NODE-EMBED - Graphical Programming for Embedded (IoT) Devices

The Internet of Things is changing much about the world we live in. Sophisticated sensors are embedded in things that surround us. Many existing platforms offer IoT data recording and processing. However, as of today, there's still no fully equipped software development platform, which really allows you to quickly develop solid software, covering most of the needs in a professional (and not only hobbyists') environment using an easy to use graphical editor.

Initial situation

Imagine: What if we are able to create a software which lets users develop their software with a visual drag and drop editor, removing most of the programming complexity, where there's no need for a deep knowledge of software development or the required programming languages?
What if we can create a software which addresses the never-ending story of wrong user documentation and just shows exactly what the software does?
What if we find a solution to speed up embedded software development and reduce the time to market for new products significantly?
What if we find a way to reduce and hide the technical complexity?
There is a need for an IoT Software Development Platform which addresses all these topics.

Goals

The goal of this Bachelor Thesis was to design and develop a graphical programming platform for IoT applications based on the principle "reduce it to the max". The platform must support ESP32, but had to be designed so that additional target systems can be added at a later time. Wherever possible, existing tools had to be used.

Results

Based on the Node-RED editor, an IoT Software Development Platform including an IDE, an extensible and scalable framework and a cloud based Over-the-Air update solution for ESP32 devices was developed. For this purpose, various existing technologies and frameworks were used, disassembled, expanded and finally combined to a new product. The NODE- EMBED IoT Software Development Platform is the result.

The framework in it's first version supports running MQTT, an asynchronous webserver, Over-the-Air software updates, support for GPIO and serial communication, scheduling, custom code functions and a captive portal to connect to the internet easily (all on an ESP32 microcontroller).
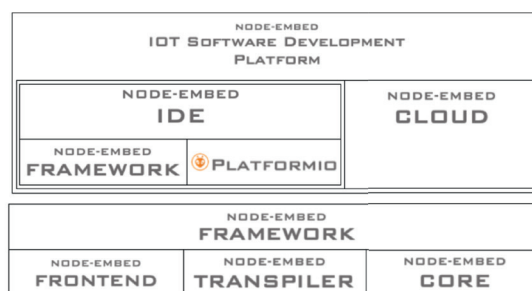
The modular system offers almost unlimited possibilities in the future. The framework can be extended with new technologies or functions in just a few steps. These could be e.g. simplified connections to the big IOT providers, or extensions in the field of home automation just to mention two of them.

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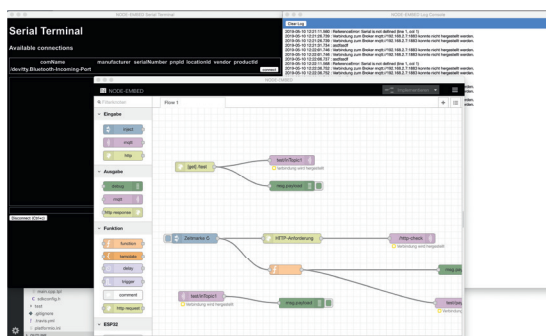
NODE-EMBED IDE

NODE-EMBED IoT Software Development Platform