Impact of Obstacles on a Gateway Selection Scheme in an M2M Architecture for Short Range Wireless Devices

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Technologies such as Bluetooth V4.x and device miniaturization have enabled an ever increasing number of today's personal and commercial aspects to be attached to multiple innovative wireless devices such as smartphones and other sensor/actuator type devices which are embedded in every imaginable place from shoes, cars to buildings. The Machine-to-Machine (M2M) communication between these devices enables a multitude of services such as e-Health, connected consumers, city automation, smart transportation and smart grid. Telecom carrier networks may need to rethink their operational strategies to accommodate the influx of user devices and their interaction while identifying new business opportunities. These expanding networks face new challenges such as, how to identify the best access point for a certain service, Quality of Service (QoS), etc. This study investigated the issues which arise when the distance between a gateway and a device is used as a metric in an environment containing obstacles to select a gateway in the European Telecommunications Standards Institute (ETSI) M2M architecture.

Using the ETSI M2M architecture, the study considered the issues in the M2M Device and Gateway domain. It also assumed that M2M gateway devices were operated by a service provider within a geographical area. The flood of M2M user devices in this service area creates issues such as efficient management of the connections in the M2M device and gateway domain. In some cases, the Received Signal Strength Indicator (RSSI) has been considered as a metric for selecting a device and gateway among multiple alternatives.

Bluetooth Low Energy (BLE) has gained much interest recently because of to its ultra-low power usage. Here the BLE device is considered as the M2M device and the equipment obtaining some information from the BLE device or issuing commands to it is considered as the M2M gateway. The BLE standard also promotes M2M communication as device-gateway pairing is not required and an M2M gateway can connect to a large number of devices compared to classical Bluetooth where pairing is necessary and there are limitations to the number of connections.

RSSI is considered as the metric for initializing a connection between a M2M gateway and a BLE device. The gateways obtain the RSSI from BLE devices and forward them to the server. Then, the server selects the gateway for each device in order to make the connection between the BLE device and the server. The RSSI value of a BLE device is considered as an indicator of the distance of the path between a gateway and a device. A simulation program was developed to evaluate the above scenario. The results enabled the accurate study of the effect of obstacles in the selection of M2M gateways for short range wireless devices in a service environment.