

JCOP 4.7 R1.00.4 (JCOP Simulator)

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User Manual

Document information

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Abstract	JCOP Simulator User Manual contains generic description, Changes Notes, limitations and legal information of JCOP Simulator



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1. Introduction

NXP semiconductor offers a Java Card Open Platform operating system called JCOP based on independent third-party specifications. The JCOP Simulator is the executable program which works on Windows platform. This document gives overview of simulator with regard to its usage .

1.1 Release Package

JCOP Simulator package contains the following:

- User Manual (this document)
- Windows package containing following files
 - jcop.exe (Windows executable)
 - RomizedImage.bin (Image file)

2. Baseline features

This release supports the feature set based on JCOP 4.7 R1.00.4.

3. Installation instructions

There is no special installation required for the JCOP Simulator.

All files contained in the delivery package for the corresponding platform (refer to Section 1.1) shall be placed in the same directory to run the simulator.

4. Usage

Below sections describe the usage of the JCOP Simulator to run multiple instances and choice of the ports.

To run the simulator executable, invoke from the directory where all installation files are located.

Please refer to Section 4.4 for the command line options supported by the simulator.

4.1 Running Multiple Instances

The JCOP Simulator executable (jcop.exe) can be run with multiple instances. These instances can run either on the same or on multiple machines. Every instance of the simulator runs as a separate executable.

4.2 Multiple Ports as interfaces

The JCOP Simulator supports multiple interfaces such as contact or contactless using different socket ports. If required, the port number for the interfaces can be specified using command line options. This is described in Section 4.4.

4.3 Usage in combination with the JCOP Tools Eclipse Plugin

To use the stand-alone JCOP Simulator in combination with the JCOP Tools Eclipse Plugin, a JCOP Tools Eclipse Plugin version 3.7.1.0 or higher needs to be installed. The Eclipse plugin requires a local instance of simulator to be started.

Ensure that Eclipse is running, load the project to be debugged, and switch to the “Debug View”. Then edit the targeted “Run/Debug Configuration” in the Eclipse Plugin to connect to the running simulator instance. In the configuration window switch from “Default Target Configuration” to “Connect to an externally started JCOP Simulator” and enter the port number and related configuration. For further details refer to the context help as provided by the JCOP Tools Eclipse Plugin.

4.4 Command line parameters

The Simulator supports the following command line parameters:

Parameter	Description
Generic parameters	
-help	Print a help message
-image=[path]<filename>	Path and image file name
Network server and port parameters for interfaces	
-bindall	Start the JCOP Simulator on all available network interfaces. If you have multiple network adapters and/or multiple IP addresses assigned to network adapters, a TCP/IP server will be started listening on all of them. By default, the simulator will start listening only on localhost and will not be reachable over network.
-bindip=<ip addr>	Start the TCP/IP server internal to the JCOP Simulator on the network interface with the specified IP address. This parameter conflicts with the parameter -bindall.
-portc=<port number>	Port number of the contact interface. This parameter is optional and defaults to 8050.
-portcl=<port number>	Port number of the contactless interface. This parameter is optional, by default an available port number is chosen randomly.
Debug sever parameters	
-enable-debug	Enable java debugging functionality. The JCOP Simulator will start a JDWP server (java debug server)

	on the port 8000. The port number can be changed using the <code>-jcdwp_port</code> parameter.
<code>-jcdwp_port=<port number></code>	Debug server (JDWP server) port number. This parameter is optional. It requires presence of the parameter <code>-enable-debug</code> .
<code>-applet_dirpath = <path1;path2;...></code>	Project path of the applet to debug. Multiple directories may be specified separated by semicolons.
Embedded HTTP server parameters	
<code>-enable-httpd</code>	Start the embedded HTTPD server on port 8090. The port number can be changed using the parameter <code>-porthttpd</code> .
<code>-porthttpd=<port number></code>	Specify the port number to be used for embedded HTTPD server. This requires the presence of the parameter <code>-enable-httpd</code> .
Tracing parameters	
<code>-bin-trace</code>	Enable the tracing functionality. The JCOP Simulator will create a file <code>trace-<timestamp>.ztrc</code> with tracing information. This trace file can be analyzed using the JCOP Trace Analyzer tool integrated to NXP JCOP Eclipse plug-in. By default, trace files will be created in directory where JCOP Simulator has been started.
<code>-trace-dir=<path> or -output-dir=<path></code>	Optional parameter to specify the output directory of trace files. It requires the presence of the parameter <code>-bin-trace</code> .
<code>-trace-filename=<filename></code>	Name of binary trace filename. Binary trace filename can be customized only by filename. It may also contain parametrized parameters (%t and %n) in any place of filename, where %t is for timestamp and %n is for sequence number. By default, sequence number starts from 1. If there are any files in the output directory which matches with the filename template then sequence number must be continued from the sequence number of last filename.
Pseudo random number generator with seed	
<code>-random-seed=<seed></code>	Optional parameter to specify seed for random number generator. Default value is current time.
Externalized CAP file directory	

-externalized-caps-dir=
<path1;path2;...>

Optional parameter to specify path of externalized cap files. By default simulator looks into current execution directory for externalized cap files.

4.5 Debugging JCOP OS objects

Objects that are in the scope of the JCOP OS only are not available for debugging. For example, they cannot be used for watch points and their content is inaccessible. However, in some cases a local instance can be created, e.g.:

```
public void process(APDU apdu) {
    // Good practice: Return 9000 on SELECT
    if (selectingApplet()) {
        return;
    }

    byte[] buf = apdu.getBuffer();
    switch (buf[ISO7816.OFFSET_INS]) {
        case (byte) 0x00:
```

While the *apdu* object is not directly accessible in the snippet above, the *APDU* buffer can be analyzed through the local variable *buf*.

Similarly, key objects can be analyzed as in the following example:

```
/** Derived session key for AC generation (3DES, 2 key option) */
protected static DESKey ks_ac;
ks_ac = (DESKey) KeyBuilder.buildKey
    (KeyBuilder.TYPE_DES_TRANSIENT_DESELECT,
     KeyBuilder.LENGTH_DES3_2KEY, false);
```

Here, the local variable *ks_ac* is inaccessible as the *DESKey* interface and its implementation object belong to the JCOP OS. In order to get the key values, the following can be used:

```
byte[] keyData = new byte[KeyBuilder.LENGTH_DES3_2KEY];
byte keyLen = ks_ac.getKey(keyData, (short) 0);
```

The key value is copied to *keyData* byte array which is in scope of applet and accessible for debugging.

4.6 Usage of JDB for Debugging Applets

The Java Debugger (JDB) is a command-line debugger for java classes. JDB is called with the help of “jdb” command. The command provides different options to perform different options. The Java Debugger command demonstrates the Java Platform Debugger Architecture(JDBA) and provides inspection and debugging of a local or remote Java Virtual Machine(JVM).

4.6.1 Basic “jdb” commands

- help - displays a list of recognized commands with brief description
- run – Once JDB is start and breakpoints are set, “run” command can be used to execute debugged application
- cont – continuous execution of the debugged application after a breakpoint, exception or step.
- print – displays java objects and primitive values
- dump – for objects, dump command prints the current value of each field defined in the object, and for primitive values, the command's behavior is similar to that of Print
- threads – lists currently running threads
- thread- select a thread which is a current thread
- classes - list currently known classes
- methods <class id> - list a class's methods
- where – where command with no arguments dumps the stack of the current thread, where all command dumps the stack of all threads in the current thread group, where *threadindex* dumps the stack of the specified thread.

4.6.2 Steps to connect to JDB

- Start the simulator in debug mode
- Open the command prompt and execute the command “jdb -connect com.sun.jdi.SocketAttach:hostname=localhost,port=<debug_port>”
 - The debug connection will be established and the user can subsequently use the jdb commands to debug the applet.

Example usage:

```
>jdb -connect com.sun.jdi.SocketAttach:hostname=localhost,port=9051
Initializing jdb
> classes
** classes list **

VmProfiling
boolean[]
byte[]
```



```
com.nxp.id.TestApp01
int[]
java.lang.Object[]
java.lang.String
short[]
unknown
> methods com.nxp.id.TestApp01
** methods list **
com.nxp.id.TestApp01 <init>()
com.nxp.id.TestApp01 install(byte[], short, byte)
com.nxp.id.TestApp01 process(javacard.framework.APDU)
```

4.7 Interface Handling in JCOP Simulator

JCOP Simulator supports multiple interfaces, Wired and Contactless. These Interfaces has one configuration per physical interface and are mapped to fixed node addresses, i.e. their mapping cannot be changed at runtime.

#	Interface Type	Connection parameter string	Default NAD	Mapping of Node Address
1	Contactless	CIU Interface	0x07	Fixed
2	Wired	UART Interface	0x06	Fixed

5. Change Log

Baseline Release	Description of Change
Based on JCOP 4.7 R1.00.4	<ul style="list-style-type: none">Alignment with JCOP on-card code
Based on JCOP 4.7 R1.00.4	<ul style="list-style-type: none">Alignment with JCOP on-card code

6. References

6.1 JCOP Trace Analyzer

The JCOP Trace Analyzer tool allows analyzing traces generated by JCOP Simulator. It can be used to get information on code coverage, executed byte codes, stack usage and related debugging information. It is a powerful JavaCard applet debugging tool for the JCOP Simulator. The simulator records the applet execution into a trace file and the analyzer provides offline debugging of the trace recording.

For more information about JCOP Trace Analyzer refer to JCOP_JCOPTraceAnalyzer_Manual.pdf.

6.2 JCOP Remote Communication Protocol (JRCP)

JRCP offers a set of commands to communicate with JCOP products connected to remote devices (e.g. embedded controllers). Besides offering an interface to communicate with JCOP, JRCP also provides commands to interact with remote devices (e.g. to send and receive status/error information).

For more information about JRCP protocol kindly refer to AN_JCOP_Remote_Communication.pdf

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- (b) a voluntary or involuntary petition in bankruptcy or winding up is filed against Licensee, any proceedings in insolvency or bankruptcy (including reorganization) are instituted against Licensee, a trustee or receiver is appointed over Licensee, or any assignment is made for the benefit of creditors of Licensee; or
- (c) and to the extent as required by applicable third party rights according to Section 6 of this Agreement.

7.3 Upon termination or expiration of this Agreement, Licensee shall immediately return all Licensed Software, Documentation and other Confidential Information to NXP.

8.0 CONFIDENTIALITY.

8.1 Licensee shall retain in confidence and not disclose to any third person or employees except to those Licensee permanent employees who have a legitimate need to know any Confidential Information that it receives from NXP hereunder, and Licensee shall not use the Confidential Information for any purpose whatsoever except for the purpose of this Agreement.

8.2 Licensee represents and warrants that Licensee shall have as of the Effective Date, and shall maintain thereafter, with each of its employees who will have access to any Confidential Information, prior to their access to any Confidential Information, a written, signed agreement legally sufficient and effective to enable Licensee and each such employee to comply with all the provisions of this Agreement.

8.3 Except as expressly permitted in Article 2.0, Licensee shall not, and shall not permit anyone else to use, reproduce, duplicate, or otherwise disclose, distribute or disseminate any Confidential Information. Licensee agrees to take all reasonable steps to prevent disclosure and unauthorized use of Confidential Information and to use no less than same degree of care that it uses with respect to its own confidential information of similar kind or nature. Licensee shall promptly notify NXP of any unauthorized access to or any unauthorized use or disclosure of Confidential Information.

8.4 Licensee's obligations of confidentiality under this Agreement shall not apply to information that Licensee can establish by legally sufficient evidence: (i) is already in the public domain at the time it was disclosed or subsequently enters the public domain through no fault of the Licensee; (ii) is known to Licensee or in its possession, as shown by dated documentation prior to receipt; (iii) is independently developed by Licensee, as shown by dated documentation; or (iv) is rightfully received by Licensee on a non-confidential basis from a third party, as shown by dated documentation, without breach of this Agreement by Licensee.

9.0 WARRANTY.

9.1 The Licensed Software and related Documentation is provided to Licensee AS IS WITHOUT WARRANTY OF ANY KIND, which is accepted by Licensee. NXP makes no warranties to Licensee and shall not indemnify Licensee or hold it harmless for any reason related to the Licensed Software or Documentation, or otherwise be liable to Licensee. Licensee acknowledges and agrees that the Licensed Software and Documentation is provided AS IS and accepts all risks of utilizing the Licensed Software and Documentation under the conditions set forth in this Agreement. The foregoing states the entire liability of NXP in connection with any defective, error, omission or non-conforming Licensed Software or Documentation supplied hereunder.

9.2 NXP EXPRESSLY DISCLAIMS ALSO ON BEHALF AND FOR THE BENEFIT OF ITS AFFILIATES ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. NXP SHALL HAVE NO LIABILITY TO LICENSEE, OR ITS SUBSIDIARIES, AFFILIATES, OR ANY OTHER THIRD PARTY FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION, DAMAGES RESULTING OR ALLEGED TO HAVE RESULTED FROM ANY DEFECT, ERROR OR OMISSION IN THE LICENSED SOFTWARE, THIRD PARTY APPLICATION SOFTWARE AND/OR DOCUMENTATION, OR AS A RESULT OF ANY INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT OF ANY THIRD PARTY.

10.0 LIMITATION OF LIABILITY

10.1 EXCEPT FOR LICENSEE'S LIABILITY FOR BREACH OF ARTICLES 2, 3, 4, 8, OR 9 HEREOF, NO PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL

DAMAGES (INCLUDING LOST PROFITS OR LOST SAVINGS) WHETHER OR NOT SUCH DAMAGES ARE BASED ON TORT, WARRANTY, CONTRACT OR ANY OTHER LEGAL THEORY - EVEN IF SUCH PARTY HAS BEEN ADVISED, OR IS AWARE, OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL NXP BE LIABLE FOR ANY DAMAGE, COSTS OR EXPENSES ASSOCIATED WITH WARRANTY OR INTELLECTUAL PROPERTY INFRINGEMENT CLAIMS WHETHER FOR THE REPLACEMENT OR REPAIR OF PRODUCTS, INCLUDING LABOR, INSTALLATION OR OTHER COSTS INCURRED BY LICENSEE AND, IN PARTICULAR, ANY COSTS RELATED TO THE REMOVAL OR REPLACEMENT OF ANY PRODUCTS SOLDERED OR OTHERWISE PERMANENTLY AFFIXED TO ANY PRINTED CIRCUIT BOARD, EXCESS PROCUREMENT COSTS, OR REWORK CHARGES.

10.2 THE LICENSED SOFTWARE IS NOT DESIGNED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN MEDICAL, MILITARY, AIR CRAFT, SPACE OR LIFE SUPPORT EQUIPMENT NOR IN APPLICATION WHERE FAILURE OR MALFUNCTION OF THE LICENSED SOFTWARE CAN REASONABLY BE EXPECTED TO RESULT IN A PERSONAL INJURY, DEATH OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. INCLUSION AND /OR USE OF LICENSED SOFTWARE IN SUCH EQUIPMENT OR APPLICATIONS, WITHOUT PRIOR AUTHORIZATION IN WRITING OF NXP, IS NOT PERMITTED AND FOR LICENSEE'S OWN RISK. LICENSEE AGREES TO FULLY INDEMNIFY NXP FOR ANY DAMAGES RESULTING FROM SUCH INCLUSION OR USE.

11.0 GENERAL.

11.1 The provisions of Articles 1, 3, 4, 5, 6, 7, 8, 9, 10 and 11 shall survive the expiration or termination of this Agreement.

11.2 Licensee shall not assign its rights or obligations under this Agreement without the prior written consent of NXP, and any purported assignment without such consent shall be void and have no force or effect. Subject to the foregoing, this Agreement shall bind and inure to the benefit of the respective parties hereto and their successors and assigns. Without limiting the generality of the foregoing, a change in the majority ownership or control of Licensee, by the transfer, directly or indirectly, of fifty percent (50%) or more of the shares of Licensee entitled to vote for the election of directors or other persons performing similar functions, or by equivalent change in ownership or control of Licensee if a partnership or other non-corporate form, shall be deemed an assignment of the Agreement by Licensee for the purpose of this Section 10.2. In the event of any assignment or attempted assignment by Licensee, this Agreement shall terminate and all Licensed Software, Documentation, Confidential Information and related materials shall be returned to NXP within ten (10) days. NXP may assign this Agreement to any of its Affiliates without consent of Licensee.

11.3 The Parties hereto intend to establish a relationship of licensee and licensor and as such are independent contractors with neither party having authority to act as an agent or legal representative of the other to create any obligation, express or implied, on behalf of the other.

No principal/agent, joint venture or partnership relationship is created between them by this Agreement.

11.4 Each Party shall comply with all applicable federal, state and local laws, including, but not limited to those pertaining to U.S. and member states of the European Union's Export Administration or the export or import controls or restrictions of other applicable jurisdictions in performing under this

Agreement. Licensed Software, Documentation and other Confidential Information may be subject to United States and/or member states of the European Union's export control laws and may be subject to other foreign export and import control laws and regulations. Licensee agrees to strictly comply with all applicable export and import control laws and regulations, and, in particular, Licensee will not export or re-export the Licensed Software without all required, if any, United States and member states of the European Union's and foreign governmental licenses, approvals, or waivers.

11.5 Licensee acknowledges that a breach of this Agreement may cause irreparable damage for which recovery of money damages would be inadequate, and that, in addition to any and all remedies available at law and equity, NXP shall be entitled to seek injunctive relief to protect its rights under this Agreement.

11.6 Each Party acknowledges and agrees that this Agreement does not confer any rights to use any of the other Party's names, trademarks, or logos for any reason, including but not limited to, in connection with it advertising, publicity or other marketing activities.

11.7 The failure on the part of either Party to exercise, or any delay in exercising, any right or remedy arising from this Agreement shall not operate as a waiver thereof; nor shall any single or partial exercise of any right or remedy arising therefrom preclude any other or future exercise thereof or the exercise of any other right or remedy arising from this Agreement or by law.

11.8 The headings and captions to Articles and Sections of this Agreement are for reference and only and shall not affect the construction or interpretation of this Agreement.

11.9 This Agreement shall be governed by and construed in accordance with the laws of Germany, without regard to provisions concerning conflicts of law. Licensee submits and consents to, for the exclusive benefit of NXP, the jurisdiction of the state and federal courts of Germany. Parties however also agree that NXP, at NXP's sole discretion, may also elect to bring legal action regarding any dispute arising from or in connection with this Agreement before any court in any country (or political subdivision thereof) which may have jurisdiction and Licensee herewith irrevocably and unconditionally submits to the exclusive jurisdiction of the courts chosen by NXP. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement.

11.10 All notices or communications to be given under this Agreement shall be in writing and shall be deemed to be validly given by delivery thereof to its recipient if (i) delivered upon hand delivery, or (ii) by deposit in the mail of the home country of the Party, postage prepaid, by certified, registered or first class mail or equivalent, or (iii) by nationally recognized overnight courier service (e.g., FedEx, UPS) prepaid, all of which are addressed to the parties at their addresses set forth above or such other address that a Party may notify the other party from time to time, in accordance with this Section 11.10. Any written notice is deemed to have been received, if sent by hand delivery, certified or registered, first class (or equivalent) mail or prepaid overnight courier, at the time of its delivery.

11.11 Neither Party shall publicize or disclose the existence or terms of this Agreement to any third Party, other than on a confidential basis to its legal and financial advisors, without the prior written consent of the other, except as otherwise may be required by law.

11.12 In the event that any provision(s) of this Agreement shall be held invalid or unenforceable by a court of competent jurisdiction or by any future legislative or administrative action, such holding or action shall not negate the validity or enforceability of any other provisions hereof.

11.13 This Agreement may be executed in one or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

11.14 This Agreement, including its Appendices, sets forth the entire agreement between the parties relating to the subject matter herein, and supersedes and replaces all prior or contemporaneous agreements, discussions and understandings, written or oral, with respect to such subject matter. Each Party represents that it is duly authorized to enter into the Agreement. The terms and conditions of this Agreement may not be modified, or amended.

APPENDIX A – Delivered Software

1. LICENSED SOFTWARE

A. EXECUTABLE CODE

NXP JCOP Simulator for Linux, Windows, and MAC OSX

B. OBJECT CODE

NXP JCOP Simulator object file (jcop.o) for Linux

C. SOURCE CODE

None

2. DOCUMENTATION

A. DOCUMENTATION

None

APPENDIX B – Third Party Software

1. DELIVERED THIRD PARTY SOFTWARE

A. EXECUTABLE CODE

None

B. OBJECT CODE

- glibc 2.19 - Licensed under GNU LESSER GENERAL PUBLIC LICENSE 2.1

- OpenSSL 1.0.1g-1 - Licensed under the OpenSSL License and the original SSLeay license

C. SOURCE CODE

None

2. DOCUMENTATION

A. DOCUMENTATION

None