Simulator-Specific Extensions v3.1

JRCP extensions specific to the JCOP Simulator

Rev. 1.1 — May 10, 2017 Application note

Document information

Info	Content
Keywords	JCOP Simulator, JCOP Tools, JCOP remote communication protocol
Abstract	This document describes the simulator-specific extensions of JCOP Remote Communication Protocol (JCRP)

Revision history

Rev	Date	Description
1.0	Mar 08, 2017	First Revision
1.1	Apr 11, 2017	v3.1: Clarification of interface handling in JCOP Simulator v3.1: Clarifications, extension to the Timing Information Request v3.1: New Timeout Status Code in Generic Status Codes

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1. Introduction

This document specifies the simulator-specific extensions to the JCOP Remote Communication Protocol (JRCP). For more details on the JRCP see [1].

– These extensions are not part of the JRCP protocol itself, but provide further functionality in combination of the JCOP Simulator. –

In the following, simulator-specific extensions are listed. These commands are only valid for certain JCOP simulators. Any JRCP Server will return the error message “Unsupported command received” (see Section 4.23 “Generic Status Codes” in the JRCP specification [1]) if the extension is not supported. To query the device identifier, use the Feature Control Request with sub-MTY “0003h” (see Section 4.21 in the JRCP specification [1]).

1.1 Overview and Scope

Section 2 defines the version number used for all commands of this simulator-specific extensions document.

Section 4 provides extensions to existing commands of the JRCP specification.

Section 5 specifies the simulator-specific extensions of the JRCP protocol.

It is not the aim of this application note to describe details about how to exactly implement the protocol on an embedded controller, but rather to provide a protocol specification.

1.2 Intended Audience

This document guides (software) developers and architects who develop software for embedded devices containing a JCOP product inside.

1.3 Ordering JCOP Tools

The JCOP Tools are provided free of charge by NXP to JCOP customers. As the JCOP Tools contain product-specific implementation details, they are provided under the same restrictions as JCOP itself. Rules for export control and confidentiality (NDA) apply.

1.4 Nomenclature

During this document, the key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [2]. Additionally, the term “OBSOLETE” describes features that have been part of previous versions of the specification but have been removed and shall not be supported in current implementations. “DEPRECATED” denotes a feature that should be supported by server and client implementations but shall be obsoleted in future revisions of the specification.

1.5 Reserved for Future Use

The term Reserved for Future Use (RFU) defines the following specific behavior of implementations according to this specification:

- Fields defined as RFU SHALL be always sent as zero unless explicitly stated otherwise.
- Values defined as RFU SHALL NOT be send.
- Commands defined as RFU SHALL be responded as defined in Section 4.23 “Generic Status Codes” in the JRCP document [1].
- Unless explicitly stated otherwise, values defined as RFU SHALL be disregarded by the receiver and the receiver SHALL keep the same interpretation of all other fields.

1.6 Not Allowed

The term Not Allowed defines the following specific behavior of implementations according to this specification:

- Values defined as Not Allowed SHALL NOT be sent.
- When a Not Allowed value is received the implementation SHALL abort the command execution and return the according status code defined for the command.

2. Protocol Version

A server implementing this revision of the specification SHALL indicate a version 3.1 for all commands that extend the JRCP protocol. In particular, the value of 03h for the major version and a value of 01h for the minor version shall be used as a response to the feature control request (MTY FFh) with sub-MTY 0001h to any message type defined in this document. For all other commands of the generic JRCP specification the version of the JRCP specification SHALL be used. For the process of version discovery and version agreement refer to [1].

3. Interface Handling in JCOP Simulator

Depending on its configuration, the JCOP simulator may support multiple interfaces. Their handling and mapping to node addresses is treated in this section.

All interfaces that only provide one configuration per physical interface in the product are mapped to fixed node addresses. Their mapping cannot be changed at run-time. According to Section 3.6 of the JRCP Specification document [1], the range of their node addresses in the range of 00h – 7Fh.

Interfaces that support multiple configurations may be connected using some default interface options and they support to get disconnect and then (re-)connected with selected interface options.

Please refer to the JCOP Simulator User Manual for a mapping table.

A connection using selected interface options is established by using the request “Controller Configuration (MTY FEh)”, sub-MTY 0004h of the JRCP Specification document [1], Section 4.21. They are consequently mapped to node addresses in the range 80h – FEh. In order to change the configuration, the corresponding node address needs to be disconnected (MTY FEh, sub-MTY 0005h) first.

The wireless interface is configurable and accepts the following connection parameters in the argument of the request “Controller Configuration (MTY FEh)”, sub-MTY 0004h of the JRCP Specification document [1], Section 4.21:

Table 1. Connection Parameters for Connecting to the Wireless Interface

NAD	Connection Parameter String	Remaining bytes
81h	**“Type A Card RF Gate”**	Connect to the RF Gate using type A communication
82h	**“Type B Card RF Gate”**	Connect to the RF Gate using type B communication
83h	**“Type F Card RF Gate”**	Connect to the RF Gate using type F communication
	Others	Not allowed

The parameter string is according to ETSI TS 102 622 [3] and SHALL be provided without the quotes but including whitespaces. By default, the JCOP Simulator connects the wireless interface in type A mode.

Although all of these interfaces are returned in the list of attached readers (MTY FEh, sub-MTY 0001h), only one connection is possible to the RF Gate. Subsequent connections to a different gate shall result in “Generic Error” (0001h), see Section 4.23 “Generic Status Codes”, Table 44 in the JRCP document [1].

After the connection parameters have been changed successfully, the client SHALL issue a reset of the simulator according to Section 4.17 “Cold Reset (MTY 31h)” in the JRCP document [1].

4. Extensions to Existing JRCP Commands

The JCOP simulator provides additional functionality to existing JRCP commands. These are categorized by their corresponding message type (MTY). Please refer main JRCP specification document [1] for more information.

4.1 Extensions to the Feature Control Request (MTY FFh)

The JCOP simulator provides the following extensions to Section 4.22 “Feature Control Request (MTY FFh)” of the JRCP Specification document [1]. The JCOP simulator shall respond with an ASCII encoded string equal to “*JCOP Simulator*” when queried for its identifier (sub-MTY “00h 03h” as defined in [1], Section 4.22 “Feature Control Request (MTY FFh)”). The string returned SHALL not be NULL terminated.

Table 2. JCOP Simulator Feature Control Identifier (Request and response)

Host	Direction	Remote Device
A5 FF FF 00 00 00 00 02 00 03 00h	→	

Host	Direction	Remote Device
	←	A5 FF FF 00 00 00 00 **10** 00 03 **4A 43 4F 50 20 53 69 6D 75 6C 61 74 6F 72** 00h

4.2 Extensions to the Preparation of Tearing (MTY 0Ch)

The JCOP simulator provides the following additional actions (sub-MTYs) to Section 4.13 “Preparation of Tearing (MTY 0Ch)”, Table 19 in the JRCP document [1]:

Table 3. Additional actions (sub-MTYs) for Preparation of Tearing (MTY 0Ch)

Description	Sub-MTY	Remaining bytes
Dump memory and reset (no power cycle)	8001h	Four byte time information [JC Byte Code Cnt]
Dump memory and reset (with power cycle)	8002h	Four byte time information [JC Byte Code Cnt]
Dump memory and restart	8003h	Four byte time information [JC Byte Code Cnt]
Dump memory and terminate	8004h	Four byte time information [JC Byte Code Cnt]

The JCOP simulator interprets the time information as JavaCard byte code counter instead of milliseconds as specified in the JCRP specification document.

4.3 Extensions to the Timing Information (MTY 0Bh)

Due to the fact that timing information of JCOP Simulator is not relevant for performance measurement and profiling, the number of executed JavaCard bytecodes is returned in the response to the Timing Information request instead of the command execution time in microseconds.

Of the actions defined in Table 14 of [1], the following ones are supported by the JCOP Simulator:

Table 4. Layout of the Payload (Action definition)

Description	Sub-MTY	Remaining bytes
Reserved for Status Codes	0000h	See Table 15 in **[1]**
Reset the timer	0001h	None
Query timer	0002h	None

All other sub-MTY values not mentioned in above table SHALL return “Unsupported command received”.

4.4 Extensions to the Generic Status Codes

The JCOP simulator provides the following additional generic status codes to Section 4.23 “Generic Status Codes”, Table 44 in the JRCP document [1]:

Table 5. Generic Status codes

Payload (after sub-MTY 0000h)	Comment
EEh 01h	The Internal error occurred.
00h EEh	Timeout occurred

5. JCOP Simulator-specific Extensions (MTY EEh)

The JCOP simulator is using the MTY EEh in the range of the device-specific extensions.

Any version query to one of the commands specified in this section shall return the version as defined in Section 2.

5.1 Request Format

The request format of the JCOP simulator-specific extension is defined as follows:

Table 6. JCOP Simulator-specific Extensions Request Format

SOF	MTY	NAD	HDL	LN3–LN0	Sub-MTY	Payload	TIL
A5h	**EEh**	NAD	00h	Length	Sub-MTY	See Sub-MTY	00h

5.2 Response Status Codes (sub-MTY 0000h)

Any JCOP Simulator device-specific command is acknowledged by a response. The response may be either indicating a successful execution of the command or an error that the command failed.
The following table defines the supported status codes:

Table 7. JCOP Simulator Status Codes

Payload (after sub-MTY 0000h)	Description
EEh 00h	Command executed successfully
EEh 01h	Command aborted or execution resulted in an error
Others	Not Allowed

5.3 Restart Simulator (sub-MTY 0100h)

Stops the execution, loads the default / defined NVM state and restarts the simulated JCOP (see JCOP Simulator User Manual for more details).

5.4 Terminate Simulator (sub-MTY 0200h)

Stops the execution and quits the JCOP Simulator (ends itself).

5.5 Information Trace Event (sub-MTY 0900h – 09FFh)

The “Information Trace Event” command sends a message to the simulator. This message is used to create a trace event containing the submitted string that is visible in the JCOP Trace Analyzer. The string is contained in the payload and shall be ASCII encoded string. The string length shall not exceed 32,768 bytes.

Table 8. Information Trace Event Request Format

SOF	MTY	NAD	HDL	LN3–LN0	Sub-MTY	Payload	TIL
A5h	**EEh**	NAD	00h	Payload length + 2	09h|xxh xx Event Type	ASCII encoded string	00h

The second byte of the sub-MTY defines the trace event type as is defined as in Table 9.

Table 9. Type Identifier for the Information Trace Event Command

Event Type	Name	Comment
00h	Generic event (regular echo)	-
01h	RFU	-
02h	RFU	-
03h	Script/command line	Passes the current line of the script or the current command line to the simulator for tracing.
04h	RFU	-
05h	RNG Seed	The payload SHALL only contain the seed used to initialize the RNG of JCShell in hexadecimal ASCII representation.
Others	Not Allowed	

The response shall be according to Table 7.

5.6 Dump Memory – RFU (sub-MTY 8000h – 80FFh)

The “Dump Memory” command allows to dump memory in combination with an optional action. This message is used to create a memory dump at the time of current execution when the command is received.

Table 10. Dump Memory Request Format

SOF	MTY	NAD	HDL	LN3–LN0	Sub-MTY	Payload	TIL
A5h	**EEh**	NAD	00h	Payload length + 2	80h|xxh xx Action type	RFU	00h

The second byte of the sub-MTY defines the action type as is defined as in Table 11.

Table 11. Action Type for the Dump Memory Command

Action Type	Name	Comment
00h	No action	-
02h	Restart	Additionally a Restart is applied
03h	Terminate	Additionally a Terminate is applied
04h	Reset (no power cycle)	Additionally a Reset (no power cycle) is applied
05h	Reset (with power cycle)	Additionally a Reset (with power cycle) is applied
Others	Not Allowed	

The response shall be according to Table 7.

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7. References

[1] NXP Semiconductors B.V., *JCOP Remote Communication Protocol: Protocol Specification Rev. 2.7,* 2017.

[2] S. Bradner, *RFC2119: Key words for use in RFCs to Indicate Requirement Levels,* 1997.

[3] ETSI, *Technical Specification 102 622: Smart Cards; UICC - Contactless Front-end (CLF) Interface; Host Controller Interface (HCI) (Release 13),* 2016.

8. List of figures

No table of figures entries found.

9. List of tables

10. Contents

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Date of release: May 10, 2017
Document identifier: