

Technical Document

Linux N4 Supervisor

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niagara⁴

Linux N4 Supervisor

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About this Guide

This topic contains important information about the purpose, content, context, and intended audience for this document.

Product documentation

This document is part of the Niagara technical documentation library. Released versions of Niagara software include a complete collection of technical information that is provided in both online help and PDF format. The information in this document is written primarily for Systems Integrators. In order to make the most of the information in this book, readers should have some training or previous experience with Niagara 4 or NiagaraAX software.

Document content

This document provides installation details specific to the Niagara 4.2 N4Supervisor running on Red Hat Enterprise Linux 7/CentOS distribution on a specific PC platform.

Document change log

Updates (changes/additions) to this *Linux N4 Supervisor Notes* engineering notes document are listed below.

- December 13, 2016: In the "Linux N4Supervisor Notes" and "Troubleshooting" topics, added content regarding the "Too many files open" exception which can occur if the file descriptor (FD) limit for a distribution is set too low.
- August 5, 2016: Updated for Niagara 4.2. Many changes throughout including the following:
 - Updated the supported version of Red Hat Enterprise Linux to 7.
 - Noted change to the user/group "owning" a station running on a Linux N4Supervisor, it is now `niagara/niagara`.
 - There are a few changes to the directory structure for the N4.2 Linux N4Supervisor installation file, as well as changes to the contents of the installation directory.
 - Removed information describing installing a 32-bit Linux Supervisor since only 64-bit is supported.
 - Updated questions presented during the installation process.
 - Updated names of various scripts, replacing "AX" with "N4".
 - Added description of the `gradelew` script to the topic explaining `!/bin` contents.
 - Added description of the `install_common.sh` script to the topic explaining `!/install` contents.
 - Added note explaining the need to logoff of the Linux and back on again in order for shortcut to work properly.
 - Added procedure for Using the Linux Supervisor station template.
 - Removed outdated installation examples.
- An earlier version of Linux Supervisor documentation exists as the *Linux AX Supervisor Notes*.

Related documentation

Additional information about Linux Supervisor operation is available in the following documents.

- *Niagara 4 Platform Guide*
- *Linux AX Supervisor Notes*

Chapter 1 Linux N4Supervisor Notes

Topics covered in this chapter

- ◆ About installing the Linux N4Supervisor

Niagara 4.2 supports an N4Supervisor running on Red Hat Enterprise Linux 7/CentOS distribution on a specific PC platform (contact your Tridium sales channel for further PC platform details). This document provides installation details specific to this Linux N4Supervisor. For related details on Niagara 4 platform operation, see the *Niagara 4 Platform Guide* section "Linux-based N4Supervisor."

NOTE: Note that the station running on a Linux N4Supervisor is "owned" by a specially created user/group `niagara:niagara`, and therefore cannot bind to Linux "root owned" software ports 1-1024. This is not an issue for either of the conventional ports (secure: 5011, or non-secure: 3011) used for a platform connection, but does affect the standard port used by the station's WebService (Http Port), which cannot be used at the default port (80) setting. In addition, other software ports potentially used by various drivers must be adjusted above port 1024.

NOTE: Be aware that large Supervisor stations typically require more file descriptors than the default limit set for most distributions allows. The situation may occur where you have many concurrently open files (histories, alarms, etc.) which causes the exception, "Too many files open". This simply means the file descriptor limit is set too low. Use means available to increase the limit to a greater value.

About installing the Linux N4Supervisor

Once you have obtained the Linux N4Supervisor image, via CD or download, you will initially have a file on your machine named similar to `Vykon_N4_Supervisor_for_Linux_x64-4.2.n.zip`.

You can expand this file to examine its contents. To do that, change to the parent directory and enter the following command:

```
root@<host>:/home/<user># unzip <vendor>_<release version>_Supervisor_for_Linux_x64-n.n.#.zip
```

(For example, `Vykon_N4_Supervisor_for_Linux_x64-4.2.36.12.zip`).

The command expands the image and produces the directory hierarchy:

dist	folder
docs	folder
install-data	folder
javaodc	folder
modules	folder
overlay	folder
install.sh	shell script
INSTALL	installation instructions
README	README document
install_common.sh	Tar archive

Please review the README and INSTALL files. When you are ready to begin the installation process, type the following at the command prompt:

```
root@<host>:/home/<user># sudo bash install.sh
```

NOTE: You must type "`sudo bash install.sh`" in order to run the installer since elevated permissions are required to perform some operations during the installation,

This script steps you through the installation process by asking a series of yes/no questions, where the default choice appears in capital letters, that is YES or NO instead of yes or no. Press Enter to accept the default, or type "y" or "n".

Some of the more complicated questions include:

Would you like to configure which users can use Niagara 4 [YES/no] :

If you answer YES to this question, any user you provide will be added to the new group 'niagara', have permissions to start/stop/query the platform service, and have Desktop and Menu Icons installed to their home directory.

If you choose not to configure any users, you'll still be able to run the 'niagarad' software and Niagara 4, but it can only be controlled as 'root'.

If you want to add users later, use the command: `usermod -G -a niagara UserNameYouWantToAdd`

NOTE: There are also Linux bash scripts that you can run to add and remove users: `add_n4_user.sh` and `remove_n4_user.sh`. These are found in `/opt/Niagara/Niagara-<version>/install`. These scripts need to be executed with elevated permissions using `sudo`. For more details, see for description of the bash scripts.

NOTE: As a security precaution, only the user "niagara" may start and stop the niagarad process. The file `/etc/sudoers` can be modified to grant all users in the group "niagara" permission to start and stop the niagarad process.

Should the installer make the necessary modifications to `/etc/sudoers`? [yes/NO] :

This is a convenience. If you choose yes, then the `/etc/sudoers` entry required to allow members of the group 'niagara' to execute `/usr/bin/niagaradctl` as the user 'niagara' is automatically generated and added to the file `/etc/sudoers`. If you choose no, then the necessary entry will still be generated and logged, you will just need to manually modify the `/etc/sudoers` file through vim or visudo.

The remainder of the questions asked by the installer should not require explanation. The installer will ask you to review your choices and then it copies files. If the installer fails at any step, please send an email to Tri-dium support that specifies your Linux distribution, version, and the `install.log` file.

CAUTION: Important information is included at the end of the installation script. Please take the time to read this information and complete any additional steps it may ask you to do.

NOTE: After installation is complete, you must log off of the Linux operating system and then log on again. Only then will the shortcut to launch Workbench work.

Once you have installed Niagara 4.2, the default installation directory is `/opt/Niagara/Niagara-4.2.nn/`. Note, that you can select a different directory during installation. The following contents are in the installation directory:

bin	folder
cleanDist	folder
conversion	folder
defaults	folder
docs	folder
etc	folder
install	folder
jre	folder
lib	folder
logs	folder
modules	folder
security	folder

sw	folder
uninstall	folder

Linux N4Supervisor !/bin contents

In the N4Supervisor EC-Net 4.2.n/bin folder, find the following:

n4launcher

This file is the shell script responsible for launching Niagara 4 applications. It is used primarily by the Desktop and Menu entries as a means to automate the creation of a suitable runtime environment (that is, env variables); although, a user could use this script from the command line if they choose.

If this file is deleted, Desktop and Menu shortcuts will no longer work. It is not advised to change the contents of this file.

Default attributes are: `-r-xr-x- -- niagara:niagara`

gradlew

This file is a shell script responsible for downloading, if necessary, and launching `gradle` to build Niagara 4 modules. It corresponds to the `gradlew.bat` file in a Windows environment.

Default attributes are: `-rwxr-xr-x niagara:niagara`

lib*.so

These files are runtime libraries used by Niagara. They correspond to the `*.dll` files in a Windows environment. Deletion of any of these files will result in Niagara run time failure.

Default attributes are: `-rwxr-xr-x niagara:niagara`

.niagara

This file sets up the run time environment needed to run any Niagara 4 binary. It will properly initialize several important variables, such as `LD_LIBRARY_PATH` and `NIAGARA_HOME`. This script can be sourced at the command line to allow you to launch Niagara 4 binaries, such as `wb`, from the command line at a later time. Deletion of this file will prevent Desktop and Menu shortcuts from functioning properly, as well as `n4launcher` and `niagaradctl`. Do not modify the contents of this file as it is custom generated at install time for Niagara 4.

Default attributes are: `-rwxr-xr-x niagara:niagara`

niagarad

This file is the niagara daemon, aka platform daemon. It corresponds to the file `niagarad.exe` in a Windows environment. Do not execute this file manually, as it should only be controlled (e.g, started/stopped) by the script `niagaradctl`. Deletion of this file will prevent the `niagaradctl` script from functioning properly and will prevent you from making platform connections to your host in "wb". Do not delete or modify this file in any way.

Default attributes are: `-r-x----- niagara:niagara`

niagaradctl

This file is the control script for `niagarad`. It is used to start, stop, and query as to the status of `niagarad`. Symbolic links from `/etc/init.d` and `runlevel` directories are made to this file at service installation time. This script may be executed by any users who are configured to use `niagarad` (done at installation time) to manually start, stop, restart or query the `niagarad` service. Deletion of this file will prevent `niagarad` from running as a service, and will prevent `niagarad` from starting at boot time, and stopping at restart/reboot time. Do not delete or modify the contents of this file in any fashion.

Default attributes are: `-rwxr-xr-x niagara:niagara`

niagaradlog

Executing this script allows you to see any output from `niagarad`. `niagarad` is run as a service and therefore its standard output is redirected to an internal logging service. This script will locate the logs generated by `niagarad` and print them to the screen. Deletion of this file will prevent you from seeing `niagarad` output externally from Niagara applications (that is, you'll still be able to see it in "wb").

Default attributes are: `-rwxr-xr-x niagara:niagara`

nre

This file is responsible for launching the Niagara Runtime Environment (NRE). It corresponds to the `nre.exe` file in a windows environment. Deletion of this file will prevent you from being able to query the NRE externally from other Niagara applications, for example for `hostid`.

Default attributes are: `-rwxr-xr-x niagara:niagara`

station

This file is responsible for launching Niagara stations on your platform. It corresponds to the `station.exe` file in a Windows environment. Deletion of this file will prevent you from launching any stations on your local platform, pretty much rendering your N4Supervisor useless.

Default attributes are: `-rwxr-xr-x niagara:niagara`

test

This file is responsible for running predefined test cases against the NRE. It corresponds to the `test.exe` file in a Windows environment. This file is not critical, but deletion of this file will prevent you from testing the Framework.

Default attributes are: `-rwxr-xr-x niagara:niagara`

wb

This file is responsible for launching `wb`, that is Workbench. It corresponds to the file `wb.exe` in a Windows environment. Deletion of this file will prevent you from launching `wb`.

Default attributes are: `-rwxr-xr-x niagara:niagara`

Linux N4Supervisor !/install contents

In the N4Supervisor `Niagara-4.2.n/install` folder, find the following:

install_common.sh

This script contains constants and functions used by other scripts, including but not limited to `add_n4_user.sh` and `install_service.sh`. This script should not be executed. Do not delete or modify the contents of this file in any fashion.

Default attributes are: `-r-xr-x- -- niagara:niagara`

add_n4_user.sh

This script is responsible for adding users on this platform to the user group that is eligible to start and stop the Niagara 4 daemon. This process is also available when initially running `install.sh` but this standalone script permits the addition of users after installation has taken place. This script needs to be executed with elevated permissions using "sudo".

Default attributes are: `-r-xr-x- -- niagara:niagara`

install_service.sh

This script is responsible for installing the Niagara 4 Platform Service, also referred to as “niagarad”. You will need root privileges to successfully run the script. It can be run as a stand-alone installer and does not require or rely on `install.sh` at all. When run, the script will install (but not start) the platform daemon of that version of Niagara 4, overwriting any other Niagara 4 daemon currently installed on that platform.

This means you can use this script to switch between Niagara 4 installations on your platform. Once completed, you may start the service from the command line or simply reboot. The script relies on `niagarad_generic`, and as such, might fail to function properly if that file is significantly modified. If deleted, you will be unable to switch the platform daemon between multiple Niagara 4 installations on your machine. Aside from the fact that this script does not start the daemon upon completion, it corresponds to the **Install Platform Daemon** command available in a Windows environment. For details, see “Installing the platform daemon”.

Default attributes are: `-r-xr-x- -- niagara:niagara`

niagarad_generic

This file is a cache of the original code used to generate `niagaradctl` used by `install.sh`. The contents of this file are concatenated to `niagaradctl` at its creation following the generation of platform dependent code during `install.sh` and `install_service.sh` runtime. Deletion of this file, or more than trivial modification will prevent you from successfully reinstalling the platform service, i.e. `install_service.sh`.

Default attributes are: `-rwxrwxr-x niagara:niagara`

remove_n4_user.sh

This script is responsible for removing users on this platform from the user group that is eligible to start and stop the Niagara 4 daemon. This process is also available when running `uninstall.sh` but this standalone script permits the removal of users without completely uninstalling Niagara 4. This script needs to be executed with elevated permissions using “sudo”.

Default attributes are: `-r-xr-x- -- niagara:niagara`

Linux N4Supervisor !/uninstall contents

In the N4Supervisor EC-Net 4.2.n/uninstall folder, find the following:

uninstall_service.sh

This script is responsible for uninstalling the Niagara 4 Platform Service, aka **niagarad**. You need root privileges to successfully run the script. It can be run as a standalone uninstaller, and will not remove the complete Niagara installation from your platform, just the service. This script is provided as a convenience for users who would like to prevent **niagarad** from starting at boot-time, or would like to disable the Niagara installation temporarily, rather than remove it completely. Modification of this file may prevent it from successfully completing. For details, see “Uninstalling the platform daemon”.

Default attributes are: `-r-xr-x- -- niagara:niagara`

uninstall.sh

This script is responsible for completely removing the Linux N4Supervisor from your platform. In a Windows environment, this script corresponds to `uninstall.exe`. You will need root privileges to successfully run the script. It steps you through the uninstallation process via a series of yes or no questions. In order to safely and efficiently remove Niagara 4, it uses a configuration file generated at installation time named `uninstall.conf`. For details, see “Uninstalling the Linux N4Supervisor.” However, if this file is missing, the uninstaller can still be executed successfully (but it may ask unnecessary questions, and/or report incorrect information). If this file is significantly modified, you may be unable to remove Niagara via an automated process—and you just have to do it manually file by file.

Default attributes are: `-r-xr-x- -- niagara:niagara`

uninstall.conf

This file is created at installation time based on the configuration of Niagara 4 (install service, doc, dist, etc.) you chose to install. The key/value pairs in this file are used to efficiently remove Niagara when running the script `uninstall.sh` by asking questions tailored for your platform. Modification or deletion of this file will not prevent you from uninstalling Niagara, but it might cause the script `uninstall.sh` to ask questions, and attempt to remove items, not tailored for your platform.

Default attributes are: `-r- -r- -r- - niagara:niagara`

Chapter 2 Common tasks

Topics covered in this chapter

- ◆ Using the NewSupervisorStationLinux template
- ◆ Interacting with the platform daemon
- ◆ Starting the platform daemon
- ◆ Stopping the platform daemon
- ◆ Reinstalling the platform daemon
- ◆ Uninstalling the platform daemon
- ◆ Uninstalling the Linux N4Supervisor
- ◆ Troubleshooting

Using the NewSupervisorStationLinux template

Niagara 4.2 provides a Linux Supervisor station template. The resulting station's Web Service is configured for HTTP on port 8080 and HTTPS on port 8443. Note, that you need to add a rule in your network firewall to allow data transmission on these ports.

Prerequisites:

- The Niagara 4.2 successfully installed

Step 1 In Workbench, click **Tools→New Station**.

Step 2 In the New Station wizard, click the **Linux Supervisor** station template and click **OK**.

The wizard steps you through the process of creating the station. For detailed information on creating a new station, see "Creating a new station" in *Getting Started with Niagara*.

Step 3 In the new station's Services node, expand **WebServices** and confirm configuration of the following port settings:

- HTTP = 8080
- HTTPS = 8443

Step 4 In the system firewall, set up rules to do the following:

- redirect HTTP port 80 (external) to port 8080 (internal)
- redirect HTTPS port 443 (external) to port 8443 (internal)

This will make it appear to a remote client that the web server is running on port 80, but all requests sent to port 80 are redirected to port 8080 where the Niagara Web Server is listening for them. Similarly, requests sent to port 443 are redirected to port 8443.

Interacting with the platform daemon

Once Niagara has been installed, you will be able to control the platform daemon, 'niagarad', through the control script `niagaradctl`. This script can be found in the `! /bin` directory of your Niagara installation or from the symbolic link `'/usr/bin/niagaradctl'`.

Step 1 At the command line, type `niagaradctl`, as shown:

```
<user>@<host>:/usr/bin# niagaradctl

Usage: n4d {start|stop|restart|status}
```

Where 'n4d' stands for "Niagara 4 Daemon", and it is the name presented to the operating system to associate with this service (niagarad). As you can see, with this script, you will have the ability to start, stop, restart and query the platform daemon.

Starting the platform daemon

This procedure describes commands to start the LinuxN4Supervisor platform daemon and to verify that it is running.

Step 1 Type the following at the command line to start the platform daemon on a Linux N4Supervisor:

```
<user>@<host>:/usr/bin# niagaradctl start
Starting Niagara Daemon: [ OK ]
```

Step 2 Type the following at the command line to verify that the daemon has started:

```
<user>@<host>:/usr/bin# niagaradctl status
niagarad (pid 4815162342) is running...
```

The platform daemon is now running on your platform and can accept platform connections.

Stopping the platform daemon

This procedure describes commands to stop the Linux N4Supervisor and to verify that it is not running.

NOTE: You rarely stop the platform daemon (and station) on any N4Supervisor, except immediately before installing a new point release (an upgrade).

Step 1 At the command line, type the following to stop the platform daemon.

```
<user>@<host>:/usr/bin# niagaradctl stop
Stopping Niagara Daemon: [ OK ]
```

Step 2 Type the following at the command line to verify that the daemon has stopped:

```
<user>@<host>:/usr/bin# niagaradctl status
niagarad is stopped
```

Reinstalling the platform daemon

To reinstall the platform daemon on a Linux N4Supervisor for a particular version of Niagara 4 you will have to execute the script 'install_service', found in the Niagara "install" directory. It is not necessary to execute this script after a successful Niagara 4 installation, as that process will automatically install the platform daemon.

Prerequisites:

- You need to be acting as root to accomplish this task.

The main reasons for executing this file are:

- You have accidentally broken your Niagara environment and you want to repair it.
- You have two versions of Niagara installed on your platform, and you want to change which platform daemon is started/controlled by '/usr/bin/niagaradctl'.

Step 1 To change to the target release's install directory, type the following:

```
root@<host>:/usr/bin# cd <targetNiagaraReleaseDirectory>/install
```

Step 2 To issue the `install_service.sh` command, type the following:

```
root@<host>:/opt/Niagara/Niagara-4.n.nn/install# bash install_service.sh
```

The platform daemon (service) is installed, but not started. See "Starting the platform daemon".

NOTE: After installation is complete, you must log off of the Linux operating system and then log on again. Only then will the shortcut to launch Workbench work.

Uninstalling the platform daemon

To disable the platform daemon at start up, that is remove the Niagara 4 scripts in `/usr/bin` and `/etc/init.d`, you have to execute the `uninstall_service` script, found in the `/uninstall` directory. It is not necessary to execute this script prior to running main Niagara 4 uninstallation script, as it will uninstall the service, and more, on its own.

Prerequisites:

- You need to be acting as root to accomplish this task.

Step 1 To change to the target release's uninstall directory, type:

```
root@<host>:/usr/bin# cd <targetNiagaraReleaseDirectory>/uninstall
```

Step 2 To issue the `uninstall_service.sh` command type:

```
root@<host>:/opt/Niagara/Niagara-4.2.n/uninstall# bash uninstall_service.sh
```

The platform daemon (service) is uninstalled. The service can be safely reinstalled using the `install_service.sh` command. See "Installing the platform daemon".

Uninstalling the Linux N4Supervisor

This procedure describes the commands to completely uninstall a version of Niagara from your Linux N4Supervisor machine, by executing the `uninstall.sh` script found in the Niagara 4 `/uninstall` directory.

Prerequisites:

- You need to be acting as root to accomplish this task.

Step 1 To change to the target release's uninstall directory, type:

```
root@<host>:/usr/bin# cd <targetNiagaraReleaseDirectory>/uninstall
```

Step 2 To issue the `uninstall.sh` command, type:

```
root@<host>:/opt/Niagara/Niagara-4.2.nn/uninstall# bash uninstall.sh
```

The uninstallation procedure is very similar to that of the Windows environment, and the script steps you through the process. Once finished, please make sure you read and following any additional instructions that were not automated by the script.

Troubleshooting

Tips for troubleshooting issues that you may encounter when installing or running a Linux N4Supervisor:

- error while loading shared libraries**

This error can happen with any of shared libraries in NiagaraAX: `libnre.so`, `libplatform.so`, or `libjvm.so`. Although these libraries are probably installed on your machine, the shared library loader cannot locate them. This mostly likely means you have not sourced the script `'.niagara'`.

As user `root`, from your installation's `/bin` directory, type the following:

```
root@<host>:/opt/Niagara/Niagara-3.8.n/bin# ./.niagara
```

Then try whatever command you used to produce this error again (`wb`, `nre`, `niagarad`, `station`).

- java.net.BindException**

This error can happen when starting a station. In the Linux OS, ports 1-1024 are "root ports," meaning only an application running with `root` privileges may bind to them. Since `'station'` is running as the user `'niagara'` (who does not have root privileges), it cannot bind to port 80. If you have not configured your station to start on a port above 1024, you will see this error.

To fix this error, configure your station to start its WebService bound to port 8080, or another port above 1024.

NOTE: In N4.2, the Linux Supervisor station template is provided which creates a new station with the WebService already configured for HTTP on port 8080 and HTTPS on port 8443. You will still need to set-up firewall rules to redirect port 80 to 8080, and port 443 to 8443.

- **too many files open exception**

Large Supervisor stations typically require more file descriptors than the default number set for most distributions. The situation may occur where you have many concurrently open files (histories, alarms, etc.) which causes the exception, "Too many files open". This simply means the file descriptor (FD) limit is set too low. Use `ulimit` to increase the limit to a greater value.

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