Red Hat Enterprise Linux 7

Automating system administration by using RHEL System Roles in RHEL 7.9

Consistent and repeatable configuration of RHEL deployments across multiple hosts with Red Hat Ansible Automation Platform playbooks

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Abstract

The Red Hat Enterprise Linux (RHEL) System Roles are a collection of Ansible roles, modules, and playbooks that help automate the consistent and repeatable administration of RHEL systems. With RHEL System Roles, you can efficiently manage large inventories of systems by running configuration playbooks from a single system.

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MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright's message.

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CHAPTER 1. INTRODUCTION TO RHEL SYSTEM ROLES

By using RHEL System Roles, you can remotely manage the system configurations of multiple RHEL systems across major versions of RHEL. RHEL System Roles is a collection of Ansible roles and modules. To use it to configure systems, you must use the following components:

Control node

A control node is the system from which you run Ansible commands and playbooks. Your control node can be an Ansible Automation Platform, Red Hat Satellite, or a RHEL 9, 8, or 7 host. For more information, see Preparing a control node on RHEL 8 .

Managed node

Managed nodes are the servers and network devices that you manage with Ansible. Managed nodes are also sometimes called hosts. Ansible does not have to be installed on managed nodes. For more information, see Preparing a managed node .

Ansible playbook

In a playbook, you define the configuration you want to achieve on your managed nodes or a set of steps for the system on the managed node to perform. Playbooks are Ansible's configuration, deployment, and orchestration language.

Inventory

In an inventory file, you list the managed nodes and specify information such as IP address for each managed node. In an inventory, you can also organize managed nodes, creating and nesting groups for easier scaling. An inventory file is also sometimes called a hostfile.

On Red Hat Enterprise Linux 8, you can use the following roles provided by the **rhel-system-roles** package, which is available in the **AppStream** repository:

Role name	Role description	Chapter title
certificate	Certificate Issuance and Renewal	Requesting certificates using RHEL System Roles
cockpit	Web console	Installing and configuring web console with the cockpit RHEL System Role
crypto_policies	System-wide cryptographic policies	Setting a custom cryptographic policy across systems
firewall	Firewalld	Configuring firewalld using System Roles
ha_cluster	HA Cluster	Configuring a high-availability cluster using System Roles
kdump	Kernel Dumps	Configuring kdump using RHEL System Roles
kernel_settings	Kernel Settings	Using Ansible roles to permanently configure kernel parameters

Role name	Role description	Chapter title
logging	Logging	Using the logging System Role
metrics	Metrics (PCP)	Monitoring performance using RHEL System Roles
microsoft.sql.server	Microsoft SQL Server	Configuring Microsoft SQL Server using the microsoft.sql.server Ansible role
network	Networking	Using the network RHEL System Role to manage InfiniBand connections
nbde_client	Network Bound Disk Encryption client	Using the nbde_client and nbde_server System Roles
nbde_server	Network Bound Disk Encryption server	Using the nbde_client and nbde_server System Roles
postfix	Postfix	Variables of the postfix role in System Roles
selinux	SELinux	Configuring SELinux using System Roles
ssh	SSH client	Configuring secure communication with the ssh System Roles
sshd	SSH server	Configuring secure communication with the ssh System Roles
storage	Storage	Managing local storage using RHEL System Roles
tlog	Terminal Session Recording	Configuring a system for session recording using the tlog RHEL System Role
timesync	Time Synchronization	Configuring time synchronization using RHEL System Roles
vpn	VPN	Configuring VPN connections with IPsec by using the vpn RHEL System Role

Additional resources

- Red Hat Enterprise Linux (RHEL) System Roles
- **/usr/share/doc/rhel-system-roles/** provided by the **rhel-system-roles** package

CHAPTER 2. PREPARING A CONTROL NODE AND MANAGED NODES TO USE RHEL SYSTEM ROLES

Before you can use individual RHEL System Roles to manage services and settings, you must prepare the control node and managed nodes.

2.1. PREPARING A CONTROL NODE ON RHEL 8

Before using RHEL System Roles, you must configure a control node. This system then configures the managed hosts from the inventory according to the playbooks.

Prerequisites

- RHEL 7.9 is installed. For more information about installing RHEL, see Installation guide.
- The system is registered to the Customer Portal.
- A **Red Hat Enterprise Linux Server** subscription is attached to the system.
- If available in your Customer Portal account, an **Ansible Automation Platform** subscription is attached to the system.

Procedure

1. Install the **rhel-system-roles** package:

   ```
   [root@control-node]# yum install rhel-system-roles
   ```

   This command installs the **ansible-core** package as a dependency.

2. Create a user named **ansible** to manage and run playbooks:

   ```
   [root@control-node]# useradd ansible
   ```

3. Switch to the newly created **ansible** user:

   ```
   [root@control-node]# su - ansible
   ```

   Perform the rest of the procedure as this user.

4. Create an SSH public and private key:

   ```
   [ansible@control-node]$ ssh-keygen
   Generating public/private rsa key pair.
   Enter file in which to save the key (/home/ansible/.ssh/id_rsa): <password>
   ...
   ```

   Use the suggested default location for the key file.

5. Optional: To prevent Ansible from prompting you for the SSH key password each time you establish a connection, configure an SSH agent.

6. Create the ~/**.ansible.cfg** file with the following content:

```
[defaults]
inventory = /home/ansible/inventory
remote_user = ansible

[privilege_escalation]
become = True
become_method = sudo
become_user = root
become_ask_pass = True
```

NOTE

Settings in the ~/**.ansible.cfg** file have a higher priority and override settings from the global **/etc/ansible/ansible.cfg** file.

With these settings, Ansible performs the following actions:

- Manages hosts in the specified inventory file.
- Uses the account set in the **remote_user** parameter when it establishes SSH connections to managed nodes.
- Uses the **sudo** utility to execute tasks on managed nodes as the **root** user.
- Prompts for the root password of the remote user every time you apply a playbook. This is recommended for security reasons.

7. Create an ~/**inventory** file in INI or YAML format that lists the hostnames of managed hosts. You can also define groups of hosts in the inventory file. For example, the following is an inventory file in the INI format with three hosts and one host group named **US**:

```
managed-node-01.example.com

[US]
managed-node-02.example.com ansible_host=192.0.2.100
managed-node-03.example.com
```

Note that the control node must be able to resolve the hostnames. If the DNS server cannot resolve certain hostnames, add the **ansible_host** parameter next to the host entry to specify its IP address.

Next steps

- Prepare the managed nodes. For more information, see Preparing a managed node .

Additional resources

- Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories
- How to register and subscribe a system to the Red Hat Customer Portal using subscription-manager
- The **ssh-keygen(1)** man page

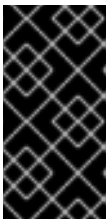
- Connecting to remote machines with SSH keys using ssh-agent
- Ansible configuration settings
- How to build your inventory
- Updates to using Ansible in RHEL 8.6 and 9.0

2.2. PREPARING A MANAGED NODE

Managed nodes are the systems listed in the inventory and which will be configured by the control node according to the playbook. You do not have to install Ansible on managed hosts.

Prerequisites

- You prepared the control node. For more information, see Preparing a control node on RHEL 8 .
- You have SSH access from the control node.



IMPORTANT

Direct SSH access as the **root** user is a security risk. To reduce this risk, you will create a local user on this node and configure a **sudo** policy when preparing a managed node. Ansible on the control node can then use the local user account to log in to the managed node and run playbooks as different users, such as **root**.

Procedure

1. Create a user named **ansible**:

```
[root@managed-node-01]# useradd ansible
```

   The control node later uses this user to establish an SSH connection to this host.

2. Set a password for the **ansible** user:

```
[root@managed-node-01]# passwd ansible
Changing password for user ansible.
New password: <password>
Retype new password: <password>
passwd: all authentication tokens updated successfully.
```

   You must enter this password when Ansible uses **sudo** to perform tasks as the **root** user.

3. Install the **ansible** user's SSH public key on the managed node:

   a. Log in to the control node as the **ansible** user, and copy the SSH public key to the managed node:

```
[ansible@control-node]$ ssh-copy-id managed-node-01.example.com
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed:
"/home/ansible/.ssh/id_rsa.pub"
The authenticity of host 'managed-node-01.example.com (192.0.2.100)' can't be
```

```
established.
ECDSA key fingerprint is
SHA256:9bZ33GJNODK3zbNhybokN/6Mq7hu3vpBXDrCxe7NAvo.
```

b. When prompted, connect by entering **yes**:

```
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that
are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is
to install the new keys
```

c. When prompted, enter the password:

```
ansible@managed-node-01.example.com's password: <password>

Number of key(s) added: 1

Now try logging into the machine, with:   "ssh '<managed-node-01.example.com>'"
and check to make sure that only the key(s) you wanted were added.
```

d. Verify the SSH connection by remotely executing a command on the control node:

```
[ansible@control-node]$ ssh <managed-node-01.example.com> whoami
ansible
```

4. Create a **sudo** configuration for the **ansible** user:

a. Create and edit the **/etc/sudoers.d/ansible** file by using the **visudo** command:

```
[root@managed-node-01]# visudo /etc/sudoers.d/ansible
```

The benefit of using **visudo** over a normal editor is that this utility provides basic sanity checks and checks for parse errors before installing the file.

b. Configure a **sudoers** policy in the **/etc/sudoers.d/ansible** file that meets your requirements, for example:

- To grant permissions to the **ansible** user to run all commands as any user and group on this host after entering the **ansible** user's password, use:

```
ansible ALL=(ALL) ALL
```

- To grant permissions to the **ansible** user to run all commands as any user and group on this host without entering the **ansible** user's password, use:

```
ansible ALL=(ALL) NOPASSWD: ALL
```

Alternatively, configure a more fine-granular policy that matches your security requirements. For further details on **sudoers** policies, see the **sudoers(5)** man page.

Verification

1. Verify that you can execute commands from the control node on an all managed nodes:

```
[ansible@control-node]$ ansible all -m ping
BECOME password: <password>
managed-node-01.example.com | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
...
```

The hard-coded all group dynamically contains all hosts listed in the inventory file.

2. Verify that privilege escalation works correctly by running the **whoami** utility on a managed host by using the Ansible **command** module:

```
[ansible@control-node]$ ansible managed-node-01.example.com -m command -a
whoami
BECOME password: <password>
managed-node-01.example.com | CHANGED | rc=0 >>
root
```

If the command returns root, you configured **sudo** on the managed nodes correctly.

Additional resources

- Preparing a control node on RHEL 8 .
- The **sudoers(5)** man page

CHAPTER 3. INSTALLING AND USING COLLECTIONS

3.1. INTRODUCTION TO ANSIBLE COLLECTIONS

Ansible Collections are the new way of distributing, maintaining, and consuming automation. By combining multiple types of Ansible content such as playbooks, roles, modules, and plugins, you can benefit from improvements in flexibility and scalability.

The Ansible Collections are an option to the traditional RHEL System Roles format. Using the RHEL System Roles in the Ansible Collection format is almost the same as using it in the traditional RHEL System Roles format. The difference is that Ansible Collections use the concept of a **fully qualified collection name** (FQCN), which consists of a **namespace** and the **collection name**. The **namespace** we use is **redhat** and the **collection name** is **rhel_system_roles**. So, while the traditional RHEL System Roles format for the **kernel_settings** role is presented as **rhel-system-roles.kernel_settings** (with dashes), using the Collection **fully qualified collection name** for the **kernel_settings** role would be presented as **redhat.rhel_system_roles.kernel_settings** (with underscores).

The combination of a **namespace** and a **collection name** guarantees that the objects are unique. It also ensures that objects are shared across the Ansible Collections and namespaces without any conflicts.

Additional resources

- To use the Red Hat Certified Collections by accessing the Automation Hub, you must have an Ansible Automation Platform (AAP subscription).

3.2. COLLECTIONS STRUCTURE

Collections are a package format for Ansible content. The data structure is as below:

- docs/: local documentation for the collection, with examples, if the role provides the documentation
- galaxy.yml: source data for the MANIFEST.json that will be part of the Ansible Collection package
- playbooks/: playbooks are available here
  - tasks/: this holds 'task list files' for include_tasks/import_tasks usage
- plugins/: all Ansible plugins and modules are available here, each in its subdirectory
  - modules/: Ansible modules
  - modules_utils/: common code for developing modules
  - lookup/: search for a plugin
  - filter/: Jinja2 filter plugin
  - connection/: connection plugins required if not using the default
- roles/: directory for Ansible roles
- tests/: tests for the collection's content

3.3. INSTALLING COLLECTIONS BY USING THE CLI

Collections are a distribution format for Ansible content that can include playbooks, roles, modules, and plugins.

You can install Collections through Ansible Galaxy, through the browser, or by using the command line.

Prerequisites

- Access and permissions to one or more *managed nodes*.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.
  - An inventory file which lists the managed nodes.

Procedure

- Install the collection via RPM package:

```
# yum install rhel-system-roles
```

After the installation is finished, the roles are available as **redhat.rhel_system_roles.<role_name>**. Additionally, you can find the documentation for each role at **/usr/share/ansible/collections/ansible_collections/redhat/rhel_system_roles/roles/<role_name>/README.md**.

Verification steps

To verify the installation, run the **kernel_settings** role with **check** mode on your localhost. You must also use the **--become** parameter because it is necessary for the Ansible **package** module. However, the parameter will not change your system:

1. Run the following command:

```
$ ansible-playbook -c local -i localhost, --check --become
/usr/share/ansible/collections/ansible_collections/redhat/rhel_system_roles/tests/kernel_settings
ests_default.yml
```

The last line of the command output should contain the value **failed=0**.

NOTE

The comma after **localhost** is mandatory. You must add it even if there is only one host on the list. Without it, **ansible-playbook** would identify **localhost** as a file or a directory.

Additional resources

- The **ansible-playbook** man page.
- The **-i** option of the **ansible-playbook** command

3.4. INSTALLING COLLECTIONS FROM AUTOMATION HUB

If you are using the Automation Hub, you can install the RHEL System Roles Collection hosted on the Automation Hub.

Prerequisites

- Access and permissions to one or more *managed nodes*.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.
  - An inventory file which lists the managed nodes.

Procedure

1. Define Red Hat Automation Hub as the default source for content in the **ansible.cfg** configuration file. See Configuring Red Hat Automation Hub as the primary source for content .
2. Install the **redhat.rhel_system_roles** collection from the Automation Hub:

```
# ansible-galaxy collection install redhat.rhel_system_roles
```

   After the installation is finished, the roles are available as **redhat.rhel_system_roles.<role_name>**. Additionally, you can find the documentation for each role at **/usr/share/ansible/collections/ansible_collections/redhat/rhel_system_roles/roles/<role_name>/README.md**.

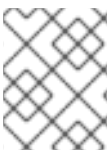
Verification steps

To verify the install, run the **kernel_settings** role with **check** mode on your localhost. You must also use the **--become** parameter because it is necessary for the Ansible **package** module. However, the parameter will not change your system:

1. Run the following command:

```
$ ansible-playbook -c local -i localhost, --check --become
/usr/share/ansible/collections/ansible_collections/redhat/rhel_system_roles/tests/kernel_settings
ests_default.yml
```

The last line of the command output should contain the value **failed=0**.



NOTE

The comma after **localhost** is mandatory. You must add it even if there is only one host on the list. Without it, **ansible-playbook** would identify **localhost** as a file or a directory.

Additional resources

- The **ansible-playbook** man page.
- The **-i** option of the **ansible-playbook** command

3.5. APPLYING A LOCAL LOGGING SYSTEM ROLE USING COLLECTIONS

Following is an example using Collections to prepare and apply an Ansible playbook to configure a logging solution on a set of separate machines.

Prerequisites

- A Collection format of rhel-system-roles is installed either from an rpm package or from the Automation Hub.

Procedure

1. Create a playbook that defines the required role:
   a. Create a new YAML file and open it in a text editor, for example:

   ```
   # vi logging-playbook.yml
   ```

   b. Insert the following content into the YAML file:

   ```
   ---
   - name: Deploying basics input and implicit files output
     hosts: all
     roles:
       - redhat.rhel_system_roles.logging
     vars:
       logging_inputs:
         - name: system_input
           type: basics
       logging_outputs:
         - name: files_output
           type: files
       logging_flows:
         - name: flow1
           inputs: [system_input]
           outputs: [files_output]
   ```

2. Execute the playbook on a specific inventory:

   ```
   # ansible-playbook -i inventory-file logging-playbook.yml
   ```

   Where:

   - *inventory-file* is the name of your inventory file.
   - *logging-playbook.yml* is the playbook you use.

Verification steps

1. Test the syntax of the configuration files **/etc/rsyslog.conf** and **/etc/rsyslog.d**:

   ```
   # rsyslogd -N 1
   rsyslogd: version 8.1911.0-6.el8, config validation run (level 1), master config
   ```

```
/etc/rsyslog.conf
rsyslogd: End of config validation run. Bye.
```

2. Verify that the system sends messages to the log:

   a. Send a test message:

   ```
   # logger test
   ```

   b. View the **/var/log/messages** log, for example:

   ```
   # cat /var/log/messages
   Aug  5 13:48:31 hostname root[6778]: test
   ```

   The **hostname** is the hostname of the client system. The log displays the user name of the user that entered the logger command, in this case, **root**.

CHAPTER 4. ANSIBLE IPMI MODULES IN RHEL

4.1. THE RHEL_MGMT COLLECTION

The Intelligent Platform Management Interface (IPMI) is a specification for a set of standard protocols to communicate with baseboard management controller (BMC) devices. The **IPMI** modules allow you to enable and support hardware management automation. The **IPMI** modules are available in:

- The **rhel_mgmt** Collection. The package name is **ansible-collection-redhat-rhel_mgmt**.
- The RHEL 7.9 AppStream, as part of the new **ansible-collection-redhat-rhel_mgmt** package.

The following IPMI modules are available in the rhel_mgmt collection:

- **ipmi_boot**: Management of boot device order
- **ipmi_power**: Power management for machine

The mandatory parameters used for the IPMI Modules are:

- **ipmi_boot** parameters:

Module name	Description
name	Hostname or ip address of the BMC
password	Password to connect to the BMC
bootdev	Device to be used on next boot * network * floppy * hd * safe * optical * setup * default
User	Username to connect to the BMC

- **ipmi_power** parameters:

Module name	Description
name	BMC Hostname or IP address

Module name	Description
password	Password to connect to the BMC
user	Username to connect to the BMC
State	Check if the machine is on the desired status * on * off * shutdown * reset * boot

4.2. INSTALLING THE RHEL MGMT COLLECTION USING THE CLI

You can install the **rhel_mgmt** Collection using the command line.

Prerequisites

- The **ansible-core** package is installed.

Procedure

- Install the collection via RPM package:

```
# yum install ansible-collection-redhat-rhel_mgmt
```

After the installation is finished, the IPMI modules are available in the **redhat.rhel_mgmt** Ansible collection.

Additional resources

- The **ansible-playbook** man page.

4.3. EXAMPLE USING THE IPMI_BOOT MODULE

The following example shows how to use the **ipmi_boot** module in a playbook to set a boot device for the next boot. For simplicity, the examples use the same host as the Ansible control host and managed host, thus executing the modules on the same host where the playbook is executed.

Prerequisites

- The rhel_mgmt collection is installed.
- The **pyghmi** library in the **python3-pyghmi** package is installed in one of the following locations:
  - The host where you execute the playbook.

    - The managed host. If you use localhost as the managed host, install the **python3-pyghmi** package on the host where you execute the playbook instead.

- The IPMI BMC that you want to control is accessible via network from the host where you execute the playbook, or the managed host (if not using localhost as the managed host). Note that the host whose BMC is being configured by the module is generally different from the host where the module is executing (the Ansible managed host), as the module contacts the BMC over the network using the IPMI protocol.

- You have credentials to access BMC with an appropriate level of access.

Procedure

1. Create a new *playbook.yml* file with the following content:

```
---
- name: Sets which boot device will be used on next boot
  hosts: localhost
    tasks:
    - redhat.rhel_mgmt.ipmi_boot:
       name: bmc.host.example.com
         user: admin_user
         password: basics
         bootdev: hd
```

2. Execute the playbook against localhost:

```
# ansible-playbook playbook.yml
```

As a result, the output returns the value “success”.

4.4. EXAMPLE USING THE IPMI_POWER MODULE

This example shows how to use the **ipmi_boot** module in a playbook to check if the system is turned on. For simplicity, the examples use the same host as the Ansible control host and managed host, thus executing the modules on the same host where the playbook is executed.

Prerequisites

- The rhel_mgmt collection is installed.

- The **pyghmi** library in the **python3-pyghmi** package is installed in one of the following locations:

    - The host where you execute the playbook.

    - The managed host. If you use localhost as the managed host, install the **python3-pyghmi** package on the host where you execute the playbook instead.

- The IPMI BMC that you want to control is accessible via network from the host where you execute the playbook, or the managed host (if not using localhost as the managed host). Note that the host whose BMC is being configured by the module is generally different from the host where the module is executing (the Ansible managed host), as the module contacts the BMC over the network using the IPMI protocol.

- You have credentials to access BMC with an appropriate level of access.

Procedure

1. Create a new *playbook.yml* file with the following content:

```
---
- name: Turn the host on
  hosts: localhost
    tasks:
    - redhat.rhel_mgmt.ipmi_power:
        name: bmc.host.example.com
          user: admin_user
          password: basics
          state: on
```

2. Execute the playbook:

```
# ansible-playbook playbook.yml
```

The output returns the value “true”.

CHAPTER 5. THE REDFISH MODULES IN RHEL

The Redfish modules for remote management of devices are now part of the **redhat.rhel_mgmt** Ansible collection. With the Redfish modules, you can easily use management automation on bare-metal servers and platform hardware by getting information about the servers or control them through an Out-Of-Band (OOB) controller, using the standard HTTPS transport and JSON format.

5.1. THE REDFISH MODULES

The **redhat.rhel_mgmt** Ansible collection provides the Redfish modules to support hardware management in Ansible over Redfish. The **redhat.rhel_mgmt** collection is available in the **ansible-collection-redhat-rhel_mgmt** package. To install it, see Installing the redhat.rhel_mgmt Collection using the CLI.

The following Redfish modules are available in the **redhat.rhel_mgmt** collection:

1. **redfish_info**: The **redfish_info** module retrieves information about the remote Out-Of-Band (OOB) controller such as systems inventory.
2. **redfish_command**: The **redfish_command** module performs Out-Of-Band (OOB) controller operations like log management and user management, and power operations such as system restart, power on and off.
3. **redfish_config**: The **redfish_config** module performs OOB controller operations such as changing OOB configuration, or setting the BIOS configuration.

5.2. REDFISH MODULES PARAMETERS

The parameters used for the Redfish modules are:

redfish_info parameters:	Description
baseuri	(Mandatory) - Base URI of OOB controller.
category	(Mandatory) - List of categories to execute on OOB controller. The default value is ["Systems"].
command	(Mandatory) - List of commands to execute on OOB controller.
username	Username for authentication to OOB controller.
password	Password for authentication to OOB controller.

redfish_command parameters:	Description
baseuri	(Mandatory) - Base URI of OOB controller.
category	(Mandatory) - List of categories to execute on OOB controller. The default value is ["Systems"].

redfish_command parameters:	Description
command	(Mandatory) - List of commands to execute on OOB controller.
username	Username for authentication to OOB controller.
password	Password for authentication to OOB controller.

redfish_config parameters:	Description
baseuri	(Mandatory) - Base URI of OOB controller.
category	(Mandatory) - List of categories to execute on OOB controller. The default value is ["Systems"].
command	(Mandatory) - List of commands to execute on OOB controller.
username	Username for authentication to OOB controller.
password	Password for authentication to OOB controller.
bios_attributes	BIOS attributes to update.

5.3. USING THE REDFISH_INFO MODULE

The following example shows how to use the **redfish_info** module in a playbook to get information about the CPU inventory. For simplicity, the example uses the same host as the Ansible control host and managed host, thus executing the modules on the same host where the playbook is executed.

Prerequisites

- The **redhat.rhel_mgmt** collection is installed.
- The **pyghmi** library in the **python3-pyghmi** package is installed on the managed host. If you use localhost as the managed host, install the **python3-pyghmi** package on the host where you execute the playbook.
- OOB controller access details.

Procedure

1. Create a new *playbook.yml* file with the following content:

```
---
```

```
- name: Get CPU inventory
  hosts: localhost
  tasks:
    - redhat.rhel_mgmt.redfish_info:
        baseuri: "{{ baseuri }}"
        username: "{{ username }}"
        password: "{{ password }}"
        category: Systems
        command: GetCpuInventory
      register: result
```

2. Execute the playbook against localhost:

```
# ansible-playbook playbook.yml
```

As a result, the output returns the CPU inventory details.

5.4. USING THE REDFISH_COMMAND MODULE

The following example shows how to use the **redfish_command** module in a playbook to turn on a system. For simplicity, the example uses the same host as the Ansible control host and managed host, thus executing the modules on the same host where the playbook is executed.

Prerequisites

- The **redhat.rhel_mgmt** collection is installed.
- The **pyghmi** library in the **python3-pyghmi** package is installed on the managed host. If you use localhost as the managed host, install the **python3-pyghmi** package on the host where you execute the playbook.
- OOB controller access details.

Procedure

1. Create a new *playbook.yml* file with the following content:

```
---
- name: Power on system
  hosts: localhost
  tasks:
    - redhat.rhel_mgmt.redfish_command:
        baseuri: "{{ baseuri }}"
        username: "{{ username }}"
        password: "{{ password }}"
        category: Systems
        command: PowerOn
```

2. Execute the playbook against localhost:

```
# ansible-playbook playbook.yml
```

As a result, the system powers on.

5.5. USING THE REDFISH_CONFIG MODULE

The following example shows how to use the **redfish_config** module in a playbook to configure a system to boot with UEFI. For simplicity, the example uses the same host as the Ansible control host and managed host, thus executing the modules on the same host where the playbook is executed.

Prerequisites

- The **redhat.rhel_mgmt** collection is installed.
- The **pyghmi** library in the **python3-pyghmi** package is installed on the managed host. If you use localhost as the managed host, install the **python3-pyghmi** package on the host where you execute the playbook.
- OOB controller access details.

Procedure

1. Create a new *playbook.yml* file with the following content:

```
---
- name: "Set BootMode to UEFI"
  hosts: localhost
  tasks:
    - redhat.rhel_mgmt.redfish_config:
        baseuri: "{{ baseuri }}"
        username: "{{ username }}"
        password: "{{ password }}"
        category: Systems
        command: SetBiosAttributes
        bios_attributes:
          BootMode: Uefi
```

2. Execute the playbook against localhost:

```
# ansible-playbook playbook.yml
```

As a result, the system boot mode is set to UEFI.

CHAPTER 6. CONFIGURING KERNEL PARAMETERS PERMANENTLY BY USING THE KERNEL_SETTINGS RHEL SYSTEM ROLE

As an experienced user with good knowledge of Red Hat Ansible, you can use the **kernel_settings** role to configure kernel parameters on multiple clients at once. This solution:

- Provides a friendly interface with efficient input setting.
- Keeps all intended kernel parameters in one place.

After you run the **kernel_settings** role from the control machine, the kernel parameters are applied to the managed systems immediately and persist across reboots.

IMPORTANT

Note that RHEL System Role delivered over RHEL channels are available to RHEL customers as an RPM package in the default AppStream repository. RHEL System Role are also available as a collection to customers with Ansible subscriptions over Ansible Automation Hub.

6.1. INTRODUCTION TO THE KERNEL_SETTINGS ROLE

RHEL System Roles is a set of roles that provide a consistent configuration interface to remotely manage multiple systems.

RHEL System Roles were introduced for automated configurations of the kernel using the **kernel_settings** System Role. The **rhel-system-roles** package contains this system role, and also the reference documentation.

To apply the kernel parameters on one or more systems in an automated fashion, use the **kernel_settings** role with one or more of its role variables of your choice in a playbook. A playbook is a list of one or more plays that are human-readable, and are written in the YAML format.

You can use an inventory file to define a set of systems that you want Ansible to configure according to the playbook.

With the **kernel_settings** role you can configure:

- The kernel parameters using the **kernel_settings_sysctl** role variable
- Various kernel subsystems, hardware devices, and device drivers using the **kernel_settings_sysfs** role variable
- The CPU affinity for the **systemd** service manager and processes it forks using the **kernel_settings_systemd_cpu_affinity** role variable
- The kernel memory subsystem transparent hugepages using the **kernel_settings_transparent_hugepages** and **kernel_settings_transparent_hugepages_defrag** role variables

Additional resources

- **README.md** and **README.html** files in the **/usr/share/doc/rhel-system-roles/kernel_settings/** directory
- Working with playbooks
- How to build your inventory

6.2. APPLYING SELECTED KERNEL PARAMETERS USING THE KERNEL_SETTINGS ROLE

Follow these steps to prepare and apply an Ansible playbook to remotely configure kernel parameters with persisting effect on multiple managed operating systems.

Prerequisites

- You have **root** permissions.
- Entitled by your RHEL subscription, you installed the **ansible-core** and **rhel-system-roles** packages on the control machine.
- An inventory of managed hosts is present on the control machine and Ansible is able to connect to them.

Procedure

1. Optionally, review the **inventory** file for illustration purposes:

```
# cat /home/jdoe/<ansible_project_name>/inventory
[testingservers]
pdoe@192.168.122.98
fdoe@192.168.122.226

[db-servers]
db1.example.com
db2.example.com

[webservers]
web1.example.com
web2.example.com
192.0.2.42
```

   The file defines the **[testingservers]** group and other groups. It allows you to run Ansible more effectively against a specific set of systems.

2. Create a configuration file to set defaults and privilege escalation for Ansible operations.

   a. Create a new YAML file and open it in a text editor, for example:

```
# vi /home/jdoe/<ansible_project_name>/ansible.cfg
```

   b. Insert the following content into the file:

```
[defaults]
inventory = ./inventory
```

```
[privilege_escalation]
become = true
become_method = sudo
become_user = root
become_ask_pass = true
```

The **[defaults]** section specifies a path to the inventory file of managed hosts. The **[privilege_escalation]** section defines that user privileges be shifted to **root** on the specified managed hosts. This is necessary for successful configuration of kernel parameters. When Ansible playbook is run, you will be prompted for user password. The user automatically switches to **root** by means of **sudo** after connecting to a managed host.

3. Create an Ansible playbook that uses the **kernel_settings** role.

   a. Create a new YAML file and open it in a text editor, for example:

   ```
   # vi /home/jdoe/<ansible_project_name>/kernel-roles.yml
   ```

   This file represents a playbook and usually contains an ordered list of tasks, also called *plays*, that are run against specific managed hosts selected from your **inventory** file.

   b. Insert the following content into the file:

   ```
   ---
   -
     hosts: testingservers
     name: "Configure kernel settings"
     roles:
       - rhel-system-roles.kernel_settings
     vars:
       kernel_settings_sysctl:
         - name: fs.file-max
           value: 400000
         - name: kernel.threads-max
           value: 65536
       kernel_settings_sysfs:
         - name: /sys/class/net/lo/mtu
           value: 65000
       kernel_settings_transparent_hugepages: madvise
   ```

   The **name** key is optional. It associates an arbitrary string with the play as a label and identifies what the play is for. The **hosts** key in the play specifies the hosts against which the play is run. The value or values for this key can be provided as individual names of managed hosts or as groups of hosts as defined in the **inventory** file.

   The **vars** section represents a list of variables containing selected kernel parameter names and values to which they have to be set.

   The **roles** key specifies what system role is going to configure the parameters and values mentioned in the **vars** section.

   NOTE

   You can modify the kernel parameters and their values in the playbook to fit your needs.

4. Optionally, verify that the syntax in your play is correct.

```
# ansible-playbook --syntax-check kernel-roles.yml

playbook: kernel-roles.yml
```

This example shows the successful verification of a playbook.

5. Execute your playbook.

```
# ansible-playbook kernel-roles.yml

...

BECOME password:

PLAY [Configure kernel settings]
*********************************************************************************



PLAY RECAP
*********************************************************************************************************
fdoe@192.168.122.226      : ok=10   changed=4    unreachable=0    failed=0    skipped=6
rescued=0    ignored=0
pdoe@192.168.122.98       : ok=10   changed=4    unreachable=0    failed=0    skipped=6
rescued=0    ignored=0
```

Before Ansible runs your playbook, you are going to be prompted for your password and so that a user on managed hosts can be switched to **root**, which is necessary for configuring kernel parameters.

The recap section shows that the play finished successfully (**failed=0**) for all managed hosts, and that 4 kernel parameters have been applied (**changed=4**).

6. Restart your managed hosts and check the affected kernel parameters to verify that the changes have been applied and persist across reboots.

Additional resources

- Preparing a control node and managed nodes to use RHEL System Roles
- **README.html** and **README.md** files in the **/usr/share/doc/rhel-system-roles/kernel_settings/** directory
- Build Your Inventory
- Configuring Ansible
- Working With Playbooks
- Using Variables
- Roles

CHAPTER 7. USING THE RHC SYSTEM ROLE TO REGISTER THE SYSTEM

The **rhc** RHEL System Role enables administrators to automate the registration of multiple systems with Red Hat Subscription Management (RHSM) and Satellite servers. The role also supports Insights-related configuration and management tasks by using Ansible.

7.1. INTRODUCTION TO THE RHC SYSTEM ROLE

RHEL System Role is a set of roles that provides a consistent configuration interface to remotely manage multiple systems. The remote host configuration (**rhc**) System Role enables administrators to easily register RHEL systems to Red Hat Subscription Management (RHSM) and Satellite servers. By default, when you register a system by using the **rhc** System Role, the system is connected to Insights. Additionally, with the **rhc** System Role, you can:

- Configure connections to Red Hat Insights
- Enable and disable repositories
- Configure the proxy to use for the connection
- Configure insights remediations and, auto updates
- Set the release of the system
- Configure insights tags

7.2. REGISTERING A SYSTEM BY USING THE RHC SYSTEM ROLE

You can register your system to Red Hat by using the **rhc** RHEL System Role. By default, the **rhc** RHEL System Role connects the system to Red Hat Insights when you register it.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a vault to save the sensitive information:

```
$ ansible-vault create secrets.yml
New Vault password: password
Confirm New Vault password: password
```

2. The **ansible-vault create** command creates an encrypted vault file and opens it in an editor. Enter the sensitive data you want to save in the vault, for example:

```
activationKey: activation_key
username: username
password: password
```

3. Save the changes, and close the editor. Ansible encrypts the data in the vault.
   You can later edit the data in the vault by using the **ansible-vault edit *secrets.yml*** command.

4. Optional: Display the vault content:

```
$ ansible-vault view secrets.yml
```

5. Create a playbook file, for example ~/**registration.yml**, and use one of the following options depending on the action you want to perform:

   a. To register by using an activation key and organization ID (recommended), use the following playbook:

```
---
- name: Registering system using activation key and organization ID
  hosts: managed-node-01.example.com
  vars_files:
    - secrets.yml
  vars:
    rhc_auth:
      activation_keys:
        keys:
          - "{{ activationKey }}"
     rhc_organization: organizationID
  roles:
    - role: rhel-system-roles.rhc
```

   b. To register by using a username and password, use the following playbook:

```
---
- name: Registering system with username and password
  hosts:  managed-node-01.example.com
  vars_files:
    - secrets.yml
  vars:
    rhc_auth:
      login:
        username: "{{ username }}"
        password: "{{ password }}"
  roles:
    - role: rhel-system-roles.rhc
```

6. Run the playbook:

```
# ansible-playbook ~/registration.yml --ask-vault-pass
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.3. REGISTERING A SYSTEM WITH SATELLITE BY USING THE RHC SYSTEM ROLE

When organizations use Satellite to manage systems, it is necessary to register the system through Satellite. You can remotely register your system with Satellite by using the **rhc** RHEL System Role.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a vault to save the sensitive information:

```
$ ansible-vault create secrets.yml
New Vault password: password
Confirm New Vault password: password
```

2. The **ansible-vault create** command creates an encrypted file and opens it in an editor. Enter the sensitive data you want to save in the vault, for example:

```
activationKey: activation_key
```

3. Save the changes, and close the editor. Ansible encrypts the data in the vault.
   You can later edit the data in the vault by using the **ansible-vault edit *secrets.yml*** command.

4. Optional: Display the vault content:

```
$ ansible-vault view secrets.yml
```

5. Create a playbook file, for example ~/**registration-sat.yml**.

6. Use the following text in ~/**registration-sat.yml** to register the system by using an activation key and organization ID:

```
---
- name: Register to the custom registration server and CDN
  hosts: managed-node-01.example.com
  vars_files:
    - secrets.yml
  vars:
    rhc_auth:
      login:
        activation_keys:
          keys:
            - "{{ activationKey }}"
        rhc_organization: organizationID
    rhc_server:
      hostname: example.com
```

```
      port: 443
      prefix: /rhsm
  rhc_baseurl: http://example.com/pulp/content
 roles:
   - role: rhel-system-roles.rhc
```

7. Run the playbook:

```
# ansible-playbook ~/registration-sat.yml --ask-vault-pass
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.4. DISABLING THE CONNECTION TO INSIGHTS AFTER THE REGISTRATION BY USING THE RHC SYSTEM ROLE

When you register a system by using the **rhc** RHEL System Role, the role by default, enables the connection to Red Hat Insights. You can disable it by using the **rhc** System Role, if not required.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- The system is already registered.

Procedure

1. Create a playbook file, for example **~/dis-insights.yml** and add the following content in it:

```
---
- name: Disable Insights connection
  hosts: managed-node-01.example.com
  vars:
    rhc_insights:
      state: absent
  roles:
    - role: rhel-system-roles.rhc
```

2. Run the playbook:

```
# ansible-playbook ~/dis-insights.yml
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.5. ENABLING REPOSITORIES BY USING THE RHC SYSTEM ROLE

You can remotely enable or disable repositories on managed nodes by using the **rhc** RHEL System Role.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- You have details of the repositories which you want to enable or disable on the managed nodes.
- You have registered the system.

Procedure

1. Create a playbook file, for example ~/**configure-repos.yml**:

   a. To enable a repository:

```
---
- name: Enable repository
  hosts: managed-node-01.example.com
  vars:
    rhc_repositories:
      - {name: "RepositoryName", state: enabled}
  roles:
    - role: rhel-system-roles.rhc
```

   b. To disable a repository:

```
---
- name: Disable repository
  hosts: managed-node-01.example.com
  vars:
    rhc_repositories:
      - {name: "RepositoryName", state: disabled}
  roles:
    - role: rhel-system-roles.rhc
```

2. Run the playbook:

```
# ansible-playbook ~/configure-repos.yml
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.6. SETTING RELEASE VERSIONS BY USING THE RHC SYSTEM ROLE

You can limit the system to use only repositories for a particular minor RHEL version instead of the latest one. This way, you can lock your system to a specific minor RHEL version.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- You know the minor RHEL version to which you want to lock the system. Note that you can only lock the system to the RHEL minor version that the host currently runs or a later minor version.
- You have registered the system.

Procedure

1. Create a playbook file, for example ~/**release.yml**:

```
---
- name: Set Release
  hosts: managed-node-01.example.com
  vars:
    rhc_release: "8.6"
  roles:
    - role: rhel-system-roles.rhc
```

2. Run the playbook:

```
# ansible-playbook ~/release.yml
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.7. USING A PROXY SERVER WHEN REGISTERING THE HOST BY USING THE RHC SYSTEM ROLE

If your security restrictions allow access to the Internet only through a proxy server, you can specify the proxy's settings in the playbook when you register the system using the **rhc** RHEL System Role.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a vault to save the sensitive information:

```
$ ansible-vault create secrets.yml
New Vault password: password
Confirm New Vault password: password
```

2. The **ansible-vault create** command creates an encrypted file and opens it in an editor. Enter the sensitive data you want to save in the vault, for example:

```
username: username
password: password
proxy_username: proxyusernme
proxy_password: proxypassword
```

3. Save the changes, and close the editor. Ansible encrypts the data in the vault.
You can later edit the data in the vault by using the **ansible-vault edit *secrets.yml*** command.

4. Optional: Display the vault content:

```
$ ansible-vault view secrets.yml
```

5. Create a playbook file, for example ~/**configure-proxy.yml**:

   a. To register to the RHEL customer portal by using a proxy:

```
---
- name: Register using proxy
  hosts: managed-node-01.example.com
  vars_files:
    - secrets.yml
  vars:
    rhc_auth:
      login:
        username: "{{ username }}"
        password: "{{ password }}"
    rhc_proxy:
      hostname: proxy.example.com
      port: 3128
      username: "{{ proxy_username }}"
      password: "{{ proxy_password }}"
  roles:
    - role: rhel-system-roles.rhc
```

   b. To remove the proxy server from the configuration of the Red Hat Subscription Manager service:

```
---
- name: To stop using proxy server for registration
  hosts: managed-node-01.example.com
  vars_files:
    - secrets.yml
  vars:
    rhc_auth:
      login:
```

```
      username: "{{ username }}"
      password: "{{ password }}"
    rhc_proxy: {"state":"absent"}
roles:
  - role: rhel-system-roles.rhc
```

6. Run the playbook:

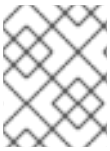
```
# ansible-playbook ~/configure-proxy.yml --ask-vault-pass
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.8. DISABLING AUTO UPDATES OF INSIGHTS RULES BY USING THE RHC SYSTEM ROLE

You can disable the automatic collection rule updates for Red Hat Insights by using the **rhc** RHEL System Role. By default, when you connect your system to Red Hat Insights, this option is enabled. You can disable it by using the **rhc** RHEL System Role.



NOTE

If you disable this feature, you risk using outdated rule definition files and not getting the most recent validation updates.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- You have registered the system.

Procedure

1. Create a vault to save the sensitive information:

```
$ ansible-vault create secrets.yml
New Vault password: password
Confirm New Vault password: password
```

2. The **ansible-vault create** command creates an encrypted file and opens it in an editor. Enter the sensitive data you want to save in the vault, for example:

```
username: username
password: password
```

3. Save the changes, and close the editor. Ansible encrypts the data in the vault.
You can later edit the data in the vault by using the **ansible-vault edit *secrets.yml*** command.

4. Optional: Display the vault content:

```
$ ansible-vault view secrets.yml
```

5. Create a playbook file, for example ~/**auto-update.yml** and add following content to it:

```
---
 - name: Disable Red Hat Insights autoupdates
   hosts: managed-node-01.example.com
   vars_files:
     - secrets.yml
   vars:
    rhc_auth:
      login:
        username: "{{ username }}"
        password: "{{ password }}"
    rhc_insights:
      autoupdate: false
      state: present
    roles:
      - role: rhel-system-roles.rhc
```

6. Run the playbook:

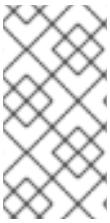
```
# ansible-playbook ~/auto-update.yml --ask-vault-pass
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.9. DISABLING INSIGHTS REMEDIATIONS BY USING THE RHC RHEL SYSTEM ROLE

You can configure systems to automatically update the dynamic configuration by using the **rhc** RHEL System Role. When you connect your system to Red hat Insights, it is enabled by default. You can disable it, if not required.



NOTE

Enabling remediation with the **rhc** System Role ensures your system is ready to be remediated when connected directly to Red Hat. For systems connected to a Satellite, or Capsule, enabling remediation must be achieved differently. For more information about Red Hat Insights remediations, see Red Hat Insights Remediations Guide .

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

- You have Insights remediations enabled.
- You have registered the system.

Procedure

1. To enable the remediation, create a playbook file, for example ~/**remediation.yml**:

```
---
- name: Disable remediation
  hosts: managed-node-01.example.com
  vars:
    rhc_insights:
      remediation: absent
      state: present
  roles:
    - role: rhel-system-roles.rhc
```

2. Run the playbook:

```
# ansible-playbook ~/remediation.yml
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

7.10. CONFIGURING INSIGHTS TAGS BY USING THE RHC SYSTEM ROLE

You can use tags for system filtering and grouping. You can also customize tags based on the requirements.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a vault to save the sensitive information:

```
$ ansible-vault create secrets.yml
New Vault password: password
Confirm New Vault password: password
```

2. The **ansible-vault create** command creates an encrypted file and opens it in an editor. Enter the sensitive data you want to save in the vault, for example:

```
username: username
password: password
```

3. Save the changes, and close the editor. Ansible encrypts the data in the vault.
   You can later edit the data in the vault by using the **ansible-vault edit *secrets.yml*** command.

4. Optional: Display the vault content:

```
$ ansible-vault view secrets.yml
```

5. Create a playbook file, for example **~/tags.yml**, and add following content to it:

```
---
- name: Creating tags
  hosts: managed-node-01.example.com
  vars_files:
    - secrets.yml
  vars:
    rhc_auth:
      login:
        username: "{{ username }}"
        password: "{{ password }}"
    rhc_insights:
      tags:
        group: group-name-value
          location: location-name-value
          description:
            - RHEL8
            - SAP
           sample_key:value
        state: present
  roles:
    - role: rhel-system-roles.rhc
```

6. Run the playbook:

```
# ansible-playbook ~/remediation.yml --ask-vault-pass
```

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file
- For more information, see System Filtering and groups Red Hat Insights .

7.11. UNREGISTERING A SYSTEM BY USING THE RHC SYSTEM ROLE

You can unregister the system from Red Hat if you no longer need the subscription service.

Prerequisites

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.

- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- The system is already registered.

Procedure

1. To unregister, create a playbook file, for example, ~/**unregister.yml** and add the following content to it:

```
---
- name: Unregister the system
  hosts: managed-node-01.example.com
  vars:
    rhc_state: absent
  roles:
    - role: rhel-system-roles.rhc
```

2. Run the playbook:

```
# ansible-playbook ~/unregister.yml
```

Additional resources

- The /**usr/share/ansible/roles/rhel-system-roles.rhc/README.md** file

CHAPTER 8. CONFIGURING NETWORK SETTINGS BY USING RHEL SYSTEM ROLES

Administrators can automate network-related configuration and management tasks by using the **network** RHEL System Role.

8.1. CONFIGURING AN ETHERNET CONNECTION WITH A STATIC IP ADDRESS BY USING THE NETWORK RHEL SYSTEM ROLE WITH AN INTERFACE NAME

You can remotely configure an Ethernet connection using the **network** RHEL System Role.

For example, the procedure below creates a NetworkManager connection profile for the **enp7s0** device with the following settings:

- A static IPv4 address - **192.0.2.1** with a **/24** subnet mask
- A static IPv6 address - **2001:db8:1::1** with a **/64** subnet mask
- An IPv4 default gateway - **192.0.2.254**
- An IPv6 default gateway - **2001:db8:1::fffe**
- An IPv4 DNS server - **192.0.2.200**
- An IPv6 DNS server - **2001:db8:1::ffbb**
- A DNS search domain - **example.com**

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- A physical or virtual Ethernet device exists in the server's configuration.
- The managed nodes use NetworkManager to configure the network.

Procedure

1. Create a playbook file, for example ***~/ethernet-static-IP.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
```

```
- name: Configure an Ethernet connection with static IP
  include_role:
    name: rhel-system-roles.network

  vars:
    network_connections:
      - name: enp7s0
        interface_name: enp7s0
        type: ethernet
        autoconnect: yes
        ip:
          address:
            - 192.0.2.1/24
            - 2001:db8:1::1/64
          gateway4: 192.0.2.254
          gateway6: 2001:db8:1::fffe
          dns:
            - 192.0.2.200
            - 2001:db8:1::ffbb
          dns_search:
            - example.com
        state: up
```

2. Run the playbook:

```
# ansible-playbook ~/ethernet-static-IP.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.2. CONFIGURING AN ETHERNET CONNECTION WITH A STATIC IP ADDRESS BY USING THE NETWORK RHEL SYSTEM ROLE WITH A DEVICE PATH

You can remotely configure an Ethernet connection using the **network** RHEL System Role.

You can identify the device path with the following command:

```
# udevadm info /sys/class/net/<device_name> | grep ID_PATH=
```

For example, the procedure below creates a NetworkManager connection profile with the following settings for the device that matches the PCI ID **0000:00:0[1-3].0** expression, but not **0000:00:02.0**:

- A static IPv4 address - **192.0.2.1** with a **/24** subnet mask
- A static IPv6 address - **2001:db8:1::1** with a **/64** subnet mask
- An IPv4 default gateway - **192.0.2.254**
- An IPv6 default gateway - **2001:db8:1::fffe**
- An IPv4 DNS server - **192.0.2.200**

- An IPv6 DNS server – **2001:db8:1::ffbb**
- A DNS search domain – **example.com**

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- A physical or virtual Ethernet device exists in the server's configuration.
- The managed nodes use NetworkManager to configure the network.

Procedure

1. Create a playbook file, for example ***~/ethernet-static-IP.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure an Ethernet connection with static IP
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        - name: example
          match:
            path:
              - pci-0000:00:0[1-3].0
              - &!pci-0000:00:02.0
          type: ethernet
          autoconnect: yes
          ip:
            address:
              - 192.0.2.1/24
              - 2001:db8:1::1/64
            gateway4: 192.0.2.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 192.0.2.200
              - 2001:db8:1::ffbb
            dns_search:
              - example.com
          state: up
```

The **match** parameter in this example defines that Ansible applies the play to devices that

match PCI ID **0000:00:0[1-3].0**, but not **0000:00:02.0**. For further details about special modifiers and wild cards you can use, see the **match** parameter description in the **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file.

2. Run the playbook:

```
# ansible-playbook ~/ethernet-static-IP.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.3. CONFIGURING AN ETHERNET CONNECTION WITH A DYNAMIC IP ADDRESS BY USING THE NETWORK RHEL SYSTEM ROLE WITH AN INTERFACE NAME

You can remotely configure an Ethernet connection using the **network** RHEL System Role. For connections with dynamic IP address settings, NetworkManager requests the IP settings for the connection from a DHCP server.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- A physical or virtual Ethernet device exists in the server's configuration.
- A DHCP server is available in the network
- The managed nodes use NetworkManager to configure the network.

Procedure

1. Create a playbook file, for example ***~/ethernet-dynamic-IP.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure an Ethernet connection with dynamic IP
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        - name: enp7s0
```

```
    interface_name: enp7s0
    type: ethernet
    autoconnect: yes
    ip:
      dhcp4: yes
      auto6: yes
    state: up
```

2. Run the playbook:

```
# ansible-playbook ~/ethernet-dynamic-IP.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.4. CONFIGURING AN ETHERNET CONNECTION WITH A DYNAMIC IP ADDRESS BY USING THE NETWORK RHEL SYSTEM ROLE WITH A DEVICE PATH

You can remotely configure an Ethernet connection using the **network** RHEL System Role. For connections with dynamic IP address settings, NetworkManager requests the IP settings for the connection from a DHCP server.

You can identify the device path with the following command:

```
# udevadm info /sys/class/net/<device_name> | grep ID_PATH=
```

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- A physical or virtual Ethernet device exists in the server's configuration.
- A DHCP server is available in the network.
- The managed hosts use NetworkManager to configure the network.

Procedure

1. Create a playbook file, for example *~/ethernet-dynamic-IP.yml*, with the following content:

```
---
- name: Configure the network
```

```
hosts: managed-node-01.example.com
tasks:
- name: Configure an Ethernet connection with dynamic IP
  include_role:
    name: rhel-system-roles.network

  vars:
    network_connections:
      - name: example
        match:
          path:
            - pci-0000:00:0[1-3].0
            - &!pci-0000:00:02.0
        type: ethernet
        autoconnect: yes
        ip:
          dhcp4: yes
          auto6: yes
        state: up
```

The **match** parameter in this example defines that Ansible applies the play to devices that match PCI ID **0000:00:0[1-3].0**, but not **0000:00:02.0**. For further details about special modifiers and wild cards you can use, see the **match** parameter description in the **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file.

2. Run the playbook:

```
# ansible-playbook ~/ethernet-dynamic-IP.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.5. CONFIGURING VLAN TAGGING BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Role to configure VLAN tagging. This example adds an Ethernet connection and a VLAN with ID **10** on top of this Ethernet connection. As the child device, the VLAN connection contains the IP, default gateway, and DNS configurations.

Depending on your environment, adjust the play accordingly. For example:

- To use the VLAN as a port in other connections, such as a bond, omit the **ip** attribute, and set the IP configuration in the child configuration.
- To use team, bridge, or bond devices in the VLAN, adapt the **interface_name** and **type** attributes of the ports you use in the VLAN.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.

- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/vlan-ethernet.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure a VLAN that uses an Ethernet connection
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        # Add an Ethernet profile for the underlying device of the VLAN
        - name: enp1s0
          type: ethernet
          interface_name: enp1s0
          autoconnect: yes
          state: up
          ip:
            dhcp4: no
            auto6: no

        # Define the VLAN profile
        - name: enp1s0.10
          type: vlan
          ip:
            address:
              - "192.0.2.1/24"
              - "2001:db8:1::1/64"
            gateway4: 192.0.2.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 192.0.2.200
              - 2001:db8:1::ffbb
            dns_search:
              - example.com
          vlan_id: 10
          parent: enp1s0
          state: up
```

   The **parent** attribute in the VLAN profile configures the VLAN to operate on top of the **enp1s0** device.

2. Run the playbook:

```
# ansible-playbook ~/vlan-ethernet.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.6. CONFIGURING A NETWORK BRIDGE BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Role to configure a Linux bridge. For example, use it to configure a network bridge that uses two Ethernet devices, and sets IPv4 and IPv6 addresses, default gateways, and DNS configuration.

NOTE

Set the IP configuration on the bridge and not on the ports of the Linux bridge.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- Two or more physical or virtual network devices are installed on the server.

Procedure

1. Create a playbook file, for example ***~/bridge-ethernet.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure a network bridge that uses two Ethernet ports
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        # Define the bridge profile
        - name: bridge0
          type: bridge
          interface_name: bridge0
          ip:
            address:
              - "192.0.2.1/24"
              - "2001:db8:1::1/64"
            gateway4: 192.0.2.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 192.0.2.200
```

```
      - 2001:db8:1::ffbb
    dns_search:
      - example.com
  state: up

# Add an Ethernet profile to the bridge
- name: bridge0-port1
  interface_name: enp7s0
  type: ethernet
  controller: bridge0
  port_type: bridge
  state: up

# Add a second Ethernet profile to the bridge
- name: bridge0-port2
  interface_name: enp8s0
  type: ethernet
  controller: bridge0
  port_type: bridge
  state: up
```

2. Run the playbook:

```
# ansible-playbook ~/bridge-ethernet.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.7. CONFIGURING A NETWORK BOND BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Roles to configure a Linux bond. For example, use it to configure a network bond in active-backup mode that uses two Ethernet devices, and sets an IPv4 and IPv6 addresses, default gateways, and DNS configuration.

NOTE

Set the IP configuration on the bond and not on the ports of the Linux bond.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- Two or more physical or virtual network devices are installed on the server.

Procedure

1. Create a playbook file, for example ***~/bond-ethernet.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure a network bond that uses two Ethernet ports
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        # Define the bond profile
        - name: bond0
          type: bond
          interface_name: bond0
          ip:
            address:
              - "192.0.2.1/24"
              - "2001:db8:1::1/64"
            gateway4: 192.0.2.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 192.0.2.200
              - 2001:db8:1::ffbb
            dns_search:
              - example.com
          bond:
            mode: active-backup
          state: up

        # Add an Ethernet profile to the bond
        - name: bond0-port1
          interface_name: enp7s0
          type: ethernet
          controller: bond0
          state: up

        # Add a second Ethernet profile to the bond
        - name: bond0-port2
          interface_name: enp8s0
          type: ethernet
          controller: bond0
          state: up
```

2. Run the playbook:

```
# ansible-playbook ~/bond-ethernet.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.8. CONFIGURING AN IPOIB CONNECTION BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Role to remotely create NetworkManager connection profiles for IP over InfiniBand (IPoIB) devices. For example, remotely add an InfiniBand connection for the **mlx4_ib0** interface with the following settings by running an Ansible playbook:

- An IPoIB device - **mlx4_ib0.8002**
- A partition key **p_key** - **0x8002**
- A static **IPv4** address - **192.0.2.1** with a **/24** subnet mask
- A static **IPv6** address - **2001:db8:1::1** with a **/64** subnet mask

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- An InfiniBand device named **mlx4_ib0** is installed in the managed nodes.
- The managed nodes use NetworkManager to configure the network.

Procedure

1. Create a playbook file, for example ***~/IPoIB.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure IPoIB
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:

        # InfiniBand connection mlx4_ib0
        - name: mlx4_ib0
          interface_name: mlx4_ib0
          type: infiniband

        # IPoIB device mlx4_ib0.8002 on top of mlx4_ib0
        - name: mlx4_ib0.8002
          type: infiniband
          autoconnect: yes
```

```
    infiniband:
      p_key: 0x8002
      transport_mode: datagram
    parent: mlx4_ib0
    ip:
      address:
        - 192.0.2.1/24
        - 2001:db8:1::1/64
    state: up
```

If you set a **p_key** parameter as in this example, do not set an **interface_name** parameter on the IPoIB device.

2. Run the playbook:

```
# ansible-playbook ~/IPoIB.yml
```

Verification

1. On the **managed-node-01.example.com** host, display the IP settings of the **mlx4_ib0.8002** device:

```
# ip address show mlx4_ib0.8002
...
inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute ib0.8002
   valid_lft forever preferred_lft forever
inet6 2001:db8:1::1/64 scope link tentative noprefixroute
   valid_lft forever preferred_lft forever
```

2. Display the partition key (P_Key) of the **mlx4_ib0.8002** device:

```
# cat /sys/class/net/mlx4_ib0.8002/pkey
0x8002
```

3. Display the mode of the **mlx4_ib0.8002** device:

```
# cat /sys/class/net/mlx4_ib0.8002/mode
datagram
```

Additional resources

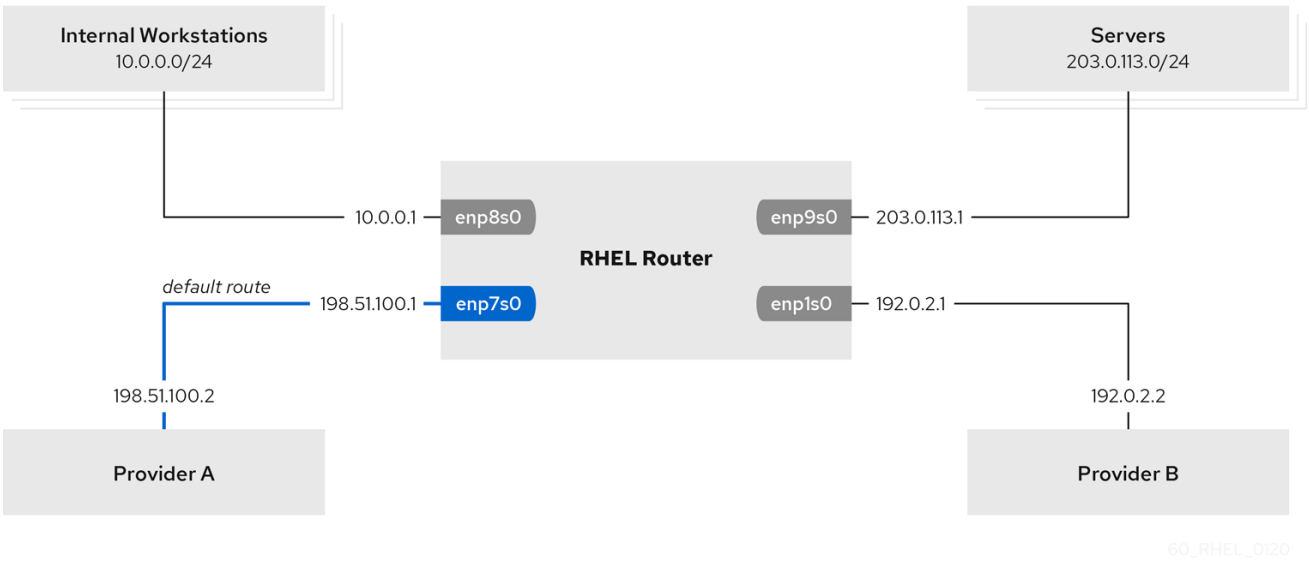
- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.9. ROUTING TRAFFIC FROM A SPECIFIC SUBNET TO A DIFFERENT DEFAULT GATEWAY BY USING THE NETWORK RHEL SYSTEM ROLE

You can use policy-based routing to configure a different default gateway for traffic from certain subnets. For example, you can configure RHEL as a router that, by default, routes all traffic to Internet provider A using the default route. However, traffic received from the internal workstations subnet is routed to provider B.

To configure policy-based routing remotely and on multiple nodes, you can use the RHEL **network** System Role. Perform this procedure on the Ansible control node.

This procedure assumes the following network topology:



Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on the them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.
- The managed nodes uses the **NetworkManager** and **firewalld** services.
- The managed nodes you want to configure has four network interfaces:
  - The **enp7s0** interface is connected to the network of provider A. The gateway IP in the provider's network is **198.51.100.2**, and the network uses a **/30** network mask.
  - The **enp1s0** interface is connected to the network of provider B. The gateway IP in the provider's network is **192.0.2.2**, and the network uses a **/30** network mask.
  - The **enp8s0** interface is connected to the **10.0.0.0/24** subnet with internal workstations.
  - The **enp9s0** interface is connected to the **203.0.113.0/24** subnet with the company's servers.
- Hosts in the internal workstations subnet use **10.0.0.1** as the default gateway. In the procedure, you assign this IP address to the **enp8s0** network interface of the router.
- Hosts in the server subnet use **203.0.113.1** as the default gateway. In the procedure, you assign this IP address to the **enp9s0** network interface of the router.

Procedure

1. Create a playbook file, for example ~/**pbr.yml**, with the following content:

```
---
- name: Configuring policy-based routing
  hosts: managed-node-01.example.com
  tasks:
  - name: Routing traffic from a specific subnet to a different default gateway
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        - name: Provider-A
          interface_name: enp7s0
          type: ethernet
          autoconnect: True
          ip:
            address:
              - 198.51.100.1/30
            gateway4: 198.51.100.2
            dns:
              - 198.51.100.200
          state: up
          zone: external

        - name: Provider-B
          interface_name: enp1s0
          type: ethernet
          autoconnect: True
          ip:
            address:
              - 192.0.2.1/30
            route:
              - network: 0.0.0.0
                prefix: 0
                gateway: 192.0.2.2
                table: 5000
          state: up
          zone: external

        - name: Internal-Workstations
          interface_name: enp8s0
          type: ethernet
          autoconnect: True
          ip:
            address:
              - 10.0.0.1/24
            route:
              - network: 10.0.0.0
                prefix: 24
                table: 5000
            routing_rule:
              - priority: 5
                from: 10.0.0.0/24
                table: 5000
          state: up
          zone: trusted
```

```
    - name: Servers
      interface_name: enp9s0
      type: ethernet
      autoconnect: True
      ip:
        address:
          - 203.0.113.1/24
      state: up
      zone: trusted
```

2. Run the playbook:

```
# ansible-playbook ~/pbr.yml
```

Verification

1. On a RHEL host in the internal workstation subnet:
   a. Install the **traceroute** package:

```
# yum install traceroute
```

   b. Use the **traceroute** utility to display the route to a host on the Internet:

```
# traceroute redhat.com
traceroute to redhat.com (209.132.183.105), 30 hops max, 60 byte packets
 1  10.0.0.1 (10.0.0.1)     0.337 ms  0.260 ms  0.223 ms
 2  192.0.2.1 (192.0.2.1)   0.884 ms  1.066 ms  1.248 ms
 ...
```

   The output of the command displays that the router sends packets over **192.0.2.1**, which is the network of provider B.

2. On a RHEL host in the server subnet:
   a. Install the **traceroute** package:

```
# yum install traceroute
```

   b. Use the **traceroute** utility to display the route to a host on the Internet:

```
# traceroute redhat.com
traceroute to redhat.com (209.132.183.105), 30 hops max, 60 byte packets
 1  203.0.113.1 (203.0.113.1)    2.179 ms  2.073 ms  1.944 ms
 2  198.51.100.2 (198.51.100.2)  1.868 ms  1.798 ms  1.549 ms
 ...
```

   The output of the command displays that the router sends packets over **198.51.100.2**, which is the network of provider A.

3. On the RHEL router that you configured using the RHEL System Role:
   a. Display the rule list:

```
# ip rule list
0:      from all lookup local
5:    from 10.0.0.0/24 lookup 5000
32766:  from all lookup main
32767:  from all lookup default
```

By default, RHEL contains rules for the tables **local**, **main**, and **default**.

b. Display the routes in table **5000**:

```
# ip route list table 5000
0.0.0.0/0 via 192.0.2.2 dev enp1s0 proto static metric 100
10.0.0.0/24 dev enp8s0 proto static scope link src 192.0.2.1 metric 102
```

c. Display the interfaces and firewall zones:

```
# firewall-cmd --get-active-zones
external
  interfaces: enp1s0 enp7s0
trusted
  interfaces: enp8s0 enp9s0
```

d. Verify that the **external** zone has masquerading enabled:

```
# firewall-cmd --info-zone=external
external (active)
  target: default
  icmp-block-inversion: no
  interfaces: enp1s0 enp7s0
  sources:
  services: ssh
  ports:
  protocols:
  masquerade: yes
  ...
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.10. CONFIGURING A STATIC ETHERNET CONNECTION WITH 802.1X NETWORK AUTHENTICATION BY USING THE NETWORK RHEL SYSTEM ROLE

Using the **network** RHEL System Role, you can automate the creation of an Ethernet connection that uses the 802.1X standard to authenticate the client. For example, remotely add an Ethernet connection for the **enp1s0** interface with the following settings by running an Ansible playbook:

- A static IPv4 address - **192.0.2.1** with a **/24** subnet mask
- A static IPv6 address - **2001:db8:1::1** with a **/64** subnet mask
- An IPv4 default gateway - **192.0.2.254**

- An IPv6 default gateway - **2001:db8:1::fffe**
- An IPv4 DNS server - **192.0.2.200**
- An IPv6 DNS server - **2001:db8:1::ffbb**
- A DNS search domain - **example.com**
- 802.1X network authentication using the **TLS** Extensible Authentication Protocol (EAP)

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file
- The network supports 802.1X network authentication.
- The managed nodes uses NetworkManager.
- The following files required for TLS authentication exist on the control node:
  - The client key is stored in the **/srv/data/client.key** file.
  - The client certificate is stored in the **/srv/data/client.crt** file.
  - The Certificate Authority (CA) certificate is stored in the **/srv/data/ca.crt** file.

Procedure

1. Create a playbook file, for example ***~/enable-802.1x.yml***, with the following content:

```
---
- name: Configure an Ethernet connection with 802.1X authentication
  hosts: managed-node-01.example.com
  tasks:
    - name: Copy client key for 802.1X authentication
      copy:
        src: "/srv/data/client.key"
        dest: "/etc/pki/tls/private/client.key"
        mode: 0600

    - name: Copy client certificate for 802.1X authentication
      copy:
        src: "/srv/data/client.crt"
        dest: "/etc/pki/tls/certs/client.crt"

    - name: Copy CA certificate for 802.1X authentication
      copy:
        src: "/srv/data/ca.crt"
```

```
    dest: "/etc/pki/ca-trust/source/anchors/ca.crt"

- include_role:
    name: rhel-system-roles.network

  vars:
    network_connections:
      - name: enp1s0
        type: ethernet
        autoconnect: yes
        ip:
          address:
            - 192.0.2.1/24
            - 2001:db8:1::1/64
          gateway4: 192.0.2.254
          gateway6: 2001:db8:1::fffe
          dns:
            - 192.0.2.200
            - 2001:db8:1::ffbb
          dns_search:
            - example.com
        ieee802_1x:
          identity: user_name
          eap: tls
          private_key: "/etc/pki/tls/private/client.key"
          private_key_password: "password"
          client_cert: "/etc/pki/tls/certs/client.crt"
          ca_cert: "/etc/pki/ca-trust/source/anchors/ca.crt"
          domain_suffix_match: example.com
        state: up
```

2. Run the playbook:

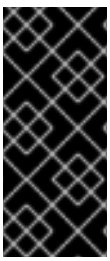
```
# ansible-playbook ~/enable-802.1x.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.11. SETTING THE DEFAULT GATEWAY ON AN EXISTING CONNECTION BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Role to set the default gateway.



IMPORTANT

When you run a play that uses the **network** RHEL System Role, the system role overrides an existing connection profile with the same name if the value of settings does not match the ones specified in the play. Therefore, always specify the whole configuration of the network connection profile in the play, even if, for example, the IP configuration already exists. Otherwise, the role resets these values to their defaults.

Depending on whether it already exists, the procedure creates or updates the **enp1s0** connection profile with the following settings:

- A static IPv4 address - **198.51.100.20** with a **/24** subnet mask
- A static IPv6 address - **2001:db8:1::1** with a **/64** subnet mask
- An IPv4 default gateway - **198.51.100.254**
- An IPv6 default gateway - **2001:db8:1::fffe**
- An IPv4 DNS server - **198.51.100.200**
- An IPv6 DNS server - **2001:db8:1::ffbb**
- A DNS search domain - **example.com**

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/ethernet-connection.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure an Ethernet connection with static IP and default gateway
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        - name: enp1s0
          type: ethernet
          autoconnect: yes
          ip:
            address:
              - 198.51.100.20/24
              - 2001:db8:1::1/64
            gateway4: 198.51.100.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 198.51.100.200
              - 2001:db8:1::ffbb
```

```
    dns_search:
      - example.com
    state: up
```

2. Run the playbook:

```
# ansible-playbook ~/ethernet-connection.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.12. CONFIGURING A STATIC ROUTE BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Role to configure static routes.

IMPORTANT

When you run a play that uses the **network** RHEL System Role, the system role overrides an existing connection profile with the same name if the value of settings does not match the ones specified in the play. Therefore, always specify the whole configuration of the network connection profile in the play, even if, for example, the IP configuration already exists. Otherwise, the role resets these values to their defaults.

Depending on whether it already exists, the procedure creates or updates the **enp7s0** connection profile with the following settings:

- A static IPv4 address - **192.0.2.1** with a **/24** subnet mask
- A static IPv6 address - **2001:db8:1::1** with a **/64** subnet mask
- An IPv4 default gateway - **192.0.2.254**
- An IPv6 default gateway - **2001:db8:1::fffe**
- An IPv4 DNS server - **192.0.2.200**
- An IPv6 DNS server - **2001:db8:1::ffbb**
- A DNS search domain - **example.com**
- Static routes:
  - **198.51.100.0/24** with gateway **192.0.2.10**
  - **2001:db8:2::/64** with gateway **2001:db8:1::10**

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes

- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/add-static-routes.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure an Ethernet connection with static IP and additional routes
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        - name: enp7s0
          type: ethernet
          autoconnect: yes
          ip:
            address:
              - 192.0.2.1/24
              - 2001:db8:1::1/64
            gateway4: 192.0.2.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 192.0.2.200
              - 2001:db8:1::ffbb
            dns_search:
              - example.com
            route:
              - network: 198.51.100.0
                prefix: 24
                gateway: 192.0.2.10
              - network: 2001:db8:2::
                prefix: 64
                gateway: 2001:db8:1::10
          state: up
```

2. Run the playbook:

```
# ansible-playbook ~/add-static-routes.yml
```

Verification

1. On the managed nodes:

   a. Display the IPv4 routes:

```
# ip -4 route
...
198.51.100.0/24 via 192.0.2.10 dev enp7s0
```

b. Display the IPv6 routes:

```
# ip -6 route
...
2001:db8:2::/64 via 2001:db8:1::10 dev enp7s0 metric 1024 pref medium
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.13. CONFIGURING AN ETHTOOL OFFLOAD FEATURE BY USING THE NETWORK RHEL SYSTEM ROLE

You can use the **network** RHEL System Role to configure **ethtool** features of a NetworkManager connection.

IMPORTANT

When you run a play that uses the **network** RHEL System Role, the system role overrides an existing connection profile with the same name if the value of settings does not match the ones specified in the play. Therefore, always specify the whole configuration of the network connection profile in the play, even if, for example the IP configuration, already exists. Otherwise the role resets these values to their defaults.

Depending on whether it already exists, the procedure creates or updates the **enp1s0** connection profile with the following settings:

- A static **IPv4** address - **198.51.100.20** with a **/24** subnet mask
- A static **IPv6** address - **2001:db8:1::1** with a **/64** subnet mask
- An **IPv4** default gateway - **198.51.100.254**
- An **IPv6** default gateway - **2001:db8:1::fffe**
- An **IPv4** DNS server - **198.51.100.200**
- An **IPv6** DNS server - **2001:db8:1::ffbb**
- A DNS search domain - **example.com**
- **ethtool** features:
  - Generic receive offload (GRO): disabled
  - Generic segmentation offload (GSO): enabled
  - TX stream control transmission protocol (SCTP) segmentation: disabled

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/configure-ethernet-device-with-ethtool-features.yml***, with the following content:

```
---
- name: Configure the network
  hosts: managed-node-01.example.com
  tasks:
  - name: Configure an Ethernet connection with ethtool features
    include_role:
      name: rhel-system-roles.network

    vars:
      network_connections:
        - name: enp1s0
          type: ethernet
          autoconnect: yes
          ip:
            address:
              - 198.51.100.20/24
              - 2001:db8:1::1/64
            gateway4: 198.51.100.254
            gateway6: 2001:db8:1::fffe
            dns:
              - 198.51.100.200
              - 2001:db8:1::ffbb
            dns_search:
              - example.com
          ethtool:
            features:
              gro: "no"
              gso: "yes"
              tx_sctp_segmentation: "no"
          state: up
```

2. Run the playbook:

```
# ansible-playbook ~/configure-ethernet-device-with-ethtool-features.yml
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

8.14. NETWORK STATES FOR THE NETWORK RHEL SYSTEM ROLE

The **network** RHEL system role supports state configurations in playbooks to configure the devices. For this, use the **network_state** variable followed by the state configurations.

Benefits of using the **network_state** variable in a playbook:

- Using the declarative method with the state configurations, you can configure interfaces, and the NetworkManager creates a profile for these interfaces in the background.
- With the **network_state** variable, you can specify the options that you require to change, and all the other options will remain the same as they are. However, with the **network_connections** variable, you must specify all settings to change the network connection profile.

For example, to create an Ethernet connection with dynamic IP address settings, use the following **vars** block in your playbook:

Playbook with state configurations

```
vars:
  network_state:
    interfaces:
    - name: enp7s0
      type: ethernet
      state: up
      ipv4:
        enabled: true
        auto-dns: true
        auto-gateway: true
        auto-routes: true
        dhcp: true
      ipv6:
        enabled: true
        auto-dns: true
        auto-gateway: true
        auto-routes: true
        autoconf: true
        dhcp: true
```

Regular playbook

```
vars:
  network_connections:
    - name: enp7s0
      interface_name: enp7s0
      type: ethernet
      autoconnect: yes
      ip:
        dhcp4: yes
        auto6: yes
      state: up
```

For example, to only change the connection status of dynamic IP address settings that you created as above, use the following **vars** block in your playbook:

Playbook with state configurations

Regular playbook

```
vars:
  network_state:
    interfaces:
    - name: enp7s0
      type: ethernet
      state: down
```

```
vars:
  network_connections:
    - name: enp7s0
      interface_name: enp7s0
      type: ethernet
      autoconnect: yes
      ip:
        dhcp4: yes
        auto6: yes
      state: down
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.network/README.md** file

CHAPTER 9. CONFIGURING FIREWALLD USING SYSTEM ROLES

You can use the **firewall** System Role to configure settings of the **firewalld** service on multiple clients at once. This solution:

- Provides an interface with efficient input settings.
- Keeps all intended **firewalld** parameters in one place.

After you run the **firewall** role on the control node, the System Role applies the **firewalld** parameters to the managed node immediately and makes them persistent across reboots.

9.1. INTRODUCTION TO THE FIREWALL RHEL SYSTEM ROLE

RHEL System Roles is a set of contents for the Ansible automation utility. This content together with the Ansible automation utility provides a consistent configuration interface to remotely manage multiple systems.

The **rhel-system-roles.firewall** role from the RHEL System Roles was introduced for automated configurations of the **firewalld** service. The **rhel-system-roles** package contains this System Role, and also the reference documentation.

To apply the **firewalld** parameters on one or more systems in an automated fashion, use the **firewall** System Role variable in a playbook. A playbook is a list of one or more plays that is written in the text-based YAML format.

You can use an inventory file to define a set of systems that you want Ansible to configure.

With the **firewall** role you can configure many different **firewalld** parameters, for example:

- Zones.
- The services for which packets should be allowed.
- Granting, rejection, or dropping of traffic access to ports.
- Forwarding of ports or port ranges for a zone.

Additional resources

- **README.md** and **README.html** files in the **/usr/share/doc/rhel-system-roles/firewall/** directory
- Working with playbooks
- How to build your inventory

9.2. RESETTING THE FIREWALLD SETTINGS USING THE FIREWALL RHEL SYSTEM ROLE

With the **firewall** RHEL system role, you can reset the **firewalld** settings to their default state. If you add the **previous:replaced** parameter to the variable list, the System Role removes all existing user-defined settings and resets **firewalld** to the defaults. If you combine the **previous:replaced** parameter with other settings, the **firewall** role removes all existing settings before applying new ones.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on the them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/reset-firewalld.yml***, with the following content:

```
---
- name: Reset firewalld example
  hosts: managed-node-01.example.com
  tasks:
  - name: Reset firewalld
    include_role:
      name: rhel-system-roles.firewall

    vars:
      firewall:
        - previous: replaced
```

2. Run the playbook:

```
# ansible-playbook ~/configuring-a-dmz.yml
```

Verification

- Run this command as **root** on the managed node to check all the zones:

```
# firewall-cmd --list-all-zones
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.firewall/README.md**
- **ansible-playbook(1)**
- **firewalld(1)**

9.3. FORWARDING INCOMING TRAFFIC FROM ONE LOCAL PORT TO A DIFFERENT LOCAL PORT

With the **firewall** role you can remotely configure **firewalld** parameters with persisting effect on multiple managed hosts.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on the them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/port_forwarding.yml***, with the following content:

```
---
- name: Configure firewalld
  hosts: managed-node-01.example.com
  tasks:
  - name: Forward incoming traffic on port 8080 to 443
    include_role:
      name: rhel-system-roles.firewall

    vars:
      firewall:
        - { forward_port: 8080/tcp;443;, state: enabled, runtime: true, permanent: true }
```

2. Run the playbook:

```
# ansible-playbook ~/port_forwarding.yml
```

Verification

- On the managed host, display the **firewalld** settings:

```
# firewall-cmd --list-forward-ports
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.firewall/README.md**

9.4. CONFIGURING PORTS USING SYSTEM ROLES

You can use the RHEL **firewall** System Role to open or close ports in the local firewall for incoming traffic and make the new configuration persist across reboots. For example you can configure the default zone to permit incoming traffic for the HTTPS service.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on the them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/opening-a-port.yml***, with the following content:

```
---
- name: Configure firewalld
  hosts: managed-node-01.example.com
  tasks:
  - name: Allow incoming HTTPS traffic to the local host
    include_role:
      name: rhel-system-roles.firewall

    vars:
      firewall:
        - port: 443/tcp
          service: http
          state: enabled
          runtime: true
          permanent: true
```

   The **permanent: true** option makes the new settings persistent across reboots.

2. Run the playbook:

```
# ansible-playbook ~/opening-a-port.yml
```

Verification

- On the managed node, verify that the **443/tcp** port associated with the **HTTPS** service is open:

```
# firewall-cmd --list-ports
443/tcp
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.firewall/README.md**

9.5. CONFIGURING A DMZ FIREWALLD ZONE BY USING THE FIREWALLD RHEL SYSTEM ROLE

As a system administrator, you can use the **firewall** System Role to configure a **dmz** zone on the **enp1s0** interface to permit **HTTPS** traffic to the zone. In this way, you enable external users to access your web servers.

Perform this procedure on the Ansible control node.

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on the them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a playbook file, for example ***~/configuring-a-dmz.yml***, with the following content:

```
---
- name: Configure firewalld
  hosts: managed-node-01.example.com
  tasks:
  - name: Creating a DMZ with access to HTTPS port and masquerading for hosts in DMZ
    include_role:
      name: rhel-system-roles.firewall

    vars:
      firewall:
        - zone: dmz
          interface: enp1s0
          service: https
          state: enabled
          runtime: true
          permanent: true
```

2. Run the playbook:

```
# ansible-playbook ~/configuring-a-dmz.yml
```

Verification

- On the managed node, view detailed information about the **dmz** zone:

```
# firewall-cmd --zone=dmz --list-all
dmz (active)
  target: default
  icmp-block-inversion: no
  interfaces: enp1s0
  sources:
  services: https ssh
  ports:
  protocols:
  forward: no
  masquerade: no
```

```
forward-ports:
source-ports:
icmp-blocks:
```

Additional resources

- **/usr/share/ansible/roles/rhel-system-roles.firewall/README.md**

CHAPTER 10. VARIABLES OF THE POSTFIX ROLE IN SYSTEM ROLES

The **postfix** role variables allow the user to install, configure, and start the **postfix** Mail Transfer Agent (MTA).

The following role variables are defined in this section:

- **postfix_conf**: It includes key/value pairs of all the supported **postfix** configuration parameters. By default, the **postfix_conf** does not have a value.

```
postfix_conf:
  relayhost: example.com
```

If your scenario requires removing any existing configuration and apply the desired configuration on top of a clean **postfix** installation, specify the **previous: replaced** option within the **postfix_conf** dictionary:

An example with the **previous: replaced** option:

```
postfix_conf:
  relayhost: example.com
  previous: replaced
```

- **postfix_check**: It determines if a check has been executed before starting the **postfix** to verify the configuration changes. The default value is true.

For example:

```
postfix_check: true
```

- **postfix_backup**: It determines whether a single backup copy of the configuration is created. By default the **postfix_backup** value is false.

To overwrite any previous backup run the following command:

```
# *cp /etc/postfix/main.cf /etc/postfix/main.cf.backup*
```

If the **postfix_backup** value is changed to **true**, you must also set the **postfix_backup_multiple** value to false.

For example:

```
postfix_backup: true
postfix_backup_multiple: false
```

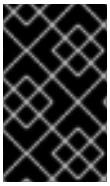
- **postfix_backup_multiple**: It determines if the role will make a timestamped backup copy of the configuration.

To keep multiple backup copies, run the following command:

```
# *cp /etc/postfix/main.cf /etc/postfix/main.cf.$(date -Isec)*
```

By default the value of **postfix_backup_multiple** is true. The **postfix_backup_multiple:true** setting overrides **postfix_backup**. If you want to use **postfix_backup** you must set the **postfix_backup_multiple:false**.

- **postfix_manage_firewall**: Integrates the **postfix** role with the **firewall** role to manage port access. By default, the variable is set to **false**. If you want to automatically manage port access from the **postfix** role, set the variable to **true**.
- **postfix_manage_selinux**: Integrates the **postfix** role with the **selinux** role to manage port access. By default, the variable is set to **false**. If you want to automatically manage port access from the **postfix** role, set the variable to **true**.



IMPORTANT

The configuration parameters cannot be removed. Before running the **postfix** role, set the **postfix_conf** to all the required configuration parameters and use the file module to remove **/etc/postfix/main.cf**.

10.1. ADDITIONAL RESOURCES

- **/usr/share/doc/rhel-system-roles/postfix/README.md**

CHAPTER 11. CONFIGURING SELINUX USING SYSTEM ROLES

11.1. INTRODUCTION TO THE SELINUX SYSTEM ROLE

RHEL System Roles is a collection of Ansible roles and modules that provide a consistent configuration interface to remotely manage multiple RHEL systems. The **selinux** System Role enables the following actions:

- Cleaning local policy modifications related to SELinux booleans, file contexts, ports, and logins.
- Setting SELinux policy booleans, file contexts, ports, and logins.
- Restoring file contexts on specified files or directories.
- Managing SELinux modules.

The following table provides an overview of input variables available in the **selinux** System Role.

Table 11.1. selinux System Role variables

Role variable	Description	CLI alternative
selinux_policy	Chooses a policy protecting targeted processes or Multi Level Security protection.	**SELINUXTYPE** in **/etc/selinux/config**
selinux_state	Switches SELinux modes.	**setenforce** and **SELINUX** in **/etc/selinux/config**.
selinux_booleans	Enables and disables SELinux booleans.	**setsebool**
selinux_fcontexts	Adds or removes a SELinux file context mapping.	**semanage fcontext**
selinux_restore_dirs	Restores SELinux labels in the file-system tree.	**restorecon -R**
selinux_ports	Sets SELinux labels on ports.	**semanage port**
selinux_logins	Sets users to SELinux user mapping.	**semanage login**
selinux_modules	Installs, enables, disables, or removes SELinux modules.	**semodule**

The **/usr/share/doc/rhel-system-roles/selinux/example-selinux-playbook.yml** example playbook installed by the **rhel-system-roles** package demonstrates how to set the targeted policy in enforcing mode. The playbook also applies several local policy modifications and restores file contexts in the **/tmp/test_dir/** directory.

For a detailed reference on **selinux** role variables, install the **rhel-system-roles** package, and see the **README.md** or **README.html** files in the **/usr/share/doc/rhel-system-roles/selinux/** directory.

Additional resources

- Introduction to RHEL System Roles

11.2. USING THE SELINUX SYSTEM ROLE TO APPLY SELINUX SETTINGS ON MULTIPLE SYSTEMS

Follow the steps to prepare and apply an Ansible playbook with your verified SELinux settings.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **selinux** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.
  - An inventory file which lists the managed nodes.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Prepare your playbook. You can either start from the scratch or modify the example playbook installed as a part of the **rhel-system-roles** package:

```
# cp /usr/share/doc/rhel-system-roles/selinux/example-selinux-playbook.yml my-selinux-playbook.yml
# vi my-selinux-playbook.yml
```

2. Change the content of the playbook to fit your scenario. For example, the following part ensures that the system installs and enables the **selinux-local-1.pp** SELinux module:

```
selinux_modules:
- { path: "selinux-local-1.pp", priority: "400" }
```

3. Save the changes, and exit the text editor.

4. Run your playbook on the *host1*, *host2*, and *host3* systems:

```
# ansible-playbook -i host1,host2,host3 my-selinux-playbook.yml
```

Additional resources

- For more information, install the **rhel-system-roles** package, and see the **/usr/share/doc/rhel-system-roles/selinux/** and **/usr/share/ansible/roles/rhel-system-roles.selinux/** directories.

CHAPTER 12. CONFIGURING LOGGING BY USING RHEL SYSTEM ROLES

As a system administrator, you can use the **logging** System Role to configure a RHEL host as a logging server to collect logs from many client systems.

12.1. THE LOGGING SYSTEM ROLE

With the **logging** System Role, you can deploy logging configurations on local and remote hosts.

To apply a **logging** System Role on one or more systems, you define the logging configuration in a *playbook*. A playbook is a list of one or more plays. Playbooks are human-readable, and they are written in the YAML format. For more information about playbooks, see Working with playbooks in Ansible documentation.

The set of systems that you want to configure according to the playbook is defined in an *inventory file*. For more information on creating and using inventories, see How to build your inventory in Ansible documentation.

Logging solutions provide multiple ways of reading logs and multiple logging outputs.

For example, a logging system can receive the following inputs:

- local files,
- **systemd/journal**,
- another logging system over the network.

In addition, a logging system can have the following outputs:

- logs stored in the local files in the /**var**/**log** directory,
- logs sent to Elasticsearch,
- logs forwarded to another logging system.

With the **logging** System Role, you can combine the inputs and outputs to fit your scenario. For example, you can configure a logging solution that stores inputs from **journal** in a local file, whereas inputs read from files are both forwarded to another logging system and stored in the local log files.

12.2. LOGGING SYSTEM ROLE PARAMETERS

In a **logging** System Role playbook, you define the inputs in the **logging_inputs** parameter, outputs in the **logging_outputs** parameter, and the relationships between the inputs and outputs in the **logging_flows** parameter. The **logging** System Role processes these variables with additional options to configure the logging system. You can also enable encryption or an automatic port management.

NOTE

Currently, the only available logging system in the **logging** System Role is **Rsyslog**.

- **logging_inputs**: List of inputs for the logging solution.

    - **name**: Unique name of the input. Used in the **logging_flows**: inputs list and a part of the generated **config** file name.
    - **type**: Type of the input element. The type specifies a task type which corresponds to a directory name in **roles/rsyslog/{tasks,vars}/inputs/**.
        - **basics**: Inputs configuring inputs from **systemd** journal or **unix** socket.
            - **kernel_message**: Load **imklog** if set to **true**. Default to **false**.
            - **use_imuxsock**: Use **imuxsock** instead of **imjournal**. Default to **false**.
            - **ratelimit_burst**: Maximum number of messages that can be emitted within **ratelimit_interval**. Default to **20000** if **use_imuxsock** is false. Default to **200** if **use_imuxsock** is true.
            - **ratelimit_interval**: Interval to evaluate **ratelimit_burst**. Default to 600 seconds if **use_imuxsock** is false. Default to 0 if **use_imuxsock** is true. 0 indicates rate limiting is turned off.
            - **persist_state_interval**: Journal state is persisted every **value** messages. Default to **10**. Effective only when **use_imuxsock** is false.
        - **files**: Inputs configuring inputs from local files.
        - **remote**: Inputs configuring inputs from the other logging system over network.
    - **state**: State of the configuration file. **present** or **absent**. Default to **present**.
- **logging_outputs**: List of outputs for the logging solution.
    - **files**: Outputs configuring outputs to local files.
    - **forwards**: Outputs configuring outputs to another logging system.
    - **remote_files**: Outputs configuring outputs from another logging system to local files.
- **logging_flows**: List of flows that define relationships between **logging_inputs** and **logging_outputs**. The **logging_flows** variable has the following keys:
    - **name**: Unique name of the flow
    - **inputs**: List of **logging_inputs** name values
    - **outputs**: List of **logging_outputs** name values.
- **logging_manage_firewall**: If set to **true**, the variable uses the **firewall** role to automatically manage port access from within the **logging** role.
- **logging_manage_selinux**: If set to **true**, the variable uses the **selinux** role to automatically manage port access from within the **logging** role.

Additional resources

- Documentation installed with the **rhel-system-roles** package in **/usr/share/ansible/roles/rhel-system-roles.logging/README.html**

12.3. APPLYING A LOCAL LOGGING SYSTEM ROLE

Prepare and apply an Ansible playbook to configure a logging solution on a set of separate machines. Each machine records logs locally.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **logging** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

NOTE

You do not have to have the **rsyslog** package installed, because the System Role installs **rsyslog** when deployed.

Procedure

1. Create a playbook that defines the required role:
   a. Create a new YAML file and open it in a text editor, for example:

```
# vi logging-playbook.yml
```

   b. Insert the following content:

```
---
- name: Deploying basics input and implicit files output
  hosts: all
  roles:
    - rhel-system-roles.logging
```

```
vars:
  logging_inputs:
    - name: system_input
      type: basics
  logging_outputs:
    - name: files_output
      type: files
  logging_flows:
    - name: flow1
      inputs: [system_input]
      outputs: [files_output]
```

2. Run the playbook on a specific inventory:

```
# ansible-playbook -i inventory-file /path/to/file/logging-playbook.yml
```

Where:

- ***inventory-file*** is the inventory file.
- ***logging-playbook.yml*** is the playbook you use.

Verification

1. Test the syntax of the **/etc/rsyslog.conf** file:

```
# rsyslogd -N 1
rsyslogd: version 8.1911.0-6.el8, config validation run...
rsyslogd: End of config validation run. Bye.
```

2. Verify that the system sends messages to the log:

   a. Send a test message:

```
# logger test
```

   b. View the **/var/log/messages** log, for example:

```
# cat /var/log/messages
Aug  5 13:48:31 hostname root[6778]: test
```

   Where `*hostname*` is the host name of the client system. Note that the log contains the user name of the user that entered the logger command, in this case **root**.

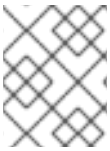
12.4. FILTERING LOGS IN A LOCAL LOGGING SYSTEM ROLE

You can deploy a logging solution which filters the logs based on the **rsyslog** property-based filter.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **logging** System Role.

- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - Red Hat Ansible Core is installed
  - The **rhel-system-roles** package is installed
  - An inventory file which lists the managed nodes.



NOTE

You do not have to have the **rsyslog** package installed, because the System Role installs **rsyslog** when deployed.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- name: Deploying files input and configured files output
  hosts: all
  roles:
    - linux-system-roles.logging
  vars:
    logging_inputs:
      - name: files_input
        type: basics
    logging_outputs:
      - name: files_output0
        type: files
        property: msg
        property_op: contains
        property_value: error
        path: /var/log/errors.log
      - name: files_output1
        type: files
        property: msg
        property_op: "!contains"
        property_value: error
        path: /var/log/others.log
    logging_flows:
      - name: flow0
        inputs: [files_input]
        outputs: [files_output0, files_output1]
```

   Using this configuration, all messages that contain the ***error*** string are logged in **/var/log/errors.log**, and all other messages are logged in **/var/log/others.log**.

   You can replace the ***error*** property value with the string by which you want to filter.

   You can modify the variables according to your preferences.

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

Verification

1. Test the syntax of the **/etc/rsyslog.conf** file:

```
# rsyslogd -N 1
rsyslogd: version 8.1911.0-6.el8, config validation run...
rsyslogd: End of config validation run. Bye.
```

2. Verify that the system sends messages that contain the **error** string to the log:

   a. Send a test message:

   ```
   # logger error
   ```

   b. View the **/var/log/errors.log** log, for example:

   ```
   # cat /var/log/errors.log
   Aug  5 13:48:31 hostname root[6778]: error
   ```

   Where ***hostname*** is the host name of the client system. Note that the log contains the user name of the user that entered the logger command, in this case **root**.

Additional resources

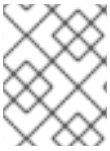
- Documentation installed with the **rhel-system-roles** package in **/usr/share/ansible/roles/rhel-system-roles.logging/README.html**

12.5. APPLYING A REMOTE LOGGING SOLUTION USING THE LOGGING SYSTEM ROLE

Follow these steps to prepare and apply a Red Hat Ansible Core playbook to configure a remote logging solution. In this playbook, one or more clients take logs from **systemd-journal** and forward them to a remote server. The server receives remote input from **remote_rsyslog** and **remote_files** and outputs the logs to local files in directories named by remote host names.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **logging** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.
  - An inventory file which lists the managed nodes.



NOTE

You do not have to have the **rsyslog** package installed, because the System Role installs **rsyslog** when deployed.

Procedure

1. Create a playbook that defines the required role:

   a. Create a new YAML file and open it in a text editor, for example:

   ```
   # vi logging-playbook.yml
   ```

   b. Insert the following content into the file:

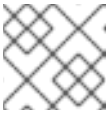
   ```
   ---
   - name: Deploying remote input and remote_files output
     hosts: server
     roles:
       - rhel-system-roles.logging
     vars:
       logging_inputs:
         - name: remote_udp_input
           type: remote
           udp_ports: [ 601 ]
         - name: remote_tcp_input
           type: remote
           tcp_ports: [ 601 ]
       logging_outputs:
         - name: remote_files_output
           type: remote_files
       logging_flows:
         - name: flow_0
           inputs: [remote_udp_input, remote_tcp_input]
           outputs: [remote_files_output]

   - name: Deploying basics input and forwards output
     hosts: clients
     roles:
       - rhel-system-roles.logging
     vars:
       logging_inputs:
         - name: basic_input
           type: basics
       logging_outputs:
         - name: forward_output0
           type: forwards
           severity: info
           target: _host1.example.com_
           udp_port: 601
         - name: forward_output1
           type: forwards
           facility: mail
           target: _host1.example.com_
           tcp_port: 601
       logging_flows:
   ```

```
      - name: flows0
        inputs: [basic_input]
        outputs: [forward_output0, forward_output1]

[basic_input]
[forward_output0, forward_output1]
```

Where ***host1.example.com*** is the logging server.



NOTE

You can modify the parameters in the playbook to fit your needs.

WARNING

The logging solution works only with the ports defined in the SELinux policy of the server or client system and open in the firewall. The default SELinux policy includes ports 601, 514, 6514, 10514, and 20514. To use a different port, modify the SELinux policy on the client and server systems.

2. Create an inventory file that lists your servers and clients:

   a. Create a new file and open it in a text editor, for example:

   ```
   # vi inventory.ini
   ```

   b. Insert the following content into the inventory file:

   ```
   [servers]
   server ansible_host=host1.example.com
   [clients]
   client ansible_host=host2.example.com
   ```

   Where:

   - ***host1.example.com*** is the logging server.
   - ***host2.example.com*** is the logging client.

3. Run the playbook on your inventory.

   ```
   # ansible-playbook -i /path/to/file/inventory.ini /path/to/file/_logging-playbook.yml
   ```

   Where:

   - ***inventory.ini*** is the inventory file.
   - ***logging-playbook.yml*** is the playbook you created.

Verification

1. On both the client and the server system, test the syntax of the **/etc/rsyslog.conf** file:

```
# rsyslogd -N 1
rsyslogd: version 8.1911.0-6.el8, config validation run (level 1), master config
/etc/rsyslog.conf
rsyslogd: End of config validation run. Bye.
```

2. Verify that the client system sends messages to the server:

   a. On the client system, send a test message:

```
# logger test
```

   b. On the server system, view the **/var/log/messages** log, for example:

```
# cat /var/log/messages
Aug  5 13:48:31 host2.example.com root[6778]: test
```

   Where ***host2.example.com*** is the host name of the client system. Note that the log contains the user name of the user that entered the logger command, in this case **root**.

Additional resources

- Preparing a control node and managed nodes to use RHEL System Roles
- Documentation installed with the **rhel-system-roles** package in **/usr/share/ansible/roles/rhel-system-roles.logging/README.html**
- RHEL System Roles KB article

12.6. USING THE LOGGING SYSTEM ROLE WITH TLS

Transport Layer Security (TLS) is a cryptographic protocol designed to securely communicate over the computer network.

As an administrator, you can use the **logging** RHEL System Role to configure secure transfer of logs using Red Hat Ansible Automation Platform.

12.6.1. Configuring client logging with TLS

You can use the **logging** System Role to configure logging in RHEL systems that are logged on a local machine and can transfer logs to the remote logging system with TLS by running an Ansible playbook.

This procedure configures TLS on all hosts in the clients group in the Ansible inventory. The TLS protocol encrypts the message transmission for secure transfer of logs over the network.

Prerequisites

- You have permissions to run playbooks on managed nodes on which you want to configure TLS.
- The managed nodes are listed in the inventory file on the control node.

- The **ansible** and **rhel-system-roles** packages are installed on the control node.

Procedure

1. Create a ***playbook.yml*** file with the following content:

```
---
- name: Deploying files input and forwards output with certs
  hosts: clients
  roles:
    - rhel-system-roles.logging
  vars:
    logging_pki_files:
      - ca_cert_src: /local/path/to/ca_cert.pem
        cert_src: /local/path/to/cert.pem
        private_key_src: /local/path/to/key.pem
    logging_inputs:
      - name: input_name
        type: files
        input_log_path: /var/log/containers/*.log
    logging_outputs:
      - name: output_name
        type: forwards
        target: your_target_host
        tcp_port: 514
        tls: true
        pki_authmode: x509/name
        permitted_server: 'server.example.com'
    logging_flows:
      - name: flow_name
        inputs: [input_name]
        outputs: [output_name]
```

The playbook uses the following parameters:

logging_pki_files

Using this parameter you can configure TLS and has to pass **ca_cert_src**, **cert_src**, and **private_key_src** parameters.

ca_cert

Represents the path to CA certificate. Default path is **/etc/pki/tls/certs/ca.pem** and the file name is set by the user.

cert

Represents the path to cert. Default path is **/etc/pki/tls/certs/server-cert.pem** and the file name is set by the user.

private_key

Represents the path to private key. Default path is **/etc/pki/tls/private/server-key.pem** and the file name is set by the user.

ca_cert_src

Represents local CA cert file path which is copied to the target host. If **ca_cert** is specified, it is copied to the location.

cert_src

Represents the local cert file path which is copied to the target host. If **cert** is specified, it is copied to the location.

private_key_src

Represents the local key file path which is copied to the target host. If **private_key** is specified, it is copied to the location.

tls

Using this parameter ensures secure transfer of logs over the network. If you do not want a secure wrapper, you can set **tls: true**.

2. Verify playbook syntax:

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file playbook.yml
```

12.6.2. Configuring server logging with TLS

You can use the **logging** System Role to configure logging in RHEL systems as a server and can receive logs from the remote logging system with TLS by running an Ansible playbook.

This procedure configures TLS on all hosts in the server group in the Ansible inventory.

Prerequisites

- You have permissions to run playbooks on managed nodes on which you want to configure TLS.
- The managed nodes are listed in the inventory file on the control node.
- The **ansible** and **rhel-system-roles** packages are installed on the control node.

Procedure

1. Create a ***playbook.yml*** file with the following content:

```
---
- name: Deploying remote input and remote_files output with certs
  hosts: server
  roles:
    - rhel-system-roles.logging
  vars:
    logging_pki_files:
      - ca_cert_src: /local/path/to/ca_cert.pem
        cert_src: /local/path/to/cert.pem
        private_key_src: /local/path/to/key.pem
    logging_inputs:
      - name: input_name
        type: remote
        tcp_ports: 514
        tls: true
        permitted_clients: ['clients.example.com']
    logging_outputs:
```

```
      - name: output_name
        type: remote_files
        remote_log_path: /var/log/remote/%FROMHOST%/%PROGRAMNAME:::secpath-
replace%.log
        async_writing: true
        client_count: 20
        io_buffer_size: 8192
    logging_flows:
      - name: flow_name
        inputs: [input_name]
        outputs: [output_name]
```

The playbook uses the following parameters:

logging_pki_files

Using this parameter you can configure TLS and has to pass **ca_cert_src**, **cert_src**, and **private_key_src** parameters.

ca_cert

Represents the path to CA certificate. Default path is **/etc/pki/tls/certs/ca.pem** and the file name is set by the user.

cert

Represents the path to cert. Default path is **/etc/pki/tls/certs/server-cert.pem** and the file name is set by the user.

private_key

Represents the path to private key. Default path is **/etc/pki/tls/private/server-key.pem** and the file name is set by the user.

ca_cert_src

Represents local CA cert file path which is copied to the target host. If **ca_cert** is specified, it is copied to the location.

cert_src

Represents the local cert file path which is copied to the target host. If **cert** is specified, it is copied to the location.

private_key_src

Represents the local key file path which is copied to the target host. If **private_key** is specified, it is copied to the location.

tls

Using this parameter ensures secure transfer of logs over the network. If you do not want a secure wrapper, you can set **tls: true**.

2. Verify playbook syntax:

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file playbook.yml
```

12.7. USING THE LOGGING SYSTEM ROLES WITH RELP

Reliable Event Logging Protocol (RELP) is a networking protocol for data and message logging over the TCP network. It ensures reliable delivery of event messages and you can use it in environments that do not tolerate any message loss.

The RELP sender transfers log entries in form of commands and the receiver acknowledges them once they are processed. To ensure consistency, RELP stores the transaction number to each transferred command for any kind of message recovery.

You can consider a remote logging system in between the RELP Client and RELP Server. The RELP Client transfers the logs to the remote logging system and the RELP Server receives all the logs sent by the remote logging system.

Administrators can use the **logging** System Role to configure the logging system to reliably send and receive log entries.

12.7.1. Configuring client logging with RELP

You can use the **logging** System Role to configure logging in RHEL systems that are logged on a local machine and can transfer logs to the remote logging system with RELP by running an Ansible playbook.

This procedure configures RELP on all hosts in the **clients** group in the Ansible inventory. The RELP configuration uses Transport Layer Security (TLS) to encrypt the message transmission for secure transfer of logs over the network.

Prerequisites

- You have permissions to run playbooks on managed nodes on which you want to configure RELP.
- The managed nodes are listed in the inventory file on the control node.
- The **ansible** and **rhel-system-roles** packages are installed on the control node.

Procedure

1. Create a ***playbook.yml*** file with the following content:

```
---
- name: Deploying basic input and relp output
  hosts: clients
  roles:
    - rhel-system-roles.logging
  vars:
    logging_inputs:
      - name: basic_input
        type: basics
    logging_outputs:
      - name: relp_client
        type: relp
        target: _logging.server.com_
        port: 20514
        tls: true
        ca_cert: _/etc/pki/tls/certs/ca.pem_
        cert: _/etc/pki/tls/certs/client-cert.pem_
        private_key: _/etc/pki/tls/private/client-key.pem_
        pki_authmode: name
```

```
      permitted_servers:
        - '*.server.example.com'
  logging_flows:
    - name: _example_flow_
      inputs: [basic_input]
      outputs: [relp_client]
```

The playbooks uses following settings:

- **target**: This is a required parameter that specifies the host name where the remote logging system is running.
- **port**: Port number the remote logging system is listening.
- **tls**: Ensures secure transfer of logs over the network. If you do not want a secure wrapper you can set the **tls** variable to **false**. By default **tls** parameter is set to true while working with RELP and requires key/certificates and triplets {**ca_cert**, **cert**, **private_key**} and/or {**ca_cert_src**, **cert_src**, **private_key_src**}.
  - If {**ca_cert_src**, **cert_src**, **private_key_src**} triplet is set, the default locations **/etc/pki/tls/certs** and **/etc/pki/tls/private** are used as the destination on the managed node to transfer files from control node. In this case, the file names are identical to the original ones in the triplet
  - If {**ca_cert**, **cert**, **private_key**} triplet is set, files are expected to be on the default path before the logging configuration.
  - If both the triplets are set, files are transferred from local path from control node to specific path of the managed node.
- **ca_cert**: Represents the path to CA certificate. Default path is **/etc/pki/tls/certs/ca.pem** and the file name is set by the user.
- **cert**: Represents the path to cert. Default path is **/etc/pki/tls/certs/server-cert.pem** and the file name is set by the user.
- **private_key**: Represents the path to private key. Default path is **/etc/pki/tls/private/server-key.pem** and the file name is set by the user.
- **ca_cert_src**: Represents local CA cert file path which is copied to the target host. If ca_cert is specified, it is copied to the location.
- **cert_src**: Represents the local cert file path which is copied to the target host. If cert is specified, it is copied to the location.
- **private_key_src**: Represents the local key file path which is copied to the target host. If private_key is specified, it is copied to the location.
- **pki_authmode**: Accepts the authentication mode as **name** or **fingerprint**.
- **permitted_servers**: List of servers that will be allowed by the logging client to connect and send logs over TLS.
- **inputs**: List of logging input dictionary.
- **outputs**: List of logging output dictionary.

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook:

```
# ansible-playbook -i inventory_file playbook.yml
```

12.7.2. Configuring server logging with RELP

You can use the **logging** System Role to configure logging in RHEL systems as a server and can receive logs from the remote logging system with RELP by running an Ansible playbook.

This procedure configures RELP on all hosts in the **server** group in the Ansible inventory. The RELP configuration uses TLS to encrypt the message transmission for secure transfer of logs over the network.

Prerequisites

- You have permissions to run playbooks on managed nodes on which you want to configure RELP.
- The managed nodes are listed in the inventory file on the control node.
- The **ansible** and **rhel-system-roles** packages are installed on the control node.

Procedure

1. Create a ***playbook.yml*** file with the following content:

```
---
- name: Deploying remote input and remote_files output
  hosts: server
  roles:
    - rhel-system-roles.logging
  vars:
    logging_inputs:
      - name: relp_server
        type: relp
        port: 20514
        tls: true
        ca_cert: _/etc/pki/tls/certs/ca.pem_
        cert: _/etc/pki/tls/certs/server-cert.pem_
        private_key: _/etc/pki/tls/private/server-key.pem_
        pki_authmode: name
        permitted_clients:
          - '_*example.client.com_'
    logging_outputs:
      - name: _remote_files_output_
        type: _remote_files_
    logging_flows:
      - name: _example_flow_
        inputs: _relp_server_
        outputs: _remote_files_output_
```

The playbooks uses following settings:

- **port**: Port number the remote logging system is listening.
- **tls**: Ensures secure transfer of logs over the network. If you do not want a secure wrapper you can set the **tls** variable to **false**. By default **tls** parameter is set to true while working with RELP and requires key/certificates and triplets {**ca_cert**, **cert**, **private_key**} and/or {**ca_cert_src**, **cert_src**, **private_key_src**}.
  - If {**ca_cert_src**, **cert_src**, **private_key_src**} triplet is set, the default locations **/etc/pki/tls/certs** and **/etc/pki/tls/private** are used as the destination on the managed node to transfer files from control node. In this case, the file names are identical to the original ones in the triplet
  - If {**ca_cert**, **cert**, **private_key**} triplet is set, files are expected to be on the default path before the logging configuration.
  - If both the triplets are set, files are transferred from local path from control node to specific path of the managed node.
- **ca_cert**: Represents the path to CA certificate. Default path is **/etc/pki/tls/certs/ca.pem** and the file name is set by the user.
- **cert**: Represents the path to cert. Default path is **/etc/pki/tls/certs/server-cert.pem** and the file name is set by the user.
- **private_key**: Represents the path to private key. Default path is **/etc/pki/tls/private/server-key.pem** and the file name is set by the user.
- **ca_cert_src**: Represents local CA cert file path which is copied to the target host. If ca_cert is specified, it is copied to the location.
- **cert_src**: Represents the local cert file path which is copied to the target host. If cert is specified, it is copied to the location.
- **private_key_src**: Represents the local key file path which is copied to the target host. If private_key is specified, it is copied to the location.
- **pki_authmode**: Accepts the authentication mode as **name** or **fingerprint**.
- **permitted_clients**: List of clients that will be allowed by the logging server to connect and send logs over TLS.
- **inputs**: List of logging input dictionary.
- **outputs**: List of logging output dictionary.

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook:

```
# ansible-playbook -i inventory_file playbook.yml
```

12.8. ADDITIONAL RESOURCES

- Preparing a control node and managed nodes to use RHEL System Roles
- Documentation installed with the **rhel-system-roles** package in **/usr/share/ansible/roles/rhel-system-roles.logging/README.html**.
- RHEL System Roles
- **ansible-playbook(1)** man page.

CHAPTER 13. CONFIGURING THE SYSTEMD JOURNAL BY USING THE JOURNALD RHEL SYSTEM ROLE

With the **journald** System Role you can automate the **systemd** journal, and configure persistent logging by using the Red Hat Ansible Automation Platform.

13.1. VARIABLES FOR THE JOURNALD RHEL SYSTEM ROLE

The **journald** System Role provides a set of variables for customizing the behavior of **journald** logging service. The role includes the following variables:

Role Variable	Description
journald_persistent	Use this boolean variable to configure **journald** for storing log files on disk in the **/var/log/journal/** directory. When you set this variable to **true**, logs are stored on disk, otherwise, they are stored in volatile memory. The default value is **false**.
journald_max_disk_size	Use this variable to specify the maximum size, in megabytes, that journal files can occupy on disk. Refer to the default sizing calculation described in **journald.conf(5)** man page.
journald_max_files	Use this variable to specify the maximum number of journal files you want to keep while respecting the **journal_max_disk_size** setting for journal.
journald_max_file_size	Use this variable to specify the maximum size, in megabytes, of a single journal file.
journald_per_user	Use this boolean variable to configure **journald** for keeping log data separate for each user. The default value is **true** and the unprivileged users can read system logs from their own user services. Note that per-user journal files are only available when the **journald_persistent** variable is set to **true**.
journald_compression	Use this boolean variable to apply compression to **journald** data objects that are larger than the default 512 bytes. The default value is **true**.
journald_sync_interval	Use this variable to specify the time, in minutes, after which **journald** synchronizes the currently used journal file to disk. By default, the role does not alter the current value.

Additional resources

- The **journald.conf(5)** man page.

13.2. CONFIGURING PERSISTENT LOGGING BY USING THE JOURNALD SYSTEM ROLE

As a system administrator, you can configure persistent logging by using the **journald** System Role. The following example shows how to set up the **journald** System Role variables in a playbook to achieve the following goals:

- Configuring persistent logging
- Specifying the maximum size of disk space for journal files
- Configuring **journald** to keep log data separate for each user
- Defining the synchronization interval

Prerequisites

- You have prepared the control node and the managed nodes
- You are logged in to the control node as a user who can run playbooks on the managed nodes.
- The account you use to connect to the managed nodes has **sudo** permissions on them.
- The managed nodes or groups of managed nodes on which you want to run this playbook are listed in the Ansible inventory file.

Procedure

1. Create a new **playbook.yml** file with the following content:

```
---
- hosts: all
  vars:
    journald_persistent: true
    journald_max_disk_size: 2048
    journald_per_user: true
    journald_sync_interval: 1
  roles:
    - linux-system-roles.journald
---
```

   As a result, the **journald** service stores your logs persistently on a disk to the maximum size of 2048 MB, and keeps log data separate for each user. The synchronization happens every minute.

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml -i inventory_file
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

13.3. ADDITIONAL RESOURCES

- The **journald.conf(5)** man page
- The **ansible-playbook(1)** man page

CHAPTER 14. CONFIGURING SECURE COMMUNICATION BY USING THE SSH AND SSHD RHEL SYSTEM ROLES

As an administrator, you can use the **sshd** System Role to configure SSH servers and the **ssh** System Role to configure SSH clients consistently on any number of RHEL systems at the same time by using Red Hat Ansible Automation Platform.

14.1. SSH SERVER SYSTEM ROLE VARIABLES

In an **sshd** System Role playbook, you can define the parameters for the SSH configuration file according to your preferences and limitations.

If you do not configure these variables, the System Role produces an **sshd_config** file that matches the RHEL defaults.

In all cases, Booleans correctly render as **yes** and **no** in **sshd** configuration. You can define multi-line configuration items using lists. For example:

```
sshd_ListenAddress:
  - 0.0.0.0
  - '::'
```

renders as:

```
ListenAddress 0.0.0.0
ListenAddress ::
```

Variables for the sshd System Role

sshd_enable

If set to **False**, the role is completely disabled. Defaults to **True**.

sshd_skip_defaults

If set to **True**, the System Role does not apply default values. Instead, you specify the complete set of configuration defaults by using either the **sshd** dict, or **sshd_Key** variables. Defaults to **False**.

sshd_manage_service

If set to **False**, the service is not managed, which means it is not enabled on boot and does not start or reload. Defaults to **True** except when running inside a container or AIX, because the Ansible service module does not currently support **enabled** for AIX.

sshd_allow_reload

If set to **False**, **sshd** does not reload after a change of configuration. This can help with troubleshooting. To apply the changed configuration, reload **sshd** manually. Defaults to the same value as **sshd_manage_service** except on AIX, where **sshd_manage_service** defaults to **False** but **sshd_allow_reload** defaults to **True**.

sshd_install_service

If set to **True**, the role installs service files for the **sshd** service. This overrides files provided in the operating system. Do not set to **True** unless you are configuring a second instance and you also change the **sshd_service** variable. Defaults to **False**.

The role uses the files pointed by the following variables as templates:

```
sshd_service_template_service (default: templates/sshd.service.j2)
sshd_service_template_at_service (default: templates/sshd@.service.j2)
sshd_service_template_socket (default: templates/sshd.socket.j2)
```

sshd_service

This variable changes the **sshd** service name, which is useful for configuring a second **sshd** service instance.

sshd

A dict that contains configuration. For example:

```
sshd:
  Compression: yes
  ListenAddress:
    - 0.0.0.0
```

sshd_*OptionName*

You can define options by using simple variables consisting of the **sshd_** prefix and the option name instead of a dict. The simple variables override values in the **sshd** dict.. For example:

```
sshd_Compression: no
```

sshd_match and **sshd_match_1** to **sshd_match_9**

A list of dicts or just a dict for a Match section. Note that these variables do not override match blocks as defined in the **sshd** dict. All of the sources will be reflected in the resulting configuration file.

Secondary variables for the sshd System Role

You can use these variables to override the defaults that correspond to each supported platform.

sshd_packages

You can override the default list of installed packages using this variable.

sshd_config_owner, sshd_config_group, and **sshd_config_mode**

You can set the ownership and permissions for the **openssh** configuration file that this role produces using these variables.

sshd_config_file

The path where this role saves the **openssh** server configuration produced.

sshd_config_namespace

The default value of this variable is null, which means that the role defines the entire content of the configuration file including system defaults. Alternatively, you can use this variable to invoke this role from other roles or from multiple places in a single playbook on systems that do not support drop-in directory. The **sshd_skip_defaults** variable is ignored and no system defaults are used in this case. When this variable is set, the role places the configuration that you specify to configuration snippets in an existing configuration file under the given namespace. If your scenario requires applying the role several times, you need to select a different namespace for each application.

NOTE

Limitations of the **openssh** configuration file still apply. For example, only the first option specified in a configuration file is effective for most of the configuration options.

Technically, the role places snippets in "Match all" blocks, unless they contain other match blocks, to ensure they are applied regardless of the previous match blocks in the existing configuration file. This allows configuring any non-conflicting options from different roles invocations.

sshd_binary

The path to the **sshd** executable of **openssh**.

sshd_service

The name of the **sshd** service. By default, this variable contains the name of the **sshd** service that the target platform uses. You can also use it to set the name of the custom **sshd** service when the role uses the **sshd_install_service** variable.

sshd_verify_hostkeys

Defaults to **auto**. When set to **auto**, this lists all host keys that are present in the produced configuration file, and generates any paths that are not present. Additionally, permissions and file owners are set to default values. This is useful if the role is used in the deployment stage to make sure the service is able to start on the first attempt. To disable this check, set this variable to an empty list **[]**.

sshd_hostkey_owner, sshd_hostkey_group, sshd_hostkey_mode

Use these variables to set the ownership and permissions for the host keys from **sshd_verify_hostkeys**.

sshd_sysconfig

On RHEL-based systems, this variable configures additional details of the **sshd** service. If set to **true**, this role manages also the **/etc/sysconfig/sshd** configuration file based on the following configuration. Defaults to **false**.

sshd_sysconfig_override_crypto_policy

In RHEL, when set to **true**, this variable overrides the system-wide crypto policy. Defaults to **false**.

sshd_sysconfig_use_strong_rng

On RHEL-based systems, this variable can force **sshd** to reseed the **openssl** random number generator with the number of bytes given as the argument. The default is **0**, which disables this functionality. Do not turn this on if the system does not have a hardware random number generator.

14.2. CONFIGURING OPENSSH SERVERS USING THE SSHD SYSTEM ROLE

You can use the **sshd** System Role to configure multiple SSH servers by running an Ansible playbook.

NOTE

You can use the **sshd** System Role with other System Roles that change SSH and SSHD configuration, for example the Identity Management RHEL System Roles. To prevent the configuration from being overwritten, make sure that the **sshd** role uses namespaces (RHEL 8 and earlier versions) or a drop-in directory (RHEL 9).

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **sshd** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Copy the example playbook for the **sshd** System Role:

```
# cp /usr/share/doc/rhel-system-roles/sshd/example-root-login-playbook.yml path/custom-playbook.yml
```

2. Open the copied playbook by using a text editor, for example:

```
# vim path/custom-playbook.yml

---
- hosts: all
  tasks:
  - name: Configure sshd to prevent root and password login except from particular subnet
    include_role:
      name: rhel-system-roles.sshd
    vars:
      sshd:
        # root login and password login is enabled only from a particular subnet
        PermitRootLogin: no
        PasswordAuthentication: no
        Match:
        - Condition: "Address 192.0.2.0/24"
          PermitRootLogin: yes
          PasswordAuthentication: yes
```

The playbook configures the managed node as an SSH server configured so that:

- password and **root** user login is disabled
- password and **root** user login is enabled only from the subnet **192.0.2.0/24**

You can modify the variables according to your preferences. For more details, see SSH Server System Role variables.

3. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check path/custom-playbook.yml
```

4. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file path/custom-playbook.yml

...

PLAY RECAP
**************************************************

localhost : ok=12 changed=2 unreachable=0 failed=0
skipped=10 rescued=0 ignored=0
```

Verification

1. Log in to the SSH server:

```
$ ssh user1@10.1.1.1
```

Where:

- ***user1*** is a user on the SSH server.
- ***10.1.1.1*** is the IP address of the SSH server.

2. Check the contents of the **sshd_config** file on the SSH server:

```
$ cat /etc/ssh/sshd_config
…
PasswordAuthentication no
PermitRootLogin no
…
Match Address 192.0.2.0/24
  PasswordAuthentication yes
  PermitRootLogin yes
…
```

3. Check that you can connect to the server as root from the **192.0.2.0/24** subnet:

a. Determine your IP address:

```
$ hostname -I
192.0.2.1
```

If the IP address is within the **192.0.2.1** - **192.0.2.254** range, you can connect to the server.

b. Connect to the server as **root**:

```
$ ssh root@10.1.1.1
```

Additional resources

- **/usr/share/doc/rhel-system-roles/sshd/README.md** file.
- **ansible-playbook(1)** man page.

14.3. SSH SYSTEM ROLE VARIABLES

In an **ssh** System Role playbook, you can define the parameters for the client SSH configuration file according to your preferences and limitations.

If you do not configure these variables, the System Role produces a global **ssh_config** file that matches the RHEL defaults.

In all cases, booleans correctly render as **yes** or **no** in **ssh** configuration. You can define multi-line configuration items using lists. For example:

```
LocalForward:
  - 22 localhost:2222
  - 403 localhost:4003
```

renders as:

```
LocalForward 22 localhost:2222
LocalForward 403 localhost:4003
```

NOTE

The configuration options are case sensitive.

Variables for the ssh System Role

ssh_user

You can define an existing user name for which the System Role modifies user-specific configuration. The user-specific configuration is saved in **~/.ssh/config** of the given user. The default value is null, which modifies global configuration for all users.

ssh_skip_defaults

Defaults to **auto**. If set to **auto**, the System Role writes the system-wide configuration file **/etc/ssh/ssh_config** and keeps the RHEL defaults defined there. Creating a drop-in configuration file, for example by defining the **ssh_drop_in_name** variable, automatically disables the **ssh_skip_defaults** variable.

ssh_drop_in_name

Defines the name for the drop-in configuration file, which is placed in the system-wide drop-in directory. The name is used in the template **/etc/ssh/ssh_config.d/{ssh_drop_in_name}.conf** to reference the configuration file to be modified. If the system does not support drop-in directory, the default value is null. If the system supports drop-in directories, the default value is **00-ansible**.

WARNING

If the system does not support drop-in directories, setting this option will make the play fail.

The suggested format is **NN-name**, where **NN** is a two-digit number used for ordering the configuration files and **name** is any descriptive name for the content or the owner of the file.

ssh

A dict that contains configuration options and their respective values.

ssh_*OptionName*

You can define options by using simple variables consisting of the **ssh_** prefix and the option name instead of a dict. The simple variables override values in the **ssh** dict.

ssh_additional_packages

This role automatically installs the **openssh** and **openssh-clients** packages, which are needed for the most common use cases. If you need to install additional packages, for example, **openssh-keysign** for host-based authentication, you can specify them in this variable.

ssh_config_file

The path to which the role saves the configuration file produced. Default value:

- If the system has a drop-in directory, the default value is defined by the template **/etc/ssh/ssh_config.d/{ssh_drop_in_name}.conf**.
- If the system does not have a drop-in directory, the default value is **/etc/ssh/ssh_config**.
- if the **ssh_user** variable is defined, the default value is **~/.ssh/config**.

ssh_config_owner, ssh_config_group, ssh_config_mode

The owner, group and modes of the created configuration file. By default, the owner of the file is **root:root**, and the mode is **0644**. If **ssh_user** is defined, the mode is **0600**, and the owner and group are derived from the user name specified in the **ssh_user** variable.

14.4. CONFIGURING OPENSSH CLIENTS USING THE SSH SYSTEM ROLE

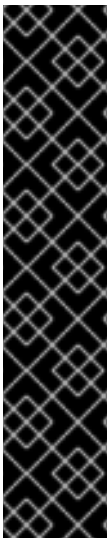
You can use the **ssh** System Role to configure multiple SSH clients by running an Ansible playbook.

NOTE

You can use the **ssh** System Role with other System Roles that change SSH and SSHD configuration, for example the Identity Management RHEL System Roles. To prevent the configuration from being overwritten, make sure that the **ssh** role uses a drop-in directory (default from RHEL 8).

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **ssh** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.



IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- hosts: all
  tasks:
  - name: "Configure ssh clients"
    include_role:
      name: rhel-system-roles.ssh
    vars:
      ssh_user: root
      ssh:
        Compression: true
        GSSAPIAuthentication: no
        ControlMaster: auto
        ControlPath: ~/.ssh/.cm%C
        Host:
          - Condition: example
            Hostname: example.com
            User: user1
      ssh_ForwardX11: no
```

This playbook configures the **root** user's SSH client preferences on the managed nodes with the following configurations:

- Compression is enabled.

- ControlMaster multiplexing is set to **auto**.
- The ***example*** alias for connecting to the ***example.com*** host is ***user1***.
- The ***example*** host alias is created, which represents a connection to the ***example.com*** host the with ***user1*** user name.
- X11 forwarding is disabled.

Optionally, you can modify these variables according to your preferences. For more details, see **ssh** System Role variables .

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check path/custom-playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file path/custom-playbook.yml
```

Verification

- Verify that the managed node has the correct configuration by opening the SSH configuration file in a text editor, for example:

```
# vi ~root/.ssh/config
```

After application of the example playbook shown above, the configuration file should have the following content:

```
# Ansible managed
Compression yes
ControlMaster auto
ControlPath ~/.ssh/.cm%C
ForwardX11 no
GSSAPIAuthentication no
Host example
  Hostname example.com
  User user1
```

14.5. USING THE SSHD SYSTEM ROLE FOR NON-EXCLUSIVE CONFIGURATION

Normally, applying the **sshd** System Role overwrites the entire configuration. This may be problematic if you have previously adjusted the configuration, for example with a different System Role or playbook. To apply the **sshd** System Role for only selected configuration options while keeping other options in place, you can use the non-exclusive configuration.

In RHEL 8 and earlier, you can apply the non-exclusive configuration with a configuration snippet.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **sshd** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** package is installed.
  - An inventory file which lists the managed nodes.
  - A playbook for a different RHEL System Role.

Procedure

1. Add a configuration snippet with the **sshd_config_namespace** variable to the playbook:

```
---
- hosts: all
  tasks:
  - name: <Configure SSHD to accept some useful environment variables>
    include_role:
      name: rhel-system-roles.sshd
    vars:
      sshd_config_namespace: <my-application>
      sshd:
        # Environment variables to accept
        AcceptEnv:
          LANG
          LS_COLORS
          EDITOR
```

When you apply the playbook to the inventory, the role adds the following snippet, if not already present, to the **/etc/ssh/sshd_config** file.

```
# BEGIN sshd system role managed block: namespace <my-application>
Match all
  AcceptEnv LANG LS_COLORS EDITOR
# END sshd system role managed block: namespace <my-application>
```

Verification

- Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml -i inventory_file
```

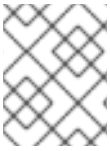
Additional resources

- **/usr/share/doc/rhel-system-roles/sshd/README.md** file.
- **ansible-playbook(1)** man page.

CHAPTER 15. CONFIGURING VPN CONNECTIONS WITH IPSEC BY USING THE VPN RHEL SYSTEM ROLE

With the **vpn** System Role, you can configure VPN connections on RHEL systems by using Red Hat Ansible Automation Platform. You can use it to set up host-to-host, network-to-network, VPN Remote Access Server, and mesh configurations.

For host-to-host connections, the role sets up a VPN tunnel between each pair of hosts in the list of **vpn_connections** using the default parameters, including generating keys as needed. Alternatively, you can configure it to create an opportunistic mesh configuration between all hosts listed. The role assumes that the names of the hosts under **hosts** are the same as the names of the hosts used in the Ansible inventory, and that you can use those names to configure the tunnels.



NOTE

The **vpn** RHEL System Role currently supports only Libreswan, which is an IPsec implementation, as the VPN provider.

15.1. CREATING A HOST-TO-HOST VPN WITH IPSEC USING THEVPN SYSTEM ROLE

You can use the **vpn** System Role to configure host-to-host connections by running an Ansible playbook on the control node, which will configure all the managed nodes listed in an inventory file.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **vpn** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

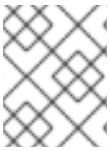
```
- name: Host to host VPN
  hosts: managed_node1, managed_node2
  roles:
    - rhel-system-roles.vpn
  vars:
    vpn_connections:
      - hosts:
          managed_node1:
          managed_node2:
    vpn_manage_firewall: true
    vpn_manage_selinux: true
```

This playbook configures the connection ***managed_node1*-to-*managed_node2*** using pre-shared key authentication with keys auto-generated by the system role. Since **vpn_manage_firewall** and **vpn_manage_selinux** are both set to true, the **vpn** role will use the **firewall** and **selinux** roles to manage the ports used by the **vpn** role.

2. Optional: Configure connections from managed hosts to external hosts that are not listed in the inventory file by adding the following section to the **vpn_connections** list of hosts:

```
    vpn_connections:
      - hosts:
          managed_node1:
          managed_node2:
          external_node:
            hostname: 192.0.2.2
```

This configures two additional connections: ***managed_node1*-to-*external_node*** and ***managed_node2*-to-*external_node***.



NOTE

The connections are configured only on the managed nodes and not on the external node.

1. Optional: You can specify multiple VPN connections for the managed nodes by using additional sections within **vpn_connections**, for example a control plane and a data plane:

```
- name: Multiple VPN
  hosts: managed_node1, managed_node2
  roles:
    - rhel-system-roles.vpn
  vars:
    vpn_connections:
      - name: control_plane_vpn
        hosts:
          managed_node1:
            hostname: 192.0.2.0 # IP for the control plane
          managed_node2:
            hostname: 192.0.2.1
      - name: data_plane_vpn
```

```
hosts:
  managed_node1:
    hostname: 10.0.0.1 # IP for the data plane
  managed_node2:
    hostname: 10.0.0.2
```

2. Optional: You can modify the variables according to your preferences. For more details, see the **/usr/share/doc/rhel-system-roles/vpn/README.md** file.

3. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check /path/to/file/playbook.yml -i /path/to/file/inventory_file
```

4. Run the playbook on your inventory file:

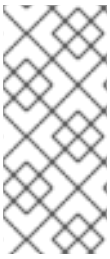
```
# ansible-playbook -i /path/to/file/inventory_file /path/to/file/playbook.yml
```

Verification

1. On the managed nodes, confirm that the connection is successfully loaded:

```
# ipsec status | grep connection.name
```

Replace *connection.name* with the name of the connection from this node, for example **managed_node1-to-managed_node2**.



NOTE

By default, the role generates a descriptive name for each connection it creates from the perspective of each system. For example, when creating a connection between **managed_node1** and **managed_node2**, the descriptive name of this connection on **managed_node1** is **managed_node1-to-managed_node2** but on **managed_node2** the connection is named **managed_node2-to-managed_node1**.

1. On the managed nodes, confirm that the connection is successfully started:

```
# ipsec trafficstatus | grep connection.name
```

2. Optional: If a connection did not successfully load, manually add the connection by entering the following command. This will provide more specific information indicating why the connection failed to establish:

```
# ipsec auto --add connection.name
```

NOTE

Any errors that may have occurred during the process of loading and starting the connection are reported in the logs, which can be found in **/var/log/pluto.log**. Because these logs are hard to parse, try to manually add the connection to obtain log messages from the standard output instead.

15.2. CREATING AN OPPORTUNISTIC MESH VPN CONNECTION WITH IPSEC BY USING THE VPN SYSTEM ROLE

You can use the **vpn** System Role to configure an opportunistic mesh VPN connection that uses certificates for authentication by running an Ansible playbook on the control node, which will configure all the managed nodes listed in an inventory file.

Authentication with certificates is configured by defining the **auth_method: cert** parameter in the playbook. The **vpn** System Role assumes that the IPsec Network Security Services (NSS) crypto library, which is defined in the **/etc/ipsec.d** directory, contains the necessary certificates. By default, the node name is used as the certificate nickname. In this example, this is **managed_node1**. You can define different certificate names by using the **cert_name** attribute in your inventory.

In the following example procedure, the control node, which is the system from which you will run the Ansible playbook, shares the same classless inter-domain routing (CIDR) number as both of the managed nodes (192.0.2.0/24) and has the IP address 192.0.2.7. Therefore, the control node falls under the private policy which is automatically created for CIDR 192.0.2.0/24.

To prevent SSH connection loss during the play, a clear policy for the control node is included in the list of policies. Note that there is also an item in the policies list where the CIDR is equal to default. This is because this playbook overrides the rule from the default policy to make it private instead of private-or-clear.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **vpn** System Role.
    - On all the managed nodes, the NSS database in the **/etc/ipsec.d** directory contains all the certificates necessary for peer authentication. By default, the node name is used as the certificate nickname.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
    - The **ansible-core** and **rhel-system-roles** packages are installed.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
- name: Mesh VPN
  hosts: managed_node1, managed_node2, managed_node3
  roles:
    - rhel-system-roles.vpn
  vars:
    vpn_connections:
      - opportunistic: true
        auth_method: cert
        policies:
          - policy: private
            cidr: default
          - policy: private-or-clear
            cidr: 198.51.100.0/24
          - policy: private
            cidr: 192.0.2.0/24
          - policy: clear
            cidr: 192.0.2.7/32
    vpn_manage_firewall: true
    vpn_manage_selinux: true
```

NOTE

Since **vpn_manage_firewall** and **vpn_manage_selinux** are both set to true, the **vpn** role will use the **firewall** and **selinux** roles to manage the ports used by the **vpn** role.

2. Optional: You can modify the variables according to your preferences. For more details, see the **/usr/share/doc/rhel-system-roles/vpn/README.md** file.

3. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

4. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

15.3. ADDITIONAL RESOURCES

- For details about the parameters used in the **vpn** System Role and additional information about the role, see the **/usr/share/doc/rhel-system-roles/vpn/README.md** file.
- For details about the **ansible-playbook** command, see the **ansible-playbook(1)** man page.

CHAPTER 16. SETTING A CUSTOM CRYPTOGRAPHIC POLICY BY USING THE CRYPTO-POLICIES RHEL SYSTEM ROLE

As an administrator, you can use the **crypto_policies** RHEL System Role to quickly and consistently configure custom cryptographic policies across many different systems using the Ansible Core package.

16.1. CRYPTO_POLICIES SYSTEM ROLE VARIABLES AND FACTS

In a **crypto_policies** System Role playbook, you can define the parameters for the **crypto_policies** configuration file according to your preferences and limitations.

If you do not configure any variables, the System Role does not configure the system and only reports the facts.

Selected variables for the crypto_policies System Role

crypto_policies_policy

Determines the cryptographic policy the System Role applies to the managed nodes. For details about the different crypto policies, see System-wide cryptographic policies .

crypto_policies_reload

If set to **yes**, the affected services, currently the **ipsec**, **bind**, and **sshd** services, reload after applying a crypto policy. Defaults to **yes**.

crypto_policies_reboot_ok

If set to **yes**, and a reboot is necessary after the System Role changes the crypto policy, it sets **crypto_policies_reboot_required** to **yes**. Defaults to **no**.

Facts set by the crypto_policies System Role

crypto_policies_active

Lists the currently selected policy.

crypto_policies_available_policies

Lists all available policies available on the system.

crypto_policies_available_subpolicies

Lists all available subpolicies available on the system.

Additional resources

- Creating and setting a custom system-wide cryptographic policy .

16.2. SETTING A CUSTOM CRYPTOGRAPHIC POLICY USING THE CRYPTO_POLICIES SYSTEM ROLE

You can use the **crypto_policies** System Role to configure a large number of managed nodes consistently from a single control node.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **crypto_policies** System Role.

- Access and permissions to a control node, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- hosts: all
  tasks:
  - name: Configure crypto policies
    include_role:
      name: rhel-system-roles.crypto_policies
    vars:
      - crypto_policies_policy: FUTURE
      - crypto_policies_reboot_ok: true
```

   You can replace the *FUTURE* value with your preferred crypto policy, for example: **DEFAULT**, **LEGACY**, and **FIPS:OSPP**.

   The **crypto_policies_reboot_ok: true** variable causes the system to reboot after the System Role changes the cryptographic policy.

   For more details, see crypto_policies System Role variables and facts .

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file playbook.yml
```

Verification

1. On the control node, create another playbook named, for example, ***verify_playbook.yml***:

```
- hosts: all
  tasks:
 - name: Verify active crypto policy
   include_role:
     name: rhel-system-roles.crypto_policies

 - debug:
     var: crypto_policies_active
```

   This playbook does not change any configurations on the system, only reports the active policy on the managed nodes.

2. Run the playbook on the same inventory file:

```
# ansible-playbook -i inventory_file verify_playbook.yml

TASK [debug] ***************************
ok: [host] => {
    "crypto_policies_active": "FUTURE"
}
```

   The **"crypto_policies_active":** variable shows the policy active on the managed node.

16.3. ADDITIONAL RESOURCES

- **/usr/share/ansible/roles/rhel-system-roles.crypto_policies/README.md** file.
- **ansible-playbook(1)** man page.
- Preparing a control node and managed nodes to use RHEL System Roles .

CHAPTER 17. CONFIGURING NBDE BY USING RHEL SYSTEM ROLES

17.1. INTRODUCTION TO THE NBDE_CLIENT AND NBDE_SERVER SYSTEM ROLES (CLEVIS AND TANG)

RHEL System Roles is a collection of Ansible roles and modules that provide a consistent configuration interface to remotely manage multiple RHEL systems.

You can use Ansible roles for automated deployments of Policy-Based Decryption (PBD) solutions using Clevis and Tang. The **rhel-system-roles** package contains these system roles, the related examples, and also the reference documentation.

The **nbde_client** System Role enables you to deploy multiple Clevis clients in an automated way. Note that the **nbde_client** role supports only Tang bindings, and you cannot use it for TPM2 bindings at the moment.

The **nbde_client** role requires volumes that are already encrypted using LUKS. This role supports to bind a LUKS-encrypted volume to one or more Network-Bound (NBDE) servers - Tang servers. You can either preserve the existing volume encryption with a passphrase or remove it. After removing the passphrase, you can unlock the volume only using NBDE. This is useful when a volume is initially encrypted using a temporary key or password that you should remove after you provision the system.

If you provide both a passphrase and a key file, the role uses what you have provided first. If it does not find any of these valid, it attempts to retrieve a passphrase from an existing binding.

PBD defines a binding as a mapping of a device to a slot. This means that you can have multiple bindings for the same device. The default slot is slot 1.

The **nbde_client** role provides also the **state** variable. Use the **present** value for either creating a new binding or updating an existing one. Contrary to a **clevis luks bind** command, you can use **state: present** also for overwriting an existing binding in its device slot. The **absent** value removes a specified binding.

Using the **nbde_client** System Role, you can deploy and manage a Tang server as part of an automated disk encryption solution. This role supports the following features:

- Rotating Tang keys
- Deploying and backing up Tang keys

Additional resources

- For a detailed reference on Network-Bound Disk Encryption (NBDE) role variables, install the **rhel-system-roles** package, and see the **README.md** and **README.html** files in the **/usr/share/doc/rhel-system-roles/nbde_client/** and **/usr/share/doc/rhel-system-roles/nbde_server/** directories.
- For example system-roles playbooks, install the **rhel-system-roles** package, and see the **/usr/share/ansible/roles/rhel-system-roles.nbde_server/examples/** directories.
- For more information on RHEL System Roles, see Preparing a control node and managed nodes to use RHEL System Roles.

17.2. USING THE NBDE_SERVER SYSTEM ROLE FOR SETTING UP MULTIPLE TANG SERVERS

Follow the steps to prepare and apply an Ansible playbook containing your Tang server settings.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **nbde_server** System Role.
- Access and permissions to a control node, which is a system from which Red Hat Ansible Core configures other systems.
  On the control node:
  - The **ansible-core** and **rhel-system-roles** packages are installed.

IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

- An inventory file which lists the managed nodes.

Procedure

1. Prepare your playbook containing settings for Tang servers. You can either start from the scratch, or use one of the example playbooks from the **/usr/share/ansible/roles/rhel-system-roles.nbde_server/examples/** directory.

```
# cp /usr/share/ansible/roles/rhel-system-roles.nbde_server/examples/simple_deploy.yml
./my-tang-playbook.yml
```

2. Edit the playbook in a text editor of your choice, for example:

```
# vi my-tang-playbook.yml
```

3. Add the required parameters. The following example playbook ensures deploying of your Tang server and a key rotation:

```
---
- hosts: all
```

```
vars:
  nbde_server_rotate_keys: yes
  nbde_server_manage_firewall: true
  nbde_server_manage_selinux: true

roles:
  - rhel-system-roles.nbde_server
```

NOTE

Since **nbde_server_manage_firewall** and **nbde_server_manage_selinux** are both set to true, the **nbde_server** role will use the **firewall** and **selinux** roles to manage the ports used by the **nbde_server** role.

4. Apply the finished playbook:

```
# ansible-playbook -i inventory-file my-tang-playbook.yml
```

Where: * ***inventory-file*** is the inventory file. * ***logging-playbook.yml*** is the playbook you use.

IMPORTANT

To ensure that networking for a Tang pin is available during early boot by using the **grubby** tool on the systems where Clevis is installed:

```
# grubby --update-kernel=ALL --args="rd.neednet=1"
```

Additional resources

- For more information, install the **rhel-system-roles** package, and see the **/usr/share/doc/rhel-system-roles/nbde_server/** and **usr/share/ansible/roles/rhel-system-roles.nbde_server/** directories.

17.3. USING THE NBDE_CLIENT SYSTEM ROLE FOR SETTING UP MULTIPLE CLEVIS CLIENTS

Follow the steps to prepare and apply an Ansible playbook containing your Clevis client settings.

NOTE

The **nbde_client** System Role supports only Tang bindings. This means that you cannot use it for TPM2 bindings at the moment.

Prerequisites

- Access and permissions to one or more *managed nodes*, which are systems you want to configure with the **nbde_client** System Role.
- Access and permissions to a *control node*, which is a system from which Red Hat Ansible Core configures other systems.
- The Ansible Core package is installed on the control machine.

- The **rhel-system-roles** package is installed on the system from which you want to run the playbook.

Procedure

1. Prepare your playbook containing settings for Clevis clients. You can either start from the scratch, or use one of the example playbooks from the **/usr/share/ansible/roles/rhel-system-roles.nbde_client/examples/** directory.

```
# cp /usr/share/ansible/roles/rhel-system-roles.nbde_client/examples/high_availability.yml
./my-clevis-playbook.yml
```

2. Edit the playbook in a text editor of your choice, for example:

```
# vi my-clevis-playbook.yml
```

3. Add the required parameters. The following example playbook configures Clevis clients for automated unlocking of two LUKS-encrypted volumes by when at least one of two Tang servers is available:

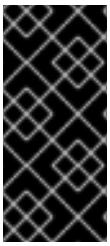
```
---
- hosts: all

  vars:
    nbde_client_bindings:
      - device: /dev/rhel/root
        encryption_key_src: /etc/luks/keyfile
        servers:
          - http://server1.example.com
          - http://server2.example.com
      - device: /dev/rhel/swap
        encryption_key_src: /etc/luks/keyfile
        servers:
          - http://server1.example.com
          - http://server2.example.com

  roles:
    - rhel-system-roles.nbde_client
```

4. Apply the finished playbook:

```
# ansible-playbook -i host1,host2,host3 my-clevis-playbook.yml
```



IMPORTANT

To ensure that networking for a Tang pin is available during early boot by using the **grubby** tool on the system where Clevis is installed:

```
# grubby --update-kernel=ALL --args="rd.neednet=1"
```

Additional resources

- For details about the parameters and additional information about the NBDE Client System Role, install the **rhel-system-roles** package, and see the **/usr/share/doc/rhel-system-roles/nbde_client/** and **/usr/share/ansible/roles/rhel-system-roles.nbde_client/** directories.

CHAPTER 18. REQUESTING CERTIFICATES USING RHEL SYSTEM ROLES

With the **certificate** System Role, you can use Red Hat Ansible Core to issue and manage certificates.

This chapter covers the following topics:

- The **certificate** System Role
- Requesting a new self-signed certificate using the **certificate** System Role
- Requesting a new certificate from IdM CA using the **certificate** System Role

18.1. THE CERTIFICATE SYSTEM ROLE

Using the **certificate** System Role, you can manage issuing and renewing TLS and SSL certificates using Ansible Core.

The role uses **certmonger** as the certificate provider, and currently supports issuing and renewing self-signed certificates and using the IdM integrated certificate authority (CA).

You can use the following variables in your Ansible playbook with the **certificate** System Role:

certificate_wait

to specify if the task should wait for the certificate to be issued.

certificate_requests

to represent each certificate to be issued and its parameters.

Additional resources

- See the **/usr/share/ansible/roles/rhel-system-roles.certificate/README.md** file.
- Preparing a control node and managed nodes to use RHEL System Roles

18.2. REQUESTING A NEW SELF-SIGNED CERTIFICATE USING THE CERTIFICATE SYSTEM ROLE

With the **certificate** System Role, you can use Ansible Core to issue self-signed certificates.

This process uses the **certmonger** provider and requests the certificate through the **getcert** command.

NOTE

By default, **certmonger** automatically tries to renew the certificate before it expires. You can disable this by setting the **auto_renew** parameter in the Ansible playbook to **no**.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.

Procedure

1. *Optional:* Create an inventory file, for example **inventory.file**:

```
$ *touch inventory.file*
```

2. Open your inventory file and define the hosts on which you want to request the certificate, for example:

```
[webserver]
server.idm.example.com
```

3. Create a playbook file, for example **request-certificate.yml**:

   - Set **hosts** to include the hosts on which you want to request the certificate, such as **webserver**.
   - Set the **certificate_requests** variable to include the following:
     - Set the **name** parameter to the desired name of the certificate, such as **mycert**.
     - Set the **dns** parameter to the domain to be included in the certificate, such as ***.example.com**.
     - Set the **ca** parameter to **self-sign**.
   - Set the **rhel-system-roles.certificate** role under **roles**.
     This is the playbook file for this example:

```
---
- hosts: webserver

  vars:
    certificate_requests:
      - name: mycert
        dns: "*.example.com"
        ca: self-sign

  roles:
    - rhel-system-roles.certificate
```

4. Save the file.

5. Run the playbook:

```
$ *ansible-playbook -i inventory.file request-certificate.yml*
```

Additional resources

- See the **/usr/share/ansible/roles/rhel-system-roles.certificate/README.md** file.
- See the **ansible-playbook(1)** man page.

18.3. REQUESTING A NEW CERTIFICATE FROM IDM CA USING THE CERTIFICATE SYSTEM ROLE

With the **certificate** System Role, you can use **anible-core** to issue certificates while using an IdM server with an integrated certificate authority (CA). Therefore, you can efficiently and consistently manage the certificate trust chain for multiple systems when using IdM as the CA.

This process uses the **certmonger** provider and requests the certificate through the **getcert** command.

NOTE

By default, **certmonger** automatically tries to renew the certificate before it expires. You can disable this by setting the **auto_renew** parameter in the Ansible playbook to **no**.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.

Procedure

1. *Optional:* Create an inventory file, for example **inventory.file**:

```
$ *touch inventory.file*
```

2. Open your inventory file and define the hosts on which you want to request the certificate, for example:

```
[webserver]
server.idm.example.com
```

3. Create a playbook file, for example **request-certificate.yml**:
   - Set **hosts** to include the hosts on which you want to request the certificate, such as **webserver**.
   - Set the **certificate_requests** variable to include the following:
     - Set the **name** parameter to the desired name of the certificate, such as **mycert**.
     - Set the **dns** parameter to the domain to be included in the certificate, such as **www.example.com**.
     - Set the **principal** parameter to specify the Kerberos principal, such as **HTTP/www.example.com@EXAMPLE.COM**.
     - Set the **ca** parameter to **ipa**.
   - Set the **rhel-system-roles.certificate** role under **roles**.
     This is the playbook file for this example:

```
---
- hosts: webserver
```

```
vars:
  certificate_requests:
    - name: mycert
      dns: www.example.com
      principal: HTTP/www.example.com@EXAMPLE.COM
      ca: ipa

roles:
  - rhel-system-roles.certificate
```

4. Save the file.

5. Run the playbook:

```
$ *ansible-playbook -i inventory.file request-certificate.yml*
```

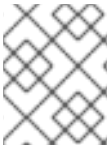
Additional resources

- See the **/usr/share/ansible/roles/rhel-system-roles.certificate/README.md** file.
- See the **ansible-playbook(1)** man page.

18.4. SPECIFYING COMMANDS TO RUN BEFORE OR AFTER CERTIFICATE ISSUANCE USING THE CERTIFICATE SYSTEM ROLE

With the **certificate** Role, you can use Ansible Core to execute a command before and after a certificate is issued or renewed.

In the following example, the administrator ensures stopping the **httpd** service before a self-signed certificate for **www.example.com** is issued or renewed, and restarting it afterwards.



NOTE

By default, **certmonger** automatically tries to renew the certificate before it expires. You can disable this by setting the **auto_renew** parameter in the Ansible playbook to **no**.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.

Procedure

1. *Optional:* Create an inventory file, for example **inventory.file**:

```
$ *touch inventory.file*
```

2. Open your inventory file and define the hosts on which you want to request the certificate, for example:

```
[webserver]
server.idm.example.com
```

3. Create a playbook file, for example **request-certificate.yml**:
   - Set **hosts** to include the hosts on which you want to request the certificate, such as **webserver**.
   - Set the **certificate_requests** variable to include the following:
     - Set the **name** parameter to the desired name of the certificate, such as **mycert**.
     - Set the **dns** parameter to the domain to be included in the certificate, such as **www.example.com**.
     - Set the **ca** parameter to the CA you want to use to issue the certificate, such as **self-sign**.
     - Set the **run_before** parameter to the command you want to execute before this certificate is issued or renewed, such as **systemctl stop httpd.service**.
     - Set the **run_after** parameter to the command you want to execute after this certificate is issued or renewed, such as **systemctl start httpd.service**.
   - Set the **rhel-system-roles.certificate** role under **roles**.
     This is the playbook file for this example:

```
---
- hosts: webserver
  vars:
    certificate_requests:
      - name: mycert
        dns: www.example.com
        ca: self-sign
        run_before: systemctl stop httpd.service
        run_after: systemctl start httpd.service

  roles:
    - rhel-system-roles.certificate
```

4. Save the file.
5. Run the playbook:

```
$ *ansible-playbook -i inventory.file request-certificate.yml*
```

Additional resources

- See the **/usr/share/ansible/roles/rhel-system-roles.certificate/README.md** file.
- See the **ansible-playbook(1)** man page.

CHAPTER 19. CONFIGURING AUTOMATIC CRASH DUMPS BY USING THE KDUMP RHEL SYSTEM ROLE

To manage kdump using Ansible, you can use the **kdump** role, which is one of the RHEL System Roles available in RHEL 7.9.

Using the **kdump** role enables you to specify where to save the contents of the system's memory for later analysis.

19.1. THE KDUMP RHEL SYSTEM ROLE

The **kdump** System Role enables you to set basic kernel dump parameters on multiple systems.

19.2. KDUMP ROLE PARAMETERS

The parameters used for the **kdump** RHEL System Roles are:

Role Variable	Description
kdump_path	The path to which **vmcore** is written. If **kdump_target** is not null, path is relative to that dump target. Otherwise, it must be an absolute path in the root file system.

Additional resources

- The makedumpfile(8) man page.
- For details about the parameters used in **kdump** and additional information about the **kdump** System Role, see the **/usr/share/ansible/roles/rhel-system-roles.tlog/README.md** file.

19.3. CONFIGURING KDUMP USING RHEL SYSTEM ROLES

You can set basic kernel dump parameters on multiple systems using the **kdump** System Role by running an Ansible playbook.

WARNING

The **kdump** role replaces the kdump configuration of the managed hosts entirely by replacing the **/etc/kdump.conf** file. Additionally, if the **kdump** role is applied, all previous **kdump** settings are also replaced, even if they are not specified by the role variables, by replacing the **/etc/sysconfig/kdump** file.

Prerequisites

- The Ansible Core package is installed on the control machine.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- You have an inventory file which lists the systems on which you want to deploy **kdump**.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- hosts: kdump-test
  vars:
    kdump_path: /var/crash
  roles:
    - rhel-system-roles.kdump
```

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

Additional resources

- For a detailed reference on **kdump** role variables, see the README.md or README.html files in the /usr/share/doc/rhel-system-roles/kdump directory.
- See Preparing the control node and managed nodes to use RHEL System Roles
- Documentation installed with the **rhel-system-roles** package **/usr/share/ansible/roles/rhel-system-roles.kdump/README.html**

CHAPTER 20. MANAGING LOCAL STORAGE USING RHEL SYSTEM ROLES

To manage LVM and local file systems (FS) using Ansible, you can use the **storage** role, which is one of the RHEL System Roles available in RHEL 8.

Using the **storage** role enables you to automate administration of file systems on disks and logical volumes on multiple machines and across all versions of RHEL starting with RHEL 7.7.

For more information about RHEL System Roles and how to apply them, see Introduction to RHEL System Roles.

20.1. INTRODUCTION TO THE STORAGE RHEL SYSTEM ROLE

The **storage** role can manage:

- File systems on disks which have not been partitioned
- Complete LVM volume groups including their logical volumes and file systems
- MD RAID volumes and their file systems

With the **storage** role, you can perform the following tasks:

- Create a file system
- Remove a file system
- Mount a file system
- Unmount a file system
- Create LVM volume groups
- Remove LVM volume groups
- Create logical volumes
- Remove logical volumes
- Create RAID volumes
- Remove RAID volumes
- Create LVM volume groups with RAID
- Remove LVM volume groups with RAID
- Create encrypted LVM volume groups
- Create LVM logical volumes with RAID

20.2. PARAMETERS THAT IDENTIFY A STORAGE DEVICE IN THE STORAGE RHEL SYSTEM ROLE

Your **storage** role configuration affects only the file systems, volumes, and pools that you list in the following variables.

storage_volumes

List of file systems on all unpartitioned disks to be managed.
storage_volumes can also include **raid** volumes.

Partitions are currently unsupported.

storage_pools

List of pools to be managed.
Currently the only supported pool type is LVM. With LVM, pools represent volume groups (VGs). Under each pool there is a list of volumes to be managed by the role. With LVM, each volume corresponds to a logical volume (LV) with a file system.

20.3. EXAMPLE ANSIBLE PLAYBOOK TO CREATE AN XFS FILE SYSTEM ON A BLOCK DEVICE

This section provides an example Ansible playbook. This playbook applies the **storage** role to create an XFS file system on a block device using the default parameters.

WARNING

The **storage** role can create a file system only on an unpartitioned, whole disk or a logical volume (LV). It cannot create the file system on a partition.

Example 20.1. A playbook that creates XFS on /dev/sdb

```
---
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - sdb
        fs_type: xfs
  roles:
    - rhel-system-roles.storage
```

- The volume name (***barefs*** in the example) is currently arbitrary. The **storage** role identifies the volume by the disk device listed under the **disks:** attribute.
- You can omit the **fs_type: xfs** line because XFS is the default file system in RHEL 8.

- To create the file system on an LV, provide the LVM setup under the **disks:** attribute, including the enclosing volume group. For details, see Example Ansible playbook to manage logical volumes.
  Do not provide the path to the LV device.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.4. EXAMPLE ANSIBLE PLAYBOOK TO PERSISTENTLY MOUNT A FILE SYSTEM

This section provides an example Ansible playbook. This playbook applies the **storage** role to immediately and persistently mount an XFS file system.

Example 20.2. A playbook that mounts a file system on /dev/sdb to /mnt/data

```
---
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - sdb
        fs_type: xfs
        mount_point: /mnt/data
  roles:
    - rhel-system-roles.storage
```

- This playbook adds the file system to the **/etc/fstab** file, and mounts the file system immediately.
- If the file system on the **/dev/sdb** device or the mount point directory do not exist, the playbook creates them.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.5. EXAMPLE ANSIBLE PLAYBOOK TO MANAGE LOGICAL VOLUMES

This section provides an example Ansible playbook. This playbook applies the **storage** role to create an LVM logical volume in a volume group.

Example 20.3. A playbook that creates a mylv logical volume in the myvg volume group

```
- hosts: all
  vars:
```

```
  storage_pools:
    - name: myvg
      disks:
        - sda
        - sdb
        - sdc
      volumes:
        - name: mylv
          size: 2G
          fs_type: ext4
          mount_point: /mnt/data
roles:
  - rhel-system-roles.storage
```

- The **myvg** volume group consists of the following disks:
  - **/dev/sda**
  - **/dev/sdb**
  - **/dev/sdc**
- If the **myvg** volume group already exists, the playbook adds the logical volume to the volume group.
- If the **myvg** volume group does not exist, the playbook creates it.
- The playbook creates an Ext4 file system on the **mylv** logical volume, and persistently mounts the file system at **/mnt**.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.6. EXAMPLE ANSIBLE PLAYBOOK TO ENABLE ONLINE BLOCK DISCARD

This section provides an example Ansible playbook. This playbook applies the **storage** role to mount an XFS file system with online block discard enabled.

Example 20.4. A playbook that enables online block discard on /mnt/data/

```
---
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - sdb
        fs_type: xfs
        mount_point: /mnt/data
```

```
      mount_options: discard
roles:
  - rhel-system-roles.storage
```

Additional resources

- Example Ansible playbook to persistently mount a file system
- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.7. EXAMPLE ANSIBLE PLAYBOOK TO CREATE AND MOUNT AN EXT4 FILE SYSTEM

This section provides an example Ansible playbook. This playbook applies the **storage** role to create and mount an Ext4 file system.

Example 20.5. A playbook that creates Ext4 on /dev/sdb and mounts it at /mnt/data

```
---
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - sdb
        fs_type: ext4
        fs_label: label-name
        mount_point: /mnt/data
  roles:
    - rhel-system-roles.storage
```

- The playbook creates the file system on the **/dev/sdb** disk.
- The playbook persistently mounts the file system at the ***/mnt/data*** directory.
- The label of the file system is ***label-name***.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.8. EXAMPLE ANSIBLE PLAYBOOK TO CREATE AND MOUNT AN EXT3 FILE SYSTEM

This section provides an example Ansible playbook. This playbook applies the **storage** role to create and mount an Ext3 file system.

Example 20.6. A playbook that creates Ext3 on/dev/sdb and mounts it at/mnt/data

```
---
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - sdb
        fs_type: ext3
        fs_label: label-name
        mount_point: /mnt/data
  roles:
    - rhel-system-roles.storage
```

- The playbook creates the file system on the **/dev/sdb** disk.
- The playbook persistently mounts the file system at the ***/mnt/data*** directory.
- The label of the file system is ***label-name***.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.9. EXAMPLE ANSIBLE PLAYBOOK TO RESIZE AN EXISTING EXT4 OR EXT3 FILE SYSTEM USING THE STORAGE RHEL SYSTEM ROLE

This section provides an example Ansible playbook. This playbook applies the **storage** role to resize an existing Ext4 or Ext3 file system on a block device.

Example 20.7. A playbook that set up a single volume on a disk

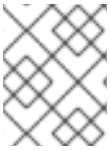
```
---
- name: Create a disk device mounted on /opt/barefs
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - /dev/sdb
        size: 12 GiB
        fs_type: ext4
        mount_point: /opt/barefs
  roles:
    - rhel-system-roles.storage
```

- If the volume in the previous example already exists, to resize the volume, you need to run the same playbook, just with a different value for the parameter **size**. For example:

Example 20.8. A playbook that resizes ext4 on /dev/sdb

```
---
- name: Create a disk device mounted on /opt/barefs
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
          - /dev/sdb
        size: 10 GiB
        fs_type: ext4
        mount_point: /opt/barefs
  roles:
    - rhel-system-roles.storage
```

- The volume name (barefs in the example) is currently arbitrary. The Storage role identifies the volume by the disk device listed under the disks: attribute.



NOTE

Using the **Resizing** action in other file systems can destroy the data on the device you are working on.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.10. EXAMPLE ANSIBLE PLAYBOOK TO RESIZE AN EXISTING FILE SYSTEM ON LVM USING THE STORAGE RHEL SYSTEM ROLE

This section provides an example Ansible playbook. This playbook applies the **storage** RHEL System Role to resize an LVM logical volume with a file system.

WARNING

Using the **Resizing** action in other file systems can destroy the data on the device you are working on.

Example 20.9. A playbook that resizes existing mylv1 and myvl2 logical volumes in the myvg volume group

```
---

- hosts: all
  vars:
    storage_pools:
      - name: myvg
```

```
      disks:
        - /dev/sda
        - /dev/sdb
        - /dev/sdc
      volumes:
        - name: mylv1
          size: 10 GiB
          fs_type: ext4
          mount_point: /opt/mount1
        - name: mylv2
          size: 50 GiB
          fs_type: ext4
          mount_point: /opt/mount2

- name: Create LVM pool over three disks
  include_role:
    name: rhel-system-roles.storage
```

- This playbook resizes the following existing file systems:
  - The Ext4 file system on the **mylv1** volume, which is mounted at **/opt/mount1**, resizes to 10 GiB.
  - The Ext4 file system on the **mylv2** volume, which is mounted at **/opt/mount2**, resizes to 50 GiB.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.11. EXAMPLE ANSIBLE PLAYBOOK TO CREATE A SWAP VOLUME USING THE STORAGE RHEL SYSTEM ROLE

This section provides an example Ansible playbook. This playbook applies the **storage** role to create a swap volume, if it does not exist, or to modify the swap volume, if it already exist, on a block device using the default parameters.

Example 20.10. A playbook that creates or modify an existing XFS on /dev/sdb

```
---
- name: Create a disk device with swap
- hosts: all
  vars:
    storage_volumes:
      - name: swap_fs
        type: disk
        disks:
          - /dev/sdb
 size: 15 GiB
        fs_type: swap
  roles:
    - rhel-system-roles.storage
```

- The volume name (***swap_fs*** in the example) is currently arbitrary. The **storage** role identifies the volume by the disk device listed under the **disks:** attribute.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.12. CONFIGURING A RAID VOLUME USING THE STORAGE SYSTEM ROLE

With the **storage** System Role, you can configure a RAID volume on RHEL using Red Hat Ansible Automation Platform and Ansible-Core. Create an Ansible playbook with the parameters to configure a RAID volume to suit your requirements.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- You have an inventory file detailing the systems on which you want to deploy a RAID volume using the **storage** System Role.

Procedure

1. Create a new *playbook.yml* file with the following content:

```
---
- name: Configure the storage
  hosts: managed-node-01.example.com
  tasks:
  - name: Create a RAID on sdd, sde, sdf, and sdg
    include_role:
      name: rhel-system-roles.storage
    vars:
    storage_safe_mode: false
    storage_volumes:
      - name: data
        type: raid
        disks: [sdd, sde, sdf, sdg]
        raid_level: raid0
        raid_chunk_size: 32 KiB
        mount_point: /mnt/data
        state: present
```

WARNING

Device names might change in certain circumstances, for example, when you add a new disk to a system. Therefore, to prevent data loss, do not use specific disk names in the playbook.

2. Optional: Verify the playbook syntax:

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook:

```
# ansible-playbook -i inventory.file /path/to/file/playbook.yml
```

Additional resources

- Managing RAID
- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file
- Preparing a control node and managed nodes to use RHEL System Roles .

20.13. CONFIGURING AN LVM POOL WITH RAID USING THE STORAGE RHEL SYSTEM ROLE

With the **storage** System Role, you can configure an LVM pool with RAID on RHEL using Red Hat Ansible Automation Platform. In this section you will learn how to set up an Ansible playbook with the available parameters to configure an LVM pool with RAID.

Prerequisites

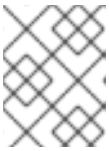
- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- You have an inventory file detailing the systems on which you want to configure an LVM pool with RAID using the **storage** System Role.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
- hosts: all
  vars:
    storage_safe_mode: false
    storage_pools:
      - name: my_pool
        type: lvm
```

```
      disks: [sdh, sdi]
      raid_level: raid1
      volumes:
        - name: my_pool
          size: "1 GiB"
          mount_point: "/mnt/app/shared"
          fs_type: xfs
          state: present
  roles:
    - name: rhel-system-roles.storage
```



NOTE

To create an LVM pool with RAID, you must specify the RAID type using the **raid_level** parameter.

2. Optional. Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory.file /path/to/file/playbook.yml
```

Additional resources

- Managing RAID.
- The **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file.

20.14. EXAMPLE ANSIBLE PLAYBOOK TO COMPRESS AND DEDUPLICATE A VDO VOLUME ON LVM USING THE STORAGE RHEL SYSTEM ROLE

This section provides an example Ansible playbook. This playbook applies the **storage** RHEL System Role to enable compression and deduplication of Logical Volumes (LVM) using Virtual Data Optimizer (VDO).

Example 20.11. A playbook that creates a mylv1 LVM VDO volume in the myvg volume group

```
---
- name: Create LVM VDO volume under volume group 'myvg'
  hosts: all
  roles:
    -rhel-system-roles.storage
  vars:
    storage_pools:
     - name: myvg
       disks:
         - /dev/sdb
       volumes:
         - name: mylv1
```

```
    compression: true
    deduplication: true
    vdo_pool_size: 10 GiB
    size: 30 GiB
    mount_point: /mnt/app/shared
```

In this example, the **compression** and **deduplication** pools are set to true, which specifies that the VDO is used. The following describes the usage of these parameters:

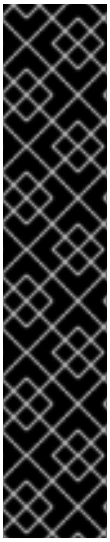
- The **deduplication** is used to deduplicate the duplicated data stored on the storage volume.
- The compression is used to compress the data stored on the storage volume, which results in more storage capacity.
- The vdo_pool_size specifies the actual size the volume takes on the device. The virtual size of VDO volume is set by the **size** parameter. NOTE: Because of the Storage role use of LVM VDO, only one volume per pool can use the compression and deduplication.

20.15. CREATING A LUKS2 ENCRYPTED VOLUME USING THE STORAGE RHEL SYSTEM ROLE

You can use the **storage** role to create and configure a volume encrypted with LUKS by running an Ansible playbook.

Prerequisites

- Access and permissions to one or more managed nodes, which are systems you want to configure with the **crypto_policies** System Role.
- An inventory file, which lists the managed nodes.
- Access and permissions to a control node, which is a system from which Red Hat Ansible Core configures other systems. On the control node, the **ansible-core** and **rhel-system-roles** packages are installed.



IMPORTANT

RHEL 8.0-8.5 provided access to a separate Ansible repository that contains Ansible Engine 2.9 for automation based on Ansible. Ansible Engine contains command-line utilities such as **ansible**, **ansible-playbook**, connectors such as **docker** and **podman**, and many plugins and modules. For information about how to obtain and install Ansible Engine, see the How to download and install Red Hat Ansible Engine Knowledgebase article.

RHEL 8.6 and 9.0 have introduced Ansible Core (provided as the **ansible-core** package), which contains the Ansible command-line utilities, commands, and a small set of built-in Ansible plugins. RHEL provides this package through the AppStream repository, and it has a limited scope of support. For more information, see the Scope of support for the Ansible Core package included in the RHEL 9 and RHEL 8.6 and later AppStream repositories Knowledgebase article.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
- hosts: all
  vars:
    storage_volumes:
      - name: barefs
        type: disk
        disks:
         - sdb
        fs_type: xfs
        fs_label: label-name
        mount_point: /mnt/data
        encryption: true
        encryption_password: your-password
  roles:
   - rhel-system-roles.storage
```

   You can also add the other encryption parameters such as **encryption_key**, **encryption_cipher**, **encryption_key_size**, and **encryption_luks** version in the *playbook.yml* file.

2. Optional: Verify playbook syntax:

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory.file /path/to/file/playbook.yml
```

Verification

1. View the encryption status:

```
# cryptsetup status sdb

/dev/mapper/sdb is active and is in use.
type: LUKS2
cipher: aes-xts-plain64
keysize: 512 bits
key location: keyring
device: /dev/sdb
[...]
```

2. Verify the created LUKS encrypted volume:

```
# cryptsetup luksDump /dev/sdb

Version:        2
Epoch:          6
Metadata area:  16384 [bytes]
Keyslots area:  33521664 [bytes]
UUID:           a4c6be82-7347-4a91-a8ad-9479b72c9426
Label:          (no label)
Subsystem:      (no subsystem)
Flags:        allow-discards
```

```
Data segments:
  0: crypt
 offset: 33554432 [bytes]
 length: (whole device)
 cipher: aes-xts-plain64
 sector: 4096 [bytes]
[...]
```

3. View the **cryptsetup** parameters in the ***playbook.yml*** file, which the **storage** role supports:

```
# cat ~/playbook.yml

    - hosts: all
      vars:
        storage_volumes:
          - name: foo
            type: disk
            disks:
             - nvme0n1
            fs_type: xfs
            fs_label: label-name
            mount_point: /mnt/data
            encryption: true
            #encryption_password: passwdpasswd
            encryption_key: /home/passwd_key
            encryption_cipher: aes-xts-plain64
            encryption_key_size: 512
            encryption_luks_version: luks2

      roles:
       - rhel-system-roles.storage
```

Additional resources

- Encrypting block devices using LUKS
- **/usr/share/ansible/roles/rhel-system-roles.storage/README.md** file

20.16. EXAMPLE ANSIBLE PLAYBOOK TO EXPRESS POOL VOLUME SIZES AS PERCENTAGE USING THE STORAGE RHEL SYSTEM ROLE

This section provides an example Ansible playbook. This playbook applies the **storage** System Role to enable you to express Logical Manager Volumes (LVM) volume sizes as a percentage of the pool's total size.

Example 20.12. A playbook that express volume sizes as a percentage of the pool's total size

```
---
- name: Express volume sizes as a percentage of the pool's total size
  hosts: all
  roles
    - rhel-system-roles.storage
  vars:
```

```
storage_pools:
- name: myvg
  disks:
    - /dev/sdb
  volumes:
    - name: data
      size: 60%
      mount_point: /opt/mount/data
    - name: web
      size: 30%
      mount_point: /opt/mount/web
    - name: cache
      size: 10%
      mount_point: /opt/cache/mount
```

This example specifies the size of LVM volumes as a percentage of the pool size, for example: "60%". Additionally, you can also specify the size of LVM volumes as a percentage of the pool size in a human-readable size of the file system, for example, "10g" or "50 GiB".

20.17. ADDITIONAL RESOURCES

- **/usr/share/doc/rhel-system-roles/storage/**
- **/usr/share/ansible/roles/rhel-system-roles.storage/**

CHAPTER 21. CONFIGURING TIME SYNCHRONIZATION BY USING THE TIMESYNC RHEL SYSTEM ROLE

With the **timesync** RHEL System Role, you can manage time synchronization on multiple target machines on RHEL using Red Hat Ansible Automation Platform.

21.1. THE TIMESYNC RHEL SYSTEM ROLE

You can manage time synchronization on multiple target machines using the **timesync** RHEL System Role.

The **timesync** role installs and configures an NTP or PTP implementation to operate as an NTP client or PTP replica in order to synchronize the system clock with NTP servers or grandmasters in PTP domains.

Note that using the **timesync** role also facilitates the migration to chrony, because you can use the same playbook on all versions of Red Hat Enterprise Linux starting with RHEL 6 regardless of whether the system uses **ntp** or **chrony** to implement the NTP protocol.

21.2. APPLYING THE TIMESYNC SYSTEM ROLE FOR A SINGLE POOL OF SERVERS

The following example shows how to apply the **timesync** role in a situation with just one pool of servers.

WARNING

The **timesync** role replaces the configuration of the given or detected provider service on the managed host. Previous settings are lost, even if they are not specified in the role variables. The only preserved setting is the choice of provider if the **timesync_ntp_provider** variable is not defined.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- You have an inventory file which lists the systems on which you want to deploy **timesync** System Role.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- hosts: timesync-test
  vars:
    timesync_ntp_servers:
```

```
    - hostname: 2.rhel.pool.ntp.org
      pool: yes
      iburst: yes
  roles:
    - rhel-system-roles.timesync
```

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

21.3. APPLYING THE TIMESYNC SYSTEM ROLE ON CLIENT SERVERS

You can use the **timesync** role to enable Network Time Security (NTS) on NTP clients. Network Time Security (NTS) is an authentication mechanism specified for Network Time Protocol (NTP). It verifies that NTP packets exchanged between the server and client are not altered.

WARNING

The **timesync** role replaces the configuration of the given or detected provider service on the managed host. Previous settings are lost even if they are not specified in the role variables. The only preserved setting is the choice of provider if the **timesync_ntp_provider** variable is not defined.

Prerequisites

- You do not have to have Red Hat Ansible Automation Platform installed on the systems on which you want to deploy the **timesync** solution.
- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- You have an inventory file which lists the systems on which you want to deploy the **timesync** System Role.
- The **chrony** NTP provider version is 4.0 or later.

Procedure

1. Create a ***playbook.yml*** file with the following content:

```
---
- hosts: timesync-test
  vars:
    timesync_ntp_servers:
      - hostname: ptbtime1.ptb.de
```

```
      iburst: yes
      nts: yes
  roles:
    - rhel-system-roles.timesync
```

ptbtime1.ptb.de is an example of public server. You may want to use a different public server or your own server.

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

Verification

1. Perform a test on the client machine:

```
# chronyc -N authdata

Name/IP address         Mode KeyID Type KLen Last Atmp  NAK Cook CLen
==============================================================================
ptbtime1.ptb.de         NTS     1   15  256  157    0    0    8  100
```

2. Check that the number of reported cookies is larger than zero.

Additional resources

- **chrony.conf(5)** man page

21.4. TIMESYNC SYSTEM ROLES VARIABLES

You can pass the following variable to the **timesync** role:

- **timesync_ntp_servers**:

Role variable settings	Description
hostname: host.example.com	Hostname or address of the server
minpoll: *number*	Minimum polling interval. Default: 6
maxpoll: *number*	Maximum polling interval. Default: 10
iburst: yes	Flag enabling fast initial synchronization. Default: no
pool: yes	Flag indicating that each resolved address of the hostname is a separate NTP server. Default: no

Role variable settings	Description
nts: yes	Flag to enable Network Time Security (NTS). Default: no. Supported only with chrony >= 4.0.

Additional resources

- For a detailed reference on **timesync** role variables, install the rhel-system-roles package, and see the README.md or README.html files in the **/usr/share/doc/rhel-system-roles/timesync** directory.

CHAPTER 22. MONITORING PERFORMANCE BY USING THE METRICS RHEL SYSTEM ROLE

As a system administrator, you can use the **metrics** RHEL System Role with any Ansible Automation Platform control node to monitor the performance of a system.

22.1. INTRODUCTION TO THE METRICS SYSTEM ROLE

RHEL System Roles is a collection of Ansible roles and modules that provide a consistent configuration interface to remotely manage multiple RHEL systems. The **metrics** System Role configures performance analysis services for the local system and, optionally, includes a list of remote systems to be monitored by the local system. The **metrics** System Role enables you to use **pcp** to monitor your systems performance without having to configure **pcp** separately, as the set-up and deployment of **pcp** is handled by the playbook.

Table 22.1. metrics system role variables

Role variable	Description	Example usage
metrics_monitored_hosts	List of remote hosts to be analyzed by the target host. These hosts will have metrics recorded on the target host, so ensure enough disk space exists below **/var/log** for each host.	**metrics_monitored_hosts: ["*webserver.example.com*", "*database.example.com*"]**
metrics_retention_days	Configures the number of days for performance data retention before deletion.	**metrics_retention_days: 14**
metrics_graph_service	A boolean flag that enables the host to be set up with services for performance data visualization via **pcp** and **grafana**. Set to false by default.	**metrics_graph_service: no**
metrics_query_service	A boolean flag that enables the host to be set up with time series query services for querying recorded **pcp** metrics via **redis**. Set to false by default.	**metrics_query_service: no**
metrics_provider	Specifies which metrics collector to use to provide metrics. Currently, **pcp** is the only supported metrics provider.	**metrics_provider: "pcp"**
metrics_manage_firewall	Uses the **firewall** role to manage port access directly from the **metrics** role. Set to false by default.	**metrics_manage_firewall: true**

Role variable	Description	Example usage
metrics_manage_selinux	Uses the **selinux** role to manage port access directly from the **metrics** role. Set to false by default.	**metrics_manage_selinux: true**

NOTE

For details about the parameters used in **metrics_connections** and additional information about the **metrics** System Role, see the **/usr/share/ansible/roles/rhel-system-roles.metrics/README.md** file.

22.2. USING THE METRICS SYSTEM ROLE TO MONITOR YOUR LOCAL SYSTEM WITH VISUALIZATION

This procedure describes how to use the **metrics** RHEL System Role to monitor your local system while simultaneously provisioning data visualization via **Grafana**.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the machine you want to monitor.

Procedure

1. Configure **localhost** in the **/etc/ansible/hosts** Ansible inventory by adding the following content to the inventory:

```
localhost ansible_connection=local
```

2. Create an Ansible playbook with the following content:

```
---
- name: Manage metrics
  hosts: localhost
  vars:
    metrics_graph_service: yes
    metrics_manage_firewall: true
    metrics_manage_selinux: true
  roles:
    - rhel-system-roles.metrics
```

3. Run the Ansible playbook:

```
# ansible-playbook name_of_your_playbook.yml
```

NOTE

Since the **metrics_graph_service** boolean is set to value="yes", **Grafana** is automatically installed and provisioned with **pcp** added as a data source. Since metrics_manage_firewall and metrics_manage_selinux are both set to true, the metrics role will use the firewall and selinux system roles to manage the ports used by the metrics role.

4. To view visualization of the metrics being collected on your machine, access the **grafana** web interface as described in Accessing the Grafana web UI.

22.3. USING THE METRICS SYSTEM ROLE TO SETUP A FLEET OF INDIVIDUAL SYSTEMS TO MONITOR THEMSELVES

This procedure describes how to use the **metrics** System Role to set up a fleet of machines to monitor themselves.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the machine you want to use to run the playbook.
- You have the SSH connection established.

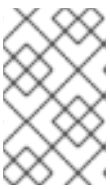
Procedure

1. Add the name or IP of the machines you want to monitor via the playbook to the **/etc/ansible/hosts** Ansible inventory file under an identifying group name enclosed in brackets:

```
[remotes]
webserver.example.com
database.example.com
```

2. Create an Ansible playbook with the following content:

```
---
- hosts: remotes
  vars:
    metrics_retention_days: 0
    metrics_manage_firewall: true
    metrics_manage_selinux: true
  roles:
    - rhel-system-roles.metrics
```



NOTE

Since **metrics_manage_firewall** and **metrics_manage_selinux** are both set to true, the metrics role will use the **firewall** and **selinux** roles to manage the ports used by the **metrics** role.

3. Run the Ansible playbook:

```
# ansible-playbook name_of_your_playbook.yml -k
```

Where the **-k** prompt for password to connect to remote system.

22.4. USING THE METRICS SYSTEM ROLE TO MONITOR A FLEET OF MACHINES CENTRALLY VIA YOUR LOCAL MACHINE

This procedure describes how to use the **metrics** System Role to set up your local machine to centrally monitor a fleet of machines while also provisioning visualization of the data via **grafana** and querying of the data via **redis**.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the machine you want to use to run the playbook.

Procedure

1. Create an Ansible playbook with the following content:

```
---
- hosts: localhost
  vars:
    metrics_graph_service: yes
    metrics_query_service: yes
    metrics_retention_days: 10
    metrics_monitored_hosts: ["database.example.com", "webserver.example.com"]
    metrics_manage_firewall: yes
    metrics_manage_selinux: yes
  roles:
    - rhel-system-roles.metrics
```

2. Run the Ansible playbook:

```
# ansible-playbook name_of_your_playbook.yml
```

NOTE

Since the **metrics_graph_service** and **metrics_query_service** booleans are set to value="yes", **grafana** is automatically installed and provisioned with **pcp** added as a data source with the **pcp** data recording indexed into **redis**, allowing the **pcp** querying language to be used for complex querying of the data. Since **metrics_manage_firewall** and **metrics_manage_selinux** are both set to true, the **metrics** role will use the **firewall** and **selinux** roles to manage the ports used by the **metrics** role.

3. To view graphical representation of the metrics being collected centrally by your machine and to query the data, access the **grafana** web interface as described in Accessing the Grafana web UI.

22.5. SETTING UP AUTHENTICATION WHILE MONITORING A SYSTEM USING THE METRICS SYSTEM ROLE

PCP supports the **scram-sha-256** authentication mechanism through the Simple Authentication Security Layer (SASL) framework. The **metrics** RHEL System Role automates the steps to setup authentication using the **scram-sha-256** authentication mechanism. This procedure describes how to setup authentication using the **metrics** RHEL System Role.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the machine you want to use to run the playbook.

Procedure

1. Include the following variables in the Ansible playbook you want to setup authentication for:

```
---
 vars:
   metrics_username: your_username
   metrics_password: your_password
   metrics_manage_firewall: true
   metrics_manage_selinux: true
```

NOTE

Since **metrics_manage_firewall** and **metrics_manage_selinux** are both set to true, the **metrics** role will use the **firewall** and **selinux** roles to manage the ports used by the **metrics** role.

2. Run the Ansible playbook:

```
# ansible-playbook name_of_your_playbook.yml
```

Verification steps

- Verify the **sasl** configuration:

```
# pminfo -f -h "pcp://ip_adress?username=your_username" disk.dev.read
Password:
disk.dev.read
inst [0 or "sda"] value 19540
```

ip_adress should be replaced by the IP address of the host.

22.6. USING THE METRICS SYSTEM ROLE TO CONFIGURE AND ENABLE METRICS COLLECTION FOR SQL SERVER

This procedure describes how to use the **metrics** RHEL System Role to automate the configuration and enabling of metrics collection for Microsoft SQL Server via **pcp** on your local system.

Prerequisites

- The Ansible Core package is installed on the control machine.
- You have the **rhel-system-roles** package installed on the machine you want to monitor.
- You have installed Microsoft SQL Server for Red Hat Enterprise Linux and established a 'trusted' connection to an SQL server. See Install SQL Server and create a database on Red Hat .
- You have installed the Microsoft ODBC driver for SQL Server for Red Hat Enterprise Linux. See Red Hat Enterprise Server and Oracle Linux .

Procedure

1. Configure **localhost** in the **/etc/ansible/hosts** Ansible inventory by adding the following content to the inventory:

```
localhost ansible_connection=local
```

2. Create an Ansible playbook that contains the following content:

```
---
- hosts: localhost
  vars:
   metrics_from_mssql: true
   metrics_manage_firewall: true
   metrics_manage_selinux: true
  roles:
   - role: rhel-system-roles.metrics
```

NOTE

Since **metrics_manage_firewall** and **metrics_manage_selinux** are both set to true, the **metrics** role will use the **firewall** and **selinux** roles to manage the ports used by the **metrics** role.

3. Run the Ansible playbook:

```
# ansible-playbook name_of_your_playbook.yml
```

Verification steps

- Use the **pcp** command to verify that SQL Server PMDA agent (mssql) is loaded and running:

```
# pcp
platform: Linux rhel82-2.local 4.18.0-167.el8.x86_64 #1 SMP Sun Dec 15 01:24:23 UTC
2019 x86_64
 hardware: 2 cpus, 1 disk, 1 node, 2770MB RAM
 timezone: PDT+7
 services: pmcd pmproxy
     pmcd: Version 5.0.2-1, 12 agents, 4 clients
     pmda: root pmcd proc pmproxy xfs linux nfsclient mmv kvm mssql
```

```
        jbd2 dm
pmlogger: primary logger: /var/log/pcp/pmlogger/rhel82-2.local/20200326.16.31
   pmie: primary engine: /var/log/pcp/pmie/rhel82-2.local/pmie.log
```

Additional resources

- For more information about using Performance Co-Pilot for Microsoft SQL Server, see this Red Hat Developers Blog post.

CHAPTER 23. CONFIGURING MICROSOFT SQL SERVER USING THE MICROSOFT.SQL.SERVER ANSIBLE ROLE

As an administrator, you can use the **microsoft.sql.server** Ansible role to install, configure, and start Microsoft SQL Server (SQL Server). The **microsoft.sql.server** Ansible role optimizes your operating system to improve performance and throughput for the SQL Server. The role simplifies and automates the configuration of your RHEL host with recommended settings to run the SQL Server workloads.

23.1. PREREQUISITES

- 2 GB of RAM
- **root** access to the managed node where you want to configure SQL Server
- Pre-configured firewall
  You can set the **mssql_manage_firewall** variable to **true** so that the role can manage firewall automatically.

  Alternatively, enable the connection on the SQL Server TCP port set with the **mssql_tcp_port** variable. If you do not define this variable, the role defaults to the TCP port number **1433**.

  To add a new port, use:

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

  Replace *xxxx* with the TCP port number then reload the firewall rules.
- *Optional*: Create a file with the **.sql** extension containing the SQL statements and procedures to input them to SQL Server.

23.2. INSTALLING THE MICROSOFT.SQL.SERVER ANSIBLE ROLE

The **microsoft.sql.server** Ansible role is part of the **ansible-collection-microsoft-sql** package.

Prerequisites

- **root** access

Procedure

1. Install Ansible Core which is available in the RHEL 7.9 AppStream repository:

   ```
   # *yum install ansible-core*
   ```

2. Install the **microsoft.sql.server** Ansible role:

   ```
   # *yum install ansible-collection-microsoft-sql*
   ```

23.3. INSTALLING AND CONFIGURING SQL SERVER USING THE MICROSOFT.SQL.SERVER ANSIBLE ROLE

You can use the **microsoft.sql.server** Ansible role to install and configure SQL server.

Prerequisites

- The Ansible inventory is created

Procedure

1. Create a file with the **.yml** extension. For example, **mssql-server.yml**.
2. Add the following content to your **.yml** file:

```
---
- hosts: all
  vars:
    mssql_accept_microsoft_odbc_driver_17_for_sql_server_eula: true
    mssql_accept_microsoft_cli_utilities_for_sql_server_eula: true
    mssql_accept_microsoft_sql_server_standard_eula: true
    mssql_password: <password>
    mssql_edition: Developer
    mssql_tcp_port: 1433
  roles:
    - microsoft.sql.server
```

   Replace *<password>* with your SQL Server password.

3. Run the **mssql-server.yml** ansible playbook:

```
# *ansible-playbook mssql-server.yml*
```

23.4. TLS VARIABLES

You can use the following variables to configure the Transport Level Security (TLS) protocol.

Table 23.1. TLS role variables

Role variable	Description

Role variable	Description
mssql_tls_enable	This variable enables or disables TLS encryption. The **microsoft.sql.server** Ansible role performs following tasks when the variable is set to **true**: ● Copies TLS certificate to **/etc/pki/tls/certs/** on the SQL Server ● Copies private key to **/etc/pki/tls/private/** on the SQL Server ● Configures SQL Server to use TLS certificate and private key to encrypt connections When set to **false**, the TLS encryption is disabled. The role does not remove the existing certificate and private key files.
mssql_tls_cert	To define this variable, enter the path to the TLS certificate file.
mssql_tls_private_key	To define this variable, enter the path to the private key file.
mssql_tls_remote_src	Defines if the role searches for **mssql_tls_cert** and **mssql_tls_private_key** files remotely or on the control node. When set to the default **false**, the role searches for **mssql_tls_cert** or **mssql_tls_private_key** files on the Ansible control node. When set to **true**, the role searches for **mssql_tls_cert** or **mssql_tls_private_key** files on the Ansible managed node.
mssql_tls_version	Define this variable to select which TSL version to use. The default is **1.2**
mssql_tls_force	Set this variable to **true** to replace the certificate and private key files on the host. The files must exist under **/etc/pki/tls/certs/** and **/etc/pki/tls/private/** directories. The default is **false**.

23.5. ACCEPTING EULA FOR MLSERVICES

You must accept all the EULA for the open-source distributions of Python and R packages to install the required SQL Server Machine Learning Services (MLServices).

See **/usr/share/doc/mssql-server** for the license terms.

Table 23.2. SQL Server Machine Learning Services EULA variables

Role variable	Description
mssql_accept_microsoft_sql_server_standard_eula	This variable determines whether to accept the terms and conditions for installing the **mssql-conf** package. To accept the terms and conditions set this variable to **true**. The default is **false**.

23.6. ACCEPTING EULAS FOR MICROSOFT ODBC 17

You must accept all the EULAs to install the Microsoft Open Database Connectivity (ODBC) driver.

See **/usr/share/doc/msodbcsql17/LICENSE.txt** and **/usr/share/doc/mssql-tools/LICENSE.txt** for the license terms.

Table 23.3. Microsoft ODBC 17 EULA variables

Role variable	Description
mssql_accept_microsoft_odbc_driver_17_for_sql_server_eula	This variable determines whether to accept the terms and conditions for installing the **msodbcsql17** package. To accept the terms and conditions set this variable to **true**. The default is **false**.
mssql_accept_microsoft_cli_utilities_for_sql_server_eula	This variable determines whether to accept the terms and conditions for installing the **mssql-tools** package. To accept the terms and conditions set this variable to **true**. The default is **false**.

23.7. HIGH AVAILABILITY VARIABLES

You can configure high availability for Microsoft SQL Server with the variables from the table below.

Table 23.4. High availability configuration variables

Variable	Description

mssql_ha_configure	The default value is **false**.
	
	When it is set to **true**, performs the following actions:
	
	- Configures firewall by opening a port from the **mssql_ha_listener_port** variable and enables the **high-availability** service in firewall.
	- Configures SQL Server for high availability.
	  - Enables Always On Health events.
	  - Creates certificate on the primary replica and distributes it to other replicas.
	  - Configures endpoint and availability group.
	  - Configures the user from the **mssql_ha_login** variable for Pacemaker.
	- Optional: Includes the System Roles **ha_cluster** role to configure Pacemaker. You must set **mssql_ha_cluster_run_role** to **true** and provide all variables that the **ha_cluster** role requires for a Pacemaker cluster configuration.

mssql_ha_replica_type	This variable specifies which type of replica you can configure on the host. You can set this variable to **primary**, **synchronous**, and **witness**. You must set it to **primary** only on one host.
mssql_ha_listener_port	The default port is **5022**. The role uses this TCP port to replicate data for an Always On availability group.
mssql_ha_cert_name	You must define the name of the certificate to secure transactions between members of an Always On availability group.
mssql_ha_master_key_password	You must set the password for the master key to use with the certificate.
mssql_ha_private_key_password	You must set the password for the private key to use with the certificate.

Variable	Description
mssql_ha_reset_cert	The default value is **false**. If it is set to **true**, resets the certificate which an Always On availability group uses.
mssql_ha_endpoint_name	You must define the name of the endpoint to configure.
mssql_ha_ag_name	You must define the name of the availability group to configure.
mssql_ha_db_names	You can define a list of the databases to replicate, otherwise the role creates a cluster without replicating databases.
mssql_ha_login	The SQL Server Pacemaker resource agent utilizes this user to perform database health checks and manage state transitions from replica to primary server.
mssql_ha_login_password	The password for the **mssql_ha_login** user in SQL Server.
mssql_ha_cluster_run_role	The default value is **false**. This variable defines if this role runs the **ha_cluster** role. Note that the **ha_cluster** role replaces the configuration of the HA cluster on specified nodes, any variables currently configured for the HA cluster are erased and overwritten. To work around this limitation, the **microsoft.sql.server** role does not set any variables for the **ha_cluster** role to ensure that it does not overwrite any existing Pacemaker configuration. If you want the **microsoft.sql.server** to run the **ha_cluster** role, set this variable to **true** and provide variables for the **ha_cluster** role with the **microsoft.sql.server** role call.

Note, this role backs up the database to the **/var/opt/mssql/data/** directory.

For examples on how to use high availability variables for Microsoft SQL Server:

- If you install the role from Automation Hub, see the **~/.ansible/collections/ansible_collections/microsoft/sql/roles/server/README.md** file on your server.

- If you install the role from a package, open the **/usr/share/microsoft/sql-server/README.html** file in your browser.

CHAPTER 24. CONFIGURING A SYSTEM FOR SESSION RECORDING USING THE TLOG RHEL SYSTEM ROLE

With the **tlog** RHEL System Role, you can configure a system for terminal session recording on RHEL using Red Hat Ansible Automation Platform.

24.1. THE TLOG SYSTEM ROLE

You can configure a RHEL system for terminal session recording on RHEL using the **tlog** RHEL System Role.

You can configure the recording to take place per user or user group by means of the **SSSD** service.

Additional resources

- For more details on session recording in RHEL, see Recording Sessions.

24.2. COMPONENTS AND PARAMETERS OF THE TLOG SYSTEM ROLE

The Session Recording solution has the following components:

- The **tlog** utility
- System Security Services Daemon (SSSD)
- Optional: The web console interface

The parameters used for the **tlog** RHEL System Role are:

Role Variable	Description
tlog_use_sssd (default: yes)	Configure session recording with SSSD, the preferred way of managing recorded users or groups
tlog_scope_sssd (default: none)	Configure SSSD recording scope - all / some / none
tlog_users_sssd (default: [])	YAML list of users to be recorded
tlog_groups_sssd (default: [])	YAML list of groups to be recorded

- For details about the parameters used in **tlog** and additional information about the **tlog** System Role, see the **/usr/share/ansible/roles/rhel-system-roles.tlog/README.md** file.

24.3. DEPLOYING THE TLOG RHEL SYSTEM ROLE

Follow these steps to prepare and apply an Ansible playbook to configure a RHEL system to log session recording data to the systemd journal.

Prerequisites

- You have set SSH keys for access from the control node to the target system where the **tlog** System Role will be configured.
- You have at least one system that you want to configure the **tlog** System Role.
- The Ansible Core package is installed on the control machine.
- The **rhel-system-roles** package is installed on the control machine.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- name: Deploy session recording
  hosts: all
  vars:
    tlog_scope_sssd: some
    tlog_users_sssd:
      - recorded-user

  roles:
    - rhel-system-roles.tlog
```

   Where,

   - **tlog_scope_sssd**:
     - **some** specifies you want to record only certain users and groups, not **all** or **none**.
   - **tlog_users_sssd**:
     - **recorded-user** specifies the user you want to record a session from. Note that this does not add the user for you. You must set the user by yourself.

2. Optionally, verify the playbook syntax.

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i IP_Address /path/to/file/playbook.yml -v
```

As a result, the playbook installs the **tlog** RHEL System Role on the system you specified. The role includes **tlog-rec-session**, a terminal session I/O logging program, that acts as the login shell for a user. It also creates an SSSD configuration drop file that can be used by the users and groups that you define. SSSD parses and reads these users and groups, and replaces their user shell with **tlog-rec-session**. Additionally, if the **cockpit** package is installed on the system, the playbook also installs the **cockpit-session-recording** package, which is a **Cockpit** module that allows you to view and play recordings in the web console interface.

Verification steps

To verify that the SSSD configuration drop file is created in the system, perform the following steps:

1. Navigate to the folder where the SSSD configuration drop file is created:

```
# cd /etc/sssd/conf.d
```

2. Check the file content:

```
# cat /etc/sssd/conf.d/sssd-session-recording.conf
```

You can see that the file contains the parameters you set in the playbook.

24.4. DEPLOYING THE TLOG RHEL SYSTEM ROLE FOR EXCLUDING LISTS OF GROUPS OR USERS

You can use the **tlog** System Role to support the SSSD session recording configuration options **exclude_users** and **exclude_groups**. Follow these steps to prepare and apply an Ansible playbook to configure a RHEL system to exclude users or groups from having their sessions recorded and logged in the systemd journal.

Prerequisites

- You have set SSH keys for access from the control node to the target system on which you want to configure the **tlog** System Role.
- You have at least one system on which you want to configure the **tlog** System Role.
- The Ansible Core package is installed on the control machine.
- The **rhel-system-roles** package is installed on the control machine.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- name: Deploy session recording excluding users and groups
  hosts: all
  vars:
    tlog_scope_sssd: all
    tlog_exclude_users_sssd:
      - jeff
      - james
    tlog_exclude_groups_sssd:
      - admins

  roles:
    - rhel-system-roles.tlog
```

Where,

- **tlog_scope_sssd**:
  - **all**: specifies that you want to record all users and groups.
- **tlog_exclude_users_sssd**:

- user names: specifies the user names of the users you want to exclude from the session recording.

- **tlog_exclude_groups_sssd**:
  - **admins** specifies the group you want to exclude from the session recording.

2. Optionally, verify the playbook syntax;

```
# ansible-playbook --syntax-check playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i IP_Address /path/to/file/playbook.yml -v
```

As a result, the playbook installs the **tlog** RHEL System Role on the system you specified. The role includes **tlog-rec-session**, a terminal session I/O logging program, that acts as the login shell for a user. It also creates an **/etc/sssd/conf.d/sssd-session-recording.conf** SSSD configuration drop file that can be used by users and groups except those that you defined as excluded. SSSD parses and reads these users and groups, and replaces their user shell with **tlog-rec-session**. Additionally, if the **cockpit** package is installed on the system, the playbook also installs the **cockpit-session-recording** package, which is a **Cockpit** module that allows you to view and play recordings in the web console interface.

Verification steps

To verify that the SSSD configuration drop file is created in the system, perform the following steps:

1. Navigate to the folder where the SSSD configuration drop file is created:

```
# cd /etc/sssd/conf.d
```

2. Check the file content:

```
# cat sssd-session-recording.conf
```

You can see that the file contains the parameters you set in the playbook.

Additional resources

- See the **/usr/share/doc/rhel-system-roles/tlog/** and **/usr/share/ansible/roles/rhel-system-roles.tlog/** directories.
- The Recording a session using the deployed Terminal Session Recording System Role in the CLI .

24.5. RECORDING A SESSION USING THE DEPLOYED TLOG SYSTEM ROLE IN THE CLI

After you have deployed the **tlog** System Role in the system you have specified, you are able to record a user terminal session using the command-line interface (CLI).

Prerequisites

- You have deployed the **tlog** System Role in the target system.

- The SSSD configuration drop file was created in the **/etc/sssd/conf.d** directory. See Deploying the Terminal Session Recording RHEL System Role.

Procedure

1. Create a user and assign a password for this user:

```
# useradd recorded-user
# passwd recorded-user
```

2. Log in to the system as the user you just created:

```
# ssh recorded-user@localhost
```

3. Type "yes" when the system prompts you to type yes or no to authenticate.
4. Insert the *recorded-user's* password.
   The system displays a message about your session being recorded.

```
ATTENTION! Your session is being recorded!
```

5. After you have finished recording the session, type:

```
# exit
```

   The system logs out from the user and closes the connection with the localhost.

As a result, the user session is recorded, stored and you can play it using a journal.

Verification steps

To view your recorded session in the journal, do the following steps:

1. Run the command below:

```
# journalctl -o verbose -r
```

2. Search for the **MESSAGE** field of the **tlog-rec** recorded journal entry.

```
# journalctl -xel _EXE=/usr/bin/tlog-rec-session
```

24.6. WATCHING A RECORDED SESSION USING THE CLI

You can play a user session recording from a journal using the command-line interface (CLI).

Prerequisites

- You have recorded a user session. See Recording a session using the deployed tlog System Role in the CLI .

Procedure

1. On the CLI terminal, play the user session recording:

```
# journalctl -o verbose -r
```

2. Search for the **tlog** recording:

```
$ /tlog-rec
```

You can see details such as:

- The username for the user session recording
- The **out_txt** field, a raw output encode of the recorded session
- The identifier number TLOG_REC=*ID_number*

3. Copy the identifier number TLOG_REC=*ID_number*.
4. Playback the recording using the identifier number TLOG_REC=*ID_number*.

```
# tlog-play -r journal -M TLOG_REC=ID_number
```

As a result, you can see the user session recording terminal output being played back.

CHAPTER 25. CONFIGURING A HIGH-AVAILABILITY CLUSTER BY USING THE HA_CLUSTER RHEL SYSTEM ROLE

With the **ha_cluster** System Role, you can configure and manage a high-availability cluster that uses the Pacemaker high availability cluster resource manager.

25.1. HA_CLUSTER SYSTEM ROLE VARIABLES

In an **ha_cluster** System Role playbook, you define the variables for a high availability cluster according to the requirements of your cluster deployment.

The variables you can set for an **ha_cluster** System Role are as follows.

ha_cluster_enable_repos

A boolean flag that enables the repositories containing the packages that are needed by the **ha_cluster** System Role. When this variable is set to **true**, the default value, you have active subscription coverage for RHEL and the RHEL High Availability Add-On on the systems that you will use as your cluster members or the System Role will fail.

ha_cluster_manage_firewall

A boolean flag that determines whether the **ha_cluster** System Role manages the firewall. When **ha_cluster_manage_firewall** is set to **true**, the firewall high availability service and the **fence-virt** port are enabled. When **ha_cluster_manage_firewall** is set to **false**, the **ha_cluster** System Role does not manage the firewall. If your system is running the **firewalld** service, you must set the parameter to **true** in your playbook.
You can use the **ha_cluster_manage_firewall** parameter to add ports, but you cannot use the parameter to remove ports. To remove ports, use the **firewall** System Role directly.

As of RHEL 7.9, the firewall is no longer configured by default, because it is configured only when **ha_cluster_manage_firewall** is set to **true**.

ha_cluster_manage_selinux

A boolean flag that determines whether the **ha_cluster** System Role manages the ports belonging to the firewall high availability service using the **selinux** System Role. When **ha_cluster_manage_selinux** is set to **true**, the ports belonging to the firewall high availability service are associated with the SELinux port type **cluster_port_t**. When **ha_cluster_manage_selinux** is set to **false**, the **ha_cluster** System Role does not manage SELinux. If your system is running the **selinux** service, you must set this parameter to **true** in your playbook. Firewall configuration is a prerequisite for managing SELinux. If the firewall is not installed, the managing SELinux policy is skipped.

You can use the **ha_cluster_manage_selinux** parameter to add policy, but you cannot use the parameter to remove policy. To remove policy, use the **selinux** System Role directly.

ha_cluster_cluster_present

A boolean flag which, if set to **true**, determines that HA cluster will be configured on the hosts according to the variables passed to the role. Any cluster configuration not specified in the role and not supported by the role will be lost.
If **ha_cluster_cluster_present** is set to **false**, all HA cluster configuration will be removed from the target hosts.

The default value of this variable is **true**.

The following example playbook removes all cluster configuration on **node1** and **node2**

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_present: false

  roles:
    - rhel-system-roles.ha_cluster
```

ha_cluster_start_on_boot

A boolean flag that determines whether cluster services will be configured to start on boot. The default value of this variable is **true**.

ha_cluster_fence_agent_packages

List of fence agent packages to install. The default value of this variable is **fence-agents-all**, **fence-virt**.

ha_cluster_extra_packages

List of additional packages to be installed. The default value of this variable is no packages.
This variable can be used to install additional packages not installed automatically by the role, for example custom resource agents.

It is possible to specify fence agents as members of this list. However, **ha_cluster_fence_agent_packages** is the recommended role variable to use for specifying fence agents, so that its default value is overridden.

ha_cluster_hacluster_password

A string value that specifies the password of the **hacluster** user. The **hacluster** user has full access to a cluster. It is recommended that you vault encrypt the password, as described in Encrypting content with Ansible Vault. There is no default password value, and this variable must be specified.

ha_cluster_corosync_key_src

The path to Corosync **authkey** file, which is the authentication and encryption key for Corosync communication. It is highly recommended that you have a unique **authkey** value for each cluster. The key should be 256 bytes of random data.
If you specify a key for this variable, it is recommended that you vault encrypt the key, as described in Encrypting content with Ansible Vault .

If no key is specified, a key already present on the nodes will be used. If nodes do not have the same key, a key from one node will be distributed to other nodes so that all nodes have the same key. If no node has a key, a new key will be generated and distributed to the nodes.

If this variable is set, **ha_cluster_regenerate_keys** is ignored for this key.

The default value of this variable is null.

ha_cluster_pacemaker_key_src

The path to the Pacemaker **authkey** file, which is the authentication and encryption key for Pacemaker communication. It is highly recommended that you have a unique **authkey** value for each cluster. The key should be 256 bytes of random data.
If you specify a key for this variable, it is recommended that you vault encrypt the key, as described in Encrypting content with Ansible Vault .

If no key is specified, a key already present on the nodes will be used. If nodes do not have the same key, a key from one node will be distributed to other nodes so that all nodes have the same key. If no node has a key, a new key will be generated and distributed to the nodes.

If this variable is set, **ha_cluster_regenerate_keys** is ignored for this key.

The default value of this variable is null.

ha_cluster_fence_virt_key_src

The path to the **fence-virt** or **fence-xvm** pre-shared key file, which is the location of the authentication key for the **fence-virt** or **fence-xvm** fence agent.
If you specify a key for this variable, it is recommended that you vault encrypt the key, as described in Encrypting content with Ansible Vault .

If no key is specified, a key already present on the nodes will be used. If nodes do not have the same key, a key from one node will be distributed to other nodes so that all nodes have the same key. If no node has a key, a new key will be generated and distributed to the nodes. If the **ha_cluster** System Role generates a new key in this fashion, you should copy the key to your nodes' hypervisor to ensure that fencing works.

If this variable is set, **ha_cluster_regenerate_keys** is ignored for this key.

The default value of this variable is null.

ha_cluster_pcsd_public_key_srcr, ha_cluster_pcsd_private_key_src

The path to the **pcsd** TLS certificate and private key. If this is not specified, a certificate-key pair already present on the nodes will be used. If a certificate-key pair is not present, a random new one will be generated.
If you specify a private key value for this variable, it is recommended that you vault encrypt the key, as described in Encrypting content with Ansible Vault .

If these variables are set, **ha_cluster_regenerate_keys** is ignored for this certificate-key pair.

The default value of these variables is null.

ha_cluster_pcsd_certificates

Creates a **pcsd** private key and certificate using the **certificate** System Role.
If your system is not configured with a **pcsd** private key and certificate, you can create them in one of two ways:

- Set the **ha_cluster_pcsd_certificates** variable. When you set the **ha_cluster_pcsd_certificates** variable, the **certificate** System Role is used internally and it creates the private key and certificate for **pcsd** as defined.
- Do not set the **ha_cluster_pcsd_public_key_src**, **ha_cluster_pcsd_private_key_src**, or the **ha_cluster_pcsd_certificates** variables. If you do not set any of these variables, the **ha_cluster** System Role will create **pcsd** certificates by means of **pcsd** itself. The value of **ha_cluster_pcsd_certificates** is set to the value of the variable **certificate_requests** as specified in the **certificate** System Role. For more information about the **certificate** System Role, see Requesting certificates using RHEL System Roles .

The following operational considerations apply to the use of the **ha_cluster_pcsd_certificate** variable:

- Unless you are using IPA and joining the systems to an IPA domain, the **certificate** System

Role creates self-signed certificates. In this case, you must explicitly configure trust settings outside of the context of RHEL System Roles. System Roles do not support configuring trust settings.

- When you set the **ha_cluster_pcsd_certificates** variable, do not set the **ha_cluster_pcsd_public_key_src** and **ha_cluster_pcsd_private_key_src** variables.
- When you set the **ha_cluster_pcsd_certificates** variable, **ha_cluster_regenerate_keys** is ignored for this certificate - key pair.

The default value of this variable is **[]**.
For an example **ha_cluster** System Role playbook that creates TLS certificates and key files in a high availability cluster, see Creating pcsd TLS certificates and key files for a high availability cluster .

ha_cluster_regenerate_keys

A boolean flag which, when set to **true**, determines that pre-shared keys and TLS certificates will be regenerated. For more information about when keys and certificates will be regenerated, see the descriptions of the **ha_cluster_corosync_key_src**, **ha_cluster_pacemaker_key_src**, **ha_cluster_fence_virt_key_src**, **ha_cluster_pcsd_public_key_src**, and **ha_cluster_pcsd_private_key_src** variables.

The default value of this variable is **false**.

ha_cluster_pcs_permission_list

Configures permissions to manage a cluster using **pcsd**. The items you configure with this variable are as follows:

- **type** - **user** or **group**
- **name** - user or group name
- **allow_list** - Allowed actions for the specified user or group:
  - **read** - View cluster status and settings
  - **write** - Modify cluster settings except permissions and ACLs
  - **grant** - Modify cluster permissions and ACLs
  - **full** - Unrestricted access to a cluster including adding and removing nodes and access to keys and certificates

The structure of the **ha_cluster_pcs_permission_list** variable and its default values are as follows:

```
ha_cluster_pcs_permission_list:
  - type: group
    name: hacluster
    allow_list:
      - grant
      - read
      - write
```

ha_cluster_cluster_name

The name of the cluster. This is a string value with a default of **my-cluster**.

ha_cluster_transport

Sets the cluster transport method. The items you configure with this variable are as follows:

- **type** (optional) - Transport type: **knet**, **udp**, or **udpu**. The **udp** and **udpu** transport types support only one link. Encryption is always disabled for **udp** and **udpu**. Defaults to **knet** if not specified.
- **options** (optional) - List of name-value dictionaries with transport options.
- **links** (optional) - List of list of name-value dictionaries. Each list of name-value dictionaries holds options for one Corosync link. It is recommended that you set the **linknumber** value for each link. Otherwise, the first list of dictionaries is assigned by default to the first link, the second one to the second link, and so on.
- **compression** (optional) - List of name-value dictionaries configuring transport compression. Supported only with the **knet** transport type.
- **crypto** (optional) - List of name-value dictionaries configuring transport encryption. By default, encryption is enabled. Supported only with the **knet** transport type.
  For a list of allowed options, see the **pcs -h cluster setup** help page or the **setup** description in the **cluster** section of the **pcs**(8) man page. For more detailed descriptions, see the **corosync.conf**(5) man page.

  The structure of the **ha_cluster_transport** variable is as follows:

```
ha_cluster_transport:
  type: knet
  options:
    - name: option1_name
      value: option1_value
    - name: option2_name
      value: option2_value
  links:
    -
      - name: option1_name
        value: option1_value
      - name: option2_name
        value: option2_value
    -
      - name: option1_name
        value: option1_value
      - name: option2_name
        value: option2_value
  compression:
    - name: option1_name
      value: option1_value
    - name: option2_name
      value: option2_value
  crypto:
    - name: option1_name
      value: option1_value
    - name: option2_name
      value: option2_value
```

  For an example **ha_cluster** System Role playbook that configures a transport method, see Configuring Corosync values in a high availability cluster .

ha_cluster_totem

Configures Corosync totem. For a list of allowed options, see the **pcs -h cluster setup** help page or the **setup** description in the **cluster** section of the **pcs**(8) man page. For a more detailed description, see the **corosync.conf**(5) man page.
The structure of the **ha_cluster_totem** variable is as follows:

```
ha_cluster_totem:
  options:
    - name: option1_name
      value: option1_value
    - name: option2_name
      value: option2_value
```

For an example **ha_cluster** System Role playbook that configures a Corosync totem, see Configuring Corosync values in a high availability cluster .

ha_cluster_quorum

Configures cluster quorum. You can configure the following items for cluster quorum:

- **options** (optional) - List of name-value dictionaries configuring quorum. Allowed options are: **auto_tie_breaker**, **last_man_standing**, **last_man_standing_window**, and **wait_for_all**. For information about quorum options, see the **votequorum**(5) man page.

- **device** (optional) -

Configures the cluster to use a quorum device. By default, no quorum device is used. ** **model** (mandatory) - Specifies a quorum device model. Only **net** is supported

+ ** **model_options** (optional) - List of name-value dictionaries configuring the specified quorum device model. For model **net**, you must specify **host** and **algorithm** options.

+ Use the **pcs-address** option to set a custom **pcsd** address and port to connect to the **qnetd** host. If you do not specify this option, the role connects to the default **pcsd** port on the **host**.

+ ** **generic_options** (optional) - List of name-value dictionaries setting quorum device options that are not model specific.

+ ** **heuristics_options** (optional) - List of name-value dictionaries configuring quorum device heuristics.

+ For information about quorum device options, see the **corosync-qdevice**(8) man page. The generic options are **sync_timeout** and **timeout**. For model **net** options see the **quorum.device.net** section. For heuristics options, see the **quorum.device.heuristics** section.

+ To regenerate a quorum device TLS certificate, set the **ha_cluster_regenerate_keys** variable to **true**.

+ :: The structure of the **ha_cluster_quorum** variable is as follows:

+

```
ha_cluster_quorum:
  options:
    - name: option1_name
      value: option1_value
```

```
    - name: option2_name
      value: option2_value
  device:
    model: string
    model_options:
      - name: option1_name
        value: option1_value
      - name: option2_name
        value: option2_value
    generic_options:
      - name: option1_name
        value: option1_value
      - name: option2_name
        value: option2_value
    heuristics_options:
      - name: option1_name
        value: option1_value
      - name: option2_name
        value: option2_value
```

+ For an example **ha_cluster** System Role playbook that configures cluster quorum, see Configuring Corosync values in a high availability cluster. For an example **ha_cluster** System Role playbook that configures a cluster using a quorum device, see Configuring a high availability cluster using a quorum device.

ha_cluster_sbd_enabled

A boolean flag which determines whether the cluster can use the SBD node fencing mechanism. The default value of this variable is **false**.
For an example **ha_cluster** System Role playbook that enables SBD, see Configuring a high availability cluster with SBD node fencing.

ha_cluster_sbd_options

List of name-value dictionaries specifying SBD options. Supported options are:

- **delay-start** - defaults to **no**
- **startmode** - defaults to **always**
- **timeout-action** - defaults to **flush,reboot**
- **watchdog-timeout** - defaults to **5**
  For information about these options, see the **Configuration via environment** section of the **sbd**(8) man page.

For an example **ha_cluster** System Role playbook that configures SBD options, see Configuring a high availability cluster with SBD node fencing.
When using SBD, you can optionally configure watchdog and SBD devices for each node in an inventory. For information about configuring watchdog and SBD devices in an inventory file, see Specifying an inventory for the ha_cluster System Role .

ha_cluster_cluster_properties

List of sets of cluster properties for Pacemaker cluster-wide configuration. Only one set of cluster properties is supported.
The structure of a set of cluster properties is as follows:

```
ha_cluster_cluster_properties:
  - attrs:
      - name: property1_name
        value: property1_value
      - name: property2_name
        value: property2_value
```

By default, no properties are set.

The following example playbook configures a cluster consisting of **node1** and **node2** and sets the **stonith-enabled** and **no-quorum-policy** cluster properties.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_cluster_properties:
      - attrs:
          - name: stonith-enabled
            value: 'true'
          - name: no-quorum-policy
            value: stop

  roles:
    - rhel-system-roles.ha_cluster
```

ha_cluster_resource_primitives

This variable defines pacemaker resources configured by the System Role, including stonith resources, including stonith resources. You can configure the following items for each resource:

- **id** (mandatory) - ID of a resource.
- **agent** (mandatory) - Name of a resource or stonith agent, for example **ocf:pacemaker:Dummy** or **stonith:fence_xvm**. It is mandatory to specify **stonith:** for stonith agents. For resource agents, it is possible to use a short name, such as **Dummy**, instead of **ocf:pacemaker:Dummy**. However, if several agents with the same short name are installed, the role will fail as it will be unable to decide which agent should be used. Therefore, it is recommended that you use full names when specifying a resource agent.
- **instance_attrs** (optional) - List of sets of the resource's instance attributes. Currently, only one set is supported. The exact names and values of attributes, as well as whether they are mandatory or not, depend on the resource or stonith agent.
- **meta_attrs** (optional) - List of sets of the resource's meta attributes. Currently, only one set is supported.
- **operations** (optional) - List of the resource's operations.
  - **action** (mandatory) - Operation action as defined by pacemaker and the resource or stonith agent.
  - **attrs** (mandatory) - Operation options, at least one option must be specified.

The structure of the resource definition that you configure with the **ha_cluster** System Role is as follows.

```
- id: resource-id
  agent: resource-agent
  instance_attrs:
    - attrs:
        - name: attribute1_name
          value: attribute1_value
        - name: attribute2_name
          value: attribute2_value
  meta_attrs:
    - attrs:
        - name: meta_attribute1_name
          value: meta_attribute1_value
        - name: meta_attribute2_name
          value: meta_attribute2_value
  operations:
    - action: operation1-action
      attrs:
        - name: operation1_attribute1_name
          value: operation1_attribute1_value
        - name: operation1_attribute2_name
          value: operation1_attribute2_value
    - action: operation2-action
      attrs:
        - name: operation2_attribute1_name
          value: operation2_attribute1_value
        - name: operation2_attribute2_name
          value: operation2_attribute2_value
```

By default, no resources are defined.

For an example **ha_cluster** System Role playbook that includes resource configuration, see Configuring a high availability cluster with fencing and resources .

ha_cluster_resource_groups

This variable defines pacemaker resource groups configured by the System Role. You can configure the following items for each resource group:

- **id** (mandatory) - ID of a group.
- **resources** (mandatory) - List of the group's resources. Each resource is referenced by its ID and the resources must be defined in the **ha_cluster_resource_primitives** variable. At least one resource must be listed.
- **meta_attrs** (optional) - List of sets of the group's meta attributes. Currently, only one set is supported.

The structure of the resource group definition that you configure with the **ha_cluster** System Role is as follows.

```
ha_cluster_resource_groups:
  - id: group-id
    resource_ids:
      - resource1-id
      - resource2-id
    meta_attrs:
```

```
    - attrs:
      - name: group_meta_attribute1_name
        value: group_meta_attribute1_value
      - name: group_meta_attribute2_name
        value: group_meta_attribute2_value
```

By default, no resource groups are defined.

For an example **ha_cluster** System Role playbook that includes resource group configuration, see Configuring a high availability cluster with fencing and resources .

ha_cluster_resource_clones

This variable defines pacemaker resource clones configured by the System Role. You can configure the following items for a resource clone:

- **resource_id** (mandatory) - Resource to be cloned. The resource must be defined in the **ha_cluster_resource_primitives** variable or the **ha_cluster_resource_groups** variable.
- **promotable** (optional) - Indicates whether the resource clone to be created is a promotable clone, indicated as **true** or **false**.
- **id** (optional) - Custom ID of the clone. If no ID is specified, it will be generated. A warning will be displayed if this option is not supported by the cluster.
- **meta_attrs** (optional) - List of sets of the clone's meta attributes. Currently, only one set is supported.

The structure of the resource clone definition that you configure with the **ha_cluster** System Role is as follows.

```
ha_cluster_resource_clones:
  - resource_id: resource-to-be-cloned
    promotable: true
    id: custom-clone-id
    meta_attrs:
      - attrs:
          - name: clone_meta_attribute1_name
            value: clone_meta_attribute1_value
          - name: clone_meta_attribute2_name
            value: clone_meta_attribute2_value
```

By default, no resource clones are defined.

For an example **ha_cluster** System Role playbook that includes resource clone configuration, see Configuring a high availability cluster with fencing and resources .

ha_cluster_constraints_location

This variable defines resource location constraints. Resource location constraints indicate which nodes a resource can run on. You can specify a resources specified by a resource ID or by a pattern, which can match more than one resource. You can specify a node by a node name or by a rule.
You can configure the following items for a resource location constraint:

- **resource** (mandatory) - Specification of a resource the constraint applies to.
- **node** (mandatory) - Name of a node the resource should prefer or avoid.

- **id** (optional) - ID of the constraint. If not specified, it will be autogenerated.
- **options** (optional) - List of name-value dictionaries.
  - **score** - Sets the weight of the constraint.
    - A positive **score** value means the resource prefers running on the node.
    - A negative **score** value means the resource should avoid running on the node.
    - A **score** value of **-INFINITY** means the resource must avoid running on the node.
    - If **score** is not specified, the score value defaults to **INFINITY**.

By default no resource location constraints are defined.
The structure of a resource location constraint specifying a resource ID and node name is as follows:

```
ha_cluster_constraints_location:
  - resource:
      id: resource-id
    node: node-name
    id: constraint-id
    options:
      - name: score
        value: score-value
      - name: option-name
        value: option-value
```

The items that you configure for a resource location constraint that specifies a resource pattern are the same items that you configure for a resource location constraint that specifies a resource ID, with the exception of the resource specification itself. The item that you specify for the resource specification is as follows:

- **pattern** (mandatory) - POSIX extended regular expression resource IDs are matched against.

The structure of a resource location constraint specifying a resource pattern and node name is as follows:

```
ha_cluster_constraints_location:
  - resource:
      pattern: resource-pattern
    node: node-name
    id: constraint-id
    options:
      - name: score
        value: score-value
      - name: resource-discovery
        value: resource-discovery-value
```

You can configure the following items for a resource location constraint that specifies a resource ID and a rule:

- **resource** (mandatory) - Specification of a resource the constraint applies to.
  - **id** (mandatory) - Resource ID.

    - **role** (optional) - The resource role to which the constraint is limited: **Started**, **Unpromoted**, **Promoted**.

- **rule** (mandatory) - Constraint rule written using **pcs** syntax. For further information, see the **constraint location** section of the **pcs**(8) man page.

- Other items to specify have the same meaning as for a resource constraint that does not specify a rule.

The structure of a resource location constraint that specifies a resource ID and a rule is as follows:

```
ha_cluster_constraints_location:
  - resource:
      id: resource-id
      role: resource-role
    rule: rule-string
    id: constraint-id
    options:
      - name: score
        value: score-value
      - name: resource-discovery
        value: resource-discovery-value
```

The items that you configure for a resource location constraint that specifies a resource pattern and a rule are the same items that you configure for a resource location constraint that specifies a resource ID and a rule, with the exception of the resource specification itself. The item that you specify for the resource specification is as follows:

- **pattern** (mandatory) - POSIX extended regular expression resource IDs are matched against.

The structure of a resource location constraint that specifies a resource pattern and a rule is as follows:

```
ha_cluster_constraints_location:
  - resource:
      pattern: resource-pattern
      role: resource-role
    rule: rule-string
    id: constraint-id
    options:
      - name: score
        value: score-value
      - name: resource-discovery
        value: resource-discovery-value
```

For an example **ha_cluster** system role playbook that creates a cluster with resource constraints, see Configuring a high availability cluster with resource constraints .

ha_cluster_constraints_colocation

This variable defines resource colocation constraints. Resource colocation constraints indicate that the location of one resource depends on the location of another one. There are two types of colocation constraints: a simple colocation constraint for two resources, and a set colocation constraint for multiple resources.

You can configure the following items for a simple resource colocation constraint:

- **resource_follower** (mandatory) - A resource that should be located relative to **resource_leader**.
  - **id** (mandatory) - Resource ID.
  - **role** (optional) - The resource role to which the constraint is limited: **Started**, **Unpromoted**, **Promoted**.
- **resource_leader** (mandatory) - The cluster will decide where to put this resource first and then decide where to put **resource_follower**.
  - **id** (mandatory) - Resource ID.
  - **role** (optional) - The resource role to which the constraint is limited: **Started**, **Unpromoted**, **Promoted**.
- **id** (optional) - ID of the constraint. If not specified, it will be autogenerated.
- **options** (optional) - List of name-value dictionaries.
  - **score** - Sets the weight of the constraint.
    - Positive **score** values indicate the resources should run on the same node.
    - Negative **score** values indicate the resources should run on different nodes.
    - A **score** value of **+INFINITY** indicates the resources must run on the same node.
    - A **score** value of **-INFINITY** indicates the resources must run on different nodes.
    - If **score** is not specified, the score value defaults to **INFINITY**.

By default no resource colocation constraints are defined.
The structure of a simple resource colocation constraint is as follows:

```
ha_cluster_constraints_colocation:
  - resource_follower:
      id: resource-id1
      role: resource-role1
    resource_leader:
      id: resource-id2
      role: resource-role2
    id: constraint-id
    options:
      - name: score
        value: score-value
      - name: option-name
        value: option-value
```

You can configure the following items for a resource set colocation constraint:

- **resource_sets** (mandatory) - List of resource sets.
  - **resource_ids** (mandatory) - List of resources in a set.

    - **options** (optional) - List of name-value dictionaries fine-tuning how resources in the sets are treated by the constraint.

- **id** (optional) - Same values as for a simple colocation constraint.
- **options** (optional) - Same values as for a simple colocation constraint.

The structure of a resource set colocation constraint is as follows:

```
ha_cluster_constraints_colocation:
 - resource_sets:
    - resource_ids:
       - resource-id1
       - resource-id2
      options:
       - name: option-name
         value: option-value
  id: constraint-id
  options:
    - name: score
      value: score-value
    - name: option-name
      value: option-value
```

For an example **ha_cluster** system role playbook that creates a cluster with resource constraints, see Configuring a high availability cluster with resource constraints .

ha_cluster_constraints_order

This variable defines resource order constraints. Resource order constraints indicate the order in which certain resource actions should occur. There are two types of resource order constraints: a simple order constraint for two resources, and a set order constraint for multiple resources.
You can configure the following items for a simple resource order constraint:

- **resource_first** (mandatory) - Resource that the **resource_then** resource depends on.
    - **id** (mandatory) - Resource ID.
    - **action** (optional) - The action that must complete before an action can be initiated for the **resource_then** resource. Allowed values: **start**, **stop**, **promote**, **demote**.
- **resource_then** (mandatory) - The dependent resource.
    - **id** (mandatory) - Resource ID.
    - **action** (optional) - The action that the resource can execute only after the action on the **resource_first** resource has completed. Allowed values: **start**, **stop**, **promote**, **demote**.
- **id** (optional) - ID of the constraint. If not specified, it will be autogenerated.
- **options** (optional) - List of name-value dictionaries.

By default no resource order constraints are defined.
The structure of a simple resource order constraint is as follows:

```
ha_cluster_constraints_order:
```

```
- resource_first:
    id: resource-id1
    action: resource-action1
  resource_then:
    id: resource-id2
    action: resource-action2
  id: constraint-id
  options:
    - name: score
      value: score-value
    - name: option-name
      value: option-value
```

You can configure the following items for a resource set order constraint:

- **resource_sets** (mandatory) - List of resource sets.
  - **resource_ids** (mandatory) - List of resources in a set.
  - **options** (optional) - List of name-value dictionaries fine-tuning how resources in the sets are treated by the constraint.
- **id** (optional) - Same values as for a simple order constraint.
- **options** (optional) - Same values as for a simple order constraint.

The structure of a resource set order constraint is as follows:

```
ha_cluster_constraints_order:
  - resource_sets:
      - resource_ids:
          - resource-id1
          - resource-id2
        options:
          - name: option-name
            value: option-value
    id: constraint-id
    options:
      - name: score
        value: score-value
      - name: option-name
        value: option-value
```

For an example **ha_cluster** system role playbook that creates a cluster with resource constraints, see Configuring a high availability cluster with resource constraints .

ha_cluster_constraints_ticket

This variable defines resource ticket constraints. Resource ticket constraints indicate the resources that depend on a certain ticket. There are two types of resource ticket constraints: a simple ticket constraint for one resource, and a ticket order constraint for multiple resources.
You can configure the following items for a simple resource ticket constraint:

- **resource** (mandatory) - Specification of a resource the constraint applies to.
  - **id** (mandatory) - Resource ID.

    - **role** (optional) - The resource role to which the constraint is limited: **Started**, **Unpromoted**, **Promoted**.

- **ticket** (mandatory) - Name of a ticket the resource depends on.
- **id** (optional) - ID of the constraint. If not specified, it will be autogenerated.
- **options** (optional) - List of name-value dictionaries.
    - **loss-policy** (optional) - Action to perform on the resource if the ticket is revoked.

By default no resource ticket constraints are defined.
The structure of a simple resource ticket constraint is as follows:

```
ha_cluster_constraints_ticket:
  - resource:
      id: resource-id
      role: resource-role
    ticket: ticket-name
    id: constraint-id
    options:
      - name: loss-policy
        value: loss-policy-value
      - name: option-name
        value: option-value
```

You can configure the following items for a resource set ticket constraint:

- **resource_sets** (mandatory) - List of resource sets.
    - **resource_ids** (mandatory) - List of resources in a set.
    - **options** (optional) - List of name-value dictionaries fine-tuning how resources in the sets are treated by the constraint.
- **ticket** (mandatory) - Same value as for a simple ticket constraint.
- **id** (optional) - Same value as for a simple ticket constraint.
- **options** (optional) - Same values as for a simple ticket constraint.

The structure of a resource set ticket constraint is as follows:

```
ha_cluster_constraints_ticket:
  - resource_sets:
      - resource_ids:
          - resource-id1
          - resource-id2
        options:
          - name: option-name
            value: option-value
    ticket: ticket-name
    id: constraint-id
    options:
      - name: option-name
        value: option-value
```

For an example **ha_cluster** system role playbook that creates a cluster with resource constraints, see Configuring a high availability cluster with resource constraints .

ha_cluster_qnetd

(RHEL 8.8 and later) This variable configures a **qnetd** host which can then serve as an external quorum device for clusters.
You can configure the following items for a **qnetd** host:

- **present** (optional) - If **true**, configure a **qnetd** instance on the host. If **false**, remove **qnetd** configuration from the host. The default value is **false**. If you set this **true**, you must set **ha_cluster_cluster_present** to **false**.
- **start_on_boot** (optional) - Configures whether the **qnetd** instance should start automatically on boot. The default value is **true**.
- **regenerate_keys** (optional) - Set this variable to **true** to regenerate the **qnetd** TLS certificate. If you regenerate the certificate, you must either re-run the role for each cluster to connect it to the **qnetd** host again or run **pcs** manually.

You cannot run **qnetd** on a cluster node because fencing would disrupt **qnetd** operation.
For an example **ha_cluster** System Role playbook that configures a cluster using a quorum device, see Configuring a cluster using a quorum device .

25.2. SPECIFYING AN INVENTORY FOR THE HA_CLUSTER SYSTEM ROLE

When configuring an HA cluster using the **ha_cluster** System Role playbook, you configure the names and addresses of the nodes for the cluster in an inventory.

25.2.1. Configuring node names and addresses in an inventory

For each node in an inventory, you can optionally specify the following items:

- **node_name** - the name of a node in a cluster.
- **pcs_address** - an address used by **pcs** to communicate with the node. It can be a name, FQDN or an IP address and it can include a port number.
- **corosync_addresses** - list of addresses used by Corosync. All nodes which form a particular cluster must have the same number of addresses and the order of the addresses matters.

The following example shows an inventory with targets **node1** and **node2**. **node1** and **node2** must be either fully qualified domain names or must otherwise be able to connect to the nodes as when, for example, the names are resolvable through the /**etc**/**hosts** file.

```
all:
  hosts:
    node1:
      ha_cluster:
        node_name: node-A
        pcs_address: node1-address
        corosync_addresses:
          - 192.168.1.11
          - 192.168.2.11
```

```
    node2:
      ha_cluster:
        node_name: node-B
        pcs_address: node2-address:2224
        corosync_addresses:
          - 192.168.1.12
          - 192.168.2.12
```

25.2.2. Configuring watchdog and SBD devices in an inventory

When using SBD, you can optionally configure watchdog and SBD devices for each node in an inventory. Even though all SBD devices must be shared to and accesible from all nodes, each node can use different names for the devices. Watchdog devices can be different for each node as well. For information on the SBD variables you can set in a system role playbook, see the entries for **ha_cluster_sbd_enabled** and **ha_cluster_sbd_options** in **ha_cluster** System Role variables.

For each node in an inventory, you can optionally specify the following items:

- **sbd_watchdog** - Watchdog device to be used by SBD. Defaults to **/dev/watchdog** if not set.
- **sbd_devices** - Devices to use for exchanging SBD messages and for monitoring. Defaults to empty list if not set.

The following example shows an inventory that configures watchdog and SBD devices for targets **node1** and **node2**.

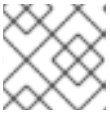
```
all:
  hosts:
    node1:
      ha_cluster:
        sbd_watchdog: /dev/watchdog2
        sbd_devices:
          - /dev/vdx
          - /dev/vdy
    node2:
      ha_cluster:
        sbd_watchdog: /dev/watchdog1
        sbd_devices:
          - /dev/vdw
          - /dev/vdz
```

25.3. CREATING PCSD TLS CERTIFICATES AND KEY FILES FOR A HIGH AVAILABILITY CLUSTER

You can use the **ha_cluster** System Role to create TLS certificates and key files in a high availability cluster. When you run this playbook, the **ha_cluster** System Role uses the **certificate** System Role internally to manage TLS certificates.

Prerequisites

- The **ansible-core** and the **rhel-system-roles** packages are installed on the node from which you want to run the playbook.



NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services and creates a self-signed **pcsd** certificate and private key files in **/var/lib/pcsd**. The **pcsd** certificate has the file name **FILENAME.crt** and the key file is named **FILENAME.key**.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_pcsd_certificates:
      - name: FILENAME
        common_name: "{{ ansible_hostname }}"
        ca: self-sign
  roles:
    - linux-system-roles.ha_cluster
```

3. Save the file.
4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

```
# ansible-playbook -i inventory new-cluster.yml
```

Additional resources

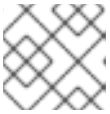
- Requesting certificates using RHEL System Roles

25.4. CONFIGURING A HIGH AVAILABILITY CLUSTER RUNNING NO RESOURCES

The following procedure uses the **ha_cluster** System Role, to create a high availability cluster with no fencing configured and which runs no resources.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.



NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services with no fencing configured and which runs no resources.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
```

```
roles:
  - rhel-system-roles.ha_cluster
```

3. Save the file.
4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

```
# ansible-playbook -i inventory new-cluster.yml
```

25.5. CONFIGURING A HIGH AVAILABILITY CLUSTER WITH FENCING AND RESOURCES

The following procedure uses the **ha_cluster** System Role to create a high availability cluster that includes a fencing device, cluster resources, resource groups, and a cloned resource.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.

NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services. The cluster includes fencing, several resources, and a resource group. It also includes a resource clone for the resource group.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_resource_primitives:
      - id: xvm-fencing
        agent: 'stonith:fence_xvm'
        instance_attrs:
          - attrs:
              - name: pcmk_host_list
                value: node1 node2
      - id: simple-resource
        agent: 'ocf:pacemaker:Dummy'
      - id: resource-with-options
        agent: 'ocf:pacemaker:Dummy'
        instance_attrs:
          - attrs:
              - name: fake
                value: fake-value
              - name: passwd
                value: passwd-value
        meta_attrs:
          - attrs:
              - name: target-role
                value: Started
              - name: is-managed
                value: 'true'
        operations:
          - action: start
            attrs:
              - name: timeout
                value: '30s'
          - action: monitor
            attrs:
              - name: timeout
                value: '5'
              - name: interval
                value: '1min'
      - id: dummy-1
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-2
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-3
        agent: 'ocf:pacemaker:Dummy'
      - id: simple-clone
        agent: 'ocf:pacemaker:Dummy'
      - id: clone-with-options
        agent: 'ocf:pacemaker:Dummy'
    ha_cluster_resource_groups:
      - id: simple-group
```

```
      resource_ids:
        - dummy-1
        - dummy-2
      meta_attrs:
        - attrs:
            - name: target-role
              value: Started
            - name: is-managed
              value: 'true'
    - id: cloned-group
      resource_ids:
        - dummy-3
  ha_cluster_resource_clones:
    - resource_id: simple-clone
    - resource_id: clone-with-options
      promotable: yes
      id: custom-clone-id
      meta_attrs:
        - attrs:
            - name: clone-max
              value: '2'
            - name: clone-node-max
              value: '1'
    - resource_id: cloned-group
      promotable: yes

roles:
  - rhel-system-roles.ha_cluster
```

3. Save the file.

4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

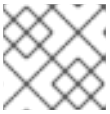
```
# ansible-playbook -i inventory new-cluster.yml
```

25.6. CONFIGURING A HIGH AVAILABILITY CLUSTER WITH RESOURCE CONSTRAINTS

The following procedure uses the **ha_cluster** system role to create a high availability cluster that includes resource location constraints, resource colocation constraints, resource order constraints, and resource ticket constraints.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.



NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.

- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** system role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services. The cluster includes resource location constraints, resource colocation constraints, resource order constraints, and resource ticket constraints.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    # In order to use constraints, we need resources the constraints will apply
    # to.
    ha_cluster_resource_primitives:
      - id: xvm-fencing
        agent: 'stonith:fence_xvm'
        instance_attrs:
          - attrs:
              - name: pcmk_host_list
                value: node1 node2
      - id: dummy-1
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-2
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-3
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-4
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-5
        agent: 'ocf:pacemaker:Dummy'
      - id: dummy-6
```

```
    agent: 'ocf:pacemaker:Dummy'
# location constraints
ha_cluster_constraints_location:
  # resource ID and node name
  - resource:
      id: dummy-1
    node: node1
    options:
      - name: score
        value: 20
  # resource pattern and node name
  - resource:
      pattern: dummy-\d+
    node: node1
    options:
      - name: score
        value: 10
  # resource ID and rule
  - resource:
      id: dummy-2
    rule: '#uname eq node2 and date in_range 2022-01-01 to 2022-02-28'
  # resource pattern and rule
  - resource:
      pattern: dummy-\d+
    rule: node-type eq weekend and date-spec weekdays=6-7
# colocation constraints
ha_cluster_constraints_colocation:
  # simple constraint
  - resource_leader:
      id: dummy-3
    resource_follower:
      id: dummy-4
    options:
      - name: score
        value: -5
  # set constraint
  - resource_sets:
      - resource_ids:
          - dummy-1
          - dummy-2
      - resource_ids:
          - dummy-5
          - dummy-6
        options:
          - name: sequential
            value: "false"
    options:
      - name: score
        value: 20
# order constraints
ha_cluster_constraints_order:
  # simple constraint
  - resource_first:
      id: dummy-1
    resource_then:
      id: dummy-6
```

```
      options:
        - name: symmetrical
          value: "false"
    # set constraint
    - resource_sets:
        - resource_ids:
            - dummy-1
            - dummy-2
          options:
            - name: require-all
              value: "false"
            - name: sequential
              value: "false"
        - resource_ids:
            - dummy-3
        - resource_ids:
            - dummy-4
            - dummy-5
          options:
            - name: sequential
              value: "false"
  # ticket constraints
  ha_cluster_constraints_ticket:
    # simple constraint
    - resource:
        id: dummy-1
      ticket: ticket1
      options:
        - name: loss-policy
          value: stop
    # set constraint
    - resource_sets:
        - resource_ids:
            - dummy-3
            - dummy-4
            - dummy-5
      ticket: ticket2
      options:
        - name: loss-policy
          value: fence

roles:
  - linux-system-roles.ha_cluster
```

3. Save the file.

4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

```
# ansible-playbook -i inventory new-cluster.yml
```

25.7. CONFIGURING COROSYNC VALUES IN A HIGH AVAILABILITY CLUSTER

The following procedure uses the **ha_cluster** System Role to create a high availability cluster that configures Corosync values.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.

NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, Vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services that configures Corosync properties.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_transport:
      type: knet
      options:
        - name: ip_version
          value: ipv4-6
        - name: link_mode
          value: active
    links:
      -
        - name: linknumber
```

```
          value: 1
        - name: link_priority
          value: 5
      -
        - name: linknumber
          value: 0
        - name: link_priority
          value: 10
    compression:
      - name: level
        value: 5
      - name: model
        value: zlib
    crypto:
      - name: cipher
        value: none
      - name: hash
        value: none
  ha_cluster_totem:
    options:
      - name: block_unlisted_ips
        value: 'yes'
      - name: send_join
        value: 0
  ha_cluster_quorum:
    options:
      - name: auto_tie_breaker
        value: 1
      - name: wait_for_all
        value: 1

roles:
  - linux-system-roles.ha_cluster
```

3. Save the file.

4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

```
# ansible-playbook -i inventory new-cluster.yml
```

25.8. CONFIGURING A HIGH AVAILABILITY CLUSTER WITH SBD NODE FENCING

The following procedure uses the **ha_cluster** System Role to create a high availability cluster that uses SBD node fencing.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.

NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role. You can optionally configure watchdog and SBD devices for each node in the cluster in an inventory file.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services that uses SBD fencing.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_sbd_enabled: yes
    ha_cluster_sbd_options:
      - name: delay-start
        value: 'no'
      - name: startmode
        value: always
      - name: timeout-action
        value: 'flush,reboot'
      - name: watchdog-timeout
        value: 5

  roles:
    - linux-system-roles.ha_cluster
```

3. Save the file.
4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

```
# ansible-playbook -i inventory new-cluster.yml
```

25.9. CONFIGURING A HIGH AVAILABILITY CLUSTER USING A QUORUM DEVICE

To configure a high availability cluster with a separate quorum device by using the **ha_cluster** System Role, first set up the quorum device. After setting up the quorum device, you can use the device in any number of clusters.

25.9.1. Configuring a quorum device

To configure a quorum device using the **ha_cluster** System Role, follow these steps. Note that you cannot run a quorum device on a cluster node.

Prerequisites

- The **ansible-core** and the **rhel-system-roles** packages are installed on the node from which you want to run the playbook.

NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

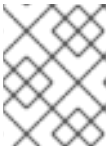
- The system that you will use to run the quorum device has active subscription coverage for RHEL and the RHEL High Availability Add-On.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create a playbook file, for example **qdev-playbook.yml**.



NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a quorum device on a system running the **firewalld** and **selinux** services.

```
- hosts: nodeQ
  vars:
    ha_cluster_cluster_present: false
    ha_cluster_hacluster_password: password
```

```
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_qnetd:
      present: true

  roles:
    - linux-system-roles.ha_cluster
```

2. Save the file.
3. Run the playbook, specifying the host node for the quorum device.

```
# ansible-playbook -i nodeQ, qdev-playbook.yml
```

25.9.2. Configuring a cluster to use a quorum device

To configure a cluster to use a quorum device, follow these steps.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.

NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.
- You have configured a quorum device.

WARNING

The **ha_cluster** system role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **new-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a cluster running the **firewalld** and **selinux** services that uses a quorum device.

```
- hosts: node1 node2
  vars:
    ha_cluster_cluster_name: my-new-cluster
    ha_cluster_hacluster_password: password
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_quorum:
      device:
        model: net
        model_options:
          - name: host
            value: nodeQ
          - name: algorithm
            value: lms

  roles:
    - linux-system-roles.ha_cluster
```

3. Save the file.

4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

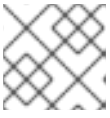
```
# ansible-playbook -i inventory new-cluster.yml
```

25.10. CONFIGURING AN APACHE HTTP SERVER IN A HIGH AVAILABILITY CLUSTER WITH THE HA_CLUSTER SYSTEM ROLE

This procedure configures an active/passive Apache HTTP server in a two-node Red Hat Enterprise Linux High Availability Add-On cluster using the **ha_cluster** System Role.

Prerequisites

- You have **ansible-core** installed on the node from which you want to run the playbook.



NOTE

You do not need to have **ansible-core** installed on the cluster member nodes.

- You have the **rhel-system-roles** package installed on the system from which you want to run the playbook.
- The systems that you will use as your cluster members have active subscription coverage for RHEL and the RHEL High Availability Add-On.
- Your system includes a public virtual IP address, required for Apache.

- Your system includes shared storage for the nodes in the cluster, using iSCSI, Fibre Channel, or other shared network block device.
- You have configured an LVM logical volume with an XFS file system, as described in Configuring an LVM volume with an XFS file system in a Pacemaker cluster.
- You have configured an Apache HTTP server, as described in Configuring an Apache HTTP Server.
- Your system includes an APC power switch that will be used to fence the cluster nodes.

WARNING

The **ha_cluster** System Role replaces any existing cluster configuration on the specified nodes. Any settings not specified in the role will be lost.

Procedure

1. Create an inventory file specifying the nodes in the cluster, as described in Specifying an inventory for the ha_cluster System Role.
2. Create a playbook file, for example **http-cluster.yml**.

NOTE

When creating your playbook file for production, vault encrypt the password, as described in Encrypting content with Ansible Vault .

The following example playbook file configures a previously-created Apache HTTP server in an active/passive two-node HA cluster running the **firewalld** and **selinux** services.

This example uses an APC power switch with a host name of **zapc.example.com**. If the cluster does not use any other fence agents, you can optionally list only the fence agents your cluster requires when defining the **ha_cluster_fence_agent_packages** variable, as in this example.

```
- hosts: z1.example.com z2.example.com
  roles:
    - rhel-system-roles.ha_cluster
  vars:
    ha_cluster_hacluster_password: password
    ha_cluster_cluster_name: my_cluster
    ha_cluster_manage_firewall: true
    ha_cluster_manage_selinux: true
    ha_cluster_fence_agent_packages:
      - fence-agents-apc-snmp
    ha_cluster_resource_primitives:
      - id: myapc
        agent: stonith:fence_apc_snmp
        instance_attrs:
          - attrs:
```

```
            - name: ipaddr
              value: zapc.example.com
            - name: pcmk_host_map
              value: z1.example.com:1;z2.example.com:2
            - name: login
              value: apc
            - name: passwd
              value: apc
      - id: my_lvm
        agent: ocf:heartbeat:LVM-activate
        instance_attrs:
          - attrs:
            - name: vgname
              value: my_vg
            - name: vg_access_mode
              value: system_id
      - id: my_fs
        agent: Filesystem
        instance_attrs:
          - attrs:
            - name: device
              value: /dev/my_vg/my_lv
            - name: directory
              value: /var/www
            - name: fstype
              value: xfs
      - id: VirtualIP
        agent: IPaddr2
        instance_attrs:
          - attrs:
            - name: ip
              value: 198.51.100.3
            - name: cidr_netmask
              value: 24
      - id: Website
        agent: apache
        instance_attrs:
          - attrs:
            - name: configfile
              value: /etc/httpd/conf/httpd.conf
            - name: statusurl
              value: http://127.0.0.1/server-status
    ha_cluster_resource_groups:
      - id: apachegroup
        resource_ids:
          - my_lvm
          - my_fs
          - VirtualIP
          - Website
```

3. Save the file.

4. Run the playbook, specifying the path to the inventory file *inventory* you created in Step 1.

```
# ansible-playbook -i inventory http-cluster.yml
```

5. When you use the **apache** resource agent to manage Apache, it does not use **systemd**. Because of this, you must edit the **logrotate** script supplied with Apache so that it does not use **systemctl** to reload Apache.
   Remove the following line in the **/etc/logrotate.d/httpd** file on each node in the cluster.

```
/bin/systemctl reload httpd.service > /dev/null 2>/dev/null || true
```

   - Replace the line you removed with the following three lines, specifying **/var/run/httpd-*website*.pid** as the PID file path where *website* is the name of the Apache resource. In this example, the Apache resource name is **Website**.

```
/usr/bin/test -f /var/run/httpd-Website.pid >/dev/null 2>/dev/null &&
/usr/bin/ps -q $(/usr/bin/cat /var/run/httpd-Website.pid) >/dev/null 2>/dev/null &&
/usr/sbin/httpd -f /etc/httpd/conf/httpd.conf -c "PidFile /var/run/httpd-Website.pid" -k
graceful > /dev/null 2>/dev/null || true
```

Verification steps

1. From one of the nodes in the cluster, check the status of the cluster. Note that all four resources are running on the same node, **z1.example.com**.
   If you find that the resources you configured are not running, you can run the **pcs resource debug-start *resource*** command to test the resource configuration.

```
[root@z1 ~]# pcs status
Cluster name: my_cluster
Last updated: Wed Jul 31 16:38:51 2013
Last change: Wed Jul 31 16:42:14 2013 via crm_attribute on z1.example.com
Stack: corosync
Current DC: z2.example.com (2) - partition with quorum
Version: 1.1.10-5.el7-9abe687
2 Nodes configured
6 Resources configured

Online: [ z1.example.com z2.example.com ]

Full list of resources:
 myapc  (stonith:fence_apc_snmp):       Started z1.example.com
 Resource Group: apachegroup
    my_lvm     (ocf::heartbeat:LVM-activate):   Started z1.example.com
    my_fs      (ocf::heartbeat:Filesystem):    Started z1.example.com
    VirtualIP  (ocf::heartbeat:IPaddr2):       Started z1.example.com
    Website    (ocf::heartbeat:apache):        Started z1.example.com
```

2. Once the cluster is up and running, you can point a browser to the IP address you defined as the **IPaddr2** resource to view the sample display, consisting of the simple word "Hello".

```
Hello
```

3. To test whether the resource group running on **z1.example.com** fails over to node **z2.example.com**, put node **z1.example.com** in **standby** mode, after which the node will no longer be able to host resources.

```
[root@z1 ~]# pcs node standby z1.example.com
```

4. After putting node **z1** in **standby** mode, check the cluster status from one of the nodes in the cluster. Note that the resources should now all be running on **z2**.

```
[root@z1 ~]# pcs status
Cluster name: my_cluster
Last updated: Wed Jul 31 17:16:17 2013
Last change: Wed Jul 31 17:18:34 2013 via crm_attribute on z1.example.com
Stack: corosync
Current DC: z2.example.com (2) - partition with quorum
Version: 1.1.10-5.el7-9abe687
2 Nodes configured
6 Resources configured

Node z1.example.com (1): standby
Online: [ z2.example.com ]

Full list of resources:

 myapc  (stonith:fence_apc_snmp):       Started z1.example.com
 Resource Group: apachegroup
     my_lvm     (ocf::heartbeat:LVM-activate):   Started z2.example.com
     my_fs      (ocf::heartbeat:Filesystem):    Started z2.example.com
     VirtualIP  (ocf::heartbeat:IPaddr2):       Started z2.example.com
     Website    (ocf::heartbeat:apache):        Started z2.example.com
```

   The web site at the defined IP address should still display, without interruption.

5. To remove **z1** from **standby** mode, enter the following command.

```
[root@z1 ~]# pcs node unstandby z1.example.com
```

NOTE

Removing a node from **standby** mode does not in itself cause the resources to fail back over to that node. This will depend on the **resource-stickiness** value for the resources. For information about the **resource-stickiness** meta attribute, see Configuring a resource to prefer its current node .

25.11. ADDITIONAL RESOURCES

- Preparing a control node and managed nodes to use RHEL System Roles .
- Documentation installed with the **rhel-system-roles** package in **/usr/share/ansible/roles/rhel-system-roles.logging/README.html**
- RHEL System Roles KB article
- The **ansible-playbook(1)** man page.

CHAPTER 26. INSTALLING AND CONFIGURING WEB CONSOLE WITH THE COCKPIT RHEL SYSTEM ROLE

With the **cockpit** RHEL System Role, you can install and configure the web console in your system.

26.1. THE COCKPIT SYSTEM ROLE

You can use the **cockpit** System Role to automatically deploy and enable the web console and thus be able to manage your RHEL systems from a web browser.

26.2. VARIABLES FOR THE COCKPIT RHEL SYSTEM ROLE

The parameters used for the **cockpit** RHEL System Roles are:

Role Variable	Description
cockpit_packages: (default: default)	Sets one of the predefined package sets: default, minimal, or full. * cockpit_packages: (default: default) - most common pages and on-demand install UI * cockpit_packages: (default: minimal) - just the Overview, Terminal, Logs, Accounts, and Metrics pages; minimal dependencies * cockpit_packages: (default: full) - all available pages Optionally, specify your own selection of cockpit packages you want to install.
cockpit_enabled: (default:true)	Configures if the web console web server is enabled to start automatically at boot
cockpit_started: (default:true)	Configures if the web console should be started
cockpit_config: (default: nothing)	You can apply settings in the **/etc/cockpit/cockpit.conf** file. NOTE: The previous settings file will be lost.
cockpit_port: (default: 9090)	The web console runs on port 9090 by default. You can change the port using this option.
cockpit_manage_firewall: (default: false)	Allows the **cockpit** role to control the **firewall** role to add ports. It cannot be used for removing ports. If you want to remove ports, you will need to use the firewall system role directly.

Role Variable	Description
cockpit_manage_selinux: (default: false)	Allows the **cockpit** role to configure SELinux using the **selinux** role. The default SELinux policy does not allow Cockpit to listen on anything other than port 9090. If you change the port, set this option to **true** so that the **selinux** role can set the correct port permissions (**websm_port_t**).
cockpit_certificates: (default: nothing)	Allows the **cockpit** role to generate new certificates using the **certificate** role. The value of **cockpit_certificates** is passed on to the **certificate_requests** variable of the **certificate** role. This role is called internally by the **cockpit** role and it generates the private key and certificate.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.cockpit/README.md** file.
- The Cockpit configuration file man page.

26.3. INSTALLING THE WEB CONSOLE BY USING THE COCKPIT RHEL SYSTEM ROLE

You can use the **cockpit** System Role to install and enable the RHEL web console.

By default, the RHEL web console uses a self-signed certificate. For security reasons, you can specify a certificate that was issued by a trusted certificate authority instead.

In this example, you use the **cockpit** System Role to:

- Install the RHEL web console.
- Allow the web console to manage **firewalld**.
- Set the web console to use a certificate from the **ipa** trusted certificate authority instead of using a self-signed certificate.
- Set the web console to use a custom port 9050.

NOTE

You do not have to call the **firewall** or **certificate** System Roles in the playbook to manage the Firewall or create the certificate. The **cockpit** System Role calls them automatically as needed.

Prerequisites

- Access and permissions to one or more *managed nodes*.
- Access and permissions to a *control node*.

On the control node:

- Red Hat Ansible Engine is installed.
- The **rhel-system-roles** package is installed.
- An inventory file exists that lists the managed nodes.

Procedure

1. Create a new ***playbook.yml*** file with the following content:

```
---
- hosts: all
  tasks:
    - name: Install RHEL web console
      include_role:
        name: rhel-system-roles.cockpit
      vars:
        cockpit_packages: default
        #cockpit_packages: minimal
        #cockpit_packages: full
        cockpit_port:9050
        cockpit_manage_selinux: true
        cockpit_manage_firewall: true
        cockpit_certificates:
          - name: /etc/cockpit/ws-certs.d/01-certificate
            dns: ['localhost', 'www.example.com']
            ca: ipa
            group: cockpit-ws
```

2. Optional: Verify the playbook syntax:

```
# ansible-playbook --syntax-check -i inventory_file playbook.yml
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/playbook.yml
```

Additional resources

- Installing and enabling the web console .
- Requesting certificates using RHEL System Roles .

CHAPTER 27. MANAGING CONTAINERS BY USING THE PODMAN RHEL SYSTEM ROLE

With the **podman** RHEL System Role, you can manage Podman configuration, containers, and **systemd** services which run Podman containers.

27.1. THE PODMAN RHEL SYSTEM ROLE

You can use the **podman** RHEL System Role to manage Podman configuration, containers, and systemd services which run Podman containers.

Additional resources

- Installing RHEL System Roles
- For details about the parameters used in **podman** and additional information about the **podman** RHEL System Role, see the **/usr/share/ansible/roles/rhel-system-roles.podman/README.md** file.

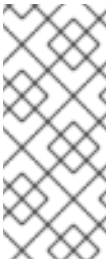
27.2. VARIABLES FOR THE PODMAN RHEL SYSTEM ROLE

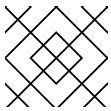
The parameters used for the **podman** RHEL System Role are:

Variable	Description

podman_kube_spec	Describes a podman pod and corresponding systemd unit to manage.
	• **state**: (default: **created**) - denotes an operation to be executed with **systemd** services and pods:
	  ◦ **created**: create the pods and **systemd** service, but do not run them
	  ◦ **started**: create the pods and **systemd** services and start them
	  ◦ **absent**: remove the pods and **systemd** services
	• **run_as_user**: (default: **podman_run_as_user**) - a per-pod user. If not specified, root is used.
	 
	NOTE
	The user must already exist.
	• **run_as_group** (default: **podman_run_as_group**) - a per-pod group. If not specified, root is used.

Variable	Description
	NOTE The group must already exist. • **systemd_unit_scope** (default: **podman_systemd_unit_scope**) - scope to use for the **systemd** unit. If not specified, **system** is used for root containers and **user** for user containers. • **kube_file_src** - name of a Kubernetes YAML file on the controller node which will be copied to **kube_file** on the managed node NOTE Do not specify the **kube_file_src** variable if you specify **kube_file_content** variable. The **kube_file_content** takes precedence over **kube_file_src**. • **kube_file_content** - string in Kubernetes YAML format or a dict in Kubernetes YAML format. It specifies the contents of **kube_file** on the managed node. NOTE Do not specify the **kube_file_content** variable if you specify **kube_file_src** variable. The **kube_file_content** takes precedence over **kube_file_src**. • **kube_file** - a name of a file on the managed node that contains the Kubernetes specification of the container or pod. You typically do not have to specify the **kube_file** variable unless you need to copy the **kube_file** file to the managed node outside of the role. If you specify either **kube_file_src** or **kube_file_content**, you do not have to specify this. NOTE It is highly recommended to omit **kube_file** and instead specify either **kube_file_src** or **kube_file_content** and let the role manage the file path and name.

Variable	Description
	○ The file basename will be the metadata.name value from the K8s yaml, with a **.yml** suffix appended to it. ○ The directory is **/etc/containers/ansible-kubernetes.d** for system services. ○ The directory is **$HOME/.config/containers/ansible-kubernetes.d** for user services. ○ This will be copied to the file **/etc/containers/ansible-kubernetes.d/*<application_name>*.yml** on the managed node.
podman_create_host_directories	If true, the role ensures host directories specified in host mounts in **volumes.hostPath** specifications in the Kubernetes YAML given in **podman_kube_specs**. The default value is false.  NOTE Directories must be specified as absolute paths (for root containers), or paths relative to the home directory (for non-root containers), in order for the role to manage them. Anything else is ignored. The role applies its default ownership or permissions to the directories. If you need to set ownership or permissions, see **podman_host_directories**.
podman_host_directories	It is a dict. If using **podman_create_host_directories** to tell the role to create host directories for volume mounts, and you need to specify permissions or ownership that apply to these created host directories, use **podman_host_directories**. Each key is the absolute path of the host directory to manage. The value is in the format of the parameters to the file module. If you do not specify a value, the role will use its built-in default values. If you want to specify a value to be used for all host directories, use the special key **DEFAULT**.
podman_firewall	It is a list of dict. Specifies ports that you want the role to manage in the firewall. This uses the same format as used by the firewall RHEL System Role.

Variable	Description
podman_selinux_ports	It is a list of dict. Specifies ports that you want the role to manage the SELinux policy for ports used by the role. This uses the same format as used by the selinux RHEL System Role.
podman_run_as_user	Specifies the name of the user to use for all rootless containers. You can also specify per-container username with **run_as_user** in **podman_kube_specs**.  NOTE The user must already exist.
podman_run_as_group	Specifies the name of the group to use for all rootless containers. You can also specify a per-container group name with **run_as_group** in **podman_kube_specs**.  NOTE The group must already exist.
podman_systemd_unit_scope	Defines the **systemd** scope to use by default for all **systemd** units. You can also specify per-container scope with **systemd_unit_scope** in **podman_kube_specs**. By default, rootless containers use **user** and root containers use **system**.
podman_containers_conf	Defines the **containers.conf(5)** settings as a dict. The setting is provided in a drop-in file in the **containers.conf.d** directory. If running as root (see **podman_run_as_user**), the **system** settings are managed. Otherwise, the **user** settings are managed. See the **containers.conf** man page for the directory locations.
podman_registries_conf	Defines the **containers-registries.conf(5)** settings as a dict. The setting is provided in a drop-in file in the **registries.conf.d** directory. If running as root (see **podman_run_as_user**), the **system** settings are managed. Otherwise, the **user** settings are managed. See the **registries.conf** man page for the directory locations.

Variable	Description
podman_storage_conf	Defines the **containers-storage.conf(5)** settings as a dict. If running as root (see **podman_run_as_user**), the **system** settings are managed. Otherwise, the **user** settings are managed. See the **storage.conf** man page for the directory locations.
podman_policy_json	Defines the **containers-policy.conf(5)** settings as a dict. If running as root (see **podman_run_as_user**), the **system** settings are managed. Otherwise, the **user** settings are managed. See the **policy.json** man page for the directory locations.

Additional resources

- Installing RHEL System Roles
- For details about the parameters used in **podman** and additional information about the **podman** RHEL System Role, see the **/usr/share/ansible/roles/rhel-system-roles.podman/README.md** file.

27.3. ADDITIONAL RESOURCES

- For details about the parameters used in **podman** and additional information about the **podman** RHEL System Role, see the **/usr/share/ansible/roles/rhel-system-roles.podman/README.md** file.
- For details about the **ansible-playbook** command, see the **ansible-playbook(1)** man page.

CHAPTER 28. INTEGRATING RHEL SYSTEMS DIRECTLY WITH AD USING RHEL SYSTEM ROLES

With the **ad_integration** System Role, you can automate a direct integration of a RHEL system with Active Directory (AD) using Red Hat Ansible Automation Platform.

This chapter covers the following topics:

- The **ad_integration** System Role
- Variables for the ad_integration RHEL System Role
- Connecting a RHEL system directly to AD using the **ad_integration** System Role

28.1. THE AD_INTEGRATION SYSTEM ROLE

Using the **ad_integration** System Role, you can directly connect a RHEL system to Active Directory (AD).

The role uses the following components:

- SSSD to interact with the central identity and authentication source
- **realmd** to detect available AD domains and configure the underlying RHEL system services, in this case SSSD, to connect to the selected AD domain

NOTE

The **ad_integration** role is for deployments using direct AD integration without an Identity Management (IdM) environment. For IdM environments, use the **ansible-freeipa** roles.

Additional resources

- Connecting RHEL systems directly to AD using SSSD .

28.2. VARIABLES FOR THE AD_INTEGRATION RHEL SYSTEM ROLE

The **ad_integration** RHEL System Role uses the following parameters:

Role Variable	Description
ad_integration_realm	Active Directory realm, or domain name to join.
ad_integration_password	The password of the user used to authenticate with when joining the machine to the realm. Do not use plain text. Instead, use Ansible Vault to encrypt the value.

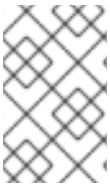
Role Variable	Description
ad_integration_manage_crypto_policies	If **true**, the **ad_integration** role will use **fedora.linux_system_roles.crypto_policies** as needed. Default: **false**
ad_integration_allow_rc4_crypto	If **true**, the **ad_integration** role will set the crypto policy to allow RC4 encryption. Providing this variable automatically sets **ad_integration_manage_crypto_policies** to **true**. Default: **false**
ad_integration_timesync_source	Hostname or IP address of time source to synchronize the system clock with. Providing this variable automatically sets **ad_integration_manage_timesync** to **true**.

Additional resources

- The **/usr/share/ansible/roles/rhel-system-roles.ad_integration/README.md** file.

28.3. CONNECTING A RHEL SYSTEM DIRECTLY TO AD USING THE AD_INTEGRATION SYSTEM ROLE

You can use the **ad_integration** System Role to configure a direct integration between a RHEL system and an AD domain by running an Ansible playbook.



NOTE

Starting with RHEL8, RHEL no longer supports RC4 encryption by default. If it is not possible to enable AES in the AD domain, you must enable the **AD-SUPPORT** crypto policy and allow RC4 encryption in the playbook.

IMPORTANT

Time between the RHEL server and AD must be synchronized. You can ensure this by using the **timesync** System Role in the playbook.

In this example, the RHEL system joins the **domain.example.com** AD domain, using the AD **Administrator** user and the password for this user stored in the Ansible vault. The playbook also sets the **AD-SUPPORT** crypto policy and allows RC4 encryption. To ensure time synchronization between the RHEL system and AD, the playbook sets the **adserver.domain.example.com** server as the **timesync** source.

Prerequisites

- Access and permissions to one or more *managed nodes*.
- Access and permissions to a *control node*.
  On the control node:
  - Red Hat Ansible Engine is installed.
  - The **rhel-system-roles** package is installed.
  - An inventory file which lists the managed nodes.
- The following ports on the AD domain controllers are open and accessible from the RHEL server:

Table 28.1. Ports Required for Direct Integration of Linux Systems into AD Using the ad_integration System Role

Source Port	Destination Port	Protocol	Service
1024:65535	53	UDP and TCP	DNS
1024:65535	389	UDP and TCP	LDAP
1024:65535	636	TCP	LDAPS
1024:65535	88	UDP and TCP	Kerberos
1024:65535	464	UDP and TCP	Kerberos change/set password (**kadmin**)
1024:65535	3268	TCP	LDAP Global Catalog
1024:65535	3269	TCP	LDAP Global Catalog SSL/TLS
1024:65535	123	UDP	NTP/Chrony (Optional)
1024:65535	323	UDP	NTP/Chrony (Optional)

Procedure

1. Create a new **ad_integration.yml** file with the following content:

```
---
- hosts: all
  vars:
    ad_integration_realm: "domain.example.com"
    ad_integration_password: !vault | vault encrypted password
    ad_integration_manage_crypto_policies: true
    ad_integration_allow_rc4_crypto: true
```

```
    ad_integration_timesync_source: "adserver.domain.example.com"
  roles:
    - linux-system-roles.ad_integration
---
```

2. Optional: Verify playbook syntax.

```
# ansible-playbook --syntax-check ad_integration.yml -i inventory_file
```

3. Run the playbook on your inventory file:

```
# ansible-playbook -i inventory_file /path/to/file/ad_integration.yml
```

Verification

- Display an AD user details, such as the **administrator** user:

```
getent passwd administrator@ad.example.com
administrator@ad.example.com:*:1450400500:1450400513:Administrator:/home/administrator
@ad.example.com:/bin/bash
```

28.4. ADDITIONAL RESOURCES

- The **/usr/share/ansible/roles/rhel-system-roles.ad_integration/README.md** file.
- **man ansible-playbook(1)**