CSR Synergy Bluetooth 18.2.0

HCRP – Hardcopy Cable Replacement Profile Server

API Description

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1 Introduction

1.1 Introduction and Scope

This document describes the message interface provided by the Hardcopy Cable Replacement Profile Server (HCRP Server). HCRP Server conforms to the server side of the Hardcopy Cable Replacement Feature, ref. [HCRP].

1.2 Assumptions

The following assumptions and preconditions are made in the following:

- There is a secure and reliable transport between the profile part, i.e. HCRP Server and the application
- The HCRP Server shall only handle one request at a time
- The client only authenticates HCRP Server doing a connect session

2 Description

2.1 Introduction

The scenario covered by this profile is the following:

- Usage of a Bluetooth® device e.g. a PC that supports HCRP client to send one or more files (images, documents etc.) to a Bluetooth® enabled printer supporting the HCRP server

The Hardcopy Cable Replacement Profile server (HCRP) must be activated by the application. When it is activated it provides the application with the ability to receive files from a remote Bluetooth® device, e.g. a PC, equipped with the Hardcopy Cable Replacement Profile compatible Bluetooth function.

The HCRP Server provides Service Discovery handling.

2.2 Reference Models

The HCRP Server interfaces to the Security Controller (SC), and to the Connection Manager (CM). It is the responsibility of the application to authenticate connecting clients using the SC.
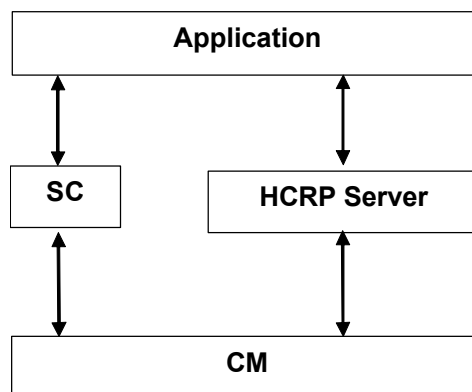
Figure 1: Standard reference model

Apart from the standard reference model where a single application interfaces to the HCRP, an alternative setup exists, where two applications interface to the HCRP. One application, known as the *control application*, takes care of authentication, connections, etc, whereas the other application, known as the *data application* handles the HCRP data.
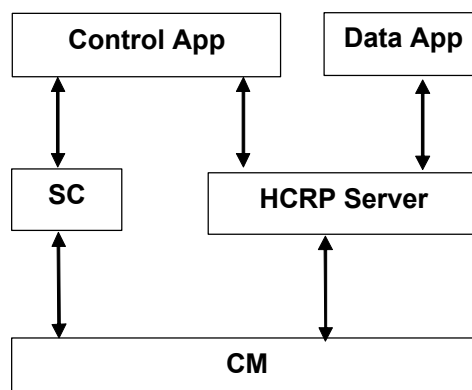
Figure 2: Alternative reference model

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2.3 Sequence Overview

HCRP Server starts up being in an IDLE state. When the application activates HCRP Server, the server enters an ACTIVATE state and is ready to handle incoming requests. The server remains in this state until deactivated by application. When deactivated it re-enters an IDLE state.
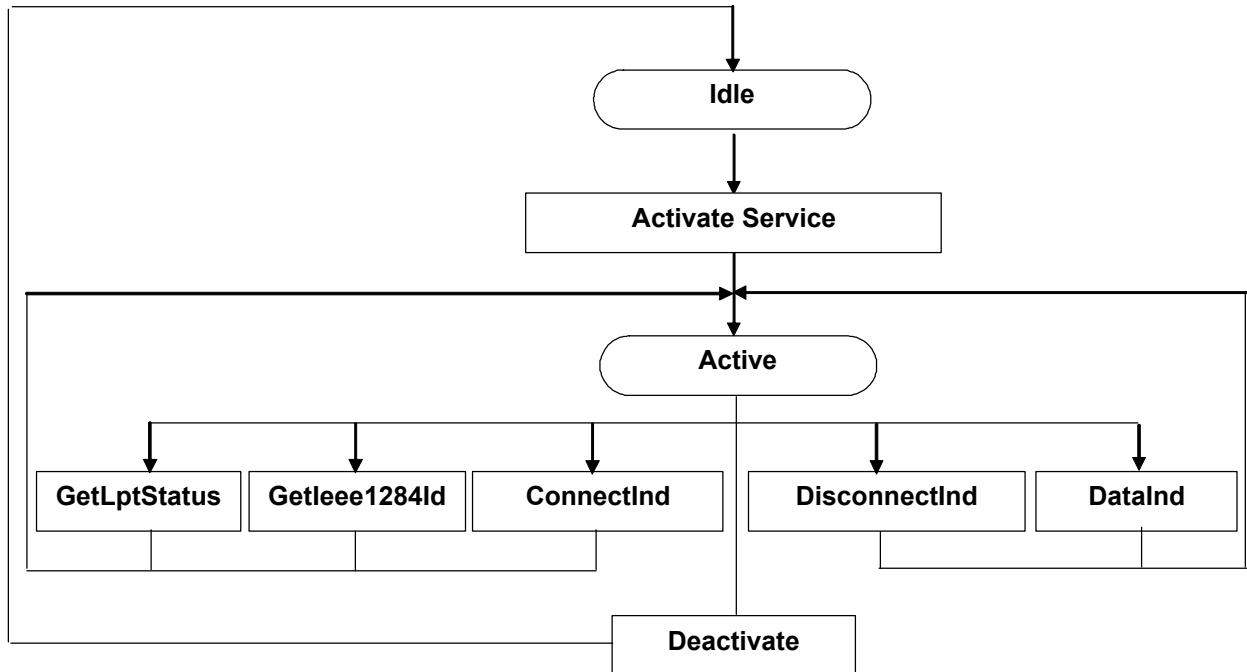
Figure 3: HCRP Server state diagram

3 Interface Description

3.1 Activation

Sending a CSR_BT_HCRP_ACTIVATE_REQ activates HCRP Server. HCRP Server then registers a Service Record in the Service Discovery Server and makes it connectable. HCRP Server is now ready to handle incoming requests.
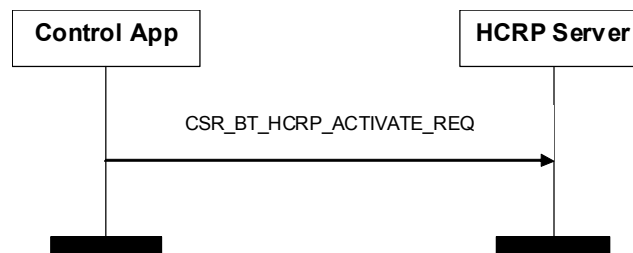
Figure 4: Activation

Please note that whether or not the Bluetooth device will be discoverable, i.e. can be found by other Bluetooth devices, it must be controlled by the application. For more information, please refer to [CM]. After initialization of CSR Synergy Bluetooth the Bluetooth® device is set up to be discoverable.

3.2 Registering a Data Application

If the alternative two-application model is to be utilized, a second application needs to be registered. This registration can take place from any state and takes effect immediately. The sequence is as follows:
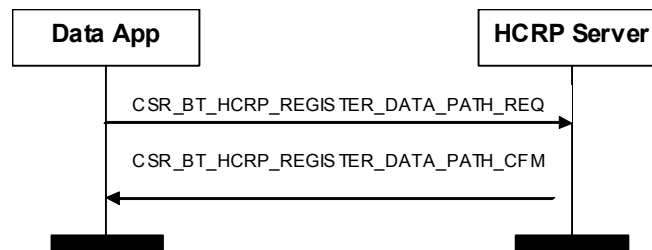

Note that this setup is optional – if not data application is registered, the control application will receive all messages.

3.3 Get Printer Status

When the HCRP L2CAP control connection has been made the get printer status function is used for retrieving the IEEE 1284 status bits. These bits are compatible with the status register of a standard PC parallel port.

Bits	Field	Description
7 .. 6	Reserved	Reserved for future use – device shall return these bits set to zero.
5	Paper Empty	1 = Paper Empty, 0 = Paper Not Empty
4	Select	1 = Selected, 0 = Not Selected
3	Not Error	1 = No Error, 0 = Error
2 .. 0	Reserved	Reserved for future use – device shall return these bits set to zero.

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When the client is making a get printer status request against the server, the application receives a CSR_BT_HCRP_GET_LPT_STATUS_IND message. The application must respond with CSR_BT_HCRP_GET_LPT_STATUS_RES with the appropriate printer status bits.
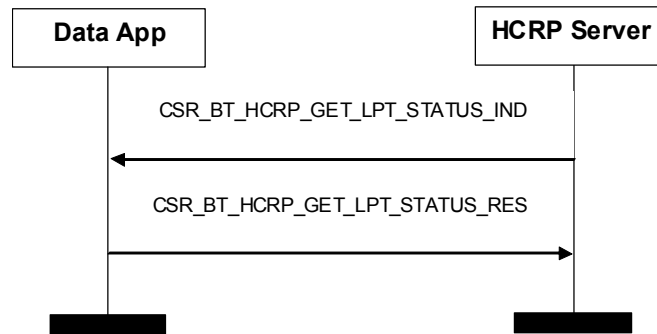
Figure 4: Get Printer Status

3.4   Get IEEE 1284 Id String

When the HCRP L2CAP control connection has been made the get IEEE 1284 Id function is used for retrieving the IEEE 1284 Id string from the printer.

When the HCRP client is making a get IEEE 1284 Id string request against the server, the application receives a CSR_BT_HCRP_GET_IEEE_1284_IND message. The application must respond with a CSR_BT_HCRP_GET _IEEE_1284_RES message with the IEEE 1284 Id string value.
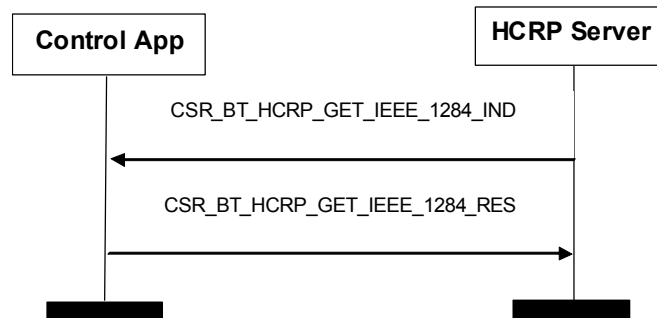
Figure 5: Get IEEE 1284 Id String

3.5   Connection Indication

When both the HCRP L2CAP control and data connections have been made from the client the data connection indication is sent to the application. This function is used for indicating to the application that a reliable connection has been made from the client and the server can perform any tasks that are required prior to a print job being submitted by the client.

If the two-application setup is used, a status indication with the *connect* flag set to true is sent to the data application. Note that this message is sent only if a data application has been registered.
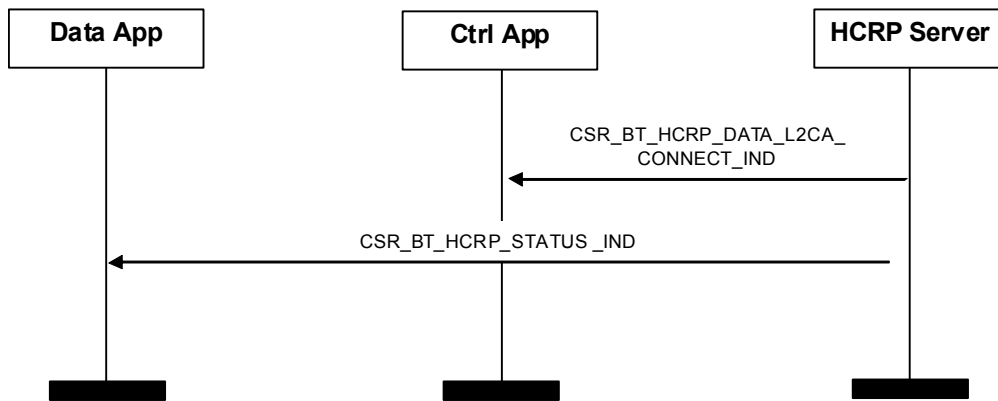
Figure 6: Connection indication

3.6 Disconnection Indication

When both the HCRP L2CAP control and data connections have been closed from the client the data disconnection indication is sent to the application. This function is used for indicating to the application that the connection from the client has now been closed and the server can perform any tasks that are required after a print job has been received or the print job has been cancelled.
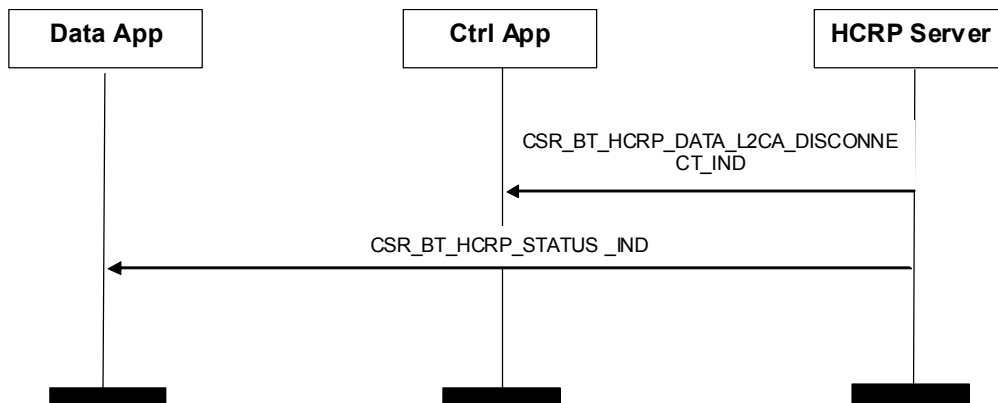
Figure 7: Disconnect indication

Analogues to the connect indication, a status indication with the *connect* flag set to false is sent to the data application if registered.

3.7 Data Indication

When the HCRP client begins sending raw printer data to the server it uses the HCRP L2CAP data connection. For each file that is printed there will be multiple packets transmitted from the client to the server. Each packet received by the HCRP server will result in a CSR_BT_HCRP_DATA_L2CA_DATA_IND message being sent to the application. This will be accompanied with the raw printer data that the application will handle in the appropriate manner.
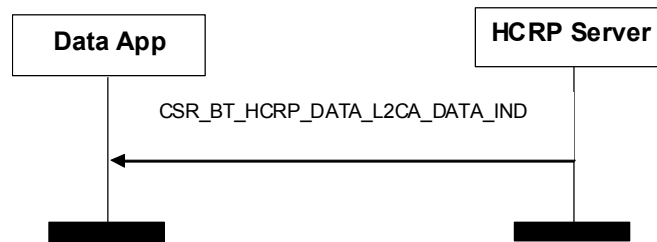
Figure 8: Send Document handling

3.8 Deactivation

Sending a CSR_BT_HCRP_DEACTIVATION_REQ message deactivates the HCRP Server.

Any transaction in progress will be terminated immediately when this message is received by the HCRP server.
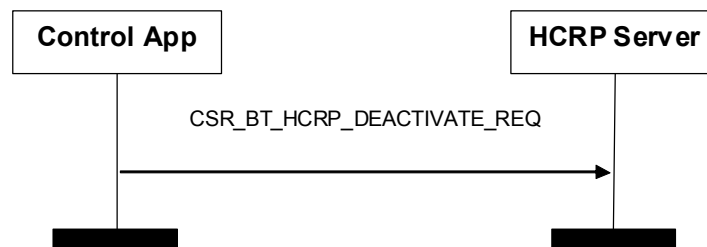
Figure 9: Deactivation request handling

Provided that the service discovery server cannot register the service record for BPPS, or provided that CSR Synergy Bluetooth does not allow any more simultaneous RFCOMM connections, the application receives a CSR_BT_BPPS_DEACTIVATE_IND message.

4   Hardcopy Cable Replacement Profile Primitives

This section gives an overview of the primitives and parameters in the interface. Detailed information can be found in the corresponding csr_bt_hcrp_prim.h file.

4.1   List of All Primitives

Primitives:	Reference:
CSR_BT_HCRP_ACTIVATE_REQ	See section 4.2
CSR_BT_HCRP_DEACTIVATE_REQ	See section 4.3
CSR_BT_HCRP_REGISTER_DATA_PATH_REQ	See section 4.4
CSR_BT_HCRP_REGISTER_DATA_PATH_CFM	See section 4.4
CSR_BT_HCRP_STATUS_IND	See section 4.5
CSR_BT_HCRP_GET_LPT_STATUS_IND	See section 4.6
CSR_BT_HCRP_GET_LPT_STATUS_RES	See section 4.6
CSR_BT_HCRP_GET_IEEE_1284_ID_IND	See section 4.7
CSR_BT_HCRP_GET_IEEE_1284_ID_RES	See section 4.7
CSR_BT_HCRP_DATA_L2CA_CONNECT_IND	See section 4.8
CSR_BT_HCRP_DATA_L2CA_DISCONNECT_IND	See section 4.9
CSR_BT_HCRP_DATA_L2CA_DATA_IND	See section 4.10
CSR_BT_HCRP_SECURITY_IN_REQ	See section 4.11
CSR_BT_HCRP_SECURITY_IN_CFM	See section 4.11

Table 1: List of all primitives

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4.2 CSR_BT_HCRP_ACTIVATE

Parameters Primitives	type	appHandle	*ileee1284ld
CSR_BT_HCRP_ACTIVATE_REQ	✓	✓	✓

Table 2: CSR_BT_HCRP_ACTIVATE Primitive

Description

This signal is used for activating the HCRP Server and making it accessible from a remote device. The process includes:

1. Register the HCRP Server service record in the service discovery database.

2. Enabling page scan.

HCRP will remain activated until a CSR_BT_BPPS_DEACTIVATE_REQ is received.

Parameters

type	Signal identity, i.e. CSR_BT_HCRP_ACTIVATE_REQ.
appHandle	The identity of the calling process. It is possible to initiate the procedure by any higher layer process as the response is returned to appHandle.
*ieee1284Id	Appended to the Service Discovery Record before it is registered with the Connection Manager (CM). This value contains the IEEE 1284 printer identification string that describes the particular model of printer. This is a null-terminated utf-8 string limited to the ASCII character set.

4.3 CSR_BT_HCRP_DEACTIVATE

Primitives	type
CSR_BT_HCRP_DEACTIVATE_REQ	✔

Table 3: CSR_BT_HCRP_DEACTIVATE Primitive

Description

This signal deactivates the HCRP Server.

The service will no longer be visible to inquiring devices and the inquiry and page scan may be stopped (depending on the fact if other services are available or not). The HCRP server service is removed from the service discovery database.

Parameters

type   Signal identity, i.e. CSR_BT_HCRP_DEACTIVATE_REQ

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4.4 CSR_BT_HCRP_REGISTER_DATA_PATH

Primitives	type	dataHandle
CSR_BT_HCRP_REGISTER_DATA_PATH_REQ	✓	✓
CSR_BT_HCRP_REGISTER_DATA_PATH_CFM	✓	

Table 4: CSR_BT_HCRP_REGISTER_DATA_PATH Primitives

Description

This signal is used for enabling the two-application setup, which redirects data messages to a data application. When the data application has been registered at the HCRP server, a confirmation signal is sent back to the newly registered application.

Parameters

type   Signal identity, i.e. CSR_BT_HCRP_REGISTER_DATA_PATH_REQ/CFM.

dataHandle   Handle of data application to receive all future data messages.

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4.5 CSR_BT_HCRP_STATUS

Primitives	type	connect
CSR_BT_HCRP_STATUS_IND	✓	✓

<p align="center">Table 5: CSR_BT_HCRP_STATUS Primitive</p>

Description

This message is only sent if a data application has been registered using the CSR_BT_HCRP_REGISTER_DATA_PATH signals.

If a data application has been registered, this signal is sent to the data handler after a connection has established or released. The *connect* field is used for determining whether a connection was established or released.

Parameters

type   Signal identity, i.e. CSR_BT_HCRP_STATUS_IND.

connect   Boolean status of the connection, i.e. TRUE if a connection has been
                                established, FALSE if a connection has been released.

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4.6 CSR_BT_HCRP_GET_LPT_STATUS

Parameters / Primitives	type	pduId	transId	lptStatus
CSR_BT_HCRP_GET_LPT_STATUS_IND	✔	✔	✔	
CSR_BT_HCRP_GET_LPT_STATUS_RES	✔	✔	✔	✔

Table 6: CSR_BT_HCRP_GET_LPT_STATUS Primitives

Description

This signal indicates that the HCRP client is requesting the IEEE LPT status byte from the printer. The application is responsible for constructing the IEEE status byte and then returning it to the client.

Parameters

type	Signal identity, i.e. CSR_BT_HCRP_GET_LPT_STATUS_IND/RES.
pduId	The protocol data unit identifier value for HCRP's CR_GetLPTStatus transaction. Required to be returned by the application during the CSR_BT_HCRP_GET_LPT_STATUS response transaction.
transId	The unique transaction identifier value for this HCRP transaction. Required to be returned by the application during the CSR_BT_HCRP_GET_LPT_STATUS response transaction.
lptStatus	The IEEE 1284 job status bits returned by the application during the CSR_BT_HCRP_GET_LPT_STATUS response transaction. These bits are compatible with the status register of a standard PC parallel port.

4.7 CSR_BT_HCRP_GET_IEEE_1284

Parameters / Primitives	type	pduId	transId	*ieee1284
CSR_BT_HCRP_GET_IEEE_1284_IND	✓	✓	✓	
CSR_BT_HCRP_GET_IEEE_1284_RES	✓	✓	✓	✓

Table 7: CSR_BT_HCRP_GET_IEEE_1284 Primitives

Description

This signal indicates that the HCRP client is requesting the IEEE 1284 identification string from the printer. The application is responsible for constructing the IEEE 1284 identification string and then returning it to the client.

Parameters

type	Signal identity, i.e. CSR_BT_HCRP_GET_IEEE_1284_IND/RES.
pduId	The protocol data unit identifier value for HCRP's CR_Get1284ID transaction. Required to be returned by the application during the CSR_BT_HCRP_GET_IEEE_1284 response transaction.
transId	The unique transaction identifier value for this HCRP transaction. Required to be returned by the application during the CSR_BT_HCRP_GET_IEEE_1284 response transaction.
*ieee1284	The 1284 ID string. This is a null-terminated utf-8 string limited to the ASCII character set.

4.8 CSR_BT_HCRP_DATA_L2CA_CONNECT

Primitives	type	btConnId
CSR_BT_HCRP_DATA_L2CA_CONNECT_IND	✓	✓

Table 8: CSR_BT_HCRP_DATA_L2CA_CONNECT Primitives

Description

This signal indicates that the HCRP client has made a connection to the server in order to begin a print job transaction.

Parameters

type   Signal identity, i.e. CSR_BT_HCRP_DATA_L2CA_CONNECT_IND.

btConnId   Identifier used when moving the connection to another AMP controller, i.e. when calling the `CsrBtAmpmMoveReqSend`-function.

4.9   CSR_BT_HCRP_L2CA_DISCONNECT

Primitives	type	reasonCode	reasonSupplier
CSR_BT_HCRP_L2CA_DISCONNECT_IND	✓	✓	✓

Table 9: CSR_BT_HCRP_L2CA_DISCONNECT Primitives

Description

This signal indicates that the HCRP client is disconnecting from the server after a print job transaction has finished.

Parameters

type   Signal identity, CSR_BT_HCRP_L2CA_DISCONNECT_IND.

reasonCode   The reason code of the operation. Possible values depend on the value of reasonSupplier. If e.g. the reasonSupplier == CSR_BT_SUPPLIER_CM then the possible reason codes can be found in csr_bt_cm_prim.h. All values which are currently not specified in the respective prim.h files are regarded as reserved and the application should consider them as errors.

reasonSupplier   This parameter specifies the supplier of the reason given in reasonCode. Possible values can be found in csr_bt_result.h

4.10   CSR_BT_HCRP_DATA_L2CA_DATA

Parameters Primitives	type	payloadLength	*payload
CSR_BT_HCRP_DATA_L2CA_DATA_IND	✓	✓	✓

Table 10: CSR_BT_HCRP_DATA_L2CA_DATA Primitives

Description

This signal indicates that the HCRP client has transmitted a packet of raw printer data to the server during a print job transaction. Multiple packets will be sent as part of any print job. The HCRP server library manager does no processing on the raw printer data and passes it to the application where it is treated accordingly.

Parameters

type	Signal identity, CSR_BT_HCRP_DATA_L2CA_DATA_IND.
payloadLength	Number of bytes in the payload.
*payload	Pointer to the actual payload (the raw printer data).

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4.11   CSR_BT_HCRP_SECURITY_IN

Primitives	type	appHandle	secLevel	resultCode	resultSupplier
CSR_BT_HCRP_SECURITY_IN_REQ	✔	✔	✔		
CSR_BT_HCRP_SECURITY_IN_CFM	✔			✔	✔

Table 11: CSR_BT_HCRP_SECURITY_IN Primitives

Description

Applications that wish to change the enforcement to a specific profile security level, i.e. authentication, encryption and/or authorisation, can use this API to set up the security level for *new* connections. Note that this API is for the local device only and can be used from within any state.

The *CSR_BT_SECURITY_IN_REQ* signal sets up the security level for new incoming connections. Already established or pending connections are not altered.

Note, that any attempts to set security to a less secure level than the mandatory security level will be rejected. See csr_bt_profiles.h for mandatory security settings. The default settings used by CSR Synergy Bluetooth are set to require authentication and encryption.

Note that if MITM protection is requested and the remote device does not have the required IO capabilities, pairing/bonding will fail and connections to the remote device *cannot* be made. See [SC] for further details.

Parameters

type	Signal identity CSR_BT_HCRP_SECURITY_IN_REQ/CFM.
appHandle	Application handle to which the confirm message is sent.
secLevel	The application must specify one of the following values:

- CSR_BT_SEC_DEFAULT   : Use default security settings
- CSR_BT_SEC_MANDATORY : Use mandatory security settings
- CSR_BT_SEC_SPECIFY   : Specify new security settings

If CSR_BT_SEC_SPECIFY is set the following values can be OR'ed additionally:

- CSR_BT_SEC_AUTHORISATION: Require authorisation
- CSR_BT_SEC_AUTHENTICATION: Require authentication
- CSR_BT_SEC_ SEC_ENCRYPTION: Require encryption (implies authentication)
- CSR_BT_SEC_MITM: Require MITM protection (implies encryption)

resultCode	The result code of the operation. Possible values depend on the value of resultSupplier. If e.g. the resultSupplier == CSR_BT_SUPPLIER_CM then the possible result codes can be found in csr_bt_cm_prim.h. All values which are currently not specified in the respective prim.h file are regarded as reserved and the application should consider them as errors.
resultSupplier	This parameter specifies the supplier of the result given in resultCode. Possible values can be found in csr_bt_result.h

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5   Document References

Document	Reference
Hardcopy Cable Replacement Profile Interoperability Specification 23 September 2002	[HCRP]
CSR Synergy Bluetooth. CM – Connection Manager API Description, doc. no. api-0101-cm	[CM]
CSR Synergy Bluetooth, SC – Security Controller API Description	[SC]

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Terms and Definitions

BlueCore®	Group term for CSR's range of Bluetooth wireless technology chips
Bluetooth®	Set of technologies providing audio and data transfer over short-range radio connections
CSR	Cambridge Silicon Radio
HCRP	Hardcopy Cable Replacement Profile (server)
SDS	Service Discovery Server
SIG	Special Interest Group
PDU	Protocol Data Unit
UniFi™	Group term for CSR's range of chips designed to meet IEEE 802.11 standards

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Document History

Revision	Date	History
1	26 SEP 11	Ready for release 18.2.0

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