HPC Software License Management Guide

2nd Edition (October 2018)

Preface

This document describes about license management of the licensed products of HPC System software.

Trademarks and copyright

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1. Introduction

1.1. Overview

This guide explains how to manage the licenses of the NEC HPC System Software and how to setup the license server to use HPC system software.

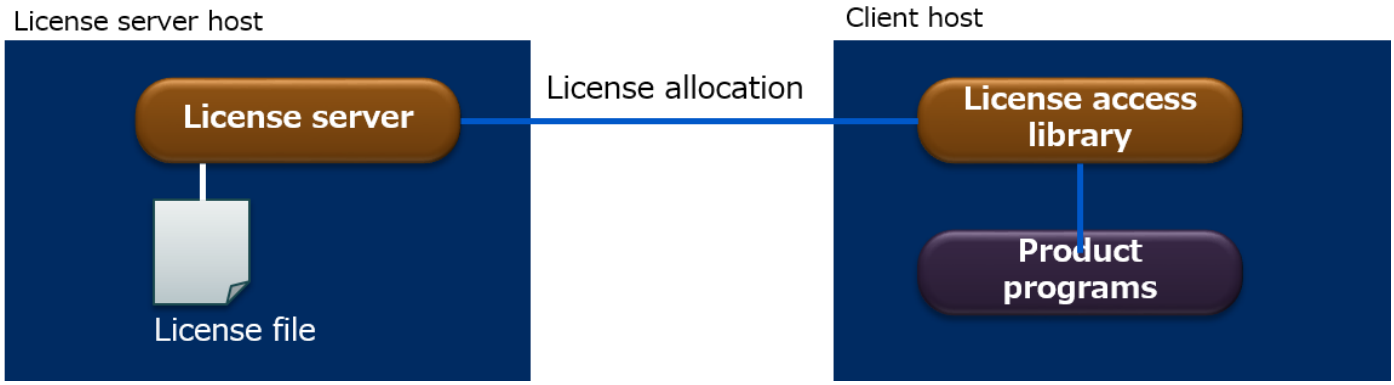
1.2. Glossary

The table below lists terms used in this document.

Table 1. Glossary

Terms	Description
License server	The license server function used to manage the HPC System Software License. The licensed software of the HPC System Software should be used with this license server. To use the license server, the license server should be installed on a definite host and its service should be enabled. * The host on which the license server is running is called as license server host below.
License access library	The library that is used by the licensed programs to access the license server. This library should be installed on the hosts on which the licensed program is executed.
HPC System Software's License Issuing Web System	The license issuing system for the HPC System Software. This page can be accessed from the URL: https://www.hpc-license.nec.com/aurora/
License Issue Key	The key code which is individually given to each licensed product for the HPC System Software. License Issue Key is required to issue licenses for the products. The description form is *NNNNNN-NNNNNN-NNNNNN-NNNNNN-NNNNNN*.
License file	The file in which contains HPC System Software license information. This file is issued by HPC System Software's License Issuing Web System.
Heartbeat	In this document, heartbeat means the periodic communication that shows an HPC system software program (daemon) is using the license to the license server.

1.3. Software Layout



The HPC System Software licenses are managed by the license server based on the license information in the license file located on the license server.
When using the HPC System Software product, the target software's program gets required license count from the license server by connecting to it through the license access library at the startup of the program.

1.4. Target Products

The following HPC System Software products require the license management described in this guide.

Table 2. Target Products

Products	Product Codes	Description
NEC Software Development Kit for Vector Engine (SDK)	UWAA00-N10E-I	License number defined by the product code is used to limit number of executing users of C/C++ compiler and Fortran compiler.
	UWHAA00-H101E-I	
	UWAA00-N1xE-I (x=1,2,3)	
	UWHAA00-H1xyE-I (x=1,2,3,y=1,3,5)	
NEC MPI (MPI)	UWAB00-N1xE-I (x=1-9,A)	License number defined by the product code is used to limit maximum VEs executed in each MPI program.
	UWHAB00-H1xE-I (x=1-9,A)	
NEC Scalable Technology File System/Server (ScaTeFS Server)	UWAD00-N11E-I	License number defined by the product code is used to limit number of IO servers in operation.
	UWHAD00-H11E-I	
NEC Scalable Technology File System/Client (ScaTeFS Client)	UWAE00-N1xE-I (x=1-7)	License number defined by the product code is used to limit number of client hosts.
	UWHAE00-H1Ex-I (x=1-7)	
NEC Network Queuing System V/JobServer (NQSV/JobServer)	UWAG00-N1xE-I (x=1-8)	License number defined by the product code is used to limit number of whole CPUs (sockets) used in the NQSV system.
	UWHAG00-H1xE-I (x=1-8)	
NEC Network Queuing System V/JobManipulator (NQSV/JobManipulator)	UWAH00-N1xE-I (x=1-8)	
	UWHAH00-H1xE-I (x=1-8)	

1.5. Requirements

The following environments are required to use the license server to manage the HPC system softwares.

- H/W A computer with x86_64 architecture processor.
  Network interface card
  2GB System memory (or more)
  1GB Hard disk capacity (or more)
- OS Red Hat Enterprise Linux 7.3 (or higher)
  or
  CentOS 7.3 (or higher)

1.6. How to use the license

The license management of the HPC System Software is performed as following sequence. The details of the license management sequence is described in the latter chapters.

(1) Determining the hosts

First, determine the license server host and the hosts for the compilers (C/C++ compiler and Fortran compiler). The host information is needed for getting the license file.

(2) Getting the license file

Access to the HPC System Software license issuing system and perform the required software license issuing operation by using the license issue key which is attached to the product. And download the license file which contains the license information.

(3) Getting the license server and license access library

Download the license server package and the license access library package from the HPC System Software license issuing system or from the designated download site for the NEC HPC System Software.

(4) Installing the license server and environment settings

Install the license server package in a license server host. And locate the license file and perform the license server's environment settings.

(5) Starting the license server

Start the service of the license server.

(6) Client environment settings

Install the license access library on all hosts (client hosts) that the HPC System Software will run on. And set the destination license server's configuration on the hosts.

2. How to manage license

2.1. Host specification

For the SDK product in the HPC System Software products, the target programs (C/C++ compiler and Fortran compiler) can be executed only on the hosts specified in the license file.
Therefore the licenses of the SDK products should be issued by specifying the execution hosts of the programs.

2.2. License count

A positive number is set in each license of the HPC System Software product as the license count. The target products use the license to start their programs or to execute their functions. And the license count means the maximum number of licenses that can be used simultaneously by the programs.
How to use the license count is different by the products. How the license of each HPC System Software is issued and how the license count is used in the software are described as follows.

Table 2. Number of License for each Software

Products	Issuing the license	How to use the license count
SDK	♦ Licenses of the C/C++ compiler and the Fortran compiler are issued for purchased SDK products. And the each licenses are associated to the compiler's execution hosts. ♦ The license count set in the C/C++ and Fortran license information is equal to the total number of the license counts defined by the purchased product codes. ♦ The number of issuing C/C++ and Fortran licenses (number of execution hosts) is limited to the value of the license count included in the license information.	The license count of the SDK license defines the number of maximum concurrent execution users(*) of C/C++ compiler and Fortran compiler through the all execution hosts of the compilers. For each compiler (C/C++ and Fortran), concurrent executions are limited to the value of the license count. (*) The number of users is the total value of the number of execution users counted on each host.
MPI	♦ Licenses are issued for each products. ♦ The value of license count set in the license information is defined by the product code of each software products. ♦ When two or more pieces of the same product are purchased, the license of the product has the total value of the license count, (the license count defined by the product code) x (purchased count) as the license count of its product's license.	The license count of the MPI license defines the maximum number of VEs that MPI program uses in its execution. The execution of an MPI program which uses VEs over the license count will be denied.
ScaTeFS Server		The license count of the ScaTeFS Server's license defines the maximum number of the ScaTeFS Server hosts. The number of ScaTeFS Servers over the license count cannot be operated.

ScaTeFS Client		The license count of the ScaTeFS Client's license defines the maximum number of the ScaTeFS Client hosts. The number of ScaTeFS Clients over the license count cannot be operated.
NQSV		The requested number of licenses for the NQSV components are allocated to the NQSV Batch server from the license server. And the license server can assign the number of licenses to one or more NQSV Batch servers, however, the total number of licenses for each NQSV component is limited to the license count of the component.

3. Getting a license file

3.1. Product license

A license issue key is attached in each purchased HPC System Software product. In order to get a license file, you will need to access the HPC System Software license issuing system and input required information including the license issue key. Then the license file can be downloaded from the system after the issuing operations.

The HPC System Software license issuing system can be accessed from the following URL.

https://www.hpc-license.nec.com/aurora/

To begin with, user registration is needed at the HPC System Software license issuing system in order to get a license file from there. The HPC System Software license issuing system manages the issued licenses by each user.

In the operation of the HPC System Software license issuing system, the following information is needed to get the license. Please prepare the information before signing in.

- User name and its password (Registration is needed at the first access.)
- License Issue Key
- License server's hostname and host ID
- Host name and its host ID for the host on which the compilers are used.

The host names and host IDs can be confirmed as the following way.

- Host ID of the license server host

  The HPC System Software license uses MAC address of a computer as the host ID. The MAC addresses of the network interface cards mounted on a license server host can be confirmed by the following method.

```
$ ip address
        :
2: eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast master br0 state UP qlen 1000
    link/ether XX:XX:XX:XX:XX:XX brd ff:ff:ff:ff:ff:ff
        :
```

- Host names and Host IDs of the computers on which the compilers in the SDK product are installed (in case a license of the SDK product is needed).

  For the SDK product, it is necessary to determine the hosts on which the C/C++ compiler and the Fortran compiler are used. So the host names and the host ID of the compiler's execution hosts should be get before the license issuing.

  The HPC System Software license uses the primary host name (displayed by 'hostname' command) as the host name. And the MAC address is used for the host ID.

When issuing the license on the HPC System Software license issuing system, the license issue key and the

host information are required. Please refer to the HPC System Software license issuing system for the details of the issuing steps.

3.2. Trial license

Before purchasing the products, a trial license ca be used to evaluate the software.
The available period of the trial license is 180 days from the day the license is issued.
The license count of the trial licenses of each products are as follows.

Table 4. License count of trial licenses

Products	License Count	Description
SDK	1	Number of compiler's execution host= 1. And only 1 compiler process can be used at one time.
MPI	2048	Only MPI program which uses 1VE can be executed.
ScaTeFS Server	2	ScaTeFS Servers can be operated on maximum 2 host (in a redundant operation)
ScaTeFS Client	8	Number of ScaTeFS Client hosts is up to 8.
NQSV/JobServer	16	Number of CPUs (sockets) operated by NQSV is up to 16.
NQSV/JobManipulator	16	

For the trial license, it is necessary to do the issuing operations on the license issuing system and to download license file, as with product licenses. For issuing the trial license, license issue key is not needed, but the host id of the license server, host name of compiler's execution hosts and their host IDs are required to issue trial licenses. Compiler's execution host names and host IDs are needed only for SDK product's trial licenses.

4. Getting License server and License access library

The license server and the license access library needed to manage HPC system software's license can be downloaded from the HPC System Software license issuing system or the following download site.

- HPC System Software license issuing system
  https://www.hpc-license.nec.com/aurora/

The software packages to be downloaded are as follows.

License server:	aurlic-server-*X.X-X*.x86_64.rpm
License access library:	aurlic-lib-*X.X-X*.x86_64.rpm

Note: This document is for the version 1.2 or later of the packages.

5. Installation and Environment settings of the license server

5.1. Installation

Install the downloaded package of the license server on the license server host. By super-user, rpm command is run as follows to install the license server. All the following operations should be executed by super-user.

```
# rpm -ihv aurlic-server-X.X-X.x86_64.rpm
```

5.2. Location of the license file

Locate the license file which is got from the HPC System Software license issuing system under /opt/nec/aur_license directory.

```
# cp license.dat /opt/nec/aur_license
```

Note: Be sure not to edit/change the license file.

5.3. Registration of license issue keys

When using product licenses, the license issue keys that are used in the issuing procedure should be registered on the license server host.

To register the license issue keys, execute /opt/nec/aur_license/bin/reg_serialkey command for each license issue keyas follows. If you have two or more license issue keys, register all the license issue keys for the licenses set in the license file.

```
# /opt/nec/aur_license/bin/reg_serialkey NNNNN-NNNNN-NNNNN-NNNNN-NNNNN
```

After registration, reg_serialkey command also can be used to confirm the registration result as follows. When the registration is done successfully, "OK" will be displayed.

```
# /opt/nec/aur_license/bin/reg_serialkey --check
OK
```

If OK is not displayed, please confirm the license issue key or confirm that all license issue keys for the licenses listed in the license file has been registered.

5.4. Settings of the license server

The settings of the license server are done by editing /opt/nec/aur_license/aur_license.conf file.

The setting items are as follows.

(1) Port number

The license server communicate with the client program which uses the licenses by TCP/IP. The license server's TCP port number can be changed by this item. The default port number is 7300.

(2) Heartbeat interval

The license server requires heartbeat communications with ScaTeFS/Server, ScaTeFS/Client and NQSV batch server. The interval of the heartbeat communications is set to 1 day (24 hours) by default. By the heartbeat, the license server recognize the clients are using allocated licenses. Therefore, when

a client program accidentally dies, the license server treats the client is using the license and the license used by the dead client will not be allocated to other client until the heartbeat timeout.
So if you need that the license of abnormally terminated client can be used by other client in a short time, it is necessary to change this setting to smaller value.
However short heartbeat interval causes increase in communication between the license server and clients, and it is concerned that it makes the license server's load rise too much depending on the number of the clients. So it is necessary to determine an appropriate value by considering the number of clients.

(3) Heartbeat timeout factor

The heartbeat timeouts when the time of (the heartbeat interval) + (the heartbeat interval) * (the heartbeat timeout factor) passed without heartbeat communications.
The default value of the heartbeat timeout factor is 1.0. So the heartbeat timeouts after 48 hours (24 + 24 * 1.0) without heartbeat communications by default.

(4) Log level

The license server writes error messages and other miscellaneous information to the log file.

/var/opt/nec/aur_license/license.log

The license server has the following 4 log levels, and one of these levels can be used in its operation.

- error

  Only error messages are output.
- warning

  In addition to error messages, warning messages are output.
- info

  In addition to error and warning messages, license server's operational information is output.
- debug

  Also debug messages are output.

Default setting of the log level is "info".

For the configuration of aur_license.conf file, each items are written in separate lines. And each lines should be written in the syntax as follows.

Title=Value

The titles and their values of the items are as follows.

Table 5. Settings for license server

Items	Titles	Values
Port number	License_server_port	Specify a port number in decimal.

Heartbeat interval	Heartbeat_interval	Specify a heartbeat interval in minutes. (Default＝1440 (24 hours))
Heartbeat timeout factor	Heartbeat_timeout_factor	Positive decimal number (with or without a decimal point) (Default=1.0)
Log level	Loglevel	“error”, “warning”, “info” or “debug” (Default = ”info”)

Example of aur_license.conf

```
License_server_port=7300
Heartbeat_interval=1440
Heartbeat_timeout_factor=1.0
Loglevel=info
```

5.5. Settings for firewall

When the firewall is enabled, settings for firewall are needed for the license server to communicate using the port number described above. The settings can be performed by firewall-cmd command as follows.

```
# firewall-cmd --add-port=7300/tcp --permanent
# firewall-cmd --reload
```

This example shows the case of port number=7300.

If the firewall is disabled, skip this settings.

That's all for the license server's settings.

5.6. Files

Table 6. Files for the license server

Files	Description
/opt/nec/aur_license/license.dat	License file
/opt/nec/aur_license/aur_license.conf	Configuration file
/var/opt/nec/aur_license/license.log	Log file

6. Operation of the license server

6.1. Start and stop of the license server

After the location of license file, registration of the license issue-keys, settings of the license server and firewall's settings, start the license server. To start the license server, execute systemctl as follows.

```
# systemctl start aurlic-server.service
#
```

After starting the license server, license server's status can be confirmed by systemctl command.

```
# systemctl status aurlic-server.service
* aurlic-server.service - Vector System License Server
   Loaded: loaded (/usr/lib/systemd/system/aurlic-server.service; disabled; vendor preset: disabled)
   Active: active (running) since Mon 2018-01-01 00:00:01 JST; 2s ago
  Process: 2268 ExecStart=/opt/nec/aur_license/bin/aur_license_server (code=exited, status=0/SUCCESS)
 Main PID: 2269 (aur_license_ser)
   CGroup: /system.slice/aurlic-server.service
           `-2269 /opt/nec/aur_license/bin/aur_license_server

Jan  1 00:00:01 sv-host systemd[1]: Starting Vector System License Server...
Jan  1 00:00:01 sv-host aur_license_server[2268]: Warning: License expired. (line=3)
Jan  1 00:00:01 sv-host systemd[1]: Started Vector System License Server.
```

Even when the license server starts successfully, ' systemctl status' might show some warning messages. The example above shows the case that there is an expired trial license in the license file.

In such case, check the license file.

To stop the license server, execute systemctl as follows.

```
# systemctl stop aurlic-server.service
#
```

And to automatically start the license server at OS boot, execute systemctl as follows.

```
# Systemctl enable aurlic-server.service
Created symlink from /etc/systemd/system/multi-user.target.wants/aurlic-server.service to
/usr/lib/systemd/system/aurlic-server.service.
#
```

6.2. Updating the license file

When you migrate the license from a trial license to a product license, and when you add a license of other product, it is necessary to update the license file. Updating the license file can be performed during operation of the license server. The update sequence is as follows.

(1) Replace the license file

Replace the license file, /opt/nec/aur_license/license.dat to a new one issued by the license issuing system.

```
# cp license.dat /opt/nec/aur_license/license.dat
```

(2) Register license issue keys

When you add a new product, register the license issue key of the product on the license server host.

```
# /opt/nec/aur_license/bin/reg_serialkey NNNNN-NNNNN-NNNNN-NNNNN-NNNNN
```

(3) Reload license file

By executing systemctl command as follows, make the license server to reload the license file.

```
# systemctl reload aurlic-server.service
```

So the license server will start operation with the new license file.

7. Settings on clients

On all hosts on which the HPC System Software is executed, client settings to be able to connect to license server are required.

Note: When you setup VH environment of SX-Aurora TSUBASA system, please refer to "SX-Aurora TSUBASA Installation Guide".

7.1. Installing license access library

Install the license access library package on all client hosts.

```
# rpm -ihv aurlic-lib-X.X-X.x86_64.rpm
```

7.2. Configuration for destination license server

On client hosts, it is required to set information of the license server from which the HPC software programs will allocate licenses.

There are two methods to set license server from which the client programs will allocate licenses.

(1) Configuration file

When all the programs on a client host use the same license server, the configuration file /opt/nec/aur_license/aur_license.conf can be used to set the license server information such as hostname and port number.

The configuration file's syntax is the same as described in 5.4. Settings of the license server. The items to be set are hostname and port number as follows.

Table 6. Client settings

Items	Titles	Values
Hostname of license server	License_server_host	Hostname string
Port number	License_server_port	Port number (decimal)

Example of aur_license.conf

```
License_server_host=sv_host
License_server_port=7300
```

(2) Environment variables

For the client programs (C/C++ compiler, Fortran compiler, daemon program of ScaTeFS, NQSV Batch Server. NEC MPI), destination license server can be set to each program's process by using the following environment variables.

Table 7. Environment variables to set destination license server

Items	Environment variables
Hostname of license server	AURLIC_SERVER_HOSTNAME
Port number	AURLIC_SERVER_PORT

Example using bash

```
$ export AURLIC_SERVER_HOSTNAME="sv_host"
$ export AURLIC_SERVER_PORT="7300"
```

The setting by the environment variables is prior to the configuration file.

8. Updating license server / license access library

When updating of license server or license access library is needed, perform the update as follows on required hosts.

- Updating of license server

  Get an update package for license server and apply the update package on the license server host as follows.

```
# rpm -Uvh aurlic-server-X.X-X.x86_64.rpm
```

- Updating of license access library

  Get an update package for license access library and apply the update package on client hosts as follows.

```
# rpm -Uvh aurlic-lib-X.X-X.x86_64.rpm
```

If "How to apply the package" is specified in particular for the package, follow the specification.

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NEC Corporation