PIC, Atmel AVR, STM32 (ARM Cortex-M), and other ARM-based systems. These platforms are interfaced with over 300 sensors for real-time monitoring of physical parameters such as temperature, humidity, pressure, light, gas concentration, vibration, acceleration, proximity, etc. Sensor modules are compatible with standard digital (I2C, SPI, UART) and analog interfaces, enabling rapid sensor network deployment.

For wireless and IoT connectivity, the lab includes a wide set of communication modules: GSM/GPRS for mobile networking, LoRa for long-range low-power communication, Wi-Fi and Bluetooth for local connectivity, and ZigBee for mesh networking. These modules facilitate multi-protocol IoT system implementation, ideal for scenarios requiring heterogeneous connectivity and distributed sensing.

A key feature of the infrastructure is its integration with a scalable middleware platform for data acquisition and storage, supporting MQTT, RESTful APIs, and database interfacing. This enables the implementation of end-to-end systems—from sensor acquisition to cloud-level analytics—making the lab suitable for applications in smart environments, condition monitoring, predictive maintenance, and edge computing.

The infrastructure enables precise validation of complex system architectures, offering robust support for real-world testing, algorithm deployment, and cyber-physical integration in IoT domains. It serves as a high-functionality testbed for accelerating R&D efforts across embedded systems, sensor networks, and intelligent device communication.