Laird Custom BLE Serial Port Service

Introduction

This document assumes you are aware of the concept of a GATT Table in BLE, an array of attributes that define Services, Characteristics, and Descriptors (this information is fully described in the Bluetooth SIG’s Core Specification).

**Note:** The data direction terminology in this document is from the perspective of the device that is serving this service. Hence, outgoing data means from the server to the client and vice versa.

Virtual Serial Port Service

Laird’s custom BLE serial port service can be used to emulate a bi-directional streaming serial port which has four characteristics (two are mandatory; the rest are optional). Two of those four characteristics each have a Client Characteristic Configuration Descriptor (CCCD) which is used to enable data to be sent using notifications.

<table>
<thead>
<tr>
<th>Service UUID</th>
<th>569a1101-b87f-490c-92cb-11ba5ea5167c</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX_FIFO characteristic</td>
<td>569a2001-b87f-490c-92cb-11ba5ea5167c</td>
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<tr>
<td>TX_FIFO characteristic</td>
<td>569a2000-b87f-490c-92cb-11ba5ea5167c</td>
</tr>
<tr>
<td>MODEM_IN characteristic</td>
<td>569a2003-b87f-490c-92cb-11ba5ea5167c</td>
</tr>
<tr>
<td>MODEM_OUT characteristic</td>
<td>569a2002-b87f-490c-92cb-11ba5ea5167c</td>
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</table>

The TX_FIFO and MODEM_OUT characteristics are notifiable and so they have Client Characteristic Configuration Descriptors (CCCD).

MODEM_OUT Characteristic

This optional characteristic consists of a single byte which is notified to the client.

The value of the single byte is 0x01 if the server is ready to accept data and is 0x00 if not. This information is analogous to the RTS line in serial port.

Because it is notifiable, it has a corresponding CCCD descriptor and only the notify bit is modified by the client.

A client updates the CCCD as soon as there is a connection so that client can be notified of the receive state of the server.

RX_FIFO Characteristic

This mandatory characteristic is for incoming data and is a minimum of 20 bytes long when Data Length Extension is not enabled and as long as the ATT_MTU when it is enabled.

The GATT client uses a WRITE_COMMAND PDU to write to this characteristic only if it received a server notification from the MODEM_OUT characteristic. Given that the MODEM_OUT Characteristic is optional, if it is absent, the client assumes that the value is always 0x01.

When the client uses WRITE PDU, this results in over halving of the throughput as the ACK can only be sent in the next connection interval.

Multiple WRITE_COMMAND PDUs can be queued per connection interval.
MODEM_IN Characteristic

This optional characteristic consists of a single byte which is written by the client.

The value of the single byte is 0x01 if the client is ready to accept data and is 0x00 if not. This information is analogous to the CTS line in serial port.

The GATT Client uses a WRITE or WRITE_COMMAND PDU to write to this characteristic.

TX_FIFO Characteristic

This mandatory characteristic is for outgoing data. It is a minimum of 20 bytes long when Data Length Extension is not enabled and as long as the ATT_MTU when it is enabled.

Because it is notifiable, it has a corresponding CCCD descriptor and only the notify bit is modified by the client.

When the server has data to be sent to the client, it sends it in a notification only if the MODEM_IN characteristic value is 0x01. More than one notification can be sent in a connection interval if invoked in quick succession.

If the optional MODEM_IN characteristic is absent, then the server assumes a value of 0x01.

Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Notes</th>
<th>Contributor(s)</th>
<th>Approver</th>
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<tbody>
<tr>
<td>1.0</td>
<td>08 Jan 2019</td>
<td>Initial Release</td>
<td>Mahendra Tailor</td>
<td>Jonathan Kaye</td>
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