



U Y U N I

# Uyuni 2024.07

## Installation and Upgrade Guide

July 04 2024



# Table of Contents

Deployment and Upgrade Guide Overview	1
1. Requirements	2
1.1. Requirements	2
1.1.1. Server Requirements	2
1.1.2. Proxy Requirements	2
1.2. Network Requirements	3
1.2.1. Fully Qualified Domain Name (FQDN)	3
1.2.2. Hostname and IP Address	3
1.2.3. Air-gapped Deployment	4
1.2.4. Ports	4
1.3. Public Cloud Requirements	7
1.3.1. Network Requirements	8
1.3.2. Prepare Storage Volumes	8
2. Deployment and Installation	10
2.1. Server	10
2.1.1. Deploy on openSUSE Leap Micro 5.5	10
2.1.2. Uyuni Server Air-gapped Deployment	13
2.2. Install the Server (Legacy)	14
2.2.1. Install Uyuni Server with openSUSE	14
2.3. Migration	15
2.3.1. Migrating the Uyuni server to a containerized environment	15
2.4. Proxy	16
2.4.1. Containerized Uyuni Proxy Setup	16
2.4.2. Deploy a Uyuni 2024.07 Proxy	20
2.4.3. Install Containerized Uyuni Proxy on k3s	29
2.5. Install the Proxy	29
2.5.1. Install Uyuni Proxy with openSUSE Leap	30
3. Upgrade and Migration	31
3.1. Server	31
3.1.1. Migrating the Uyuni server to a containerized environment	31
3.2. Proxy	32
3.2.1. Proxy Migration	32
3.3. Clients	36
3.3.1. Upgrade the Clients	36
4. Upgrade and Migration	37
4.1. Server	37
4.1.1. Container	37
4.1.2. Legacy	38
4.2. Proxy	41
4.2.1. Upgrade the Proxy	41
4.2.2. Proxy - Major Upgrade	41
4.2.3. Proxy - Minor Upgrade	42
5. Basic Server Management	44
5.1. Custom YAML Configuration and Deployment with mgadm	44
5.2. Starting and Stopping Containers	45
5.3. List of persistent storage volumes	45



# Deployment and Upgrade Guide Overview

**Updated:** 2024-07-04

This book provides guidance on deploying and upgrading Uyuni Server and Proxy. It is split into the following sections:

## Requirements

Describes hardware, software, and networking requirements before you begin.

## Deployment

Describes tasks for deploying Uyuni as a container and initial setup.

## Upgrade and Migration

Describes upgrade and migration of Uyuni

## Public Cloud

You can also deploy Uyuni to a public cloud instance.

For more information on using Uyuni on a public cloud, see [Specialized-guides > Public-cloud-guide](#).

# Chapter 1. Requirements

## 1.1. Requirements

The following tables specify the minimum server and proxy requirements.

### 1.1.1. Server Requirements

*Table 1. Server Requirements for x86-64 Architecture*

Software and Hardware	Details	Recommendation
openSUSE Leap 15.5	Clean installation, up-to-date	openSUSE Leap 15.5
CPU	-	Minimum 4 dedicated 64-bit CPU cores (x86-64)
RAM	Test or Base Installation	Minimum 16 GB
	Production Server	Minimum 32 GB
Disk Space	/ (root directory)	Minimum 40 GB
	/var/lib/pgsql	Minimum 50 GB
	/var/spacewalk	Minimum storage required: 100 GB (this will be verified by the implemented check)  * 50 GB for each SUSE product and Package Hub  * 360 GB for each Red Hat product
	/var/cache	Minimum 10 GB. Add 100 MB per SUSE product, 1 GB per Red Hat or other product. Double the space if the server is an ISS Master.
	Swap space	3 GB

### 1.1.2. Proxy Requirements

*Table 2. Proxy Requirements*

Software and Hardware	Details	Recommendation
openSUSE Leap 15.5	Clean installation, up-to-date	openSUSE Leap 15.5

Software and Hardware	Details	Recommendation
CPU		Minimum 2 dedicated 64-bit CPU cores
RAM	Test Server	Minimum 2 GB
	Production Server	Minimum 8 GB
Disk Space	/ (root directory)	Minimum 40 GB
	/srv	Minimum 100 GB
	/var/cache (Squid)	Minimum 100 GB

Uyuni Proxy caches packages in the `/var/cache/` directory. If there is not enough space available in `/var/cache/`, the proxy will remove old, unused packages and replace them with newer packages.

As a result of this behavior:

- The larger `/var/cache/` directory is on the proxy, the less traffic there will be between it and the Uyuni Server.
- By making the `/var/cache/` directory on the proxy the same size as `/var/spacewalk/` on the Uyuni Server, you avoid a large amount of traffic after the first synchronization.
- The `/var/cache/` directory can be small on the Uyuni Server compared to the proxy. For a guide to size estimation, see the [\[server-hardware-requirements\]](#) section.

## 1.2. Network Requirements

This section details the networking and port requirements for Uyuni.

### 1.2.1. Fully Qualified Domain Name (FQDN)

The Uyuni server must resolve its FQDN correctly. If the FQDN cannot be resolved, it can cause serious problems in a number of different components.

For more information about configuring the hostname and DNS, see <https://documentation.suse.com/sles/15-SP4/html/SLES-all/cha-network.html#sec-network-yast-change-host>.

### 1.2.2. Hostname and IP Address

To ensure that the Uyuni domain name can be resolved by its clients, both server and client machines must be connected to a working DNS server. You also need to ensure that reverse lookups are correctly configured.

For more information about setting up a DNS server, see <https://documentation.suse.com/sles/15-SP4/html/SLES-all/cha-dns.html>.

### 1.2.3. Air-gapped Deployment

If you are on an internal network and do not have access to SUSE Customer Center, you can use an **Installation-and-upgrade > Container-deployment**.

In a production environment, the Uyuni Server and clients should always use a firewall. For a comprehensive list of the required ports, see **Installation-and-upgrade > Ports**.

### 1.2.4. Ports

This section contains a comprehensive list of ports that are used for various communications within Uyuni.

You will not need to open all of these ports. Some ports only need to be opened if you are using the service that requires them.

#### 1.2.4.1. External Inbound Server Ports

External inbound ports must be opened to configure a firewall on the Uyuni Server to protect the server from unauthorized access.

Opening these ports allows external network traffic to access the Uyuni Server.

*Table 3. External Port Requirements for Uyuni Server*

Port number	Protocol	Used By	Notes
22			Required for ssh-push and ssh-push-tunnel contact methods.
67	TCP/UDP	DHCP	Required only if clients are requesting IP addresses from the server.
69	TCP/UDP	TFTP	Required if server is used as a PXE server for automated client installation.
80	TCP	HTTP	Required temporarily for some bootstrap repositories and automated installations.
443	TCP	HTTPS	Serves the Web UI, client, and server and proxy ( <code>tftpsync</code> ) requests.
4505	TCP	salt	Required to accept communication requests from clients. The client initiates the connection, and it stays open to receive commands from the Salt master.
4506	TCP	salt	Required to accept communication requests from clients. The client initiates the connection, and it stays open to report results back to the Salt master.

Port number	Protocol	Used By	Notes
25151	TCP	Cobbler	

#### 1.2.4.2. External Outbound Server Ports

External outbound ports must be opened to configure a firewall on the Uyuni Server to restrict what the server can access.

Opening these ports allows network traffic from the Uyuni Server to communicate with external services.

*Table 4. External Port Requirements for Uyuni Server*

Port number	Protocol	Used By	Notes
80	TCP	HTTP	Required for SUSE Customer Center. Port 80 is not used to serve the Web UI.
443	TCP	HTTPS	Required for SUSE Customer Center.
25151	TCP	Cobbler	

#### 1.2.4.3. Internal Server Ports

Internal port are used internally by the Uyuni Server. Internal ports are only accessible from localhost.

In most cases, you will not need to adjust these ports.

*Table 5. Internal Port Requirements for Uyuni Server*

Port number	Notes
2828	Satellite-search API, used by the RHN application in Tomcat and Taskomatic.
2829	Taskomatic API, used by the RHN application in Tomcat.
8005	Tomcat shutdown port.
8009	Tomcat to Apache HTTPD (AJP).
8080	Tomcat to Apache HTTPD (HTTP).
9080	Salt-API, used by the RHN application in Tomcat and Taskomatic.
32000	Port for a TCP connection to the Java Virtual Machine (JVM) that runs Taskomatic and satellite-search.

Port 32768 and higher are used as ephemeral ports. These are most often used to receive TCP connections. When a TCP connection request is received, the sender will choose one of these ephemeral port numbers to match the destination port.

You can use this command to find out which ports are ephemeral ports:

```
cat /proc/sys/net/ipv4/ip_local_port_range
```

#### 1.2.4.4. External Inbound Proxy Ports

External inbound ports must be opened to configure a firewall on the Uyuni Proxy to protect the proxy from unauthorized access.

Opening these ports allows external network traffic to access the Uyuni proxy.

*Table 6. External Port Requirements for Uyuni Proxy*

Port number	Protocol	Used By	Notes
22			Required for ssh-push and ssh-push-tunnel contact methods. Clients connected to the proxy initiate check in on the server and hop through to clients.
67	TCP/UDP	DHCP	Required only if clients are requesting IP addresses from the server.
69	TCP/UDP	TFTP	Required if the server is used as a PXE server for automated client installation.
443	TCP	HTTPS	Web UI, client, and server and proxy ( <code>tftpsync</code> ) requests.
4505	TCP	salt	Required to accept communication requests from clients. The client initiates the connection, and it stays open to receive commands from the Salt master.
4506	TCP	salt	Required to accept communication requests from clients. The client initiates the connection, and it stays open to report results back to the Salt master.

#### 1.2.4.5. External Outbound Proxy Ports

External outbound ports must be opened to configure a firewall on the Uyuni Proxy to restrict what the proxy can access.

Opening these ports allows network traffic from the Uyuni Proxy to communicate with external services.

*Table 7. External Port Requirements for Uyuni Proxy*

Port number	Protocol	Used By	Notes
80			Used to reach the server.

Port number	Protocol	Used By	Notes
443	TCP	HTTPS	Required for SUSE Customer Center.

#### 1.2.4.6. External Client Ports

External client ports must be opened to configure a firewall between the Uyuni Server and its clients.

In most cases, you will not need to adjust these ports.

*Table 8. External Port Requirements for Uyuni Clients*

Port number	Direction	Protocol	Notes
22	Inbound	SSH	Required for ssh-push and ssh-push-tunnel contact methods.
80	Outbound		Used to reach the server or proxy.
9090	Outbound	TCP	Required for Prometheus user interface.
9093	Outbound	TCP	Required for Prometheus alert manager.
9100	Outbound	TCP	Required for Prometheus node exporter.
9117	Outbound	TCP	Required for Prometheus Apache exporter.
9187	Outbound	TCP	Required for Prometheus PostgreSQL.

#### 1.2.4.7. Required URLs

There are some URLs that Uyuni must be able to access to register clients and perform updates. In most cases, allowing access to these URLs is sufficient:

- scc.suse.com
- updates.suse.com

If you are using non-SUSE clients you might also need to allow access to other servers that provide specific packages for those operating systems. For example, if you have Ubuntu clients, you will need to be able to access the Ubuntu server.

For more information about troubleshooting firewall access for non-SUSE clients, see **Administration > Troubleshooting**.

## 1.3. Public Cloud Requirements

This section provides the requirements for installing Uyuni on public cloud infrastructure. We have tested these instructions on Amazon EC2, Google Compute Engine, and Microsoft Azure, but they should work on other providers as well, with some variation.

Before you begin, here are some considerations:

- The Uyuni setup procedure performs a forward-confirmed reverse DNS lookup. This must succeed in order for the setup procedure to complete and for Uyuni to operate as expected. It is important to perform hostname and IP configuration before you set up Uyuni.
- Uyuni Server and Proxy instances need to run in a network configuration that provides you control over DNS entries, but cannot be accessed from the internet at large.
- Within this network configuration DNS resolution must be provided: `hostname -f` must return the fully qualified domain name (FQDN).
- DNS resolution is also important for connecting clients.
- DNS is dependent on the cloud framework you choose. Refer to the cloud provider documentation for detailed instructions.
- We recommend that you locate software repositories, the server database, and the proxy squid cache on an external virtual disk. This prevents data loss if the instance is unexpectedly terminated. This section includes instructions for setting up an external virtual disk.

### 1.3.1. Network Requirements

When you use Uyuni on a public cloud, you must use a restricted network. We recommend using a VPC private subnet with an appropriate firewall setting. Only machines in your specified IP ranges must be able to access the instance.



Running Uyuni on the public cloud means implementing robust security measures. It is essential to limit, filter, monitor, and audit access to the instance. SUSE strongly advises against a globally accessible Uyuni instance that lacks adequate perimeter security.

To access the Uyuni Web UI, allow HTTPS when configuring the network access controls. This allows you to access the Uyuni Web UI.

In EC2 and Azure, create a new security group, and add inbound and outbound rules for HTTPS. In GCE, check the `Allow HTTPS traffic` box under the `Firewall` section.

### 1.3.2. Prepare Storage Volumes

We recommend that the repositories and the database for Uyuni are stored on separate storage devices from the root volume. This will help to avoid data loss and possibly increase performance.

The Uyuni container utilizes default storage locations. These locations should be configured prior to deployment for custom storage. For more information see **Installation-and-upgrade > Container-management**



Do not use logical volume management (LVM) for public cloud installations.

The size of the disk for repositories storage is dependent on the number of distributions and channels you intend to manage with Uyuni. When you attach the virtual disks, they will appear in your instance as Unix device nodes. The names of the device nodes will vary depending on your provider, and the instance type selected.

Ensure the root volume of the Uyuni Server is 100 GB or larger. Add an additional storage disk of 500 GB or more, and choose SSD storage if you can. The cloud images for Uyuni Server use a script to assign this separate volume when your instance is launched.

When you launch your instance, you can log in to the Uyuni Server and use this command to find all available storage devices:

```
hwinfo --disk | grep -E "Device File:"
```

If you are not sure which device to choose, use the `lsblk` command to see the name and size of each device. Choose the name that matches with the size of the virtual disk you are looking for.

You can set up the external disk with the `mgr-storage-server` command. This creates an XFS partition mounted at `/manager_storage` and uses it as the location for the database and repositories:

```
/usr/bin/mgr-storage-server <devicename>
```

# Chapter 2. Deployment and Installation

## 2.1. Server

### 2.1.1. Deploy on openSUSE Leap Micro 5.5

#### 2.1.1.1. Deployment preparations

In this section, you will gain expertise in setting up and deploying a Uyuni Server. The process encompasses the installation of Podman, Uyuni container utilities, deployment, and then initiating interaction with the container through `mgrctl`.



This section assumes you have already configured an openSUSE Leap Micro 5.5 host server, whether it is running on a physical machine or within a virtual environment.

#### 2.1.1.2. Container Host general requirements

For general requirements, see [Installation-and-upgrade > General-requirements](#).

An openSUSE Leap Micro 5.5 server should be installed from installation media. This procedure is described below.

#### 2.1.1.3. Container Host Requirements

For CPU, RAM, and storage requirements, see [Installation-and-upgrade > Hardware-requirements](#).



To guarantee that clients can resolve the FQDN domain name, both the containerized server and the host machines must be linked to a functional DNS server. Additionally, it is essential to ensure correct configuration of reverse lookups.

#### 2.1.1.4. Installing Uyuni tools for use with containers

*Procedure: Installing Uyuni Tools on openSUSE Leap Micro 5.5*

1. On your local host open a terminal window or start up a virtual machine running openSUSE Leap Micro 5.5.
2. Login.
3. Enter the `transactional-update` shell:

```
transactional-update shell
```

4. Add the following repository to your openSUSE Leap Micro 5.5 server:

```
zypper ar
https://download.opensuse.org/repositories/systemsmanagement:/Uyuni:/Stable:/ContainerUtils/openSUSE_Leap_Micro_5.5/systemsmanagement:Uyuni:Stable:ContainerUtils.repo
```

5. Refresh the repository list and accept the key:

```
zypper ref
```

6. Install the container tools:

```
zypper in mgradm mgrctl mgradm-bash-completion mgrctl-bash-completion
netavark
```

7. Exit the transactional shell:

```
transactional update # exit
```

8. Reboot the host.

For more information on the Uyuni Container Utilities, see [Uyuni Container Utilities](#).

#### 2.1.1.5. Configure Custom Persistent Storage

This step is optional. However, if custom persistent storage is required for your infrastructure, use the `mgr-storage-server` tool.

- For more information, see `mgr-storage-server --help`. This tool simplifies creating the container storage and database volumes.

Use the command in the following manner:

+

```
mgr-storage-server <storage-disk-device> [<database-disk-device>]
```

For example:

```
mgr-storage-server /dev/nvme1n1 /dev/nvme2n1
```

+



This command will create the persistent storage volumes at `/var/lib/containers/storage/volumes`.

For more information, see [Installation-and-upgrade > Container-management](#).

### 2.1.1.6. Deploying an Uyuni container with Podman

#### 2.1.1.6.1. mgradm overview

Uyuni is deployed as a container using the `mgradm` tool. There are two methods of deploying a Uyuni server as a container. In this section we will focus on basic container deployment.

For information on using a custom configuration file to deploy, see [Installation-and-upgrade > Container-management](#).

For additional information, you can explore further by running `mgradm --help` from the command line.

*Procedure: Deploying an Uyuni container with Podman*

1. From the terminal run the following command as the sudo user or as root.

```
sudo mgradm install podman
```



You must deploy the container as sudo or root. The following error will be displayed at the terminal if you miss this step.

```
INF Setting up uyuni network
9:58AM INF Enabling system service
9:58AM FTL Failed to open /etc/systemd/system/uyuni-
server.service for writing error="open
/etc/systemd/system/uyuni-server.service: permission
denied"
```

2. Wait for deployment to complete.
3. Open a browser and proceed to your servers FQDN.

In this section you learned how to deploy an Uyuni Server container.

#### 2.1.1.6.2. Persistent volumes

Many users will want to specify locations for their persistent volumes.



If you are just testing out Uyuni you do not need to specify these volumes. `mgradm` will setup the correct volumes by default.

Specifying volume locations will generally be used for larger production deployments.

By default podman stores its volumes in `/var/lib/containers/storage/volumes/`.

You can provide custom storage for the volumes by mounting disks on this path or the expected volume path inside it such as: `/var/lib/containers/storage/volumes/var-spacewalk`. This is especially important for the database and package mirrors.

For a list of all persistent volumes in the container, see [Installation-and-upgrade > Container-management](#).

## 2.1.2. Uyuni Server Air-gapped Deployment

### 2.1.2.1. What is air-gapped deployment?

Air-gapped deployment refers to the setup and operation of any networked system that is physically isolated from insecure networks, especially the internet. This type of deployment is commonly used in high-security environments such as military installations, financial systems, critical infrastructure, and anywhere sensitive data is handled and must be protected from external threats.

You can easily deploy container images using Podman, Docker, or Skopeo on a machine with internet access.

Pull the desired image then, save the image as a tar archive. For example:

#### *Listing 1. Podman*

```
podman pull registry.suse.com/suse/manager:5.0/x86_64/server:5.0.0-beta2
podman save --output server.tar
registry.suse.com/suse/manager:5.0/x86_64/server:5.0.0-beta2
```

#### *Listing 2. Docker*

```
docker pull registry.suse.com/suse/manager:5.0/x86_64/server:5.0.0-beta2
docker save --output server.tar
registry.suse.com/suse/manager:5.0/x86_64/server:5.0.0-beta2
```

#### *Listing 3. Skopeo*

```
skopeo copy docker://registry.suse.com/suse/manager:5.0/x86_64/server:5.0.0-
beta2 docker-
archive:server.tar:registry.suse.com/suse/manager:5.0/x86_64/server:5.0.0-
beta2
```

Transfer the resulting `server-image.tar` to the Server container host and load it using the following

command:

***Listing 4. Load the Server Image***

```
podman load -i server.tar
```

## 2.2. Install the Server (Legacy)

### 2.2.1. Install Uyuni Server with openSUSE

Uyuni Server can be installed on openSUSE.

For requirements, see **Installation-and-upgrade > Uyuni-install-requirements**.



For more information about the latest version and updates of openSUSE Leap, see <https://doc.opensuse.org/release-notes/>.

#### 2.2.1.1. Install Uyuni on openSUSE Leap

***Procedure: Installing openSUSE Leap with Uyuni***

1. As the base system, install openSUSE Leap with all available service packs and package updates applied.
2. Configure a resolvable fully qualified domain name (FQDN) with **yast > System > Network Settings > Hostname/DNS**.
3. Set variables to use to create repository as **root**:

```
repo=repositories/systemsmanagement:/  
repo=${repo}Uyuni:/Stable/images/repo/Uyuni-Server-POOL-x86_64-Medial/
```

4. Add the repository for installing the Uyuni Server software as **root**:

```
zypper ar https://download.opensuse.org/$repo uyuni-server-stable
```

5. Refresh metadata from the repositories as **root**:

```
zypper ref
```

6. Install the pattern for the Uyuni Server as **root**:

```
zypper in patterns-uyuni_server
```

7. Reboot.

- For more information about the stable version of Uyuni, see <https://www.uyuni-project.org/pages/stable-version.html>.
- For more information about the development version of Uyuni, see <https://www.uyuni-project.org/pages/devel-version.html>.

When the installation is complete, you can continue with Uyuni setup. For more information, see **Installation-and-upgrade > Uyuni-server-setup**.

## 2.3. Migration

### 2.3.1. Migrating the Uyuni server to a containerized environment

To migrate a regular Uyuni server to a container, a new machine is required.



It is not possible to perform an in-place migration.

The original server is referred to as the **source server**, while the newly set-up machine is designated as the **destination server**.

The migration procedure currently does not include any hostname renaming functionality. Consequently, the fully qualified domain name (FQDN) on the new server will remain identical to that on the source server. Therefore, following migration, it will be necessary to manually adjust the DNS records to point to the new server.

*Procedure: Initial preparation*

1. Stop the source server:

```
spacewalk-service stop
```

2. Stop the source services:

```
systemctl stop postgresql
```

*Procedure: Preparing the SSH connection*

1. The SSH configuration and agent should be ready on the host for a passwordless connection to the source server.



To establish a passwordless connection, the migration script relies on an SSH agent running on the server. If one isn't active yet, initiate it by running `eval $(ssh-agent)`. Then, add the SSH key to the running agent with `ssh-add /path/to/the/private/key`. You'll be prompted to enter the password for the private key during this process.

2. The migration script only uses the source server fully qualified domain name in the SSH command.
3. This means that every other configuration required to connect needs to be defined in the `~/.ssh/config` file.

### 2.3.1.1. Prepare for Kubernetes

Before executing the migration command with `mgradm migrate`, it's essential to predefine **Persistent Volumes**, especially considering that the migration job initiates the container from scratch. Please consult the installation section for comprehensive guidance on preparing these volumes.

See: [Installation-and-upgrade > Container-management](#)

### 2.3.1.2. Migrating

Execute the following command to install a new Uyuni server, replacing `<Uyuni.source.fqdn>` with the appropriate FQDN of the source server:

```
mgradm migrate podman <{productname}.source.fqdn>
```

or

```
mgradm migrate kubernetes <{productname}.source.fqdn>
```



After successfully running the `mgradm migrate` command, the Salt setup on all clients will still point to the old server (source server). To redirect them to the new server (destination server), it is required to rename the new server at the infrastructure level (DHCP and DNS) to use the same Fully Qualified Domain Name and IP address as old server (source server).

## 2.4. Proxy

### 2.4.1. Containerized Uyuni Proxy Setup

Once container host for Uyuni Proxy containers is prepared, setup of containers require few additional steps to finish configuration.

1. Generate Uyuni Proxy configuration archive file
2. Transfer configuration archive to the container host prepared in installation step and extract it
3. Start the proxy services with `mgrpProxy`

### 2.4.1.1. Generate the Proxy Configuration

The configuration archive of the Uyuni Proxy is generated by the Uyuni Server. Each additional Proxy requires its own configuration archive.



2 GB represents the default proxy squid cache size. This will need to be adjusted for your environment.



For Podman deployment, the container host for the Uyuni Proxy must be registered as a client to the Uyuni Server prior to generating this proxy configuration.

If a proxy FQDN is used to generate a proxy container configuration that is not a registered client (as in the Kubernetes use case), a new system entry will appear in system list. This new entry will be shown under previously entered Proxy FQDN value and will be of `Foreign` system type.

#### 2.4.1.1.1. Generate the Proxy Configuration with Web UI

*Procedure: Generating a Proxy Container Configuration using Web UI*

1. In the Web UI, navigate to **Systems > Proxy Configuration** and fill the required data:
2. In the **Proxy FQDN** field type fully qualified domain name for the proxy.
3. In the **Parent FQDN** field type fully qualified domain name for the Uyuni Server or another Uyuni Proxy.
4. In the **Proxy SSH port** field type SSH port on which SSH service is listening on Uyuni Proxy. Recommended is to keep default 8022.
5. In the **Max Squid cache size [MB]** field type maximal allowed size for Squid cache. Recommended is to use at most 60% of available storage for the containers.



2 GB represents the default proxy squid cache size. This will need to be adjusted for your environment.

6. In the **SSL certificate** selection list choose if new server certificate should be generated for Uyuni Proxy or an existing one should be used. You can consider generated certificates as Uyuni builtin (self signed) certificates.

Depending on the choice then provide either path to signing CA certificate to generate a new certificate or path to an existing certificate and its key to be used as proxy certificate.

The CA certificates generated by the server are stored in the `/var/lib/containers/storage/volumes/root/_data/ssl-build` directory.

For more information about existing or custom certificates and the concept of corporate and intermediate certificates, see **Administration > Ssl-certs-imported**.

7. Click **[Generate]** to register a new proxy FQDN in the Uyuni Server and generate a configuration archive (`config.tar.gz`) containing details for the container host.
8. After a few moments you are presented with file to download. Save this file locally.

#### Container Based Proxy Configuration

You can generate a set of configuration files and certificates in order to register and run a container-based proxy. Once the following form is filled out and submitted you will get a .zip archive to download.

Proxy FQDN *:	<input type="text" value="e.g., proxy.domain.com"/>
Server FQDN *:	<input type="text" value="e.g., server.domain.com"/>
Proxy SSH port:	<input type="text" value="8022"/> <small>Port range: 1 - 65535</small>
Max Squid cache size (MB) *:	<input type="text" value="e.g., 2048"/>
Proxy administrator email *:	<input type="text" value="admin"/>
SSL certificate *:	<input checked="" type="radio"/> Create <input type="radio"/> Use existing <input type="button" value="Browse..."/> No file selected.
CA certificate to use to sign the SSL certificate in PEM format *:	<input type="button" value="Browse..."/> No file selected.
CA private key to use to sign the SSL certificate in PEM format *:	<input type="button" value="Browse..."/> No file selected.
The CA private key password *:	<input type="text" value="*****"/>
<b>SSL Certificate data</b> <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;"> <input type="text" value="Alternate CNAMEs"/> </div> <div style="display: flex; justify-content: space-between;"> <div style="flex: 1;"> <p>2-letter country code: <input type="text"/></p> <p>State: <input type="text"/></p> <p>City: <input type="text"/></p> <p>Organization: <input type="text"/></p> <p>Organization Unit: <input type="text"/></p> <p>Email: <input type="text"/></p> </div> <div style="flex: 1; text-align: right;"> <input type="button" value="Generate"/> <input type="button" value="Clear fields"/> </div> </div>	

#### 2.4.1.1.2. Generate the Proxy Configuration with spacecmd and Self-Signed Certificate

*Procedure: Generating Proxy Configuration with spacecmd and Self-Signed Certificate*

You can generate a Proxy configuration using spacecmd.

1. SSH into your container host.
2. Execute the following command replacing the Server and Proxy FQDN:

```
mgrctl exec -ti 'spacecmd proxy_container_config_generate_cert -- dev-pxy.example.com dev-srv.example.com 2048 email@example.com' -o /tmp/config.tar.gz
```

3. Copy the generated configuration from the server container:

```
mgrctl cp server:/tmp/config.tar.gz .
```

#### 2.4.1.1.3. Generate the Proxy Configuration with spacecmd and Custom Certificate

You can generate a Proxy configuration using spacecmd for a custom certificates rather than the default self-signed certificates.

*Procedure: Generating Proxy Configuration with spacecmd and Custom Certificate*

1. SSH into your Server container host.
2. Execute the following command replacing the Server and Proxy FQDN:

```
for f in ca.crt proxy.crt proxy.key; do
    mgrctl cp $f server:/tmp/$f
done
mgrctl exec -ti 'spacecmd proxy_container_config -- -p 8022
pxy.example.com srv.example.com 2048 email@example.com /tmp/ca.crt
/tmp/proxy.crt /tmp/proxy.key -o /tmp/config.tar.gz'
```

3. Copy the generated configuration from the server container:

```
mgrctl cp server:/tmp/config.tar.gz .
```

#### 2.4.1.2. Transfer Uyuni Proxy configuration

Both spacecmd command and Web UI ways generate a configuration archive. This archive needs to be made available on container host.

Transfer this generated archive to the container host.

For installation instructions to use the archive to get the proxy containers, see **Installation-and-upgrade > Container-deployment**.

#### 2.4.1.3. Start Uyuni Proxy containers

Container can now be started with the mgrpxy command:

*Listing 5. Procedure: Start Uyuni Proxy containers*

```
mgrpxy start uyuni-proxy-pod
```

Check if all containers started up as expected by calling

```
podman ps
```

Five Uyuni Proxy containers should be present:

- proxy-salt-broker

- proxy-httdp
- proxy-tftpd
- proxy-squid
- proxy-ssh

And should be part of proxy-pod container pod.

### 2.4.2. Deploy a Uyuni 2024.07 Proxy

This guide outlines the deployment process for the Uyuni 2024.07 Proxy. This guide presumes you have already successfully deployed a Uyuni 2024.07 Server. To successfully deploy, you will perform the following actions:

*Checklist: Proxy Deployment*

1. Review hardware requirements.
2. Synchronize the openSUSE Leap Micro 5.5 parent channel and the Proxy extension child channel on the server.
3. Install openSUSE Leap Micro 5.5 on a bare-metal machine.
4. During the installation, register openSUSE Leap Micro 5.5 along with the Uyuni 2024.07 Proxy extension.
5. Create a Salt activation key.
6. Bootstrap the Proxy as a Salt minion.
7. Generate a Proxy configuration.
8. Transfer the Proxy configuration from Server to Proxy
9. Use the Proxy configuration to register the Salt minion as a Proxy with Uyuni.

*Supported operating system for the Proxy Container Host*

The supported operating system for the container host is openSUSE Leap Micro 5.5.

**Container host**



A container host is a server equipped with a container engine like Podman, which lets it manage and deploy containers. These containers hold applications and their essential parts, such as libraries, but not a full operating system, making them lightweight. This setup ensures applications run the same way in different environments. The container host supplies the necessary resources such as CPU, memory, and storage for these containers.

#### 2.4.2.1. Hardware Requirements for the Proxy

This table shows the hardware requirements for deploying Uyuni Proxy.

**Table 9. Proxy Hardware Requirements**

<b>Hardware</b>	<b>Details</b>	<b>Recommendation</b>
CPU	x86-64, ARM	Minimum 2 dedicated 64-bit CPU cores
RAM	Minimum	2 GB
	Recommended	8 GB
Disk Space	/ (root directory)	Minimum 40 GB
	/var/lib/containers/storage/volumes/srv-www	Minimum 100 GB, Storage requirements should be calculated for the number of ISO distribution images, containers, and bootstrap repositories you will use.
	/var/lib/containers/storage/volumes/var-cache (Squid)	Minimum 100 GB

#### 2.4.2.2. Sync the Parent and Proxy Extension Child channels

Products are listed on the **Admin > Setup Wizard → Products** page. This channel must be fully synchronized on the server, with the child channel [systemitem]Proxy as an extension option selected.

Product Description	Arch	Channels
SUSE Linux Enterprise Micro 5.0 x86_64	x86_64	<input type="checkbox"/> include recommended
SUSE Linux Enterprise Micro 5.1 x86_64	x86_64	<input type="checkbox"/> include recommended
SUSE Linux Enterprise Micro 5.2 x86_64	x86_64	<input type="checkbox"/> include recommended
SUSE Linux Enterprise Micro 5.3 x86_64	x86_64	<input type="checkbox"/> include recommended
SUSE Linux Enterprise Micro 5.4 x86_64	x86_64	<input type="checkbox"/> include recommended
<b>SUSE Linux Enterprise Micro 5.5 x86_64</b>	x86_64	<input checked="" type="checkbox"/> (S) <input type="checkbox"/> <input type="checkbox"/>
SUSE Manager Client Tools for SLE Micro 5 x86_64 recommended		<input checked="" type="checkbox"/> (S) <input type="checkbox"/> <input type="checkbox"/>
SUSE Manager Retail Branch Server Extension 5.0 x86_64 (BETA)		<input type="checkbox"/>
SUSE Package Hub 15 SP5 x86_64		<input type="checkbox"/>
SUSE Manager Server Extension 5.0 x86_64 (BETA)		<input type="checkbox"/>
SUSE Linux Enterprise Live Patching 15 SP5 x86_64		<input type="checkbox"/>
SUSE Manager Proxy Extension 5.0 x86_64 (BETA)		<input checked="" type="checkbox"/> <input type="checkbox"/>

Page 1 of 1

Figure 1. Uyuni 2024.07 Channel Sync for Proxy

**Task: Sync the Proxy Parent Channel and Proxy Extension**

1. In the Uyuni Web UI select **Admin > Products**.
2. From the products page enter SLE Micro in the filter field.
3. Next use the dropdown to select the required architecture. For this example x86-64.
4. In the Product Description field select the SLE Micro 5.5 checkbox then use the dropdown to select the SUSE Manager Proxy Extension 5.0 x86\_64 BETA extension.
5. Click the **[+ Add products]** button.
6. Wait for the sync to complete.

**2.4.2.3. SLE Micro 5.5 Installation****Task: Download the Installation Media**

1. Locate the SLE Micro 5.5 installation media at <https://www.suse.com/download/sle-micro/>.
2. You will need an account with SUSE Customer Center and must be logged in to download the ISO.
3. Download the following file: SLE-Micro-5.5-DVD-x86\_64-GM-Medial.iso

4. Prepare a USB fash disk or DVD for installation.
5. Insert a DVD or a bootable USB stick containing the installation image for SLE Micro 5.5.
6. Boot or reboot your system.

For detailed documentation on preparing your machines OS (virtual or physical), see [SLE Micro 5.5 Deployment Guide](#).

*Task: SLE Micro 5.5 Installation*

1. Use the arrow keys to select Installation.
2. Adjust Keyboard and language. Click the checkbox to accept the License Agreement.
3. Click Next to continue.
4. Select your registration method. For this example we will register the server with SUSE Customer Center.



*Uyuni 2024.07 Proxy as an extension*

The Uyuni 2024.07 Proxy is registered as an extension. Therefore, in addition to acquiring an SUSE Customer Center registration key for SLE Micro 5.5, you will also need an SUSE Customer Center registration code for the following extension:

- Uyuni 2024.07 Proxy

5. Enter your SUSE Customer Center Email address.
6. Enter your registration code for SLE Micro 5.5.
7. Click Next to continue.
8. On the Extension and Module Selection page uncheck the **Hide Development Versions** checkbox.
9. Select the Uyuni 2024.07 Proxy extension Checkbox.
10. Click Next to continue.
11. Enter your Uyuni 2024.07 Proxy extension registration code.
12. Click **[Next]** to continue.
13. On the NTP Configuration page click **[Next]**.
14. On the Authentication for the System page enter a password for the root user. Click **[Next]**.
15. On the Installation Settings page click **[Install]**.

This concludes installation of SLE Micro 5.5 and Uyuni 2024.07 Proxy as an extension.

#### 2.4.2.3.1. Update the system

*Task: Update the System*

1. Login as **root**.
2. Run **transactional-update**:

```
transactional-update
```

3. Reboot the system.
4. Login as root.
5. Install the container utilities:



Alternatively you may install `mgrpaxy-zsh-completion` or `mgrpaxy-fish-completion`.

```
transactional-update pkg install mgrpaxy mgrpaxy-bash-completion
```

6. Reboot the system.

#### 2.4.2.4. Configure Custom Persistent Storage

This step is optional. However, if custom persistent storage is required for your infrastructure, use the `mgr-storage-proxy` tool.

- For more information, see `mgr-storage-proxy --help`. This tool simplifies creating the container storage and Squid cache volumes.

Use the command in the following manner:

+

```
mgr-storage-proxy <storage-disk-device>
```

For example:

```
mgr-storage-proxy /dev/nvme1n1
```

+



This command will create the persistent storage volumes at `/var/lib/containers/storage/volumes`.

For more information, see [Installation-and-upgrade > Container-management](#).

#### 2.4.2.5. Create an Activation Key for the Proxy

*Task: Create an Activation Key*

1. Select **Systems** > **Activation Keys** then click **[+ Create key]**.
2. Create an activation key for the proxy host with SLE Micro 5.5 as the parent channel. This key should include all recommended channels and the Proxy as an extension child channel.
3. Proceed to bootstrapping the proxy host as a minion.

#### 2.4.2.6. Bootstrap the Proxy Host as a Minion

*Task: Bootstrap the Proxy Host*

1. Select **Systems** > **Bootstrapping**.
2. Fill in the fields for your Proxy host.
3. Select the Activation key created in the previous step from the dropdown.
4. Click **[+ Bootstrap]**.
5. Wait for the Bootstrap process to complete successfully. Check the **Salt** menu and confirm the Salt minion key is listed and accepted.
6. Reboot the Proxy host.
7. Select the host from the **System** list and trigger a second reboot after all events are finished to conclude the onboarding.

*Task: Update the Proxy Host*

1. Select the host from the **Systems** list and apply all patches to update it.
2. Reboot the Proxy host.

#### 2.4.2.7. Generate the Proxy Configuration

The configuration archive of the Uyuni Proxy is generated by the Uyuni Server. Each additional Proxy requires its own configuration archive.



The container host for the Uyuni Proxy must be registered as a salt minion to the Uyuni Server prior to generating this Proxy configuration.

You will perform the following tasks:

1. Generate a Proxy configuration file.

- 
2. Transfer the configuration to the Proxy.
  3. Start the Proxy with the `mgrpxy` command.

*Task: Generating a Proxy Container Configuration using Web UI*

1. In the Web UI, navigate to **Systems > Proxy Configuration** and fill the required data:
2. In the **Proxy FQDN** field type fully qualified domain name for the proxy.
3. In the **Parent FQDN** field type fully qualified domain name for the Uyuni Server or another Uyuni Proxy.
4. In the **Proxy SSH port** field type SSH port on which SSH service is listening on Uyuni Proxy. Recommended is to keep default 8022.
5. In the **Max Squid cache size [MB]** field type maximal allowed size for Squid cache. Typically this should be at most 60% of available storage for the containers.
6. In the **SSL certificate** selection list choose if new server certificate should be generated for Uyuni Proxy or an existing one should be used. You can consider generated certificates as Uyuni builtin (self signed) certificates.

Depending on the choice then provide either path to signing CA certificate to generate a new certificate or path to an existing certificate and its key to be used as proxy certificate.

The CA certificates generated on the server are stored in the `/var/lib/containers/storage/volumes/root/ssl-build` directory.

For more information about existing or custom certificates and the concept of corporate and intermediate certificates, see **Administration > Ssl-certs-imported**.

7. Click **[Generate]** to register new proxy FQDN in Uyuni Server and generate configuration archive with details for container host.
8. After a few moments you are presented with file to download. Save this file locally.

## Container Based Proxy Configuration [?](#)

You can generate a set of configuration files and certificates in order to register and run a container-based proxy. Once the following form is filled out and submitted you will get a .zip archive to download.

Proxy FQDN \*:

Server FQDN \*:

FQDN of the server of proxy to connect to.

Proxy SSH port:

Port range: 1 - 65535

Max Squid cache size (MB) \*:

Proxy administrator email \*:

SSL certificate \*:

Create  Use existing

CA certificate to use to sign the SSL certificate in PEM format \*:

 No file selected.

CA private key to use to sign the SSL certificate in PEM format \*:

 No file selected.

The CA private key password \*:

SSL Certificate data

Alternate CNAMEs	<a href="#"></a>
2-letter country code:	<input type="text"/>
State:	<input type="text"/>
City:	<input type="text"/>
Organization:	<input type="text"/>
Organization Unit:	<input type="text"/>
Email:	<input type="text"/>

[Generate](#)

[Clear fields](#)

### 2.4.2.8. Transfer the Proxy Configuration

The Web UI generates a configuration archive. This archive needs to be made available on the Proxy container host.

*Task: Copy the Proxy configuration*

1. Copy the files from the Server container to the Server host OS:

```
mgrctl cp server:/root/config.tar.gz .
```

2. Next copy the files from the Server host OS to the Proxy host:

```
scp config.tar.gz <proxy-FQDN>:/root
```

3. Install the Proxy with:

```
mgrpctl install podman config.tar.gz
```

### 2.4.2.9. Start the Uyuni 2024.07 Proxy

Container can now be started with the `mgrpxy` command:

*Task: Start and Check Proxy Status*

1. Start the Proxy by calling:

```
mgrpxy start
```

2. Check container status by calling:

```
mgrpxy status
```

Five Uyuni Proxy containers should be present:

- proxy-salt-broker
- proxy-htpd
- proxy-tftpd
- proxy-squid
- proxy-ssh

And should be part of the `proxy-pod` container pod.

#### 2.4.2.9.1. Using a custom container image for a service

By default, the Uyuni Proxy suite is set to use the same image version and registry path for each of its services. However, it is possible to override the default values for a specific service using the install parameters ending with `-tag` and `-image`.

For example, use it like this:

```
mgrpxy install podman --httpd-tag 0.1.0 --httpd-image
registry.opensuse.org/uyuni/proxy-htpd /path/to/config.tar.gz
```

It adjusts the configuration file for the httpd service, where `registry.opensuse.org/uyuni/proxy-htpd`s is the image to use and `0.1.0` is the version tag, before restarting it.

To reset the values to defaults, run the install command again without those parameters:

```
mgrpxy install podman /path/to/config.tar.gz
```

This command first resets the configuration of all services to the global defaults and then reloads it.

## 2.4.3. Install Containerized Uyuni Proxy on k3s

### 2.4.3.1. Installing k3s

On the container host machine, install k3s (replace <K3S\_HOST\_FQDN> with the FQDN of your k3s host):

```
curl -sfL https://get.k3s.io | INSTALL_K3S_EXEC="--tls-san=<K3S_HOST_FQDN>" sh -
```

### 2.4.3.2. Installing tools

The installation requires the `mgrpxy` and `helm` packages.

The `mgrpxy` package is available in the container utils repository: pick the one matching the distribution in: <https://download.opensuse.org/repositories/systemsmanagement:/Uyuni:/Stable:/ContainerUtils/>.

To install them run:

```
zypper in helm mgrpxy
```

### 2.4.3.3. Deploying the Uyuni proxy helm chart

To configure the storage of the volumes to be used by the Uyuni Proxy pod, define persistent volumes for the following claims. If you do not customize the storage configuration, k3s will automatically create the storage volumes for you.

The persistent volume claims are named:

- `squid-cache-pv-claim`
- `/package-cache-pv-claim`
- `/tftp-boot-pv-claim`

Create the configuration for the Uyuni Proxy as documented in **Installation-and-upgrade > Container-deployment**. Copy the configuration `tar.gz` file and then install:

```
mgrpxy install kubernetes /path/to/config.tar.gz
```

For more information see <https://kubernetes.io/docs/concepts/storage/persistent-volumes/> (kubernetes) or <https://rancher.com/docs/k3s/latest/en/storage/> (k3s) documentation.

## 2.5. Install the Proxy

## 2.5.1. Install Uyuni Proxy with openSUSE Leap

Uyuni Proxy can be installed on openSUSE Leap 15.5.

### *Procedure: Installing openSUSE Leap with Uyuni Proxy*

1. Install openSUSE Leap and apply all package updates available.
2. Configure a resolvable fully qualified domain name (FQDN) with **yast** > **System** > **Network Settings** > **Hostname/DNS**.
3. Add the repository with the Uyuni Proxy software. As **root** enter:

```
repo=repositories/systemsmanagement:/  
repo=${repo}Uyuni:/Stable/images/repo/Uyuni-Proxy-POOL-x86_64-Media1/  
zypper ar https://download.opensuse.org/$repo uyuni-proxy-stable
```

4. Refresh metadata from the repositories. As **root** enter:

```
zypper ref
```

5. Install the pattern for the Uyuni Proxy: As **root** enter:

```
zypper in patterns-uyuni_proxy
```

6. Reboot the Uyuni Proxy.

- For more information about the stable version of Uyuni, see <https://www.uyuni-project.org/pages/stable-version.html>.
- For more information about the development version of Uyuni, see <https://www.uyuni-project.org/pages/devel-version.html>.

When the installation is complete, you can continue with Uyuni setup. For more information, see **Installation-and-upgrade** > **Uyuni-proxy-registration**.

# Chapter 3. Upgrade and Migration

## 3.1. Server

### 3.1.1. Migrating the Uyuni server to a containerized environment

To migrate a regular Uyuni server to a container, a new machine is required.



It is not possible to perform an in-place migration.

The original server is referred to as the **source server**, while the newly set-up machine is designated as the **destination server**.

The migration procedure currently does not include any hostname renaming functionality. Consequently, the fully qualified domain name (FQDN) on the new server will remain identical to that on the source server. Therefore, following migration, it will be necessary to manually adjust the DNS records to point to the new server.

#### *Procedure: Initial preparation*

1. Stop the source server:

```
spacewalk-service stop
```

2. Stop the source services:

```
systemctl stop postgresql
```

#### *Procedure: Preparing the SSH connection*

1. The SSH configuration and agent should be ready on the host for a passwordless connection to the source server.



To establish a passwordless connection, the migration script relies on an SSH agent running on the server. If one isn't active yet, initiate it by running `eval $(ssh-agent)`. Then, add the SSH key to the running agent with `ssh-add /path/to/the/private/key`. You'll be prompted to enter the password for the private key during this process.

2. The migration script only uses the source server fully qualified domain name in the SSH command.
3. This means that every other configuration required to connect needs to be defined in the `~/.ssh/config` file.

### 3.1.1.1. Prepare for Kubernetes

Before executing the migration command with mgradm migrate, it's essential to predefine **Persistent Volumes**, especially considering that the migration job initiates the container from scratch. Please consult the installation section for comprehensive guidance on preparing these volumes.

See: **Installation-and-upgrade > Container-management**

### 3.1.1.2. Migrating

Execute the following command to install a new Uyuni server, replacing <Uyuni.source.fqdn> with the appropriate FQDN of the source server:

```
mgradm migrate podman <{productname}.source.fqdn>
```

or

```
mgradm migrate kubernetes <{productname}.source.fqdn>
```

## 3.2. Proxy

### 3.2.1. Proxy Migration

In Uyuni 2024.04, the containerized proxy is managed by a set of systemd services.

In Uyuni 2024.07, management of the containerized proxy was re-designed and made simpler with the `mgrpProxy` tool.

This section will help you migrate from the legacy `systemd` proxy using the new `mgrpProxy` tool.



An in-place migration from Uyuni 2024.04 to 2024.06 will remain unsupported due to the HostOS change from SUSE Linux Enterprise Server 15 SP4 to openSUSE Leap Micro 5.5

The traditional contact protocol is no longer supported in Uyuni 2024.07 and later. Before migrating from Uyuni 2024.04 to 2024.07, any existing traditional clients including the traditional proxies must be migrated to Salt.

For more information about migrating traditional Uyuni 2024.04 clients to Salt clients, see <https://documentation.suse.com/suma/4.3/en/suse-manager/client-configuration/contact-methods-migrate-traditional.html>

#### 3.2.1.1. Migrate from Legacy to Containerized Proxy with Systemd

### 3.2.1.1.1. Generate the Proxy Configuration

*Task: Generate the Proxy Configuration*

1. Log in to the Uyuni Server Web UI.
2. Select **Systems > Proxy Configuration** from the left navigation.
3. Enter your Proxy FQDN. Use the same FQDN as the original proxy host.
4. Enter your Server FQDN.
5. Enter the Proxy port number. *We recommend using the default port of 8022*
6. Certificate and private key are located on the Server container host in `/var/lib/containers/storage/volumes/root/_data/ssl-build/`.
  - RHN-ORG-TRUSTED-SSL-CERT
  - RHN-ORG-PRIVATE-SSL-KEY
7. Copy the certificate and key to your machine with:

```
scp root@uyuni-server-example.com:/root/ssl-build/RHN-ORG-PRIVATE-SSL-KEY .
scp root@uyuni-server-example.com:/root/ssl-build/RHN-ORG-TRUSTED-SSL-CERT .
```

8. Select **[Choose File]** and browse your local machine for the certificate.
9. Select **[Choose File]** and brose your local machine for the private key.
10. Enter the CA password.
11. Click **[Generate]**.

### 3.2.1.1.2. Transfer Proxy Configuration to New Host

*Task: Transfer the Proxy Configuration*

1. From the Server transfer the generated tar.gz file containing the proxy configuration to the new Proxy host:

```
scp config.tar.gz <uyuni-proxy-FQDN>:/root/
```

2. Disable the legacy proxy prior to executing the next step:

*Listing 6. Disable the Legacy Proxy*

```
spacewalk-proxy stop
```

3. Deploy the new Proxy with:

```
systemctl start uyuni-proxy-pod
```

4. Enable the new Proxy with:

```
systemctl enable --now uyuni-proxy-pod
```

5. Run podman ps to verify all the containers are present and running:

```
proxy-salt-broker
proxy-httpd
proxy-tftpd
proxy-squid
proxy-ssh
```

### 3.2.1.2. Migrate Uyuni 2024.04 Proxy to Uyuni 2024.07 Containerized Proxy

*Task: Migrate Uyuni 2024.04 Containerized Proxy to Uyuni 2024.07 New Containerized Proxy*

1. Boot your new machine and begin installation of openSUSE Leap Micro 5.5.
2. Complete the installation.
3. Update the system:

```
transactional-update --continue
```

4. Install mgrpxy and optionally, mgrpxy-bash-completion:

```
transactional-update pkg install mgrpxy mgrpxy-bash-completion
```

5. Reboot.
6. Copy your tar.gz proxy configuration to the host.

### 3.2.1.3. Installing packages using the Web UI

The mgrpxy and mgrpxy-bash-completion packages can also be installed via the web UI after the minion has been bootstrapped and registered with the Server.

*Task: Installing Packages using the Web UI*

1. After installation, ensure that the SLE Micro 5.5 Parent channel and Proxy child channels are added and synced from the **Admin > Setup Wizard → Products** page.
2. In the Web UI, go to **Systems > Activation Keys** and create an activation key linked to the synced SLE Micro 5.5 channel.
3. Bootstrap your system as a minion using the **Systems > Bootstrapping** page.
4. Once the new machine is onboarded and displayed in the systems list, select the system and navigate to the **System Details > Install Package** page.

5. Install the packages `mgrpctl` and `mgrpctl-bash-completion`.
6. Reboot the system.

#### 3.2.1.4. Generate Proxy Config with spacecmd and Self-Signed Certificate

*Task: Generate Proxy Config with spacecmd and Self-Signed Certificate*

You can generate a Proxy configuration using spacecmd.

1. SSH into your container host.
2. Execute the following command replacing the Server and Proxy FQDN:

```
mgrctl exec -ti 'spacecmd proxy_container_config_generate_cert -- dev-pxy.example.com dev-srv.example.com 2048 email@example.com' -o /tmp/config.tar.gz
```

3. Copy the generated config to the Proxy:

```
mgrctl cp server:/tmp/config.tar.gz .
```

4. Deploy the Proxy with:

```
mgrpctl install podman config.tar.gz
```

#### 3.2.1.5. Generate Proxy Config with spacecmd and Custom Certificate

You can generate a Proxy configuration using spacecmd for a custom certificates rather than the default self signed certificates.



2 GB represents the default proxy squid cache size. This will need to be adjusted for your environment.

*Task: Generate Proxy Config with spacecmd and Custom Certificate*

1. SSH into your Server container host.
2. Execute the following command replacing the Server and Proxy FQDN:

```
for f in ca.crt proxy.crt proxy.key; do
    mgrctl cp $f server:/tmp/$f
done
mgrctl exec -ti 'spacecmd proxy_container_config -- -p 8022
pxy.example.com srv.example.com 2048 email@example.com /tmp/ca.crt
/tmp/proxy.crt /tmp/proxy.key -o /tmp/config.tar.gz'
```

3. Copy the generated config to the Proxy:

```
mgrctl cp server:/tmp/config.tar.gz .
```

4. Deploy the Proxy with:

```
mgrpxy install podman config.tar.gz
```

## 3.3. Clients

### 3.3.1. Upgrade the Clients

Clients use the versioning system of their underlying operating system. For clients using SUSE operating systems, you can perform upgrades within the Uyuni Web UI.

For more information about upgrading clients, see [Client-configuration > Client-upgrades](#).

# Chapter 4. Upgrade and Migration

## 4.1. Server

### 4.1.1. Container

#### 4.1.1.1. Migrating the Uyuni server to a containerized environment

To migrate a regular Uyuni server to a container, a new machine is required.



It is not possible to perform an in-place migration.

The original server is referred to as the **source server**, while the newly set-up machine is designated as the **destination server**.

The migration procedure currently does not include any hostname renaming functionality. Consequently, the fully qualified domain name (FQDN) on the new server will remain identical to that on the source server. Therefore, following migration, it will be necessary to manually adjust the DNS records to point to the new server.

*Procedure: Initial preparation*

1. Stop the source server:

```
spacewalk-service stop
```

2. Stop the source services:

```
systemctl stop postgresql
```

*Procedure: Preparing the SSH connection*

1. The SSH configuration and agent should be ready on the host for a passwordless connection to the source server.



To establish a passwordless connection, the migration script relies on an SSH agent running on the server. If one isn't active yet, initiate it by running `eval $(ssh-agent)`. Then, add the SSH key to the running agent with `ssh-add /path/to/the/private/key`. You'll be prompted to enter the password for the private key during this process.

2. The migration script only uses the source server fully qualified domain name in the SSH command.
3. This means that every other configuration required to connect needs to be defined in the `~/.ssh/config` file.

#### 4.1.1.1. Prepare for Kubernetes

Before executing the migration command with mgradm migrate, it's essential to predefine **Persistent Volumes**, especially considering that the migration job initiates the container from scratch. Please consult the installation section for comprehensive guidance on preparing these volumes.

See: **Installation-and-upgrade > Container-management**

#### 4.1.1.2. Migrating

Execute the following command to install a new Uyuni server, replacing <Uyuni.source.fqdn> with the appropriate FQDN of the source server:

```
mgradm migrate podman <{productname}.source.fqdn>
```

or

```
mgradm migrate kubernetes <{productname}.source.fqdn>
```



After successfully running the mgradm migrate command, the Salt setup on all clients will still point to the old server (source server). To redirect them to the new server (destination server), it is required to rename the new server at the infrastructure level (DHCP and DNS) to use the same Fully Qualified Domain Name and IP address as old server (source server).

## 4.1.2. Legacy

### 4.1.2.1. Server - Minor Upgrade

Several times a year, the Uyuni team releases minor upgrades of the Uyuni Server. These updates address bug fixes and feature improvements, and sometimes include new features.



Some additional manual steps might be required, and this information is only available in the release notes. For more information about such a major upgrade, see **Installation-and-upgrade > Server-major-upgrade-uyuni**.

For information about your upgrade, see the release notes at <https://www.uyuni-project.org/pages/stable-version.html>.

Performing a minor upgrade is similar to installing operating system package updates.

#### *Procedure: Updating Packages on the Uyuni Server*

By default, several update repositories are configured and enabled for the Uyuni Server. New and updated packages become available automatically.

It is recommended you make a backup of the server before upgrading. For more information about backing up Uyuni, see **Administration > Backup-restore**.

1. On the Uyuni Server, at the command prompt, as root, stop the spacewalk services:

```
spacewalk-service stop
```

2. Refresh software repositories:

```
zypper ref
```

3. Update new packages: (Repeat this if prompted by zypper)

```
zypper up
```

Uyuni is different from SUSE Manager in this step. SUSE Manager uses `zypper patch`, but Uyuni requires `zypper up`.

+

1. If zypper reports that the Uyuni package will not be upgraded, run the command manually:

```
zypper install Uyuni-Server-release
```

2. Restart the spacewalk services:

```
spacewalk-service start
```

Reboot the server if a patch update recommends rebooting.



By default, zypper refreshes the repository every ten minutes (see `repo.refresh.delay` in `/etc/zypp/zypp.conf`). If `autorefresh` is disabled, run `zypper ref` to refresh all repositories.



Starting with Uyuni 2020.04 `spacewalk-schema-upgrade` is not needed anymore.

The schema upgrade is run automatically when the spacewalk service is started with `spacewalk-service start`.



Services affected by a package update are not automatically restarted after an update. You need to restart these services manually to avoid potential failures. Use `zypper ps` to check for applications that are using old code and require restarting.

#### 4.1.2.2. Server - Major Upgrade

When Uyuni core components are upgraded to new major versions, you need to perform a major upgrade on the Uyuni Server. This is the case if a version upgrade of PostgreSQL, Salt, or openSUSE Leap is needed. openSUSE Leap is the underlying base operating system (OS).



Some additional manual steps might be required, and this information is only available in the release notes. For important extra information about your upgrade, see the release notes at:

<https://www.uyuni-project.org/pages/stable-version.html>.



You will not be able to fix issues that arise during the migration. Ensure you have created a backup before you start the migration. For more information about backing up Uyuni, see **Administration > Backup-restore**. If you are running Uyuni Server on a virtual machine, we recommend that you create a snapshot before you start.



Before the upgrade, ensure that storage requirements are met. For more information, see [uyuni-install-requirements.pdf](#). The migration procedure can fill the root partition if there is not enough space available due to the service pack migration and the download of new software packages. It is the same for the `/var/lib/pgsql` when upgrading PostgreSQL. It takes a copy of the old database, thus be sure to have at least enough space available to cope with a copy of the database.

The `server-migrator.sh` script migrates Uyuni Server to the latest version. It also upgrades the underlying operating system to version 15.5. The script is part of the `susemanager` package.

*Procedure: Migrating the Uyuni Server*

1. Before running the `server-migrator.sh` script, check whether the most recent version of the `susemanager` package is installed:

```
zypper ref
zypper up susemanager
```

2. Run the `/usr/lib/susemanager/bin/server-migrator.sh` script to upgrade the base OS and Uyuni Server.



After the migration is complete, manually reboot the Uyuni Server:

## 4.2. Proxy

### 4.2.1. Upgrade the Proxy

Uyuni Proxies are managed in the same way as clients.



The upgrade procedure to 2024.07 can either be a major or a minor upgrade. For more information, see the Uyuni 2024.07 release notes.

#### Major Upgrade

See [Installation-and-upgrade > Proxy-uyuni](#).

#### Minor Upgrade

See [Installation-and-upgrade > Proxy-minor-uyuni](#).

### 4.2.2. Proxy - Major Upgrade

Before you perform any proxy update, schedule a maintenance window. The clients registered to Uyuni through the proxy will not be able to connect to Uyuni while the update is in progress. For more information about maintenance windows, see [Administration > Maintenance-windows](#).



Major proxy upgrades include a version upgrade of the operating system. For more information, see the Uyuni 2024.07 release notes.

#### 4.2.2.1. Preparation for the Upgrade

*Procedure: Adding openSUSE Leap 15.5 Software Channels at the Command Prompt*

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

```
spacewalk-common-channels opensuse_leap15_5 \
opensuse_leap15_5-non-oss \
opensuse_leap15_5-non-oss-updates \
opensuse_leap15_5-updates \
opensuse_leap15_5-backports-updates \
opensuse_leap15_5-sle-updates \
uyuni-proxy-stable-leap-155
```

- Fully synchronize all channels with `spacewalk-repo-sync`.

#### 4.2.2.2. Upgrade the Proxy

To upgrade a proxy you first stop the proxy service, then you replace the software repositories and update

the software, and finally you restart the proxy service.

*Procedure: Updating the Uyuni Proxy*

1. On the Uyuni Proxy, stop the proxy service:

```
spacewalk-proxy stop
```

2. In the Uyuni Server Web UI, navigate to **Systems > Proxy** and click the name of the proxy.
3. Click **Software > Software Channels**, and as the base channel select the openSUSE Leap 15.5 channel that is listed in the **Customs Channels** list.
4. In the **Child Channels** pane, select the 15.5 child channels.
5. Click **[Next]**, and Confirm Software Channel Change with **[Confirm]**.
6. Click **Details > Remote Command**, add `zypper --non-interactive dup --allow-vendor-change --replacefiles` to the script field, and click **[Schedule]**.
7. Wait until the remote command is executed.
8. On the Uyuni Proxy, start the proxy service:

```
spacewalk-proxy start
```

If you need to update many proxies, you can create an action chain of this command sequence on the Uyuni Server. You can use the action chain to perform updates on multiple proxies at the same time.

### 4.2.3. Proxy - Minor Upgrade

Before you perform any proxy update, schedule a maintenance window. The clients registered to Uyuni through the proxy will not be able to connect to Uyuni while the update is in progress. For more information about maintenance windows, see **Administration > Maintenance-windows**.



- Minor proxy upgrades do not include a version upgrade of the operating system.
- For more information, see the Uyuni 2024.07 release notes.

#### 4.2.3.1. Upgrade the Proxy

To update a proxy you first stop the proxy service, then update the software and finally restart the proxy service.

*Procedure: Updating the Uyuni Proxy*

1. On the Uyuni Proxy, stop the proxy service:

```
spacewalk-proxy stop
```

2. In the Uyuni Server Web UI, navigate to **Systems > Proxy** and click the name of the proxy.
3. Select all the packages to be updated on the proxy, and then apply the selection.
4. On the Uyuni Proxy, start the proxy service:

```
spacewalk-proxy start
```

If you need to update many proxies, you can create an action chain of this command sequence on the Uyuni Server. You can use the action chain to perform updates on multiple proxies at the same time.

# Chapter 5. Basic Server Management

## 5.1. Custom YAML Configuration and Deployment with mgradm

You have the option to create a custom `mgradm.yaml` file, which the `mgradm` tool can utilize during deployment.



- mgradm will prompt for basic variables if they are not provided using command line parameters or the `mgradm.yaml` configuration file.
- For security, **using command line parameters to specify passwords should be avoided**: use a configuration file with proper permissions instead.

*Procedure: Deploying the Uyuni container with Podman using a custom configuration file*

1. Prepare a configuration file named `mgradm.yaml` similar to the following example:

```
# Database password. Randomly generated by default
db:
    password: MySuperSecretDBPass

# Password for the CA certificate
ssl:
    password: MySuperSecretSSLPASSWORD

# Your SUSE Customer Center credentials
scc:
    user: ccUsername
    password: ccPassword

# Organization name
organization: YourOrganization

# Email address sending the notifications
emailFrom: notifications@example.com

# Administrators account details
admin:
    password: MySuperSecretAdminPass
    login: LoginName
    firstName: Admin
    lastName: Admin
    email: email@example.com
```

2. From the terminal, as root, run the following command. Entering your server's FQDN is optional.

```
mgradm -c mgradm.yaml install podman <FQDN>
```

You must deploy the container as sudo or root. The following error will be displayed on the terminal if you miss this step.



```
INF Setting up uyuni network
9:58AM INF Enabling system service
9:58AM FTL Failed to open /etc/systemd/system/uyuni-
server.service for writing error="open
/etc/systemd/system/uyuni-server.service: permission
denied"
```

3. Wait for deployment to complete.
4. Open a browser and proceed to your server's FQDN or IP address.

In this section you learned how to deploy an Uyuni 2024.07 Server container using a custom YAML configuration.

## 5.2. Starting and Stopping Containers

The Uyuni 2024.07 Server container can be restarted, started, and stopped using the following commands:

To restart the Uyuni 2024.07 Server execute the following command:

```
# mgradm restart
5:23PM INF Welcome to mgradm
5:23PM INF Executing command: restart
```

To start the server execute the following command:

```
# mgradm start
5:21PM INF Welcome to mgradm
5:21PM INF Executing command: start
```

To stop the server execute the following command:

```
# mgradm stop
5:21PM INF Welcome to mgradm
5:21PM INF Executing command: stop
```

## 5.3. List of persistent storage volumes

Modifications performed within containers are not retained. Any alterations made outside of persistent volumes will be discarded. Below is a list of persistent volumes for Uyuni 2024.07.

To customize the default volume locations, ensure you create the necessary volumes before launching the pod for the first time, utilizing the `podman volume create` command.



Ensure that this table aligns precisely with the volumes mapping outlined in both the Helm chart and the systemctl services definitions.

The following volumes are stored under the **Podman** default storage location.

*Table 10. Persistent Volumes: Podman Default Storage*

Volume Name	Volume Directory
<b>Podman Storage</b>	/var/lib/containers/storage/volumes/

*Table 11. Persistent Volumes: root*

Volume Name	Volume Directory
<b>root</b>	/root

*Table 12. Persistent Volumes: var/*

Volume Name	Volume Directory
<b>var-cobbler</b>	/var/lib/cobbler
<b>var-salt</b>	/var/lib/salt
<b>var-pgsql</b>	/var/lib/pgsql
<b>var-cache</b>	/var/cache
<b>var-spacewalk</b>	/var/spacewalk
<b>var-log</b>	/var/log

*Table 13. Persistent Volumes: srv/*

Volume Name	Volume Directory
<b>srv-salt</b>	/srv/salt
<b>srv-www</b>	/srv/www/
<b>srv-tftpboot</b>	/srv/tftpboot
<b>srv-formulametadata</b>	/srv/formula_metadata
<b>srv-pillar</b>	/srv/pillar
<b>srv-susemanager</b>	/srv/susemanager
<b>srv-spacewalk</b>	/srv/spacewalk

*Table 14. Persistent Volumes: etc/*

Volume Name	Volume Directory
<b>etc-apache2</b>	/etc/apache2
<b>etc-rhn</b>	/etc/rhn
<b>etc-systemd-multi</b>	/etc/systemd/system/multi-user.target.wants
<b>etc-systemd-sockets</b>	/etc/systemd/system/sockets.target.wants
<b>etc-salt</b>	/etc/salt
<b>etc-tomcat</b>	/etc/tomcat
<b>etc-cobbler</b>	/etc/cobbler
<b>etc-sysconfig</b>	/etc/sysconfig
<b>etc-tls</b>	/etc/pki/tls
<b>etc-postfix</b>	/etc/postfix
<b>ca-cert</b>	/etc/pki/trust/anchors

# Chapter 6. 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 retitle 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".