

Laird Custom BLE Serial Port Service

Application Note

v1.0

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.

Service UUID	569a 1101 -b87f-490c-92cb-11ba5ea5167c
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It contains two mandatory characteristics:

RX_FIFO characteristic	569a 2001 -b87f-490c-92cb-11ba5ea5167c
TX_FIFO characteristic	569a 2000 -b87f-490c-92cb-11ba5ea5167c

It contains two optional characteristics:

MODEM_IN characteristic	569a 2003 -b87f-490c-92cb-11ba5ea5167c
MODEM_OUT characteristic	569a 2002 -b87f-490c-92cb-11ba5ea5167c

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 *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

Version	Date	Notes	Contributor(s)	Approver
1.0	08 Jan 2019	Initial Release	Mahendra Tailor	Jonathan Kaye