CLAIMS:

1. A gateway device for an IoT system comprising:

a short range (SR) wireless communication module for interfacing with one or more sensors, actuators or devices;

a memory unit containing a software to control a micro-controller, wherein data from the one or more sensors, actuators or devices are aggregated into a data package;

a low power, long range (LR) wireless communication module for transmitting the data package to a monitor centre at predetermined time periods;

an artificial intelligence or a machine learning module disposed in the micro-controller to record time blocks when the SR wireless communication is silent and, in response, to turn on a radio associated with the LR wireless communication, so as to avert interference between the SR and LR wireless communication; and

a battery for powering the gateway device.

2. The gateway device according to claim 1, further comprising a setup/gateway mode switch, a charging port /local communication port and a web server module.

3. The gateway device according to claim 1 or 2, wherein the SR wireless communication module comprises a chip set providing Bluetooth, Bluetooth low energy (BLE), Zigbee, near-field communications (NFC) or similar short range wireless communication.

4. The gateway device according to any one of the preceding claims, wherein the LR wireless communication module comprises a chip set providing narrow-band IoT (NB-IoT), Sigfox, LoRa or similar low power, long range wireless communication.

5. The gateway device according to any one of the preceding claims, wherein the gateway device is connectable to an external setup device via a USB, wifi or LAN port.

6. The gateway device according to any one of the preceding claims, wherein when the SR or LR wireless communication is silent, the gateway device is operable to turn off the radio associated with the SR or LR wireless communication so as to conserve power in the battery.

7. The gateway device according to any one of the preceding claims, wherein each data package comprises a header and sensor information, which sensor information includes the sensor identity and sensor value.

8. The gateway device according to claim 7, wherein when the sensor value does not change, only a heartbeat message is sent to the monitor centre, instead of sending sensor value periodically.

9. The gateway device according to any one of the preceding claims, wherein when a data package contains a time-critical message or an ad-hoc message, the associated sensor, actuator or device transmits the message broadcast to the gateway device.

10. The gateway device according to any one of claims 1-9 is configured for Bluetooth low energy (BLE) communication, wherein:

a BLE scan cycle is divided into 64 equal time blocks so that a scan window has a scan interval lasting 160 ms;

a BLE scan window is shifted by one time block for each scan cycle to listen for any BLE sensor that is located within range and is cyclically advertising; and

the scan window shifting and listening processes are repeated until a scan window time block substantially or effectively coincides with a time block that a BLE sensor is advertising, and in response, turning on a BLE scanner located in the gateway device during these coincidental or connected time blocks to further conserve power in the battery.

11. The gateway device according to claim 10, wherein a duty cycle of the scan window is a unity and therefore the BLE scanner is turned on for substantially 1.56% of the time during each scan cycle.

12. The gateway device according to claim 10 or 11, wherein the BLE scanner is turned off during the time blocks outside the connected BLE time blocks to further conserve power in the battery.

13. The gateway device according to any one of claims 10-12, wherein when a BLE sensor broadcast timing has drifted or disappeared and BLE message is lost, the microcontroller for controlling the gateway system creates two scan windows in a successive scan cycle, with a first scan window located one scan interval prior to the previously known connected scan window and a second scan window located one scan interval after the previously known connected scan window, and directionally shifting the first scan windows and the second scan window outwardly to the left and right by one scan interval, respectively, in each successive scan cycle to facilitate fast sensor re-discovery and re-connection, with concomitantly low power consumption.

14. The gateway device according to claim 13, wherein after operating a predetermined number of re-discovery and re-connection scanning cycles and re-connection fails, the microcontroller starts a fresh BLE sensor discovery and connection operation.

15. The gateway device according to claim 14, wherein after operating a predetermined number of fresh BLE discovery cycles and connection fails to re-establish, the microcontroller declares a BLE sensor failure and sends an alert to the monitor centre.

16. The gateway device according to any one of claims 12-15, wherein the artificial intelligence or a machine learning module records and learns the pattern of the BLE scanner time blocks whichsynchronise or connect with the time blocks of the BLE sensors/actuators, so that the BLE device radio is powered on only during these connected time blocks to further conserve power in the battery.

17. The gateway according to any one of claims 2-16, wherein the web module is connectable to provide wide-area network (WAN) communication.