

NJE Bridge: Installation Guide for Unix and Linux Systems Version 2 Release 1.0

Sine Nomine Associates
43596 Blacksmith Square
Ashburn, VA 20147

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About This Document

This document describes the installation and verification process for installing Sine Nomine's full NJE Bridge product on Linux and Solaris systems. The document describes the prerequisites and installation procedure, and then provides some basic tests for checking basic functionality. This document does not detail the configuration options or discuss design theory for building a NJE network. The NJE Bridge Software Reference document contains detailed descriptions of configuration statements and command syntax.

About the NJE Bridge

The NJE/IP Bridge is a product designed to enable TCPNJE connections between traditional IBM NJE hosts and open/discrete systems. It supports communication between any supported platforms (broadly, almost any system with a POSIX.1 interface) and RSCS, JES2, JES3, VSE/POWER, or other NJE/IP Bridge systems.

The NJE/IP Bridge is designed to allow file transfer and remote job submission to traditional mainframe hosts from Open Systems platforms, as well as to enable submission to Open Systems platforms from mainframe hosts. It is particularly useful for enabling printing from mainframe hosts to printers in an Open Systems environment. The NJE/IP Bridge provides a mechanism for batch job control, and a general mechanism for messaging between users/services/virtual machines on either end of the link, which makes it well-suited for the design of a distributed processing system.

The NJE/IP Bridge provides:

- The ability to define TCP (version 4 and version 6) links point-to-point connection with or without SSL protection
- A store-and-forward file transfer service
- Interactive messaging
- The ability to take arbitrary action via user-defined exits on receipt of a message; this can include mapping of "pseudo-users" to particular services.
- If the POSIX system is equipped with NQS, the ability to accept remotely-submitted jobs, execute them, and return output to arbitrary NJE destinations.

A product activation key (PAK) is required for the product to function. Please contact Sine Nomine Associates before installation to obtain a PAK for your system.

Installing the NJE Bridge

Installing the NJE Bridge on Linux

Prerequisites

Hardware

The NJE Bridge software is supported on Linux distributions on the following processor architectures:

- i386/i686 (32-bit Intel or Intel-compatible processors)
- x86_64 (64-bit Intel, AMD or Intel-compatible processors)
- s390x (64-bit IBM System z processors, either bare-metal LPAR or within a z/VM virtual machine)

Software

The NJE Bridge software is supported on Red Hat Enterprise Linux or compatible distributions on the supported hardware. Tested platforms include:

- Red Hat Enterprise Linux 6.x
- Red Hat Enterprise Linux 7.x
- CentOS 6.x
- CentOS 7.x
- ClefOS 6.x (s390x only)
- ClefOS 7.x (s390x only)

The Linux NJE Bridge package consists of two RPMs containing the code and the documentation (this document). You should have the following RPMs:

- nje-doc-<release>.<version>.<modification>-<build>.noarch.rpm
- nje-<release>.<version>.<modification>-<build>.<architecture>.rpm

where terms are defined as:

<release> Major release of the package

<version> Version of the major release (usually used for minor function increments)

<modification> Specific patch level identifier.

<build> Serial number applied to each package build as a unique identifier

noarch Non-executable files used on all architectures

<architecture> Processor architecture (drawn from /bin/arch) for executable binaries

Authorizations and/or Permissions

To install the NJE Bridge, you need the following permissions/authorizations:

- A product activation key for this application. If you do not have one, contact Sine Nomine support as described in section “Reporting A Problem” on page 16.
- Root access on the system to receive the software installation (or appropriate permissions in `/etc/sudoers` to become root after login).

Configuration Information

To configure the software, you will need:

- A unique NJE node name for this system (8 characters or less). This name may be the same or an abbreviation of the IP hostname of the system, but must be 8 characters or less and unique within your NJE network.
- The IPv4 or IPv6 DNS hostname or IP address of the target system you wish to connect to via TCPNJE. Hostnames are preferred, but either will work.
- The NJE node name of the target system you wish to connect to via TCPNJE.
- The number of streams defined at the remote system for the NJE link to your system. The default is 1, however both ends of each NJE link between systems in your NJE network must agree on this parameter.
- The buffer size defined at the remote system for the NJE link to your system. The default size is 4096 bytes, however the actual size used will be negotiated at link startup.

Installation Steps

1. Retrieve the installation RPMs from the Sine Nomine support system using your support userid and password. Multiple access protocols are available; use the one compatible with your network configuration, firewalls and network policies. The `scp` method is generally simplest when working with Unix or Linux hosts.

An example of the retrieval process for the `x86_64` architecture is shown in Figure 1.

```
scp -r <userid>@scp.sinenomine.net:/<dir>/software/nje-rpm-x86_64/* .
```

Figure 1. Retrieving the Linux RPMs From The Support System (x86_64)

If you are installing the `s390x` architecture, the command will appear similar to Figure 2.

```
scp -r <userid>@scp.sinenomine.net:/<dir>/software/nje-rpm-s390x/* .
```

Figure 2. Retrieving the Linux RPMs From The Support System (s390x)

If you are installing the `i386` (32 bit Intel) architecture, the command will appear similar to Figure 3 on page 6.

```
scp -r <userid>@scp.sinenomine.net:/<dir>/software/nje-rpm-i386/* .
```

Figure 3. Retrieving the Linux RPMs From The Support System (i386)

Replace <userid> with your support userid. Note the dot (.) at the end of the command to indicate that the files will be transferred to the current directory on your system.

2. Retrieve the Product Activation Key (PAK)

To retrieve your product activation key for the software, use the same userid and password you used to retrieve the software and copy the access key files as shown in Figure 4.

```
scp -r <userid>@scp.sinenomine.net:/<dir>/keys/<arch>*.txt .
```

Figure 4. Retrieving the Product Activation Key (PAK)

Replace <userid> with your support userid and <arch> with the string from the repository you used to retrieve the code RPM (see figures in previous step for options). Note the dot (.) at the end of the command to indicate that the PAK files will be transferred to the current directory on your system.

3. If the system you used to retrieve the packages is not the system to be used for installation, transfer the installation packages to the system to be used for the installation. Make sure you use a file transfer method that preserves binary data intact.
4. If you are not logged in as the root user, use `su` or `sudo` to enable root privileges. Your installation may have preferred methods to perform this activity; consult your local documentation for the preferred method to enable elevated privileges.
5. Install the NJE Bridge RPM first.

To install the RPM, execute:

```
yum install ./nje-2.3.0-40.x86_64.rpm
```

Figure 5. Installing the NJE Bridge Code RPM

If prompted to install prerequisites, answer Y for yes. The install process will download and apply any required prerequisite packages automatically.

6. Install the NJE Bridge Documentation RPM To install the documentation RPM, execute:

```
yum install ./nje-doc-2.3.2-1.noarch.rpm
```

Figure 6. Installing the NJE Bridge Documentation RPM

If prompted to install prerequisites, answer Y for yes. The install process will download and apply any required prerequisite packages automatically.

The NJE Bridge programs and documentation are now installed. See “Configuring the Software” on page 10 for information on configuration and setup of the software.

Installing the NJE Bridge on Solaris

Prerequisites

Hardware

The NJE Bridge software is supported on Solaris operating systems on the following processor architectures:

- SPARC32 (32 bit SPARC)
- SPARC64 (64 bit SPARC)
- x86_64 (64 bit Intel, AMD, or Intel-compatible processors)

Software

The NJE Bridge software is supported on:

- Solaris 10u6 or higher (all SPARC32, SPARC64 and x86_64 processors)
- Solaris 11 or higher (all SPARC sun4v processors and higher capable of running Solaris 11, and all x86_64 processors)

Authorizations and/or Permissions

To install the NJE Bridge, you need the following permissions/authorizations:

- A product activation key for this application. If you do not have one, contact Sine Nomine support as described in section “Reporting A Problem” on page 16.
- Root access on the system to receive the software installation (or appropriate permissions in `/etc/sudoers` to become root after login).

Configuration Information

To configure the software, you will need:

- A unique NJE node name for this system (8 characters or less). This name may be the same or an abbreviation of the IP hostname of the system, but must be 8 characters or less and unique within your NJE network.
- The IPv4 or IPv6 DNS hostname or IP address of the target system you wish to connect to via TCPNJE. Hostnames are preferred, but either will work.
- The NJE node name of the target system you wish to connect to via TCPNJE.
- The number of streams defined at the remote system for the NJE link to your system. The default is 1, however both ends of each NJE link between systems in your NJE network must agree on this parameter.
- The buffer size defined at the remote system for the NJE link to your system. The default size is 4096 bytes, however the actual size used will be negotiated at link startup.

Installation Steps

1. Retrieve the installation packages from the Sine Nomine support system using your support userid and password. Multiple access protocols are available; use the one compatible with your network configuration, firewalls and network policies. The `scp` method is generally simplest when working with Unix or Linux hosts.

An example of the retrieval process for the `x86_64` architecture is shown in Figure 7.

```
scp -r <userid>@scp.sinenomine.net: /<dir>/software/nje-sol-x86_64/* .
```

Figure 7. Retrieving Packages From The Support System (x86_64)

If you are installing the SPARC32 architecture, the command will appear similar to Figure 8.

```
scp -r <userid>@scp.sinenomine.net: /<dir>/software/nje-sol-sparc32/* .
```

Figure 8. Retrieving Packages From The Support System (SPARC32)

If you are installing the SPARC64 architecture, the command will appear similar to Figure 9.

```
scp -r <userid>@scp.sinenomine.net: /<dir>/software/nje-sol-sparc64/* .
```

Figure 9. Retrieving Packages From The Support System (SPARC64)

Replace `<userid>` with your support userid. Note the dot (`.`) at the end of the command to indicate that the files will be transferred to the current directory on your system.

2. Retrieve the Product Activation Key (PAK)

To retrieve your product activation key for the software, use the same userid and password you used to retrieve the software and copy the access key files as shown in Figure 10

```
scp -r <userid>@scp.sinenomine.net: /<dir>/keys/<arch>*.txt .
```

Figure 10. Retrieving the Product Activation Key (PAK)

Replace `<userid>` with your support userid and `<arch>` with the string from the repository you used to retrieve the code packages (see figures in previous step for options). Note the dot (`.`) at the end of the command to indicate that the PAK files will be transferred to the current directory on your system.

3. If the system you used to retrieve the packages is not the system to be used for installation, transfer the installation packages to the system to be used for the installation. Make sure you use a file transfer method that preserves binary data intact.

4. If you are not logged in as the root user, use `su` or `sudo` to enable root privileges. Your installation may have preferred methods to perform this activity; consult your local documentation for the preferred method to enable elevated privileges.
5. Install the NJE Bridge Code Package

To install the code package on all Solaris systems, execute:

```
pkgadd nje_solaris_sparc.pkg
. /etc/nje/postinstall.sh
```

Figure 11. Installing the NJE Bridge Packages on Solaris

Note the dot (.) at the beginning of the second line. The post-install script performs some cleanup that cannot be done within the scope of a System V package management tool.

6. Install the NJE Bridge Documentation Package

To install the code package on all Solaris systems, execute:

```
pkgadd nje_solaris_doc_sparc.pkg
```

Figure 12. Installing the NJE Bridge Doc Packages on Solaris

The documentation package does not have any executable files or code install steps required after installation, so no post-install script is required.

The NJE Bridge programs and documentation are now installed. See “Configuring the Software” on page 10 for information on configuration and setup of the software.

Configuring the Software

Installing the Product Activation Key (PAK)

The NJE Bridge code will not function without a product activation key installed. If you do not have a PAK, contact Sine Nomine Associates to obtain a PAK for your architecture.

To install the PAK:

1. Change directory to `/etc/nje`

```
cd /etc/nje
```

Figure 13. Change Current Directory to `/etc/nje`

2. Edit the PAK file using your preferred editor and note down the license key string. If your platform supports copy and paste, you may want to select the key string and copy it into a temporary buffer to avoid typing the string out in the next step.
3. Edit the file `nje.cf` and locate the `LICENSE` line at the end of the first group of configuration statements. Position the cursor at the end of this line.
4. Insert the key string at the end of this line. Type the string exactly as it appears in the key file (including capitalization and any punctuation). Your `nje.cf` file should appear similar to Figure 14.

```
*
*   Configuration file for NJE IP Bridge
*
NAME          PRODHUB
*ALIAS        NJE
IPADDRESS     localhost
*May be an IP address rather than a DNS name (not recommended)
*IPADDRESS    127.0.0.1
QUEUE         /var/spool/nje
TABLE         /var/run/nje.route
*INFORM       POSTMAST@NJENODE1
USEREXITS     /etc/nje/file-exit.cf
MSGEXITS      /etc/nje/msg-exit.cf
LLEVEL       1
*EBCDICTBL    /etc/nje/e2a.tbl
DEFFORM       STANDARD
DEFAULT-ROUTE FEDORA
CERTIFICATE   /etc/pki/nje
GROUP         nje
ADMGROUP      njeadmin
LICENSE       xxxxx-xxxxx-xxxxx-xxxxx-xxxxx
```

Figure 14. Example `nje.cf` File with PAK Installed

5. Save the `nje.cf` file and exit your editor.

The PAK is now installed.

Starting the Software Manually

Linux

To start the software manually, execute the following command as root:

- For systems using SysV init (RHEL6):

```
service njed start
```

Figure 15. Starting the Software Manually (RHEL6)

- For systems using systemd (RHEL7):

```
systemctl start nje.service
```

Figure 16. Starting the Software Manually (RHEL7)

Solaris

To start the software manually on Solaris, execute:

```
svcadm start nje
```

Figure 17. Starting the Software Manually (Solaris)

Stopping the Software Manually

Linux

To stop the software manually, execute the following command as root:

- For systems using SysV init (RHEL6):

```
service njed stop
```

Figure 18. Stopping the Software Manually (RHEL6)

- For systems using systemd (RHEL7):

```
systemctl stop nje.service
```

Figure 19. Stopping the Software Manually (RHEL7)

Solaris

To stop the software manually on Solaris, execute:

```
svcadm stop nje
```

Figure 20. Stopping the Software Manually (Solaris)

Configuring the Software to Auto-Start on Boot

Linux

The installation procedure sets the software to autostart on boot. If for some reason this gets reset, use the following steps to re-enable start on boot.

To autostart the software at boot time on systems using SysV `init`:

```
chkconfig 345 njed  
chkconfig njed on
```

Figure 21. Setting the NJE Bridge to Autostart (RHEL6)

To autostart the software at boot time on systems using `systemd`:

```
systemctl enable nje.service
```

Figure 22. Setting the NJE Bridge to Autostart (RHEL7)

Solaris

To autostart the software at boot time on Solaris, use:

```
svcadm enable nje
```

Figure 23. Setting the NJE Bridge to Autostart on Solaris

The software is shipped with a minimal test configuration installed. The next section exercises some of that test configuration to validate the installation of the software. Additional configuration information and detailed descriptions of the configuration statements can be found in the NJE Bridge Configuration Reference manual.

Validating the Installation

To validate that the installation process worked correctly, you can check the following steps.

1. Ensure that the configuration directory exists.

To verify the configuration directory exists, change your working directory to it with:

```
cd /etc/nje
```

Figure 24. Test Existence of Configuration Directory

You should see no error message.

2. Ensure that the critical configuration files exist

Verify that the critical configuration files by executing the following command:

```
ls -l
```

Figure 25. Verify Existence of Critical Files

You should see output like this:

```
-rw-r--r-- 1 root root 2942 Sep 16 17:00 cmd-help.txt
-rw-r--r-- 1 root root 2620 Sep 16 17:00 file-exit.cf
-rw-r--r-- 1 root root 3704 Sep 16 17:00 msg-exit.cf
-rw-r--r-- 1 root root 1582 Sep 16 17:00 nje.cf
```

Figure 26. Critical Configuration Files

Do not worry if the file sizes are somewhat different, or if the dates are different.

3. Ensure that spool directory exists and is owned by (and is writeable by) group nje.

`ls -ld /var/spool/nje` should produce output that resembles:

```
drwxrwxr-x 8 root nje 4096 Sep 22 19:02 /var/spool/nje
```

If these steps produce output similar to the examples, the product files are correctly installed.

Testing Basic Functionality

We now proceed to test basic functions of the software.

1. If the NJE Bridge is not running, start the software. Refer to “Starting the Software Manually” on page 11 for instructions on starting the software manually.
2. As root, run the ucp program.

```
/usr/bin/ucp
```

ucp should start and connect to the running NJE IP Bridge process. If you get an error message rather than the NJE-CP> prompt, stop here and verify that the NAME and IPADDRESS statements in /etc/nje/nje.cf are correct. If they are, and stopping and restarting the software does not solve the problem, contact support immediately.

3. Display the active lines.

```
SHOW LINES
```

This should display the LINE entries in the sample configuration. The output should look something like:

```
NJE-CP> show line
NJE0098I Line 0 CMSNJE Type: TCPv4 Status: LISTEN
          Files In/Out: 0 0 Bytes In/Out: 0 0 Buffer Size: 4096
NJE0098I Line 1 ZOS19 Type: TCPv4 Status: ACTIVE
          Files In/Out: 0 0 Bytes In/Out: 468876 113 Buffer Size: 4096
NJE0098I Line 2 ZOS112 Type: TCPv4 Status: ACTIVE
          Files In/Out: 25 0 Bytes In/Out: 165615975 4114 Buffer Size: 4096
```

4. Display the contents of the queue.

```
SHOW QUEUE
```

There should be no files queued. The sample output should appear something like:

```
NJE0170I CMSNJE    1 (NJE SERVICE) Disp: D State: SEND
          Size: 00000006 Org: FEDORA16.NEALE Dest: CMSNJE.NEALE
```

5. Exit the ucp control panel.

```
QUIT
```

6. If you do not wish to leave the software running, stop the software according to the steps in “Stopping the Software Manually” on page 11.

If the steps above completed successfully, your installation is validated, and you can begin creating your own NJE network.

If You Have Trouble

If You Have Trouble

Gathering Information About The Problem

Logging and Log Files

The application logs information to the general Unix system log using syslog's local0 facility.

Setting An Elevated Debugging Level

From the ucp control panel tool, use the command `LOGLEVEL 6`. This is the highest setting and will log the most debug data; levels between 1 and 6 log intermediate amounts.

What to Capture

To assist in debugging, capture the following files and submit them to support as email attachments when requested.

- The relevant portion of the log file from `syslog`.

The location of the file containing the local0 messages can differ between systems; examine the `syslogd.conf` file to determine where local0 messages are being logged.

Turning Debugging Off

From ucp, use the command `LOGLEVEL 1` to turn debugging messages back down to normal operational levels.

Reporting A Problem

Use the instructions supplied to open a trouble ticket per the instructions in your support contract. If requested by the support team, please send the log file demonstrating the problem at that point.

Helpful Hints While Working on the Problem

The following hints will help speed resolution of your issue.

- When reporting a problem, send problem reports to `support@sinomine.net`. You will receive an automated response containing your case number.
- While working with support, please preserve the subject line of the email and ensure that "[sinomine.net #nnnnn]" remains in the first 16 characters of the subject line of your replies. This allows the ticketing system to associate your replies with the problem report automatically, and keeps the flow of conversation connected.
- Please report only one issue per case. Reusing incident numbers confuses issues, and will delay resolution.

Appendix A. Other Helpful References

The NJE protocol is well-documented. The following sections describe where to find more information on the protocol and on the IBM implementations of NJE.

In the following sections, URL references, even if split across multiple lines, are to be entered as a single long string into the browser's location field.

NJE Protocol References

The best reference to NJE as a whole is unquestionably: *z/OS NJE Formats And Protocols* (IBM Document Number SA22-7539)

An earlier version (lacking TCPNJE), IBM Document Number SC23-0070-03, is publicly available at:

- http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/BOOKS/IEA1M503/CCONTENTS?SHELF=IEA1MB00&DN=SC23-0070-03&DT=19980414152716

For the initial definition of NJE transmission over TCP/IP, consult document "Definition of the BITNET II Protocol: A Technical Overview of VMNET" (Peter Olenick, Princeton University). It is available from:

- <http://www.funet.fi/pub/netinfo/BITNET/brf0002.text>

Connecting to IBM Implementations

RSCS Connections

For RSCS (including TCPNJE) configuration, use *VM RSCS Planning And Configuration*, IBM Document Number SH24-5219, available at:

- http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/download/DMTA2A03.pdf?DT=19990511213526

VSE/POWER Connections

For VSE, there are two primary reference books on NJE configuration. These books are:

- *VSE/POWER Networking*, IBM Document Number SC33-6735
<http://publibfp.boulder.ibm.com/epubs/pdf/iesnpe20.pdf>
- *VSE/POWER Administration and Configuration*, IBM Document Number SC33-6733
<http://publibfp.boulder.ibm.com/epubs/pdf/iespme30.pdf>

z/OS and JES2 Connections

NJE configuration documentation for JES version 2 (5740-XC6) is available in the following manuals:

- *MVS/SP JES2 Initialization and Tuning*, IBM Document Number SC23-0065
- *MVS/SP JES2 Commands*, IBM Document Number SC23-0064

- MVS/SP JES2 Logic, IBM Document Number LY24-6008

z/OS and JES3 Connections

NJE documentation for JES3 version 4 (5695-048) is available in the following manuals:

- JES3 V4 Initialization and Tuning Guide, IBM Document Number SC23- 0088
- JES3 V4 Initialization and Tuning Reference, IBM Document Number SC23-0089
- JES3 V4 Commands, IBM Document Number GC23-0090
- JES3 V4 Customization, IBM Document Number LY28-1026
- Diagnosis Reference, IBM Document Number LY28-1032

iSeries Connections

NJE setup examples are best documented in a IBM redbook shown below. The manuals for your release of the iSeries operating system are likely quite dated.

To read more about iSeries NJE implementation, consult:

- VSE/POWER and OS/400 NJE Configuration Guide, IBM document number GG24-4259-00

Note that this document includes only information about the IBM Systems Network Architecture (SNA) implementation of NJE; the utilities and system configurations used to transmit and receive information are the same when used with the NJE Bridge.

Appendix B. Your Comments are Welcome!

NJE Bridge: Installation Guide for Unix and Linux Systems

Use this form to tell us what you think about this manual, or send email to support AT sinenomine.net. If you have found errors in it, or if you want to express your opinion about how the information is organized or presented, or make suggestions for improvements, this is the form to use.

Be sure to include your name and email address (and optionally, a telephone number with country and area code) if you would like a reply.