

SX-Aurora TSUBASA

SX-Aurora TSUBASA Installation Guide (with OSS)

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Preface

This document describes how to set up your SX-Aurora TSUBASA system environment by using open source software (OSS).

The latest version of this document is available at:

https://sxaoratsubasa.sakura.ne.jp/documents/guide/pdfs/SX-Aurora_TSUBASA-InstallGuide_with_OSS_E.pdf

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.
Vector Island (VI)	A set of a VH and VEs that are attached to the VH. A VI is the basic unit for the tower model and rack mount model described below.
Tower model	One of the SX-Aurora TSUBASA product models. The tower model is a desk side model that can be simply set-up.
Rack mount model	One of the SX-Aurora TSUBASA product models. The rack mount model is a 1U or 4U server model with a server rack. It covers from small systems to large scale systems.
Supercomputer model	One of the SX-Aurora TSUBASA product models. The supercomputer model is positioned as the next generation model of the SX series. It can mount up to eight 4U rack mount servers. All vector engines have water cooling devices.
VMC	Abbreviation of VE Management Controller
IB	Abbreviation of InfiniBand
BMC	Abbreviation of Board Management controller
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.
Inventory file	Text file with which managed machines are registered on Ansible.
Playbook	Text files describing how to configure managed machines in the YAML format on Ansible.

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Chapter1 Introduction

1.1 Overview

The SX-Aurora TSUBASA system allows configuring a system with more than hundreds or thousands of VH nodes mounting the Vector Engine (VE). As the system configuration grows larger, huge amount of time is required to install software programs on VHs and set up the environments for the software programs.

The SX-Aurora TSUBASA system provides procedures (this document) for setting up software environments using open source software (OSS), samples of OSS configuration files, and tools used in setting up environments, which automate installation of software programs on VHs and environment setup in a large scale system, leading to improved efficiency.

This document describes how to set up your SX-Aurora TSUBASA system environment by using OSS.

The table below shows OSS used to automate provisioning of the TSUBASA system environment.

Table 1 Used OSS

What is automated	OSS
OS installation to VHs	Cobbler
Software installation and environment setup	Ansible

Notice

SX-Aurora TSUABSA software installation and environment setup for VH by Ansible in this document are available at release as of October 2023. The target OS are RHEL 7.9/8.6/8.8 , Rocky Linux 8.6/8.8 and CentOS 7.9. In addition, updates of SX-Aurora TSUBASA software are not supported.

1.2 System Architecture

The SX-Aurora TSUBASA system uses Cobbler and Ansible on the management server to automate environment setup of VHs. Because of this, the management server needs to connect to all VHs of the system through a network. Install Cobbler and Ansible on the

management server. Install the HTTP server and the DHCP server on the management server as well to automatically install the OS on VHs using Cobbler.

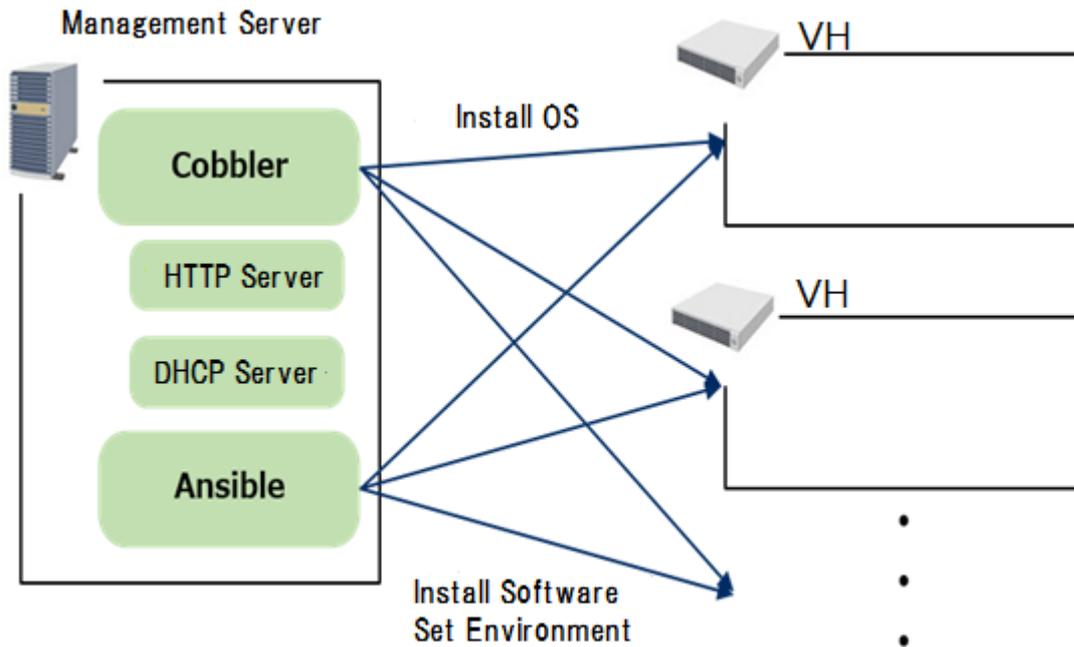


Figure 1 System Architecture

You may need to boot or power off VHs from the management server while setting up the VH environment. Configure your network to allow access from the management server to the BMC of VHs.

Using the same network for management and BMC :

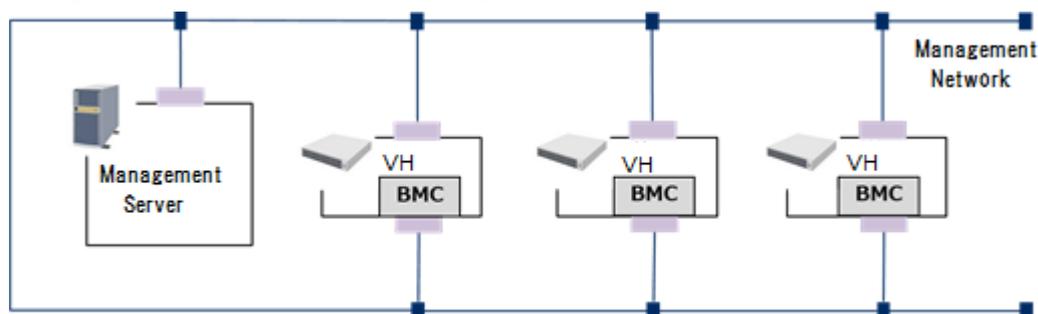


Figure 2 Network Layout 1

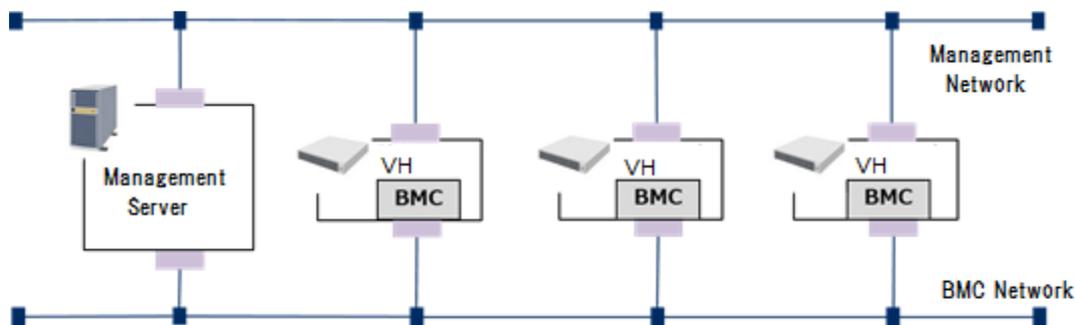


Figure 3 Network Layout 2

1.3 Operating Environment

The following environment supports automation of VH environment setup described in this document.

[Management Server]

H/W	X86_64 Architecture machine
OS	Red Hat Enterprise Linux 7.9 or later (Cobbler) Red Hat Enterprise Linux 7.9 or later / 8.6 or later (Ansible)
OSS	Cobbler 2.8.0 / 2.8.3 / 2.8.5(2.8.5-0.3) (The operations check is done until version 2.8.5-0.3 of Cobbler.)
	Ansible 2.8.1 / 2.9.1

[VH]

H/W	The models listed in the SX-Aurora TSUBASA product catalog.
OS	The NEC support portal below lists the operating systems and their kernel versions verified for the SX-Aurora TSUBASA. [SX-Aurora TSUBASA] Supported OSes and kernel versions

http://www.support.nec.co.jp/en/View.aspx?id=4140100078

1.4 Sequence of environment setup

Follow the steps below to set up an environment for the SX-Aurora TSUBASA system.

(1) Setting the management server

Create an administrative user, and Install the required packages on the management server.

(2) Obtain the required packages

Obtain the packages required for installation, and put on the management server.

(3) Install the OS on VHs.

Install the OS on VHs by using Cobbler.

(4) Setting for using Ansible.

Configure the management server to be able to operate the VHs by using Ansible.

(5) Install the SX-Aurora TSUBASA software to VHs.

Install software programs required for operation of the SX-Aurora TSUBASA system and start their services by using Ansible.

1.5 Prerequisites

- Install OS to the Management Server.
- Connect the management server to the VHs by the network.

1.6 Notice

Please use UEFI mode as factory default at BOOT mode in BIOS settings. System boot or OS installation might be possible if you change the BIOS settings, but this equipment does not support it except factory default.

Chapter2 Setting the Management Server

2.1 Creating an administrative user (admin)

Create an account for an administrative user admin. And it is required to give sudo privilege and to disable requiretty for admin user. The administrative user admin is a user who runs Ansible commands. You must create an admin user before you install the template package at "2.3 Installing the template Package".

```
Example:
# useradd -m admin
# passwd admin
Changing password for user admin.
New UNIX password: (Input Password)
Retype new UNIX password: (Re-input Password)
passwd: all authentication tokens updated successfully.
# visudo
:
admin ALL=(ALL) NOPASSWD: ALL
Defaults:admin !requiretty
```

When you are using Ansible, an administrative user admin remotely logs in VHS from the management server over SSH. Because of this, you need to create the administrative user admin on the VHS as well. The administrative user admin is created when they use Cobbler to install the OS on VHS. The details are described in "4. OS Installation on VH".

2.2 Setting administrative user's SSH public and private keys

Ansible used to setup the VH environment first logs into VHS over SSH for further operations. Generate public and private keys for the administrative user admin to log in VHS over SSH, and change the SSH configuration.

```
# su - admin
$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/admin/.ssh/id_rsa):
Enter passphrase (empty for no passphrase): (Input passphrase)
Enter same passphrase again: (Re-input passphrase)
```

```
Your identification has been saved in /home/admin/.ssh/id_rsa.  
Your public key has been saved in /home/admin/.ssh/id_rsa.pub.  
The key fingerprint is:
```

```
:
```

The public key is created in the `~admin/.ssh/id_rsa.pub` file.

Change the SSH configuration of administrative user admin, [`~admin/.ssh/config`], as follows to prevent the warning message from appearing when connecting to a VH over SSH.

```
$ cat ~/.ssh/config  
Host *  
    StrictHostKeyChecking no  
$ chmod 600 ~/.ssh/config
```

2.3 Installing the template package

The template package, `TSUBASA-sysmng-soft-X.Y-Z.noarch.rpm`, provides sample files and tools described in this document. Download the latest `TSUBASA-sysmng-soft-X.Y-Z.noarch.rpm` and save it in any directory you wish on the management server.

File Path:

```
https://sxaurooratsubasa.sakura.ne.jp/repos/additional/management\_tools/management\_tools\_e1x/TSUBASA-sysmng-soft-X.Y-Z.noarch.rpm
```

For install:

```
# yum install TSUBASA-sysmng-soft-X.Y-Z.noarch.rpm
```

If you can access to the open repository, install as follows:

For install:

```
# yum install  
https://sxaurooratsubasa.sakura.ne.jp/repos/additional/management\_tools/management\_tools\_e1x/TSUBASA-sysmng-soft-X.Y-Z.noarch.rpm
```

This template package will install the property under `/opt/nec/sysmng-soft/` directory.

2.4 Installing software programs

Install the following software programs used for setting up the VH environment.

2.4.1 Installing Cobbler

Install Cobbler on the management server. For information about verified versions, see "1.3. Operating Environment". Please refer to the official website of Cobbler for the installation sequence.

2.4.2 Installing Ansible

Install Ansible on the management server. For information about verified versions, see "1.3. Operating Environment". Please refer to the official website of Ansible for the installation sequence.

2.4.3 Installing Apache HTTP Server

You use the HTTP server on the management server to download files to each VH. Install the Apache HTTP Server on the management server and start the HTTP server.

```
# yum -y install httpd
# systemctl start httpd.service
```

2.4.4 Installing unzip

You use unzip command for expand the SX-Aurora TSUBASA software zip file. Install the unzip on the management server.

```
# yum -y install unzip
```

Chapter3 Obtaining and placing the required files for installation

3.1 Confirm the support ID of SX-Aurora TSUBASA

Access to the yum repository for the paid software requires the support pack or support contract.

Edit the yum configuration file `/etc/yum.repos.d/TSUBASA-restricted.repo` for the paid software based on the contract details you have: Enter the 16 digits of the serial number on the serial number card, excluding the hyphens, in the username field, the right eight digits in the password field, and 1 in the enabled field.

If you have bought the support pack, the serial number card is included in the file you can download from the internet delivery product download service. If you have the support contract, please contact our sales. Below figure shows an example of the serial number card.

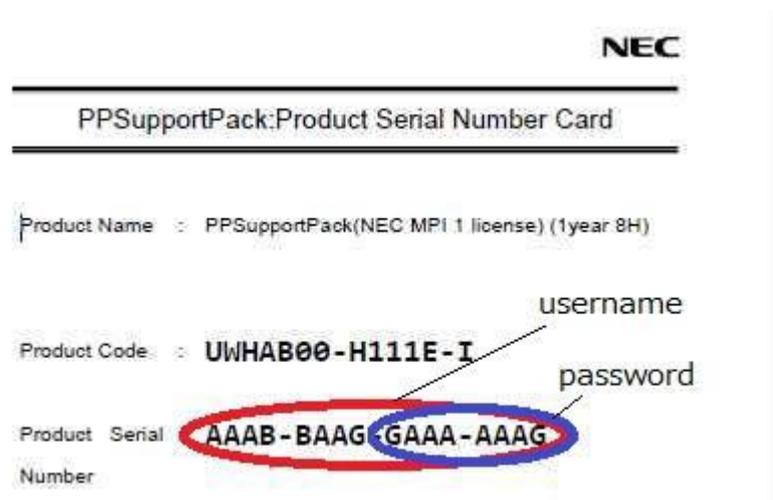


Figure 4 Serial Number Card

3.2 TSUBASA-soft-release package

If the open repository is usable from VH, you do not need to obtain the TSUBASA-soft-release package in this procedure.

Obtain a package (TSUBASA-soft-release-ve?-X.Y-Z.noarch.rpm) to install the software needed for the SX-Aurora TSUBASA system from the open repository, and place it under /opt/nec/sysmng-soft/rpms/. This package contains such as scripts for the service start/stop and the GPG public key required for installation.

File Path:

```
https://sxauratorsubasa.sakura.ne.jp/repos/TSUBASA-soft-release-ve?-X.Y-Z.noarch.rpm
```

Example of RHEL8.8:

```
# cd /opt/nec/sysmng-soft/rpms/

[VE1/VE2 model]
# cp <suitable path>/TSUBASA-soft-release-ve1-3.0-1.noarch.rpm .

[VE3 model]
# cp <suitable path>/TSUBASA-soft-release-ve3-3.0-1.noarch.rpm .
```

3.3 The ISO image file of installing OS

Obtain the ISO image file of the OS you want to install on the VH and place it under /opt/nec/sysmng-soft/iso/. And create a /var/www/html/os_repos/ directory and mount the ISO image there.

Example of RHEL8.8:

```
# cd /opt/nec/sysmng-soft/iso/
# cp <suitable path>/rhel-8.8-x86_64-dvd.iso .
# mkdir /var/www/html/os_repos
# mount -t iso9660 -o ro /opt/nec/sysmng-soft/iso/rhel-8.8-x86_64-dvd.iso
/var/www/html/os_repos
```

The NEC support portal below lists the operating systems and their kernel versions verified for the SX-Aurora TSUBASA.

[SX-Aurora TSUBASA] Supported Oses and kernel versions

<http://www.support.nec.co.jp/en/View.aspx?id=4140100078>

3.4 Kernel update packages

After you install the OS in the VH, you must update the Linux kernel on the VH to a verified kernel version. Obtain the update packages of kernel and place that under /opt/nec/sysmng-soft/updates/.

The package files to be obtained are as follows:

[RHEL/CentOS 7.x]

- kernel-x.x.x.*.rpm
- kernel-headers-x.x.x.*.rpm
- kernel-devel-x.x.x.*.rpm

[RHEL/CentOS/Rocky Linux 8.x]

- kernel-x.x.x.*.rpm
- kernel-headers-x.x.x.*.rpm
- kernel-core-x.x.x.*.rpm
- kernel-modules-x.x.x.*.rpm
- kernel-devel-x.x.x.*.rpm
- kernel-modules-extra-x.x.x.*.rpm (Case of RHEL/Rocky Linux 8.8)
- linux-firmware-20220726-110.git150864a4.el8.noarch.rpm (Case of RHEL/Rocky Linux 8.6)

```
# cd /opt/nec/sysmng-soft/updates/  
# cp <suitable path>/kernel*.rpm .
```

The NEC support portal below lists the operating systems and their kernel versions verified for the SX-Aurora TSUBASA.

[SX-Aurora TSUBASA] Supported OSES and kernel versions

<http://www.support.nec.co.jp/en/View.aspx?id=4140100078>

3.5 The ISO file of MLNX_OFED

If you use InfiniBand with the SX-Aurora TSUBASA, you must also install MLNX_OFED onto the VHS.

Correspondence between the OS Versions and Mellanox OFED is as follows. Obtain the ISO image of MLNX_OFED of corresponding version and place that under /opt/nec/sysmng-soft/mlnx/ .

OS	MLNX_OFED
RHEL/CentOS 7.9	MLNX_OFED 4.9-2.2.4.0
RHEL/Rocky Linux 8.6	MLNX_OFED 5.8-1.1.2.1
RHEL/Rocky Linux 8.8	MLNX_OFED 23.04-1.1.3.0

You can obtain the ISO image of Mellanox OFED and related documents from the Mellanox official home page.

https://network.nvidia.com/products/infiniband-drivers/linux/mlnx_ofed/

Example of RHEL8.8:

```
# cd /opt/nec/sysmng-soft/mlnx
# cp <suitable path>/MLNX_OFED_LINUX-23.04-1.1.3.0-rhel8.8-x86_64.iso .
```

3.6 SX-Aurora TSUBASA software packages

If your SX-Aurora TSUBASA system does not have direct access to the Internet, it is necessary to set up a locally accessible yum repository.

You can obtain the zip files of the yum repository from the following links. Please download the files corresponding to your OS version and the PP support contract you have. Please note that access to the files for the paid software requires the username (the 16 digits of the serial number) and password (the right eight digits of the serial number) of the PP support contract (refer to “3.1 Confirm the support ID of SX-Aurora TSUBASA”).

- RHEL7.9

- SDK(MPI)

https://sxaoratsubasa.sakura.ne.jp/repos/restricted/mpi/mpi_el7.zip

or

- https://sxauratorsubasa.sakura.ne.jp/repos/runtime/mpi/mpi_el7.zip (Runtime)
 - SDK (except MPI)
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/sdk/sdk_el7.zip
or
https://sxauratorsubasa.sakura.ne.jp/repos/runtime/sdk/sdk_el7.zip (Runtime)
 - NQSV
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/nqsv/nqsv_el7.zip
 - ScaTeFS
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/scatefs/scatefs_el7.9.zip
 - VEOS, MMM, etc.
https://sxauratorsubasa.sakura.ne.jp/repos/TSUBASA-repo_el7.9.zip
- RHEL8.6
 - SDK(MPI)
For the enviroment where Mellanox OFED 5.x is not installed:
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/mpi/mpi_el8.zip
or
https://sxauratorsubasa.sakura.ne.jp/repos/runtime/mpi/mpi_el8.zip (Runtime)
For the enviroment where Mellanox OFED 5.x is installed:
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/mpi/mpi_mofed5_el8.zip
or
https://sxauratorsubasa.sakura.ne.jp/repos/runtime/mpi/mpi_mofed5_el8.zip (Runtime)
 - SDK (except MPI)
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/sdk/sdk_el8.zip
or
https://sxauratorsubasa.sakura.ne.jp/repos/runtime/sdk/sdk_el8.zip (Runtime)
 - NQSV
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/nqsv/nqsv_el8.zip
 - ScaTeFS
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/scatefs/scatefs_el8.6.zip
 - VEOS, MMM, etc
https://sxauratorsubasa.sakura.ne.jp/repos/TSUBASA-repo_el8.6.zip
- RHEL8.8
 - SDK(MPI)
For the enviroment where Mellanox OFED 5.x is not installed:
https://sxauratorsubasa.sakura.ne.jp/repos/restricted/mpi/mpi_el8.zip
or
https://sxauratorsubasa.sakura.ne.jp/repos/runtime/mpi/mpi_el8.zip (Runtime)

For the environment where Mellanox OFED 5.x is installed:

https://sxaurosubasa.sakura.ne.jp/repos/restricted/mpi/mpi_mofed5_el8.zip

or

https://sxaurosubasa.sakura.ne.jp/repos/runtime/mpi/mpi_mofed5_el8.zip (Runtime)

➤ SDK (except MPI)

https://sxaurosubasa.sakura.ne.jp/repos/restricted/sdk/sdk_el8.zip

or

https://sxaurosubasa.sakura.ne.jp/repos/runtime/sdk/sdk_el8.zip (Runtime)

➤ NQSV

https://sxaurosubasa.sakura.ne.jp/repos/restricted/nqsv/nqsv_el8.zip

➤ ScaTeFS

https://sxaurosubasa.sakura.ne.jp/repos/restricted/scatefs/scatefs_el8.8.zip

➤ VEOS, MMM, etc

https://sxaurosubasa.sakura.ne.jp/repos/TSUBASA-repo_el8.8.zip

Obtain the zip files of the product you want to install from the above path, place that under /var/www/html/repos/ and expand that.

```
# mkdir /var/www/html/repos/  
# cd /var/www/html/repos  
# cp <suitable path>/*.zip .  
# find . -name '*.zip' | xargs -n1 unzip
```

Chapter4 OS installation on VH

This chapter describes how to automatically install the OS on VHs by using Cobbler.

4.1 Creating the VH information file

You need the information file such as host names, IP addresses, and MAC addresses of VHs to install the OS by Cobbler. Create the file name `/opt/nec/sysmng-soft/etc/cobimport.txt` according to the format below.

Host name	MAC address	IP address	Netmask	Gateway
-----------	-------------	------------	---------	---------

Example :

vh-host01	00:1D:7D:7F:D7:01	192.168.1.1	255.255.255.0	192.168.1.100
vh-host02	00:1D:7D:7F:D7:02	192.168.1.2	255.255.255.0	192.168.1.100
vh-host03	00:1D:7D:7F:D7:03	192.168.1.3	255.255.255.0	192.168.1.100
vh-host04	00:1D:7D:7F:D7:04	192.168.1.4	255.255.255.0	192.168.1.100

4.2 Preparations for using Cobbler

To use Cobbler, change the management server settings and start required services.

4.2.1 Configuration of xinetd server

Cobbler uses the tftp service to distribute the OS boot kernel and the initrd image to VHs. Enable the tftp service on the xinetd server.

(1) Edit the tftp service configuration file.

Change `disable` in the `[/etc/xinetd.d/tftp]` file to `no`.

```
service tftp
{
    disable = no
    :
}
```

(2) Restart xinetd server.

Execute the following command to restart xinetd server.

```
# systemctl restart xinetd.service
```

4.2.2 Configuration of rsync server

When Cobbler copies a package file to VHs, it uses rsync to synchronize the file and directory.

Start up the rsync server.

```
# systemctl start rsyncd.service
# systemctl enable rsyncd.service
# systemctl list-unit-files -t service
# systemctl status rsyncd.service
```

4.2.3 Disabling SELinux and the firewall

If SELinux and the firewall are enabled on the management server, temporarily disable them before you start using Cobbler.

 Notice

Restore the SELinux and firewall configurations after installing the OS.

Disabling SELinux

```
# setenforce Permissive
```

Disabling the firewall

```
# systemctl stop firewalld.service
# systemctl disable firewalld.service
# systemctl is-enabled firewalld.service
```

4.3 Configuration of Cobbler

This section describes about the configuration of Cobbler on the management server.

4.3.1 Editing the Cobbler configuration file

In the Cobbler configuration file, [/etc/cobbler/settings], specify the IP address of the Cobbler server and how the DHCP server is managed.

- IP address of the Cobbler server

Specify the IP address of the machine where the Cobbler server runs; specify the IP address of the management server.

```
server: management-server-ipaddress
```

- Setting for DHCP server

When Installing the VH machine by Cobbler, Cobbler server get the IP address information from DHCP server. If a DHCP server already exists and the information of target machine is registered, set "manage_dhcp" to "0". Otherwise, set "manage_dhcp" to "1".

```
manage_dhcp: 0
or
manage_dhcp: 1
```

When "manage_dhcp" is "1", a DHCP server for installation is executed by Cobbler server. Once you have installed the OS on VHs, stop DHCP server. Please refer "4.6. Post OS installation tasks".

- IP address of tftp server

Specify the IP address of the machine where the tftp server runs; specify the IP address of the management server.

```
next_server: management-server-ipaddr
```

- Password of the root user on VHs

Determine the root password of VHs and set the encrypted string of the password.

```
default_password_crypted: crypted-password-string
```

To obtain *crypted-password-string* described above, run the openssl command on the management server and enter the root password of VHs.

```
# openssl passwd -1
Password: (Input root password)
Verifying - Password: (Re-input root password)
crypted-password-string
```

4.3.2 Configuration of DHCP server

When you use the existing DHCP server, please register information of target machine to a DHCP server. And, to install the OS in UEFI boot mode, edit 'filename' in the '#else' to specify "grub/grubx86_64.efi" on the group block of [/etc/dhcp/dhcpd.conf].

When you execute a DHCP server by Cobbler server, edit the template file [/etc/cobbler/dhcp.template]. Cobbler creates a configuration file [/etc/dhcp/dhcpd.conf] for DHCP server from the template file.

(1) Basic settings of dhcp.template

Edit the subnet block of the template file, [/etc/cobbler/dhcp.template], according to the VH environment.

The below is the default settings of the [/etc/cobbler/dhcp.template].

```
subnet 192.168.1.0 netmask 255.255.255.0 {
    option routers 192.168.1.5;
    option domain-name-servers 192.168.1.1;
    option subnet-mask 255.255.255.0;
    range dynamic-bootp 192.168.1.100 192.168.1.254;
    default-lease-time 21600;
    max-lease-time 43200;
    next-server $next_server;
    (omitted below)
}
```

subnet <subnet-number> netmask <mask-number>	Specify network address and its netmask.
option routers	Specify the router's IP address.
option domain-name-servers	Specify a DNS server's IP address.
option subnet-mask	Specify sub-netmask of client hosts
range dynamic-bootp	The range of IP addresses dynamically allocated to the clients. Remove this item.
default-lease-time	The default lease period of IP address in seconds.
max-lease-time	The maximum lease period of IP address in seconds.
next-server	Don't touch this item.

(2) Installation in UEFI boot mode

To install the OS in UEFI boot mode, edit the group block of [/etc/cobbler/dhcp.template].

Edit 'filename' in the '#else' clause of the conditional statement '#if \$iface.enable_gppe:' to specify "grub/grub-x86_64.efi".

```
group {
    (omitted)
    host $iface.name {
        (略)
        #if $iface.enable_gppe:
        if exists user-class and option user-class = "gPXE" {
            filename http://$cobbler_server/cblr/svc/op/gppe/system/$iface.owner";
        } else if exists user-class and option user-class = "iPXE" {
            filename "http://$cobbler_server/cblr/svc/op/gppe/system/$iface.owner";
        } else {
            filename "undionly.kppe";
        }
        #else
        ##filename "$iface.filename";
        filename "grub/grub-x86_64.efi";
        #end if
        (omitted)
    }
}
```

(3) The management server and VH machines on different subnets

By default, Cobbler installs the OS only on clients on the same subnet where the Cobbler machine resides. When the management server where the Cobbler server is located, and VH machines reside on different subnets, use the DHCP relay agent function of the router. The DHCP relay agent function allows communicating messages between a DHCP server and DHCP clients residing in different subnets. See the manual of your router to set the DHCP relay agent function.

The subnet block in [/etc/cobbler/dhcp.template] should be set by each subnet.

Example when installing VHs on 2 subnets:

```

subnet 192.168.2.0 netmask 255.255.255.0 {
    option routers 192.168.2.5;
    option domain-name-servers 192.168.1.1;
    option subnet-mask 255.255.255.0;
    range dynamic-bootp 192.168.2.100 192.168.2.254;
    default-lease-time 21600;
    max-lease-time 43200;
    next-server $next_server;
    (omitted)
}
subnet 192.168.3.0 netmask 255.255.255.0 {
    option routers 192.168.3.5;
    option domain-name-servers 192.168.1.1;
    option subnet-mask 255.255.255.0;
    range dynamic-bootp 192.168.3.100 192.168.3.254;
    default-lease-time 21600;
    max-lease-time 43200;
    next-server $next_server;
    (omitted)
}

```

4.3.3 Obtaining and storing bootloaders

Cobbler distributes network bootloaders to VHs from the management server. Obtain the network bootloaders Cobbler provides from their official website.

At first, start the http server and the Cobbler server.

Start the http server.

```
# systemctl start httpd.service
```

Start the Cobbler server.

```
# systemctl start cobblerd.service
```

Run get-loaders, a sub command of the cobbler command, to obtain the network bootloaders.

```
# cobbler get-loaders
```

When a proxy is set on the management server, configure the proxy server in [/etc/cobbler/settings] and run the command above.

```
proxy_url_ext: "proxy-server-ipaddr:port-number"
```

4.3.4 Confirmation of Cobbler server startup

Follow the steps below to start the Cobbler server to check the configuration

Start the http server.

```
# systemctl start httpd.service
```

Start the Cobbler server.

```
# systemctl start cobblerd.service
```

Check the Cobbler server configuration.

```
# cobbler check
```

The following message appears when no configuration problems are found.

```
No configuration problems found. All systems go.
```

When there is any configuration problem, an error message appears. Use the error message to solve the problem and repeat "Check the Cobbler server configuration".

Repeat this process until all errors are fixed.

Example of error message

1 : SELinux is enabled. Please review the following wiki page for details on ensuring cobbler works correctly in your SELinux environment:

If this message is displayed, disable SELinux described as "4.2.3. Disabling SELinux and the firewall".

4.4 Preparation of OS installation

Register the information required for OS installation with the Cobbler server.

4.4.1 Editing a kickstart file

Cobbler uses the kickstart templating function to customize installation of the OS on VHs. This section describes how to edit a kickstart file for this function.

Copy the sample file of the kickstart file, '[/var/lib/cobbler/kickstarts/sample_end.ks]' to the actual file.

```
# cd /var/lib/cobbler/kickstarts
# cp sample_end.ks kickstart.ks
```

Use the explanation in this section as reference to edit the kickstart.ks file.

(1) The configuration of a kickstart file

A kickstart file broadly consists of the following three sections where you can specify your customization.

Command section	Write commands describing the settings for installation at the top of the file.	
Package section (%packages)	Specify packages to install by starting the section with the %packages line	
Script section (%pre, %post)	The section started with %pre	Specify a script to run before the installation starts
	The section started with %post	Specify a script to run after the installation.

This document provides examples of customization only for basic items. Make sure to configure the following to use Ansible for provisioning an environment for the SX-Aurora TSUBASA system.

- Registration of Ansible administrative user.
- Grant sudo permissions to Ansible administrative user.
- Disabling requiretty for Ansible administrative user.
- Registration of Ansible administrative user's SSH public key.

For customization of other items, visit Cobbler's official website. For the details of the syntax of kickstart file, please refer to the installation guide of Linux OS.

(2) Command section

In the command section, specify items such as installation method, time zone, and partitioning scheme.

Register an Ansible administrative user admin as well.

1. Settings of keyboard

Specify the type of keyboard to use.

When using the Japanese keyboard:

```
# System keyboard
keyboard jp106
```

2. Settings of language

Specify the language to use.

When using the Japanese UFT-8:

```
# System language
lang ja_JP.UTF-8
```

3. Settings of timezone

Specify the time zone to use. To use the hardware clock time for UTC, specify `--isUtc`.

When using the Japan Standard Time:

```
# System timezone
timezone Asia/Tokyo --isUtc
```

4. Partitioning

Change partitioning scheme of VH machines according to their configurations.

The following is an example of setting partitioning without using the auto partition function (autopart).

Create a `/boot/efi` partition for using UEFI boot mode.

```
# Allow anaconda to partition the system as needed
part /boot/efi --fstype vfat --size=value --ondisk=sda
part /boot --fstype ext3 --size=value --ondisk=sda
part swap --size=value --ondisk=sda
part pv.id --size=value --ondisk=sda
volgroup volname pv.id
logvol / --vgname=volname --size=value --name=logvolname-root
logvol /var --vgname=volname --size=value --name=logvolname-var
logvol /tmp --vgname=volname --size=value --name=logvolname-tmp
logvol /home --vgname=volname --size=value --grow --
name=logvolname-home
```

5. Creating an Ansible administrative user admin.

Add the following user command, and specify the password encrypting method in the auth command.

```
# System authorization information
auth --usesshadow --passalgo=sha512
(omitted)
# Add the admin user for Ansible
```

```
user --name=admin --homedir=homedirpath --shell=shellpath --
uid=userid
--gid=groupid --iscrypted --password=cryptedpassword
```

Use the user command above to add an administrative user admin, as a user belonging to the group admin (group ID: *groupid*).

Manage the home directory specified for --homedir as a local directory and do not share the directory by shared file systems. Use the following command to create *cryptedpassword*, the encrypted string of the password specified in the --password option. The following command is an example of using SHA512 for hashing.

```
$ python
>>> import crypt, getpass
>>> print(crypt.crypt(getpass.getpass(), "$6$salt"))
Password: (Input password)
cryptedpassword
>>> exit()
```

(3) Package section

In the package section, specify packages to install. Specify packages by group names or package names. For information about groups that can be specified, see the installation guide of the OS.

You do not need to specify Core and Base groups because they are selected by default. Because OpenSSH and python, which are required for using Ansible, are included in these groups, no change is necessary in the package section for OpenSSH and python. If you want to install any additional package, refer to the following for customization.

The %packages section of the kickstart sample file uses the SNIPPET() function.

```
%packages
$SNIPPET('func_install_if_enabled')
%end
```

Edit [/var/lib/cobbler/snippets/func_install_if_enabled], the file the SNIPPET function imports, and specify packages to be installed. The following describes how to edit.

- Specifying a package group

Enter one group per line. Start a line with the at sign (@) followed by the group name. The following is an example of installing packages belonging to X Windows System and the network file system client.

```
@X window system
```

```
@network-file-system-client
```

- Specifying a package

Enter one package per line. You may use an asterisk (*) for a wildcard character. The following is an example of installing `sqlite`, `curl`, and `aspell` packages as well as any package starting with `docbook`.

```
sqlite
curl
aspell
docbook*
```

(4) Script section

In the script section, specify the processes to run before or after the OS installation as described below.

- Settings not to use the Yum repository of the Cobbler server.

For VHs configured not use the Yum repository of the Cobbler server, comment out the `"$yum_config_stanza"` specification.

```
%post
:
# Start yum configuration
#$yum_config_stanza
# End yum configuration
:
%end
```

- Adding processes to use Ansible.

To use Ansible, specify the following processes as scripts to run after the OS installation.

- Grant sudo privilege to Ansible administrative user.
- Disabling requiretty for Ansible administrative user.
- Registration of Ansible administrative user's SSH public key.

A sample of the script file is provided. Edit the sample by the following sequence.

- i. Copy the sample script file.

Copy the sample of the script file installed in "2.3. Installing the template package" into the Cobbler environment.

```
# cp /opt/nec/sysmng-soft/etc/vh_admin_conf
    /var/lib/cobbler/snippets/
```

- ii. Edit the script file.

Edit the [/var/lib/cobbler/snippets/vh_admin_conf] file.

Content of the sample file:

```
# Add sudo privileges and disable requiretty for the admin user
chmod +w /etc/sudoers
echo 'admin ALL=(ALL) NOPASSWD:ALL' >> /etc/sudoers
echo 'Defaults:admin !requiretty' >> /etc/sudoers
chmod -w /etc/sudoers
# Set the ssh public key for admin user
cd ~admin
mkdir --mode=700 .ssh
cat >> .ssh/authorized_keys << PUBLIC_KEY
ssh-rsa AAAAB3N ... xPzomFvVn/g9QOJ admin@serverhostname
PUBLIC_KEY
chown admin.admin -R .ssh
chmod 600 .ssh/authorized_keys
```

Replace the here document section using PUBLIC_KEY as a delimiter with the content of [/home/admin/.ssh/id_rsa.pub] obtained in "2.2. Setting administrative user's SSH public and private keys".

- iii. Register the script in the kickstart file.

Add the process to import [vh_admin_conf] by using the SNIPPET() function to the %post section of the kickstart file.

```
%post
$SNIPPET('vh_admin_conf')
$SNIPPET('log_ks_post')
:
%end
```

To apply the changes in the kickstart file, specify the kickstart file by using the --kickstart option of the cobbler import command that registers profiles, and run the command. Details of the cobbler import command are provided in "4.4.2. Importing ISO image".

4.4.2 Importing ISO image

Import the ISO image file of the OS to be installed on VHs to Cobber, define the distribution to be provided, and register profiles. A profile associates a system name and the distribution to be provided.

1. Importing the ISO image

Import the ISO image file to Cobbler by using the import sub command of the cobbler

command.

```
# cobbler import --name=rhelN.N-x86_64 --arch=x86_64 ¥
--path=/var/www/html/os_repos --breed=redhat ¥
--kickstart=/var/lib/cobbler/kickstarts/kickstart.ks
```

- name Specify the name of the distribution to be provided.
- arch Specify the architecture type.
- path Specify the path to the location where the ISO image file is stored.
- breed Specify the OS type of kernel and other parameters applied for OS installation. Specify redhat.
- kickstart Specify the path name of the kickstart file created in "4.4.1. Editing a kickstart file".

Please refer to the manual of cobbler command for the details of these options.

2. Check the distribution.

When you run the cobbler import command, the specified distribution is registered. Run either of the following commands to check the distribution is registered successfully.

```
# cobbler distro list
# cobbler distro report --name=rhelN.N-x86_64
```

3. Check profiles

When you run the cobbler import command, profiles are registered. Run either of the following commands to check the profiles are registered successfully.

```
# cobbler profile list
# cobbler profile report --name=rhelN.N-x86_64
```

4.4.3 Registration of system

Cobbler installs the OS according to profiles registered for each of machines targeted for the installation. Because of this, information specific to each targeted machine (VH) (such as MAC address, IP address) must be registered with Cobber as system records.

Use the system sub command of the cobbler command for the registration.

1. Register system

You may use cobimport.sh, a bulk registration tool, to register systems with Cobbler. Run the following command.

```
# /opt/nec/sysmng-soft/bin/cobimport.sh ¥
```

```
--hostlist=/opt/nec/sysmng-soft/etc/cobimport.txt ¥
--profile=profilename --interface=interface --static=1
```

Specify the file cobimport.txt created in “4.1 Creating the VH information file” to the --hostlist option as the host list.

Specify the profile name registered in “4.4.2 Importing ISO image” to the --profile option. Specify the network interface (eno1, etc) to the --interface option.

Configure the --static option and choose whether to specify the IP addresses set to the VHs as static addresses or assign addresses from the DHCP server. Specify --static=1 to assign the IP addresses of the VHs as static IP addresses. Omit the --static option to assign IP addresses from the DHCP server.

This tool allows registering all the VHs on the host list file at once. In this case, VH host names are registered as system names.

You may register VHs individually without using the bulk registration tool. In this case run the cobbler system command.

```
# cobbler system add --name=systemname --profile=profilename ¥
--hostname=hostname --interface=interface --static=1 ¥
--ip-address=ipaddr --subnet=subnetmask ¥
--gateway=gateway --mac=macaddress
```

For details of each options, please refer to manual page of the cobbler command.

2. Check the system

Information about VHs is registered as systems. Run the following command to check systems are registered successfully.

```
# cobbler system list
# cobbler system report --name=systemname
```

4.5 Starting OS installation

Apply the information you have registered in the Cobbler server.

```
# cobbler sync
```

Now you are ready to install the OS on VHs.

When you have updated any file related to Cobbler settings, make sure to apply the latest status in the Cobbler server using cobbler sync command.

When you manually power on each VH and network boot starts, the OS is automatically installed. After the OS installation, VHs are started.

4.6 Post OS installation tasks

Once you have installed the OS on VHs, stop the Cobbler server and restore the SELinux and firewall configurations. Stop rsync, xinetd, and DHCP servers Cobbler used. You do not need to stop the HTTP server because you will use it for "Chapter 6 Installing SX-Aurora TSUBASA software".

1. Stop Cobbler server.

Stop the cobbler server on the management server.

```
# systemctl stop cobblerd.service
```

2. Restore the firewall configuration.

If you temporarily disabled the firewall to use Cobber in "4.2.3. Disabling SELinux and the firewall", restore the configuration.

3. Restore the SELinux configuration.

If you temporarily disabled the SELinux to use Cobber in "4.2.3. Disabling SELinux and the firewall", restore the configuration.

4. Stop rsync server.

If you do not use the rsync server on the management server, stop the rsync server.

```
# systemctl stop rsync.service
```

5. Stop xinetd server.

If you do not use the xinetd server on the management server, stop the xinetd server.

```
# systemctl stop xinetd.service
```

6. Stop DHCP server.

If you set "manage_dhcp" to 1, DHCP server is started from Cobbler server. Stop this DHCP server started on the management server.

```
# systemctl stop dhcpd.service
```


Chapter5 Setting the operating environment by Ansible

5.1 Sample playbook files

The playbooks described in this document are provided as sample files, which are installed under [/opt/nec/sysmng-soft/etc/ansible] by the procedures in "2.3. Installing the template package". The following table shows directory layout and roles of sample playbooks.

File Names	Descriptions
vh-kernel-update.yml	Playbook to update the kernel on VHS.
vh-install.yml	Playbook to install SX-Aurora TSUBASA software on VHS.
vh-add-admin.yml	Playbook to configure the management user on VHS.

5.2 Register the VH information

Create an Inventory file for use to build the VH machine environment. The file name is /opt/nec/sysmng-soft/etc/ansible/vh-hosts.

If you have installed the SX-Aurora TSUBASA software in VH and have already updated the vh-hosts file in accordance with "SX-Aurora TSUBASA Installation Guide (with OSS)", this process is not required. If you had installed it in a different way, please update the vh-hosts file.

Please describe the host name under groups on the vh-hosts file according to the following usage use of VH (devel, runtime, frontend).

VE1/VE2 model: [devel] [runtime] [frontend]

VE3 model: [ve3_devel] [ve3_runtime] [ve3_frontend]

- (1) The environment to compile and execute programs (devel, ve3_devel)
A Linux (x86) server to which VEs are attached, and compiles programs.
- (2) The environment only to execute programs (runtime, ve3_runtime)
A Linux (x86) server to which VEs are attached, and does not compile programs.
- (3) The environment only to compile programs (frontend, ve3_frontend)

A Linux (x86) server to which VEs are not attached, and compiles programs.

```

$ cd /opt/nec/sysmng-soft/etc/ansible/
$ vi vh-hosts
#####
## For Aurora VE1/VE2 machine
#####
[ve1:children]
devel
runtime
frontend

[devel]
vh-devel00

[runtime]
vh-runtime00

[frontend]
vh-frontend00

#####
## For Aurora VE3 machine
#####
[ve3:children]
ve3_devel
ve3_runtime
ve3_frontend

[ve3_devel]
vh3-devel00

[ve3_runtime]
vh3-runtime00

[ve3_frontend]
vh3-frontend00

```

The package groups to be installed for each application are as follows. However, NEC SDK, NEC MPI, NQSV, and ScaTeFS/Client are only eligible for installation if you have a support service for a paid package.

PP	devel	runtime	frontend
InfiniBand for SX-Aurora TSUBASA	ve-infiniband	ve-infiniband	-
VE Application	ve-devel	ve-runtime	ve-frontend
NEC SDK	nec-sdk-devel	nec-sdk-runtime	nec-sdk-frontend
NEC MPI	nec-mpi-devel	nec-mpi-runtime	nec-mpi-frontend
NQSV	nqsv-execution	nqsv-execution	-
ScaTeFS/Client	scatefs-client-tsubasa	scatefs-client-tsubasa	-

In addition, this Playbook installs all packages in the target package group. You cannot install only part of a package group.

5.3 Setting an administrative user (admin) on VH

If you have installed the SX-Aurora TSUBASA software in VH and have already updated the `vh-hosts` file in accordance with this document, this process is not required. If you had installed it in a different way, you will need to set an administrative user to each VH machines.

Register the SSH public key of the root user on the management server with VHs in order to access VHs via SSH as follows:

- (1) Creation of the SSH Public and Private Key Pair of the Root user on the Management Server.

```
$ su
# ssh-keygen -t rsa
```

The public key is created in the file [`~root/.ssh/id_rsa.pub`].

- (2) Registration of the Public Key with VHs

Please run the following command to every VH.

```
# ssh-copy-id -i ~/.ssh/id_rsa.pub vh-name01
root@vh-name01's password: (Enter root password)
```

- (3) Modification of the SSH Configuration of the Root user

Modify the file [`~root/.ssh/config`] as follows so that warning messages are not displayed at the access to VHs via SSH.

```
# cat ~/.ssh/config
Host *
  StrictHostKeyChecking no
# chmod 600 ~/.ssh/config
```

- (4) Execution of a Playbook to Configure the Management User

Please run `ssh-agent` command and register the private key of the root user using `ssh-add` command. Then, perform `vh-add-admin.yml` with `ansible-playbook` command. At the execution of `vh-add-admin.yml`, enter the password of the management user `admin`.

```
# ssh-agent bash
# ssh-add ~/.ssh/id_rsa
Enter passphrase for /root/.ssh/id_rsa: (Enter the private key
```

```

passphrase)
Identity added: /root/.ssh/id_rsa (/root/.ssh/id_rsa)
# cd /opt/nec/sysmng-soft/etc/ansible
# ansible-playbook -i vh-hosts vh-add-admin.yml
Enter the password of new user admin: (Enter a password of the
management user, admin)
confirm Enter the password of new user admin: (Enter the
password again)
# exit
# exit
$

```

At this point, the management user admin is created on VHS.

5.4 Checking VH connectivity

Ansible used for setting the VH environment first logs in VHS over SSH for further operations. Start the ssh-agent and run the ssh-add command to register a SSH private key before running the Ansible command. Private key registration enables remote login without entering a passphrase. The private key to be used is created in "2.2. Setting administrative user's SSH public and private keys".

```

$ ssh-agent bash
$ ssh-add ~/.ssh/id_rsa
Enter passphrase for /home/admin/.ssh/id_rsa: (Input passphrase)
Identity added: /home/admin/.ssh/id_rsa (/home/admin/.ssh/id_rsa)

```

Run the following ansible command with the --become option to ensure that the result is "uid=0(root)".

```

$ ansible -i vh-hosts all -m shell --become -a "id"
host001 | CHANGED | rc=0 >>
uid=0(root) ...

```

5.5 Setting the variables for installing SX-Aurora TSUBASA software

The common variables used in Ansible Playbook are defined in groups_vars/all file. Before running Ansible Playbook, set the value to the following variables in groups_vars/all file.

Variables	Value	Example
management_server	Specify the IP address of the management server.	management_server: <IP address>

	This variable is required to create a Yum repository for the OS, so be sure to specify it.	
repo_type	If you can access the open repository directly from VH, set remote. If you cannot access the open repository directly from VH, set local.	repo_type: remote or repo_type: local
proxy_server	If you need to configure a proxy server to access open repository from AAA, specify this variable.	proxy_server: http://xx.xx.xx.xx:yyy/
sdk_username	If you have a PP support contract for SDK, specify 16 digits of the serial number on the serial number card, excluding the hyphens, as the user name.	sdk_username: <strings of 16 digits>
sdk_password	If you have a PP support contract for SDK, specify right 8 digits of the serial number on the serial number card, excluding the hyphens, as the password.	sdk_password: <strings of 8 digits>
mpi_username	If you have a PP support contract for MPI, specify 16 digits of the serial number on the serial number card, excluding the hyphens, as the user name.	mpi_username: <strings of 16 digits>
mpi_password	If you have a PP support contract for MPI, specify right 8 digits of the serial number on the serial number card, excluding the hyphens, as the password.	mpi_password: <strings of 8 digits>
scatefs_username	If you have a PP support contract for ScaTeFS, specify 16 digits of the serial number on the serial number card, excluding the hyphens, as the user name.	scatefs_username: <strings of 16 digits>
scatefs_password	If you have a PP support contract for ScaTeFS, specify right 8 digits of the serial number on the serial number card, excluding the hyphens, as the password.	scatefs_password: <strings of 8 digits>
nqsv_username	If you have a PP support contract for	nqsv_username: <strings of 16 digits>

	NQSV, specify 16 digits of the serial number on the serial number card, excluding the hyphens, as the user name.	
nqsv_password	If you have a PP support contract for NQSV, specify right 8 digits of the serial number on the serial number card, excluding the hyphens, as the password.	nqsv_password: <strings of 8 digits>
aurlic_serverport	The port number that the license server uses to wait license request. (default:7300)	aurlic_serverport: 7301
aurlic_serverhost	The hostname or IP address of the license server	aurlic_serverhost: server001

Chapter6 Installing SX-Aurora TSUBASA software

6.1 Updating the kernel on VH

Run the `vh-kernel-update.yml` Playbook to update the kernel on the VH machine.

```
$ cd /opt/nec/sysmng-soft/etc/ansible
$ ansible-playbook -i vh-hosts vh-kernel-update.yml
```

After the kernel is updated, the VH machine is rebooted.

6.2 Installing SX-Aurora TSUABASA software

Run the `vh-install.yml` Playbook to install the latest packages of both the free software and the paid software on VH machine.

```
$ cd /opt/nec/sysmng-soft/etc/ansible
$ ansible-playbook -i vh-hosts vh-install.yml
```

6.3 Status Check of the VEs

Confirm the status of the VEs is ONLINE with the `vecmd` command as the superuser.

It can take a few minutes until it becomes ONLINE.

```
$ ansible -i vh-hosts all --become -a "/opt/nec/ve/bin/vecmd
state get"
vh-name01 | SUCCESS | rc=0 >>
Vector Engine MMM-Command v0.5.13
Command:
state -N 0,1,4,5 get
-----
VE0 [04:00.0] [ ONLINE ] Last Modif:2017/12/19 14:19:49
VE1 [06:00.0] [ ONLINE ] Last Modif:2017/12/19 14:19:51
VE4 [0c:00.0] [ ONLINE ] Last Modif:2017/12/19 14:19:53
VE5 [0e:00.0] [ ONLINE ] Last Modif:2017/12/19 14:19:55
-----
Result: Success
:
```

Appendix A Trouble Shooting

A.1 Cobbler

(1) A cobbler command failed.

- Problem

The following error occurs when running a cobbler command.

```
cobblerd does not appear to be running/accessible: error(111, 'Connection refused')
```

- Cause

The Cobbler server may not be started.

- Solution

Check that the Cobbler server is started. If not, start the Cobbler server.

```
# systemctl status cobblerd.service  
# systemctl start cobblerd.service
```

- Related information

"4.3.4. Confirmation of Cobbler server startup"

(2) The cobbler command fails to register system records.

- Problem

The following error occurs when running the cobbler system command or the cobimport.sh command.

```
exception on server: 'invalid profile name: xxxxx'
```

- Cause

A wrong profile may be specified.

- Solution

A profile name is defined in the cobbler import --name=profilename in profile registration. Specify this profile name in the --profile option of the failed command and run the command again.

- Related information
"4.4.2. Importing ISO image"

(3) IP addresses are not automatically assigned after OS installation starts.

- Problem

The following message appears on the console window after starting a VH machine for the OS installation and the installation process waits for the DHCP server to respond.

```
CLIENT MAC ADDR: xx xx  
DHCP..
```

- Cause

Possible causes are as follows:

- The DHCP server is not started.
- [/etc/cobbler/dhcp.template] is not correctly configured when the Cobbler server machine and a VH machine are located on the network of the same subnet mask.
- [/etc/cobbler/dhcp.template] is not correctly configured when the Cobbler server machine and a VH machine are located on networks of different subnet masks.
-

- Solution

- Run the cobbler sync command and start the DHCP server.
- See "4.3.2. Configuration of DHCP server" and check that the setting is correct. If you modify the [/etc/cobbler/dhcp.template], run the cobbler sync command and reboot the DHCP server.

- Related information
"4.3.2. Configuration of DHCP server"

(4) OS is not installed as intended.

- Problem

The OS is not installed as configured in the kickstart file or kickstart script file.

- Cause
After the kickstart file or kickstart script file were edited, modified settings may not be applied in the Cobbler server.
- Solution
Run the cobbler sync command to apply settings in the Cobbler server.
- Related information
"4.5. Starting OS installation"

A.2 Ansible

(1) Entry of the SSH private key's password is required.

- Problem
Entry of the SSH private key's password is required for each target machine when running ansible-playbook or ansible command.

```
$ ansible-playbook -i vh-hosts vh-install.yml
*****
Enter passphrase for key '/home/admin/.ssh/id_rsa':
Enter passphrase for key '/home/admin/.ssh/id_rsa':
Enter passphrase for key '/home/admin/.ssh/id_rsa':
:
```

- Cause
The ssh-agent is not started or the private key is not registered by the ssh-add command after starting the ssh-agent.
- Solution
Start the ssh-agent and use the ssh-add to register the private key on the terminal machine where you run ansible-playbook or the ansible command.

```
$ ssh-agent bash
$ ssh-add ~/.ssh/id_rsa
Enter passphrase for /home/admin/.ssh/id_rsa: (Input passphrase)
Identity added: /home/admin/.ssh/id_rsa (/home/admin/.ssh/id_rsa)
```

Appendix B Tuning of Ansible performance

When Ansible manages a large number of VHS, running playbooks takes time. Run the Ansible performance tuning to reduce playbook run time. This section describes typical methods of performance tuning. For details, see the Ansible documents.

Ansible connects to VHS over SSH and runs tasks in parallel; changing configurations of SSH connections and parallelism level helps reduce time for Ansible to run playbooks.

Edit the following items to the specified values in the Ansible configuration file, [/etc/ansible/ansible.cfg], for performance tuning.

Values	Description	Default	Note
[defaults]			
forks = 100	Number of parallel tasks	5	Adjust the value according to the management server performance and the number of VHS.
timeout = 180	Timeout of SSH (in sec.)	10	
gathering explicit =	Gathering information of managed hosts implicit: explicit: disabled smart: gathering information only when the cache is disabled	implicit	
gather_subset = facter	Type of information items to gather from target hosts	all	
strategy = free	Task running Methods linear: Ansible waits for all hosts to complete running tasks. free: Ansible doesn't wait.	linear	
[ssh_connection]			
pipelining =	Using the	False	VHS' requiretty

True	pipeline function		(/etc/sudoers) needs to be disabled.
------	----------------------	--	--

You need to disable the requiretty(/etc/sudoers) of VH administrative users to use the pipeline function. When administrative users are added to VHs, this setting is disabled by default.

Appendix C OSS Licenses

C.1 Ansible

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Version 3, 29 June 2007

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To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively state the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the program's name and a brief idea of what it does.>  
Copyright (C) <year> <name of author>
```

```
This program is free software: you can redistribute it and/or modify  
it under the terms of the GNU General Public License as published by  
the Free Software Foundation, either version 3 of the License, or  
(at your option) any later version.
```

```
This program is distributed in the hope that it will be useful,  
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Also add information on how to contact you by electronic and paper mail.

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```
<program> Copyright (C) <year> <name of author>
This program comes with ABSOLUTELY NO WARRANTY; for details type `show
w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
```

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Appendix D History

D.1 History table

Feb. 2018	Rev. 1
Jul. 2022	Rev. 15
Sep. 2022	Rev. 16
Jan. 2023	Rev. 17
Jun. 2023	Rev. 18
Oct. 2023	Rev. 19

D.2 Change notes

- Rev. 15
Rocky Linux 8.5 is supported.
Ansible license is added. (C.1)
- Rev. 16
RHEL / Rocky Linux 8.6 is supported.
- Rev. 17
ScaTeFS for RHEL / Rocky Linux 8.6 is supported.
Support for RHEL/CentOS 8.3 is ended.
- Rev. 18
Aurora VE3 model is supported.
Support for RHEL/CentOS 8.4 is ended.
- Rev. 19
RHEL / Rocky Linux 8.8 is supported.
Support for RHEL/Rocky Linux 8.5 is ended.