

# SX-Aurora TSUBASA

SX-Aurora TSUBASA

Setup Guide

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# Preface

This document is intended for first-time users of the SX-Aurora TSUBASA, and explains how to set up the SX-Aurora TSUBASA system, including hardware setup, installation of the OS and SX-Aurora TSUBASA software, basic environment settings, and execution of sample programs. This document is intended to install free software.

This document assumes that the SX-Aurora TSUBASA system is connected to the network that has access to the Internet, and readers have basic knowledge of Linux and can edit files on Linux using editors such as vi.

If you want to install software including paid software or install software to other environments which are not described in this document, see Installation Guide in Aurora Forum (<https://sxaoratsubasa.sakura.ne.jp/documentation>).

The procedures in this document are available for the SX-Aurora TSUBASA software released on February 2024 or later.

--- Feb. 2024 Edition ---

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## Definitions and Abbreviations

Term	Description
Vector Engine (VE)	The core part of the SX-Aurora TSUBASA system, on which applications are executed. A VE is implemented as a PCI Express card and attached to a server called a vector host.
Vector Host (VH)	A Linux (x86) server to which VEs are attached, in other words, a host computer equipped with VEs.
VMC	Abbreviation of VE Management Controller.
InfiniBand	One of the high-speed and highly reliable interface standards used to connect computers and storage devices (external storage devices) in large-scale system and between computation nodes in supercomputers (HPC clusters). Please refer Installation Guide to install InfiniBand in SX-Aurora TSUBASA system.
NEC yum repository	The yum repository for NEC SX-Aurora TSUBASA software. The yum repository for the free software can be accessed by any user. The yum repository for the paid software can be accessed only by users with PP support contract.
MPI	Abbreviation of Message Passing Interface. MPI is a standard specification for a communication library. It can be used together with OpenMP or automatic parallelization.
Installation Guide	Abbreviation of "SX-Aurora TSUBASA Installation Guide". The latest version of Installation Guide exists in NEC Aurora Forum. <a href="https://sxauroratsubasa.sakura.ne.jp/documentation">https://sxauroratsubasa.sakura.ne.jp/documentation</a>

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# Chapter1 Preparation

This chapter describes preparation for setting up the SX-Aurora TSUBASA system.

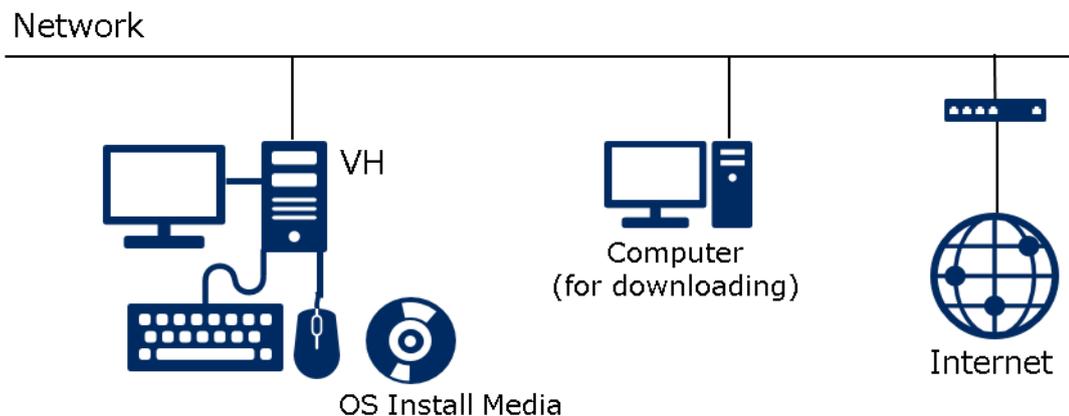
## 1.1 Hardware

Prepare the following equipment to set up the SX-Aurora TSUBASA system.

- A Vector host (A100-1)
  - VE cards (built-in)
  - A DVD drive (built-in)
  - A power cable

**(The setup procedure is explained using a tower type vector host with VE1 as an example.)**

- A Display, display cable, and power cable
- A USB Mouse and USB keyboard
- A LAN cable
- A computer with a writable DVD drive and connection to the Internet for downloading the SX-Aurora TSUBASA software.
- An OS installation DVD (refer to section 1.3 for details)



**Figure 1 Setup Environment**

## 1.2 Network Environment

To connect the vector host (VH) to a network, prepare network information such as a hostname and IP address in advance. This document uses the following values as an example.

**Table 1 Network Information**

Information	Example Value
Hostname of the vector host	vh001
Vector host IP address	192.168.1.100/24 (Fixed)
Gateway IP address	192.168.1.1
DNS server IP address	192.168.1.2

- Hereafter, vector host is abbreviated to VH.

## 1.3 OS Installation DVD

The SX-Aurora TSUBASA software runs on the Linux operating system compatible with the Red Hat Linux.

Please refer to the NEC support portal below for the latest information of the supported distributions and kernel versions.

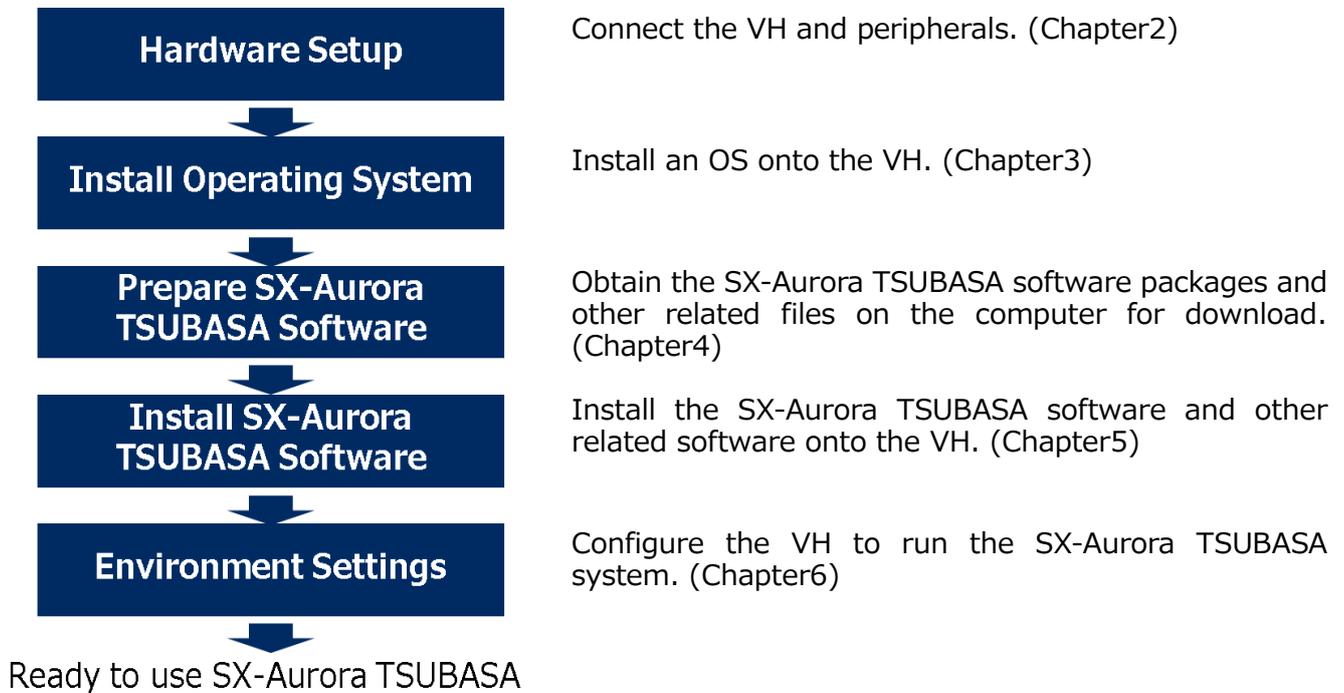
<https://www.support.nec.co.jp/en/View.aspx?id=4140100078> (English)

<https://www.support.nec.co.jp/View.aspx?id=3140106285> (Japanese)

Please prepare an installation DVD of one of the operating systems. The OS installation DVD is needed even if you have already installed the OS on the VH, because the DVD contains packages on which the SX-Aurora TSUBASA software depends. Also, it must not be the one for network installation, but has to contain software package files.

## 1.4 Setup Procedure

The following figure shows the steps for setting up the SX-Aurora TSUBASA system, which are described in the subsequent chapters.



### **⚠ Note**

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**This document describes the setup procedure on Rocky Linux 8.6 (Kernel: 4.18.0-372.32.1.el8\_6.x86\_64) as an example. The procedure can vary depending on the OS and its kernel version.**

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[Memo] Please use the tables below as a memo when setting up the SX-Aurora TSUBASA system

■ Network Information of the VH

Hostname of the VH	
IP address of the VH	
MAC address of the VH	

■ Account Information

User ID for the NEC Support portal	
Download ID for the Internet Delivery	
Serial Number of the Support Pack for NEC SDK	

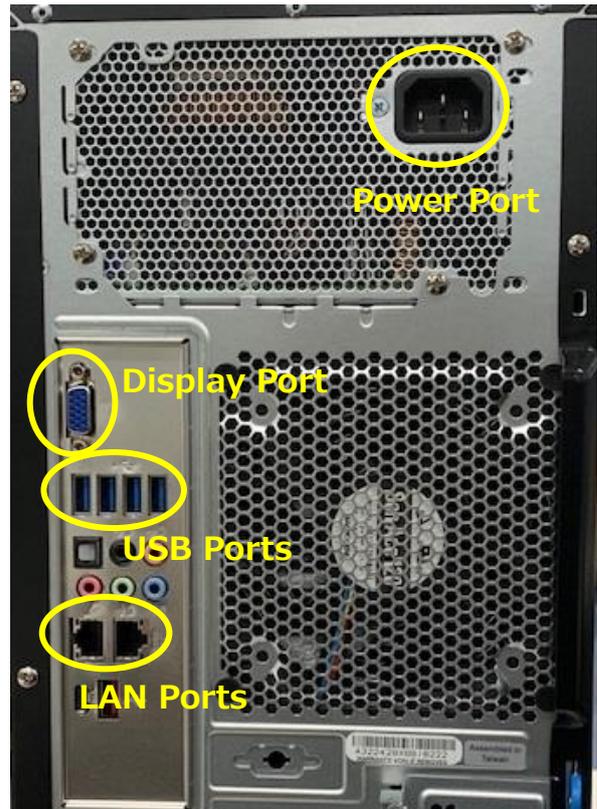
## Chapter2 Hardware Setup

This chapter illustrates the connection between a VH and peripherals. Layout of panel components of the VH such as ports in the pictures may vary depending on the shipping time.

### 2.1 Front and Back Panel Components of the VH



Front Panel



Back Panel

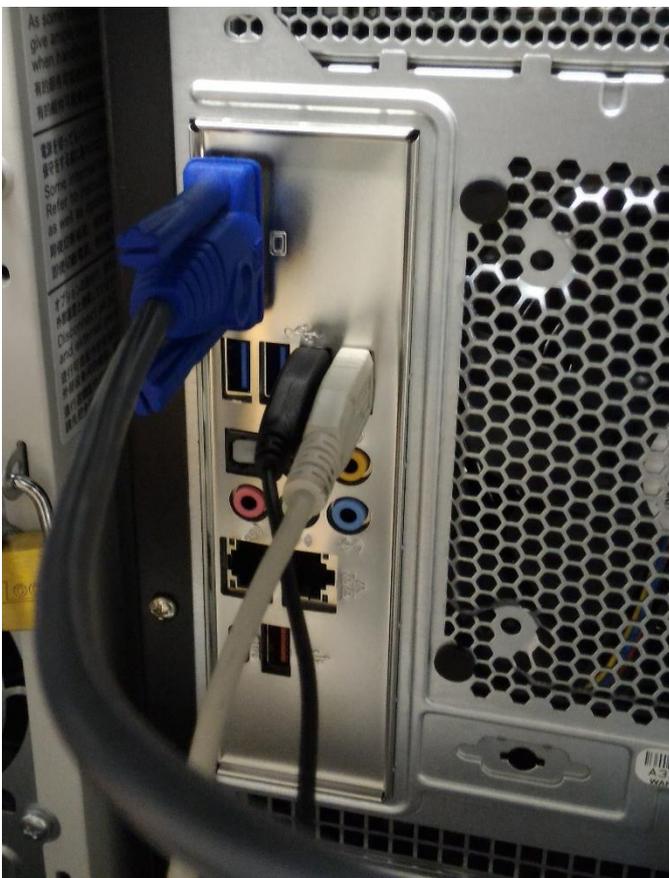
### 2.2 Connection of a Display

Connect the display port on the back panel and a display with a display cable. Also, connect a power cable to the power port of the display and plug the power cable into an outlet.



### 2.3 Connection of a Keyboard and Mouse

Connect the cables of a USB keyboard and USB mouse to USB ports on the back panel.



## 2.4 Connection of a LAN Cable

Connect one end of a LAN cable to the network and the other end to the LAN port (on the left side) on the back panel.



## 2.5 Connection of a Power Cable

Connect a power cable to the power port on the back panel and plug the power cable into an outlet.



## Chapter3 OS Installation

This chapter describes OS installation onto the VH.

### 3.1 Boot of the VH

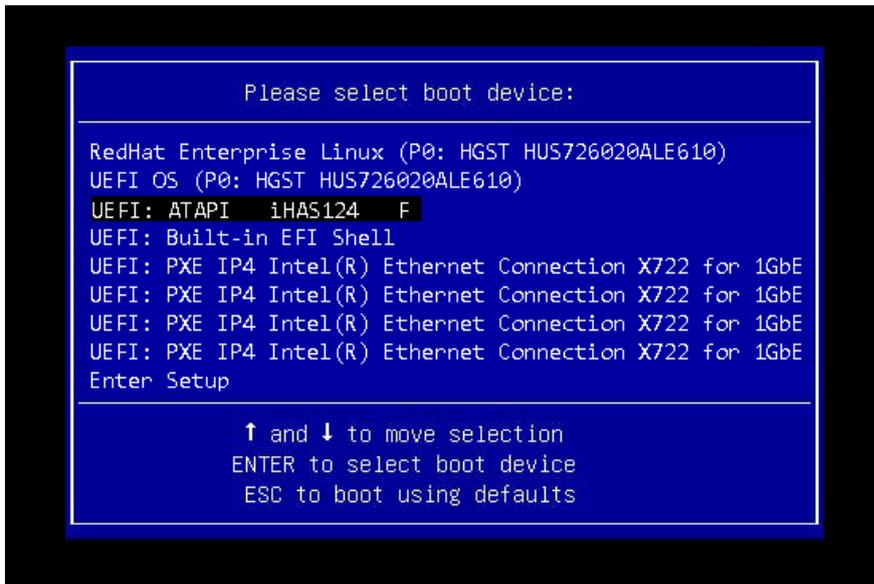
Put the OS installation DVD into the DVD drive of the VH immediately after turning on the VH.



Wait a little until you see the NEC logo on the display, and then press the F11 key on the keyboard.



After a short while, the following boot menu will be displayed.

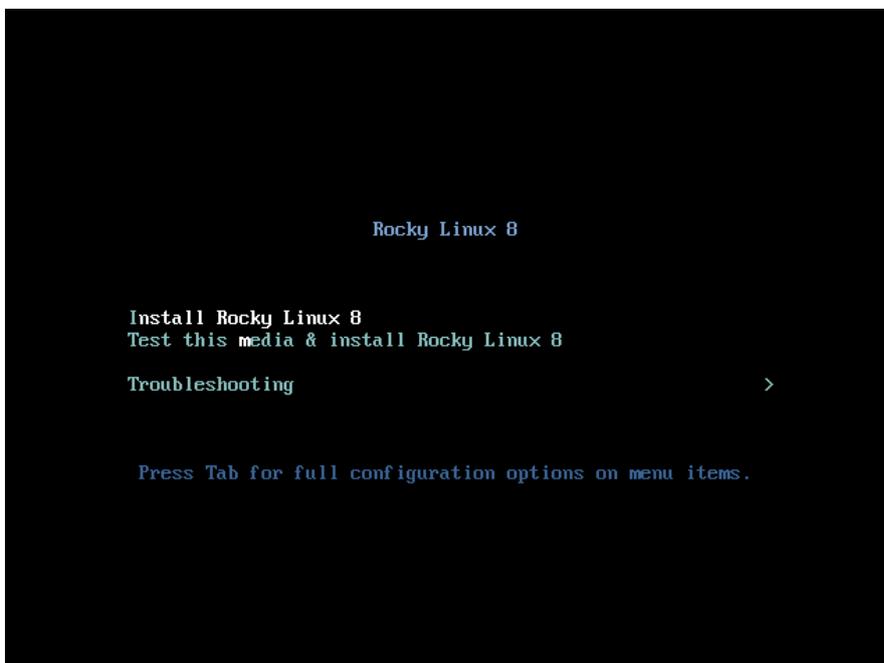


Select "UEFI: ATAPI iHAS124 F" with the arrow keys on the keyboard, and press the Return key to start booting from the DVD.

### 3.2 Start of the OS Installer

In a while, the following screen will be displayed.

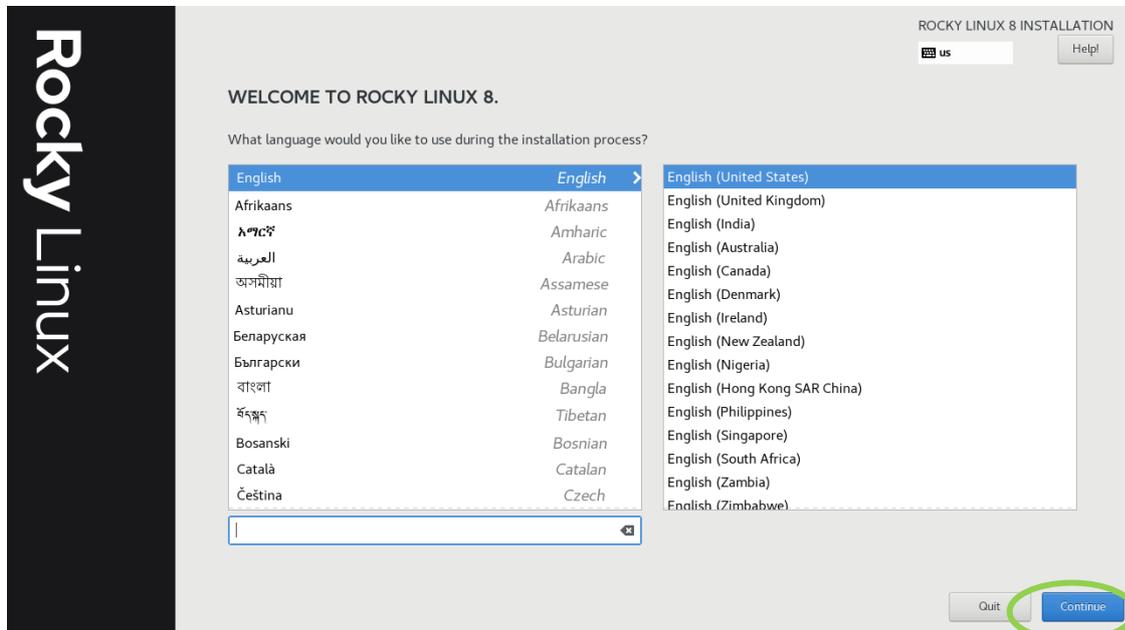
- This example shows the case of Rocky Linux 8



Select "Install Rocky Linux 8" with the arrow keys on the keyboard and press the Return key to start the OS installer.

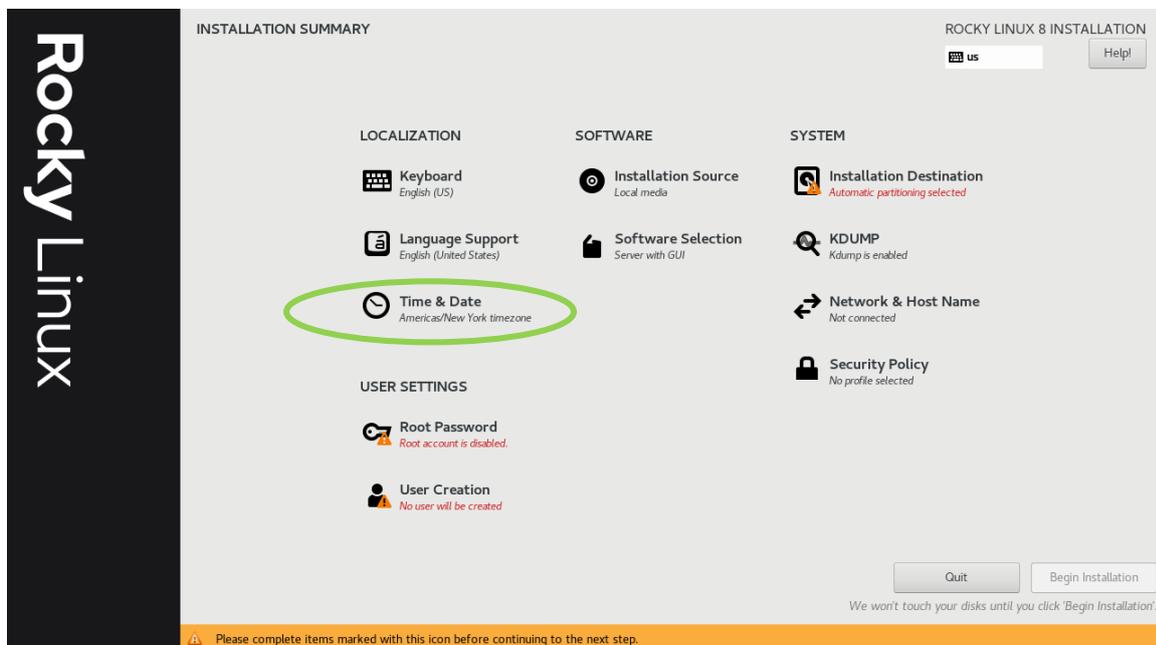
### 3.3 Selection of a Language

The OS installer will first display the screen for selecting a language used for the installation. Select your language with the mouse and click on the "Continue" button on the lower right.

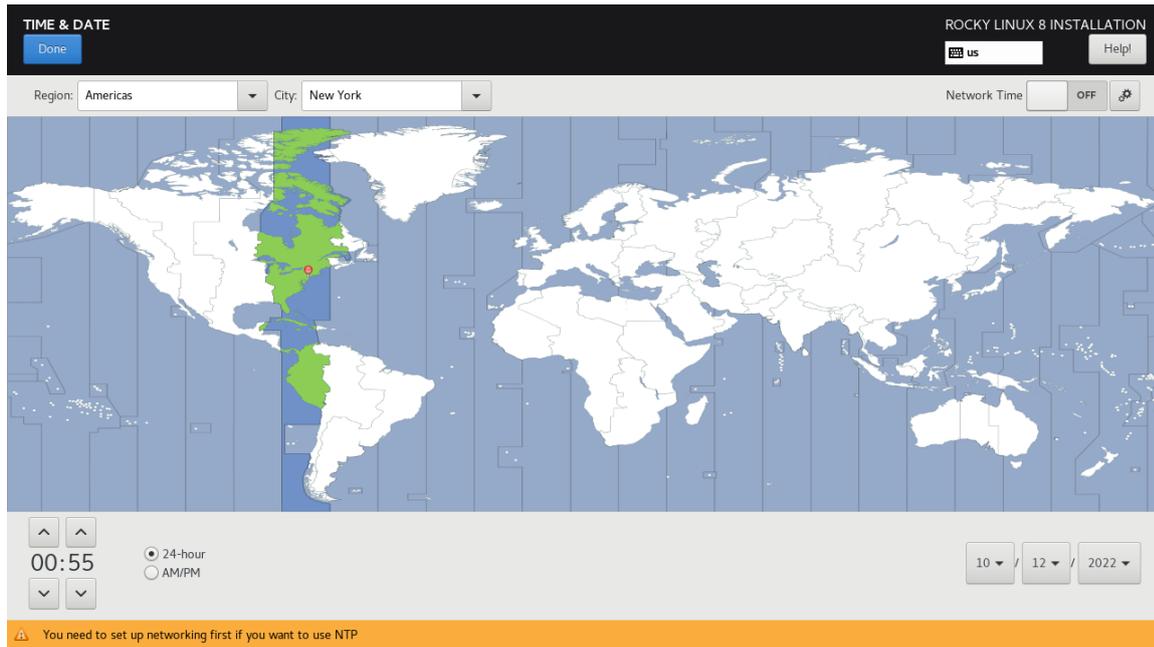


### 3.4 Selection of Timezone

Click on "Time & Date" in the "LOCALIZATION" part to select the timezone of your country.

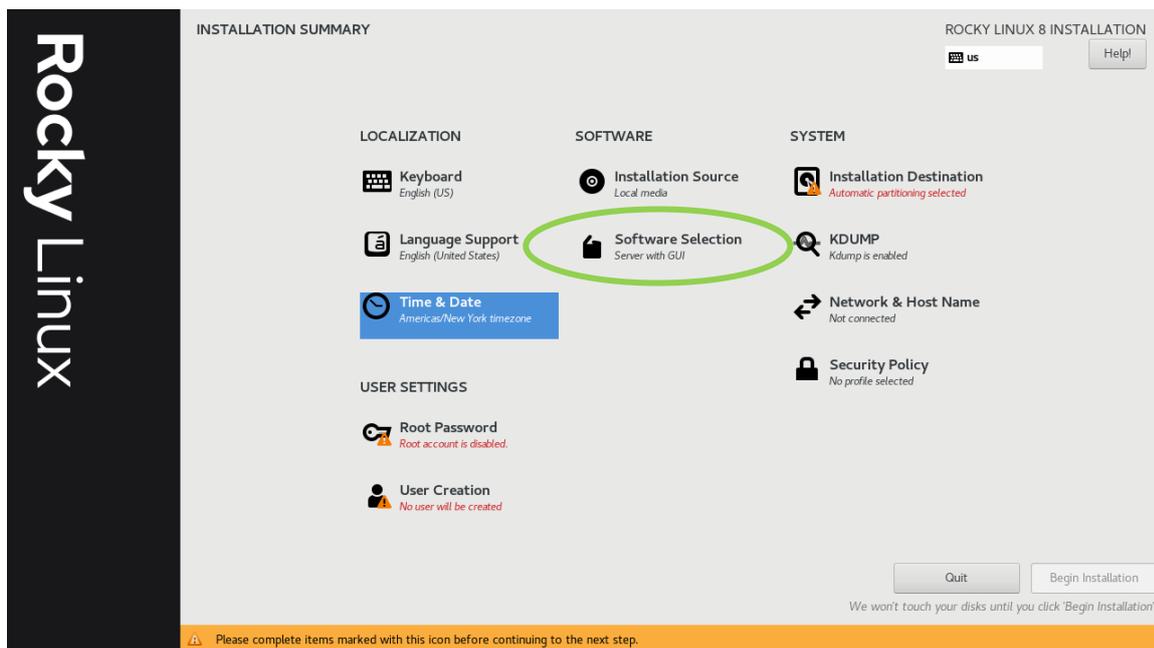


In the "TIME & DATE" screen, select the timezone of your country, and confirm the time and date.

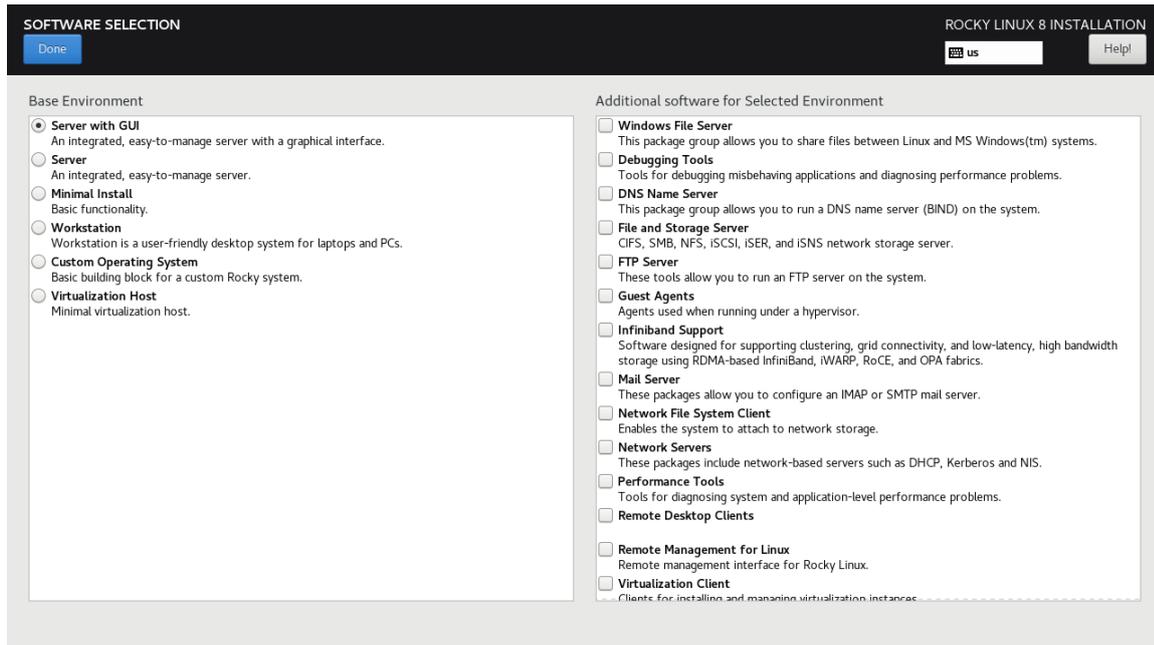


### 3.5 Selection of Software

Click on "Software Selection" in the "SOFTWARE" part to select software to install.



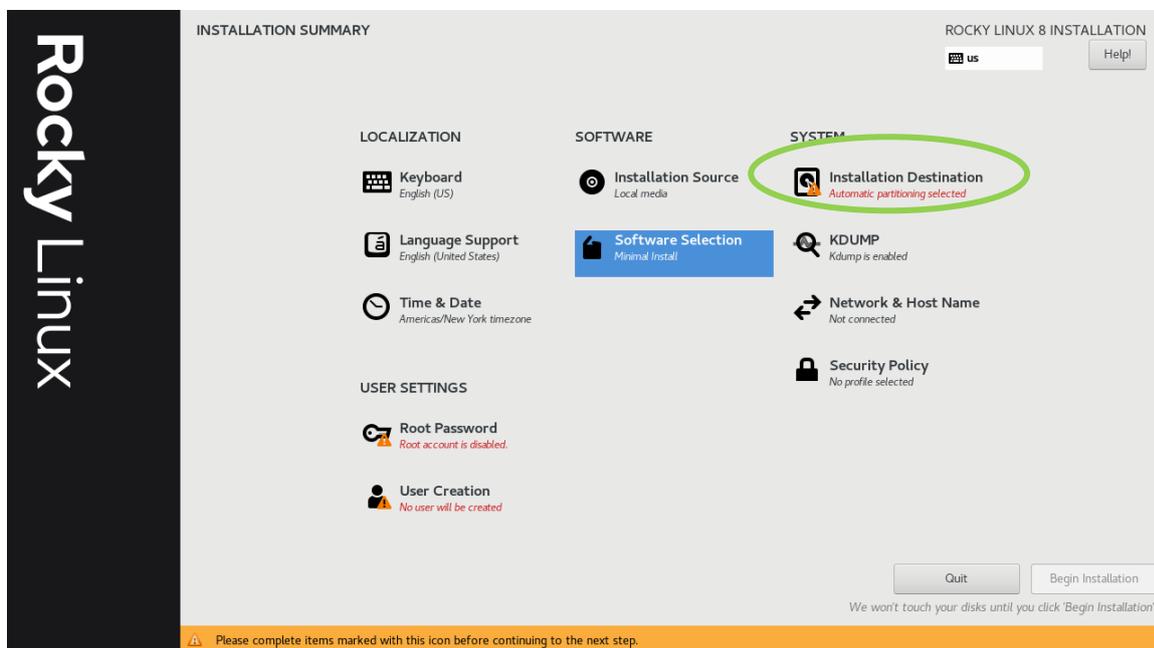
In the "SOFTWARE SELECTION" screen, "Server with GUI" is selected by default. You can change other base environment and select additional software as necessary.



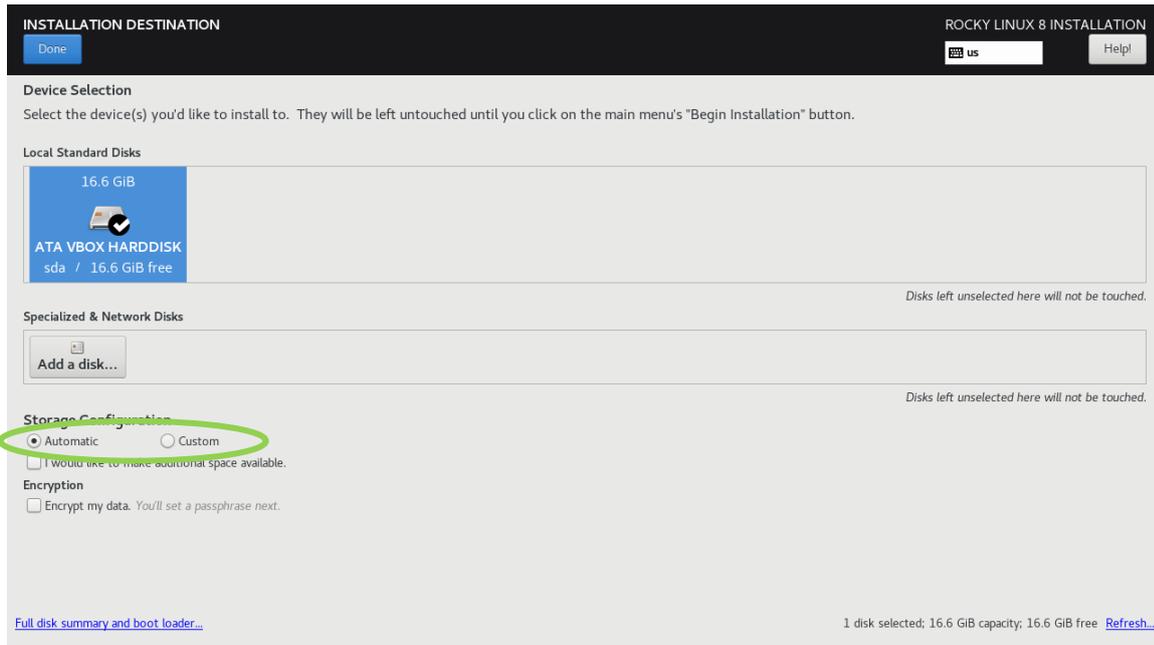
Click on the "Done" button on the upper left after the selection.

### 3.6 Creation of Installation Destination

Click on "Installation Destination" in the "SYSTEM" part to set the drive and partition onto which the OS is installed.



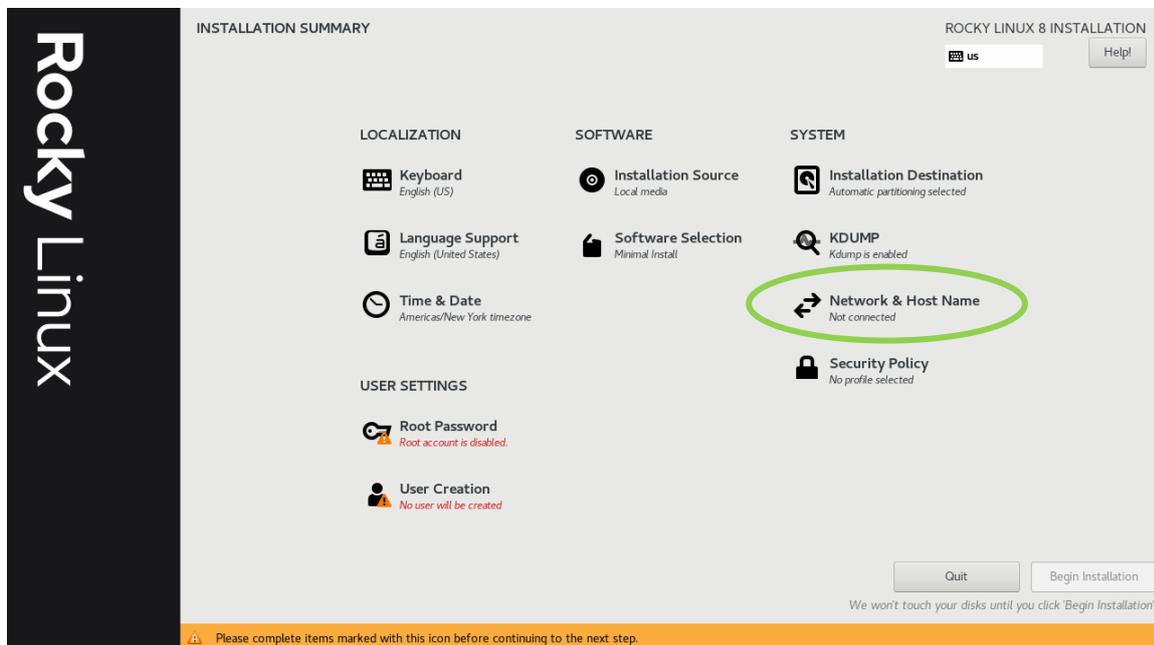
By selecting a disk in the "Device Selection" section and checking "Automatic" in the "Storage Configuration" section, a partition for OS installation using the whole disk is automatically created.



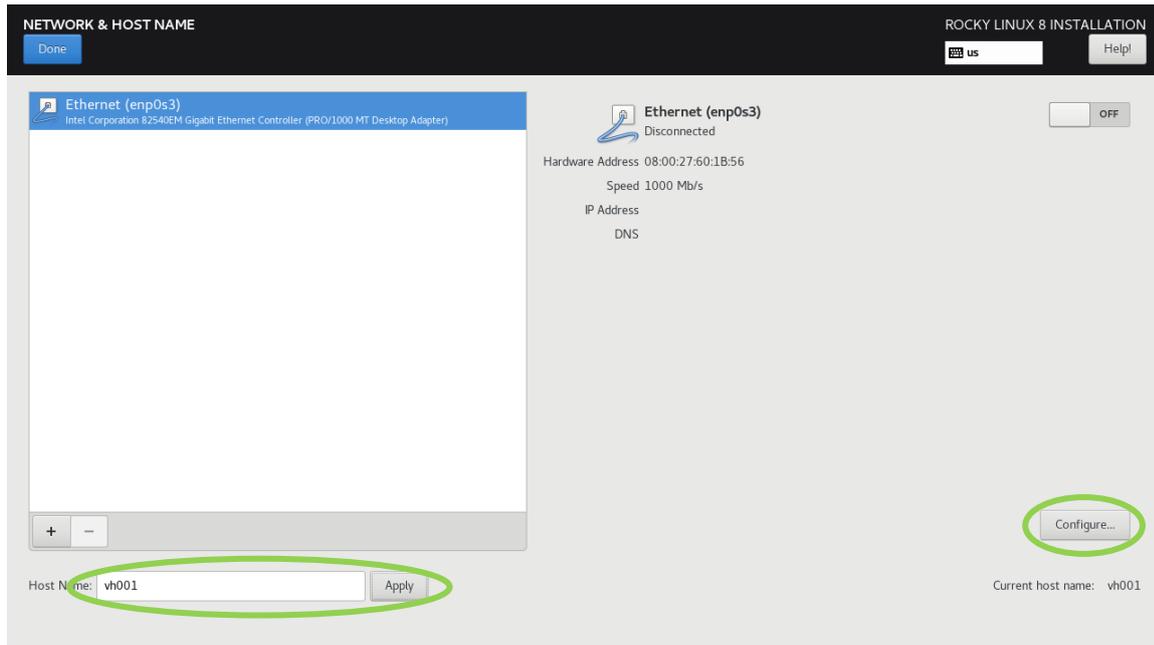
Click on the "Done" button on the upper left after the creation.

### 3.7 Configuration of Network and Hostname

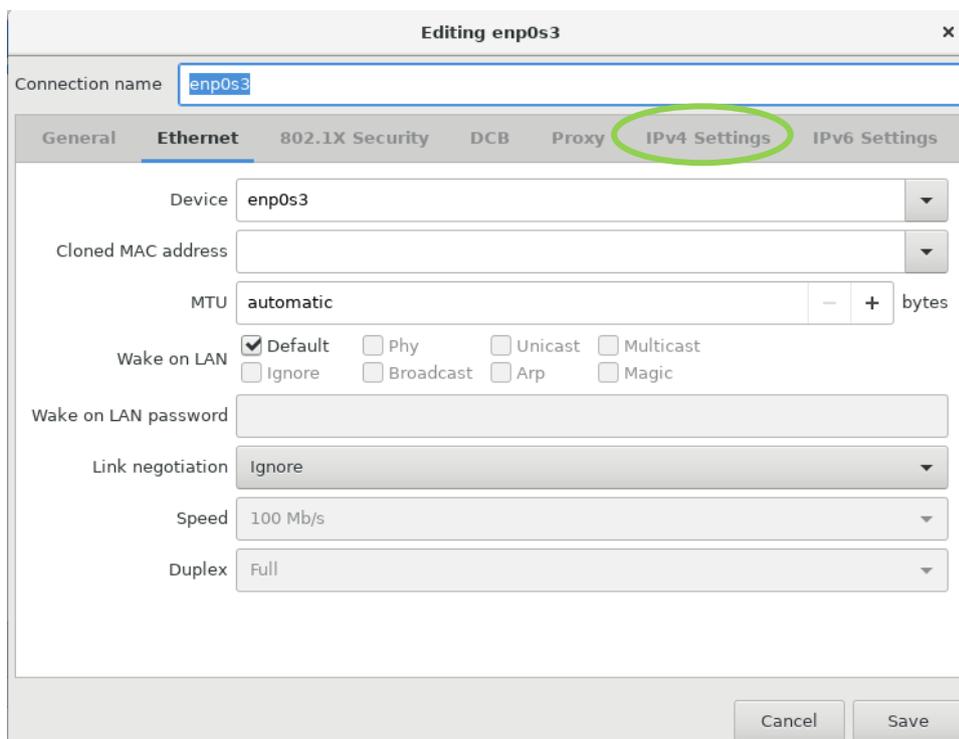
Click on "Network & Host Name" in the "SYSTEM" part to show the "NETWORK & HOST NAME" screen.



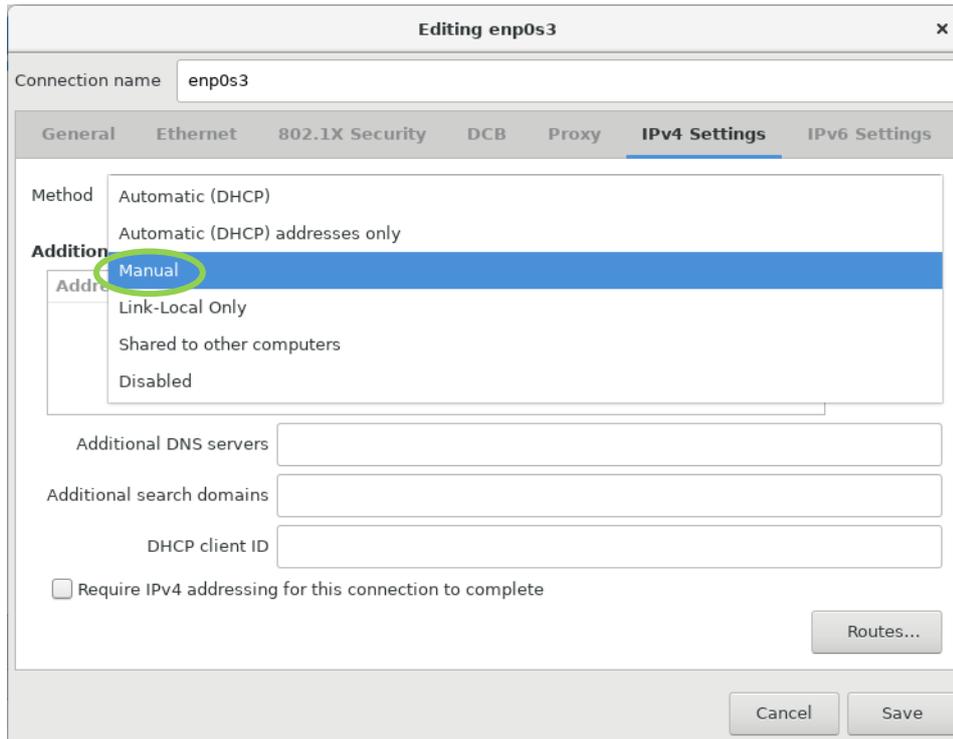
Enter an arbitrary hostname of the VH in the "Host name" field on the lower left (vh001 in this example) and click on the "Apply" button on the right of the field.



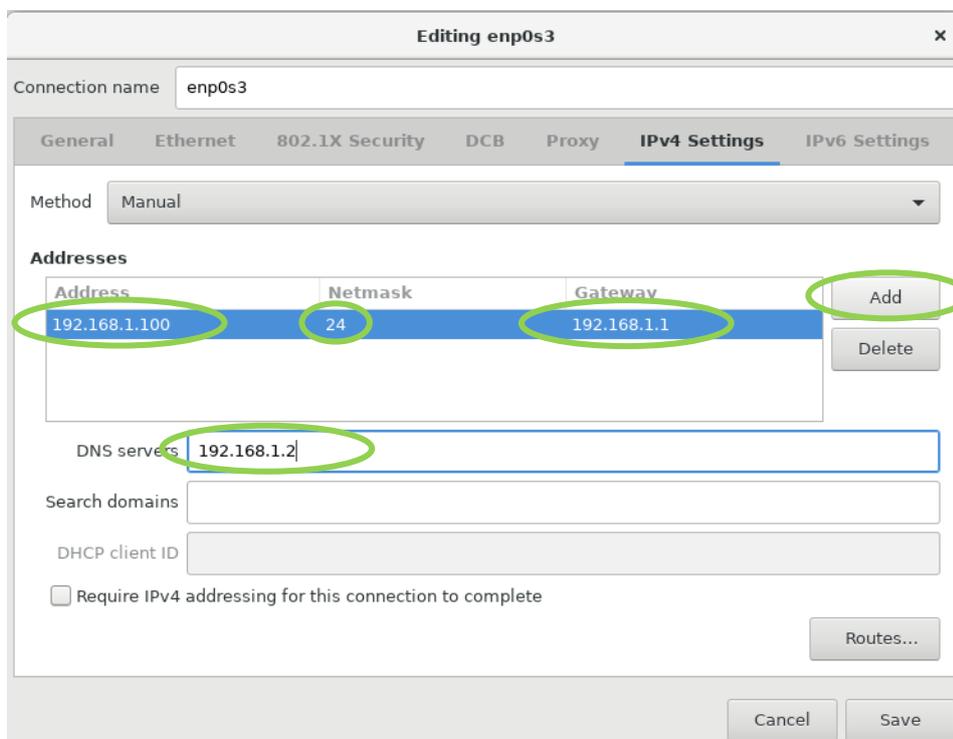
Then click on the "Configure..." button on the lower right to show a screen for configuring the network (as shown in the "Editing eno1" screen below), on which you can configure network information of the VH such as the IP address, gateway, and DNS server. The following uses the example described in section 1.2.



Click on the "IPv4 Settings" tab, and then select "Manual" from the drop-down menu on the "Method" field.

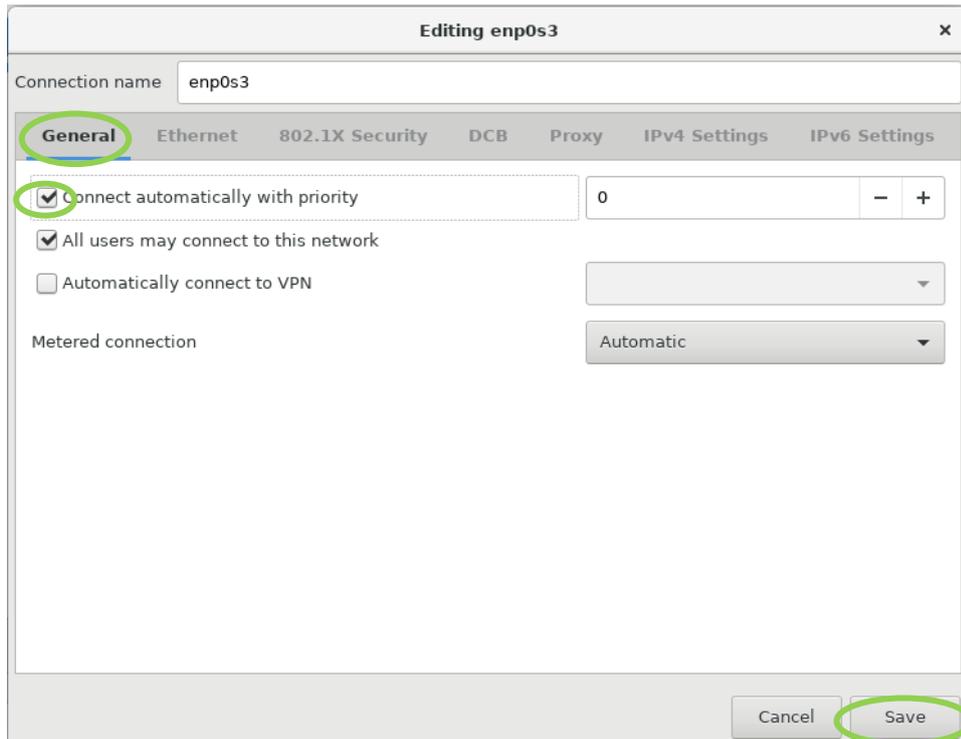


Next, click on the "Add" button on the right of the "Addresses" section, and enter the IP address of the VH, netmask, and IP address of the gateway in the corresponding cells. Also, enter the IP address of the DNS server in the "DNS servers" field under the cells.

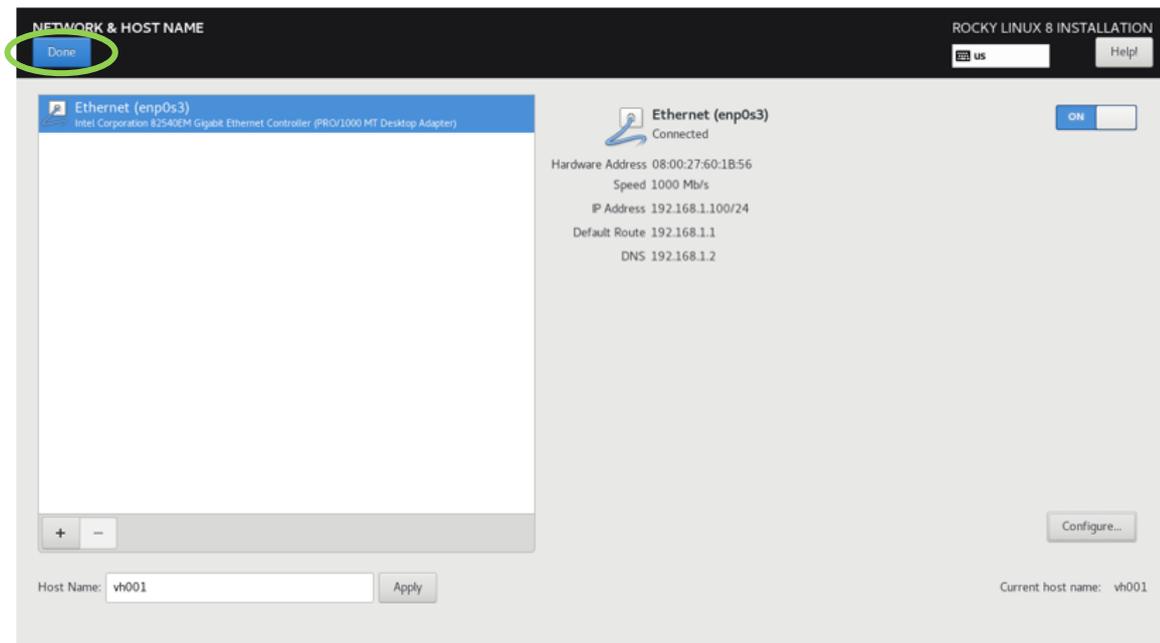


In addition, click on the "General" tab on the screen, and check "Connect automatically with priority".

After this, click on the "Save" button on the lower right to finish the network configuration.

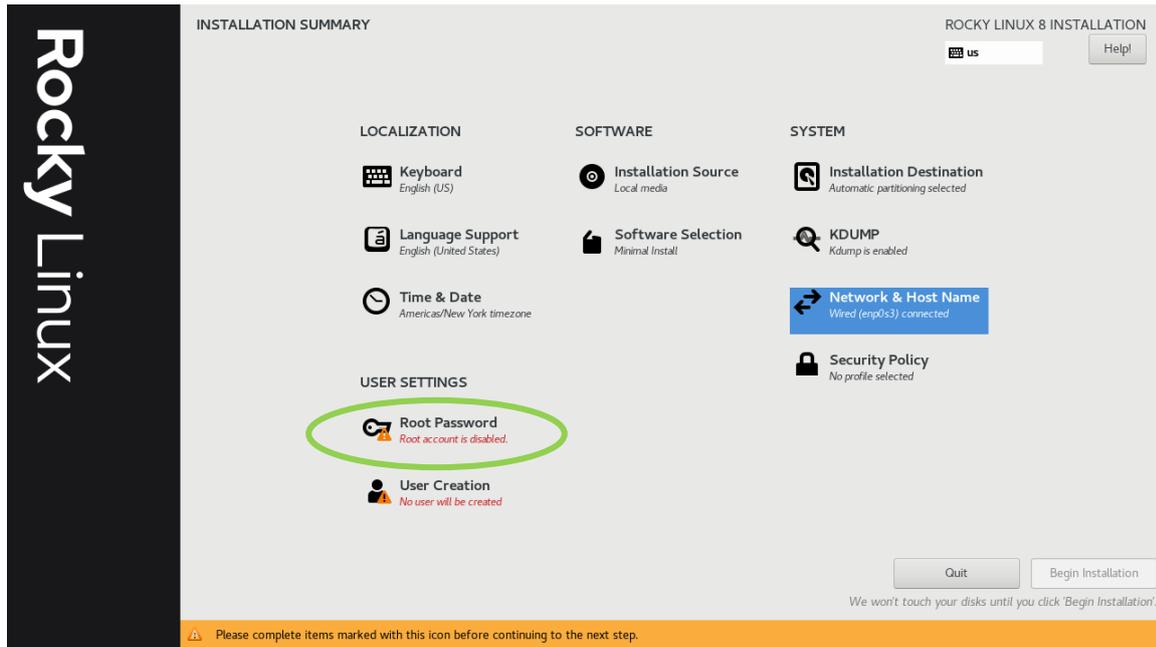


Lastly, click on the "Done" button on the upper left of the "NETWORK & HOST NAME" screen.

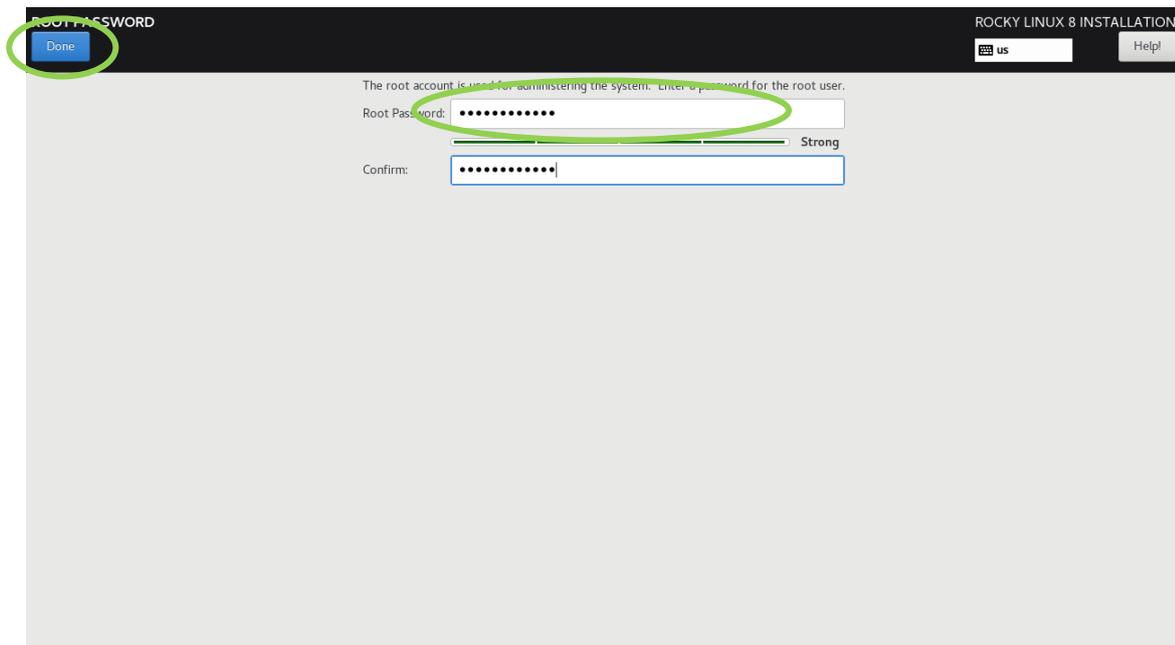


### 3.8 Setting of the Root Password

Click on "Root Password" in the "USER SETTINGS" part to show the "ROOT PASSWORD" screen.

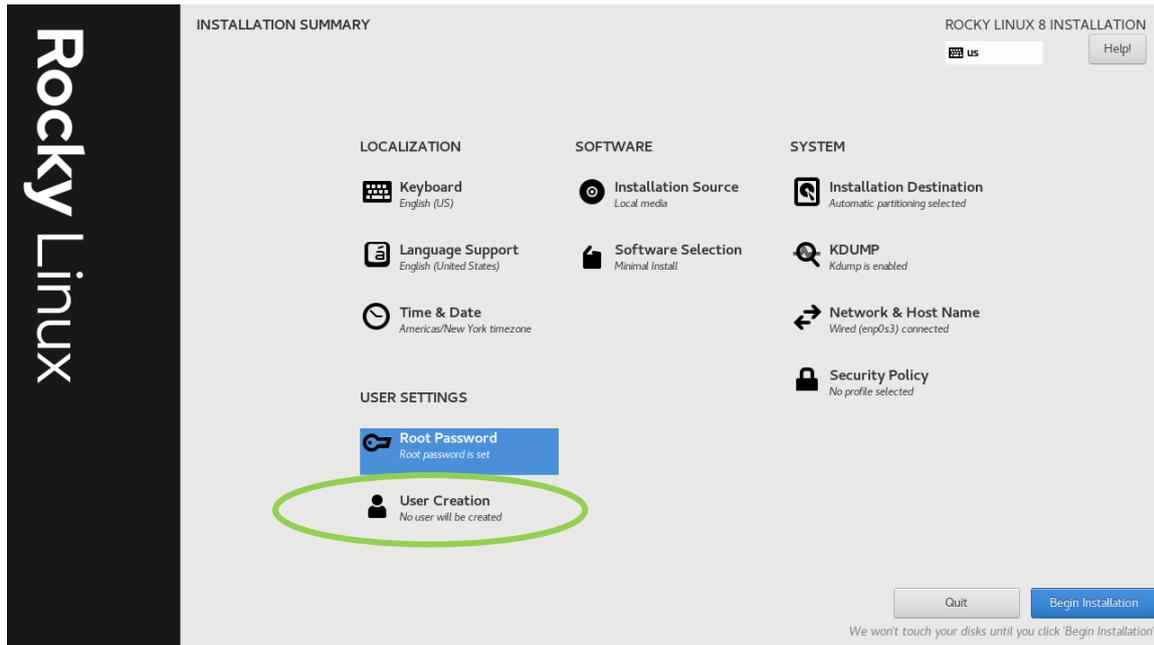


Set the root password by entering it in both of the "Root Password" and "Confirm" fields. Then click on the "Done" button on the upper left.

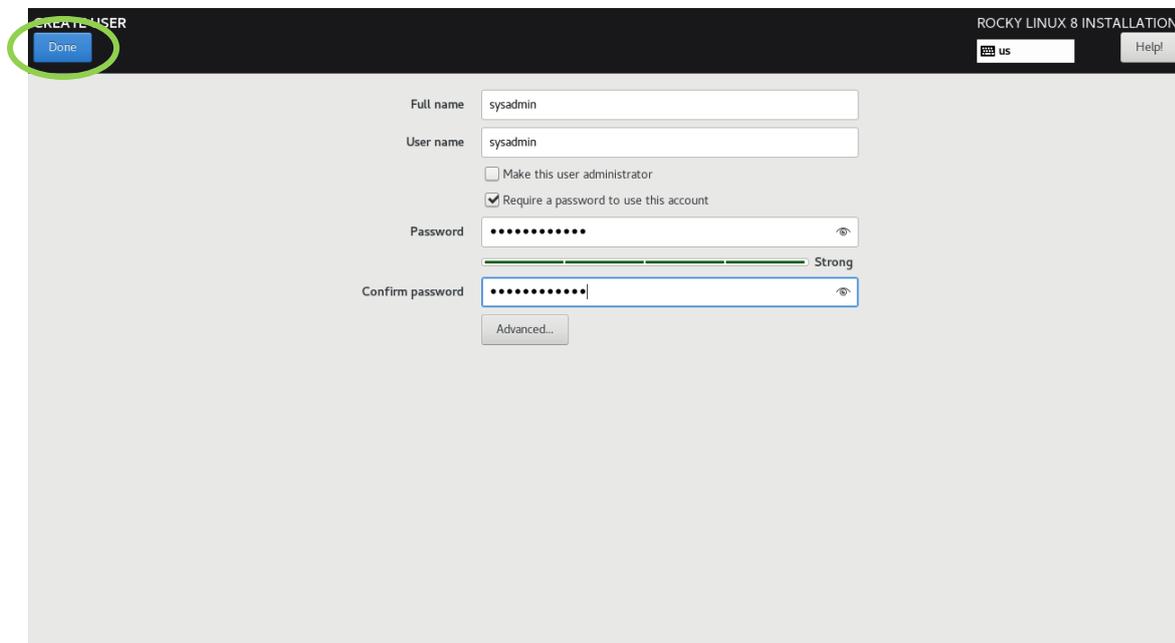


### 3.9 Creation of a User

Click on the "User Creation" of the "USER SETTINGS" screen to show the screen for creating a user.



Enter the full name of the user in the "Full name" field, login-name in the "User name" field, and password in both of the "Password" and "Confirm password" fields on the screen. If you want to give the user administrative privileges, check the checkbox "Make this user administrator".

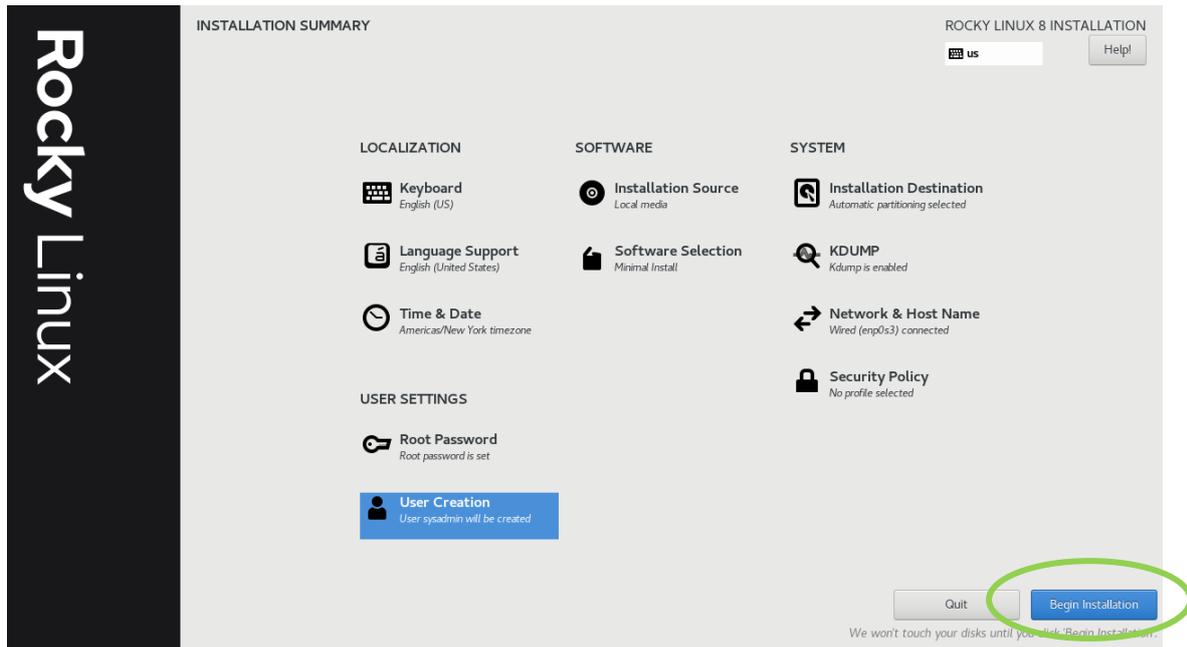


Click on the "Done" button on the upper left to return to the screen showing the progress of the installation, which is displayed on the bottom.

### 3.10 Start of OS Installation

Click on the "Begin Installation" button on the lower right of the "INSTALLATION SUMMARY"

screen to show the "INSTALLTION PROGRESS" screen.



When the installation is completed, the screen will say "Complete!" on the lower left and display the "Reboot System" button on the lower right.



### 3.11 Reboot of the VH

Click on the "Reboot" button on the lower right of the screen to reboot the VH. The booted OS will display the login prompt on the console screen.

```
Rocky Linux 8.6 (Green Obsidian)
Kernel 4.18.0-372.9.1.el8.x86_64 on an x86_64
vh001 login: _
```

Please log in as the root user with the password set in section 3.8 as the following operations require administrative privileges.

### 3.12 Configuration of the Yum Repository for the OS Installation DVD

This section describes how to configure the yum repository for software in the OS installation DVD, which is required for installation of the SX-Aurora TSUBASA software.

(1) Mount of the OS Installation DVD

Put the OS installation DVD into the DVD drive of the VH, if you have ejected it after the installation, and mount it at the directory /media/cdrom.

```
# mkdir /media/cdrom
# mount /dev/cdrom /media/cdrom
```

(2) Creation of the Yum Repository

This step creates a repository configuration file (Rocky-Media.repo) after saving the existing repository so as to install packages from the OS installation DVD with the yum command.

Firstly, save the existing repository configuration files under the directory /etc/yum.repos.d as follows

```
# cd /etc/yum.repos.d
# mkdir repo.save
# mv Rocky-* repo.save
```

Next, create a repository configuration file Rocky-Media.repo with the following content with an editor.

### **/etc/yum.repos.d/Rocky-Media.repo**

```
[media-base]
name=Rocky Linux - x86_64 - Media - BaseOS
baseurl=file:///media/cdrom/BaseOS
enabled=1
gpgcheck=0

[media-appstream]
name=Rocky Linux - x86_64 - Media - AppStream
baseurl=file:///media/cdrom/AppStream
enabled=1
gpgcheck=0
```

Please keep the DVD mounted until installation of the SX-Aurora TSUBASA software is completed.

## Chapter4 Preparation of the SX-Aurora TSUBASA Software

This chapter describes how to obtain software required for the SX-Aurora TSUBASA.

### Note

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**Please perform the operations in this chapter on the computer for download that has access to the Internet prepared in section 1.1.**

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### 4.1 Acquisition of Kernel Update Packages

This section explains how to obtain the kernel update packages corresponding to the OS and its version running on the VH. The following kernel update packages are required, in which "X.XX.X-XXX.X.X" corresponds to the kernel version.

- RHEL/Rocky Linux 8.X
  - kernel-X.XX.X-XXX.X.X.el8\_X.x86\_64.rpm
  - kernel-headers-X.XX.X-XXX.X.X.el8\_X.x86\_64.rpm
  - kernel-core-X.XX.X-XXX.X.X.el8\_X.x86\_64.rpm
  - kernel-modules-X.XX.X-XXX.X.X.el8\_X.x86\_64.rpm

Please refer to the NEC support portal below for the latest information of the supported OSes and kernel versions.

<https://www.support.nec.co.jp/en/View.aspx?id=4140100078> (English)

<https://www.support.nec.co.jp/View.aspx?id=3140106285> (Japanese)

### Note

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**This section explains the operations for Rocky Linux 8.6 (Kernel:4.18.0-372.32.1.el8\_6) as an example. The operations may vary depending on the OS and its kernel version.**

**Regarding the kernel version of the host machine, we recommend that you update the kernel to the latest version among the kernels that have been verified for operation in principle. If the latest version is not used, ve\_drv module in ve\_drv-kmod package may not be loaded and VE may not be ONLINE after installing Aurora software. In that case, you will need to**

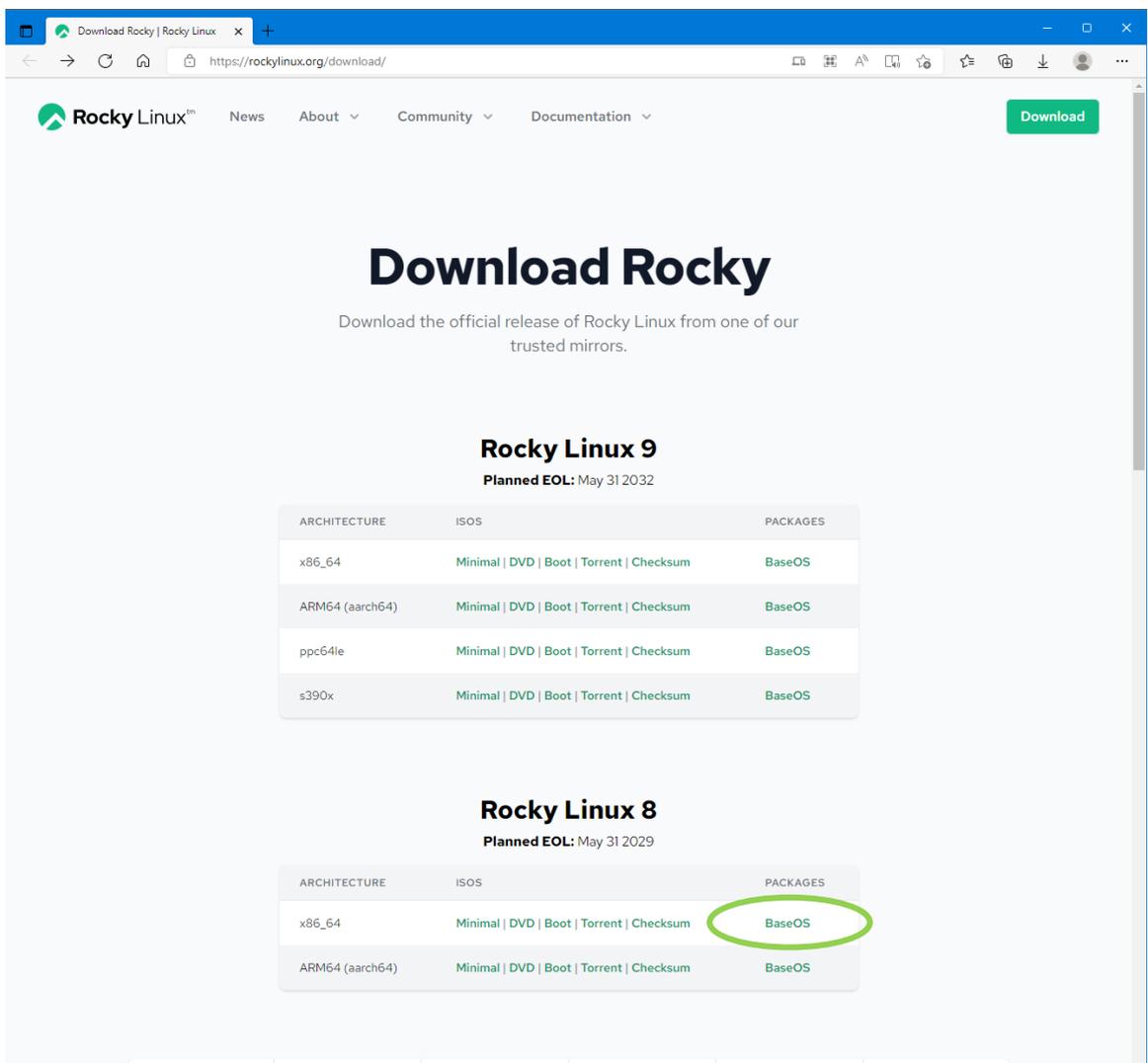
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**downgrade vp-kmod and ve\_drv-kmod packages. Please refer to "Confirmation of VE Driver Compatible with Linux kernel" section in the Installation Guide for downgrade.**

(1) Access to the Download Site

Launch a web browser on the computer for download and access the following Rocky Linux download site.

<https://rockylinux.org/download/>



The screenshot shows the Rocky Linux download page. The page title is "Download Rocky" and it includes a navigation menu with "News", "About", "Community", and "Documentation". A green "Download" button is in the top right. The main content is divided into two sections: "Rocky Linux 9" and "Rocky Linux 8". Each section has a table of download options. In the "Rocky Linux 8" table, the "BaseOS" link under the "PACKAGES" column for the "x86\_64" architecture is circled in green.

ARCHITECTURE	ISOS	PACKAGES
x86_64	<a href="#">Minimal</a>   <a href="#">DVD</a>   <a href="#">Boot</a>   <a href="#">Torrent</a>   <a href="#">Checksum</a>	<a href="#">BaseOS</a>
ARM64 (aarch64)	<a href="#">Minimal</a>   <a href="#">DVD</a>   <a href="#">Boot</a>   <a href="#">Torrent</a>   <a href="#">Checksum</a>	<a href="#">BaseOS</a>
ppc64le	<a href="#">Minimal</a>   <a href="#">DVD</a>   <a href="#">Boot</a>   <a href="#">Torrent</a>   <a href="#">Checksum</a>	<a href="#">BaseOS</a>
s390x	<a href="#">Minimal</a>   <a href="#">DVD</a>   <a href="#">Boot</a>   <a href="#">Torrent</a>   <a href="#">Checksum</a>	<a href="#">BaseOS</a>

ARCHITECTURE	ISOS	PACKAGES
x86_64	<a href="#">Minimal</a>   <a href="#">DVD</a>   <a href="#">Boot</a>   <a href="#">Torrent</a>   <a href="#">Checksum</a>	<a href="#">BaseOS</a>
ARM64 (aarch64)	<a href="#">Minimal</a>   <a href="#">DVD</a>   <a href="#">Boot</a>   <a href="#">Torrent</a>   <a href="#">Checksum</a>	<a href="#">BaseOS</a>

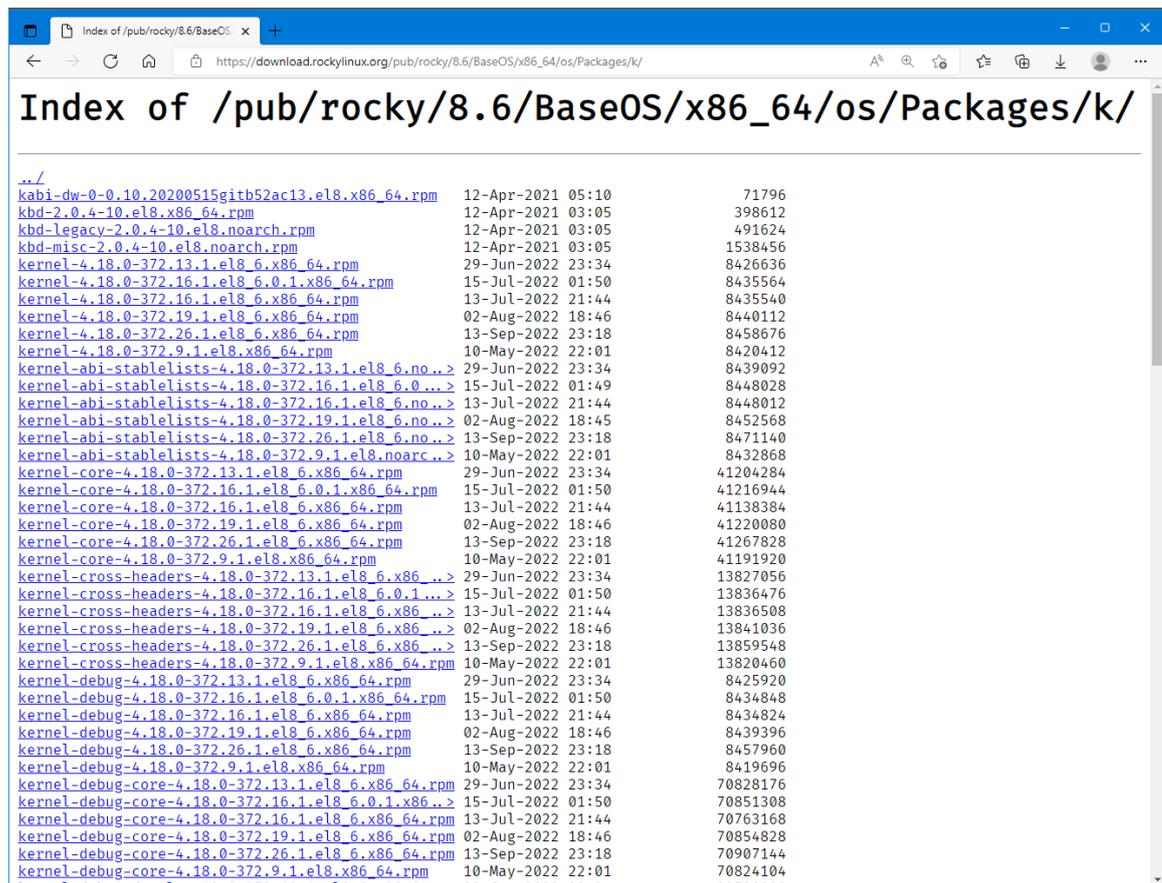
Select x86\_64 of your OS version (8.6 in this example), and navigate through the links "os", "Packages", and then "k".

## (2) Download of Update Packages

Create an arbitrary directory (folder) to store downloaded files (hereafter, the download directory "Aurora" is used as an example in this document). Then click on the kernel package corresponding to your OS version (kernel-4.18.0-372.32.1.el8\_6.x86\_64.rpm in this example) on the download site and download it onto the directory.

In addition, download the following packages onto the same directory.

- kernel-headers-4.18.0-372.32.1.el8\_6.x86\_64.rpm
- kernel-core-4.18.0-372.32.1.el8\_6.x86\_64.rpm
- kernel-modules-4.18.0-372.32.1.el8\_6.x86\_64.rpm



## 4.2 Transfer of the Files Downloaded

So far, the following files are saved in the download directory.

**Table 2 The List of the Files Downloaded**

No.	Category	File Name
[1]	Kernel Update Packages	kernel-4.18.0-372.32.1.el8_6.x86_64.rpm kernel-headers-4.18.0-372.32.1.el8_6.x86_64.rpm kernel-core-4.18.0-372.32.1.el8_6.x86_64.rpm kernel-modules-4.18.0-372.32.1.el8_6.x86_64.rpm

Please transfer the files onto the directory /var/tmp/aurora on the VH.

## Chapter5 Installation of the SX-Aurora TSUBASA Software

This chapter explains how to install the SX-Aurora TSUBASA software. Please perform the operations in this chapter on the VH as the superuser.

### 5.1 Update of the Kernel and bash

Apply the kernel update packages ([1] in Table 2) with the yum command.

```
# cd /var/tmp/aurora
# yum install \
kernel-4.18.0-372.32.1.el8_6.x86_64.rpm kernel-headers-4.18.0-372.32.1.el8_6.x86_64.rpm \
kernel-core-4.18.0-372.32.1.el8_6.x86_64.rpm kernel-modules-4.18.0-372.32.1.el8_6.x86_64.rpm
```

Reboot the VH after the update.

```
# reboot
```

You can confirm the updated kernel is running with the uname command after the reboot of the VH.

```
# uname -r
4.18.0-372.32.1.el8_6.x86_64
```

### 5.2 Mount of the OS Installation DVD

Confirm that the OS installation DVD is in the DVD drive of the VH and mount it at the directory /media/cdrom. This DVD is read at the installation of the SX-Aurora TSUBASA software.

```
# mount /dev/cdrom /media/cdrom
```

### 5.3 Setup of the Yum Repository

Set up the yum repository to install the SX-Aurora TSUBASA software onto the VH using the yum repository NEC provide on the Internet.

Please note that this guide describes the installation steps for VE1 environment. Please refer

to the Installation Guide for VE3 environment because installing packages are different.

Execute the following command:

```
# yum install https://sxaoratsubasa.sakura.ne.jp/repos/TSUBASA-soft-release-ve1-3.0-1.noarch.rpm
```

The following files are installed:

File	Description
/etc/opt/nec/ve/default.conf	Configuration file for default VE architecture
/etc/pki/rpm-gpg/RPM-GPG-KEY-TSUBASA-soft	GPG public Key
/etc/yum.repos.d/TSUBASA-restricted.repo	Configuration file for the paid software
/etc/yum.repos.d/TSUBASA-repo.repo	Configuration file for the free software
/opt/nec/ve/sbin/TSUBASA-groups-remark.sh	Script to update the group status
/opt/nec/ve/sbin/terminate-all-ve-services	Script to stop services
/opt/nec/ve/sbin/start-all-ve-services	Script to restart services
/opt/nec/ve/sbin/setup-ve-infiniband.sh	Script to configure InfiniBand

When you cannot access to the yum repository, try it again after few minutes.

The service may not be available due to server maintenance, so please check the following as well.

<https://sxaoratsubasa.sakura.ne.jp/forums/>

Make sure that "baseurl" of each item in the yum repository configuration file /etc/yum.repos.d/TSUBASA-repo.repo for the free software is corresponding to OS version in VH.

```
# cat /etc/redhat-release
Rocky Linux release 8.6 (Green Obsidian)
```

```

# vi /etc/yum.repos.d/TSUBASA-repo.repo
[TSUBASA-repo]
name=SX-Aurora TSUBASA open repository
baseurl=https://sxaororatsubasa.sakura.ne.jp/repos/TSUBASA-repo_e18.6
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-TSUBASA-soft
gpgcheck=1
enabled=1

[nec-sdk-runtime]
name=NEC SDK runtime
baseurl=https://sxaororatsubasa.sakura.ne.jp/repos/runtime/sdk/sdk_e18
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-TSUBASA-soft
gpgcheck=1
enabled=1

[nec-mpi-runtime]
name=NEC MPI runtime
baseurl=https://sxaororatsubasa.sakura.ne.jp/repos/runtime/mpi/mpi_e18
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-TSUBASA-soft
gpgcheck=1
enabled=1

[nec-sdk-community]
name=NEC SDK community
baseurl=https://sxaororatsubasa.sakura.ne.jp/repos/community/sdk/sdk_e18
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-TSUBASA-soft
gpgcheck=1
enabled=1

[nec-mpi-community]
name=NEC MPI community
baseurl=https://sxaororatsubasa.sakura.ne.jp/repos/community/mpi/mpi_e18
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-TSUBASA-soft
gpgcheck=1
enabled=1

```

## 5.4 Software Installation

Install the SX-Aurora TSUBASA software with the value of the shell variable TSUBASA\_GROUPS set to the group names to be installed. Please refer to "SX-Aurora TSUBASA Installation Guide" for the available group names.

```

# TSUBASA_GROUPS="ve-devel nec-sdk-devel nec-mpi-devel"
# /opt/nec/ve/sbin/TSUBASA-groups-remark.sh $TSUBASA_GROUPS

```

```
# yum group install $TSUBASA_GROUPS
```

## 5.5 Confirm VE device path information file

Confirm the VE device path information file using the following command:

```
# ls -l /etc/opt/nec/ve/veos/ve_nodes.json
-rw-r--r--. 1 root root 274 Feb 22 2023 /etc/opt/nec/ve/veos/ve_nodes.json
```

If the VE device path information file exists. Please go to section 5.6.

If VE device path information file does not exist, execute the following command:

```
# /opt/nec/ve/mmm/analysis/sbin/mmm-config-json.sh 2
```

After executing the above commands, reconfirm the VE device path information file and then execute the following restart ve-services commands:

```
# ls -l /etc/opt/nec/ve/veos/ve_nodes.json
-rw-r--r--. 1 root root 274 Feb 22 2023 /etc/opt/nec/ve/veos/ve_nodes.json
# /opt/nec/ve/sbin/terminate-all-ve-services
# /opt/nec/ve/sbin/start-all-ve-services
```

## 5.6 Status Check of the VE

Confirm the status of the VE is ONLINE with the vecmd command as the superuser. It can take a few minutes until it becomes ONLINE.

```
# /opt/nec/ve/bin/vecmd state get
Vector Engine MMM-Command v1.0.0
Command:
state -N 0 get
-----
VE0 [03:00.0] [ ONLINE ] Last Modif:2017/11/29 10:18:00
-----
Result: Success
```

### Note

**If the supported latest kernel version is not used, vecmd command may fail or VE may not be ONLINE after installing Aurora software. In that case, you will need to downgrade vp-kmod and ve\_drv-kmod packages. Please refer to "Confirmation of VE Driver Compatible with Linux kernel" section in the Installation Guide for confirmation and downgrade.**

**⚠ Note**

If "UNINITIALIZED" or "OFFLINE" is displayed, please wait for a short while.

If VE state does not become ONLINE after waiting, please restart services by executing the below commands.

```
# /opt/nec/ve/sbin/terminate-all-ve-services
```

```
# /opt/nec/ve/sbin/start-all-ve-services
```

And if "There is no executable ve card!" is displayed, please restart services in the same way.

If "UNAVAILABLE" is displayed, please restart the VEs by reboot command.

```
# reboot
```

If "UNAVAILABLE" is still displayed after restarting, there may be a hardware failure. Please refer to the following guide and perform the separation.

✓ [NEC Aurora Forum Documentation](#)

"Vector Engine 2.0 Troubleshooting Guide"

## 5.7 Update of the VMC Firmware

Check whether update of the VMC firmware is required as follows:

```
# /opt/nec/ve/bin/vecmd fwup check
```

If the message "Updating VMCFW is required." is displayed, you need to update the VMC firmware. In this case, perform the following operations as the root user.

(1) Change the status of the VEs and update the firmware by vecmd commands

- When updating to VE1/VE2

```
# /opt/nec/ve/bin/vecmd state set off
# /opt/nec/ve/bin/vecmd state set mnt
# /opt/nec/ve/bin/vecmd fwup vmc aurora_MK10.bin
```

\* The update of the firmware will take about a few minutes.

- When updating to VE3

```
# /opt/nec/ve/bin/vecmd state set off
# /opt/nec/ve/bin/vecmd fwup
```

\* The update of the firmware will take about 10 minutes.

- (2) Reboot the VHs

```
# reboot
```

- (3) Log in as the root user
- (4) Check the Status of the VEs

Confirm the status of the VEs is ONLINE. It can take a few minutes until it becomes ONLINE.

```
# /opt/nec/ve/bin/vecmd state get
Vector Engine MMM-Command v1.0.0
Command:
state -N 0 get
-----
VE0 [03:00.0] [ ONLINE ] Last Modif:2017/11/29 10:18:00
-----
Result: Success
```

### Note

If "UNINITIALIZED" or "OFFLINE" is displayed, please wait for a short while.

And, if some VEs are not ONLINE or not appear, please shutdown VH and power on VH.

## Chapter6 Configuration

This chapter explains how to configure the SX-Aurora TSUBASA system. Perform the procedures in this chapter as the superuser on the VH.

### 6.1 Configuration of NEC MPI

If you use NEC MPI and the firewall is running on the VH, configure to open the ports specified below. If the firewall is off, this procedure is not necessary.

Firstly, check if the firewall is running with the `firewall-cmd` command as follows.

```
# firewall-cmd --state
running
```

If "running" is displayed, the firewall is running. In this case, open the ports from 25257 to 25266 as follows because NEC MPI uses these ports by default to listen for external connections.

```
# firewall-cmd --zone=public --permanent --add-port=25257-25266/tcp
# firewall-cmd --reload
```

If the `firewall-cmd` command displays the ports, the firewall configuration is successful.

```
# firewall-cmd --list-port --zone=public
25257-25266/tcp
```

### 6.2 Configuration of HugePages

This section explains how to configure HugePages for VEOS. Please refer to "SX-Aurora TSUBASA Installation Guide" for detail.

- (1) Configure HugePages

```
# /opt/nec/ve/sbin/ve-set-hugepages
```

- (2) Confirm HugePages setting

Confirm `nr_hugepages` `nr_overcommit_hugepages` are not 0. (The following values are an example.)

```
# /opt/nec/ve/sbin/ve-set-hugepages -s
nr_hugepages:256
nr_overcommit_hugepages:23790
```

## Chapter7 Program Execution

This chapter briefly explains how to compile and execute sample programs to verify the configuration of the SX-Aurora TSUBASA system.

### 7.1 Compilation

You can compile C/C++ programs and Fortran programs with the `ncc` command and `nfort` command, respectively.

```
(C/C++ programs)
$ /opt/nec/ve/bin/ncc a.c

(Fortran programs)
$ /opt/nec/ve/bin/nfort a.f90
```

You can compile MPI programs written in C/C++ and Fortran with the `mpincc` command and `mpinfort` command respectively, after setting the environment corresponding to the version of NEC MPI with the `source` command as follows.

```
(bash)
$ source /opt/nec/ve/mpi/<version>/bin/necmpivars.sh
$ mpincc a.c

(csh)
% source /opt/nec/ve/mpi/<version>/bin/necmpivars.csh
% mpincc a.c
```

Please replace `<version>` above with the version of NEC MPI you use.

### 7.2 Execution

You can directly run executable files (`a.out`) compiled with the `ncc` command and `nfort` command.

```
$ ./a.out
```

You can run mpi programs compiled with the `mpincc` command and `mpinfort` command using the `mpirun` command specifying the number of processes with the option `-np`. Note that the environment setting for NEC MPI described in section 7.1 must be available for execution, too.

```
$ mpirun -np 8 a.out
```

## 7.3 Sample Programs

This section shows execution examples of sample programs, which can be downloaded from the following link:

[https://sxauroratsubasa.sakura.ne.jp/repos/file/SetupGuide\\_examples.tgz](https://sxauroratsubasa.sakura.ne.jp/repos/file/SetupGuide_examples.tgz)

Download and expand the file as follows:

```
$ tar xzf SetupGuide_examples.tgz
$ cd examples
$ ls
sample.c sample.f90 sample-mpi.c
```

### (1) C/C++ Program **sample.c**

```
#include <stdio.h>

#define LOOP 1000000000

main()
{
    int n, sign;
    double pi;

    pi = 0.0;
    sign = -1;

    for(n = 0; n <= LOOP; n++){
        sign = (n % 2)?(-1):1;
        pi += (double)sign / (2 * n + 1);
    }
    pi *= 4;

    printf("%.8f\n", pi);
}
```

You can compile and run the program `sample.c` as follows.

```
$ /opt/nec/ve/bin/ncc sample.c
ncc: vec( 101): sample.c, line 13: vectorized loop.
$ ./a.out
3.14159265
```

(2) Fortran Program **sample.f90**

```

program main
  implicit none
  integer      :: n
  integer, parameter :: loop=1000000000
  double precision  :: pi
  pi = 0.0d0

  do n = 1, loop
    pi = pi + ((-1.0d0) ** (n - 1)) / (2.0d0 * n - 1.0d0)
  end do

  pi = pi * 4.0d0

  write(*, '(f0.8)') pi
end program main

```

You can compile and run the program `sample.f90` as follows.

```

$ /opt/nec/ve/bin/nfort sample.f90
nfort: vec( 101): sample.f90, line 9: Vectorized loop.
$ ./a.out
3.14159265

```

(3) MPI Program **sample-mpi.c**

```

#include <stdio.h>
#include <stdlib.h>
#include <mpi.h>

int
main(int argc, char **argv)
{
  int myrank, nprocs;
  int bufsz, count, typesz;
  int sum, ans;
  int i, j;
  int *sbuf, *rbuf;

  MPI_Init(&argc, &argv);
  MPI_Comm_rank(MPI_COMM_WORLD, &myrank);
  MPI_Comm_size(MPI_COMM_WORLD, &nprocs);
  MPI_Type_size(MPI_INT, &typesz);

  bufsz = 128 * 1024 * 1024;
  count = bufsz / typesz / nprocs;
  sbuf = (int *) malloc(bufsz);
  rbuf = (int *) malloc(bufsz);
  for (i = 0; i < count * nprocs; i++)
    sbuf[i] = myrank;

  MPI_Alltoall(sbuf, count, MPI_INT, rbuf, count, MPI_INT, MPI_COMM_WORLD);

  sum = ans = 0;

```

```

for (i = 0; i < nprocs; i++)
    for (j = 0; j < count; j++)
        sum += rbuf[count * i + j] - i;
MPI_Reduce(&sum, &ans, 1, MPI_INT, MPI_SUM, 0, MPI_COMM_WORLD);

if (myrank == 0) {
    if (ans == 0)
        printf("# MPI Execution: Success\n");
    else
        printf("# MPI Execution: Fail\n");
}

MPI_Finalize();

return 0;
}

```

You can compile and run the program `sample-mpi.c` as follows. The version of NEC MPI is 2.2.0 in this example.

```

(bash)
$ source /opt/nec/ve/mpi/2.2.0/bin/necmpivars.sh
$ mpincc sample-mpi.c
ncc: vec( 101): sample-mpi.c, line 23: Vectorized loop.
ncc: vec( 101): sample-mpi.c, line 30: Vectorized loop.
$ mpirun -np 8 a.out
# MPI Execution: Success

(csh)
% source /opt/nec/ve/mpi/2.2.0/bin/necmpivars.csh
% mpincc sample-mpi.c
ncc: vec( 101): sample-mpi.c, line 23: Vectorized loop.
ncc: vec( 101): sample-mpi.c, line 30: Vectorized loop.
% mpirun -np 8 a.out
# MPI Execution: Success

```

### Note

Once the setup of the SX-Aurora TSUBASA system is successfully completed, you can delete the files under the working directory `/var/tmp/aurora`, as they are not needed for operation of the SX-Aurora TSUBASA system.

SX-Aurora TSUBASA System Software

# **SX-Aurora TSUBASA**

## **Setup Guide**

February 2024 Edition

NEC Corporation

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