Use of Bluetooth V4.0 with Thermal Printers.

Introduction

This document is intended to give information about the latest Bluetooth technology and its use in Bluetooth printers.

Background

Bluetooth was created in the mid 1990's for short range wireless communication and its specification has been developed ever since. These changes in version 2 and version 3 increased the communications speed, improved resistance to interference and added various profiles to enable communications with more device types. Bluetooth versions up to and including V3 are referred to as Classic Bluetooth. The specification for Bluetooth version 4 included Classic Bluetooth but also added Bluetooth High Speed (BHS) and Bluetooth Low Energy (BLE). BHS being Bluetooth based on IEEE 802.11 Wi-Fi and BLE introduced a new protocol stack designed for rapid connection to

Bluetooth V4.0

The Bluetooth V4.0 specification includes Classic Bluetooth for backward compatibility and Bluetooth Low Energy but a Bluetooth V4.0 device does not have to have classic Bluetooth.

The two types of device:

Bluetooth V4.0 single mode - these only support BLE. These devices are sometimes referred to as Bluetooth Smart.

Bluetooth V4.0 dual mode - these support BLE as well as Classic Bluetooth. These devices are sometimes referred to as Bluetooth Smart Ready.

Bluetooth Low Energy was designed to operate by waking up, connecting to a sensor, receiving some data, disconnecting and going back to sleep. Claims have been made of 10-20 times less power being used and beginning to transmit data 50 times quicker compared with Classic Bluetooth.

A common method of sending data using Classic Bluetooth is to use the Serial Port Profile (SPP). BLE does not have this and only allow packets up to 20 bytes in size so sending printer data using BLE would require both the host device and the printer to communicate using a proprietary protocol on top of the Generic Attribute Profile (GATT). This software would have to fragment the data to be transmitted into 20 byte chunks and concatenate the data when it is received.

A number of Bluetooth module manufacturers have single and dual mode BLE modules. When using BLE they provide performance figures that show very quick connection times (0.01 seconds) but slow data transfer times (80 bytes per second) as there needs to be a delay between each packet. Classic Bluetooth takes a number of seconds to connect but the data throughput is much quicker (Mbyte/s is possible). Using BLE to transmit a large amount of data may not save energy as the device will need to be on for longer.

BLE offers numerous profiles to enable connections with a variety of different sensors including medical/health and fitness (examples being blood pressure, heart rate and thermometer) and HID (Human Interface Device) for remote keyboards and mice. All of these require a quick connection, followed by the transfer of a small amount of data then they can go back into their low power states.

Conclusions

BLE is ideally suited to applications that require quick connection and the transfer of a small amount of data. Applications that require the transfer of larger amounts of data should resort to using classic Bluetooth.