RENESAS

Bluetooth® Low Energy Protocol Stack

API Reference Manual: CSCP

Renesas MCU

Target Device

RL78/G1D

Renesas Electronics

www.renesas.com

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General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

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1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of an MPU or MCU in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

How to Use This Manual

1.   Purpose and Target Readers

This manual describes the API (Application Program Interface) of the Cycling Speed and Cadence profile (CSCP) of the Bluetooth Low Energy protocol stack (BLE software), which is used to develop Bluetooth applications that incorporate the Renesas Bluetooth low energy microcontroller RL78/G1D. It is intended for users designing application systems incorporating this software. A basic knowledge of microcontrollers and Bluetooth low energy is necessary in order to use this manual.

Related documents

The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Document Name	Document No.
Bluetooth Low Energy Protocol Stack	
User's Manual	R01UW0095E
API Reference Manual: Basics	R01UW0088E
API Reference Manual: FMP	R01UW0089E
API Reference Manual: PXP	R01UW0090E
API Reference Manual: HTP	R01UW0091E
API Reference Manual: BLP	R01UW0092E
API Reference Manual: HOGP	R01UW0093E
API Reference Manual: ScPP	R01UW0094E
API Reference Manual: HRP	R01UW0097E
API Reference Manual: CSCP	This manual
API Reference Manual: CPP	R01UW0099E
API Reference Manual: GLP	R01UW0103E
API Reference Manual: TIP	R01UW0106E
API Reference Manual: RSCP	R01UW0107E
API Reference Manual: ANP	R01UW0108E
API Reference Manual: PASP	R01UW0109E
API Reference Manual: LNP	R01UW0113E
Application Note: Sample Program	R01AN1375E
Application Note: rBLE Command Specification	R01AN1376E

List of Abbreviations and Acronyms

Abbreviation	Full Form	Remark
ANP	Alert Notification Profile	
ANS	Alert Notification Service	
API	Application Programming Interface	
ATT	Attribute Protocol	
BAS	Battery Service	
BB	Base Band	
BD_ADDR	Bluetooth Device Address	
BLE	Bluetooth low energy	
BLP	Blood Pressure Profile	
BLS	Blood Pressure Service	
CPP	Cycling Power Profile	
CPS	Cycling Power Service	
CSCP	Cycling Speed and Cadence Profile	
CSCS	Cycling Speed and Cadence Service	
CSRK	Connection Signature Resolving Key	
CTS	Current Time Service	
DIS	Device Information Service	
EDIV	Encrypted Diversifier	
FMP	Find Me Profile	
GAP	Generic Access Profile	
GATT	Generic Attribute Profile	
GLP	Glucose Profile	
GLS	Glucose Service	
HCI	Host Controller Interface	
HID	Human Interface Device	
HIDS	HID Service	
HOGP	HID over GATT Profile	
HRP	Heart Rate Profile	
HRS	Heart Rate Service	
HTP	Health Thermometer Profile	
HTS	Health Thermometer Service	
IAS	Immediate Alert Service	
IRK	Identity Resolving Key	
L2CAP	Logical Link Control and Adaptation Protocol	
LE	Low Energy	

Abbreviation	Full Form	Remark
LL	Link Layer	
LLS	Link Loss Service	
LNP	Location and Navigation Profile	
LNS	Location and Navigation Service	
LTK	Long Term Key	
MCU	Micro Controller Unit	
MITM	Man-in-the-middle	
MTU	Maximum Transmission Unit	
NDCS	Next DST Change Service	
OOB	Out of Band	
OS	Operating System	
PASP	Phone Alert Status Profile	
PASS	Phone Alert Status Service	
PXP	Proximity Profile	
RF	Radio Frequency	
RSCP	Running Speed and Cadence Profile	
RSCS	Running Speed and Cadence Service	
RSSI	Received Signal Strength Indication	
RTUS	Reference Time Update Service	
ScPP	Scan Parameters Profile	
ScPS	Scan Parameters Service	
SM	Security Manager	
SMP	Security Manager Protocol	
STK	Short Term Key	
TIP	Time Profile	
TK	Temporary Key	
TPS	Tx Power Service	
UART	Universal Asynchronous Receiver Transmitter	
UUID	Universal Unique Identifier	

Abbreviation	Full Form	Remark
APP	Application	
CSI	Clocked Serial Interface	
IIC	Inter-Integrated Circuit	
RSCIP	Renesas Serial Communication Interface Protocol	
VS	Vendor Specific	

Contents

1. Overview

This manual describes the API (Application Program Interface) of the Cycling Speed and Cadence profile (CSCP) of the Bluetooth Low Energy protocol stack (BLE software), which is used to develop Bluetooth applications that incorporate Renesas Bluetooth low energy microcontroller RL78/G1D.

For details about the organization and features of BLE software, see the Bluetooth Low Energy Protocol Stack User's Manual.

2. Common Definitions

This section describes the definitions common to the API of each profile.

2.1 Service Definitions

This section describes the common definitions of services used by the API of multiple profiles.

Declaration of enumerated type for alert level

```
enum RBLE_SVC_ALT_LVL_enum {
  RBLE_SVC_ALERT_NONE = 0x00,          No alert
  RBLE_SVC_ALERT_MILD,                 Mild alert
  RBLE_SVC_ALERT_HIGH                  High alert
};
```

Declaration of enumerated type for PnP ID characteristic vendor ID field

```
enum RBLE_SVC_PNP_VENDOR_ID_enum {
  RBLE_SVC_SIG_ASSIGNED_ID = 0x01,     Vendor ID assigned by Bluetooth SIG
  RBLE_SVC_USB_ASSIGNED_ID             Vendor ID assigned by USB Implementer's
                                       Forum
};
```

Declaration of enumerated type for Name Space field of Characteristic Presentation Format descriptor

```
enum RBLE_SVC_PRESEN_NAMESPASE_enum {
  RBLE_SVC_NAMESPACE_SIG = 0x01,       Defined by Bluetooth SIG
};
```

Declaration of enumerated type for security level of Service

```
enum RBLE_SVC_SEC_LVL_enum {
  RBLE_SVC_SEC_NONE = 0x01,            No security
  RBLE_SVC_SEC_UNAUTH = 0x02,          Require unauthenticated pairing
  RBLE_SVC_SEC_AUTH = 0x04,            Require authenticated pairing
  RBLE_SVC_SEC_AUTZ = 0x08,            Require authorization
  RBLE_SVC_SEC_ENC = 0x10              Require encryption
};
```

Declaration of enumerated type for connection types

```
enum RBLE_PRF_CON_enum {
  RBLE_PRF_CON_DISCOVERY = 0x00,       Configuration connection performed
                                       when connecting for the first time
  RBLE_PRF_CON_NORMAL                  Normal connection performed when
                                       connecting for the second and
                                       subsequent times
};
```

Declaration of enumerated type for client configuration characteristic value

```
enum RBLE_PRF_CLIENT_CONFIG_enum {
    RBLE_PRF_STOP_NTFIND = 0x00,         Stop notification or indication of
                                         characteristic value.
    RBLE_PRF_START_NTF,                  Start notification of
                                         characteristic value.
    RBLE_PRF_START_IND                   Start indication of
                                         characteristic value.
};
```

Declaration of enumerated type for server configuration characteristic value

```
enum RBLE_PRF_SERVER_CONFIG_enum {
    RBLE_PRF_STOP_BRD = 0x00,            Stop broadcast of characteristic value.
    RBLE_PRF_START_BRD                   Start broadcast of characteristic value.
};
```

2.2   Status Definitions

This section describes the status definitions used by the API of each profile.

- Declaration of enumerated type for rBLE status

```
enum RBLE_STATUS_enum {
    RBLE_OK = 0x00,                            Normal operation
    RBLE_PRF_ERR_INVALID_PARAM = 0x90,         Invalid parameter specified for
                                               setting or acquiring a characteristic
                                               value

    RBLE_PRF_ERR_INEXISTENT_HDL,               Invalid handle specified for setting
                                               or acquiring a characteristic value
    RBLE_PRF_ERR_STOP_DISC_CHAR_MISSING,       The characteristic value is missing.
    RBLE_PRF_ERR_MULTIPLE_IAS,                 Multiple IASs exist.
    RBLE_PRF_ERR_INCORRECT_PROP,               Incorrect property
    RBLE_PRF_ERR_MULTIPLE_CHAR,                Multiple characteristic values exist.
    RBLE_PRF_ERR_NOT_WRITABLE,                 Writing is not permitted.
    RBLE_PRF_ERR_NOT_READABLE,                 Reading is not permitted.
    RBLE_PRF_ERR_REQ_DISALLOWED,               Requesting is not permitted.
    RBLE_PRF_ERR_NTF_DISABLED,                 Notification is disabled.
    RBLE_PRF_ERR_IND_DISABLED,                 Indication is disabled.
    RBLE_PRF_ERR_ATT_NOT_SUPPORTED,            The characteristic value is not
                                               supported.
};
```

Note: Statuses other than the above are described in *API Reference Manual: Basics*.

3. Cycling Speed and Cadence Profile

This section describes the API of the Cycling Speed and Cadence profile. The Cycling Speed and Cadence profile is used to enable a data collection device to obtain data from a Cycling Speed and Cadence sensor.

3.1 Definitions

This section describes the definitions used by the API of the Cycling Speed and Cadence profile.

- Declaration of enumerated type for CSCP event types

```
enum RBLE_CSCP_EVENT_TYPE_enum {
    RBLE_CSCP_EVENT_SENSOR_ENABLE_COMP = 0x01,    Sensor enable completion event
                                                  (Parameter: sensor_enable)
    RBLE_CSCP_EVENT_SENSOR_DISABLE_COMP,          Sensor disable completion event
                                                  (Parameter: sensor_disable)
    RBLE_CSCP_EVENT_SENSOR_ERROR_IND,             Sensor error indication event
                                                  (Parameter: error_ind)
    RBLE_CSCP_EVENT_SENSOR_SEND_MEASUREMENTS_COMP,
                                                  Sensor send measurements completion event
                                                  (Parameter: send_measurements)
    RBLE_CSCP_EVENT_SENSOR_SEND_SC_CP_COMP,       Sensor send SC Control Point
                                                  completion event
                                                  (Parameter: send_sc_cp)
    RBLE_CSCP_EVENT_SENSOR_CHG_SC_CP_IND,         SC Control Point change indication event
                                                  (Parameter: cscps_chg_sc_cp_ind)
    RBLE_CSCP_EVENT_SENSOR_CFG_INDNTF_IND,        Characteristic configuration change
                                                  indication event
                                                  (Parameter: cscps_cfg_indntf_ind)
    RBLE_CSCP_EVENT_SENSOR_COMMAND_DISALLOWED_IND,
                                                  Command disallowed indication event
                                                  (Parameter: cmd_disallowed_ind)
    RBLE_CSCP_EVENT_COLLECTOR_ENABLE_COMP = 0x81,
                                                  Collector enable completion event
                                                  (Parameter: collector_enable)
    RBLE_CSCP_EVENT_COLLECTOR_DISABLE_COMP,       Collector disable completion event
                                                  (Parameter: collector_disable)
    RBLE_CSCP_EVENT_COLLECTOR_ERROR_IND,          Collector error indication event
                                                  (Parameter: error_ind)
    RBLE_CSCP_EVENT_COLLECTOR_MEASUREMENTS_NTF,   Measured value notification event
                                                  (Parameter: measurements_ntf)
    RBLE_CSCP_EVENT_COLLECTOR_SC_CP_IND,          SC Control Point indication event
                                                  (Parameter: sc_cp_ind)
    RBLE_CSCP_EVENT_COLLECTOR_READ_CHAR_RESPONSE,
                                                  Characteristic value read request
                                                  response event
                                                  (Parameter: rd_char_resp)
```

```
    RBLE_CSCP_EVENT_COLLECTOR_WRITE_CHAR_RESPONSE,
                                                Characteristic value write request
                                                response event
                                                (Parameter: wr_char_resp)
    RBLE_CSCP_EVENT_COLLECTOR_COMMAND_DISALLOWED_IND
                                                Command disallowed indication event
                                                (Parameter: cmd_disallowed_ind)
};
```

- Declaration of data type for CSCP event types

```
typedef uint8_t RBLE_CSCP_EVENT_TYPE;
```

- Declaration of data type for CSCP Sensor event callback function

```
typedef void ( *RBLE_CSCPS_EVENT_HANDLER )( RBLE_CSCPS_EVENT *event );
```

- Declaration of data type for CSCP Collector event callback function

```
typedef void ( *RBLE_CSCPC_EVENT_HANDLER )( RBLE_CSCPC_EVENT *event );
```

- Declaration of enumerated type for cycling speed and cadence service/device information service characteristic codes

```
enum RBLE_CSCPC_RD_CHAR_CODE_enum {
    RBLE_CSCPC_RD_CSCS_CM_CFG = 0x00,          Measurement value notification
    RBLE_CSCPC_RD_CSCS_SCCP_CFG,               SC Control Point
    RBLE_CSCPC_RD_CSCS_CSC_FEATURE,            Supported features of the CSC Sensor
    RBLE_CSCPC_RD_CSCS_SL,                     Sensor location
    RBLE_CSCPC_RD_DIS_MANUF,                   Sensor manufacturer name
    RBLE_CSCPC_RD_DIS_MODEL,                   Sensor model number
    RBLE_CSCPC_RD_DIS_SERNB,                   Sensor serial number
    RBLE_CSCPC_RD_DIS_HWREV,                   Sensor hardware revision
    RBLE_CSCPC_RD_DIS_FWREV,                   Sensor firmware revision
    RBLE_CSCPC_RD_DIS_SWREV,                   Sensor software revision
    RBLE_CSCPC_RD_DIS_SYSID,                   Sensor system ID
    RBLE_CSCPC_RD_DIS_IEEE,                    Sensor IEEE certification
                                               information
};
```

- Declaration of enumerated type for cycling speed and cadence service characteristic value settings

```
enum RBLE_CSCPC_WR_CHAR_CODE_enum {
    RBLE_CSCPC_CYCSPD_MEAS_CODE = 0x01,        Measurement value
                                               notification setting
    RBLE_CSCPC_SC_CONTROL_POINT_CODE           SC Control Point indication setting
};
```

- Declaration of enumerated type for cycling speed and cadence sensor location characteristic value

```
enum RBLE_CSCPC_SENSOR_LOCATION_enum {
    RBLE_CSCPC_SENSOR_OTHER = 0x00,            Other
    RBLE_CSCPC_SENSOR_TOP_OF_SHOE,             Top of shoe
```

```
    RBLE_CSCPC_SENSOR_IN_SHOE,               In shoe
    RBLE_CSCPC_SENSOR_HIP,                   Hip
    RBLE_CSCPC_SENSOR_FRONT_WHEEL,           Front Wheel
    RBLE_CSCPC_SENSOR_LEFT_CRANK,            Left Crank
    RBLE_CSCPC_SENSOR_RIGHT_CRANK,           Right Crank
    RBLE_CSCPC_SENSOR_LEFT_PEDAL,            Left Pedal
    RBLE_CSCPC_SENSOR_RIGHT_PEDAL,           Right Pedal
    RBLE_CSCPC_SENSOR_FRONT_HUB,             Front Hub
    RBLE_CSCPC_SENSOR_REAR_DROPOUT,          Rear Dropout
    RBLE_CSCPC_SENSOR_CHAINSTAY,             Chainstay
    RBLE_CSCPC_SENSOR_REAR_WHEEL,            Rear Wheel
    RBLE_CSCPC_SENSOR_REAR_HUB,              Rear Hub
    RBLE_CSCPC_SENSOR_CHEST                  Chest
};
```

- Declaration of enumerated type for SC Control Point procedures (Op Codes)

```
enum RBLE_CSCP_SCCP_OP_CODE_enum {
    RBLE_CSCP_OP_SET_CUMULATIVE_CODE = 0x01,    Set Cumulative Value
    RBLE_CSCP_OP_START_SC_CODE,                 Start Sensor Calibration
    RBLE_CSCP_OP_UPDATE_SL_CODE,                Update Sensor Location
    RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE,         Request Supported Sensor Locations
    RBLE_CSCP_OP_RESPONSE_CODE = 0x10           Response code
};
```

- Declaration of enumerated type for Response code of SC Control Point procedures

```
enum RBLE_CSCP_SCCP_RES_CODE_enum {
    RBLE_CSCP_RES_SUCCESS_CODE = 0x01,          Success
    RBLE_CSCP_RES_NOT_SUPPORTED_CODE,           Op Code Not Supported
    RBLE_CSCP_RES_INVALID_PARAM_CODE,           Invalid Parameter
    RBLE_CSCP_RES_OP_FAILED_CODE                Operation Failed
};
```

- Cycling speed and cadence service characteristic information structures

```
typedef struct RBLE_CSCP_SENSOR_PARAM _t {
    uint16_t       cycspd_meas_ntf_en;       Measurement value
                                             notification configuration value
    uint16_t       sc_cp_ind_en;             SC Control Point
                                             indication configuration value
    uint8_t        sensor_location;          Sensor location value
    uint8_t        reserved;                 Reserved
} RBLE_CSCP_SENSOR_PARAM;
```

- Cycling speed and cadence Measurements information structures

```
typedef struct RBLE_CSCP_MEASUREMENTS_INFO _t{
    uint8_t        flags;                    Data field flag
    uint8_t        reserved;                 Reserved
```

```
    uint32_t        wheel_revolutions;            Cumulative Wheel Revolutions value
    uint16_t        wheel_event_time;             Last Wheel Event Time value
    uint16_t        crank_revolutions;            Cumulative Crank Revolutions value
    uint16_t        crank_event_time;             Last Crank Event Time value
} RBLE_CSCP_MEASUREMENTS_INFO;
```

- SC Control Point information structures

```
typedef struct RBLE_CSCP_SC_CONTROL_POINT_INFO _t{
    uint8_t         OpCode;                       Op Code
    uint8_t         reserved1;                    Reserved
    uint32_t        cumulative_value;             Cumulative Wheel Revolutions value
    uint8_t         sensor_location;              Sensor Location
    uint8_t         request_op_code;              Request Op Code
    uint8_t         response_value;               Response value
    uint8_t         reserved2;                    Reserved
} RBLE_CSCP_SC_CONTROL_POINT_INFO;
```

- Cycling speed and cadence service content structures

```
typedef struct RBLE_CSCS_CONTENT_t {
    uint16_t        shdl;                 CSC service start handle
    uint16_t        ehdl;                 CSC service end handle
    uint16_t        cycspd_meas_char_hdl; CSC measurement characteristic handle
    uint16_t        cycspd_meas_val_hdl;  CSC measurement characteristic value handle
    uint16_t        cycspd_meas_cfg_hdl;  CSC measurement client characteristic
                                          configuration descriptor handle
    uint8_t         cycspd_meas_prop;     CSC measurement characteristic property
    uint8_t         reserved1;            Reserved
    uint16_t        csc_feature_char_hdl; CSC supported feature characteristic handle
    uint16_t        csc_feature_val_hdl;  CSC supported feature characteristic value
                                          handle
    uint8_t         csc_feature_prop;     CSC supported feature characteristic
                                          property
    uint8_t         reserved2;            Reserved
    uint16_t        sensor_loc_char_hdl;  Sensor Location characteristic handle
    uint16_t        sensor_loc_val_hdl;   Sensor Location characteristic value handle
    uint8_t         sensor_loc_prop;      Sensor Location characteristic property
    uint8_t         reserved3;            Reserved
    uint16_t        sc_cp_char_hdl;       SC Control Point characteristic handle
    uint16_t        sc_cp_val_hdl;        SC Control Point characteristic value handle
    uint16_t        sc_cp_cfg_hdl;        SC Control Point client
                                          characteristic configuration
                                          descriptor handle
    uint8_t         sc_cp_prop;           SC Control Point characteristic property
    uint8_t         reserved4;            Reserved
} RBLE_CSCS_CONTENT;
```

- Device information service content structures

```
typedef struct RBLE_DIS_CONTENT_t {
    uint16_t        shdl;                   Device information service start
                                            handle
    uint16_t        ehdl;                   Device information service end
                                            handle
    uint16_t        sys_id_char_hdl;        System ID characteristic handle
    uint16_t        sys_id_val_hdl;         System ID characteristic value
                                            handle
    uint8_t         sys_id_prop;            System ID characteristic property
    uint8_t         reserved;               Reserved
    uint16_t        model_nb_char_hdl;      Model number characteristic handle
    uint16_t        model_nb_val_hdl;       Model number characteristic value
                                            handle
    uint8_t         model_nb_prop;          Model number characteristic
                                            property
    uint8_t         reserved2;              Reserved
    uint16_t        serial_nb_char_hdl;     Serial number characteristic handle
    uint16_t        serial_nb_val_hdl;      Serial number characteristic value
                                            handle
    uint8_t         serial_nb_prop;         Serial number characteristic
                                            property
    uint8_t         reserved3;              Reserved
    uint16_t        fw_rev_char_hdl;        Firmware revision characteristic
                                            handle
    uint16_t        fw_rev_val_hdl;         Firmware revision characteristic
                                            value handle
    uint8_t         fw_rev_prop;            Firmware revision characteristic
                                            property
    uint8_t         reserved4;              Reserved
    uint16_t        hw_rev_char_hdl;        Hardware revision characteristic
                                            handle
    uint16_t        hw_rev_val_hdl;         Hardware revision characteristic
                                            value handle
    uint8_t         hw_rev_prop;            Hardware revision characteristic
                                            property
    uint8_t         reserved5;              Reserved
    uint16_t        sw_rev_char_hdl;        Software revision characteristic
                                            handle
    uint16_t        sw_rev_val_hdl;         Software revision characteristic
                                            value handle
    uint8_t         sw_rev_prop;            Software revision characteristic
                                            property
    uint8_t         reserved6;              Reserved
    uint16_t        manuf_name_char_hdl;    Manufacturer name characteristic
                                            handle
    uint16_t        manuf_name_val_hdl;     Manufacturer name characteristic
                                            value handle
    uint8_t         manuf_name_prop;        Manufacturer name characteristic
                                            property
```

```
    uint8_t         reserved7;                  Reserved
    uint16_t        ieee_certif_char_hdl;       IEEE certification characteristic
                                                handle
    uint16_t        ieee_certif_val_hdl;        IEEE certification characteristic
                                                value handle
    uint8_t         ieee_certif_prop;           IEEE certification characteristic
                                                property
    uint8_t         reserved8;                  Reserved
} RBLE_DIS_CONTENT;
```

- CSCP Sensor event parameter structures

```
typedef struct RBLE_CSCPS_EVENT_t {
    RBLE_CSCP_EVENT_TYPE          type;              CSCP event type
    uint8_t                       reserved;          Reserved
    union Event_Cscs_Parameter_u {
        Generic event
        RBLE_STATUS               status;            Status

        Sensor enable completion event
        struct RBLE_CSCP_Sensor_Enable_t{
            RBLE_STATUS           status;            Status
            uint8_t               reserved;          Reserved
            uint16_t              conhdl;            Connection handle
        }sensor_enable;

        Sensor disable completion event
        struct RBLE_CSCP_Sensor_Disable_t{
            uint16_t              conhdl;            Connection handle
            RBLE_CSCP_SENSOR_PARAM sensor_info;      Cycling speed and cadence service
                                                     information
        }sensor_disable;

        Sensor error indication event
        struct RBLE_CSCP_Sensor_Error_Ind_t{
            uint16_t              conhdl;            Connection handle
            RBLE_STATUS           status;            Status
        }error_ind;

        Sensor measured value send completion event
        struct RBLE_CSCP_Sensor_Send_Measurements_t{
            uint16_t              conhdl;            Connection handle
            RBLE_STATUS           status;            Status
        }send_measurements;

        SC Control Point send completion event
        struct RBLE_CSCP_Sensor_Send_SC_Control_Point_t{
            uint16_t              conhdl;            Connection handle
            RBLE_STATUS           status;            Status
        }send_sc_cp;

        SC Control Point change indication event
        struct RBLE_CSCP_Sensor_Chg_Sc_Cp_Ind_t{
            uint16_t                     conhdl;     Connection handle
            RBLE_CSCP_SC_CONTROL_POINT_INFO  sc_cp_info; SC Control Point information
        }cscps_chg_sc_cp_ind;
```

Sensor configuration characteristic value indication event

```
struct RBLE_CSCP_Sensor_Cfg_indntf_Ind_t{
    uint16_t            conhdl;         Connection handle
    uint8_t             char_code;      Characteristic value code
    uint8_t             reserved;       Reserved
    uint16_t            cfg_val;        Configuration characteristic
                                        value
}cscps_cfg_indntf_ind;
```

Sensor command disallowed indication event

```
struct RBLE_CSCP_Sensor_Command_Disallowed_Ind_t{
    RBLE_STATUS         status;         Status
    uint8_t             reserved;       Reserved
    uint16_t            opcode;         Opcode
}cmd_disallowed_ind;
    } param;
} RBLE_CSCPS_EVENT;
```

- CSCP Collector event parameter structures

```
typedef struct RBLE_CSCPC_EVENT_t {
    RBLE_CSCP_EVENT_TYPE        type;           CSCP event type
    uint8_t                     reserved;       Reserved
    union Event_Cscc_Parameter_u {
```

Generic event

```
        RBLE_STATUS             status;         Status
```

Collector enable completion event

```
        struct RBLE_CSCP_Collector_Enable_t{
            RBLE_STATUS         status;         Status
            uint8_t             reserved;       Reserved
            uint16_t            conhdl;         Connection handle
            RBLE_CSCS_CONTENT   cscs;           Cycling speed and cadence service
                                                content
            RBLE_DIS_CONTENT    dis;            Device information service
                                                content
        }collector_enable;
```

Collector disable completion event

```
        struct RBLE_CSCP_Collector_Disable_t{
            RBLE_STATUS         status;         Status
            uint8_t             reserved;       Reserved
            uint16_t            conhdl;         Connection handle
        }collector_disable;
```

Collector error indication event
```
struct RBLE_CSCP_Collector_Error_Ind_t{
    RBLE_STATUS             status;             Status
    uint8_t                 reserved;           Reserved
    uint16_t                conhdl;             Connection handle
}error_ind;
```

Collector sensor measurement information notification event
```
struct RBLE_CSCP_Collector_Measurements_Ntf_t{
    uint16_t                      conhdl;       Connection handle
    RBLE_CSCP_MEASUREMENTS_INFO   measure_info; Sensor measurement information
}measurements_ntf;
```

Collector SC Control Point indication event
```
struct RBLE_CSCP_Collector_SC_CP_Ind_t{
    uint16_t                      conhdl;          Connection handle
    RBLE_CSCP_SC_CONTROL_POINT_INFO  sc_cp_info;   SC Control Point information
    uint8_t                       location_num;    number of valid response values
    uint8_t                       response_param[RBLE_CSCP_SENSORE_LOCATION_MAX];
                                                   Sensor Locations of available
}sc_cp_ind;
```

Collector characteristic value read request response event
```
struct RBLE_CSCP_Collector_Read_Char_Response_t{
    uint16_t                conhdl;       Connection handle
    uint8_t                 att_code;     Status
    uint8_t                 reserved;     Reserved
    RBLE_ATT_INFO_DATA      data;         Acquired characteristic data
}rd_char_resp;
```

Collector characteristic value write request response event
```
struct RBLE_CSCP_Collector_Write_Char_Response_t{
    uint16_t                conhdl;       Connection handle
    uint8_t                 att_code;     Status
}wr_char_resp;
```

Collector command disallowed indication event
```
struct RBLE_CSCP_Collector_Command_Disallowed_Ind_t{
    RBLE_STATUS             status;       Status
    uint8_t                 reserved;     Reserved
    uint16_t                opcode;       Opcode
}cmd_disallowed_ind;
    } param;
} RBLE_CSCPC_EVENT;
```

3.2   Functions

The following table shows the API functions defined for the CSCP of rBLE and the following sections describe the API functions in detail.

Table 3-1 API Functions Used by the CSCP

RBLE_CSCP_Sensor_Enable	Enables the Sensor role.
RBLE_CSCP_Sensor_Disable	Disables the Sensor role.
RBLE_CSCP_Sensor_Send_Measurements	Sends sensor measurement information.
RBLE_CSCP_Sensor_Send_SC_Control_Point	Sends the SC Control Point.
RBLE_CSCP_Collector_Enable	Enables the Collector role.
RBLE_CSCP_Collector_Disable	Disables the Collector role.
RBLE_CSCP_Collector_Read_Char	Reads the characteristic value.
RBLE_CSCP_Collector_Write_Char	Writes the characteristic value.
RBLE_CSCP_Collector_Write_SC_Control_Point	Sets the SC Control Point.

3.2.1   RBLE_CSCP_Sensor_Enable

RBLE_STATUS RBLE_CSCP_Sensor_Enable(uint16_t conhdl, uint8_t sec_lvl, uint8_t con_type,
     RBLE_CSCP_SENSOR_PARAM *param, RBLE_CSCPS_EVENT_HANDLER call_back)

This function enables the CSCP Sensor role.
If the measurement result notification and SC Control Point information indication setting has been specified from the Collector, set the indication/notification setting parameter to 0 to configure the connection. If this setting or information has been specified from the Sensor, perform a normal connection in accordance with the indication/notification setting parameter.
The result is reported by using the Sensor role enable completion event RBLE_CSCP_EVENT_SENSOR_ENABLE_COMP.

Parameters:

conhdl	Connection handle		
sec_lvl	Security level		
con_type	RBLE_PRF_CON_DISCOVERY	Configuration connection	
	RBLE_PRF_CON_NORMAL	Normal connection	
param	*cycspd_meas_ntf_en*	RBLE_PRF_STOP_NTFIND	Stop notification/ indication of sensor measurements information.
		RBLE_PRF_START_NTF	Start notification of sensor measurements information.
	sc_cp_ind_en	RBLE_PRF_STOP_NTFIND	Stop notification/ indication of SC Control Point information.
		RBLE_PRF_START_IND	Start indication of SC Control Point information.
	sensor_location	Sensor Location which has been specified from previous connected Collector.	
call_back	Specify the callback function that reports the CSCP event.		

Return:

RBLE_OK	Success
RBLE_ERR	Error occurred in Sensor role enable processing
RBLE_PARAM_ERR	Invalid parameter
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.

3.2.2 RBLE_CSCP_Sensor_Disable

RBLE_STATUS RBLE_CSCP_Sensor_Disable(uint16_t conhdl)	
This function disables the CSCP Sensor role. The result is reported by using the Sensor role disable completion event RBLE_CSCP_EVENT_SENSOR_DISABLE_COMP.	
Parameters:	
conhdl	Connection handle
Return:	
RBLE_OK	Success
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.

3.2.3 RBLE_CSCP_Sensor_Send_Measurements

RBLE_STATUS RBLE_CSCP_Sensor_Send_Measurements (uint16_t conhdl, RBLE_CSCP_TEMP_INFO * measurements_info)			
This function sends the measured value data from the Sensor. The result is reported by using the Sensor role measured value send completion event RBLE_CSCP_EVENT_SENSOR_SEND_TEMP_COMP.			
Parameters:			
conhdl	Connection handle		
measurements_info	*flags*		Flag that defines whether there is a data field in the characteristic value or not
	wheel_revolutions		Cumulative Wheel Revolutions value
	wheel_event_time		Last Wheel Event Time value
	crank_revolutions		Cumulative Crank Revolutions value
	crank_event_time		Last Crank Event Time value
Return:			
RBLE_OK	Success		
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.		

3.2.4   RBLE_CSCP_Sensor_Send_SC_Control_Point

RBLE_STATUS RBLE_CSCP_Sensor_Send_SC_Control_Point (uint16_t conhdl, RBLE_CSCP_SC_CONTROL_POINT_INFO *sc_cp_info)			
This function sends the SC Control Point information from the Sensor. When operation is written to the SC Control Point from the Collector, set RBLE_CSCP_OP_RESPONSE_CODE to the Parameters of *OpCode* and respond to the Collector. Set the operation code from Collector to *request_op_code*, and set the status of requested operation to *response_value*. When *request_op_code* is RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE, operable Sensor Location set by the initial value is sent. The result is reported by using the Sensor role SC Control Point send completion event RBLE_CSCP_EVENT_SENSOR_SEND_SC_CP_COMP.			
Parameters:			
	conhdl	Connection handle	
	* sc_cp_info	*OpCode*	RBLE_CSCP_OP_RESPONSE_CODE	Response code
		cumulative_value	Not use	
		sensor_location	Not use	
		request_op_code	RBLE_CSCP_OP_SET_CUMULATIVE_CODE	Set Cumulative Value
			RBLE_CSCP_OP_START_SC_CODE	Start Sensor Calibration
			RBLE_CSCP_OP_UPDATE_SL_CODE	Update Sensor Location
			RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE	Request Supported Sensor Locations
		response_value	RBLE_CSCP_RES_SUCCESS_CODE	Success
			RBLE_CSCP_RES_NOT_SUPPORTED_CODE	Op Code Not Supported
			RBLE_CSCP_RES_INVALID_PARAM_CODE	Invalid Parameter
			RBLE_CSCP_RES_OP_FAILED_CODE	Operation Failed
Return:			
	RBLE_OK	Success	
	RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.5 RBLE_CSCP_Collector_Enable

RBLE_STATUS RBLE_CSCP_Collector_Enable(uint16_t conhdl, uint8_t con_type,
RBLE_CSCS_CONTENT *cscs, RBLE_DIS_CONTENT *dis,
RBLE_CSCPC_EVENT_HANDLER call_back)

This function enables the CSCP Collector role and starts access to the service exposed by the CSCP Sensor. The result is reported by using the Collector role enable completion event RBLE_CSCP_EVENT_COLLECTOR_ENABLE_COMP.

When starting access to the service exposed by a Sensor to be connected for the first time, set 0 to the parameters of the service to configure the connection and to discover the service for the Sensor. If the handle information about the discovered service is saved and is used when the Sensor is connected normally for a second or subsequent time, detecting the service is skipped, which enables a high-speed access to the service.

While the Collector role is enabled, the service exposed by only one Sensor is accessible. To connect to more than one Sensor at the same time and access the services exposed by each Sensor, repeat enable/disable of the Collector role in order to switch access to them. At that time, perform normal connection by using the connection handle (which was obtained when connecting to each Sensor) and the handle information (which was saved when starting access to the service for the first time) as parameters.

Parameters:

conhdl	Connection handle		
con_type	RBLE_PRF_CON_DISCOVERY	Configuration connection performed when connecting for the first time	
	RBLE_PRF_CON_NORMAL	Normal connection performed when connecting for the second and subsequent times	
*cscs	*shdl*	Cycling speed and cadence service start handle	
	ehdl	Cycling speed and cadence service end handle	
	cycspd_meas_char_hdl	CSC measurement characteristic handle	
	cycspd_meas_val_hdl	CSC measurement characteristic value handle	
	cycspd_meas_cfg_hdl	CSC measurement client characteristic configuration descriptor handle	
	cycspd_meas_prop	CSC measurement characteristic property	
	csc_feature_char_hdl	CSC supported feature characteristic handle	
	csc_feature_val_hdl	CSC supported feature characteristic value handle	
	csc_feature_prop	CSC supported feature characteristic property	
	sensor_loc_char_hdl	Sensor Location characteristic handle	
	sensor_loc_val_hdl	Sensor Location characteristic value handle	
	sensor_loc_prop	Sensor Location characteristic property	
	sc_cp_char_hdl	SC Control Point characteristic handle	
	sc_cp_val_hdl	SC Control Point characteristic value handle	
	sc_cp_cfg_hdl	SC Control Point client characteristic configuration descriptor handle	
	sc_cp_prop	SC Control Point characteristic property	
*dis	*shdl*	Device information service start handle	
	ehdl	Device information service end handle	
	sys_id_char_hdl	System ID characteristic handle	
	sys_id_val_hdl	System ID characteristic value handle	
	sys_id_prop	System ID characteristic property	
	model_nb_char_hdl	Model number characteristic handle	
	model_nb_val_hdl	Model number characteristic value handle	
	model_nb_prop	Model number characteristic property	
	serial_nb_char_hdl	Serial number characteristic handle	

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		serial_nb_val_hdl	Serial number characteristic value handle
		serial_nb_prop	Serial number characteristic property
		fw_rev_char_hdl	Firmware revision characteristic handle
		fw_rev_val_hdl	Firmware revision characteristic value handle
		fw_rev_prop	Firmware revision characteristic property
		hw_rev_char_hdl	Hardware revision characteristic handle
		hw_rev_val_hdl	Hardware revision characteristic value handle
		hw_rev_prop	Hardware revision characteristic property
		sw_rev_char_hdl	Software revision characteristic handle
		sw_rev_val_hdl	Software revision characteristic value handle
		sw_rev_prop	Software revision characteristic property
		manuf_name_char_hdl	Manufacturer name characteristic handle
		manuf_name_val_hdl	Manufacturer name characteristic value handle
		manuf_name_prop	Manufacturer name characteristic property
		ieee_certif_char_hdl	IEEE certification characteristic handle
		ieee_certif_val_hdl	IEEE certification characteristic value handle
		ieee_certif_prop	IEEE certification characteristic property
	call_back	Callback	
Return:			
	RBLE_OK	Success	
	RBLE_ERR	Error occurred in initialization processing	
	RBLE_PARAM_ERR	Invalid parameter	
	RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.6   RBLE_CSCP_Collector_Disable

RBLE_STATUS RBLE_CSCP_Collector_Disable(uint16_t conhdl)		
This function disables the CSCP Collector role and terminates the access to the service exposed by CSCP Sensor. The result is reported by using the Collector role disable completion event RBLE_CSCP_EVENT_COLLECTOR_DISABLE_COMP.		
Parameters:		
conhdl	Connection handle	
Return:		
RBLE_OK	Success	
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.7   RBLE_CSCP_Collector_Read_Char

RBLE_STATUS RBLE_CSCP_Collector_Read_Char (uint16_t conhdl, uint8_t char_code)		
This function reads the characteristic value of the cycling speed and cadence service and the device information service. The result is reported by using the characteristic value read request response event RBLE_CSCP_EVENT_COLLECTOR_READ_CHAR_RESPONSE.		
Parameters:		
conhdl	Connection handle	
char_code	RBLE_CSCPC_RD_CSCS_CM_CFG	Measurement value notification
	RBLE_CSCPC_RD_CSCS_SCCP_CFG	SC Control Point
	RBLE_CSCPC_RD_CSCS_CSC_FEATURE	Supported features of the CSC Sensor
	RBLE_CSCPC_RD_CSCS_SL	Sensor Location
	RBLE_CSCPC_RD_DIS_MANUF	Sensor manufacturer name
	RBLE_CSCPC_RD_DIS_MODEL	Sensor model number
	RBLE_CSCPC_RD_DIS_SERNB	Sensor serial number
	RBLE_CSCPC_RD_DIS_HWREV	Sensor hardware revision
	RBLE_CSCPC_RD_DIS_FWREV	Sensor firmware revision
	RBLE_CSCPC_RD_DIS_SWREV	Sensor software revision
	RBLE_CSCPC_RD_DIS_SYSID	Sensor system ID
	RBLE_CSCPC_RD_DIS_IEEE	Sensor IEEE certification information
Return:		
RBLE_OK	Success	
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.8   RBLE_CSCP_Collector_Write_Char

RBLE_STATUS RBLE_CSCP_Collector_Write_Char(uint16_t conhdl, uint8_t char_code, uint16_t cfg_val)		
This function writes each client characteristic configuration descriptor of the cycling speed and cadence service. The result is reported by using the characteristic value write request response event RBLE_CSCP_EVENT_COLLECTOR_WRITE_CHAR_RESPONSE.		
Parameters:		
conhdl	Connection handle	
char_code	RBLE_CSCPC_CYCSPD_MEAS_CODE	Sensor measurement notification setting
	RBLE_CSCPC_SC_CONTROL_POINT_ CODE	SC Control Point information indication setting
cfg_val	RBLE_PRF_STOP_NTFIND	Stop notification or indication.
	RBLE_PRF_START_NTF	Start notification.
	RBLE_PRF_START_IND	Start indication.
Return:		
RBLE_OK	Success	
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.	

3.2.9 RBLE_CSCP_Collector_Write_SC_Control_Point

RBLE_STATUS RBLE_CSCP_Collector_Write_SC_Control_Point (uint16_t conhdl,
RBLE_CSCP_SC_CONTROL_POINT_INFO * sc_cp_info)

This function writes SC Control Point characteristic of the cycling speed and cadence service.

When specify RBLE_CSCP_OP_SET_CUMULATIVE_CODE to *OpCode*, set the Cumulative Wheel Revolutions value to *cumulative_value*.

When specify RBLE_CSCP_OP_UPDATE_SL_CODE to *OpCode*, set the Sensor Location value to *sensor_location*.

request_op_code and *response_value* are not used in this function.

The result is reported by using the characteristic value write request response event RBLE_CSCP_EVENT_COLLECTOR_WRITE_CHAR_RESPONSE.

Parameters:

	conhdl	Connection handle		
* sc_cp_info	*OpCode*	RBLE_CSCP_OP_SET_CUMULATIVE_CODE	Set Cumulative Value	
		RBLE_CSCP_OP_START_SC_CODE	Start Sensor Calibration	
		RBLE_CSCP_OP_UPDATE_SL_CODE	Update Sensor Location	
		RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE	Request Supported Sensor Locations	
	cumulative_value	Cumulative Wheel Revolutions value		
	sensor_location	RBLE_CSCPC_SENSOR_OTHER	Other	
		RBLE_CSCPC_SENSOR_TOP_OF_SHOE	Top of shoe	
		RBLE_CSCPC_SENSOR_IN_SHOE	In shoe	
		RBLE_CSCPC_SENSOR_HIP	Hip	
		RBLE_CSCPC_SENSOR_FRONT_WHEEL	Front Wheel	
		RBLE_CSCPC_SENSOR_LEFT_CRANK	Left Crank	
		RBLE_CSCPC_SENSOR_RIGHT_CRANK	Right Crank	
		RBLE_CSCPC_SENSOR_LEFT_PEDAL	Left Pedal	
		RBLE_CSCPC_SENSOR_RIGHT_PEDAL	Right Pedal	
		RBLE_CSCPC_SENSOR_FRONT_HUB	Front Hub	
		RBLE_CSCPC_SENSOR_REAR_DROPOUT	Rear Dropout	
		RBLE_CSCPC_SENSOR_CHAINSTAY	Chainstay	
		RBLE_CSCPC_SENSOR_REAR_WHEEL	Rear Wheel	
		RBLE_CSCPC_SENSOR_REAR_HUB	Rear Hub	
		RBLE_CSCPC_SENSOR_CHEST	Chest	
	request_op_code	Not use		
	response_value	Not use		

Return:

RBLE_OK	Success
RBLE_STATUS_ERROR	Not executable because the rBLE mode is other than RBLE_MODE_ACTIVE.

3.3 Events

The following table shows the events defined for the CSCP of rBLE and the following sections describe the events in detail.

Table 3-2 Events Defined for the CSCP

RBLE_CSCP_EVENT_SENSOR_ENABLE_COMP	Sensor role enable completion event
RBLE_CSCP_EVENT_SENSOR_DISABLE_COMP	Sensor role disable completion event
RBLE_CSCP_EVENT_SENSOR_ERROR_IND	Sensor role error indication event
RBLE_CSCP_EVENT_SENSOR_SEND_MEASUREMENTS_COMP	Sensor measurements send completion event
RBLE_CSCP_EVENT_SENSOR_SEND_SC_CP_COMP	SC Control Point send completion event
RBLE_CSCP_EVENT_SENSOR_CHG_SC_CP_IND	SC Control Point change indication event
RBLE_CSCP_EVENT_SENSOR_CFG_INDNTF_IND	Characteristic configuration change indication event
RBLE_CSCP_EVENT_SENSOR_COMMAND_DISALLOWED_IND	Sensor role command disallowed indication event
RBLE_CSCP_EVENT_COLLECTOR_ENABLE_COMP	Collector role enable completion event
RBLE_CSCP_EVENT_COLLECTOR_DISABLE_COMP	Collector role disable completion event
RBLE_CSCP_EVENT_COLLECTOR_ERROR_IND	Collector role error indication event
RBLE_CSCP_EVENT_COLLECTOR_MEASUREMENTS_NTF	Measured value notification event
RBLE_CSCP_EVENT_COLLECTOR_SC_CP_IND	SC Control Point indication event
RBLE_CSCP_EVENT_COLLECTOR_READ_CHAR_RESPONSE	Characteristic value read request response event
RBLE_CSCP_EVENT_COLLECTOR_WRITE_CHAR_RESPONSE	Characteristic value write request response event
RBLE_CSCP_EVENT_COLLECTOR_COMMAND_DISALLOWED_IND	Collector role command disallowed indication event

3.3.1　RBLE_CSCP_EVENT_SENSOR_ENABLE_COMP

RBLE_CSCP_EVENT_SENSOR_ENABLE_COMP		
This event reports the result of enabling the Sensor role (RBLE_CSCP_Sensor_Enable).		
Parameters:		
	status	Result of enabling the Sensor role (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)
	conhdl	Connection handle

3.3.2　RBLE_CSCP_EVENT_SENSOR_DISABLE_COMP

RBLE_CSCP_EVENT_SENSOR_DISABLE_COMP				
This event reports the result of disabling the Sensor role (RBLE_CSCP_Sensor_Disable).				
Parameters:				
	conhdl	Connection handle		
	sensor_info	*cycspd_meas_ntf_en*	RBLE_PRF_STOP_NTFIND	Stop notification of the measurement result.
			RBLE_PRF_START_NTF	Start notification of the measurement result.
		sc_cp_ind_en	RBLE_PRF_STOP_NTFIND	Stop indication of SC Control Point.
			RBLE_PRF_START_IND	Start indication of SC Control Point.
		sensor_location	Sensor Location set from Collector	

3.3.3　RBLE_CSCP_EVENT_SENSOR_ERROR_IND

RBLE_CSCP_EVENT_SENSOR_ERROR_IND		
This event indicates an error code unique to the Sensor role.		
Parameters:		
	conhdl	Connection handle
	status	Error code (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)

3.3.4　RBLE_CSCP_EVENT_SENSOR_SEND_MEASUREMENTS_COMP

RBLE_CSCP_EVENT_SENSOR_SEND_MEASUREMENTS_COMP		
This event reports completion of sending the measured value (RBLE_CSCP_Sensor_Send_Measurements).		
Parameters:		
	conhdl	Connection handle
	status	Measured value send completion result (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)

3.3.5 RBLE_CSCP_EVENT_SENSOR_SEND_SC_CP_COMP

RBLE_CSCP_EVENT_SENSOR_SEND_SC_CP_COMP	
This event reports completion of sending the SC Control Point (RBLE_CSCP_Sensor_Send_SC_Control_Point).	
Parameters:	
conhdl	Connection handle
status	Measurement period indication completion result (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)

3.3.6 RBLE_CSCP_EVENT_SENSOR_CHG_SC_CP_IND

RBLE_CSCP_EVENT_SENSOR_CHG_SC_CP_IND			
This event indicates that the value of the SC Control Point of the cycling speed and cadence service has been set by the Collector. When *OpCode* is RBLE_CSCP_OP_SET_CUMULATIVE_CODE, *cumulative_value* is available. When *OpCode* is RBLE_CSCP_OP_UPDATE_SL_CODE, *sensor_location* is available.			
Parameters:			
conhdl	Connection handle		
sc_cp_info	*OpCode*	RBLE_CSCP_OP_SET_CUMULATIVE_CODE	Set Cumulative Value
		RBLE_CSCP_OP_START_SC_CODE	Start Sensor Calibration
		RBLE_CSCP_OP_UPDATE_SL_CODE	Update Sensor Location
		RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE	Request Supported Sensor Locations
	cumulative_value	Cumulative Wheel Revolutions value	
	sensor_location	RBLE_CSCPC_SENSOR_OTHER	Other
		RBLE_CSCPC_SENSOR_TOP_OF_SHOE	Top of shoe
		RBLE_CSCPC_SENSOR_IN_SHOE	In shoe
		RBLE_CSCPC_SENSOR_HIP	Hip
		RBLE_CSCPC_SENSOR_FRONT_WHEEL	Front Wheel
		RBLE_CSCPC_SENSOR_LEFT_CRANK	Left Crank
		RBLE_CSCPC_SENSOR_RIGHT_CRANK	Right Crank
		RBLE_CSCPC_SENSOR_LEFT_PEDAL	Left Pedal
		RBLE_CSCPC_SENSOR_RIGHT_PEDAL	Right Pedal
		RBLE_CSCPC_SENSOR_FRONT_HUB	Front Hub
		RBLE_CSCPC_SENSOR_REAR_DROPOUT	Rear Dropout
		RBLE_CSCPC_SENSOR_CHAINSTAY	Chainstay
		RBLE_CSCPC_SENSOR_REAR_WHEEL	Rear Wheel
		RBLE_CSCPC_SENSOR_REAR_HUB	Rear Hub
		RBLE_CSCPC_SENSOR_CHEST	Chest
	request_op_code	Not use	
	response_value	Not use	

3.3.7 RBLE_CSCP_EVENT_SENSOR_CFG_INDNTF_IND

RBLE_CSCP_EVENT_SENSOR_CFG_INDNTF_IND		
This event indicates that the value of the client characteristic configuration descriptor of the cycling speed and cadence service has been set by the Collector.		
Parameters:		
conhdl	Connection handle	
char_code	RBLE_CSCPC_CYCSPD_MEAS_CODE	Sensor measurement notification setting
	RBLE_CSCPC_SC_CONTROL_POINT_CODE	SC Control Point information indication setting
cfg_val	RBLE_PRF_STOP_NTFIND	Stop notification or indication.
	RBLE_PRF_START_NTF	Start notification.
	RBLE_PRF_START_IND	Start indication.

3.3.8 RBLE_CSCP_EVENT_SENSOR_COMMAND_DISALLOWED_IND

RBLE_CSCP_EVENT_SENSOR_COMMAND_DISALLOWED_IND		
This event indicates the error that occurs when a command executed by the Sensor role cannot be accepted.		
Parameters:		
status	Result of command execution (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)	
opcode	RBLE_CMD_CSCP_SENSOR_ENABLE	Sensor role enable command
	RBLE_CMD_CSCP_SENSOR_DISABLE	Sensor role disable command
	RBLE_CMD_CSCP_SENSOR_SEND_MEASUREMENTS	Sensor measured data send command
	RBLE_CMD_CSCP_SENSOR_SEND_SC_CONTROL_POINT	SC Control point send command

3.3.9 RBLE_CSCP_EVENT_COLLECTOR_ENABLE_COMP

RBLE_CSCP_EVENT_COLLECTOR_ENABLE_COMP			
This event reports the result of enabling the Collector role (RBLE_CSCP_Collector_Enable). Save the obtained handle information about the discovered service, to enable a high-speed access to the service without service detection when restarting access to the service.			
Parameters:			
	status	Result of enabling the Collector role (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)	
	conhdl	Connection handle	
	cscs	*shdl*	Cycling speed and cadence service start handle
		ehdl	Cycling speed and cadence service end handle
		cycspd_meas_char_hdl	CSC measurement characteristic handle
		cycspd_meas_val_hdl	CSC measurement characteristic value handle
		cycspd_meas_cfg_hdl	CSC measurement client characteristic configuration descriptor handle
		cycspd_meas_prop	CSC measurement characteristic property
		csc_feature_char_hdl	CSC supported feature characteristic handle
		csc_feature_val_hdl	CSC supported feature characteristic value handle
		csc_feature_prop	CSC supported feature characteristic property
		sensor_loc_char_hdl	Sensor Location characteristic handle
		sensor_loc_val_hdl	Sensor Location characteristic value handle
		sensor_loc_prop	Sensor Location characteristic property
		sc_cp_char_hdl	SC Control Point characteristic handle
		sc_cp_val_hdl	SC Control Point characteristic value handle
		sc_cp_cfg_hdl	SC Control Point client characteristic configuration descriptor handle
		sc_cp_prop	SC Control Point characteristic property
	dis	*shdl*	Device information service start handle
		ehdl	Device information service end handle
		sys_id_char_hdl	System ID characteristic handle
		sys_id_val_hdl	System ID characteristic value handle
		sys_id_prop	System ID characteristic property
		model_nb_char_hdl	Model number characteristic handle
		model_nb_val_hdl	Model number characteristic value handle
		model_nb_prop	Model number characteristic property
		serial_nb_char_hdl	Serial number characteristic handle
		serial_nb_val_hdl	Serial number characteristic value handle
		serial_nb_prop	Serial number characteristic property
		fw_rev_nb_char_hdl	Firmware revision characteristic handle
		fw_rev_nb_val_hdl	Firmware revision characteristic value handle
		fw_rev_nb_prop	Firmware revision characteristic property
		hw_rev_nb_char_hdl	Hardware revision characteristic handle
		hw_rev_nb_val_hdl	Hardware revision characteristic value handle
		hw_rev_nb_prop	Hardware revision characteristic property
		sw_rev_nb_char_hdl	Software revision characteristic handle
		sw_rev_nb_val_hdl	Software revision characteristic value handle
		sw_rev_nb_prop	Software revision characteristic property

		manuf_name_char_hdl	Manufacturer name characteristic handle
		manuf_name_val_hdl	Manufacturer name characteristic value handle
		manuf_name_prop	Manufacturer name characteristic property
		ieee_certif_char_hdl	IEEE certification characteristic handle
		ieee_certif_val_hdl	IEEE certification characteristic value handle
		ieee_certif_prop	IEEE certification characteristic property

3.3.10   RBLE_CSCP_EVENT_COLLECTOR_DISABLE_COMP

RBLE_CSCP_EVENT_COLLECTOR_DISABLE_COMP	
This event reports the result of disabling the Collector role (RBLE_CSCP_Collector_Disable).	
Parameters:	
status	Result of disabling the Collector role (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)
conhdl	Connection handle

3.3.11   RBLE_CSCP_EVENT_COLLECTOR_ERROR_IND

RBLE_CSCP_EVENT_COLLECTOR_ERROR_IND	
This event indicates an error code unique to the CSCP Collector role.	
Parameters:	
status	Error code (See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)
conhdl	Connection handle

3.3.12   RBLE_CSCP_EVENT_COLLECTOR_MEASUREMENTS_NTF

RBLE_CSCP_EVENT_COLLECTOR_MEASUREMENTS_NTF		
This event indicates the measured value sent from the Sensor.		
Parameters:		
conhdl	Connection handle	
measure_info	*flags*	Flag that defines whether there is a data field in the characteristic value or not
	wheel_revolutions	Cumulative Wheel Revolutions value
	wheel_event_time	Last Wheel Event Time value
	crank_revolutions	Cumulative Crank Revolutions value
	crank_event_time	Last Crank Event Time value

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3.3.13   RBLE_CSCP_EVENT_COLLECTOR_SC_CP_IND

RBLE_CSCP_EVENT_COLLECTOR_SC_CP_IND			
This event indicates response of SC Control Point procedure sent from the Sensor. Confirm response_value and request_op_code whether operation has been sent by function of Sets the SC Control Point (RBLE_CSCP_Collector_Write_SC_Control_Point). When *request_op_code* is RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE, parameters of *location_num* and *response_param* are available. The *location_num* elements of the *response_param* are valid.			
Parameters:			
	conhdl	Connection handle		
	sc_cp_info	*OpCode*	RBLE_CSCP_OP_RESPONSE_CODE	Response code
		cumulative_value	Not use	
		sensor_location	Not use	
		request_op_code	RBLE_CSCP_OP_SET_CUMULATIVE_CODE	Set Cumulative Value
			RBLE_CSCP_OP_START_SC_CODE	Start Sensor Calibration
			RBLE_CSCP_OP_UPDATE_SL_CODE	Update Sensor Location
			RBLE_CSCP_OP_REQ_SUPPORTED_SL_CODE	Request Supported Sensor Locations
		response_value	RBLE_CSCP_RES_SUCCESS_CODE	Success
			RBLE_CSCP_RES_NOT_SUPPORTED_CODE	Op Code Not Supported
			RBLE_CSCP_RES_INVALID_PARAM_CODE	Invalid Parameter
			RBLE_CSCP_RES_OP_FAILED_CODE	Operation Failed
	location_num	Valid number of Sensor Location		
	response_param[RBLE_CSCP_SENSORE_LOCATION_MAX]	RBLE_CSCPC_SENSOR_OTHER	Other	
		RBLE_CSCPC_SENSOR_TOP_OF_SHOE	Top of shoe	
		RBLE_CSCPC_SENSOR_IN_SHOE	In shoe	
		RBLE_CSCPC_SENSOR_HIP	Hip	
		RBLE_CSCPC_SENSOR_FRONT_WHEEL	Front Wheel	
		RBLE_CSCPC_SENSOR_LEFT_CRANK	Left Crank	
		RBLE_CSCPC_SENSOR_RIGHT_CRANK	Right Crank	
		RBLE_CSCPC_SENSOR_LEFT_PEDAL	Left Pedal	
		RBLE_CSCPC_SENSOR_RIGHT_PEDAL	Right Pedal	
		RBLE_CSCPC_SENSOR_FRONT_HUB	Front Hub	
		RBLE_CSCPC_SENSOR_REAR_DROPOUT	Rear Dropout	
		RBLE_CSCPC_SENSOR_CHAINSTAY	Chainstay	
		RBLE_CSCPC_SENSOR_REAR_WHEEL	Rear Wheel	
		RBLE_CSCPC_SENSOR_REAR_HUB	Rear Hub	
		RBLE_CSCPC_SENSOR_CHEST	Chest	

3.3.14 RBLE_CSCP_EVENT_COLLECTOR_READ_CHAR_RESPONSE

RBLE_CSCP_EVENT_COLLECTOR_READ_CHAR_RESPONSE			
This event reports the response to the characteristic value read request (RBLE_CSCP_Collector_Read_Char). Read out the read data in accordance with the contents of the request.			
Parameters:			
	conhdl	Connection handle	
	att_code	0x00	Characteristic value successfully acquired
		Other than 0x00	Error occurred when acquiring characteristic value
	data	*each_len*	Length of each result
		len	Data length
		data[RBLE_ATTM_MAX_VALUE]	Read characteristic data

3.3.15 RBLE_CSCP_EVENT_COLLECTOR_WRITE_CHAR_RESPONSE

RBLE_CSCP_EVENT_COLLECTOR_WRITE_CHAR_RESPONSE		
This event reports the response to the characteristic value write request (RBLE_CSCP_Collector_Write_Char).		
Parameters:		
	conhdl	Connection handle
	att_code	0x00	Characteristic value successfully written
		Other than 0x00	Error occurred when writing characteristic value

3.3.16 RBLE_CSCP_EVENT_COLLECTOR_COMMAND_DISALLOWED_IND

| RBLE_CSCP_EVENT_COLLECTOR_COMMAND_DISALLOWED_IND		
This event indicates the error that occurs when a command executed by the Collector role cannot be accepted.		
Parameters:		
	status	Result of command execution
		(See *2.2* and *Bluetooth Low Energy Protocol Stack API Reference Manual: Basics, 3.2, Declaration of enumerated type for rBLE status.*)
	opcode	RBLE_CMD_CSCP_COLLECTOR_ENABLE	Collector role enable command
		RBLE_CMD_CSCP_COLLECTOR_DISABLE	Collector role disable command
		RBLE_CMD_CSCP_COLLECTOR_READ_CHAR	Characteristic read command
		RBLE_CMD_CSCP_COLLECTOR_WRITE_CHAR	Characteristic write command
		RBLE_CMD_CSCP_COLLECTOR_WRITE_CONTROL_POINT	Write SC Control Point command

3.4 Message Sequence Chart
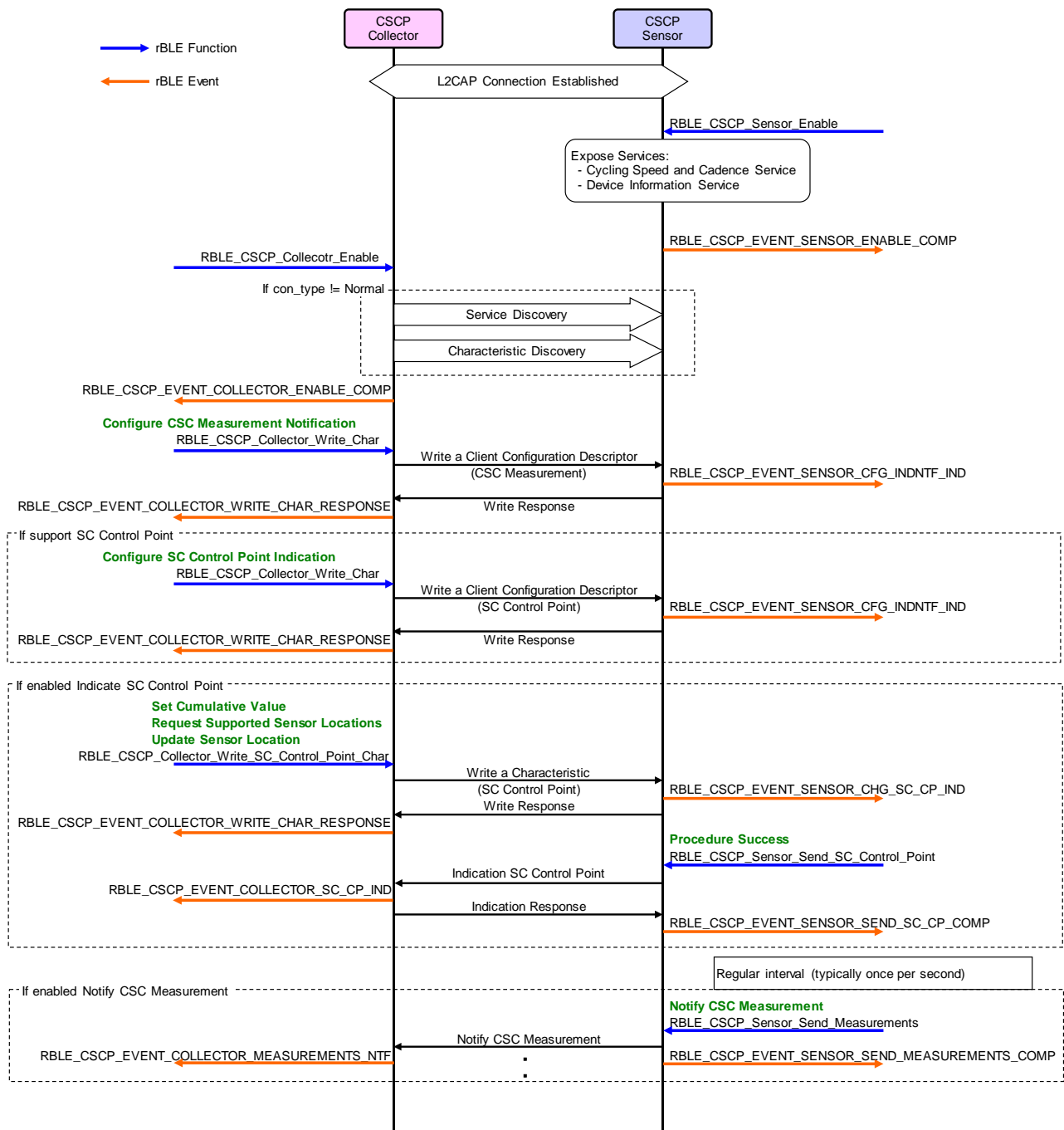
図 3-1 example of use case realization of CSCP by using rBLE API

4.   Notes

Appendix A How to Read Definition Tables

This section shows how to read the tables that describes the rBLE API functions and events shown in this document.

A.1   How to Read Function Definition Tables

The following contents are included in the function definition tables:

The Parameters area describes the parameters specified for the function.
The italicized character strings on the left are the parameters of the function.
The meaning of each parameter is described on the far right following the variables.

The italicized character string(s) next to each parameter indicate the member(s) of the parameter (structure).

The values that can be specified for the parameter might be described between the parameter name and its description.

The function definition is shown at the top of the table in the row with the light green background. This area shows the function prototype.			
The operation of the function and the event reported after executing the function are described in this area.			
Parameters:			
Parameter 1	Description of parameter 1		
Parameter 2	*Member 1*	Value 1 that can be specified for member 1	Description of value 1 that can be specified for member 1
		Value 1 that can be specified for member 2	Description of value 1 that can be specified for member 2
	Member 2	Description of member 2	
Return:			
Value 1 that might be returned	Description of value 1 that might be returned		
Value 2 that might be returned	Description of value 2 that might be returned		

The Return area describes the values returned for the function.
The leftmost row shows the value that might be returned, and the next row describes the return value.

A.2   How to Read Event Definition Tables

The following contents are included in the event definition tables:

The Parameters area describes the parameters specified for the event.
The italicized character strings on the left show the parameters of the event parameter structure. The meaning of each parameter is described on the far right.

The italicized character string(s) next to each parameter indicate the member(s) of the parameter (structure).

The event definition is shown at the top of the table in the row with the orange background. This area shows the event type.			
The information reported by the event is described in this area.			
Parameters:			
Parameter 1	Description of parameter 1		
Parameter 2	*Member 1*	Description of member 1	
	Member 2	Description of member 2	
	Member 3	Description of member 3	
Parameter 3	Value 1 that can be specified for parameter 3	Description of value 1 that can be specified for parameter 3	
	Value 2 that can be specified for parameter 3	Description of value 2 that can be specified for parameter 3	

The values that can be specified for the parameter might be shown between the parameter name and its description.

Appendix B Referenced Documents

1. Bluetooth Core Specification v4.0, Bluetooth SIG
2. Find Me Profile Specification v1.0, Bluetooth SIG
3. Immediate Alert Service Specification v1.0, Bluetooth SIG
4. Proximity Profile Specification v1.0, Bluetooth SIG
5. Link Loss Service Specification v1.0, Bluetooth SIG
6. Tx Power Service Specification v1.0, Bluetooth SIG
7. Health Thermometer Profile Specification v1.0, Bluetooth SIG
8. Health Thermometer Service Specification v1.0, Bluetooth SIG
9. Device Information Service Specification v1.1, Bluetooth SIG
10. Blood Pressure Profile Specification v1.0, Bluetooth SIG
11. Blood Pressure Service Specification v1.0, Bluetooth SIG
12. HID over GATT Profile Specification v1.0, Bluetooth SIG
13. HID Service Specification v1.0, Bluetooth SIG
14. Battery Service Specification v1.0, Bluetooth SIG
15. Scan Parameters Profile Specification v1.0, Bluetooth SIG
16. Scan Parameters Service Specification v1.0, Bluetooth SIG
17. Heart Rate Profile Specification v1.0, Bluetooth SIG
18. Heart Rate Service Specification v1.0, Bluetooth SIG
19. Cycling Speed and Cadence Profile Specification v1.0, Bluetooth SIG
20. Cycling Speed and Cadence Service Specification v1.0, Bluetooth SIG
21. Cycling Power Profile Specification v0.9, Bluetooth SIG
22. Cycling Power Service Specification v0.9, Bluetooth SIG
23. Glucose Profile Specification v1.0, Bluetooth SIG
24. Glucose Service Specification v1.0, Bluetooth SIG
25. Bluetooth SIG Assigned Numbers https://www.bluetooth.org/Technical/AssignedNumbers/home.htm
26. Services & Characteristics UUID http://developer.bluetooth.org/gatt/Pages/default.aspx
27. Personal Health Devices Transcoding White Paper v1.2, Bluetooth SIG

Appendix C Terminology

Term	Description
Service	A service is provided from a GATT server to a GATT client. The GATT server exposes some characteristics as the interface. The service prescribes how to access the exposed characteristics.
Profile	A profile enables implementation of a use case by using one or more services. The services used are defined in the specifications of each profile.
Characteristic	A characteristic is a value used to identify services. The characteristics to be exposed and their formats are defined by each service.
Role	Each device takes the role prescribed by the profile or service in order to implement the specified use case.
Client Characteristic Configuration Descriptor	A descriptor is used to control notifications or indications of characteristic values that include the client characteristic configuration descriptor sent from the GATT server.
Server Characteristic Configuration Descriptor	A descriptor is used to control broadcast of characteristic values that include the server characteristic configuration descriptor sent from the GATT server.
Connection Handle	The handle determined by the controller stack and is used to identify connection with a remote device. The valid handle range is between 0x0000 and 0x0EFF.

<table>
<tr><td rowspan="2">REVISION HISTORY</td><td>Bluetooth Low Energy Protocol Stack API Reference Manual:</td></tr>
<tr><td>CSCP</td></tr>
</table>

Rev.	Date	Description		
		Page	**Summary**	
0.11	Apr 5, 2013	---	Provisional Edition issued	
0.12	Apr 12, 2013	---	Bookmark is added.	
1.00	Nov 29, 2013	---	First Edition issued	
		30	3.4.Message Sequence Chart is added.	
1.01	Sep 19, 2014	2	The common definitions of profile are added.	
		5	Definitions of client configuration characteristic value and connection type are deleted.	
		---	Parameter description is changed to use the common definitions of profile.	
1.02	Apr 17, 2014	2	The service definitions are updated.	

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