Field Programmable Block System for the Internet of Things (IoT)

Product:
Field Programmable Block System Delivering Context-Aware Services

Development Stage:
Proof of Concept

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The Internet of Things (IoT), which comprises a growing number of physical objects connected to the Internet, promises to revolutionize the way humans and electronic devices interact with one another.

IoT-enabled applications are being developed to improve nearly all facets of life, such as transportation, healthcare, agriculture, and manufacturing to name a few. One particular example nearing commercial deployment is enhanced automobile driving technology, which can entail many aspects from collision avoidance to automated parking to traffic optimization. Another example pertains to monitoring of patients who are at least somewhat mobile and able to move about a facility, but who still require careful monitoring and prompt attention at times. A third example involves improved navigation systems for the visually impaired or people with other disabilities.

As more and more real world, IoT applications are realized, interoperability and standardization becomes important for integrating devices from multiple manufacturers into IoT systems. One drawback of current technologies is that there are numerous non-compatible platforms. Another issue is that many existing electronic devices are nevertheless not connected to the Internet or even to other devices or information management systems. For those devices already capable of being connected to the IoT, there are not enough experienced programmers available to integrate and maintain them because of their complexity.

Accordingly, there is a growing need to exploit the potential for connecting countless devices to the IoT in order to enable a wide array of new services and systems that will enhance society.

Technology Description

At WMU, a field-programmable, block system has been developed where functional blocks engage with various devices to make them "smarter" and to connect them to the Internet of Things (Fig. 1, blocks a.k.a. "Flex Beacon"). Moreover, this platform enables enhanced functionality such as "context awareness" and "situation awareness" as illustrated in Figure 2. Logistically, the WMU technology enables a user-centric approach to developing systems and solutions rather than the traditional model which typically requires highly experienced programmers to set up devices and create new applications from the ground up. The programmable blocks can be readily configured to connect most any device within proximity to the Internet. An intuitive software suite provides novice programmers as well as end-users with a visual tool that allows them to create a front-end interface. For instance, users can

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overlay graphical elements (e.g., switches, buttons, valves, instruments, etc.) on image depictions and utilize a text or graphical, rule-based language to associate the graphical elements with back-end logic that integrates the generated application with software modules that run locally or remotely (Fig. 1., "Graphical Development Suite"). Message brokers (Fig. 1 "broker cluster") are implemented to seamlessly and dynamically coordinate communications between blocks, remote devices, and user interfaces, typically via MQTT protocol.

One example of how this technology can be implemented is in a hospital use setting. For instance, the programable block can be connected to a patient thermometer via GPIB port, to a patient blood pressure monitor via USB, and to a patient heart rate monitor via WI-FI. The communications and device preferences can be configured via the graphical development suite. A nurse can then operate the intuitive graphical user interface of the mobile application (via an iPad, for example) to set up various monitoring and notification rules for patient care.

Another example, where the WMU system interacts in an even more remote manner, is for bicycling safety. In this case, bicycles and automobiles are outfitted with respective programmable blocks. The system monitors their locations, and when a bicycle and auto come within machine-to-machine (M2M) range, the respective blocks are alerted about each others' presence, triggering tactile alerts, such as on the bike rider's ear bud, vibrating handlebars or clothing, or on the auto driver's instrument cluster, audio system, etc. Optional M2M communications can ensue while the auto and bicycle are within range.

Potential Benefits

- Field programmable block system connects most any device to the Internet of Things (IoT)
- Graphical development platform is user-friendly for non-programmers and end-users
- Allows for machine-to-machine (M2M) as well as remote/Internet communications among devices
- Versatile platform enables location, context, and situation awareness

Figure 1. Schematic Example of WMU Field Programmable IoT Block System

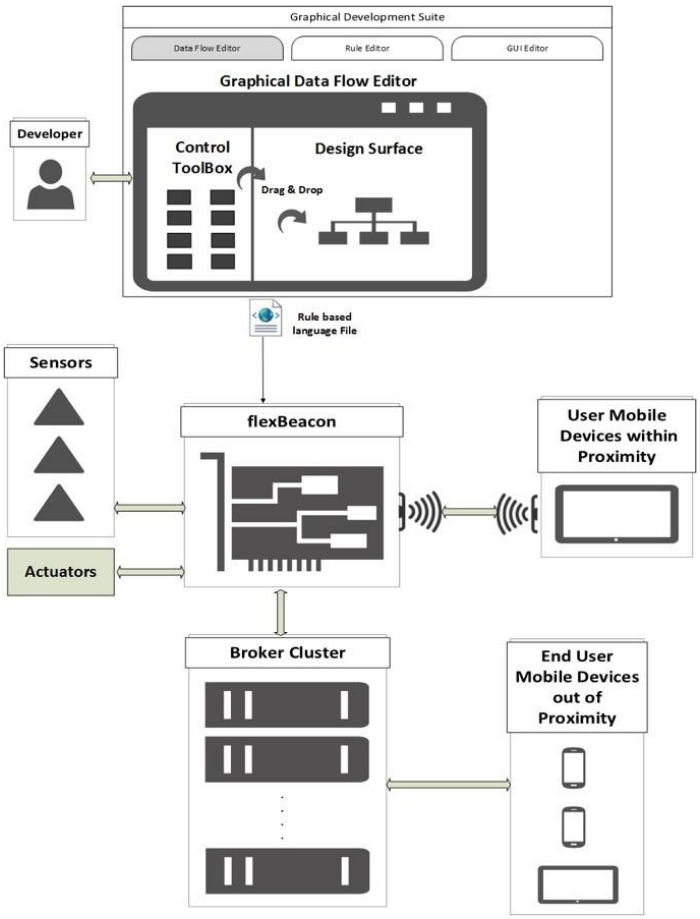

Figure 2. Flow Diagram of Implementation of Situation Awareness in IoT