# Table of Contents

Client Configuration Guide Overview ........................................... 1

Supported Clients and Features ............................................. 2

Supported Client Systems ......................................................... 2

Supported Tools Packages ........................................................ 3

Supported SUSE and openSUSE Client Features ............................. 4

Supported SUSE Linux Enterprise Server with Expanded Support Features ............ 7

Supported Red Hat Enterprise Linux Features ................................ 9

Supported CentOS Features ..................................................... 12

Supported Oracle Features ..................................................... 14

Supported Ubuntu Features .................................................... 16

Supported Debian Features ..................................................... 19

Software Channels ................................................................. 22

Packages Provided by SUSE Package Hub .................................. 22

Packages Provided by AppStream .............................................. 22

Unified Installer Updates Channels on SUSE Linux Enterprise Clients ............. 23

Software Repositories ............................................................. 23

Local Repository Locations ...................................................... 23

Software Products .................................................................... 24

Using GPG Keys ........................................................................ 25

Activation Keys ......................................................................... 26

Combining Multiple Activation Keys .......................................... 27

Reactivation Keys ..................................................................... 29

Activation Key Best Practices .................................................... 29

Bootstrap Repository ................................................................. 32

Prepare to Create a Bootstrap Repository .................................... 32

Options for Automatic Mode ...................................................... 32

Configure Bootstrap Data File .................................................... 33

Manually Generate a Bootstrap Repository ................................... 33

Repositories with Multiple Architectures .................................... 34

Bootstrap and Custom Channels ................................................... 34

Contact Methods ...................................................................... 35

SUSE Manager Daemon (rhnsd) .................................................. 35

Configure rhnsd ....................................................................... 36

Push via SSH ........................................................................... 37

Push via Salt SSH ..................................................................... 41

Available Parameters ............................................................... 42

Action Execution ...................................................................... 42

Future Features ....................................................................... 43

OSAD .................................................................................... 43

Client Registration Overview ..................................................... 46

Register Clients with the WebUI .................................................. 46

Register Clients with a Bootstrap Script ...................................... 47

Create Bootstrap Script .............................................................. 48

Editing Bootstrap Script ............................................................. 49

Connect Clients ....................................................................... 49

Register on the Command Line (Salt) ........................................... 50
GCE UUID ................................................................. 152
VHM and Kubernetes ............................................. 152
  Create a Kubernetes VHM ...................................... 153
  Retrieve Image Runtime Data .................................. 154
  Permissions and Certificates .................................. 156
Virtualization with Nutanix ..................................... 156
  VHM Setup .......................................................... 156
Virtualization with VMWare ...................................... 157
  VHM Setup .......................................................... 158
  Troubleshooting SSL Errors on VMWare ..................... 159
Virtualization with Other Third Party Providers .......... 159
Troubleshooting Clients ....................................... 162
  Autoinstallation ................................................... 162
  Bare Metal Systems .............................................. 162
  Cloned Salt Clients ............................................. 163
  Disabling the FQDNS grain ..................................... 163
  Mounting /tmp with noexec .................................... 164
  Passing Grains to a Start Event ............................... 164
  Proxy Connections and FQDN ................................. 165
  Registering Older Clients .................................... 165
GNU Free Documentation License ............................ 166
Client Configuration Guide Overview

Publication Date: 2020-09-17

Registering clients is the first step after installing Uyuni, and most of the time you spend with Uyuni will be spent on maintaining those clients.

Uyuni is compatible with a range of client technologies: you can install traditional or Salt clients, running SUSE Linux Enterprise or another Linux operating system, with a range of hardware options.

For a complete list of supported clients and features, see [Client-configuration › Supported-features ›].

This guide discusses how to register and configure different clients, both manually and automatically.
Supported Clients and Features

Uyuni is compatible with a range of client technologies. You can install traditional or Salt clients, running SUSE Linux Enterprise or another Linux operating system, with a range of hardware options.

This section contains summary of supported client systems. For a detailed list of features available on each client, see the following pages.

Supported Client Systems

Supported operating systems for traditional and Salt clients are listed in this table.

The icons in this table indicate:

- ✓ clients running this operating system are supported by SUSE
- ✗ clients running this operating system are not supported by SUSE
- ? clients are under consideration, and may or may not be supported at a later date.

Client operating system versions and SP levels must be under general support (normal or LTSS) to be supported with Uyuni. For details on supported product versions, see https://www.suse.com/lifecycle.

The operating system you run on a client is supported by the organization that supplies the operating system.

Table 1. Supported Client Systems

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Architecture</th>
<th>Traditional Clients</th>
<th>Salt Clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUSE Linux Enterprise 15</td>
<td>x86_64, POWER, IBM Z, ARM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SUSE Linux Enterprise 12</td>
<td>x86_64, POWER, IBM Z, ARM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SUSE Linux Enterprise 11</td>
<td>x86, x86_64, Itanium, IBM POWER, IBM Z</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server for SAP</td>
<td>x86_64, POWER</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>openSUSE Leap 15</td>
<td>x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server ES 8</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server ES 7</td>
<td>x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Operating System</td>
<td>Architecture</td>
<td>Traditional Clients</td>
<td>Salt Clients</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------</td>
<td>---------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server ES 6</td>
<td>x86, x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 8</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 7</td>
<td>x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 6</td>
<td>x86, x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Oracle Linux 8</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Oracle Linux 7</td>
<td>x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Oracle Linux 6</td>
<td>x86, x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CentOS 8</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>CentOS 7</td>
<td>x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CentOS 6</td>
<td>x86, x86_64</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ubuntu 20.04</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Ubuntu 18.04</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Ubuntu 16.04</td>
<td>x86_64</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Debian 10</td>
<td>x86_64, aarch64, armv7l, i586</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Debian 9</td>
<td>x86_64, aarch64, armv7l, i586</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Supported Tools Packages**

The `spacewalk-utils` and `spacewalk-utils-extras` packages can provide additional services and features. The `spacewalk-utils` package in Uyuni 4.1 and later is fully supported by SUSE, and contains these tools:

**Table 2. Spacewalk Utilities**

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Description</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>spacewalk-common-channels</code></td>
<td>Add channels not provided by SUSE Customer Center</td>
<td>✓</td>
</tr>
<tr>
<td><code>spacewalk-hostname-rename</code></td>
<td>Change the hostname of the Uyuni Server</td>
<td>✓</td>
</tr>
<tr>
<td><code>spacewalk-clone-by-date</code></td>
<td>Clone channels by a specific date</td>
<td>✓</td>
</tr>
</tbody>
</table>
The `spacewalk-utils-extras` package in Uyuni 4.1 and later has limited support by SUSE.

### Supported SUSE and openSUSE Client Features

This table lists the availability of various features on SUSE and openSUSE clients. This table covers all variants of the SUSE Linux Enterprise operating system, including SLES, SLED, SUSE Linux Enterprise Server for SAP, and SUSE Linux Enterprise Server for HPC.

The operating system you run on a client is supported by the organization that supplies the operating system. SUSE Linux Enterprise is supported by SUSE. openSUSE is supported by the SUSE community.

The icons in this table indicate:

- ✅ the feature is available on both Salt and traditional clients
- ❌ the feature is not available
- ❓ the feature is under consideration, and may or may not be made available at a later date
- ⚠️ Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients.

#### Table 3. Supported Features on SUSE and openSUSE Operating Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>SUSE Linux Enterprise 11</th>
<th>SUSE Linux Enterprise 12</th>
<th>SUSE Linux Enterprise 15</th>
<th>openSUSE 15.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>System packages</td>
<td>SUSE</td>
<td>SUSE</td>
<td>SUSE</td>
<td>openSUSE Community</td>
</tr>
<tr>
<td>Registration</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Apply patches</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Remote commands</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Feature</td>
<td>SUSE Linux Enterprise 11</td>
<td>SUSE Linux Enterprise 12</td>
<td>SUSE Linux Enterprise 15</td>
<td>openSUSE 15.1</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Basic Virtual Guest Management</td>
<td>Traditional</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management ×</td>
<td>✗</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (AutoYaST), as Host OS</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>✗</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Management</td>
<td>✗</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System deployment (PXE/AutoYaST)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>System redeployment (AutoYaST)</td>
<td>Traditional</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Feature</td>
<td>SUSE Linux Enterprise 11</td>
<td>SUSE Linux Enterprise 12</td>
<td>SUSE Linux Enterprise 15</td>
<td>openSUSE 15.1</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>Salt</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>Salt</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>Salt</td>
</tr>
<tr>
<td>Package verification</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Package locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>System locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Maintenance Windows</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>System snapshot</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>Salt</td>
</tr>
<tr>
<td>Package profiles</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Power management</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Monitoring</td>
<td>✗ (? )</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>✗</td>
<td>Salt</td>
<td>Salt</td>
<td>✗ (?)</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>✗ (? )</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>✗ (? )</td>
<td>Salt</td>
<td>✗ (?)</td>
<td>✗ (? )</td>
</tr>
<tr>
<td>Build Kiwi image with OS</td>
<td>✗ (? )</td>
<td>Salt</td>
<td>✗ (?)</td>
<td>✗ (? )</td>
</tr>
<tr>
<td>Recurring Actions</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>AppStreams</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Yomi</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

* Virtual Guest Management:

In this table, virtual guest management is split into basic and advanced.
Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop, resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.

Supported SUSE Linux Enterprise Server with Expanded Support Features

This table lists the availability of various features on SUSE Linux Enterprise Server with Expanded Support clients.

The operating system you run on a client is supported by the organization that supplies the operating system. SUSE Linux Enterprise Server with Expanded Support is supported by SUSE.

The icons in this table indicate:

- ✔ the feature is available on both Salt and traditional clients
- ✗ the feature is not available
- ? the feature is under consideration, and may or may not be made available at a later date
- Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients.

Table 4. Supported Features on SUSE Linux Enterprise Server with Expanded Support Operating Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>SLES ES 6</th>
<th>SLES ES 7</th>
<th>SLES ES 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>System packages</td>
<td>SUSE</td>
<td>SUSE</td>
<td>SUSE</td>
</tr>
<tr>
<td>Registration</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Apply patches</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Remote commands</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Feature</td>
<td>SLES ES 6</td>
<td>SLES ES 7</td>
<td>SLES ES 8</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Basic Virtual Guest Management</td>
<td>Traditional</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management</td>
<td>❌</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (Kickstart), as Host OS</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>Traditional</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>System deployment (PXE/Kickstart)</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>System redeployment (Kickstart)</td>
<td>Traditional</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>❌</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Package verification</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Package locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>System locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Maintenance Windows</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>System snapshot</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Salt</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Snapshots and profiles</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Feature</td>
<td>SLES ES 6</td>
<td>SLES ES 7</td>
<td>SLES ES 8</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Power management</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Kiwi image with OS</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Recurring Actions</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>AppStreams</td>
<td>N/A</td>
<td>N/A</td>
<td>✓</td>
</tr>
<tr>
<td>Yomi</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Virtual Guest Management:**

In this table, virtual guest management is split into basic and advanced.

Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop, resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.

**Supported Red Hat Enterprise Linux Features**

This table lists the availability of various features on native Red Hat Enterprise Linux clients (without Expanded Support).

The operating system you run on a client is supported by the organization that supplies the operating system. Red Hat Enterprise Linux is supported by Red Hat.

The icons in this table indicate:

- ✓ the feature is available on both Salt and traditional clients
- ✗ the feature is not available
- ? the feature is under consideration, and may or may not be made available at a later date
- Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients.
<table>
<thead>
<tr>
<th>Feature</th>
<th>RHEL 6</th>
<th>RHEL 7</th>
<th>RHEL 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>System packages</td>
<td>Red Hat</td>
<td>Red Hat</td>
<td>Red Hat</td>
</tr>
<tr>
<td>Registration</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Apply patches</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Remote commands</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Basic Virtual Guest Management</td>
<td>Traditional</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management</td>
<td>✗</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (Kickstart), as Host OS</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>Traditional</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>System deployment (PXE/Kickstart)</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>System redeployment (Kickstart)</td>
<td>Traditional</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>✗</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>✔️</td>
<td>✔️</td>
<td>Salt</td>
</tr>
<tr>
<td>Feature</td>
<td>RHEL 6</td>
<td>RHEL 7</td>
<td>RHEL 8</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Package verification</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Package locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>System locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Maintenance Windows</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>System snapshot</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Snapshots and profiles</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Power management</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Kiwi image with OS</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Recurring Actions</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>AppStreams</td>
<td>N/A</td>
<td>N/A</td>
<td>✔</td>
</tr>
<tr>
<td>Yomi</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Virtual Guest Management:

In this table, virtual guest management is split into basic and advanced.

Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop, resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.
Supported CentOS Features

This table lists the availability of various features on CentOS clients.

The operating system you run on a client is supported by the organization that supplies the operating system. CentOS is supported by the CentOS community.

The icons in this table indicate:

- ✓ the feature is available on both Salt and traditional clients
- × the feature is not available
- ? the feature is under consideration, and may or may not be made available at a later date
- Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients

Table 6. Supported Features on CentOS Operating Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>CentOS 6</th>
<th>CentOS 7</th>
<th>CentOS 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✓ (plain CentOS)</td>
<td>✓ (plain CentOS)</td>
<td>Salt (plain CentOS)</td>
</tr>
<tr>
<td>System packages</td>
<td>CentOS Community</td>
<td>CentOS Community</td>
<td>CentOS Community</td>
</tr>
<tr>
<td>Registration</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Apply patches (requires CVE ID)</td>
<td>✓ (third-party service required for errata)</td>
<td>✓ (third-party service required for errata)</td>
<td>Salt (third-party service required for errata)</td>
</tr>
<tr>
<td>Remote commands</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Basic Virtual Guest Management</td>
<td>Traditional</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management</td>
<td>×</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (Kickstart), as Host OS</td>
<td>Traditional</td>
<td>Traditional</td>
<td>×</td>
</tr>
<tr>
<td>Feature</td>
<td>CentOS 6</td>
<td>CentOS 7</td>
<td>CentOS 8</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>Traditional</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>System deployment (PXE/Kickstart)</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>System redeployment (Kickstart)</td>
<td>Traditional</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>✗</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing (requires CVE ID)</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Package verification</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Package locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>System locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Maintenance Windows</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
</tr>
<tr>
<td>System snapshot</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Snapshots and profiles</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Power management</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>
### Virtual Guest Management:

In this table, virtual guest management is split into basic and advanced.

Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop, resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.

### Supported Oracle Features

This table lists the availability of various features on Oracle Linux clients.

The operating system you run on a client is supported by the organization that supplies the operating system. Oracle Linux is supported by Oracle.

The icons in this table indicate:

- ✓ the feature is available on both Salt and traditional clients
- ✗ the feature is not available
- ? the feature is under consideration, and may or may not be made available at a later date
- Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients

#### Table 7. Supported Features on Oracle Linux Operating Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>Oracle Linux 6</th>
<th>Oracle Linux 7</th>
<th>Oracle Linux 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Operating system packages</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Registration</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>✓</td>
<td>✓</td>
<td>Salt</td>
</tr>
<tr>
<td>Feature</td>
<td>Oracle Linux 6</td>
<td>Oracle Linux 7</td>
<td>Oracle Linux 8</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Apply patches (requires CVE ID)</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Remote commands</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Basic Virtual Guest Management</td>
<td>Traditional</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management</td>
<td>✗</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (Kickstart), as Host OS</td>
<td>Traditional</td>
<td>Traditional</td>
<td>✗</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>Traditional</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>System deployment (PXE/Kickstart)</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>System redeployment (Kickstart)</td>
<td>Traditional</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing (requires CVE ID)</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>✅</td>
<td>✅</td>
<td>Salt</td>
</tr>
<tr>
<td>Feature</td>
<td>Oracle Linux 6</td>
<td>Oracle Linux 7</td>
<td>Oracle Linux 8</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Package verification</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Package locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>System locking</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Maintenance Windows</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>System snapshot</td>
<td>Traditional</td>
<td>Traditional</td>
<td>❌</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Snapshots and profiles</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Traditional. Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Power management</td>
<td>✔</td>
<td>✔</td>
<td>Salt</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Build Kiwi image with OS</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Recurring Actions</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>AppStreams</td>
<td>N/A</td>
<td>N/A</td>
<td>✔</td>
</tr>
<tr>
<td>Yomi</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Virtual Guest Management:

In this table, virtual guest management is split into basic and advanced.

Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop, resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.

Supported Ubuntu Features

This table lists the availability of various features on Ubuntu clients.

The operating system you run on a client is supported by the organization that supplies the operating system. Ubuntu is supported by Canonical.
The icons in this table indicate:

- ✔ the feature is available on both Salt and traditional clients
- ✗ the feature is not available
- ⚙ the feature is under consideration, and may or may not be made available at a later date
- Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients.

Table 8. Supported Features on Ubuntu Operating Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>Ubuntu 16.04</th>
<th>Ubuntu 18.04</th>
<th>Ubuntu 20.04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>System packages</td>
<td>Canonical</td>
<td>Canonical</td>
<td>Canonical</td>
</tr>
<tr>
<td>Registration</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Apply patches</td>
<td>⚙</td>
<td>⚙</td>
<td>⚙</td>
</tr>
<tr>
<td>Remote commands</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Basic Virtual Guest Management</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (Kickstart), as Host OS</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System deployment (PXE/Kickstart)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>System redeployment (Kickstart)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Feature</td>
<td>Ubuntu 16.04</td>
<td>Ubuntu 18.04</td>
<td>Ubuntu 20.04</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------</td>
<td>------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Contact methods</td>
<td>Salt: ZeroMQ, Salt-SSH</td>
<td>Salt: ZeroMQ, Salt-SSH</td>
<td>Salt: ZeroMQ, Salt-SSH</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Package verification</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Package locking</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>System locking</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>System snapshot</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Package profiles</td>
<td>Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Power management</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Monitoring</td>
<td>✗</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>Salt</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Kiwi image with OS</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

* Virtual Guest Management:

In this table, virtual guest management is split into basic and advanced.

Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop, resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.
Supported Debian Features

This table lists the availability of various features on Debian clients.

The operating system you run on a client is supported by the organization that supplies the operating system. Debian is supported by the Debian community.

The icons in this table indicate:

- ✓ the feature is available on both Salt and traditional clients
- ✗ the feature is not available
- ? the feature is under consideration, and may or may not be made available at a later date
- Traditional the feature is supported only on traditional clients
- Salt the feature is supported only on Salt clients.

Table 9. Supported Features on Debian Operating Systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>Debian 9</th>
<th>Debian 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>System packages</td>
<td>Debian Community</td>
<td>Debian Community</td>
</tr>
<tr>
<td>Registration</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Install packages</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Apply patches</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Remote commands</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System package states</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System custom states</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Group custom states</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Organization custom states</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>System set manager (SSM)</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Service pack migration</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Basic Virtual Guest Management *</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Advanced Virtual Guest Management *</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Virtual Guest Installation (Kickstart), as Host OS</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Virtual Guest Installation (image template), as Host OS</td>
<td>Salt</td>
<td>Salt</td>
</tr>
</tbody>
</table>
## Supported Debian Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Debian 9</th>
<th>Debian 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>System deployment (PXE/Kickstart)</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>System redeployment (Kickstart)</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Contact methods</td>
<td>Salt: ZeroMQ, Salt-SSH</td>
<td>Salt: ZeroMQ, Salt-SSH</td>
</tr>
<tr>
<td>Works with Uyuni Proxy</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Action chains</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Software crash reporting</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Staging (pre-download of packages)</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Duplicate package reporting</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>CVE auditing</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>SCAP auditing</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Package verification</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Package locking</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>System locking</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Maintenance Windows</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>System snapshot</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Configuration file management</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Package profiles</td>
<td>Salt: Profiles supported, Sync not supported</td>
<td>Salt: Profiles supported, Sync not supported</td>
</tr>
<tr>
<td>Power management</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Docker buildhost</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Build Docker image with OS</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>Kiwi buildhost</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Build Kiwi image with OS</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Recurring Actions</td>
<td>Salt</td>
<td>Salt</td>
</tr>
<tr>
<td>AppStreams</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Yomi</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Virtual Guest Management:

In this table, virtual guest management is split into basic and advanced.

Basic virtual guest management includes listing VMs, slow refresh, VM lifecycle actions (start, stop,
resume, pause), and modifying VM vCPU and Memory.

Advanced virtual guest management includes fast refresh, VM lifecycle actions (delete, reset, power off), modifying VM disk, network, graphical display, and graphical display configuration.
Software Channels

Channels are a method of grouping software packages. Software packages are provided by repositories, and repositories are associated with channels. Subscribing a client to a software channel allows the client to install and update any of the software associated with it.

In Uyuni, channels are divided into base channels and child channels. Organizing channels in this way ensures that only compatible packages are installed on each system. A client must be subscribed to only one base channel, assigned during registration based on the client operating system and architecture. For paid channels provided by a vendor, you must have an associated subscription.

A base channel consists of packages built for a specific operating system type, version, and architecture. For example, the SUSE Linux Enterprise Server 15 x86_64 base channel contains only software compatible with that operating system and architecture.

A child channel is associated with a base channel and provides only packages that are compatible with the base channel. A system can be subscribed to multiple child channels of its base channel. When a system has been assigned to a base channel, it is only possible for that system to install the related child channels. For example, if a system has been assigned to the SUSE Linux Enterprise Server 15 x86_64 base channel, they will only be able to install or update packages made available through the compatible base channel, or any of its associated child channels.

In the Uyuni WebUI you can browse your available channels by navigating to Software › Channel List › All. You can modify or create new channels by navigating to Software › Manage › Channels.

For more on using channels, including custom channels, see [ Administration › Channel-management › ].

Packages Provided by SUSE Package Hub

SUSE Package Hub is an extension to SUSE Linux Enterprise products that provides additional open source software provided by the openSUSE community. If you are using SUSE Linux Enterprise operating systems on your clients, you can enable the SUSE Package Hub extension to access these additional packages. This provides the SUSE Package Hub channels, which you can subscribe your clients to.

On Salt clients, you must apply the highstate after subscribing to the channel to be able to install packages.

Packages Provided by AppStream

AppStream is a modular package repository that provides additional software for most non-SUSE Linux distributions, including Red Hat and Oracle Linux. In most cases, you will need to install the base channel for your distribution, and the appropriate AppStream channel to ensure that you have all the software you need.

If you need to transform AppStream repositories into non-modular repositories for use with some upgrade operations, you can use the AppStream filter with the content lifecycle management tool. For more
information about the AppStream filter, see [Administration › Content-lifecycle-examples › ].

Unified Installer Updates Channels on SUSE Linux Enterprise Clients

This channel is used by the unified installer to ensure it is up to date before it installs the operating system. All SUSE Linux Enterprise products should have access to the installer updates channel during installation.

For SUSE Linux Enterprise Server clients the installer updates channel is synchronized by default when you add a product that contains them, and are enabled when you create an autoinstallation distribution with these product channels.

For all other SUSE Linux Enterprise variants, including SUSE Linux Enterprise for SAP, you must add the installer updates channel manually. To do this, clone the appropriate SUSE Linux Enterprise Server installer updates channel below the base channel of these SUSE Linux Enterprise variants. When creating an autoinstallation distribution for these SUSE Linux Enterprise variants after the channel was cloned, it will be used automatically.

Software Repositories

Repositories are used to collect software packages. When you have access to a software repository, you can install any of the software that the repository provides. You must have at least one repository associated with your software channels in Uyuni to assign clients to the channel and install and update packages on the client.

Most default channels in Uyuni are already associated with the correct repositories. If you are creating custom channels, you will need to associate a repository that you have access to, or that you have created yourself.

For more information about custom repositories and channels, see [Administration › Custom-channels › ].

Local Repository Locations

You can configure local repositories on Salt clients, to provide packages that are not supplied by Uyuni channels.

Local repositories are disabled during onboarding. After a client has completed onboarding, you can add local repositories to these locations:

<table>
<thead>
<tr>
<th>Client Operating System</th>
<th>Local Repository Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUSE Linux Enterprise Server</td>
<td>/etc/zypp/repos.d</td>
</tr>
<tr>
<td>openSUSE</td>
<td>/etc/zypp/repos.d</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server Expanded Support</td>
<td>/etc/yum.repos.d/</td>
</tr>
<tr>
<td>Client Operating System</td>
<td>Local Repository Directory</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux</td>
<td><code>/etc/yum.repos.d/</code></td>
</tr>
<tr>
<td>CentOS</td>
<td><code>/etc/yum.repos.d/</code></td>
</tr>
<tr>
<td>Ubuntu</td>
<td><code>/etc/apt/sources.list.d/</code></td>
</tr>
<tr>
<td>Debian</td>
<td><code>/etc/apt/sources.list.d/</code></td>
</tr>
</tbody>
</table>

For Salt clients, local repositories remain persistent, even when applying the highstate.

## Software Products

In Uyuni, software is made available in products. Your SUSE subscription allows you to access a range of different products, which you can browse and select in the Uyuni WebUI by navigating to **Admin › Setup Wizard › Products**.

Products contain any number of software channels. Click the *Show product’s channels* icon to see the channels included in the product. When you have added a product and synchronized successfully, you have access to the channels provided by the product, and can use the packages in the product on your Uyuni Server and clients.

**Procedure: Adding Software Channels**

1. In the Uyuni WebUI, navigate to **Admin › Setup Wizard › Products**.
2. Locate the appropriate products for your client operating system and architecture using the search bar, and check the appropriate product. This will automatically check all required channels. Click the arrow to see the complete list of related products, and ensure that any extra products you require are checked.
3. Click [Add Products] and wait until the products have finished synchronizing.
Using GPG Keys

Uyuni uses GPG keys to check the authenticity of software packages installed on clients. In many cases, you will not need to adjust the GPG settings to be able to install software on your clients.

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

Procedure: Trusting GPG Keys on Clients

1. On the Uyuni Server, at the command prompt, check the contents of the /srv/www/htdocs/pub/ directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the ORG_GPG_KEY= parameter and add the required key. For example:

   uyuni-gpg-pubkey-0d20833e.key

   You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.
Activation Keys

Activation keys are used with traditional and Salt clients to ensure that your clients have the correct software entitlements, are connecting to the appropriate channels, and are subscribed to the relevant groups. Each activation key is bound to an organization, which you can set when you create the key.

In Uyuni, an activation key is a group of configuration settings with a label. You can apply all configuration settings associated with an activation key by adding its label as a parameter to a bootstrap script. We recommend you use an activation key label in combination with a bootstrap script. When the bootstrap script is executed all configuration settings associated with the label are applied to the system the script is run on.

An activation key can specify:

- Channel Assignment
- System Types (Traditionally called Add-on Entitlements)
- Contact Method
- Configuration Files
- Packages to be Installed
- System Group Assignment

Procedure: Creating an Activation Key

1. In the Uyuni WebUI, as an administrator, navigate to Systems › Activation Keys.
2. Click the [Create Key] button.

3. On the Activation Key Details page, in the Description field, enter a name for the activation key.

4. In the Key field, enter the distribution and service pack associated with the key. For example, SLES12-SP4 for SUSE Linux Enterprise Server 12 SP4.

   Do not use commas in the Key field for any SUSE products. However, you must use commas for Red Hat Products. For more information, see [Reference › Systems › ].

5. In the Base Channels drop-down box, select the appropriate base software channel, and allow the relevant child channels to populate. For more information, see reference:admin/setup-wizard.pdf and [Administration › Custom-channels › ].

6. Select the child channels you need (for example, the mandatory SUSE Manager tools and updates channels).

7. We recommend you leave the Contact Method set to Default.

8. We recommend you leave the Universal Default setting unchecked.

9. Click [Create Activation Key] to create the activation key.

10. Check the Configuration File Deployment check box to enable configuration management for this key, and click [Update Activation Key] to save this change.

The Configuration File Deployment check box does not appear until after you have created the activation key. Ensure you go back and check the box if you need to enable configuration management.

Combining Mutiple Activation Keys

You can combine activation keys when executing the bootstrap script on your traditional clients. Combining keys allows for more control on what is installed on your systems and reduces duplication of keys for large or complex environments.

Combining activation keys works only on traditional clients. Salt clients do not support combined activation keys. If you use a combined key with a Salt client, only the first key is used.
You can specify multiple activation keys at the command prompt, or in a single autoinstallation profile.

At the command prompt on the Uyuni Server, use the `rhnreg ks` command, and separate the key names with a comma. To specify multiple keys in a Kickstart profile, navigate to Systems › Autoinstallation and edit the profile you want to use.

Be careful when combining activation keys, as conflicts between some values could cause client registration to fail. Check that these values do not have conflicting information before you begin:
• Software packages
• Software child channels
• Configuration channels.

If conflicts are detected, they are handled like this:

• Conflicts in base software channels: registration fails.
• Conflicts in system types: registration fails.
• Conflicts in the enable configuration flag: configuration management is enabled.
• If one key is system-specific: registration fails.

Reactivation Keys

Reactivation keys can be used once only to re-register a client and regain all Uyuni settings. Reactivation keys are client-specific, and include the system ID, history, groups, and channels.

To create a reactivation key, navigate to Systems, click the client to create a reactivation key for, and navigate to the Details › Reactivation tab. Click [Generate New Key] to create the reactivation key. Record the details of the key for later use. Unlike typical activation keys, which are not associated with a specific system ID, keys created here do not show up on the Systems › Activation Keys page.

When you have created a reactivation key, you can use it with the rhnreg_ks command line utility. This command will re-register the client and restore its Uyuni settings. You can only use a reactivation key once.

You can combine reactivation keys with activation keys to aggregate the settings of multiple keys for a single system profile. For example:

```
rhnreg_ks --server=<server-url>/XMLRPC \
   --activationkey=<reactivation-key>,<activationkey> \
   --force
```

If you autoinstall a client with its existing Uyuni profile, the profile will use the reactivation key to re-register the system and restore its settings. Do not regenerate, delete, or use this key while a profile-based autoinstallation is in progress. Doing so will cause the autoinstallation to fail.

Activation Key Best Practices

Default Parent Channel

Avoid using the SUSE Manager Default parent channel. This setting forces Uyuni to choose a parent channel that best corresponds to the installed operating system, which can sometimes lead to unexpected behavior. Instead, we recommend you create activation keys specific to each distribution and architecture.
Bootstrapping with Activation Keys

If you are using bootstrap scripts, consider creating an activation key for each script. This will help you align channel assignments, package installation, system group memberships, and configuration channel assignments. You will also need less manual interaction with your system after registration.

Bandwidth Requirements

Using activation keys might result in automatic downloading of software at registration time, which might not be desirable in environments where bandwidth is constrained.

These options create bandwidth usage:

• Assigning a SUSE Product Pool channel will result in the automatic installation of the corresponding product descriptor package.
• Any package in the Packages section will be installed.
• Any Salt state from the Configuration section might trigger downloads depending on its contents.

Key Label Naming

If you do not enter a human-readable name for your activation keys, the system will automatically generate a number string, which can make it difficult to manage your keys.

Consider a naming scheme for your activation keys to help you keep track of them. Creating names which are associated with your organization’s infrastructure will make it easier for you when performing more complex operations.

When creating key labels, consider these tips:

• OS naming (mandatory): Keys should always refer to the OS they provide settings for
• Architecture naming (recommended): Unless your company is running on one architecture only, for example x86_64, then providing labels with an architecture type is a good idea.
• Server type naming: What is, or what will this server be used for?
• Location naming: Where is the server located? Room, building, or department?
• Date naming: Maintenance windows, quarter, etc.
• Custom naming: What naming scheme suits your organizations needs?

Example activation key label names:

sles12-sp2-web_server-room_129-x86_64

sles12-sp2-test_packages-blg_502-room_21-ppc64le
Do not use commas in the **Key** field for any SUSE products. However, you **must** use commas for Red Hat Products. For more information, see [Reference › Systems › ].

**Included Channels**

When creating activation keys you also need to keep in mind which software channels will be associated with it.

Keys should have a specific base channel assigned to them, for example: `SLES12-SP2-Pool-x86_64`. If this is not the case, Uyuni cannot use specific stages. Using the default base channel is not recommended and may cause problems.

- Channels to be included:
  - suse-manager-tools

- Typical packages to be included:
  - mgr-osad (pushing tasks)
    - Installs `python-jabberpy` and `pyxml` as dependencies
  - mgr-cfg-actions (Remote Command, Configuration Management)
    - Installs `mgr-cfg` and `mgr-cfg-client` as dependencies

The **suse-manager-tools** channel is mandatory.

Typical packages to be included:

- osad (pushing tasks): Installs `python-jabberpy` and `pyxml` as dependencies
- **rhncfg-actions** (Remote Command, Configuration Management): Installs `rhncfg` and `rhncfg-client` as dependencies
Bootstrap Repository

A bootstrap repository contains packages for installing Salt on clients, as well as the required packages for registering Salt or traditional clients during bootstrapping. Bootstrap repositories are automatically created and regenerated on the Uyuni Server for every synchronized product.

Prepare to Create a Bootstrap Repository

When you select a product for synchronization, the bootstrap repository is automatically created as soon as all mandatory channels are fully mirrored.

Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to Software › Manage › Channels, then click the channel associated to the repository.
2. Navigate to the Repositories tab, then click Sync and check Sync Status.

Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the tail command to check the synchronization log file:

   ```bash
   tail -f /var/log/rhn/reposync/<channel-label>.log
   ```
2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

Options for Automatic Mode

You can change how the automated bootstrap repository creation works. This section details the various settings.

Flush Mode

By default, every regeneration starts with an empty repository and copies only the latest packages into it. To disable this behavior, add or edit this value in /etc/rhn/rhn.conf:

```bash
server.susemanager.bootstrap_repo_flush = 0
```

Alternatively, you can use the --no-flush option when you create the bootstrap repository from the command prompt.

Automatic Mode

By default, automated regeneration of the bootstrap repositories is enabled. To disable it, add or edit this value in /etc/rhn/rhn.conf:
Configure Bootstrap Data File

The tool uses a data file with information about which packages are required for each distribution. The data file is stored at /usr/share/susemanager/mgr_bootstrap_data.py. SUSE updates this file regularly. If you want to make changes to this file, do not edit it directly. Instead, create a copy in the same directory and edit your copy:

```
cd /usr/share/susemanager/
cp mgr_bootstrap_data.py my_data.py
```

When you have made your changes, configure Uyuni to use the new file. Add or edit this value in /etc/rhn/rhn.conf:

```
server.susemanager.bootstrap_repo_datamodule = my_data
```

On the next update, the new data from SUSE will overwrite the original data file, not the new one. You will need to keep the new file up to date with changes provided by SUSE.

Manually Generate a Bootstrap Repository

By default, bootstrap repositories are regenerated daily. You can manually create the bootstrap repository from the command prompt:

**Procedure: Generating the Bootstrap Repository for SUSE Linux Enterprise**

1. At the command prompt on the Uyuni Server, as root, list the available bootstrap repositories:

```
mgr-create-bootstrap-repo -l
```

2. Create the bootstrap repository, using the appropriate repository name as the product label:

```
mgr-create-bootstrap-repo -c SLE-version-x86_64
```

The client repository is located in /srv/www/htdocs/pub/repositories/.

**Procedure: Specifying a Parent Channel for a Bootstrap Repository**

If you have mirrored more than one product (for example, SLES and SLES for SAP), or if you use custom channels, you need to specify the parent channel to use when creating the bootstrap repository.
1. Check which parent channels you have available:

```
mgr-create-bootstrap-repo -c SLE-15-x86_64
Multiple options for parent channel found. Please use option
  --with-parent-channel <label> and choose one of:
  - sle-product-sles15-pool-x86_64
  - sle-product-sles_sap15-pool-x86_64
  - sle-product-sled15-pool-x86_64
```

2. Specify the appropriate parent channel:

```
mgr-create-bootstrap-repo -c SLE-15-x86_64 --with-parent-channel sle-product-sled15-pool-x86_64
```

**Repositories with Multiple Architectures**

If you are creating bootstrap repositories that include multiple different architectures, you need to be careful that all architectures are updated correctly. For example, the x86_64 and IBM Z architectures for SLE use the same bootstrap repository URL at `/srv/www/htdocs/pub/repositories/sle/15/2/bootstrap/`.

Because the `flush` option is enabled by default, when you attempt to generate the bootstrap repository for multiple architectures, only one architecture would be generated. To avoid this, use the `--no-flush` option at the command prompt when creating additional architectures. For example:

```
mgr-create-bootstrap-repo -c SLE-15-SP2-x86_64
mgr-create-bootstrap-repo --no-flush -c SLE-15-SP2-s390x
```

**Bootstrap and Custom Channels**

If you are using custom channels, you can use the `--with-custom-channels` option with the `mgr-create-bootstrap-repo` command. In this case, you will also need to specify the parent channel to use.

Automatic creation of a bootstrap repository might fail if you are using custom channels. In this case, you will need to create the repository manually.

For more information about custom channels, see [Administration › Custom-channels › ].
Contact Methods

There are a number of ways that the Uyuni Server can communicate with clients. Which one you use depends on your network architecture.

The Uyuni daemon (rhnsd) runs on traditional client systems and periodically connects with Uyuni to check for new updates and notifications. It does not apply to Salt clients.

Push via SSH and Push via Salt SSH are used in environments where clients cannot reach the Uyuni Server directly. In this environment, clients are located in a firewall-protected zone called a DMZ. No system within the DMZ is authorized to open a connection to the internal network, including the Uyuni Server.

OSAD is an alternative contact method between Uyuni and its clients. OSAD allows registered client systems to execute scheduled actions immediately.

SUSE Manager Daemon (rhnsd)

The Uyuni daemon (rhnsd) runs on traditional client systems and periodically connects with Uyuni to check for new updates and notifications. It does not apply to Salt clients.

It is only used on SUSE Linux Enterprise 11 and Red Hat Enterprise Linux Server 6, as these systems do not use systemd. On later operating systems, a systemd timer (rhnsd.timer) is used and controlled by rhnsd.service.

Start the daemon with /etc/init.d/rhnsd.

By default, it will check every four hours for new actions. This means it can take some time for clients to execute scheduled actions.

To check for updates, rhnsd runs the external mgr_check program located in /usr/sbin/. This is a small application that establishes the network connection to Uyuni. The SUSE Manager daemon does not listen on any network ports or talk to the network directly. All network activity is performed by the mgr_check utility.

This figure provides an overview of the default rhnsd process path. All items left of the Python XMLRPC server block represent processes running on a Uyuni client.
Configure rhnsd

The **rhnsd** initialization script has a configuration file on the client system at `/etc/sysconfig/rhn/rhnsd`.

An important parameter for the daemon is its check-in frequency. The default interval time is four hours (240 minutes). The minimum allowed time interval is one hour (60 minutes). If you set the interval below one hour, it will change back to the default of 4 hours (240 minutes).

If you modify the **rhnsd** configuration file, execute this command as root to restart the daemon and pick up your changes:

```
/etc/init.d/rhnsd restart
```

To see the status of **rhnsd**, use this command as root:

```
/etc/init.d/rhnsd status
```

On SUSE Linux Enterprise 12 and later, the default time interval is set in `/etc/systemd/system/timers.target.wants/rhnsd.timer`, in this section:

```
[Timer]
OnCalendar=00/4:00
RandomizedDelaySec=30min
```

You can create an overriding drop-in file for **rhnsd.timer** using `systemctl`: 
systemctl edit rhnsd.timer

For example, if you want configure a two hour time interval:

```
[Timer]
OnCalendar=00/2:00
```

The file will be saved as `/etc/systemd/system/rhnsd.timer.d/override.conf`.

For more information about system timers, see the `systemd.timer` and `systemctl` manpages.

**Push via SSH**

Push via SSH is used in environments where traditional clients cannot reach the Uyuni Server directly. In this environment, clients are located in a firewall-protected zone called a DMZ. No system within the DMZ is authorized to open a connection to the internal network, including the Uyuni Server.

The Push via SSH method creates an encrypted tunnel from the Uyuni Server on the internal network to the clients located on the DMZ. After all actions and events are executed, the tunnel is closed.

The server uses SSH to contact the clients at regular intervals, checking in and performing scheduled actions and events.

This contact method works for traditional clients only. For Salt clients, use Push via Salt SSH.

![Warning]

Re-installing systems using the provisioning model is not currently supported on clients managed with push via SSH.

This image demonstrates the push via SSH process path. All items left of the Taskomatic block represent processes running on a Uyuni client.
For tunneling connections via SSH, two available port numbers are required, one for tunneling HTTP and the second for tunneling via HTTPS (HTTP is only necessary during the registration process). The port numbers used by default are 1232 and 1233. To overwrite these, you can add two custom port numbers greater than 1024 to /etc/rhn/rhn.conf:

```bash
ssh_push_port_http = high_port_1
ssh_push_port_https = high_port_2
```

If you would like your clients to be contacted using their hostnames instead of an IP address, set this option:

```bash
ssh_push_use_hostname = true
```

It is also possible to adjust the number of threads to use for opening client connections in parallel. By default two parallel threads are used. Set taskomatic.ssh_push_workers in /etc/rhn/rhn.conf:

```bash
taskomatic.ssh_push_workers = number
```

For security reasons, you might want to use sudo with SSH, to access the system as an unprivileged user instead of as root.

**Procedure: Configuring Unprivileged SSH Access**

1. Ensure you have the latest spacewalk-taskomatic and spacewalk-certs-tools packages installed on the Uyuni Server.
2. On each client system, create an appropriate unprivileged user.
3. On each client system, open the `/etc/sudoers` file and comment out these lines:

```bash
#Defaults targetpw   # ask for the password of the target user i.e. root
#ALL    ALL=(ALL) ALL   # WARNING! Only use this together with 'Defaults targetpw'!
```

4. On each client system, in the User privilege specification section, add these lines:

```bash
<user> ALL=(ALL) NOPASSWD:/usr/sbin/mgr_check
<user> ALL=(ALL) NOPASSWD:/home/<user>/enable.sh
<user> ALL=(ALL) NOPASSWD:/home/<user>/bootstrap.sh
```

5. On each client system, in the `/home/user/.bashrc` file, add these lines:

```bash
PATH=$PATH:/usr/sbin
export PATH
```

6. On the Uyuni Server, in the `/etc/rhn/rhn.conf` configuration file, add or amend this line to include the unprivileged username:

```bash
ssh_push_sudo_user = <user>
```

Because clients are in the DMZ and cannot reach the server, you need to use the `mgr-ssh-push-init` tool to register them with the Uyuni Server.

To use the tool, you will need the client hostname or IP address, and the path to a valid bootstrap script on the Uyuni Server. For more information about bootstrapping, see [Client-configuration › Registration-bootstrap ›](#).

The bootstrap script will need to have an activation key associated with it that is configured for Push via SSH. For more information on activation keys, see [Client-configuration › Activation-keys ›](#).

Before you begin, you need to ensure that you have specified which ports to use for SSH tunneling. If you have registered clients before changing the port numbers, they will need to be registered again.

Clients that are managed with Push via SSH cannot reach the server directly. When you use the `mgr-ssh-push-init` tool, the `rhnsd` daemon is disabled.

**Procedure: Registering Clients with Push via SSH**

1. At the command prompt on the Uyuni Server, as root, execute this command:

```bash
# mgr-ssh-push-init --client <client> --register \ /srv/www/htdocs/pub/bootstrap/bootstrap_script --tunnel
```
OPTIONAL: You can remove the **--tunnel** option, if you do not want to use tunneling.

2. Verify that the SSH connection is active:

   ```
   # ssh -i /root/.ssh/id_susemanager -R <high_port>:<susemanager>:443 \
   <client> zypper ref
   ```

**Example: API Access to Push via SSH**

You can use the API to manage which contact method to use. This example Python code sets the contact method to `ssh-push`.

Valid values are:

- **default** (pull)
- **ssh-push**
- **ssh-push-tunnel**

```python
client = xmlrpclib.Server(SUMA_HOST + "/rpc/api", verbose=0)
key = client.auth.login(SUMA_LOGIN, SUMA_PASSWORD)
client.system.setDetails(key, 1000012345, {'contact_method': 'ssh-push'})
```

If you have a client that has already been registered, and you want to migrate it to use Push via SSH, some extra steps are required. You can use the `mgr-ssh-push-init` tool to set up your client.

**Procedure: Migrating Registered Systems to Push via SSH**

1. At the command prompt on the Uyuni Server, as root, set up the client:

   ```
   # mgr-ssh-push-init --client <client> \
   /srv/www/htdocs/pub/bootstrap/bootstrap_script --tunnel
   ```

2. Using the Uyuni WebUI, change the client’s contact method to `ssh-push` or `ssh-push-tunnel`.

3. **OPTIONAL:** If you need to edit an existing activation key, you can do so with this command:

   ```python
   client.activationkey.setDetails(key, '1-mykey', {'contact_method': 'ssh-push'})
   ```

You can also use Push via SSH for clients that connect using a Uyuni Proxy. Ensure your proxy is updated before you begin.

**Procedure: Registering Clients with Push via SSH to a Proxy**

1. At the command prompt on the Uyuni Proxy, as root, set up the client:
Push via Salt SSH

Push via Salt SSH is used in environments where Salt clients cannot reach the Uyuni Server directly. In this environment, clients are located in a firewall-protected zone called a DMZ. No system within the DMZ is authorized to open a connection to the internal network, including the Uyuni Server.

The Push via Salt SSH method creates an encrypted tunnel from the Uyuni Server on the internal network to the clients located on the DMZ. After all actions and events are executed, the tunnel is closed.

The server uses the `salt-ssh` tool to contact the clients at regular intervals, checking in and performing scheduled actions and events. For more information about Salt SSH, see [Salt › Salt-ssh ›](#).

This contact method works for Salt clients only. For traditional clients, use Push via SSH.

This image demonstrates the Push via Salt SSH process path. All items left of the Taskomatic block represent processes running on a Uyuni client.

To use Push via Salt SSH, you must have the SSH daemon running on the client, and reachable by the `salt-api` daemon running on the Uyuni Server. Additionally, Python must be available on the remote system, and be a version supported by Salt.
Red Hat Enterprise Linux 5, CentOS 5, and earlier are not supported, as they use unsupported versions of Python.

**Procedure: Registering Clients with Push via Salt SSH**

1. In the Uyuni WebUI, navigate to `Systems › Bootstrapping` and complete the appropriate fields.
2. Select an activation key with the Push via SSH contact method configured. For more information about activation keys, see [Client-configuration › Activation-keys › ].
3. Check the Manage system completely via SSH checkbox.
4. Click [Bootstrap] to begin registration.
5. Confirm that the system has been registered correctly by navigating to `Systems › Overview`.

**Available Parameters**

When you are configuring Push via Salt SSH, you can modify parameters that are used when a system is registered, including the host, activation key, and password. The password is used only for bootstrapping, it is not saved anywhere. All future SSH sessions are authorized via a key/certificate pair. These parameters are configured in `Systems › Bootstrapping`.

You can also configure persistent parameters that are are used system-wide, including the sudo user. For more information on configuring the sudo user, see [Client-configuration › Contact-methods-pushssh › ].

**Action Execution**

The Push via Salt SSH feature uses taskomatic to execute scheduled actions using `salt-ssh`. The taskomatic job periodically checks for scheduled actions and executes them. Unlike Push via SSH on traditional clients, the Push via Salt SSH feature executes a complete `salt-ssh` call based on the scheduled action.

By default, actions are executed sequentially on each client, and only one action will run at a time. You can increase the number of actions that can be executed in parallel, by adding this line to your configuration file, and adjusting the number upwards. We recommend you keep the number of parallel actions low, to avoid problems:

```
taskomatic.com.redhat.rhn.taskomatic.task.MinionActionExecutor.parallel_threads=N
org.quartz.threadPool.threadCount=<number>
```

This will adjust the number of actions that can run in parallel on any one client. If actions needs to be run on multiple clients, actions will always be executed sequentially on each client.

If the clients are connected through a Uyuni Proxy, you will need to adjust the MaxSessions settings on the proxy. In this case, set the number of parallel connections to be three times the total number of clients.
Future Features

There are some features that are not yet supported on Push via Salt SSH. These features will not work on Salt SSH clients:

- OpenSCAP auditing
- Beacons, resulting in:
  - Installing a package on a system using `zypper` will not invoke the package refresh.
  - Virtual Host functions (for example, a host to guests) will not work if the virtual host system is Salt SSH-based.

For more information about Salt SSH, see https://docs.saltstack.com/en/latest/topics/ssh/.

OSAD

OSAD is an alternative contact method between Uyuni and its clients. By default, Uyuni uses `rhnsd`, which contacts the server every four hours to execute scheduled actions. OSAD allows registered client systems to execute scheduled actions immediately.

- Use OSAD in addition to `rhnsd`. If you disable `rhnsd` your client will be shown as not checking in after 24 hours.

OSAD has several distinct components:

- The `osa-dispatcher` service runs on the server, and uses database checks to determine if clients need to be pinged, or if actions need to be executed.
- The `osad` service runs on the client. It responds to pings from `osa-dispatcher` and runs `mgr_check` to execute actions when directed to do so.
- The `jabberd` service is a daemon that uses the XMPP protocol for communication between the client and the server. The `jabberd` service also handles authentication.
- The `mgr_check` tool runs on the client to execute actions. It is triggered by communication from the `osa-dispatcher` service.

The `osa-dispatcher` periodically runs a query to check when clients last showed network activity. If it finds a client that has not shown activity recently, it will use `jabberd` to ping all `osad` instances running on all clients registered with your Uyuni server. The `osad` instances respond to the ping using `jabberd`, which is running in the background on the server. When the `osa-dispatcher` receives the response, it marks the client as online. If the `osa-dispatcher` fails to receive a response within a certain period of time, it marks the client as offline.

When you schedule actions on an OSAD-enabled system, the task will be carried out immediately. The `osa-dispatcher` periodically checks clients for actions that need to be executed. If an outstanding action is found, it uses `jabberd` to execute `mgr_check` on the client, which will then execute the action.
OSAD clients use the fully qualified domain name (FQDN) of the server to communicate with the osa-dispatcher service.

SSL is required for osad communication. If SSL certificates are not available, the daemon on your client systems will fail to connect. Make sure your firewall rules are set to allow the required ports. For more information, see [tab.install.ports.server].

Procedure: Enabling OSAD

1. At the command prompt on the Uyuni Server, as root, start the osa-dispatcher service:

   ```bash
   systemctl start osa-dispatcher
   ```

2. On each client, install the mgr-osad package from the Tools child channel. The mgr-osad package should be installed on clients only. If you install the mgr-osad package on your Uyuni Server, it will conflict with the osa-dispatcher package.

3. On each client, as root, start the osad service:

   ```bash
   systemctl start osad
   ```

   Because osad and osa-dispatcher are run as services, you can use standard commands to manage them, including stop, restart, and status.

Each OSAD component is configured using local configuration files. We recommend you keep the default configuration parameters for all OSAD components.

<table>
<thead>
<tr>
<th>Component</th>
<th>Location</th>
<th>Path to Configuration File</th>
</tr>
</thead>
<tbody>
<tr>
<td>osa-dispatcher</td>
<td>Server</td>
<td>/etc/rhn/rhn.conf Section: OSA configuration</td>
</tr>
<tr>
<td>osad</td>
<td>Client</td>
<td>/etc/sysconfig/rhn/osad.conf</td>
</tr>
<tr>
<td>osad log file</td>
<td>Client</td>
<td>/var/log/osad</td>
</tr>
<tr>
<td>jabberd log file</td>
<td>Both</td>
<td>/var/log/messages</td>
</tr>
</tbody>
</table>

Troubleshooting OSAD

If your OSAD clients cannot connect to the server, or if the jabberd service takes a lot of time responding to port 5552, it could be because you have exceeded the open file count.

Every client needs one always-open TCP connection to the server, which consumes a single file handler. If the number of file handlers currently open exceeds the maximum number of files that jabberd is allowed to use, jabberd will queue the requests, and refuse connections.
To resolve this issue, you can increase the file limits for jabberd by editing the /etc/security/limits.conf configuration file and adding these lines:

```
jabber soft nofile 5100
jabber hard nofile 6000
```

Calculate the limits required for your environment by adding 100 to the number of clients for the soft limit, and 1000 to the current number of clients for the hard limit.

In the example above, we have assumed 500 current clients, so the soft limit is 5100, and the hard limit is 6000.

You will also need to update the max_fds parameter in the /etc/jabberd/c2s.xml file with your chosen hard limit:

```
<max_fds>6000</max_fds>
```
Client Registration Overview

There are several ways to register clients to your Uyuni Server. The preferred methods are described in the following sections:

• For Salt clients, we recommend that you register clients using the Uyuni WebUI. For more information, see [Client-configuration › Registration-webui › ].

• If you want more control over the process, have to register many clients, or are registering traditional clients, we recommend that you create a bootstrap script. For more information, see [Client-configuration › Registration-bootstrap › ].

• For Salt clients and even more control over the process, executing single commands on the command line can be useful. For more information, see [Client-configuration › Registration-cli › ].

The client must have the date and time synchronized correctly with the Uyuni server before registration.

You must create an activation key first, to use bootstrap script or command line method. For more information about creating activation keys, see [Client-configuration › Activation-keys › ].

Do not register a Uyuni Server to itself. The Uyuni Server must be managed individually or by using another separate Uyuni Server. For more information about using multiple servers, see [Large-deployments › Multi-server › ].

Register Clients with the WebUI

Registering clients with the Uyuni WebUI works for Salt clients only.

Do not register a Uyuni Server to itself. The Uyuni Server must be managed individually or by using another separate Uyuni Server. For more information about using multiple servers, see [Large-deployments › Multi-server › ].

Procedure: Registering Clients with the WebUI

1. In the Uyuni WebUI, navigate to Systems › Bootstrapping.

2. In the Host field, type the fully-qualified domain name (FQDN) of the client to be bootstrapped.

3. In the SSH Port field, type the SSH port number to use to connect and bootstrap the client. By default, the SSH port is 22.

4. In the User field, type the username to log in to the client. By default, the username is root.

5. In the Password field, type password to log in to the client.

6. In the Activation Key field, select the activation key that is associated with the software channel you want to use to bootstrap the client. For more information, see [Client-configuration › Activation-keys › ].

7. OPTIONAL: In the Proxy field, select the proxy to register the client to.
8. By default, the **Disable SSH Strict Key Host Checking** checkbox is selected. This allows the bootstrap process to automatically accept SSH host keys without requiring you to manually authenticate.

9. **OPTIONAL:** Check the **Manage System Completely via SSH** checkbox. If you check this option, the client will be configured to use SSH for its connection to the server, and no other connection method will be configured.

10. Click [Bootstrap] to begin registration.

When the bootstrap process has completed, your client will be listed at **Systems › System List**.

When new packages or updates are installed on the client using Uyuni, any end user license agreements (EULAs) are automatically accepted. To review a package EULA, open the package details page in the WebUI.

To register and use CentOS 6, Oracle Linux 6, Red Hat Enterprise Linux 6, or SUSE Linux Enterprise Server with Expanded Support 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see [Registering Older Clients](#).

### Register Clients with a Bootstrap Script

Registering clients with a bootstrap script gives you control over parameters, and can help if you have to register a large number of clients at once. This method works for both Salt and traditional clients.

To register clients using a bootstrap script, we recommend you create a template bootstrap script to begin, which can then be copied and modified. The bootstrap script you create is executed on the client when it is registered, and ensures all the necessary packages are deployed to the client. There are some parameters contained in the bootstrap script, which ensure the client system can be assigned to its base channel, including activation keys and GPG keys.

It is important that you check the repository information carefully, to ensure it matches the base channel repository. If the repository information does not match exactly, the bootstrap script will not be able to download the correct packages.

A bootstrap repository is needed for non-SLE clients in general and for SLE clients before version 15. A bootstrap offers packages for installing Salt on clients and for registering Salt or traditional clients. For information about creating a bootstrap repository, see [Client-configuration › Bootstrap-repository › ].

If you are bootstrapping Salt clients using the WebUI, you will need to ensure that the client system has Python installed before you begin. For Salt clients running SUSE Linux Enterprise Server 12 or older, you will also require the **python-xml** package.
GPG Keys and Uyuni Client Tools

The GPG key used by Uyuni Client Tools is not trusted by default. When you create your bootstrap script, add a path to the file containing the public key fingerprint with the ORG_GPG_KEY parameter.

openSUSE Leap 15 and SLES 15 and Python 3

openSUSE Leap 15 and SLE 15 use Python 3 by default. Bootstrap scripts based on Python 2 must be re-created for openSUSE Leap 15 and SLE 15 systems. Attempting to register openSUSE Leap 15 or SLE 15 systems using Python 2 bootstrap scripts will fail.

Create a Bootstrap Script

You can use the Uyuni WebUI to create an editable bootstrap script.

Procedure: Creating a Bootstrap Script

1. In the Uyuni WebUI, navigate to Admin › Manager Configuration › Bootstrap Script.
2. In the SUSE Manager Configuration - Bootstrap dialog, uncheck the Bootstrap using Salt checkbox if you are installing a traditional client. For Salt clients, leave it checked.
3. The required fields are pre-populated with values derived from previous installation steps. For details on each setting, see [ Reference › Admin › ].
4. Click [ Update ] to create the script.
5. The bootstrap script is generated and stored on the server in the /srv/www/htdocs/pub/bootstrap directory. Alternatively, you can access the bootstrap script over HTTPS. Replace example.com with the host name of your Uyuni Server:

https://<example.com>/pub/bootstrap/bootstrap.sh

Do not disable SSL in your bootstrap script. Ensure that Enable SSL is checked in the WebUI, or that the setting USING_SSL=1 exists in the bootstrap script. If you disable SSL, the registration process requires custom SSL certificates. For more about custom certificates, see [ Administration › Ssl-certs › ].

To register and use CentOS 6, Oracle Linux 6, Red Hat Enterprise Linux 6, or SUSE Linux Enterprise Server with Expanded Support 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see Registering Older Clients at [ Client-configuration › Tshoot-clients › ].
Editing a Bootstrap Script

You can copy and modify the template bootstrap script you created to customize it. A minimal requirement when modifying a bootstrap script for use with Uyuni is the inclusion of an activation key. Most packages are signed with GPG, so you will also need to have trusted GPG keys on your system to install them.

In this procedure, you will need to know the exact name of your activation keys. Navigate to Home › Overview and, in the Tasks box, click Manage Activation Keys. All keys created for channels are listed on this page. You must enter the full name of the key you wish to use in the bootstrap script exactly as presented in the key field. For more information about activation keys, see [Client-configuration › Activation-keys › ].

Procedure: Modifying a Bootstrap Script

1. On your Uyuni server, as root at the command line change to the bootstrap directory with:

   ```
   cd /srv/www/htdocs/pub/bootstrap/
   ```

2. Create and rename two copies of the template bootstrap script for use with each of your clients.

   ```
   cp bootstrap.sh bootstrap-sles12.sh
   cp bootstrap.sh bootstrap-sles15.sh
   ```

3. Open `bootstrap-sles12.sh` for modification. Scroll down until you can see the text shown below. If `exit 1` exists in the file, comment it out by typing a hash or pound sign (#) at the beginning of the line. This activates the script. Enter the name of the key for this script in the `ACTIVATION_KEYS=` field:

   ```
   echo "Enable this script: comment (with #'s) this block (or, at least just"
   echo "the exit below)"
   echo #exit 1
   # can be edited, but probably correct (unless created during initial install):
   # NOTE: ACTIVATION_KEYS *must* be used to bootstrap a client machine.
   ACTIVATION_KEYS=1-sles12
   ORG_GPG_KEY=
   ```

4. When you have finished, save the file, and repeat this procedure for the second bootstrap script.

Connect Clients

When you have finished creating your script, you can use it to register clients.

Procedure: Running the Bootstrap Script

1. On the Uyuni Server, log in as root. At the command prompt, and change to the bootstrap directory:
2. Run this command to execute the bootstrap script on the client; replace `EXAMPLE.COM` with the host name of your client:

```bash
cat bootstrap-sles12.sh | ssh root@EXAMPLE.COM /bin/bash
```

The script will execute and proceed to download the required dependencies located in the repositories directory you created earlier.

3. When the script has finished running, you can check that your client is registered correctly by opening the Uyuni WebUI and navigating to Systems › Overview to ensure the new client is listed.

When new packages or updates are installed on the client using Uyuni, any end user license agreements (EULAs) are automatically accepted. To review a package EULA, open the package detail page in the WebUI.

**Register on the Command Line (Salt)**

Instead of the WebUI, you can use the command line to register a Salt client. This procedure requires that you have installed the Salt package on the Salt client before registration. For SLE 12 based clients, you also must have activated the Advanced Systems Management module.

Registering on the command line is also possible with traditional clients, but it requires more steps. It is not covered here. Use the bootstrap script procedure to register traditional clients. For more information, see registration-bootstrap.pdf.

**Procedure: Registering Clients Using the Command Line**

1. Choose a client configuration file located at:

   ```
   /etc/salt/minion
   ```

   or:

   ```
   /etc/salt/minion.d/NAME.conf
   ```

   This is sometimes also called a minion file.

2. Add the Uyuni Server or Proxy FQDN as the master, and the activation key, to the client configuration file:
3. Restart the `salt-minion` service:

```
systemctl restart salt-minion
```

4. On the Uyuni Server, accept the new client key; replace `<client>` with the name of your client:

```
salt-key -a '<client>'
```

To register and use CentOS 6, Oracle Linux 6, Red Hat Enterprise Linux 6, or SUSE Linux Enterprise Server with Expanded Support 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see Registering Older Clients at [Client-configuration › Tshoot-clients › ].
Other SUSE Client Registration

You can register openSUSE and SUSE Linux Enterprise Server with Expanded Support clients to your Uyuni Server. The method and details varies depending on the operating system of the client.

Before you start, ensure that the client has the date and time synchronized correctly with the Uyuni Server.

You must also have created an activation key. For more information about creating activation keys, see [Client-configuration › Activation-keys › ].

Do not register a Uyuni Server to itself. The Uyuni Server must be managed individually or by using another separate Uyuni Server. For more information about using multiple servers, see [Large-deployments › Multi-server › ].

Registering SUSE Linux Enterprise Clients

This section contains information about registering clients running SUSE Linux Enterprise operating systems.

Add Software Channels

Before you register SUSE Linux Enterprise clients to your Uyuni Server, check that you have the SUSE Linux Enterprise product enabled, and the required channels are fully synchronized.

The products you need for this procedure are:

Table 11. SLE Products - WebUI

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Product Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUSE Linux Enterprise Server 15 SP1</td>
<td>SUSE Linux Enterprise Server 15 SP1 x86_64</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server 15 SP2</td>
<td>SUSE Linux Enterprise Server 15 SP2 x86_64</td>
</tr>
</tbody>
</table>

Procedure: Adding Software Channels

1. In the Uyuni WebUI, navigate to Admin › Setup Wizard › Products.
2. Locate the appropriate products for your client operating system and architecture using the search bar, and check the appropriate product. This will automatically check all required channels. Click the arrow to see the complete list of related products, and ensure that any extra products you require are checked.
3. Click [Add Products] and wait until the products have finished synchronizing.

To add the client tools, add these channels from the command prompt:

Table 12. OpenSUSE Channels - CLI
Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:

   ```bash
   spacewalk-common-channels \
   <base_channel_name> \ 
   <child_channel_name_1> \ 
   <child_channel_name_2> \ 
   ... <child_channel_name_n>
   ```

2. Synchronize the channels:

   ```bash
   mgr-sync refresh --refresh-channels
   ```

Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to Software › Manage › Channels, then click the channel associated to the repository.

2. Navigate to the Repositories tab, then click Sync and check Sync Status.

Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

   ```bash
   tail -f /var/log/rhn/reposync/<channel-label>.log
   ```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

   SUSE Linux Enterprise channels can be very large. Synchronization can sometimes take several hours.

Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.
Procedure: Trusting GPG Keys on Clients

1. On the Uyuni Server, at the command prompt, check the contents of the `/srv/www/htdocs/pub/` directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key. For example:

   uyuni-gpg-pubkey-0d20833e.key

   You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

Register Clients

To register your SUSE Linux Enterprise clients, you need a bootstrap repository. By default, bootstrap repositories are automatically created, and regenerated daily for all synchronized products. You can manually create the bootstrap repository from the command prompt, using this command:

```
mgr-create-bootstrap-repo --with-custom-channels
```

For more information on registering your clients, see [Client-configuration › Registration-overview ›](#).

Registering openSUSE Clients

This section contains information about registering Salt clients running openSUSE operating systems. Uyuni supports openSUSE Leap 15 clients using Salt. Traditional clients are not supported.

Bootstrapping is supported for starting openSUSE clients and performing initial state runs such as setting repositories and performing profile updates.

Add Software Channels

Before you register openSUSE clients to your Uyuni Server, check that you have the openSUSE product enabled, and the required channels are fully synchronized.

The products you need for this procedure are:

Table 13. OpenSUSE Channels - CLI
### Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:

   ```bash
   spacewalk-common-channels \ 
   <base_channel_name> \ 
   <child_channel_name_1> \ 
   <child_channel_name_2> \ 
   ... <child_channel_name_n>
   ```

2. Synchronize the channels:

   ```bash
   mgr-sync refresh --refresh-channels
   ```

### Check Synchronization Status

#### Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to **Software › Manage › Channels**, then click the channel associated to the repository.

2. Navigate to the **Repositories** tab, then click **Sync** and check **Sync Status**.

#### Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

   ```bash
   tail -f /var/log/rhn/reposync/<channel-label>.log
   ```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

   openSUSE channels can be very large. Synchronization can sometimes take several hours.
Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

Procedure: Trusting GPG Keys on Clients

1. On the Uyuni Server, at the command prompt, check the contents of the /srv/www/htdocs/pub/ directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key. For example:

   ```
   uyuni-gpg-pubkey-0d20833e.key
   ```

   You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

Register Clients

To register your openSUSE clients, you need a bootstrap repository. By default, bootstrap repositories are automatically created, and regenerated daily for all synchronized products. You can manually create the bootstrap repository from the command prompt, using this command:

```
mgr-create-bootstrap-repo --with-custom-channels
```

For more information on registering your clients, see [Client-configuration › Registration-overview › ].

Registering SUSE Linux Enterprise Server with Expanded Support Clients

This section contains information about registering traditional and Salt clients running SUSE Linux Enterprise Server with Expanded Support (Expanded Support) operating systems.

Expanded Support clients are based on Red Hat Enterprise Linux or CentOS.

They are sometimes also called SLESES, RES or Red Hat Expanded Support.

You are responsible for arranging access to Red Hat or CentOS base media repositories and installation media.
SUSE does not provide support for Expanded Support systems on Uyuni.

Traditional clients are not available on Expanded Support 8. Expanded Support 8 clients are only supported as Salt clients.

Add Software Channels

For Expanded Support clients, some required packages are contained on the Red Hat Enterprise Linux or CentOS installation media. You must have these packages installed before you can register a Expanded Support client.

The Expanded Support product is provided by SUSE Customer Center. This also includes the client tools package.

Before you register Expanded Support clients to your Uyuni Server, check that you have the corresponding Expanded Support product enabled, and the required channels are fully synchronized.

You need to select two different sets of channels, one for Expanded Support and the other for the Client Tools.

You will need an activation key associated with the correct Expanded Support channels. For more information about activation keys, see [Client-configuration › Activation-keys › ].

The channels you need for this procedure are:

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Client Channel</th>
<th>Tools Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expanded Support 6</td>
<td>rhel-x86_64-server-6</td>
<td>-</td>
<td>res6-suse-manager-tools-x86_64</td>
</tr>
<tr>
<td>Expanded Support 7</td>
<td>rhel-x86_64-server-7</td>
<td>-</td>
<td>res7-suse-manager-tools-x86_64</td>
</tr>
<tr>
<td>Expanded Support 8</td>
<td>rhel-x86_64-server-8</td>
<td>-</td>
<td>res8-suse-manager-tools-x86_64</td>
</tr>
</tbody>
</table>

Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:

```
spacewalk-common-channels \  
<base_channel_name> \  
<child_channel_name_1> \  
<child_channel_name_2> \  
... <child_channel_name_n>
```
2. Synchronize the channels:

```
mgr-sync refresh --refresh-channels
```

---

**Add Base Media**

The base Expanded Support channel does not contain any packages, because SUSE does not provide Red Hat Enterprise Linux or CentOS base media. You will need to obtain base media from Red Hat or CentOS, which you can add as a child channel to the Expanded Support parent channel. To ensure you have all the packages you need, use a full DVD image, not a minimal or JeOS image.

You can use Uyuni custom channels to set up the Red Hat Enterprise Linux or CentOS media. All packages on the base media are mirrored into a child channel.

The details you need for this procedure are:

**Table 15. ES Custom Repository Settings**

<table>
<thead>
<tr>
<th>Option</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repository URL</td>
<td>The content URL provided by Red Hat CDN or CentOS</td>
</tr>
<tr>
<td>Has Signed Metadata?</td>
<td>Uncheck all Red Hat Enterprise repositories</td>
</tr>
<tr>
<td>SSL CA Certificate</td>
<td>redhat-uep</td>
</tr>
<tr>
<td>SSL Client Certificate</td>
<td>Entitlement-Cert-date</td>
</tr>
<tr>
<td>SSL Client Key</td>
<td>Entitlement-Key-date</td>
</tr>
</tbody>
</table>

**Procedure: Creating Custom Repositories**

1. On the Uyuni Server WebUI, navigate to Software › Manage › Repositories.
2. Click [Create Repository] and set the appropriate parameters for the main repository.
3. Click [Create Repository].
4. Repeat for all repositories you need to create.

The channels you need for this procedure are:

**Table 16. ES Custom Channels**

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Tools Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expanded Support 6</td>
<td>RHEL Expanded Support 6</td>
<td>RES6 SUSE-Manager-Tools x86_64</td>
</tr>
<tr>
<td>Expanded Support 7</td>
<td>RHEL Expanded Support 7</td>
<td>RES7 SUSE-Manager-Tools x86_64</td>
</tr>
</tbody>
</table>
## OS Version | Base Channel | Tools Channel
---|---|---
Expanded Support 8 | RHEL or SLES ES or CentOS 8 Base | RHEL8-Pool for x86_64

When you have created the repositories, you can create the custom channels, one for each repository:

**Procedure: Creating Custom Channels**

1. On the Uyuni Server WebUI, navigate to **Software › Manage › Channels**.
2. Click [Create Channel] and set the appropriate parameters for the channels.
3. In the **Parent Channel** field, select the appropriate base channel.
4. Click [Create Channel].
5. Repeat for all channels you need to create. There should be one custom channel for each custom repository.

You can check that you have created all the appropriate channels and repositories, by navigating to **Software › Channel List › All**.

For Red Hat 8 clients, add both the Base and AppStream channels. You will require packages from both channels. If you do not add both channels, you will not be able to create the bootstrap repository, due to missing packages.

When you have created all the channels, you can associate them with the repositories you created:

**Procedure: Associating Channels with Repositories**

1. On the Uyuni Server WebUI, navigate to **Software › Manage › Channels**, and click the channel to associate.
2. Navigate to the **Repositories** tab, and check the repository to associate with this channel.
3. Click [Update Repositories] to associate the channel and the repository.
4. Repeat for all channels and repositories you need to associate.
5. **OPTIONAL:** Navigate to the **Sync** tab to set a recurring schedule for synchronization of this repository.
6. Click [Sync Now] to begin synchronization immediately.

**Procedure: Adding Base Media to Custom Channels**

1. On the Uyuni Server, at the command prompt, as root, copy the base media image to the `/tmp/` directory.
2. Create a directory to contain the media content. Replace `<os_name>` with either `sleses6`, `sleses7` or `sleses8`:

   ```bash
   mkdir -p /srv/www/htdocs/pub/<os_name>
   ```
3. Mount the image:

```bash
mount -o loop /tmp/<iso_filename> /srv/www/htdocs/pub/<os_name>
```

When the image is mounted, you can synchronize the base media. To manually synchronize the channels, navigate to **Software › Manage › Channels**. Click each channel in the list, and navigate to menu:[Repositories › Sync]. Click [**Sync Now**] to begin synchronization immediately. You can also create a synchronization schedule from this screen.

**Check Synchronization Status**

*Procedure: Checking Synchronization Progress*

1. In the Uyuni WebUI, navigate to **Software › Manage › Channels**, then click the channel associated to the repository.

2. Navigate to the **Repositories** tab, then click **Sync** and check **Sync Status**.

*Procedure: Checking Synchronization Progress from the Command Prompt*

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

```bash
tail -f /var/log/rhn/reposync/<channel-label>.log
```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

The Expanded Support channels can be very large. The initial channel synchronization can sometimes take up to several hours.

When the initial synchronization is complete, we recommended you clone the channel before you work with it. This gives you a backup of the original synchronization data.

**Register Expanded Support Clients**

Your Expanded Support clients are now ready to be registered.

For more information on registering your clients, see [**Client-configuration › Registration-overview ›**](#).

To register and use SUSE Linux Enterprise Server with Expanded Support 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see [**Registering Older Clients**](#) at [**Client-configuration › Tshoot-clients ›**](#).
Red Hat Client Registration

You can register Red Hat Enterprise Linux clients to your Uyuni Server using either the Red Hat content delivery network (CDN), or Red Hat update infrastructure (RHUI). The method and details varies depending on the operating system of the client.

Before you start, ensure that the client has the date and time synchronized correctly with the Uyuni Server.

You must also have created an activation key. For more information about creating activation keys, see [Client-configuration › Activation-keys ›].

Registering Red Hat Enterprise Linux Clients with CDN

If you are running Red Hat Enterprise Linux clients directly, rather than using SUSE Linux Enterprise Server with Expanded Support, you need to use Red Hat sources to retrieve and update packages. This section contains information about using the Red Hat content delivery network (CDN) to register traditional and Salt clients running Red Hat Enterprise Linux operating systems.

For information about using Red Hat update infrastructure (RHUI) instead, see [Client-configuration › Clients-rh-rhui ›].

Red Hat Enterprise Linux clients are based on Red Hat and are unrelated to SUSE Linux Enterprise Server with Expanded Support, RES, Red Hat, or SUSE Linux Enterprise Server. You are responsible for arranging access to Red Hat base media repositories and RHEL installation media, as well as connecting Uyuni Server to the Red Hat content delivery network. You must obtain support from Red Hat for all your RHEL systems. If you do not do this, you might be violating your terms with Red Hat.

Traditional clients are available on Red Hat Enterprise Linux 6 and 7 only. Red Hat Enterprise Linux 8 clients are supported as Salt clients.

Import Entitlements and Certificates

Red Hat clients require a Red Hat certificate authority (CA) and entitlement certificate, and an entitlement key.

Entitlement certificates are embedded with expiration dates, which match the length of the support subscription. To avoid disruption, you will need to repeat this process at the end of every support subscription period.

Red Hat supply a subscription manager tool to manage subscription assignments. It runs locally to track installed products and subscriptions. Clients must be registered with the subscription manager to obtain certificates.
Red Hat clients use a URL to replicate repositories. The URL will change depending on where the Red Hat client is registered.

Red Hat clients can be registered in three different ways:

- Red Hat content delivery network (CDN) at redhat.com
- Red Hat Satellite Server
- Red Hat update infrastructure (RHUI) in the cloud

This guide covers clients registered to Red Hat CDN. You must have at least one system registered to the CDN, with an authorized subscription for repository content.

For information about using Red Hat update infrastructure (RHUI) instead, see [Client-configuration › Clients-rh-rhui ›].

Satellite certificates for client systems require a Satellite server and subscription. Clients using Satellite certificates are not supported with Uyuni Server.

Entitlement certificates are embedded with expiration dates, which match the length of the support subscription. To avoid disruption, you will need to repeat this process at the end of every support subscription period.

Red Hat supplies the subscription-manager tool to manage subscription assignments. It runs locally on the client system to track installed products and subscriptions. Register to redhat.com with subscription-manager, then follow this procedure to obtain certificates.

**Procedure: Registering Clients to Subscription Manager**

1. On the client system, at the command prompt, register with the subscription manager tool:

   ```bash
   subscription-manager register
   ```

   Enter your Red Hat Portal username and password when prompted.

2. Copy your entitlement certificate and key from the client system, to a location that the Uyuni Server can access:

   ```bash
   cp /etc/pki/entitlement/ /<example>/entitlement/
   ```

   Your entitlement certificate and key will both have a file extension of `.pem`. The key will also have `key` in the filename.

3. Copy the Red Hat CA Certificate file from the client system, to the same web location as the entitlement certificate and key:
To manage repositories on your Red Hat client, you need to import the CA and entitlement certificates to the Uyuni Server. This requires that you perform the import procedure three times, to create three entries: one each for the entitlement certificate, the entitlement key, and the Red Hat certificate.

Procedure: Importing Certificates to the Server

1. On the Uyuni Server WebUI, navigate to Systems › Autoinstallation › GPG and SSL Keys.
2. Click [Create Stored Key/Cert] and set these parameters for the entitlement certificate:
   - In the **Description** field, type *Entitlement-Cert-date*.
   - In the **Type** field, select SSL.
   - In the **Select file to upload** field, browse to the location where you saved the entitlement certificate, and select the `.pem` certificate file.
3. Click [Create Key].
4. Click [Create Stored Key/Cert] and set these parameters for the entitlement key:
   - In the **Description** field, type *Entitlement-key-date*.
   - In the **Type** field, select SSL.
   - In the **Select file to upload** field, browse to the location where you saved the entitlement key, and select the `.pem` key file.
5. Click [Create Key].
6. Click [Create Stored Key/Cert] and set these parameters for the Red Hat certificate:
   - In the **Description** field, type *redhat-uep*.
   - In the **Type** field, select SSL.
   - In the **Select file to upload** field, browse to the location where you saved the Red Hat certificate, and select the certificate file.
7. Click [Create Key].

Prepare Custom Repositories and Channels

To mirror the software from the Red Hat CDN, you need to create custom channels and repositories in Uyuni that are linked to the CDN by a URL. You must have entitlements to these products in your Red Hat Portal for this to work correctly. You can use the subscription manager tool to get the URLs of the repositories you want to mirror:

```
subscription-manager repos
```

You can use these repository URLs to create custom repositories. This allows you to mirror only the
content you need to manage your clients.

You can only create custom versions of Red Hat repositories if you have the correct entitlements in your Red Hat Portal.

The details you need for this procedure are:

Table 17. Red Hat Custom Repository Settings

<table>
<thead>
<tr>
<th>Option</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repository URL</td>
<td>The content URL provided by Red Hat CDN</td>
</tr>
<tr>
<td>Has Signed Metadata?</td>
<td>Uncheck all Red Hat Enterprise repositories</td>
</tr>
<tr>
<td>SSL CA Certificate</td>
<td>redhat-uep</td>
</tr>
<tr>
<td>SSL Client Certificate</td>
<td>Entitlement-Cert-date</td>
</tr>
<tr>
<td>SSL Client Key</td>
<td>Entitlement-Key-date</td>
</tr>
</tbody>
</table>

Procedure: Creating Custom Repositories

1. On the Uyuni Server WebUI, navigate to Software › Manage › Repositories.
2. Click [ Create Repository ] and set the appropriate parameters for the main repository.
3. Click [ Create Repository ].
4. Repeat for all repositories you need to create.

The channels you need for this procedure are:

Table 18. Red Hat Custom Channels

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Product</th>
<th>Base Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat 6</td>
<td>RHEL6-Pool for x86_64</td>
<td>rhel6-pool-x86_64</td>
</tr>
<tr>
<td>Red Hat 7</td>
<td>RHEL7-Pool for x86_64</td>
<td>rhel7-pool-x86_64</td>
</tr>
<tr>
<td>Red Hat 8</td>
<td>RHEL8-Pool for x86_64</td>
<td>rhel8-pool-x86_64</td>
</tr>
</tbody>
</table>

When you have created the repositories, you can create the custom channels, one for each repository:

Procedure: Creating Custom Channels

1. On the Uyuni Server WebUI, navigate to Software › Manage › Channels.
2. Click [ Create Channel ] and set the appropriate parameters for the channels.
3. In the Parent Channel field, select the appropriate base channel.
4. Click [ Create Channel ].
5. Repeat for all channels you need to create. There should be one custom channel for each custom repository.
You can check that you have created all the appropriate channels and repositories, by navigating to Software › Channel List › All.

For Red Hat 8 clients, add both the Base and AppStream channels. You will require packages from both channels. If you do not add both channels, you will not be able to create the bootstrap repository, due to missing packages.

When you have created all the channels, you can associate them with the repositories you created:

**Procedure: Associating Channels with Repositories**

1. On the Uyuni Server WebUI, navigate to Software › Manage › Channels, and click the channel to associate.
2. Navigate to the Repositories tab, and check the repository to associate with this channel.
3. Click [Update Repositories] to associate the channel and the repository.
4. Repeat for all channels and repositories you need to associate.
5. **OPTIONAL:** Navigate to the Sync tab to set a recurring schedule for synchronization of this repository.
6. Click [Sync Now] to begin synchronization immediately.

**Add Software Channels**

Before you register Red Hat clients to your Uyuni Server, check that you have the Red Hat product enabled, and the required channels are fully synchronized.

The channels you need for this procedure are:

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Client Channel</th>
<th>Tools Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat 6</td>
<td>rhel-x86_64-server-6</td>
<td>-</td>
<td>res6-suse-manager-tools-x86_64</td>
</tr>
<tr>
<td>Red Hat 7</td>
<td>rhel-x86_64-server-7</td>
<td>-</td>
<td>res7-suse-manager-tools-x86_64</td>
</tr>
<tr>
<td>Red Hat 8</td>
<td>rhel-x86_64-server-8</td>
<td>-</td>
<td>res8-suse-manager-tools-x86_64</td>
</tr>
</tbody>
</table>

**Procedure: Adding Software Channels at the Command Prompt**

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:
spacewalk-common-channels \ 
<base_channel_name> \ 
<child_channel_name_1> \ 
<child_channel_name_2> \ 
... <child_channel_name_n>

2. Synchronize the channels:

mgr-sync refresh --refresh-channels

The client tools channel provided by spacewalk-common-channels is sourced from Uyuni and not from SUSE.

Check Synchronization Status

Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to Software › Manage › Channels, then click the channel associated to the repository.

2. Navigate to the Repositories tab, then click Sync and check Sync Status.

Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the tail command to check the synchronization log file:

```
tail -f /var/log/rhn/reposync/<channel-label>.log
```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

Red Hat Enterprise Linux channels can be very large. Synchronization can sometimes take several hours.

Procedure: OPTIONAL: Creating a Salt State to Deploy Configuration Files

1. On the Uyuni Server WebUI, navigate to Configuration › Channels.

2. Click [Create State Channel].

   - In the Name field, type subscription-manager: disable yum plugins.
   - In the Label field, type subscription-manager-disable-yum-plugins.
   - In the Description field, type subscription-manager: disable yum plugins.
   - In the SLS Contents field, leave it empty.
3. Click [Create Config Channel]

4. Click [Create Configuration File]
   - In the Filename/Path field type /etc/yum/pluginconf.d/subscription-manager.conf.
   - In the File Contents field type:

   ```
   [main]
   enabled=0
   ```

   1. Click [Create Configuration File]

   2. Take note of the value of the field Salt Filesystem Path.

   3. Click on the name of the Configuration Channel.

   4. Click on View/Edit 'init.sls' File
      - In the File Contents field, type:

      ```
      configure_subscription-manager-disable-yum-plugins:
      cmd.run:
      - name: subscription-manager config --rhsm.auto_enable_yum_plugins=0
      - watch:
        - file: /etc/yum/pluginconf.d/subscription-manager.conf
      file.managed:
      - name: /etc/yum/pluginconf.d/subscription-manager.conf
      - source: salt:///etc/yum/pluginconf.d/subscription-manager.conf
      ```

   1. Click [Update Configuration File].

   ![](image)
   The **Creating a Salt State to Deploy Configuration Files** procedure is optional.

   **Procedure: Creating a System Group for Red Hat Enterprise Linux Clients**


   2. Click [Create Group].
      - In the Name field, type rhel-systems.
      - In the Description field, type All RHEL systems.

   3. Click [Create Group].

   4. Click States tab.

   5. Click Configuration Channels tab.

   6. Type subscription-manager: disable yum plugins at the search box.

   7. Click [Search] and the state will appear.
8. Click the checkbox for the state at the Assign column.

9. Click [Save changes].

10. Click [Confirm].

If you already have RHEL systems added to Uyuni, assign them to the new system group, and then apply the highstate.

Procedure: Adding the System Group to Activation Keys

You need to modify the activation keys you used for RHEL systems to include the system group created above.

1. On the Uyuni Server WebUI, navigate to Systems › Activation Keys.

2. For each the Activation Keys you used for RHEL systems, click on it and:

3. Navigate to the Groups tab, and the Join subtab.

4. Check Select rhel-systems.

5. Click [Join Selected Groups].

Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

Procedure: Trusting GPG Keys on Clients

1. On the Uyuni Server, at the command prompt, check the contents of the /srv/www/htdocs/pub/ directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the ORG_GPG_KEY= parameter and add the required key. For example:

   uyuni-gpg-pubkey-0d20833e.key

   You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

Register Clients

To register your Red Hat clients, you need a bootstrap repository. By default, bootstrap repositories are automatically created, and regenerated daily for all synchronized products. You can manually create the
bootstrap repository from the command prompt, using this command:

```
mgr-create-bootstrap-repo --with-custom-channels
```

For more information on registering your clients, see [Client-configuration › Registration-overview ›].

To register and use Red Hat Enterprise Linux 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see Registering Older Clients at [Client-configuration › Tshoot-clients ›].

Package Management and Red Hat Enterprise Linux 8 Clients

If you are using Red Hat Enterprise Linux 8 clients, you cannot perform package operations such as installing or upgrading directly from modular repositories like the Red Hat Enterprise Linux AppStream repository. You can use the AppStream filter with content lifecycle management to transform modular repositories into regular repositories.

For more information about content lifecycle management, see [Administration › Content-lifecycle ›].

Registering Red Hat Enterprise Linux Clients with RHUI

If you are running Red Hat Enterprise Linux clients directly, rather than using SUSE Linux Enterprise Server with Expanded Support, you need to use Red Hat sources to retrieve and update packages. This section contains information about using Red Hat update infrastructure (RHUI) to register traditional and Salt clients running Red Hat Enterprise Linux operating systems. If you are running your clients in a public cloud, such as Amazon EC2, use this method.

It is possible to use RHUI in conjunction with the Red Hat content delivery network (CDN) to manage your Red Hat Enterprise Linux subscriptions. For information about using Red Hat CDN, see [Client-configuration › Clients-rh-cdn ›].

Red Hat Enterprise Linux clients are based on Red Hat and are unrelated to SUSE Linux Enterprise Server with Expanded Support, RES, or SUSE Linux Enterprise Server. You are responsible for connecting Uyuni Server to the Red Hat update infrastructure. All clients that get updates using this RHUI certificate need to be correctly licensed, please check with your cloud provider and the Red Hat terms of service for more information.

When Red Hat Enterprise Linux clients registered with RHUI are switched off, Red Hat might declare the certificate invalid. In this case, you need to turn the client on again, or get a new RHUI certificate.
Traditional clients are available on Red Hat Enterprise Linux 6 and 7 only. Red Hat Enterprise Linux 8 clients are supported as Salt clients.

**Import Entitlements and Certificates**

Red Hat clients require a Red Hat certificate authority (CA) and entitlement certificate, and an entitlement key.

Red Hat clients use a URL to replicate repositories. The URL will change depending on where the Red Hat client is registered.

Red Hat clients can be registered in three different ways:

- Red Hat content delivery network (CDN) at redhat.com
- Red Hat Satellite Server
- Red Hat update infrastructure (RHUI) in the cloud

This guide covers clients registered to Red Hat update infrastructure (RHUI). You must have at least one system registered to RHUI, with an authorized subscription for repository content.

For information about using Red Hat content delivery network (CDN) instead, see [Client-configuration › Clients-rh-cdn › ].

Satellite certificates for client systems require a Satellite server and subscription. Clients using Satellite certificates are not supported with Uyuni Server.

The entitlement certificates and keys need to be copied from the client system to a location that the Uyuni Server can access.

Your entitlement certificate and the Red Hat CA Certificate file have file extensions of .crt. The key has a file extension of .key.

**Procedure: Copying Certificates to the Server**

1. Copy your entitlement certificate and key from the client system, to a location that the Uyuni Server can access:

   ```bash
   cp /etc/pki/rhui/product/content-<version>.crt /<example>/entitlement/
   cp /etc/pki/rhui/content-<version>.key /<example>/entitlement/
   ```

2. Copy the Red Hat CA Certificate file from the client system, to the same location as the entitlement certificate and key:

   ```bash
   cp /etc/pki/rhui/cdn.redhat.com-chain.crt /<example>/entitlement
   ```
To manage repositories on your Red Hat client, you need to import the CA and entitlement certificates to the Uyuni Server. This requires that you perform the import procedure three times, to create three entries: one each for the entitlement certificate, the entitlement key, and the Red Hat certificate.

**Procedure: Importing Certificates to the Server**

1. On the Uyuni Server WebUI, navigate to **Systems › Autoinstallation › GPG and SSL Keys**.

2. Click [Create Stored Key/Cert] and set these parameters for the entitlement certificate:
   - In the **Description** field, type **Entitlement-Cert-Date**.
   - In the **Type** field, select **SSL**.
   - In the **Select file to upload** field, browse to the location where you saved the entitlement certificate, and select the .crt certificate file.

3. Click [Create Key].

4. Click [Create Stored Key/Cert] and set these parameters for the entitlement key:
   - In the **Description** field, type **Entitlement-Key-Date**.
   - In the **Type** field, select **SSL**.
   - In the **Select file to upload** field, browse to the location where you saved the entitlement key, and select the .key key file.

5. Click [Create Key].

6. Click [Create Stored Key/Cert] and set these parameters for the Red Hat certificate:
   - In the **Description** field, type **redhat-cert**.
   - In the **Type** field, select **SSL**.
   - In the **Select file to upload** field, browse to the location where you saved the Red Hat certificate, and select the certificate file.

7. Click [Create Key].

**Prepare Custom Repositories and Channels**

To mirror the software from RHUI, you need to create custom channels and repositories in Uyuni that are linked to RHUI by a URL. You must have entitlements to these products in your Red Hat Portal for this to work correctly. You can use the yum utility to get the URLs of the repositories you want to mirror:

```
yum repolist -v | grep baseurl
```

You can use these repository URLs to create custom repositories. This allows you to mirror only the content you need to manage your clients.

You can only create custom versions of Red Hat repositories if you have the correct entitlements in your Red Hat Portal.
The details you need for this procedure are:

Table 20. Red Hat Custom Repository Settings

<table>
<thead>
<tr>
<th>Option</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repository URL</td>
<td>The content URL provided by RHUI</td>
</tr>
<tr>
<td>Has Signed Metadata?</td>
<td>Uncheck all Red Hat Enterprise repositories</td>
</tr>
<tr>
<td>SSL CA Certificate</td>
<td>redhat-cert</td>
</tr>
<tr>
<td>SSL Client Certificate</td>
<td>Entitlement-Cert-Date</td>
</tr>
<tr>
<td>SSL Client Key</td>
<td>Entitlement-Key-Date</td>
</tr>
</tbody>
</table>

Procedure: Creating Custom Repositories

1. On the Uyuni Server WebUI, navigate to Software › Manage › Repositories.
2. Click [Create Repository] and set the appropriate parameters for the main repository.
3. Click [Create Repository].
4. Repeat for all repositories you need to create.

The channels you need for this procedure are:

Table 21. Red Hat Custom Channels

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Product</th>
<th>Base Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat 6</td>
<td>RHEL6-Pool for x86_64</td>
<td>rhel6-pool-x86_64</td>
</tr>
<tr>
<td>Red Hat 7</td>
<td>RHEL7-Pool for x86_64</td>
<td>rhel7-pool-x86_64</td>
</tr>
<tr>
<td>Red Hat 8</td>
<td>RHEL8-Pool for x86_64</td>
<td>rhel8-pool-x86_64</td>
</tr>
</tbody>
</table>

When you have created the repositories, you can create the custom channels, one for each repository:

Procedure: Creating Custom Channels

1. On the Uyuni Server WebUI, navigate to Software › Manage › Channels.
2. Click [Create Channel] and set the appropriate parameters for the channels.
3. In the Parent Channel field, select the appropriate base channel.
4. Click [Create Channel].
5. Repeat for all channels you need to create. There should be one custom channel for each custom repository.

You can check that you have created all the appropriate channels and repositories, by navigating to Software › Channel List › All.
For Red Hat 8 clients, add both the Base and AppStream channels. You will require packages from both channels. If you do not add both channels, you will not be able to create the bootstrap repository, due to missing packages.

When you have created all the channels, you can associate them with the repositories you created:

Procedure: Associating Channels with Repositories

1. On the Uyuni Server WebUI, navigate to Software › Manage › Channels, and click the channel to associate.
2. Navigate to the Repositories tab, and check the repository to associate with this channel.
3. Click [Update Repositories] to associate the channel and the repository.
4. Repeat for all channels and repositories you need to associate.
5. OPTIONAL: Navigate to the Sync tab to set a recurring schedule for synchronization of this repository.
6. Click [Sync Now] to begin synchronization immediately.

Add Software Channels

Before you register Red Hat clients to your Uyuni Server, check that you have the Red Hat product enabled, and the required channels are fully synchronized.

The channels you need for this procedure are:

Table 22. Red Hat Channels - CLI

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Client Channel</th>
<th>Tools Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat 6</td>
<td>rhel-x86_64-server-6</td>
<td>-</td>
<td>res6-suse-manager-tools-x86_64</td>
</tr>
<tr>
<td>Red Hat 7</td>
<td>rhel-x86_64-server-7</td>
<td>-</td>
<td>res7-suse-manager-tools-x86_64</td>
</tr>
<tr>
<td>Red Hat 8</td>
<td>rhel-x86_64-server-8</td>
<td>-</td>
<td>res8-suse-manager-tools-x86_64</td>
</tr>
</tbody>
</table>

Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the spacewalk-common-channels command to add the appropriate channels:

```bash
spacewalk-common-channels \
<base_channel_name> \
<child_channel_name_1> \
<child_channel_name_2> \\ ...
```
2. Synchronize the channels:

```
mgr-sync refresh --refresh-channels
```

The client tools channel provided by `spacewalk-common-channels` is sourced from Uyuni and not from SUSE.

To use RHUI, you need to manually add the required HTTP headers to the configuration file. Without them, you cannot successfully perform a client synchronization.

**Procedure: Adding HTTP Headers to the Configuration File**

1. Locate the `X-RHUI-ID` and `X-RHUI-SIGNATURE` HTTP headers from your RHUI instance. You can use these commands on the Red Hat client to get the values from the cloud instance metadata API at `169.254.169.254`:

   ```
   echo "X-RHUI-SIGNATURE=$(curl -s http://169.254.169.254/latest/dynamic/instance-identity/signature|base64|tr -d '\n')"
   ```

2. Open the `/etc/rhn/spacewalk-repo-sync/extra_headers.conf` configuration file, and add or edit these lines with the correct information:

   ```
   [channel_label]
   X-RHUI-ID=value
   X-RHUI-SIGNATURE=value
   ```

**Check Synchronization Status**

**Procedure: Checking Synchronization Progress**

1. In the Uyuni WebUI, navigate to **Software › Manage › Channels**, then click the channel associated to the repository.

2. Navigate to the **Repositories** tab, then click **Sync** and check **Sync Status**.

**Procedure: Checking Synchronization Progress from the Command Prompt**

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

   ```
   tail -f /var/log/rhn/reposync/<channel-label>.log
   ```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.
Red Hat Enterprise Linux channels can be very large. Synchronization can sometimes take several hours.

Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

**Procedure: Trusting GPG Keys on Clients**

1. On the Uyuni Server, at the command prompt, check the contents of the `/srv/www/htdocs/pub/` directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.
2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key. For example:

   ```
   uyuni-gpg-pubkey-0d20833e.key
   ```

   You do not need to delete any previously stored keys.
3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

Register Clients

To register your Red Hat clients, you need a bootstrap repository. By default, bootstrap repositories are automatically created, and regenerated daily for all synchronized products. You can manually create the bootstrap repository from the command prompt, using this command:

```bash
mgr-create-bootstrap-repo --with-custom-channels
```

For more information on registering your clients, see [Client-configuration › Registration-overview ›](#).

To register and use Red Hat Enterprise Linux 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information, see [Registering Older Clients at](#).

Package Management and Red Hat Enterprise Linux 8 Clients

If you are using Red Hat Enterprise Linux 8 clients, you cannot perform package operations such as installing or upgrading directly from modular repositories like the Red Hat Enterprise Linux AppStream...
You can use the AppStream filter with content lifecycle management to transform modular repositories into regular repositories.

For more information about content lifecycle management, see [Administration › Content-lifecycle › ].
CentOS Client Registration

You can register CentOS clients to your Uyuni Server. The method and details varies depending on the operating system of the client.

Before you start, ensure that the client has the date and time synchronized correctly with the Uyuni Server.

You must also have created an activation key. For more information about creating activation keys, see [Client-configuration › Activation-keys › ].

Registering CentOS Clients

This section contains information about registering traditional and Salt clients running CentOS operating systems.

CentOS clients are based on CentOS and are unrelated to SUSE Linux Enterprise Server with Expanded Support, RES, Red Hat, or Expanded Support. You are responsible for arranging access to CentOS base media repositories and CentOS installation media, as well as connecting Uyuni Server to the CentOS content delivery network.

Traditional clients are not available on CentOS 8. CentOS 8 clients are only supported as Salt clients.

Add Software Channels

Before you register CentOS clients to your Uyuni Server, check that you have the CentOS product enabled, and the required channels are fully synchronized.

The channels you need for this procedure are:

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Client Channel</th>
<th>Updates Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>CentOS 6</td>
<td>centos6</td>
<td>centos6-uyuni-client</td>
<td>centos6-updates</td>
</tr>
<tr>
<td>CentOS 7</td>
<td>centos7</td>
<td>centos7-uyuni-client</td>
<td>centos7-updates</td>
</tr>
<tr>
<td>CentOS 8</td>
<td>centos8</td>
<td>centos8-uyuni-client</td>
<td>centos8-appstream</td>
</tr>
</tbody>
</table>

Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:
2. Synchronize the channels:

```
mgr-sync refresh --refresh-channels
```

The client tools channel provided by `spacewalk-common-channels` is sourced from Uyuni and not from SUSE.

For CentOS 8 clients, add both the Base and AppStream channels. You will require packages from both channels. If you do not add both channels, you will not be able to create the bootstrap repository, due to missing packages.

You might notice some disparity in the number of packages available in the AppStream channel between upstream and the Uyuni channel. You might also see different numbers if you compare the same channel added at a different point in time. This is due to the way that CentOS manages their repositories. CentOS removes older version of packages when a new version is released, while Uyuni keeps all of them, regardless of age.

Check Synchronization Status

Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to `Software › Manage › Channels`, then click the channel associated to the repository.

2. Navigate to the `Repositories` tab, then click `Sync` and check `Sync Status`.

Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

```
tail -f /var/log/rhn/reposync/<channel-label>.log
```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.
Create an Activation Key

You will need to create an activation key that is associated with your CentOS channels.

For more information on activation keys, see [Client-configuration › Activation-keys ›].

Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

Procedure: Trusting GPG Keys on Clients

1. On the Uyuni Server, at the command prompt, check the contents of the /srv/www/htdocs/pub/ directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the ORG_GPG_KEY= parameter and add the required key. For example:

   uyuni-gpg-pubkey-0d20833e.key

   You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

Register Clients

CentOS clients are registered in the same way as all other clients. For more information, see [Client-configuration › Registration-overview ›].

To register and use CentOS 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see Registering Older Clients at [Client-configuration › Tshoot-clients ›].

Manage Errata

When you update CentOS clients, the packages do not include metadata about the updates. You can use a third-party errata service to obtain this information.
The authors of CEFS provide patches or errata on a best-effort basis, in the hope they will be useful but with no guarantees of correctness or currency. This could mean that the patch dates could be incorrect, and in at least one case, the published data was shown to be more than a month old. For more information on these cases, see https://github.com/stevemeier/cefs/issues/28#issuecomment-656579382 and https://github.com/stevemeier/cefs/issues/28#issuecomment-656573607.

Any problems or delays with the patch data might result in unreliable patch information being imported to your Uyuni Server. This would cause reports, audits, CVE updates, or other patch-related information to also be incorrect. Please consider alternatives to using this service, such as independently verifying patch data, or choosing a different operating system, depending on your security-related requirements and certifications criteria.

Procedure: Installing an Errata Service

1. On the Uyuni Server, from the command prompt, as root, add the `sle-module-development-tools` module:

   ```bash
   SUSEConnect --product sle-module-development-tools/15.2/x86_64
   ```

2. Install errata service dependencies:

   ```bash
   zypper in perl-Text-Unidecode
   ```

3. Add or edit this line in `/etc/rhn/rhn.conf`:

   ```bash
   java.allow_adding_patches_via_api = centos7-updates-x86_64,centos7-x86_64,centos7-extras-x86_64
   ```

4. Restart Tomcat:

   ```bash
   systemctl restart tomcat
   ```

1. Create a file for your errata script:

   ```bash
   touch /usr/local/bin/cent-errata.sh
   ```

2. Edit the new file to include this script, editing the repository details as required. This script fetches the errata details from an external errata service, unpacks it, and publishes the details:
#!/bin/bash
mkdir -p /usr/local/centos
cd /usr/local/centos
rm *.xml
wget -c http://cefs.steve-meier.de/errata.latest.xml
#wget -c https://www.redhat.com/security/data/oval/com.redhat.rhsa-all.xml
wget -c http://cefs.steve-meier.de/errata-import.tar
tar xvf errata-import.tar
chmod +x /usr/local/centos/errata-import.pl
export SPACEWALK_USER='<adminname>';export SPACEWALK_PASS='<password>'
/usr/local/centos/errata-import.pl --server '<servername>'
   --errata /usr/local/centos/errata.latest.xml
   --include-channels=centos7-updates-x86_64,centos7-x86_64,centos7-extras-x86_64
   --publish --rhsa-oval /usr/local/centos/com.redhat.rhsa-RHEL7.xml

3. Set up a cron job to run the script daily:

   ln -s /usr/local/bin/cent-errata.sh /etc/cron.daily

For more information on this tool, see https://cefs.steve-meier.de/.
Oracle Client Registration

You can register Oracle Linux clients to your Uyuni Server. The method and details varies depending on the operating system of the client.

Before you start, ensure that the client has the date and time synchronized correctly with the Uyuni Server.

You must also have created an activation key. For more information about creating activation keys, see [Client-configuration › Activation-keys › ].

Registering Oracle Linux Clients

This section contains information about registering traditional and Salt clients running Oracle Linux operating systems.

Traditional clients are not available on Oracle Linux 8. Oracle Linux 8 clients are only supported as Salt clients.

Add Software Channels

Before you register Oracle Linux clients to your Uyuni Server, check that you have the Oracle Linux product enabled, and the required channels are fully synchronized.

The channels you need for this procedure are:

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Client Channel</th>
<th>Updates Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Linux 6</td>
<td>oraclelinux6</td>
<td>oraclelinux6-uyuni-client</td>
<td>-</td>
</tr>
<tr>
<td>Oracle Linux 7</td>
<td>oraclelinux7</td>
<td>oraclelinux7-uyuni-client</td>
<td>-</td>
</tr>
<tr>
<td>Oracle Linux 8</td>
<td>oraclelinux8</td>
<td>oraclelinux8-uyuni-client</td>
<td>oraclelinux8-appstream</td>
</tr>
</tbody>
</table>

Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:

   ```sh
   spacewalk-common-channels \\
   <base_channel_name> \\
   <child_channel_name_1> \\
   <child_channel_name_2> \\
   ... <child_channel_name_n>
   ```

2. Synchronize the channels:
The client tools channel provided by `spacewalk-common-channels` is sourced from Uyuni and not from SUSE.

For Oracle Linux 8 clients, add both the Base and AppStream channels. You will require packages from both channels. If you do not add both channels, you will not be able to create the bootstrap repository, due to missing packages.

Check Synchronization Status

**Procedure: Checking Synchronization Progress**

1. In the Uyuni WebUI, navigate to Software › Manage › Channels, then click the channel associated to the repository.

2. Navigate to the Repositories tab, then click Sync and check Sync Status.

**Procedure: Checking Synchronization Progress from the Command Prompt**

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

   ```bash
   tail -f /var/log/rhn/reposync/<channel-label>.log
   ```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

Create an Activation Key

You will need to create an activation key that is associated with your Oracle Linux channels.

For more information on activation keys, see [Client-configuration › Activation-keys › ].

Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

**Procedure: Trusting GPG Keys on Clients**

1. On the Uyuni Server, at the command prompt, check the contents of the `/srv/www/htdocs/pub/` directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key.
For example:

uyuni-gpg-pubkey-0d20833e.key

You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

Register Clients

Oracle Linux clients are registered in the same way as all other clients. For more information, see [Client-configuration › Registration-overview › ].

To register and use Oracle Linux 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption. For more information about how to resolve this error, see Registering Older Clients at [Client-configuration › Tshoot-clients › ].
Ubuntu Client Registration

You can register Ubuntu clients to your Uyuni Server. The method and details varies depending on the operating system of the client.

Before you start, ensure that the client has the date and time synchronized correctly with the Uyuni Server.

You must also have created an activation key. For more information about creating activation keys, see [Client-configuration › Activation-keys ›].

Registering Ubuntu 20.04 Clients

This section contains information about registering Salt clients running Ubuntu 20.04 LTS operating systems.

Canonical does not endorse or support Uyuni.

Ubuntu is supported for Salt clients only. Traditional clients are not supported.

Bootstrapping is supported for starting Ubuntu clients and performing initial state runs such as setting repositories and performing profile updates. However, the root user on Ubuntu is disabled by default, so to use bootstrapping, you will require an existing user with `sudo` privileges for Python.

Add Software Channels

Before you register Ubuntu clients to your Uyuni Server, check that you have the Ubuntu product enabled, and the required channels are fully synchronized.

The channels you need for this procedure are:

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Base Uyuni Channel</th>
<th>Updates Channel</th>
<th>Security Channel</th>
<th>Universe Uyuni Channel</th>
<th>Universe Updates Channel</th>
<th>Client Channel</th>
</tr>
</thead>
</table>

Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:
2. Synchronize the channels:

   mgr-sync refresh --refresh-channels

You need all the new channels fully synchronized, including Universe (Universe contains important dependencies for Salt), before bootstrapping any Ubuntu client.

Check Synchronization Status

Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to Software › Manage › Channels, then click the channel associated to the repository.

2. Navigate to the Repositories tab, then click Sync and check Sync Status.

Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the tail command to check the synchronization log file:

   \[
   \text{tail -f /var/log/rhn/reposync/<channel-label>.log}
   \]

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

Ubuntu channels can be very large. Synchronization can sometimes take several hours.

Trust GPG Keys on Clients

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

Procedure: Trusting GPG Keys on Clients

1. On the Uyuni Server, at the command prompt, check the contents of the /srv/www/htdocs/pub/ directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.
2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key. For example:

```
uyuni-gpg-pubkey-0d20833e.key
```

You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

**Root Access**

The root user on Ubuntu is disabled by default. You can enable it by editing the `sudoers` file.

*Procedure: Granting Root User Access*

1. On the client, edit the `sudoers` file:

```
sudo visudo
```

Grant `sudo` access to the user by adding this line at the end of the `sudoers` file. Replace `<user>` with the name of the user that will be used to bootstrap the client in the WebUI:

```
<user>  ALL=NOPASSWD: /usr/bin/python, /usr/bin/python2, /usr/bin/python3
```

This procedure grants root access without requiring a password, which is required for registering the client. When the client is successfully installed it will run with root privileges, so the access is no longer required. We recommend that you remove the line from the `sudoers` file after the client has been successfully installed.

**Register Clients**

To register your Ubuntu clients, you need a bootstrap repository. By default, bootstrap repositories are automatically created, and regenerated daily for all synchronized products. You can manually create the bootstrap repository from the command prompt, using this command:

```
mgr-create-bootstrap-repo
```

For more information on registering your clients, see [Client-configuration › Registration-overview › ].
Registering Ubuntu 16.04 and 18.04 Clients

This section contains information about registering Salt clients running Ubuntu 16.04 LTS, 18.04 LTS operating systems.

Uyuni supports Ubuntu 16.04 LTS and 18.04 LTS clients using Salt.

⚠️ Canonical does not endorse or support Uyuni.

ℹ️ Ubuntu is supported for Salt clients only. Traditional clients are not supported.

Bootstrapping is supported for starting Ubuntu clients and performing initial state runs such as setting repositories and performing profile updates. However, the root user on Ubuntu is disabled by default, so to use bootstrapping, you will require an existing user with `sudo` privileges for Python.

Add Software Channels

Before you register Ubuntu clients to your Uyuni Server, check that you have the Ubuntu product enabled, and the required channels are fully synchronized.

The channels you need for this procedure are:

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Base Uyuni Channel</th>
<th>Updates Channel</th>
<th>Security Channel</th>
<th>Universe Uyuni Channel</th>
<th>Universe Updates Channel</th>
<th>Client Channel</th>
</tr>
</thead>
</table>

**Procedure: Adding Software Channels at the Command Prompt**

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:
2. Synchronize the channels:

```bash
mgr-sync refresh --refresh-channels
```

You need all the new channels fully synchronized, including Universe (Universe contains important dependencies for Salt), before bootstrapping any Ubuntu client.

**Check Synchronization Status**

*Procedure: Checking Synchronization Progress*

1. In the Uyuni WebUI, navigate to **Software › Manage › Channels**, then click the channel associated to the repository.
2. Navigate to the **Repositories** tab, then click **Sync** and check **Sync Status**.

*Procedure: Checking Synchronization Progress from the Command Prompt*

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

```bash
tail -f /var/log/rhn/reposync/<channel-label>.log
```
2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.

Ubuntu channels can be very large. Synchronization can sometimes take several hours.

**Trust GPG Keys on Clients**

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

*Procedure: Trusting GPG Keys on Clients*

1. On the Uyuni Server, at the command prompt, check the contents of the `/srv/www/htdocs/pub/` directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.
2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key. For example:

```
uyuni-gpg-pubkey-0d20833e.key
```

You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

### Root Access

The root user on Ubuntu is disabled by default. You can enable it by editing the `sudoers` file.

**Procedure: Granting Root User Access**

1. On the client, edit the `sudoers` file:

```
sudo visudo
```

Grant `sudo` access to the user by adding this line at the end of the `sudoers` file. Replace `<user>` with the name of the user that will be used to bootstrap the client in the WebUI:

```
<user>  ALL=NOPASSWD: /usr/bin/python, /usr/bin/python2, /usr/bin/python3
```

This procedure grants root access without requiring a password, which is required for registering the client. When the client is successfully installed it will run with root privileges, so the access is no longer required. We recommend that you remove the line from the `sudoers` file after the client has been successfully installed.

### Register Clients

To register your Ubuntu clients, you need a bootstrap repository. By default, bootstrap repositories are automatically created, and regenerated daily for all synchronized products. You can manually create the bootstrap repository from the command prompt, using this command:

```
mgr-create-bootstrap-repo --with-custom-channels
```

For more information on registering your clients, see [Client-configuration › Registration-overview › ].
Debian Client Registration

You can register Debian clients to your Uyuni Server. The method and details varies depending on the operating system of the client.

Before you start, ensure that the client has the date and time synchronized correctly with the Uyuni Server.

You must also have created an activation key. For more information about creating activation keys, see [Client-configuration › Activation-keys › ].

Do not register a Uyuni Server to itself. The Uyuni Server must be managed individually.

Registering Debian Clients

This section contains information about registering Salt clients running Debian operating systems.

SUSE does not provide support for Debian operating systems. Uyuni allows you to manage Debian clients, but support is not provided. Using Uyuni to manage Debian clients is experimental. These instructions have been tested on Debian 9 Stretch and Debian 10 Buster. Do not rely on Debian clients in a production environment.

Debian is supported for Salt clients only. Traditional clients are not supported.

Bootstrapping can be used with Debian clients for performing initial state runs, and for profile updates.

Prepare to Register

Some preparation is required before you can register Debian clients to the Uyuni Server:

- If you are using Debian 9, install the `apt-transport-https` package on the client before you attempt to register. On the client, at the command prompt, as root, run:

  ```
  apt install apt-transport-https
  ```

- Ensure DNS is correctly configured and provides an entry for the client. Alternatively, you can configure the `/etc/hosts` files on both the Uyuni Server and the client with the appropriate entries.

- The client must have the date and time synchronized correctly with the Uyuni Server before registration.
Add Software Channels

The channels you need for this procedure are:

### Table 27. Debian Channels - CLI

<table>
<thead>
<tr>
<th>OS Version</th>
<th>Base Channel</th>
<th>Client Channel</th>
<th>Updates Channel</th>
<th>Security Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debian 10</td>
<td>debian-10-pool-amd64-uyuni</td>
<td>debian-10-amd64-uyuni-client</td>
<td>debian-10-amd64-main-updates-uyuni</td>
<td>debian-10-amd64-main-security-uyuni</td>
</tr>
</tbody>
</table>

### Procedure: Adding Software Channels at the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `spacewalk-common-channels` command to add the appropriate channels:

   ```
   spacewalk-common-channels \
   <base_channel_name> \ 
   <child_channel_name_1> \ 
   <child_channel_name_2> \ 
   ... <child_channel_name_n>
   ```

2. Synchronize the channels:

   ```
   mgr-sync refresh --refresh-channels
   ```

### Check Synchronization Status

#### Procedure: Checking Synchronization Progress

1. In the Uyuni WebUI, navigate to Software › Manage › Channels, then click the channel associated to the repository.

2. Navigate to the Repositories tab, then click Sync and check Sync Status.

#### Procedure: Checking Synchronization Progress from the Command Prompt

1. At the command prompt on the Uyuni Server, as root, use the `tail` command to check the synchronization log file:

   ```
   tail -f /var/log/rhn/reposync/<channel-label>.log
   ```

2. Each child channel generates its own log during the synchronization progress. You will need to check all the base and child channel log files to be sure that the synchronization is complete.
Debian channels can be very large. Synchronization can sometimes take several hours.

**Trust GPG Keys on Clients**

By default, some operating systems do not trust the GPG key for the Uyuni client tools. The clients can be successfully bootstrapped without the GPG key being trusted. However, you will not be able to install new client tool packages or update them until the keys are trusted.

**Procedure: Trusting GPG Keys on Clients**

1. On the Uyuni Server, at the command prompt, check the contents of the /srv/www/htdocs/pub/ directory. This directory contains all available public keys. Take a note of the key that applies to the client you are registering.

2. Open the relevant bootstrap script, locate the `ORG_GPG_KEY=` parameter and add the required key. For example:

   uyuni-gpg-pubkey-0d20833e.key

   You do not need to delete any previously stored keys.

3. If you are bootstrapping clients from the Uyuni WebUI, you will need to use a Salt state to trust the key. Create the Salt state and assign it to the organization. You can then use an activation key and configuration channels to deploy the key to the clients.

**Register Clients**

To register your Debian clients, you need a bootstrap repository. By default, bootstrap repositories are regenerated daily. You can manually create the bootstrap repository from the command prompt, using this command:

```
mgr-create-bootstrap-repo --with-custom-channels
```

For Debian 10, select `debian10-amd64-uyuni` when prompted.

For more information on registering your clients, see [Client-configuration › Registration-overview › ].
Client Registration on a Proxy

Proxy servers can act as a broker and package cache for both Salt and traditional clients. Registering clients on a Uyuni Proxy is similar to registering them directly on Uyuni, with a few key differences.

These sections contain information on registering Salt clients on a proxy using the WebUI, commands on the command line, or a bootstrap script. There is also information on registering traditional clients using a bootstrap script.

Within the WebUI, proxy pages will show information about both Salt and traditional clients. You can see a list of clients that are connected to a proxy by clicking the name of the proxy in Systems › System List › Proxy, then select the Proxy subtab of the Details tab.

A list of chained proxies for a Salt client can be seen by clicking the name of the client in Systems › All, then select the Connection subtab of the Details tab.

If you decide to move any of your clients between proxies or the server you will need to repeat the registration process from the beginning.

Register Clients to a Proxy in the WebUI

You can register Salt clients to a Uyuni Proxy using the WebUI.

A bootstrap repository is needed for non-SLE clients in general and for SLE clients before version 15. A bootstrap offers packages for installing Salt on clients and for registering Salt or traditional clients. For information about creating a bootstrap repository, see [Client-configuration › Bootstrap-repository ›].

Procedure: Registering Clients to a Proxy in the WebUI

1. In the Uyuni WebUI, navigate to Systems › Bootstrapping.
2. In the Host field, type the fully-qualified domain name (FQDN) of the client to be bootstrapped.
3. In the SSH Port field, type the SSH port number that will be used to connect and bootstrap the client. By default, the SSH port is 22.
4. In the User field, type the username to log in to the client. By default, the username is root.
5. In the Authentication Method field, select the authentication method to use for bootstrapping the client.
   - For password authentication, in the Password field, type password to log in to the client.
   - For SSH Private key authentication, enter the private key and the associated passphrase. The key is only stored for as long as the bootstrapping process takes to complete.
6. In the Activation Key field, select the activation key that is associated with the software channel you want to use to bootstrap the client.
7. In the Proxy field, select the proxy server you want to register to.

8. By default, the Disable SSH Strict Key Host Checking checkbox is selected. This allows the bootstrap process to automatically accept SSH host keys without requiring you to manually authenticate.

9. OPTIONAL: Check the Manage System Completely via SSH checkbox. If you check this option, the client will be configured to use SSH for its connection to the server, and no other connection method will be configured.

10. Click [Bootstrap] to begin registration.

When the bootstrap process has completed, your client will be listed at Systems › System List.

Register on the Command Line (Salt)

Instead of the WebUI, you can use the command line to register a Salt client to a proxy. This procedure requires that you have installed the Salt package on the Salt client before registration. For SLE 12 based clients, you also must have activated the Advanced Systems Management module.

Registering traditional clients on the command line is also possible, but it requires more steps. It is not covered here. Use the bootstrap script procedure to register traditional clients. For more information, see client-proxy-script.pdf.

Procedure: Registering Clients to a Proxy Using the Command Line

1. Choose a client configuration file located at:

   /etc/salt/minion

   or:

   /etc/salt/minion.d/NAME.conf

   This is sometimes also called a minion file.

2. Add the proxy FQDN as the master to the client configuration file:

   master: PROXY123.EXAMPLE.COM

3. Restart the salt-minion service:

   systemctl restart salt-minion

4. On the server, accept the new client key; replace <client> with the name of your client:
Registering with a Bootstrap Script (Salt and Traditional)

Registering clients (either traditional or Salt) via SUSE Manager Proxy with a bootstrap script is done almost the same way as registering clients directly with the Uyuni Server. The difference is that you create the bootstrap script on the SUSE Manager Proxy with a command line tool. The bootstrap script then deploys all necessary information to the clients. The bootstrap script requires some parameters (such as activation keys or GPG keys) that depend on your specific setup.

Procedure: Registering Clients to a Proxy with a Bootstrap Script

1. Create a client activation key on the Uyuni server using the WebUI. For more information, see [Client-configuration › Activation-keys › ].

2. On the proxy, execute the `mgr-bootstrap` command line tool as root. If needed, use the additional command line switches to tune your bootstrap script. To install a traditional client instead of a Salt client, ensure you use the `--traditional` switch.

   To view available options type `mgr-bootstrap --help` from the command line:

   ```bash
   # mgr-bootstrap --activation-keys=key-string
   ```

3. Optional: edit the resulting bootstrap script.

4. Execute the bootstrap script on the clients.
Autoinstallation

You can automate client installation with a number of different autoinstallation methods. This is useful if you need to install a large number of clients.

For most clients, you can use an autoinstallation file. The autoinstallation file contains information about the distribution to install on the clients. There are two main types of autoinstallation file. For SUSE Linux Enterprise clients, use AutoYaST. For Red Hat Enterprise Linux clients, use Kickstart. When you have created an autoinstallation file, you can upload and manage it in the Uyuni WebUI. The WebUI also provides tools to help you edit and maintain your autoinstallation files. For more information about autoinstallation files, see [Client-configuration › Autoinst-setup › ].

When you have created your autoinstallation files, you can create a profile to manage them. This makes it easier to store and manage multiple autoinstallation files for different types of clients. For more information about autoinstallation profiles, see [Client-configuration › Autoinst-profiles › ].

When you are ready to perform the autoinstallation, you need to make the Uyuni Server aware of the client. This is called provisioning. You can provision a client by enabling bare metal provisioning. Using this method, when a client connects to an IP address within a given range, the autoinstallation begins. You can also use Cobbler and PXE booting to provision clients within your network. Alternatively, you can provision clients using the Uyuni API. For more information about client provisioning, see [Client-configuration › Autoinst-provisioning › ].

Autoinstallation Setup

Before you can autoinstall clients, you need an autoinstallation file. The autoinstallation file contains information about the distribution to install on the clients.

There are two main types of autoinstallation file. For SUSE Linux Enterprise clients, use AutoYaST. For Red Hat Enterprise Linux clients, use Kickstart.

When you have created an autoinstallation file, you can upload and manage it in the Uyuni WebUI. The WebUI also provides tools to help you edit and maintain your autoinstallation files.

If you have created autoinstallation distributions using the Uyuni WebUI, you must manage them in the WebUI. If you make changes at the command prompt, the profiles will not synchronize correctly, and the WebUI will show incorrect values.

You can autoinstall Uyuni Proxies using AutoYaST in the same way as SUSE Linux Enterprise clients. Make sure you use the SUSE Linux Enterprise installation media, and choose the SLE-Product-SUSE-Manager-Proxy-4.1-Pool for x86_64 base channel.

Autoinstallation Distributions

Before you begin, you need to have installation media for the operating system you want to install on the
clients. This is usually a DVD image, that contains the Linux kernel, an initrd file, and other files required to boot the operating system in installation mode. Copy the installation media to your Uyuni Server, and take a note of the file path. You will also need to have the matching base channel synchronized on your Uyuni Server.

For SUSE operating systems, you can download installation media from https://www.suse.com/download/.

**Procedure: Creating an Autoinstallable Distribution**

1. In the Uyuni WebUI, navigate to Systems › Autoinstallation › Distributions.

2. Click Create Distribution, and complete these fields:
   - In the **Distribution Label** field, enter a name to identify your autoinstallable distribution.
   - In the **Tree Path** field, enter the path to the installation media saved on your Uyuni Server.
   - Select the matching **Base Channel**. This must match the installation media.
   - Select the **Installer Generation**. This must match the installation media.
   - OPTIONAL: Specify kernel options to use when booting this distribution. There are multiple ways to provide kernel options. Only add options here that are generic for the distribution.

3. Click [Create Autoinstallable Distribution].

Navigate to Systems › Autoinstallation › Distributions to find and create custom installation trees that may be used for automated installations.

**Autoinstallation Files**

When you perform an installation manually, you must provide information to the installer, such as partitioning and networking information and user details. An autoinstallation file is a method of providing this information in a scripted form. They are sometimes referred to as answers files.

Within Uyuni, you can use two different types of autoinstallation files, depending on the operating system of the clients you want to install. For SUSE Linux Enterprise clients, use AutoYaST. For Red Hat Enterprise Linux clients, use Kickstart. You can use both AutoYaST and Kickstart files if you want to install clients with different operating systems.

- For information about creating AutoYaST autoinstallation files, including example files, see [Client-configuration › Autoyast ›].
- For information about creating Kickstart autoinstallation files, see [Client-configuration › Kickstart ›].

If you want to download an autoinstallation file that has already been uploaded, navigate to Systems › Autoinstallation › Profiles and click the profile that contains the file you want to download. Navigate to the Autoinstallation File tab, and click [Download Autoinstallation File].
Variables

Autoinstallation variables can be used to substitute values into Kickstart and AutoYaST profiles. To define a variable, create a name-value pair (name/value) in the text box.

For example, if you want to autoinstall a system that joins the network of a specified organization (for example the Engineering department) you can create a profile variable to set the IP address and the gateway server address to a variable that any system using that profile will use. Add this line to the Variables text box.

```
IPADDR=192.168.0.28
GATEWAY=192.168.0.1
```

To use the distribution variable, use the name of the variable in the profile to substitute the value. For example, the network part of a Kickstart file looks like the following:

```
network --bootproto=static --device=eth0 --onboot=on --ip=$IPADDR \
--gateway=$GATEWAY
```

The $IPADDR will be resolved to 192.168.0.28, and the $GATEWAY to 192.168.0.1.

In Kickstart files, variables use a hierarchy. System variables take precedence over profile variables, which in turn take precedence over distribution variables.

Variables are part of the larger Cobbler infrastructure for creating templates that can be shared between multiple profiles and systems. For more information about Cobbler and templates, see [Client-configuration › Cobbler ›].

Code Snippets

You can store code snippets to use in autoinstallation files later on. Navigate to Systems › Autoinstallation › Autoinstallation Snippets to see the list of existing snippets. Click [Create Snippet] to create a new code snippet.

Use a snippet by adding the Snippet Macro statement in your autoinstallation file.

For example, in Kickstart:

```
'$SNIPPET('spacewalk/rhel_register_script')'
```

For example, in AutoYaST:

```
<init-scripts config:type="list">
  $SNIPPET('spacewalk/sles_register_script')
</init-scripts>
```
When you create a snippet with the Create Snippet link, all profiles including that snippet are updated accordingly.

**Autoinstallation Profiles**

When you have prepared an autoinstallation file and distribution, you can create profiles to manage autoinstallation on your Uyuni Server. You can create multiple autoinstallation profiles, to manage different distributions.

To see and manage your autoinstallation profiles, navigate to Systems › Autoinstallation › Profiles.

**Create an Autoinstallation Profile**

You can create your autoinstallation profile directly in the Uyuni WebUI. The simplest way to create a profile is to upload an AutoYaST or Kickstart file. Alternatively, for Kickstart only, you can use the WebUI wizard.

Before you begin, you must have created an autoinstallation distribution, and prepared an autoinstallation file. For more information about autoinstallation distributions and files, see [Client-configuration › Autoinst-setup ›].

**Procedure: Creating an Autoinstallation Profile by Upload**

1. In the Uyuni WebUI, navigate to Systems › Autoinstallation › Profiles.
2. Click [Upload Kickstart/Autoyast File ].
3. In the Label field, type a name for the profile. Do not use spaces.
4. In the Autostall Tree field, select the autoinstallation distribution to use for this profile.
5. In the Virtualization Type field, select the type of virtualization to use for this profile, or select None for no virtualization.
6. Copy the contents of your autoinstallation file into the File Contents field, or upload the file directly using the File to Upload field.
7. Click [Create ] to create the profile.

**Procedure: Creating a Kickstart Profile by Wizard**

1. In the Uyuni WebUI, navigate to Systems › Autoinstallation › Profiles.
2. Click [Create Kickstart Profile ].
3. In the Label field, type a name for the profile. Do not use spaces.
4. In the Base Channel field, select the base channel to use for this profile. This field is populated from the distributions available. If the base channel you need is not available, check that you have created the distribution correctly.
5. In the Virtualization Type field, select the type of virtualization to use for this profile, or select None for no virtualization. Click [Next ].
6. In the **Distribution File Location** type the path to the installation media installed on the Uyuni Server. Click [Next].

7. Provide a password for the root user on the client.

8. Click [Finish].

9. Review the details of your new profile, and customize as required.

When you are creating your autoinstallation profile, you can check **Always use the newest Tree for this base channel**. This setting allows Uyuni to automatically pick the latest distribution that is associated with the specified base channel. If you add new distributions later, Uyuni will use the most recently created or modified.

You can change the details and settings of your autoinstallation profiles by navigating to **Systems › Autoinstallation › Profiles** and clicking on the name of the profile you want to edit.

Changing the Virtualization Type usually requires changes to the profile bootloader and partition options. This can overwrite your customization. Verify new or changed settings before saving them, by navigating to the **Partitioning** tab.

**File Preservation for Kickstart**

If you have many custom configuration files located on a client you want to Kickstart, you can save them as a list, and associate that list with the Kickstart profile to be used.

In the Uyuni WebUI, navigate to **Systems › Autoinstallation › File Preservation** and click [Create File Preservation List]. Enter a suitable label, and list absolute paths to all files and directories you want to save. Click [Create List].

Include the file preservation list in your Kickstart profile by navigating to **Systems › Autoinstallation › Profiles** and selecting the profile you want to edit. Navigate to the **System Details › File Preservation** subtab and select the file preservation list to include.

File preservation lists are limited to a total size of 1 MB. Special devices like `/dev/hda1` and `/dev/sda1` are not supported. Only use file and directory names, you cannot use regular expression wildcards.

**Autoinstallation Provisioning**

When you have prepared an autoinstallation profile, you can autoinstall your clients.

To start autoinstallation the client must already be known to Uyuni. You can use bare metal provisioning to bring clients into Uyuni. Alternatively, you can use the Uyuni API.
Bare Metal Provisioning

Bare metal provisioning is supported on clients with AMD or Intel x86_64 processors, and at least 1 GB of RAM.

Uyuni Server uses Cobbler over TFTP to connect to bare metal clients for provisioning. Check that you have a DHCP server and that you have set the next-server configuration parameter to match the Uyuni server IP address or hostname.

When you have the bare metal provisioning option enabled, any bare metal client connected to the Uyuni network is automatically added to the organization as soon as it is powered on. The provisioning process can take a few minutes. When it is complete, the client will be shut down, and it appears in the Systems list, ready to be installed.

Procedure: Provisioning Bare Metal Clients

1. In the Uyuni WebUI, navigate to Admin › Manager Configuration › Bare-metal systems.
2. Click [ Enable adding to this organization ].
3. Navigate to Systems, locate your bare metal clients in the list, and click the client you want to provision.
4. Select the Provisioning › Autoinstallation tab.
5. Select the AutoYaST profile to use, and start the autoinstallation.

You cannot schedule autoinstallation for bare metal clients. Bare metal clients will be automatically installed when they are correctly configured and powered on.

New bare metal clients are added to the organization that belongs to the administrator who enabled the bare metal feature. To change the organization clients are added to, disable the bare metal feature, log in as the administrator of the new organization, and then re-enable the feature.

You can use the system set manager (SSM) with bare metal clients. However, not all SSM features are available for bare metal clients, because they do not yet have an operating system installed. This also applies to mixed sets that include bare metal systems. All features will become available to the set when all the clients in the set have been provisioned. For more information on SSM, see [ Client-configuration › System-set-manager › ].

API Provisioning

You can use API calls at the command prompt to bring clients into Uyuni for autoinstallation.

Procedure: Provisioning Using the API

1. At the command prompt, use the system.createSystemRecord or system.createSystemProfile API calls. In this example, replace <hw_addr> with a hardware address such as 00:25:22:71:e7:c6 and <name> with the name of your client:
2. In the Uyuni WebUI, navigate to Systems, locate your new clients in the list, and click the client you want to provision.

3. Select the Provisioning > Autoinstallation tab.

4. Select the AutoYaST profile to use, and start the autoinstallation. Alternatively, you can schedule the autoinstallation for a later time.

Advanced PXE Installation Configuration

If the client needs to be installed for the first time, you can use the Create PXE installation configuration option. This option creates a PXE boot configuration. When you power on the client, it boots from the network and the correct profile is selected for installation.

If the client is already managed, click [ Schedule Autoinstallation and Finish ] to start the installation.

For more information about AutoYaST, see https://doc.opensuse.org/projects/autoyast/.

Kickstart

When you install a Red Hat Enterprise Linux client, there are a number of questions you need to answer. To automate installation, you can create a Kickstart file with all the answers to those questions, so that no user intervention is required.

Kickstart files can be kept on a server and read by individual clients during installation. The same Kickstart file is used to install multiple clients.

Kickstart can be used to schedule a registered system to be installed with a new operating system and package profile, or you can use it to install a new system that was not previously registered, or does not yet have an operating system installed.

For more information about Kickstart, see the Red Hat documentation.

Before you Begin

Some preparation is required for your infrastructure to handle Kickstart installations. Before you create a Kickstart profile, consider:

- A DHCP server is not required for kickstarting, but it can make things easier. If you are using static IP addresses, select static IP while developing your Kickstart profile.
- An FTP server can be used instead of hosting the Kickstart distribution tree using HTTP.
- If you are performing a bare metal Kickstart installation, use these settings:
  - Configure DHCP to assign the required networking parameters and the bootloader program
In the bootloader configuration file, specify the kernel and appropriate kernel options to be used.

**Build a Bootable ISO**

You will need to create a bootable ISO image to be used by the target system for installation. When the system is rebooted or switched on, it boots from the image, loads the Kickstart configuration from your Uyuni, and installs Red Hat Enterprise Linux according to the Kickstart profile.

**Building a Bootable ISO**

1. Copy the contents of `/isolinux` from the first CD-ROM of the target distribution.
2. Edit the `isolinux.cfg` file to default to 'ks'. Change the 'ks' section to read:

   ```
   label ks
   kernel vmlinuz
   append text ks=`url`initrd=initrd.img lang= devfs.nomount \ ramdisk_size=16438'ksdevice'
   ```

   IP address-based Kickstart URLs will look like this:

   ```
   http://`my.manager.server`/kickstart/ks/mode/ip_range
   ```

   The Kickstart distribution defined via the IP range should match the distribution from which you are building, or errors will occur.

3. **OPTIONAL:** If you want to use the `ksdevice`, it looks like:

   ```
   ksdevice=eth0
   ```

   It is possible to change the distribution for a Kickstart profile within a family, such as Red Hat Enterprise Linux AS 4 to Red Hat Enterprise Linux ES 4, by specifying the new distribution label. Note that you cannot move between versions (4 to 5) or between updates (U1 to U2).

4. Customize `isolinux.cfg` further as required. For example, you can add multiple options, different boot messages, or shorter timeout periods.

5. Create the ISO with this command:

   ```
   mkisofs -o file.iso -b isolinux.bin -c boot.cat -no-emul-boot \ -boot-load-size 4 -boot-info-table -R -J -v -T isolinux/
   ```

   Note that `isolinux/` is the relative path to the directory containing the modified isolinux files copied from the distribution CD, while `file.iso` is the output ISO file, which is placed into the current directory.
6. Burn the ISO to CD-ROM and insert the disk.

7. Boot the system and type `ks` at the prompt (if you left the label for the Kickstart boot as 'ks').

8. Press `Enter` to start Kickstart.

**Integrating with PXE**

Instead of using a bootable ISO image, you can use a PXE image instead. This is less error-prone, allows Kickstart installation from bare metal, and integrates with existing PXE/DHCP environments.

To use this method, make sure your systems have network interface cards (NICs) that support PXE. You will need to install and configure a PXE server, ensure DHCP is running, and place the installation repository on an HTTP server that is reachable by the Uyuni Server.

Upload the Kickstart profile to the Uyuni Server using the Uyuni WebUI.

When the AutoYaST profile has been created, use the URL from the Autoinstallation Overview page as the image location.


For more information about autoinstallation profiles, see [Reference › Systems › ].

**AutoYaST**

When you install a SUSE Linux Enterprise client, there are a number of questions you need to answer. To automate installation, you can create an AutoYaST file with all the answers to those questions, so that no user intervention is required.

AutoYaST files can be kept on a server and read by individual clients during installation. The same AutoYaST file is used to install multiple clients.

AutoYaST can be used to schedule a registered system to be installed with a new operating system and package profile, or you can use it to install a new system that was not previously registered, or does not yet have an operating system installed.

For more information about AutoYaST, see https://doc.opensuse.org/projects/autoyast/.

**Before you Begin**

Some preparation is required for your infrastructure to handle AutoYaST installations. Before you create an AutoYaST profile, consider:

- A DHCP server is not required for AutoYaST, but it can make things easier. If you are using static IP addresses, you should select static IP while developing your AutoYaST profile.
• Host the AutoYaST distribution trees via HTTP, provided by Uyuni.

• If you are performing a bare metal AutoYaST installation, use these settings:
  ◦ Configure DHCP to assign the required networking parameters and the bootloader program location.
  ◦ In the bootloader configuration file, specify the kernel and appropriate kernel options to be used.

Build a Bootable ISO

You will need to create a bootable ISO image to be used by the target system for installation. When the system is rebooted or switched on, it boots from the image, loads the AutoYaST configuration from your Uyuni, and installs SUSE Linux Enterprise Server according to the AutoYaST profile.

To use the ISO image, boot the system and type `autoyast` at the prompt (assuming you left the label for the AutoYaST boot as `autoyast`). Press `Enter` to begin the AutoYaST installation.

This is managed by the KIWI image system. For more information about KIWI, see [http://doc.opensuse.org/projects/kiwi/doc/](http://doc.opensuse.org/projects/kiwi/doc/).

Integrate with PXE

Instead of using a bootable ISO image, you can use a PXE image instead. This is less error-prone, allows AutoYaST installation from bare metal, and integrates with existing PXE/DHCP environments.

To use this method, make sure your systems have network interface cards (NICs) that support PXE. You will need to install and configure a PXE server, ensure DHCP is running, and place the installation repository on an HTTP server that is reachable by the Uyuni Server.

Upload the AutoYaST profile to the Uyuni Server using the Uyuni WebUI.

When the AutoYaST profile has been created, use the URL from the Autoinstallation Overview page as the image location.


For more information about autoinstallation profiles, see [Reference › Systems › ].

AutoYast Example File

SUSE provides templates of AutoYaST profiles in the SUSE/manager-build-profiles public GitHub repository.

Minimalist AutoYaST Profile for Automated Installations and Useful Enhancements

The AutoYaST profile in this section installs a SUSE Linux Enterprise Server system with all default installation options including a default network configuration using DHCP. After the installation is
finished, a bootstrap script located on the Uyuni server is executed to register the freshly installed system with Uyuni. You need to adjust the IP address of the Uyuni server, the name of the bootstrap script, and the root password according to your environment:

```xml
<user>
  ...
  <username>root</username>
  <user_password>`linux`</user_password>
</user>

<location>http://`192.168.1.1`/pub/bootstrap/`my_bootstrap.sh`</location>
```

The complete AutoYaST file:

You can find the AutoYaST file at https://github.com/SUSE/manager-build-profiles/tree/master/AutoYaST/Minimal-AutoYaST.

Use this enhancement fragment to add child channels:

```xml
<add-on>
  <add_on_products config:type="list">
    <listentry>
      <ask_on_error config:type="boolean">true</ask_on_error>
      <media_url>http://$c_server/ks/dist/child/`channel-label`/`distribution-label`</media_url>
      <name>$c_name</name>
      <product>$c_product</product>
      <product_dir>/</product_dir>
    </listentry>
    ...
    <!-- SLES SUSE Manager tools Pool -->
    <listentry>
      <media_url>http://$c_server/ks/dist/child/`channel-label`/`sle-manager-tools`/`distribution-label`</media_url>
      ...
    </listentry>
  </add_on_products>
</add-on>
```

Replace `channel-label` and `distribution-label` with the correct labels (such as `sles12-sp4-updates-x86_64` and `sles12-sp4-x86_64`). Ensure that the distribution label corresponds to the Autoinstallable Distribution. Set the variables (such as `$c_server`) according to your environment. For more information about variables, see [Reference › Systems › ].

Here is a literal example for `sles12-sp4-x86_64`:
It is required that you add the updates tools channel to the `<add-on>` AutoYaST snippet section. This ensures your systems are provided with an up-to-date version of the `libzypp` package. If you do not include the updates tools channel, you will encounter 400 errors. In this example, the (DISTRIBUTION_NAME) is replaced with the name of the autoinstallation distribution from `Systems › Autoinstallation › Distributions`.

SUSE only supports Cobbler functions that are available in the Uyuni WebUI, or through the Uyuni API. Only supported features are documented here.
If you intend to use your installation with for Retail formulas, do not follow this guide to configure Cobbler on the branch server. In for Retail installations, the TFTPD formula manages these settings. For more information about the TFTPD formula, see [Salt › Formula-tftpd › ].

This section explains the Cobbler features most commonly used with Uyuni:

- The `cobbler sync` command is triggered from Uyuni Server and generate the TFTP boot environment
- Installation environment analysis using the `cobbler check` command
- Virtual machine guest installation automation with the `koan` client-side tool
- Building installation ISOs with PXE-like menus using the `cobbler buildiso` command (for Uyuni systems with x86_64 architecture)

For more information about Cobbler, see https://cobbler.readthedocs.io.

**Cobbler Requirements**

To use Cobbler for system installation with PXE, you will require a TFTP server. Uyuni installs a TFTP server by default. To PXE boot systems, you will require a DHCP server, or have access to a network DHCP server.

Cobbler uses host names as a unique key for each system. If you are using the `pxe-default-image` to onboard bare metal systems, make sure every system has a unique host name. Non-unique host names will cause all systems with the same host name to have the configuration files overwritten when a provisioning profile is assigned.

**Configure Cobbler**

Cobbler configuration is primarily managed using the `/etc/cobbler/settings` file. Cobbler will run with the default settings unchanged. All configurable settings are explained in detail in the `/etc/cobbler/settings` file.

The PXE boot process uses DHCP to find the TFTP boot server. The Uyuni Server can act as such a TFTP boot server and Cobbler can generate the content for it. You must have administrative access to the network’s DHCP server. Edit the DHCP configuration file so that it points to the Uyuni Server as the TFTP boot server:

**Procedure: Example for Configuring the ISC DHCP Server**

1. On the DHCP server, as root, open the `/etc/dhcpd.conf` file.
2. Append a new class with options for performing PXE boot installation. For example:
This example:

- Enables the `bootp` protocol for network booting.
- Creates a class called `PXE`.
- Identifies systems as `PXEClient` if they are configured with PXE as the first boot priority.
- Directs PXE Clients to the Cobbler server at `192.168.2.1`.
- Retrieves the `pxelinux.0` bootloader file.

3. Save the file.

While it is possible to use KVM with PXE booting, it can be unreliable. We do not recommend you use this on production systems.

**Procedure: Configuring PXE Boot in KVM**

1. Use the `virsh` command to produce a dump of the current network XML description:

   ```
   virsh net-dumpxml --inactive network > network.xml
   ```

2. Open the XML dump file at `network.xml` and add a `bootp` parameter within the `<dhcp>` element:

   ```
   <bootp file='/pxelinux.0' server='192.168.100.153'/>
   ```

3. Use the `virsh` command to install the updated description:

   ```
   virsh net-define network.xml
   ```

   Alternatively, you can use the `net-edit` subcommand, which will also perform some error checking.
Listing 1. Example: Minimal Network XML Description for KVM

```xml
<network>
  <name>default</name>
  <uuid>1da84185-31b5-4c8b-9ee2-a7f5ba39a7ee</uuid>
  <forward mode='nat'>
    <nat>
      <port start='1024' end='65535'/>
    </nat>
  </forward>
  <bridge name='virbr0' stp='on' delay='0'/>
  <mac address='52:54:00:29:59:18'/>
  <domain name='default'/>
  <ip address='192.168.100.1' netmask='255.255.255.0'>
    <dhcp>
      <range start='192.168.100.128' end='192.168.100.254'/>
      <bootp file='/pxelinux.0' server='192.168.100.153'/>
    </dhcp>
  </ip>
</network>
```

**TFTP**

Uyuni uses the `tftp` daemon. The `tftp` daemon is the recommended method for PXE services, and is installed by default. The default configuration works in most cases. However, if you need to change the configuration, use the YaST Services Manager.

The TFTP service must be running so it can serve the `pxelinux.0` boot image. Start YaST and use **System › Services Manager** to configure the `tftp` daemon.

You can also synchronize Cobbler-generated TFTP contents to a Uyuni Proxy. For synchronization, HTTPS port 443 must be open.

**Procedure: Installing TFTP**

1. On the Uyuni Server, as root, install the `susemanager-tftpsync` package:

   ```
   zypper install susemanager-tftpsync
   ```

2. On the Uyuni Proxy, as root user, install the `susemanager-tftpsync-recev` package:

   ```
   zypper install susemanager-tftpsync-recev
   ```

**Procedure: Configuring TFTP on a Proxy**

1. On the Uyuni Proxy, as root, run the `configure-tftpsync.sh` script.

2. The script will interactively ask you for details on the host names and IP addresses of the Uyuni Server and Proxy, as well for the location of the `tftpboot` directory on the Proxy.

For more information, use the `configure-tftpsync.sh --help` command.
**Procedure: Configuring TFTP on a Server**

1. On the Uyuni Server, as root, run the `configure-tftpsync.sh` script.

```
configure-tftpsync.sh proxy1.example.com proxy2.example.com
```

2. Run the `cobbler sync` command to push the files to the proxy. This will fail if you have not configured the proxies correctly.

3. If you want to change the list of proxies later on, you can use the `configure-tftpsync.sh` script to edit them.

   If you reinstall an already configured proxy and want to push all the files again, you must remove the cache file at `/var/lib/cobbler/pxe_cache.json` before you call `cobbler sync`.

**Background Information about the Synchronization Process**

A `cobbler sync` is a rebuild of every file Cobbler touched. On Uyuni, `cobbler sync` does the following actions:

1. Run pre-sync triggers. This can be any number of shell scripts.
2. Delete all files and directories that are not allowed in `/srv/www/cobbler/`.
3. Create all needed directories.
4. Delete all elements inside the directories.
5. Create the TFTP directory.
6. Write the DHCP files if management is enabled (unsupported). For more information, see Configure Cobbler.
7. Do the same with DNS (unsupported).
8. Clean up the cache.
9. Run `rsync` if rsync management is enabled.
10. Run post-sync triggers. This can be any number of shell scripts (unsupported).

Uyuni also adds or removes, or edits systems that are in Cobbler. Those actions trigger a so-called lite sync process. This sync only touches files and directories that are related to the change which triggered it.

If you have created Cobbler profiles, distributions, or systems using the Uyuni WebUI, you must manage them in the WebUI. If you make changes at the command prompt, the profiles will not synchronize correctly, and the WebUI will show incorrect values.
Synchronize and Start the Cobbler Service

When tftpsync is configured, the Uyuni Server must be able to access the Uyuni Proxy systems directly.

Do not start or stop the `cobblerd` service independent of the Uyuni service. Doing so can cause errors. Always use `/usr/sbin/spacewalk-service` to start or stop Uyuni.

Check that all the prerequisites the Cobbler service requires, are configured according to your requirements. You can do this by running the `cobbler check` command.

When you had to change the configuration, restart the Uyuni service:

```
/usr/sbin/spacewalk-service restart
```

Autoinstallation Templates

AutoYaST or Kickstart profiles are used to automate SUSE Linux Enterprise or Red Hat Enterprise Linux client installations. Templates are used to describe how to create autoinstallation profiles. You can create autoinstallation variables within the Uyuni WebUI. This allows you to create and manage large numbers of profiles and systems, without having to manually create profiles for each.

Cobbler uses a template engine called Cheetah that provides support for templates, variables, and snippets.

Kickstart Template Syntax

Kickstart templates can have static values for certain common items such as PXE image file names, subnet addresses, and common paths such as `/etc/sysconfig/network-scripts/`. However, templates differ from standard Kickstart files in their use of variables.

For example, a standard Kickstart file might have a networking section like this:

```
network --device=eth0 --bootproto=static --ip=192.168.100.24 \ 
--netmask=255.255.255.0 --gateway=192.168.100.1 --nameserver=192.168.100.2
```

In a Kickstart template file, the networking section would look like this instead:

```
network --device=$net_dev --bootproto=static --ip=$ip_addr \ 
--netmask=255.255.255.0 --gateway=$my_gateway --nameserver=$my_nameserver
```

These variables are substituted with the values set in your Kickstart profile variables or in your system detail variables. If the same variable is defined in both the profile and the system detail, then the system detail variable takes precedence.
Kickstart templates use syntax rules that rely on punctuation symbols. To avoid clashes, they need to be properly treated.

If the template contains shell script variables like \$(example), the content needs to be escaped with a backslash: \$(example). If the variable is defined in the template, the templating engine will evaluate it correctly. If there is no such variable, the content will be left unchanged. Escaping the $ symbol will prevent the templating engine from evaluating the symbol as an internal variable.

Long scripts or strings can be escaped by wrapping them with the \#raw and \#end raw directives. For example:

```bash
#raw
#!/bin/bash
for i in {0..2}; do
  echo "$i - Hello World!"
done
#end raw
```

Any line with a # symbol followed by a whitespace is treated as a comment and is therefore not evaluated. For example:

```bash
#start some section (this is a comment)
echo "Hello, world"
#end some section (this is a comment)
```

**Kickstart Snippets**

Kickstart snippets are sections of Kickstart code that can be called by a $SNIPPET() function. The snippet is parsed by Cobbler and substituted with the contents of the snippet.

This example sets up a snippet for a common hard drive partition configuration:

```bash
clearpart --all
part /boot --fstype ext3 --size=150 --asprimary
part / --fstype ext3 --size=40000 --asprimary
part swap --recommended
part pv.00 --size=1 --grow
volgroup vg00 pv.00
logvol /var --name=var vgname=vg00 --fstype ext3 --size=5000
```

Save this snippet of the configuration to a file in /var/lib/cobbler/snippets/, where Cobbler can access it.

Use the snippet by calling the $SNIPPET() function in your Kickstart templates. For example:

```bash
$SNIPPET('my_partition')
```
Cobbler will parse the function with the snippet of code contained in the `my_partition` file.

**Build ISOs with Cobbler**

Cobbler can create ISO boot images that contain a set of distributions, kernels, and a menu, that work similar to a PXE installation.

Building ISOs with Cobbler is not supported on IBM Z.

The Cobbler `buildiso` command takes parameters to define the name and output location of the boot ISO. For example:

```bash
cobbler buildiso --iso=/path/to/boot.iso
```

The boot ISO includes all profiles and systems by default. You can limit which profiles and systems are used, with the `--profiles` and `--systems` options. For example:

```bash
cobbler buildiso --systems="system1 system2 system3" \ --profiles="profile1 profile2 profile3"
```

If you cannot write an ISO image to a public `tmp` directory, check your systemd settings in `/usr/lib/systemd/system/cobblerd.service`.

**Bare Metal Provisioning**

Systems that have not yet been provisioned are called bare metal systems. You can provision bare metal systems using Cobbler. Once a bare metal system has been provisioned in this way, it will appear in the Systems list, where you can perform regular provisioning with autoinstallation, for a completely unattended installation.

To successfully provision a bare metal system, you will require a fully patched Uyuni server.

The system to be provisioned must have x86_64 architecture, with at least 2 GB RAM, and be capable of PXE booting.

The server uses TFTP to provision the bare metal client, so the appropriate port and networks must be configured correctly in order for provisioning to be successful. In particular, ensure that you have a DHCP server, and have set the `next-server` parameter to the Uyuni server IP address or hostname.

**Enable Bare Metal Systems Management**

Bare metal systems management can be enabled or disabled in the Uyuni WebUI by navigating to Admin › SUSE Manager Configuration › Bare-metal systems.
New systems are added to the organization of the administrator who enabled the bare metal systems management feature. To change the organization, log in as an Administrator of the required organization, and re-enable the feature.

When the feature has been enabled, any bare metal system connected to the server network will be automatically added to the organization when it is powered on. The process can take a few minutes, and the system will automatically shut down when it is complete. The system will now be visible in the **Systems › System list**. Click on the name of the system to see basic information. For more details, go to the **Properties**, **Notes**, and **Hardware** tabs. You can migrate bare metal systems to other organizations if required, using the **Migrate** tab.

**Provision Bare Metal Systems**

Provisioning bare metal systems is similar to provisioning other systems, and can be done using the **Provisioning** tab. However, you will not be able to schedule provisioning, it will happen automatically as soon as the system is configured and powered on.

System Set Manager can be used with bare metal systems. However, not all SSM features are available, because bare metal systems do not have an operating system installed. This also applies to mixed sets that contain bare metal systems. All features will be re-enabled if the bare metal systems are removed from the set.
System Set Manager

The system set manager (SSM) is used to perform actions on more than one client at a time. SSM creates ephemeral sets of clients, making it useful for one-off actions that you need to apply to a number of clients. If you want more permanent sets, consider using system groups instead. For more information about system groups, see [Client-configuration › System-groups › ].

The actions available for use in SSM are listed in this table. The icons in this table indicate:

- ✔️ this action is available in SSM for this client type
- ✖️ this action is not available in SSM for this client type
- ❓ this action is under consideration for this client type, and may or may not be supported at a later date.

Table 28. Available SSM Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Traditional</th>
<th>Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>List systems</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Install patches</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Schedule patch updates</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Upgrade packages</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Install packages</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Remove packages</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Verify packages</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Create groups</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Manage groups</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Channel memberships</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Channel subscriptions</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Deploy/diff channels</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Autostart clients</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Tag for snapshot</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Remote commands</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Power management</td>
<td>✔️</td>
<td>✖️</td>
</tr>
<tr>
<td>Update system preferences</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Update hardware profiles</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Update package profiles</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Set/remove custom values</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>
You can select clients for the SSM in several ways:

- Navigate to Systems › System List and check the clients you want to work with.
- Navigate to Systems › System Groups, and click [ Use in SSM ] for the system group you want to work with.
- Navigate to Systems › System Groups, check the group you want to work with, and click [ Work with Group ].

When you have selected the clients you want to work with, navigate to Systems › System Set Manager, or click the systems selected icon in the top menu bar.

The details in SSM might differ slightly from the details in other parts of the Uyuni WebUI. In SSM, all available updates are shown. This allows you to upgrade to packages that might not be the latest version.

**Change Base Channels in SSM**

You can use SSM to change the base channel of more than one client at the same time.

Changing the base channel significantly changes the packages and patches available to the affected clients. Use with caution.

**Procedure: Using SSM to Change Base Channels for Multiple Clients**

1. In the Uyuni WebUI, navigate to Systems › System List, check the clients you want to work with, and navigate to Systems › System Set Manager.
2. Navigate to the Channels subtab.
3. Locate the current base channel in the list, and verify that the number shown in the Systems column is correct. You can click the number in this column to see more details of the clients you are changing.
4. Select the new base channel in the Desired base Channel field, and click [ Next ].
5. For each child channel, select No change, Subscribe, or Unsubscribe, and click [ Next ].
6. Check the changes you are making, and choose a time for the action to occur.
7. Click [ Confirm ] to schedule the changes.
System Groups

You can use system groups to make it easier to manage a large number of clients. Groups can be used to perform bulk actions on clients such as applying updates, configuration channels, salt states, or formulas.

You can organize clients into groups in any way that works for your environment. For example, you could organize clients on which operating system is installed, which physical location they are in, or the type of workload they are handling. Clients can be in any number of groups, so you can define your groups in different ways.

When you have clients organized into groups, you can perform updates on all clients in one or more groups, or on intersections between groups. For example, you can define one group for all Salt clients, and another group for all SLES clients. You can then perform updates on all Salt clients, or use the intersection between the groups, and update all Salt SLES clients.

Create Groups

You need to create some groups before you can use them to organize your clients.

Procedure: Creating a New System Group

1. In the Uyuni WebUI, navigate to Systems › System Groups.
2. Click [Create Group].
3. Give your new group a name and a description.
4. Click [Create Group] to save your group.
5. Repeat for each group you require.

Add Clients to Groups

You can add individual clients to your groups, or add multiple clients at the same time.

Procedure: Adding A Single Client to a Group

1. In the Uyuni WebUI, navigate to Systems › System List and click the name of the client to add.
2. Navigate to the Groups › Join tab.
3. Check the group to join and click [Join Selected Groups].

Procedure: Adding Multiple Clients to a Group

1. In the Uyuni WebUI, navigate to Systems › System Groups and click the name of the group to add clients to.
2. Navigate to the Target systems tab.
3. Check the clients to add and click [Add Systems].

Procedure: Adding Multiple Clients to a Group with SSM
1. In the Uyuni WebUI, navigate to **Systems › System List** and check each client to add, this adds the clients to the system set manager.

2. Navigate to **Systems › System Set Manager**, and go to the **Groups** tab.

3. Locate the group to join and check **Add**.

4. Click [ **Alter Membership** ].

5. Click [ **Confirm** ] to join the clients to the selected group.

For more information about the system set manager, see [ **Client-configuration › System-set-manager** ].

You can see which clients are in a group by navigating to **Systems › System Groups**, clicking the name of the group, and navigating to the **Systems** tab. Alternatively, you can see a graphical representation of your system groups by navigating to **Systems › Visualization › Systems Grouping**.

**Work with Groups**

When you have your clients arranged into groups, you can use your groups to manage updates. For Salt clients, you can also apply states and formulas to all clients in a group.

In the Uyuni WebUI, navigate to **Systems › System Groups**. The list shows an icon if there are updates available for any of the clients in the group. Click the icon to see more information about the updates available and to apply them to the clients.

You can also work with more than one group at a time. Select the groups you want to work with, and click [ **Work with union** ] to select every client in every selected group.

Alternatively, you can work on intersections of groups. Select two or more groups, and click [ **Work with intersection** ] to select only those clients that exist in all the selected groups. For example, you might have one group for all Salt clients, and another group for all SLES clients. The intersection of these groups would be all Salt SLES clients.
Package Management

Clients use packages to install, uninstall, and upgrade software.

To manage packages on a client, navigate to Systems, click the client to manage, and navigate to the Systems › Software › Packages subtab. The options available in this section will vary depending on the type of client you have selected, and its current channel subscriptions.

When packages are installed or upgraded, licenses or EULAs are automatically accepted.

Most package management actions can be added to action chains. For more about action chains, see [Reference › Schedule › ].

Verify Packages

You can check that packages you have installed on a client match the current state of the database they were installed from. The metadata of the installed package is compared to information in the database, including the file checksum, file size, permissions, owner, group, and type.

Procedure: Verifying Installed Packages

1. In the Uyuni WebUI, navigate to Systems, click the client the package is installed on, and navigate to the Systems › Software › Packages › Verify subtab.
2. Select the packages you want to verify and click [Verify Selected Packages ].
3. When the verification is complete, navigate to Systems › Events › History to see the results.

Compare Packages

You can compare the packages installed on a client with a stored profile, or with packages installed on another client. When the comparison is made, you can choose to modify the selected client to match.

To compare packages against a profile, you need to have stored a profile. Profiles are created from the packages on a currently installed client. When the profile has been created, you can use it to install more clients with the same packages installed.

Procedure: Creating a Stored Profile

1. In the Uyuni WebUI, navigate to Systems, click the client to base your profile off, and navigate to the Systems › Software › Packages › Profiles subtab.
2. Click [Create System Profile ].
3. Type a name and description for your profile and click [Create Profile ].

Procedure: Comparing Client Packages

1. In the Uyuni WebUI, navigate to Systems, click the client to compare, and navigate to the Systems › Software › Packages › Profiles subtab. To compare with a stored profile, select the profile and
click [Compare].

2. To compare with another client, select the client name and click [Compare] to see a list of differences between the two clients.

3. Check packages you want to install on the selected client, uncheck packages you want to remove, and click [Sync Packages to].
Patch Management

You can use custom patches within your organization to manage clients. This allows you to issue patch alerts for packages in custom channels, schedule patch installation, and manage patches across organizations.

Create Patches

To use a custom patch, you need to create the patch, add packages to it and add it to one or more channels.

Procedure: Creating a Custom Patch

1. In the Uyuni WebUI, navigate to Patches › Manage Patches, click [Create Patch].

2. In the Create Patch section, use these details:
   - In the Synopsis field, type a short description of the patch.
   - In the Advisory field, type a label for the patch. We recommend you devise a naming convention for your organization to make patch management easier.
   - In the Advisory Release field, enter a release number for your patch. For example, if this is the first version of this patch, use 1.
   - In the Advisory Type field, select the type of patch to use. For example, Bug Fix Advisory for a patch that fixes errors.
   - If you selected an advisory type of Security Advisory, in the Advisory Severity field, select the severity level to use.
   - In the Product field, type the name of the product this patch refers to.
   - OPTIONAL: In the Author field, type the name of the author of the patch.
   - Complete the Topic, Description, and Solution fields with further information about the patch.

3. OPTIONAL: In the Bugs section, specify the information of any related bugs, using these details:
   - In the ID field, enter the bug number.
   - In the Summary field, type a short description of the bug.
   - In the Bugzilla URL field, type the address of the bug.
   - In the Keywords field, type any keywords related to the bug. Use a comma between each keyword.
   - Complete the References and Notes fields with further information about the bug.
   - Select one or more channels that the new patch will be added to.

4. Click [Create Patch].
You can also create patches by cloning an existing one. Cloning preserves package associations and simplifies issuing patches.

**Procedure: Cloning Patches**

1. In the Uyuni WebUI, navigate to **Patches › Clone Patches**.
2. In the **View patches potentially applicable to:** field, select the software channel for the patch you want to clone.
3. Select the patch or patches you want to clone, and click [Clone Patches].
4. Select one or more channels that the cloned patch will be added to.
5. Confirm the details to begin the clone.

When you have created a patch, you can assign packages to it.

**Procedure: Assigning Packages to a Patch**

1. In the Uyuni WebUI, navigate to **Patches › Manage Patches**, and click the advisory name of the patch to see the patch details.
2. Navigate to the **Packages › Add** tab.
3. In the **Channel** field, select the software channel that contains the packages you want to assign to the patch, and click [View Packages]. You can select All managed packages to see the available packages in all channels.
4. Check the packages you want to include, and click [Add Packages].
5. Confirm the details of the packages, and click [Confirm] to assign them to the patch.
6. Navigate to the **Packages › List/Remove** tab to check that the packages have been assigned correctly.

When packages are assigned to a patch, the patch cache is updated to reflect the changes. The cache update might take a couple of minutes.

If you need to change the details of an existing patch, you can do so from the **Patches Management** page.

**Procedure: Editing and Deleting Existing Patch Alerts**

1. In the Uyuni WebUI, navigate to **Patches › Manage Patches**.
2. Click the advisory name of the patch to see the patch details.
3. Make the changes as required, and click [Update Patch].
4. To delete a patch, select the patch in the **Patches Management** page, and click [Delete Patches]. Deleting patches might take a few minutes.

**Apply Patches to Clients**

When a patch is ready, you can apply it to clients either singly, or with other patches.
Each package within a patch is part of one or more channels. If the client is not subscribed to the channel, the update will not be installed.

If the client has a more recent version of a package already installed, the update will not be installed. If the client has an older version of the package installed, the package will be upgraded.

**Procedure: Applying All Applicable Patches**

1. In the Uyuni WebUI, navigate to **Systems › Overview** and select the client you want to update.
2. Navigate to the **Software › Patches** tab.
3. Click [Select All] to select all applicable patches.
4. Click [Apply Patches] to update the client.

If you are signed in with Administrator privileges, you can also perform larger batch upgrades for clients.

**Procedure: Applying a Single Patch to Multiple Clients**

1. In the Uyuni WebUI, navigate to **Patches › Patch List**.
2. Locate the patch you want to apply, and click the number under the **Systems** column for that patch.
3. Select the clients you want to apply the patch to, and click [Apply Patches]. Confirm the list of clients to perform the update.

**Procedure: Applying Multiple Patches to Multiple Clients**

1. In the Uyuni WebUI, navigate to **Systems › Overview** and check the clients you want to update to add them to the system set manager.
2. Navigate to **Systems › System Set Manager** and navigate to the **Patches** tab.
3. Select the patches you want to apply to the clients and click [Apply Patches].
4. Schedule a date and time for the update to occur, and click [Confirm].
5. To check the progress of the update, navigate to **Schedule › Pending Actions**.

Scheduled package updates are installed using the contact method configured for each client. For more information, see [Client-configuration › Contact-methods-intro › ].
System Locking

System locks are used to prevent actions from occurring on a client. For example, a system lock will prevent a client from being updated or restarted. This is useful for clients running production software, or to prevent accidental changes. You can disable the system lock when you are ready to perform actions.

System locks are implemented differently on traditional and Salt clients.

System Locks on Traditional Clients

When a traditional client is locked, no actions can be scheduled using the WebUI, and a padlock icon is displayed next to the name of the client in the System › System List.

Procedure: System Locking a Traditional Client

1. In the Uyuni WebUI, navigate to the System Details page for the client you want to lock.
2. Under Lock Status, click [Lock this system]. The client will remain locked until you click [Unlock this system].

Some actions can still be completed on locked traditional clients, including remote commands, and automated patch updates. To stop automated patch updates, navigate to the System Details page for the client, and on the Properties tab, uncheck Auto Patch Update.

System Locks on Salt Clients

When a Salt client is locked, or put into blackout mode, no actions can be scheduled, Salt execution commands are disabled, and a yellow banner is displayed on the System Details page. In this mode, actions can be scheduled for the locked client using the WebUI or the API, but the actions will fail.

- The locking mechanism is not available for Salt SSH clients.

Procedure: System Locking a Salt Client

1. In the Uyuni WebUI, navigate to the System Details page for the client you want to lock.
2. Navigate to the Formulas tab, check the system lock formula, and click [Save].
3. Navigate to the Formulas › System Lock tab, check Lock system, and click [Save]. On this page, you can also enable specific Salt modules while the client is locked.
4. When you have made your changes, you might need to apply the highstate. In this case, a banner in the WebUI will notify you. The client will remain locked until you remove the system lock formula.

- The system lock formula is enabled by default if SUSE CaaS Platform is detected on the node.

For more information about blackout mode in Salt, see https://docs.saltstack.com/en/latest/topics/blackout/index.html.
Package Locks

Package locks can only be used on traditional clients that use the Zypper package manager. The feature is not currently supported on Red Hat Enterprise Linux or Salt clients.

Package locks are used to prevent unauthorized installation or upgrades to software packages on traditional clients. When a package has been locked, it will show a padlock icon, indicating that it cannot be installed. Any attempt to install a locked package will be reported as an error in the event log.

Locked packages cannot be installed, upgraded, or removed, either through the Uyuni WebUI, or directly on the client machine using a package manager. Locked packages will also indirectly lock any dependent packages.

Procedure: Using Package Locks

1. On the client machine, install the `zypp-plugin-spacewalk` package as root:
   
   ```
   zypper in zypp-plugin-spacewalk
   ```

2. Navigate to the Software › Packages › Lock tab on the managed system to see a list of all available packages.

3. Select the packages to lock, and click [Request Lock]. You can also choose to enter a date and time for the lock to activate. Leave the date and time blank if you want the lock to activate as soon as possible. Note that the lock might not activate immediately.

4. To remove a package lock, select the packages to unlock and click [Request Unlock]. Leave the date and time blank if you want the lock to deactivate as soon as possible. The lock might not deactivate immediately.
Power Management

You can power on, power off, and reboot clients using the Uyuni WebUI.

This feature uses the IPMI protocol and is managed using a Cobbler profile. The client must be IPMI-enabled, and configured to use a power management server. To use any power management functionality, IPMI configuration details must be added to Uyuni.

Navigate to Systems › Systems List, select the client you want to manage, and navigate to the Provisioning › Power Management tab. Complete the details for the power management server, and click the appropriate button for the action to take, or click [Save only] to save the details without taking any action.

You can apply power management actions to multiple clients at the same time by adding them to the system set manager. For more information about using the system set manager, see [Client-configuration › System-set-manager ›].

Power Management and Cobbler

The first time you use a power management feature, a Cobbler system record is automatically created, if one does not yet exist for the client. These automatically created system records are not bootable from the network, and include a reference to a dummy system image. This is needed because Cobbler does not currently support system records without profiles or images.

Cobbler power management uses fence-agent tools to support protocols other than IPMI. Only IPMI protocols are supported by Uyuni. You can configure your client to use other protocols by adding the fence-agent names as a comma-separated list to the java.power_management.types configuration parameter in the rhn.conf configuration files.
Configuration Snapshots

Snapshots record the package profile, configuration files, and Uyuni settings for a client at a set point in time. You can roll back to older snapshots to restore previous configuration settings.

Snapshots are supported on traditional clients only. Salt clients do not support this feature.

Snapshots are captured automatically after some actions occur. You can also manually take a snapshot at any time. We recommend that you ensure you have a current snapshot before performing any potentially destructive action on your clients.

Snapshots are enabled by default. You can disable automatic snapshots by setting `enable_snapshots=0` in the `rhn.conf` configuration file.

Manage your snapshots by navigating to Systems › Systems List and selecting the client you want to manage. Navigate to the Provisioning › Snapshots tab to see a list of all current snapshots for the selected client. Click the name of a snapshot to see more information about the changes recorded in the snapshot. You can use the subtabs in the Provisioning › Snapshots tab to see the changes that rolling back to the selected snapshot will make to:

- Group memberships
- Channel subscriptions
- Installed packages
- Configuration channel subscriptions
- Configuration files
- Snapshot tags

You can use a snapshot to roll back most changes to a client, but not all of them. For example, you cannot roll back multiple updates, and you cannot roll back a service pack migration. Always ensure you have taken a backup before performing upgrades on your clients.

Snapshot Tags

Snapshot tags allow you to add meaningful descriptions to your snapshots. You can use tags to record extra information about snapshots, such as a last known working configuration, or a successful upgrade.

Manage your snapshot tags by navigating to Systems › Systems List and selecting the client you want to manage. Navigate to the Provisioning › Snapshot Tags tab to see a list of all current snapshot tags for the selected client. Click Create System Tag, enter a description, and click the [ Tag Current Snapshot ] button.
Snapshots on Large Installations

There is no maximum number of snapshots that Uyuni will keep. This means that the database that stores the snapshots grows as you add more clients, packages, channels, and configuration changes.

If you have a large installation, with thousands of clients, you can use the Uyuni API to create a recurring cleanup script on a recurring schedule to ensure that old snapshots are deleted regularly. Alternatively, you can disable the feature by setting `enable_snapshots=0` in the `rhn.conf` configuration file.
Custom System Information

You can include customized system information about your clients. System information is defined as key:value pairs, which can be assigned to clients. For example, you can define a key:value pair for a particular processor, then assign that key to all clients that have that processor installed. Custom system information is categorized, and can be searched using the Uyuni WebUI.

Before you begin, you need to create a key that will allow you to store custom information.

**Procedure: Creating a Custom System Info Key**

1. In the Uyuni WebUI, navigate to Systems › Custom System Info, and click [Create Key].
2. In the Key Label field, add a name for your key. Do not use spaces. For example, `intel-x86_64-quadcore`.
3. In the Description field, provide any additional information required.
4. Repeat for each key you require.

When you have created some custom system information keys, you can apply them to clients.

**Procedure: Applying Custom Info Keys to Clients**

1. In the Uyuni WebUI, navigate to Systems, click the client to apply custom information to, and navigate to the Details › Custom Info tab.
2. Click [Create Value].
3. Locate the value you want to apply, and click the key label.
4. In the Value field, provide any additional information.
5. Click [Update Key] to apply the custom information to the client.
Client Upgrades

Clients use the versioning system of their underlying operating system, and require regular upgrades.

For clients using SUSE operating systems, you can perform upgrades within the Uyuni WebUI. You can also automate client upgrades using the content lifecycle manager.

For more information about managing client upgrades, see [Upgrade › Client-intro › ].
Virtualization

You can use Uyuni to manage virtualized clients in addition to regular traditional or Salt clients. In this type of installation, a virtual host is installed on the Uyuni Server to manage any number of virtual guests. If you choose to, you can install several virtual hosts to manage groups of guests.

The range of capabilities that virtualized clients have depends on the third-party virtualization provider you choose.

Xen and KVM hosts and guests can be managed directly in Uyuni. This enables you to autoinstall hosts and guests using AutoYaST or Kickstart, and manage guests in the WebUI.

Additionally, SUSE CaaS Platform clusters can be managed in the Uyuni WebUI, by navigating to Clusters › Overview.

For VMWare, including VMWare vSphere, and Nutanix AHV, Uyuni requires you to set up a virtual host manager (VHM) to control the VMs. This gives you control over the hosts and guests, but in a more limited way than available with Xen and KVM.

Other third-party virtualization providers are not directly supported by Uyuni. However, if your provider allows you to export a JSON configuration file for the VM, you can upload that configuration file to Uyuni and manage it with a VHM.

For more information about using VHMs to manage virtualization, see [Client-configuration › Vhm › ].

Clusters

You can use Uyuni to directly manage SUSE CaaS Platform clusters. Manage clusters that you have registered with Uyuni by navigating to Clusters › Overview in the WebUI.

Autoinstallation Profile

SUSE CaaS Platform 4 provides an AutoYaST profile that you can use to autoinstall a node. The profile is in the patterns-caasp-Management package.

You can use Uyuni to manage one or more existing SUSE CaaS Platform clusters.

Only SUSE CaaS Platform 4 is currently supported.

Before you begin, ensure you have installed your SUSE CaaS Platform cluster.

Elect a Management Node

To manage a SUSE CaaS Platform cluster, you need to elect a client as the management node for the cluster. The management node cannot be part of the cluster, and it must have the SUSE CaaS Platform channels associated with it before you begin. You can use a single management node for multiple clusters,
as long as the clusters are all of the same kind.

**Procedure: Electing a Management Node**

1. In the Uyuni WebUI, navigate to Systems › System List and click the name of the client to elect as the management node.

2. Navigate to the Formulas › Configuration tab, and check the CaaSP Management Node formula.

3. Click [ Save ] and apply the highstate.

   Do not use the management node until the highstate has been completed.

List all known clusters by navigating to Clusters › Overview. This list displays all existing clusters, along with the cluster type, and which management node they are associated with. It also shows the nodes within the cluster, if the nodes are registered to Uyuni. For the nodes within a cluster, additional information from skuba and the Kubernetes API are shown, including the role, status, and whether any updates are available.

**Procedure: Configuring the Management Node**

1. Copy the skuba configuration directory from your cluster to the management node. This is the directory that the skuba service creates after the cluster has been bootstrapped. Take a note of the new file location for adding the cluster in the Uyuni WebUI.

2. Provide a way to authenticate.

   There are two ways you can authenticate a SUSE CaaS Platform cluster, choose the method that best suits your environment:

   - Copy the passwordless private SSH key used to access the cluster nodes to the Uyuni Server, and take a note of the file location. You need the current keys and keys for any clients that you want to use in the future.

   - You can use an ssh-agent socket, and provide the path to the socket when setting up the cluster.

There are two ways of using the ssh-agent with SUSE CaaS Platform. You can use ssh-agent locally, or forward the ssh-agent to the management node from another machine:

**Procedure: Using a Local ssh-agent**

1. On the management node, at the command prompt, start the ssh-agent service:

   ```
   eval $(ssh-agent)
   ```

2. Add the SSH key:

   ```
   ssh-add <key>
   ```
3. The socket used to access the agent is available in the \$SSH\_AUTH\_SOCK environment variable.

**Procedure: Forwarding ssh-agent to the Management Node**

1. On the system that is providing ssh-agent, at the command prompt, enable SSH forwarding, and specify the hostname of the management node:

   ```
   ssh -A <management node>
   ```

2. The socket used to access the agent is available in the \$SSH\_AUTH\_SOCK environment variable.

   If you are using the ssh-agent method, the path of the socket changes every time a new ssh-agent is started or a new ssh -A connection is started. The ssh-agent socket path can be updated at any time from the Uyuni WebUI. The socket path can also be overridden when starting any cluster action that requires SSH access.

**Manage Clusters**

To manage a cluster in Uyuni, add the cluster in the WebUI.

**Procedure: Adding an Existing Cluster**

1. In the Uyuni WebUI, navigate to Clusters › Overview and click [ Add ].
2. Follow the prompts to provide information about your cluster, including the cluster type, and select the management node to associate.
3. Type the path to the skuba configuration file for the cluster.
4. Type the passwordless SSH key you want to use, or provide the path to an ssh-agent socket.
5. Type a name, label, and description for the cluster.
6. Click [ Add ].

For each cluster you manage with Uyuni, a corresponding system group is created. By default, the system group is called Cluster <cluster_name>. Refresh the system group to update the list of nodes. Only nodes known to Uyuni are shown.

You can remove clusters from Uyuni by navigating to Clusters › Overview, unchecking the cluster to be deleted, and clicking [ Delete Cluster ].

Deleting a cluster removes the cluster from Uyuni, it does not delete the cluster nodes. Workloads running on the cluster will continue uninterrupted.
Manage Nodes

When you have the cluster created in Uyuni, you can manage nodes within the cluster.

Before you add a new node to the cluster, check the management node can access the node you want to add using passwordless SSH, or the `ssh-agent` socket you are forwarding.

You also need to ensure that the node you want to add is registered to Uyuni, and has a SUSE CaaS Platform channel assigned.

Before you add a node to a cluster, you might need to do some manual configuration. Check that the system is used exclusively as a SUSE CaaS Platform node, and that swap is turned off. For more information, see https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#disabling_swap

Procedure: Adding Nodes to a Cluster

1. In the Uyuni WebUI, navigate to Clusters › Overview and click [Join Node].
2. Select the nodes to add from the list of available nodes. The list of available nodes includes only nodes that are registered to Uyuni, are not management nodes, and are not currently part of any cluster.
3. Follow the prompts to enter the SUSE CaaS Platform parameters for the nodes to be added.
4. OPTIONAL: Specify a custom `ssh-agent` socket that is valid only for the nodes that are being added.
5. Click [Save] to schedule an action to add the nodes to the SUSE CaaS Platform cluster.

Procedure: Removing Nodes from a Cluster

1. In the Uyuni WebUI, navigate to Clusters › Overview, uncheck the nodes to remove, and click [Remove Node].
2. Follow the prompts to define the parameters for the nodes to be removed.
3. OPTIONAL: Specify a custom `ssh-agent` socket that is valid only for the nodes that are being removed.
4. Click [Save] to schedule an action to remove the nodes.


Upgrade Clusters

If the cluster has available updates, you can use Uyuni to schedule and manage the upgrade.

Uyuni upgrades all control planes first, and then upgrades the workers. For more information, see https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#cluster_updates.

Procedure: Upgrading the Cluster
1. In the Uyuni WebUI, navigate to Clusters › Overview, and click the cluster to upgrade.

2. OPTIONAL: There are no SUSE CaaS Platform parameters available for you to customize for upgrade. However, you can specify a custom ssh-agent socket that is valid only for the nodes that are being upgraded.

3. Click [Save] to schedule an action to upgrade the cluster.

Uyuni will only interact with skuba to upgrade the cluster. Any other required action, such as configuration changes, are not issued by Uyuni.

For more information about upgrading, see https://www.suse.com/releasenotes/x86_64/SUSE-CAASP/4.

Virtualization with Xen and KVM

Xen and KVM virtualized clients can be managed directly in Uyuni.

To begin, you will need to set up a virtual host on your Uyuni Server. You can then set up autoinstallation using AutoYaST or Kickstart for future virtual hosts, and for virtual guests.

This section also includes information about administering your virtual guests after they have been installed.

Host Setup

The way that you set up Xen or KVM on a VM host depends on what operating system you want to use on its associated guests.


For Red Hat Enterprise Linux operating systems, refer to the Red Hat documentation for your version.

Uyuni uses libvirt to install and manage guests. You must have the libvirtd package installed on your host. In most cases, the default settings are usually sufficient, and you should not need to adjust them. However, if you want to access the VNC console on your guests as a non-root user, you will need to perform some configuration changes. For more information about how to set this up, consult the relevant documentation for your operating system.

You will require a bootstrap script on the Uyuni Server. Your bootstrap script must include the activation key for your host. We also recommend that you include your GPG key for additional security. For more on creating a bootstrap script, see [Client-configuration › Registration-bootstrap ›].

When your bootstrap script is ready, execute it on the host to register it with the Uyuni Server. For more on client registration, see [Client-configuration › Registration-overview ›].

For Salt clients, you will need to enable the Virtualization Host entitlement. This allows you to see VM changes instantly. To do this, in the Uyuni WebUI, navigate to the System Details page for the
host, and click on the Properties tab. Alternatively, the Virtualization Host entitlement can be added at the registration key level. In the Add-On System Types section, check Virtualization Host, and click [Update Properties] to save the changes. Restart the Salt minion service to activate the change:

```
systemctl restart salt-minion
```

For traditional clients, by default, VM hosts use the rhnsd service to check for scheduled actions. The check occurs every four hours, to balance load in environments where there are a lot of clients. This can create delays of up to four hours before an action is carried out. When you are managing VM guests, this long delay is not always ideal, especially for actions like rebooting a guest. To address this, you can disable the rhnsd service, and enable the osad service. The osad service receives commands using a jabber protocol, and will execute commands instantly.

To disable the rhnsd service, and enable the osad daemon, run these commands as the root user:

```
service rhnsd stop
service rhnsd disable
service osad enable
service osad start
```

Autoinstallation

You can use AutoYaST or Kickstart to automatically install and register Xen and KVM guests.

You will require an activation key for the VM host you want to register the guests to, and for each guest. Your activation key must have the provisioning and Virtualization Platform entitlements. Your activation key must also have access to the mgr-virtualization-host and mgr-osad packages. For more on creating activation keys, see [Client-configuration › Activation-keys ›].

If you want to automatically register the guests with Uyuni after installation, you will need to create a bootstrap script. For more on creating a bootstrap script, see [Client-configuration › Registration-bootstrap ›].

Autoinstallation of VM guests works only if they are configured as Traditional clients. Salt clients can be created using a template disk image, but not by using AutoYaST or Kickstart.

Create an Autoinstallable Distribution

You will need to create an autoinstallable distribution on the VM host to be able to autoinstall clients from Uyuni. The distribution can be made available from a mounted local or remote directory, or on a loop-mounted ISO image.
The configuration of the autoinstallable distribution will differ depending on whether you are using a SLES or Red Hat Enterprise Linux operating system on your guests. The packages for a Red Hat Enterprise Linux installation are fetched from the associated base channel. Packages for installing SUSE systems are fetched from the autoinstallable distribution. Therefore, for SLES systems, the autoinstallable distribution must be a complete installation source.

<table>
<thead>
<tr>
<th>Operating System Type</th>
<th>Kernel Location</th>
<th>initrd Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat Enterprise Linux</td>
<td>images/pxeboot/vmlinuz</td>
<td>images/pxeboot/initrd.img</td>
</tr>
<tr>
<td>SLES</td>
<td>boot/&lt;arch&gt;/loader/initrd</td>
<td>boot/&lt;arch&gt;/loader/linux</td>
</tr>
</tbody>
</table>

In all cases, ensure that the base channel matches the autoinstallable distribution.

Before you begin, ensure you have a installation media available to your VM Host. It can be on a network resource, a local directory, or an loop-mounted ISO image. Additionally, ensure that all files and directories are world-readable.

Procedure: Creating an Autoinstallable Distribution

1. In the Uyuni WebUI, navigate to **Systems › Autoinstallation › Distributions** and click [Create Distribution].

2. In the **Create Autoinstallable Distribution** section, use these parameters:
   - In the **Distribution Label** section, type a unique name for the distribution. Use only letters, numbers, hyphens (-), periods (.), and underscores (_), and ensure the name is longer than four characters.
   - In the **Tree Path** field, type an absolute path to the installation source.
   - In the **Base Channel** field, select the channel that matches the installation source. This channel is used as the package source for non-SUSE installations.
   - In the **Installer Generation** field, select the operating system version that matches the installation source.
   - In the **Kernel Options** field, type any options to be passed to the kernel when booting for the installation. The **install=** parameter and the **self_update=0 pt.options=self_update** parameter are added by default.
   - In the **Post Kernel Options** section, type any options to be passed to the kernel when booting the installed system for the first time.

3. Click [Create Autoinstallable Distribution] to save.

When you have created an autoinstallable distribution, you can edit it by navigating to **Systems › Autoinstallation › Distributions** and selecting the distribution you want to edit.
Create and Upload an Autoinstallation Profile

Autoinstallation profiles contain all the installation and configuration data needed to install a system. They can also contain scripts to be executed after the installation is complete.

Kickstart profiles can be created using the Uyuni WebUI, by navigating to Systems › Autoinstallation › Profiles, clicking [ Create New Kickstart File ], and following the prompts. You can also create AutoYaST or Kickstart autoinstallation profiles by hand.

An example AutoYaST profile that includes a script for registering the client with Uyuni is available in [ Client-configuration › Autoyast-example › ]. If you are using AutoYaST to install SLES, you will also need to include this snippet:

```
<products config:type="list">
  <listentry>SLES</listentry>
</products>
```

- For more on AutoYaST, see [ Client-configuration › Autoinst-intro › ].
- For more on Kickstart, see [ Client-configuration › Kickstart › ], or refer to the Red Hat documentation for your installation.

Procedure: Uploading an Autoinstallation Profile

1. In the Uyuni WebUI, navigate to Systems › Autoinstallation › Profiles and click [ Upload Kickstart/AutoYaST File ].

2. In the Create Autoinstallation Profile section, use these parameters:
   - In the Label field, type a unique name for the profile. Use only letters, numbers, hyphens (-), periods (.), and underscores (_), and ensure the name is longer than six characters.
   - In the Autoinstall Tree field, select the autoinstallable distribution you created earlier.
   - In the Virtualization Type field, select the relevant Guest type (for example, KVM Virtualized Guest). Do not choose Xen Virtualized Host here.
   - OPTIONAL: If you want to manually create your autoinstallation profile, you can type it directly into the File Contents field. If you have a file already created, leave the File Contents field blank.
   - In the File to Upload field, click [ Choose File ], and use the system dialog to select the file to upload. If the file is successfully uploaded, the filename will be shown in the File to Upload field.
   - The contents of the uploaded file will be shown in the File Contents field. If you need to make edits, you can do so directly.

3. Click [ Create ] to save your changes and store the profile.

When you have created an autoinstallation profile, you can edit it by navigating to Systems › Autoinstallation › Profiles and selecting the profile you want to edit. Make the desired changes and save
your settings by clicking [Create].

If you change the Virtualization Type of an existing Kickstart profile, it might also modify the bootloader and partition options, potentially overwriting any custom settings. Carefully review the Partitioning tab to verify these settings before making changes.

Automatically Register Guests

When you install VM guests automatically, they are not registered to Uyuni. If you want your guests to be automatically registered as soon as they are installed, you can add a section to the autoinstallation profile that invokes a bootstrap script, and registers the guests.

This section gives instructions for adding a bootstrap script to an existing AutoYaST profile.

For more on creating a bootstrap script, see [Client-configuration › Registration-bootstrap › ]. For instructions on how to do this for {kickstart], refer to the Red Hat documentation for your installation.

Procedure: Adding a Bootstrap Script to an AutoYaST Profile

1. Ensure your bootstrap script contains the activation key for the VM guests you want to register with it, and that is located on the host at /srv/www/htdocs/pub/bootstrap_vm_guests.sh.

2. In the Uyuni WebUI, navigate to Systems › Autoinstallation › Profiles, and select the AutoYaST profile to associate this script with.

3. In the File Contents field, add this snippet at the end of the file, immediately before the closing </profile> tag. Ensure you replace the example IP address in the snippet with the correct IP address for your Uyuni Server:

```xml
<scripts>
  <init-scripts config:type="list">
    <script>
      <interpreter>shell</interpreter>
      <location>
        http://192.168.1.1/p/pub/bootstrap/bootstrap_vm_guests.sh
      </location>
    </script>
  </init-scripts>
</scripts>
```

4. Click Update to save your changes.

If your AutoYaST profile already contains a <scripts> section, do not add a second one. Place the bootstrap snippet inside the existing <scripts> section.

Autoinstall VM Guests

Once you have everything set up, you can start to autoinstall your VM guests.
Each VM host can only install one guest at a time. If you are scheduling more than one autoinstallation, make sure you time them so that the next installation does not begin before the previous one has completed. If a guest installation starts while another one is still running, the running installation will be canceled.

1. In the Uyuni WebUI, navigate to Systems › Overview, and select the VM host you want to install guests on.
2. Navigate to the Virtualization tab, and the Provisioning subtab.
3. Select the autoinstallation profile you want to use, and specify a unique name for the guest.
4. Choose a proxy if applicable and enter a schedule.
5. To change the guest’s hardware profile and configuration options, click [Advanced Options].
6. Click [Schedule Autoinstallation and Finish] to complete.

Manage VM Guests

You can use the Uyuni WebUI to manage your VM Guests, including actions like shutting down, restarting, and adjusting CPU and memory allocations.

To do this, you will need your Xen or KVM VM host registered to the Uyuni Server, and have the libvirtd service running on the host. For traditional clients, you will also need the mgr-cfg-actions package installed on your Uyuni Server.

In the Uyuni WebUI, navigate to Systems › System List, and click on the VM host for the guests you want to manage. Navigate to the Virtualization tab to see all guests registered to this host, and access the management functions.

For more information on managing VM guests using the WebUI, see [Reference › Systems ›].
Virtual Host Managers

Virtual Host Managers (VHMs) are used to gather information from a range of client types.

VHMs can be used to collect private or public cloud instances and organize them into virtualization groups. With your virtualized clients organized this way, Taskomatic collects data on the clients for display in the Uyuni WebUI. VHMs also allow you to use subscription matching on your virtualized clients.

You can create a VHM on your Uyuni Server, and use it to inventory available public cloud instances. You can also use a VHM to manage clusters created with Kubernetes and SUSE CaaS Platform.

- For more information on using a VHM with Amazon Web Services, see [Client-configuration › Vhm-aws ›].
- For more information on using a VHM with Microsoft Azure, see [Client-configuration › Vhm-azure ›].
- For more information on using a VHM with SUSE CaaS Platform, see [Client-configuration › Vhm-caasp ›].
- For more information on using a VHM with Google Compute Engine, see [Client-configuration › Vhm-gce ›].
- For more information on using a VHM with Kubernetes, see [Client-configuration › Vhm-kubernetes ›].
- For more information on using a VHM with Nutanix, see [Client-configuration › Vhm-nutanix ›].
- For more information on using a VHM with VMware vSphere, see [Client-configuration › Vhm-vmware ›].
- For more information on using a VHM with other hosts, see [Client-configuration › Vhm-file ›].

VHM and Amazon Web Services

You can use a Uyuni VHM to gather instances from Amazon Web Services (AWS).

The VHM allows Uyuni to obtain and report information about your clusters. For more information on VHMs, see [Client-configuration › Vhm ›].

Create an Amazon EC2 VHM

The Virtual Host Manager (VHM) runs on the Uyuni Server.

Ensure you have installed the virtual-host-gatherer-libcloud package on the Uyuni Server.

Procedure: Creating an Amazon EC2 VHM

1. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.
2. Click [Create] and select Amazon EC2 from the drop-down menu.
3. In the **Add an Amazon EC2 Virtual Host Manager** section, use these parameters:

   - In the **Label** field, type a custom name for your VHM.
   - In the **Access Key ID** field, type the access key ID provided by Amazon.
   - In the **Secret Access Key** field, type the secret access key associated with the Amazon instance.
   - In the **Region** field, type the region to use.
   - In the **Zone** field, type the zone your VM is located in. This is required for subscription matching to work. For more information about setting regions and zones, see [Client-configuration › Vhm › ].

4. Click [Create] to save your changes and create the VHM.

5. On the **Virtual Host Managers** page, select the new VHM.

6. On the **Properties** page, click [Refresh Data] to inventory the new VHM.

To see which objects and resources have been inventoried, navigate to **Systems › System List › Virtual Systems**.

Instances running on the Amazon public cloud will report a UUID to the Uyuni Server in the format of an i followed by seventeen hexadecimal digits:

```
i1234567890abcdef0
```

**VHM and Azure**

You can use a Uyuni VHM to gather instances from Microsoft Azure.

The VHM allows Uyuni to obtain and report information about your virtual machines. For more information on VHMs, see [Client-configuration › Vhm › ].

**Create an Azure VHM**

The Virtual Host Manager (VHM) runs on the Uyuni Server.

Ensure you have installed the `virtual-host-gatherer-libcloud` package on the Uyuni Server.

**Procedure: Creating an Azure VHM**

1. In the Uyuni WebUI, navigate to **Systems › Virtual Host Managers**.

2. Click [Create] and select Azure from the drop-down menu.

3. In the **Add an Azure Virtual Host Manager** section, use these parameters:
   - In the **Label** field, type a custom name for your VHM.
In the **Subscription ID** field, type the subscription ID provided by Azure.

In the **Application ID** field, type the application ID provided by Azure.

In the **Tenant ID** field, type the tenant ID provided by Azure.

In the **Secret Key** field, type the secret key associated with the Azure instance.

In the **Zone** field, type the zone your VM is located in. This is required for subscription matching to work.

4. Click [Create] to save your changes and create the VHM.

5. On the **Virtual Host Managers** page, select the new VHM.

6. On the **Properties** page, click [Refresh Data] to inventory the new VHM.

To see which objects and resources have been inventoried, navigate to Systems › System List › Virtual Systems.

**Assigning Permissions**

The VHM you create needs to have the correct permissions assigned, in order for it to access the Azure VM.

Log in to your Azure account as the subscription administrator, and ensure that the Azure user account and application are in the correct groups. The group that the application is in determines the role it has, and therefore the permissions.

If the permissions are not set correctly, you might receive an error like this when you run `virtual-host-gatherer`:

```
General error: [AuthorizationFailed] The client 'client_name' with object id 'object_ID' does not have authorization to perform action 'Microsoft.Compute/virtualMachines/read' over scope '/subscriptions/not-very-secret-subscription-id' or the scope is invalid. If access was recently granted, please refresh your credentials.
```

To determine the correct credentials, run this command at the prompt on the Uyuni Server:

```
virtual-host-gatherer -i input_azure.json -o out_azure.json -vvv
```

The `input_azure.json` file should contain this information:
Azure UUID

Instances running on the Azure public cloud will report this UUID to the Uyuni Server:

```
13f56399-bd52-4150-9748-7190aae1ff21
```

VHM and SUSE CaaS Platform

You can use a Uyuni VHM to manage SUSE CaaS Platform clusters. The VHM allows Uyuni to obtain and report information about your clusters. For more information on VHMs, see [Client-configuration › Vhm ›].

You can also manage SUSE CaaS Platform clusters directly with Uyuni, without using a VHM. For more information, see [Client-configuration › Virt-clusters ›].

Onboarding CaaSP Nodes

You can register each SUSE CaaS Platform node to Uyuni using the same method as you would a Salt client. For more information, see [Client-configuration › Registration-overview ›].

We recommend that you create an activation key to associate SUSE CaaS Platform channels, and to onboard the associated nodes. For more on activation keys, see [Client-configuration › Activation-keys ›].

If you are using cloud-init, we recommended that you use a bootstrap script in the cloud-init configuration. For more on bootstrapping, see [Client-configuration › Registration-bootstrap ›].

When you have added the SUSE CaaS Platform nodes to Uyuni, the registered system will automatically apply the system lock Salt formula to prevent unintended actions on the client. When a system is locked, the WebUI shows a warning and you can schedule actions using the WebUI or the API, but the action will fail. For more information about system locks, see [Client-configuration › System-locking ›].

You can disable the System Lock formula from being automatically applied by editing the configuration file. Open /etc/rhn/rhn.conf and add this line at the end of the file:
Add this line at the end of the `/etc/rhn/rhn.conf` file:

```
java.automatic_system_lock_cluster_nodes = false
```

Restart the spacewalk service to pick up the changes:

```
spacewalk-service restart
```


When using Salt or Uyuni (either via UI or API) on any SUSE CaaS Platform nodes:

- Do not apply a patch (if the patch is marked as interactive)
- Do not mark a system to automatically install patches
- Do not perform an SP migration
- Do not reboot a node
- Do not issue any power management action via Cobbler
- Do not install a package if it breaks or conflicts the `patterns-caasp-Node-x.y`
- Do not remove a package if it breaks or conflicts or is one of the packages related with the `patterns-caasp-Node-x.y`
- Do not upgrade a package if it breaks or conflicts or is one of the packages related with the `patterns-caasp-Node-x.y`

Issuing those operations could render your SUSE CaaS Platform cluster unusable. Uyuni will not stop you from issuing these operations if the system is not locked.

**Autoinstallation Profile of a SUSE CaaS Platform 4 Node**

SUSE CaaS Platform 4 provides an AutoYaST profile that you can use to autoinstall a node. The profile is in the `patterns-caasp-Management` package. For more information about the profile, see [https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_autoyast_preparation](https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-deployment/#_autoyast_preparation).

For an example script based on the SUSE CaaS Platform 4 template, customized to make use of Uyuni, see [https://github.com/SUSE/manager-build-profiles/tree/master/AutoYaST/CaaSP-autoinstall](https://github.com/SUSE/manager-build-profiles/tree/master/AutoYaST/CaaSP-autoinstall).
Manage a SUSE CaaS Platform Cluster With Uyuni

You can use Uyuni to manage one or more existing SUSE CaaS Platform clusters.

Only SUSE CaaS Platform 4 is currently supported.

Before you begin, ensure you have installed your SUSE CaaS Platform cluster.

Elect a Management Node

To manage a SUSE CaaS Platform cluster, you need to elect a client as the management node for the cluster. The management node cannot be part of the cluster, and it must have the SUSE CaaS Platform channels associated with it before you begin. You can use a single management node for multiple clusters, as long as the clusters are all of the same kind.

Procedure: Electing a Management Node

1. In the Uyuni WebUI, navigate to Systems › System List and click the name of the client to elect as the management node.

2. Navigate to the Formulas › Configuration tab, and check the CaaSP Management Node formula.

3. Click [Save] and apply the highstate.

You will not be able to use the management node until the highstate has been completed.

List all known clusters by navigating to Clusters › Overview. This list displays all existing clusters, along with the cluster type, and which management node they are associated with. It also shows the nodes within the cluster, if the nodes are registered to Uyuni. For the nodes within a cluster, additional information from skuba and the Kubernetes API are shown, including the role, status, and whether any updates are available.

For more information about the data available for nodes, see https://documentation.suse.com/suse-caasp/4/html/caasp-admin/_cluster_updates.html.

You will need to prepare the configuration from your cluster to the management node:

1. Copy the skuba configuration directory from your cluster to the management node. This is the directory that the skuba service creates after the cluster has been bootstrapped. Take a note of the new file location for adding the cluster in the Uyuni WebUI.

2. Provide a way to authentication. There are two ways you can achieve this, choose the method that best suits your environment:

   - Copy the passwordless private SSH key used to access the cluster nodes to the Uyuni Server, and take a note of the file location. You need the current keys, and keys for any clients that you want to use in the future.

   - You can use an ssh-agent socket, and provide the path to the socket when setting up the
cluster. There are two ways of using the ssh-agent with SUSE CaaS Platform:

- By using ssh-agent locally:
  - Start the ssh-agent locally: `eval $(ssh-agent)`
  - Add the SSH key: `ssh-add <key>`
  - The socket used to access the agent is available in the `$SSH_AGENT` environment variable.

- Forward the ssh-agent to the management node from another machine:
  - From your source machine: `ssh -A <management node>`. The socket path is also available in the `$SSH_AGENT` environment variable.

If you are using the ssh-agent method, the path of the socket changes every time a new ssh-agent or a new ssh -A connection is started. The ssh-agent socket path can be updated at any time from the Uyuni WebUI. The socket path can also be overridden when starting any cluster action that requires SSH access.

Manage Clusters

To manage a cluster in Uyuni, add the cluster in the WebUI.

**Procedure: Adding an Existing Cluster**

1. In the Uyuni WebUI, navigate to Clusters › Overview and click [FIXME ].
2. Follow the prompts to provide information about your cluster, including the cluster type, and select the management node to associate.
3. Type the path to the skuba configuration file for the cluster.
4. Type the passwordless SSH key you want to use, or to the ssh-agent socket.
5. Type a name, label, and description for the cluster.
6. Click [FIXME ].

For each cluster you manage with Uyuni, a corresponding system group is created. By default, the system group is called Cluster <cluster_name>. Refresh the system group to update the list of nodes. Only nodes known to Uyuni are shown.

You can remove clusters from Uyuni by navigating to Clusters › Overview, unchecking the cluster to be deleted, and clicking [Delete Cluster ].

Deleting a cluster removes the cluster from Uyuni, it does not delete the cluster nodes. Workloads running on the cluster will continue uninterrupted.
Manage Nodes

When you have the cluster created in Uyuni, you can manage nodes within the cluster.

Before you add a new node to the cluster, check the management node can access the node you want to add using passwordless SSH, or the `ssh-agent` socket you are forwarding.

You also need to ensure that the node you want to add is registered to Uyuni, and has a SUSE CaaS Platform channel assigned.

Procedure: Adding Nodes to a Cluster

1. In the Uyuni WebUI, navigate to **Clusters › Overview** and click [Join Node].
2. Select the nodes to add from the list of available nodes. The list of available nodes includes only nodes that are registered to Uyuni, are not management nodes, and are not currently part of any cluster.
3. Follow the prompts to enter the SUSE CaaS Platform parameters for the nodes to be added.
4. OPTIONAL: Specify a custom `ssh-agent` socket that is valid only for the nodes that are being added.
5. Click [Save] to schedule an action to add the nodes. During this action, Uyuni prepares the nodes for joining by disabling swap, then joins the nodes to the cluster.

Procedure: Removing Nodes from a Cluster

1. In the Uyuni WebUI, navigate to **Clusters › Overview**, uncheck the nodes to remove, and click [Remove Node].
2. Follow the prompts to define the parameters for the nodes to be removed.
3. OPTIONAL: Specify a custom `ssh-agent` socket that is valid only for the nodes that are being removed.
4. Click [Save] to schedule an action to remove the nodes.


Upgrade the Cluster

If the cluster has available updates, you can use Uyuni to schedule and manage the upgrade.

Uyuni upgrades all control planes first, and then upgrades the workers. For more information, see https://documentation.suse.com/suse-caasp/4.2/single-html/caasp-admin/#_cluster_updates.

Procedure: Upgrading the Cluster

1. In the Uyuni WebUI, navigate to **Clusters › Overview**, and click the cluster to upgrade.
2. OPTIONAL: The are no SUSE CaaS Platform parameters available for you to customize for upgrade. However, you can specify a custom `ssh-agent` socket that is valid only for the nodes that are being upgraded.
3. Click [Save] to schedule an action to upgrade the cluster.

Uyuni will only interact with skuba to upgrade the cluster. Any other required action, such as configuration changes, are not issued by Uyuni.

For more information about upgrading, see https://www.suse.com/releasenotes/x86_64/SUSE-CAASP/4.

VHM and Google Compute Engine

You can use a Uyuni VHM to gather instances from Google Compute Engine (GCE).

The VHM allows Uyuni to obtain and report information about your virtual machines. For more information on VHMs, see [Client-configuration › Vhm › ].

Create a GCE VHM

The Virtual Host Manager (VHM) runs on the Uyuni Server.

To run a VHM, your Uyuni Server will need to have port 443 open, to access the clients.

Ensure you have installed the virtual-host-gatherer-libcloud package on the Uyuni Server.

Before you begin, log in to the GCE panel, and download a certificate file. Store this file locally on your Uyuni Server, and take note of the path.

Procedure: Creating a GCE VHM

1. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.

2. Click [Create] and select Google Compute Engine from the drop-down menu.

3. In the Add a Google Compute Engine Virtual Host Manager section, use these parameters:
   - In the Label field, type a custom name for your VHM.
   - In the Service Account Email field, type the email address associated with your Google account.
   - In the Cert Path field, type the path to the certificate downloaded from the GCE panel.
   - In the Project ID field, type the project ID used by the GCE instance.
   - In the Zone field, type the zone your VM is located in. This is required for subscription matching to work.

4. Click [Create] to save your changes and create the VHM.

5. On the Virtual Host Managers page, select the new VHM.

6. On the Properties page, click [Refresh Data] to inventory the new VHM.
To see which objects and resources have been inventoried, navigate to Systems › System List › Virtual Systems.

Assigning Permissions

The VHM you create needs to have the correct permissions assigned, in order for it to access the GCE VM.

Log in to your Google Cloud Platform account as an administrator, and use the Cloud Identity and Access Management (IAM) tool to ensure that the service account has the appropriate roles. You will also need to ensure that the VM has been assigned the `VM` role.

If the permissions are not set correctly, you might receive an error like this when you run `virtual-host-gatherer`:

```
ERROR: {'domain': 'global', 'reason': 'forbidden', 'message': "Required 'compute.zones.list' permission for 'projects/project-id'"
ERROR: Could not connect to the Google Compute Engine Public Cloud using specified credentials.
```

To determine the correct credentials, run this command at the prompt on the Uyuni Server:

```
virtual-host-gatherer -i input_google.json -o out_google.json -vvv
```

The `input_google.json` file should contain this information:

```
[
  {
    "id": "google_vhm",
    "module": "GoogleCE",
    "service_account_email": "mail@example.com",
    "cert_path": "secret-key",
    "project_id": "project-id",
    "zone": "zone"
  }
]
```

GCE UUID

Instances running on the Google public cloud will report this UUID to Uyuni Server:

```
15298666232938449
```

VHM and Kubernetes

You can use a Uyuni VHM to manage Kubernetes clusters.
The VHM allows Uyuni to obtain and report information about your clusters. For more information on VHMs, see [Client-configuration › Vhm ›].

To use Uyuni with Kubernetes, you will need to have your Uyuni Server configured for container management, with all required channels present, and a registered container build host available.

You will also require:

• At least one Kubernetes or SUSE CaaS Platform cluster available on your network.
• The virtual-host-gatherer-Kubernetes package installed on the Uyuni Server.
• Kubernetes version 1.5.0 or higher, or SUSE CaaS Platform.
• Docker version 1.12 or higher on the container build host.

Create a Kubernetes VHM

Kubernetes clusters are registered with Uyuni as a VHM.

You will need a kubeconfig file to register and authorize your Kubernetes cluster. You can get a kubeconfig file using the Kubernetes command line tool kubectl. If you are using SUSE CaaS Platform, you can download the file from the Velum interface.

Procedure: Creating a Kubernetes VHM

1. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.
2. Click [Create] and select Kubernetes Cluster.
3. In the Add a Kubernetes Virtual Host Manager section, use these parameters:
   ・In the Label field, type a custom name for your VHM.
   ・Select the kubeconfig file that contains the required data for the Kubernetes cluster.
4. In the context field, select the appropriate context for the cluster. This is specified in the kubeconfig file.
5. Click [Create].

Procedure: Viewing the Nodes in a Cluster

1. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.
2. Select the Kubernetes cluster.
3. Refresh the node data by clicking [Schedule refresh data].

The node data can take a few moments to update. You might need to refresh your browser window to see the updated information.

Any connection or authentication problems are logged to gatherer.log.
Node data is not refreshed during registration. You will need to manually refresh the data to see it.

**Retrieve Image Runtime Data**

You can view runtime data about Kubernetes images in the Uyuni WebUI, by navigating to **Images › Image List**.

The image list table contains three columns:

- **Revision**:  
  A sequence number that increments on every rebuild for images built by Uyuni, or on every import for externally built images.

- **Runtime**:  
  Overall status of the running instances for each image in registered clusters.

- **Instances**:  
  Number of instances running this image across all the clusters registered in Uyuni. You can see a breakdown of numbers by clicking the pop-up icon next to the number.

The **Runtime** column displays one of these status messages:

- **All instances are consistent with SUSE Manager**:  
  All the running instances are running the same build of the image as tracked by Uyuni.

- **Outdated instances found**:  
  Some of the instances are running an older build of the image. You might need to redeploy the image.

- **No information**:  
  The checksum of the instance image does not match the image data contained in Uyuni. You might need to redeploy the image.

**Procedure: Building an Image**

1. In the Uyuni WebUI, navigate to **Images › Stores**.
2. Click [Create] to create an image store.
3. Navigate to **Images › Profiles**.
4. Click [Create] to create an image profile. You will need to use a dockerfile that is suitable to deploy to Kubernetes.

5. Navigate to Images › Build to build an image with the new profile.

6. Deploy the image into one of the registered Kubernetes clusters. You can do this with the kubectl tool.

The updated data should now be available in the image list at Images › Image List.

Procedure: Importing a Previously Deployed Image

1. In the Uyuni WebUI, navigate to Images › Image Stores.

2. Add the registry that owns the image you want to import, if it is not already there.

3. Navigate to Images › Image List and click [Import].

4. Complete the fields, select the image store you created, and click [Import].

The imported image should now be available in the image list at Images › Image List.

Procedure: Rebuilding a Previously Deployed Image

1. In the Uyuni WebUI, navigate to Images › Image List, locate the row that contains the image you want to rebuild, and click [Details].

2. Navigate to the Build Status section, and click [Rebuild]. The rebuild can take some time to complete.

When the rebuild has successfully completed, the runtime status of the image is updated in the image list at Images › Image List. This shows that the instances are running a previous build of the image.

You can only rebuild images if they were originally built with Uyuni. You cannot rebuild imported images.

Procedure: Retrieving Additional Runtime Data

1. In the Uyuni WebUI, navigate to Images › Image List, locate the row that contains the running instance, and click [Details].

2. Navigate to the Overview tab. In the Image Info section, there is data in the Runtime and Instances fields.

3. Navigate to the Runtime tab. This section contains a information about the Kubernetes pods running this image in all the registered clusters. The information in this section includes:
   - Pod name.
   - Namespace which the pod resides in.
   - The runtime status of the container in the specific pod.
Permissions and Certificates

You can only use kubeconfig files with Uyuni if they contain all embedded certificate data.

The API calls from Uyuni are:

- GET /api/v1/pods
- GET /api/v1/nodes

The minimum recommended permissions for Uyuni are:

- A ClusterRole to list all the nodes:
  
  ```yaml
  resources: ["nodes"]
  verbs: ["list"]
  ```

- A ClusterRole to list pods in all namespaces (role binding must not restrict the namespace):
  
  ```yaml
  resources: ["pods"]
  verbs: ["list"]
  ```

If /pods returns a 403 response, the entire cluster will be ignored by Uyuni.

For more information on working with RBAC Authorization, see https://kubernetes.io/docs/admin/authorization/rbac/.

Virtualization with Nutanix

You can use Nutanix AHV virtual machines, with Uyuni by setting up a virtual host manager (VHM).

To begin, you will need to set up a VHM on your Uyuni Server, and inventory the available VM hosts.

VHM Setup

The Virtual Host Manager (VHM) runs on the Uyuni Server.

Ensure you have installed the virtual-host-gatherer-Nutanix package on the Uyuni Server.

To run a VHM, your Uyuni Server must have port 9440 open to access the Nutanix Prism Element API.

Procedure: Creating a Nutanix VHM

1. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.
2. Click [Create] and select Nutanix AHV.
3. In the **Add a Nutanix AHV Virtual Host Manager** section, use these parameters:

- In the **Label** field, type a custom name for your VHM.
- In the **Hostname** field, type the fully-qualified domain name (FQDN) or host IP address.
- In the **Port** field, type the Prism Element API port to use (for example, 9440).
- In the **Username** field, type the username associated with the VM host.
- In the **Password** field, type the password associated with the VM host user.

4. Click [Create] to save your changes and create the VHM.

5. On the **Virtual Host Managers** page select the new VHM.

6. On the **Properties** page, click [Refresh Data] to inventory the new VHM.

To see which objects and resources have been inventoried, navigate to **Systems › System List › Virtual Systems**.

Connecting to the Nutanix Prism API server from a browser using HTTPS can sometimes log an **invalid certificate** error. If this occurs, refreshing the data from the virtual host manager will fail. A valid SSL certificate (not self-signed) is required on your Nutanix API server. If you’re using a custom CA authority for your Nutanix SSL certificate, please copy the custom CA certificate to `/etc-/pki/trust/anchors` on the Uyuni Server. Re-trust the certificate by running the `update-ca-certificates` command on the command line, and restart the spacewalk services.

After your VHM has been created and configured, Taskomatic will run data collection automatically. If you want to manually perform data collection, navigate to **Systems › Virtual Host Managers**, select the appropriate VHM, and click [Refresh Data].

Uyuni ships with a tool called **virtual-host-gatherer** that can connect to VHMs using their API, and request information about virtual hosts. **virtual-host-gatherer** maintains the concept of optional modules, where each module enables a specific VHM. This tool is automatically invoked nightly by Taskomatic. Log files for the **virtual-host-gatherer** tool are located at `/var/log/rhn/gatherer.log`.

**Virtualization with VMWare**

You can use VMWare vSphere virtual machines, including ESXi and vCenter, with Uyuni by setting up a virtual host manager (VHM).

To begin, you will need to set up a VHM on your Uyuni Server, and inventory the available VM hosts. Taskomatic can then begin data collection using the VMs API.
VHM Setup

The Virtual Host Manager (VHM) runs on the Uyuni Server.

To run a VHM, your Uyuni Server will need to have port 443 open, to access the VMWare API.

VMWare hosts use access roles and permissions to control access to hosts and guests. Ensure that any VMWare objects or resources that you want to be inventoried by the VHM have at least read-only permissions. If you want to exclude any objects or resources, mark them with no-access.

When you are adding new hosts to Uyuni, you will need to consider if the roles and permissions that have been assigned to users and objects need to be inventoried by Uyuni.

For more on users, roles, and permissions, see the VMWare vSphere documentation: https://docs.vmware.com/en/VMware-vSphere/index.html

Procedure: Creating a VMWare VHM

1. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.
2. Click [Create] and select VMWare-based.
3. In the Add a VMWare-based Virtual Host Manager section, use these parameters:
   - In the Label field, type a custom name for your VHM.
   - In the Hostname field, type the fully-qualified domain name (FQDN) or host IP address.
   - In the Port field, type the ESXi API port to use (for example, 443).
   - In the Username field, type the username associated with the VM host.
   - In the Password field, type the password associated with the VM host user.
4. Click [Create] to save your changes and create the VHM.
5. On the Virtual Host Managers page select the new VHM.
6. On the Properties page, click [Refresh Data] to inventory the new VHM.

To see which objects and resources have been inventoried, navigate to Systems › System List › Virtual Systems.

Connecting to the ESXi server from a browser using HTTPS can sometimes log an invalid certificate error. If this occurs, refreshing the data from the virtual hosts server will fail. To correct the problem, extract the certificate from the ESXi server, and copy it to /etc/pki/trust/anchors. Re-trust the certificate by running the update-ca-certificates command on the command line, and restart the spacewalk services.

After your VHM has been created and configured, Taskomatic will run data collection automatically. If you want to manually perform data collection, navigate to Systems › Virtual Host Managers, select the
appropriate VHM, and click [Refresh Data].

Uyuni ships with a tool called virtual-host-gatherer that can connect to VHMs using their API, and request information about virtual hosts. virtual-host-gatherer maintains the concept of optional modules, where each module enables a specific VHM. This tool is automatically invoked nightly by Taskomatic. Log files for the virtual-host-gatherer tool are located at /var/log/rhn/gather.log.

Troubleshooting SSL Errors on VMWare

If you see SSL errors while configuring your VMWare installation, you need to download the CA certificate file from VMWare, and trust it on Uyuni.

Procedure: Trusting VMWare CA Certificates

1. Download the CA Certificate from your VMWare installation. You can do this by logging in to your vCenter WebUI, and clicking [Download trusted root CA certificates].
2. If the downloaded CA certificates file is in .zip format, extract the archive. The certificate files will have a number as an extension. For example, certificate.0.
3. Copy the certificate files to your Uyuni Server, and save them to the /etc/pki/trust/anchors/ directory.
4. Change the filename suffix on the copied certificate to either .crt or .pem.
5. On the Uyuni Server, at the command prompt, update the CA certificate record:

   ```bash
   update-ca-certificates
   ```

Virtualization with Other Third Party Providers

If you want to use a third-party virtualization provider other than Xen, KVM, or VMware, you can import a JSON configuration file to Uyuni.

Similarly, if you have a VMWare installation that does not provide direct access to the API, a file-based VHM will provide you with some basic management features.

This option is for importing files that have been created with the virtual-host-gatherer tool. It is not designed for manually created files.

Procedure: Exporting and Importing a JSON File

1. Export the JSON configuration file by running virtual-host-gatherer on the VM network.
2. Save the produced file to a location accessible by your Uyuni Server.
3. In the Uyuni WebUI, navigate to Systems › Virtual Host Managers.
4. Click [Create] and select File-based.

5. In the Add a file-based Virtual Host Manager section, use these parameters:
   - In the **Label** field, type a custom name for your VHM.
   - In the **Url** field, type the path to your exported JSON configuration file.

6. Click [Create] to save your changes and create the VHM.

7. On the Virtual Host Managers page, select the new VHM.

8. On the Properties page, click [Refresh Data] to inventory the new VHM.

**Listing 2. Example: Exported JSON configuration file:**

```json
{
   "examplevhost": {
      "10.11.12.13": {
         "cpuArch": "x86_64",
         "cpuDescription": "AMD Opteron(tm) Processor 4386",
         "cpuMhz": 3092.212727,
         "cpuVendor": "amd",
         "hostIdentifier": "vim.HostSystem:host-182",
         "name": "11.11.12.13",
         "os": "VMware ESXi",
         "osVersion": "5.5.0",
         "ramMb": 65512,
         "totalCpuCores": 16,
         "totalCpuSockets": 2,
         "totalCpuThreads": 16,
         "type": "vmware",
         "vms": {
            "vCenter": "564d6d90-459c-2256-8f39-3cb2bd24b7b9"
         }
      },
      "10.11.12.14": {
         "cpuArch": "x86_64",
         "cpuDescription": "AMD Opteron(tm) Processor 4386",
         "cpuMhz": 3092.212639,
         "cpuVendor": "amd",
         "hostIdentifier": "vim.HostSystem:host-183",
         "name": "10.11.12.14",
         "os": "VMware ESXi",
         "osVersion": "5.5.0",
         "ramMb": 65512,
         "totalCpuCores": 16,
         "totalCpuSockets": 2,
         "totalCpuThreads": 16,
         "type": "vmware",
         "vms": {
            "4973e0a-c9e6-4ceb-aef8-6a9452f67cb5": "4230c60f-3f98-2a65-f7c3-600b26b79c22",
            "5a2e4e63-a957-426b-bfa8-4169302e4fda": "42307b15-1618-0595-01f2-427ffcedd88e",
            "NSX-gateway": "4230d43e-aafe-38ba-5a9e-3cb67c03a16a",
            "NSX-l3gateway": "4230b00f-0b21-0e9d-dfde-6c0b0699d5f",
            "NSX-service": "4230e924-b714-190b-340b-25de01482fd9"
         }
      }
   }
}
```
For more information, see the man page on your Uyuni server for `virtual-host-gatherer`:

```
man virtual-host-gatherer
```

The `README` file of that package provides background information about the type of a hypervisor, etc.:

```
/usr/share/doc/packages/virtual-host-gatherer/README.md
```

The man page and the `README` file also contain example configuration files.
Troubleshooting Clients

Autoinstallation

Depending on your base channel, new autoinstallation profiles might be subscribed to a channel that is missing required packages.

For autoinstallation to work, these packages are required:

- pyOpenSSL
- rhnlib
- libxml2-python
- spacewalk-koan

To resolve this issue, check these things first:

- Check that the tools software channel related to the base channel in your autoinstallation profile is available to your organization and your user.
- Check that the tools channel is available to your Uyuni as a child channel.
- Check that the required packages and any dependencies are available in the associated channels.

Bare Metal Systems

If a bare metal system on the network is not automatically added to the Systems list, check these things first:

- You must have the pxe-default-image package installed.
- File paths and parameters must be configured correctly. Check that the vmlinuz0 and initrd0.img files, which are provided by pxe-default-image, are in the locations specified in the rhn.conf configuration file.
- Ensure the networking equipment connecting the bare metal system to the Uyuni server is working correctly, and that you can reach the Uyuni server IP address from the server.
- The bare metal system to be provisioned must have PXE booting enabled in the boot sequence, and must not be attempting to boot an operating system.
- The DHCP server must be responding to DHCP requests during boot. Check the PXE boot messages to ensure that:
  - the DHCP server is assigning the expected IP address
  - the DHCP server is assigning the the Uyuni server IP address as next-server for booting.
- Ensure Cobbler is running, and that the Discovery feature is enabled.
If you see a blue Cobbler menu shortly after booting, discovery has started. If it does not complete successfully, temporarily disable automatic shutdown to help diagnose the problem. To disable automatic shutdown:

1. Select `pxe-default-profile` in the Cobbler menu with the arrow keys, and press the Tab key before the timer expires.

2. Add the kernel boot parameter `spacewalk-finally=running` using the integrated editor, and press Enter to continue booting.

3. Enter a shell with the username `root` and password `linux` to continue debugging.

**Duplicate profiles**

Due to a technical limitation, it is not possible to reliably distinguish a new bare metal system from a system that has previously been discovered. Therefore, we recommended that you do not power on bare metal systems multiple times, as this will result in duplicate profiles.

**Cloned Salt Clients**

If you have used your hypervisor clone utility, and attempted to register the cloned Salt client, you might get this error:

```
We're sorry, but the system could not be found.
```

This is caused by the new, cloned, system having the same machine ID as an existing, registered, system. You can adjust this manually to correct the error and register the cloned system successfully.

For more information and instructions, see [Administration › Tshoot-registerclones › ].

**Disabling the FQDNS grain**

The FQDNS grain returns the list of all the fully-qualified DNS services in the system. Collecting this information is usually a fast process, but if the DNS settings have been misconfigured, it could take a much longer time. In some cases, the client could become unresponsive, or crash.

To prevent this problem, you can disable the FQDNS grain with a Salt flag. If you disable the grain, you can use a network module to provide FQDNS services, without the risk of the client becoming unresponsive.

This only applies to older Salt clients. If you registered your Salt client recently, the FQDNS grain is disabled by default.

On the Uyuni Server, at the command prompt, use this command to disable the FQDNS grain:
This command restarts each client and generate Salt events that the server needs to process. If you have a large number of clients, you can execute the command in batch mode instead:

```bash
salt --batch-size 50 '*' state.sls util.mgr_disable_fqdns_grain
```

Wait for the batch command to finish executing. Do not interrupt the process with Ctrl+C.

### Mounting /tmp with noexec

Salt runs remote commands from /tmp on the client’s file system. Therefore you must not mount /tmp with the noexec option.

### Passing Grains to a Start Event

Every time a Salt client starts, it passes the `machine_id` grain to Uyuni. Uyuni uses this grain to determine if the client is registered. This process requires a synchronous Salt call. Synchronous Salt calls block other processes, so if you have a lot of clients start at the same time, the process could create significant delays.

To overcome this problem, a new feature has been introduced in Salt to avoid making a separate synchronous Salt call.

To use this feature, you can add a configuration parameter to the client configuration, on clients that support it.

To make this process easier, you can use the `mgr_start_event_grains.sls` helper Salt state.

This only applies to already registered clients. If you registered your Salt client recently, this config parameter is added by default.

On the Uyuni Server, at the command prompt, use this command to enable the `start_event_grains` configuration helper:

```bash
call state.sls util.mgr_start_event_grains
```

This command adds the required configuration into the client’s configuration file, and applies it when the client is restarted. If you have a large number of clients, you can execute the command in batch mode instead:

```bash
salt --batch-size 50 '*' state.sls mgr_start_event_grains
```
Proxy Connections and FQDN

Sometimes clients connected through a Uyuni Proxy appear in the WebUI, but do not show that they are connected through a proxy. This can occur if you are not using the fully-qualified domain name (FQDN) to connect, and the proxy is not known to Uyuni.

To correct this behavior, specify additional FQDNs as grains in the client configuration file on the proxy:

```
grains:
  susemanager:
    custom_fqdns:
    - name.one
    - name.two
```

Registering Older Clients

To register and use CentOS 6, Oracle Linux 6, Red Hat Enterprise Linux 6, or SUSE Linux Enterprise Server with Expanded Support 6 clients, you need to configure the Uyuni Server to support older types of SSL encryption.

If you are attempting to register at the command prompt, you will see an error like this:

```
Repository '<Repository_Name>' is invalid.
[!] Valid metadata not found at specified URL(s)
Please check if the URLs defined for this repository are pointing to a valid repository.
Skipping repository '<Repository_Name>' because of the above error.
Download (curl) error for 'www.example.com':
Error code: Unrecognized error
Error message: error:1409442E:SSL routines:SSL3_READ_BYTES:tlsv1 alert protocol version
```

If you are attempting to register in the WebUI, you will see an error like this:

```
Rendering SLS 'base:bootstrap' failed: Jinja error: >>> No TLS 1.2 and above for RHEL6 and SLES11. Please check your Apache config.
...
```

This occurs because Apache requires TLS v1.2, but older operating systems do not support this version of the TLS protocol. To fix this error, you need to force Apache on the server to accept a greater range of protocol versions. On the Uyuni Server, as root, open the `/etc/apache2/ssl-global.conf` configuration file, locate the `SSLProtocol` line, and update it to read:

```
SSLProtocol all -SSLv2 -SSLv3
```

This will need to be done manually on the server, and with a Salt state on the Proxy, if applicable. Restart the `apache` service on each system after making the changes.
GNU Free Documentation License

Copyright © 2000, 2001, 2002 Free Software Foundation, Inc. 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA. Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a worldwide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections
then there are none.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

A section "Entitled XYZ" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History"). To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.
You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document’s license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.

B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.

C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
D. Preserve all the copyright notices of the Document.

E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.

F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.

G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document’s license notice.

H. Include an unaltered copy of this License.

I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.

J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.

K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.

L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.

M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.

N. Do not retile any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.

O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version’s license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.
The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document’s Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION
Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided for under this License. Any other attempt to copy, modify, sublicense or distribute the Document is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See http://www.gnu.org/copyleft/.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation.

ADDENDUM: How to use this License for your documents

Copyright (c) YEAR YOUR NAME.
Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled"GNU Free Documentation License".

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the “ with…Texts.” line with this:
with the Invariant Sections being LIST THEIR TITLES, with the Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST.

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.