



## **Cisco WAE 6.2 Server Installation Guide**

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# Overview

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This chapter provides an overview of what happens as a result of the installation process, such as which packages are installed and how environment variables are set. This guide explains how to install the servers used by both the web applications and the WAE platform.

- [Collector Server Upgrades](#)—Describes options for migrating the Collector server files and upgrading the Collector server database.
- [Before You Start](#)—Requirements, best practices, and pre-installation instructions.
- [Online Installation](#)—Procedure for installing the software when you have access to the Internet.
- [Offline Installation](#)—Procedure for installing the software when you do not have access to the Internet.
- [Post Installation](#)—Optional procedures to follow after having installed the product, including pointers on where to go for configuration information and how to log in to the web UI.
- [License Installation](#)—Procedure for installing licenses for all products.
- [WAE Design Floating License Server](#)—Procedure for installing and setting up the FlexNet Publisher license server. This is applicable only if you have WAE Design and only if you need to administer floating licenses for these end users.

## Installer

An installer is an executable that runs a script to install the WAE software in the proper locations. Although WAE features are installed, they are active only if you have a license for them.

The installer automates the installation process by asking you a series of questions and performing the following tasks.

- Verifies the following.
  - Whether the device has the appropriate system requirements, including proper operating system, disk space, total memory, and required software packages.

If the installer sees that you do not have the appropriate system requirements, it either exits, gives a warning, or prompts you whether to continue. Since the installer might be checking for more than what your specific requirements are, you can press “y” to attempt to continue.

  - Whether there are existing package installations; if there are, they are preserved
- Stops all services that are running.
- Installs all RPM packages, creates the software directory structure, and creates symbolic links to the most recently installed packages.

- Sets the maximum file descriptors and processors as follows.
  - /etc/sysctl.conf file  
Sets fs.file-max=512000 if it is less than 65535.
  - /etc/security/limits.conf  
Sets nfile to 65535 for the WAE username.
  - /etc/security/limits.d/90-nproc.conf  
Sets nproc to 8192 for the WAE username.
- Sets the file capabilities for all binaries in `$CARIDEN_HOME/lib/ext/pmacct/sbin`, which enables you to collect flow data using `flow_manage` and `flow_get` without having to change the file capabilities for the flow collection server. This is the equivalent of executing the following command.
 

```
setcap 'cap_net_bind_service=+ep' $CARIDEN_HOME/lib/ext/pmacct/sbin/*
```
- Automatically starts the web server (`wae-web-server`), WAE Network Interface (NI) server (`wae-ni`), and all System services (`wae-svcs-*`). For detailed information on services, including how to start, stop, restart, and check their status, see the *WAE System Administration Guide*.
- Upon logging out and back in, the WAE username and associated permissions are set, and the environment variables are set.
  - For executables, the WAE user has read, write, and execute permissions. Users listed in `/etc/group` have read and execute permissions. All others have read-only permissions.
  - For non-executables, only the WAE user has read and write permissions. All other users have read-only permissions.

## RPM Packages

The `jdk-7u60` package is installed in `/usr/java/latest`. All other RPM packages are installed in `/opt/cariden/software`. To list these packages, enter this command.

```
rpm -qa | grep wae-
```

Package	Description
<code>jdk-7u60</code>	Oracle Java version 7 (1.7)
<code>wae-appenginecore</code>	Service API that manages and routes requests to load the network model to the appropriate <code>wae-designapiserver</code> .
<code>wae-core</code>	WAE Core server that enables the use of WAE Core REST and Thrift APIs.
<code>wae-db</code>	WAE Core database.
<code>wae-demo</code>	Demonstration UI for applications developed for WAE Core.
<code>wae-designapiserver</code>	Service that enables <code>wae-appenginecore</code> to use the Design APIs. This wraps the Design APIs and controls Design API instances.
<code>wae-dlc</code>	WAE Design, WAE Live, and WAE Collector executables and binaries.
<code>wae-messaging</code>	WAE messaging system that uses JMS (Java Message Service).
<code>wae-ni</code>	WAE NI server that enables the northbound WAE NI APIs. WAE NI is used for continuous polling and continuous PCEP LSP collection.
<code>wae-osc</code>	Open SDN Controller.

Package	Description
wae-platsvcs	Package that distributes the Automation platform services in a high-availability environment.
wae-svcs-client	Component that provides the data to the aggregation server for displaying statistics, such as logs, diagnostics, and processes.
wae-svcs-server	Aggregation server for gathering and collating the web statistics sent to it by the wae-svcs-client.

## Current Links

The current symbolic link for the DLC package is `/opt/cariden/software/mate/current`.

**Example RPM name:** `wae-dlc-1.0.2-123456789`

**Corresponding current link name:** `/opt/cariden/software/mate/current`

Other than the DLC package, all other packages have a current symbolic link using the package name as the link name.

**Example RPM name:** `wae-core-1.0.2-123456789`

**Example corresponding current link name:** `wae-core`

## Versions

To determine the release version, enter the following command.

```
license_check -version
```

To determine the current RPM versions, enter the following command.

```
rpm -qa | grep wae
```

## Environment Variables

Upon logging out and back in as the WAE user after an installation, the environment variables are automatically set using `.sh` scripts in `/etc/profile.d` directory

Environment Variable	Default
<code>\$WAE_ROOT</code>	<code>/opt/cariden</code>
<code>\$WAE_HOME</code>	<code>/opt/cariden/software</code>
<code>\$CARIDEN_ROOT</code>	<code>/opt/cariden</code>
<code>\$CARIDEN_HOME</code>	<code>/opt/cariden/software/mate/current</code>
<code>\$CASSANDRA_HOME</code>	<code>/opt/cariden/software/wae-db</code>
<code>\$COLLECTOR_HOME</code>	<code>/opt/cariden/software/wae-ni</code>

Environment Variable	Default
\$JAVA_HOME	/usr/java/latest
\$PYTHONPATH	/opt/cariden/software/wae-demo/lib/python2.7/site-packages For use by the /etc/profile.d/wae-demo.sh script.





## Collector Server Upgrades

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If you are upgrading and if you use the same installation directory in both installation processes, the Collector server files located in these directories remain intact.

- `/opt/cariden/data/collector/server/file-persistence`
- `/opt/cariden/data/collector/server/snapshots`
- `/opt/cariden/etc/collector/server/configs`
- `/opt/cariden/etc/collector/server/db-persistence`

## File Migration

Migrating Collector server files means copying the Collector server files (located in above directories) from the previous release to the new one.

During the installation process, you are given the option to migrate the Collector server files. If you are using different installation directories and if you want these files automatically copied to their respective locations under the new installation directory, enter “Yes” when prompted. If you choose “No,” you can use the `collector_migrate` tool to migrate these files at a later time.

Note that if you are using the same installation directory, file migration is not applicable.

## Database Upgrades

Upgrading the Collector server database means that the existing `/<install_directory>/etc/collector/server/db-persistence/DiscoveryEngineImplementation.db` file is upgraded with information from the new release, such as with new default values and column headings.

Except for new installations, when you start the web server, a backup directory containing the previous release's database is automatically created in

`/<install_directory>/etc/collector/server/db-persistence`. Also when you start the web server, database upgrades occur automatically. Since the installation process automatically starts this server, the backup directory creation and the database upgrade both occur automatically. This can prove useful if you need to later roll back the Collector server database.

The `/opt/cariden/etc/sysconfig/wae-web-server.cfg` file contains a parameter for turning off this automatic upgrade feature. For information, see the [Before You Start](#) chapter.

Note that this database (DiscoveryEngineImplementation.db) file has the potential to be both migrated and upgraded. Table 2-1 describes what happens to the database file, depending on the combination of answers given.

- The “Autoupgrade =” column references the autoupgrade parameter in the `/opt/cariden/etc/sysconfig/wae-web-server.cfg` file.
- The “Migration Install =” column references the answer given during the installation process when prompted whether to migrate Collector server files.

**Table 2-1 Database File Migration and Upgrade**

Autoupgrade =	Migrate Install =	Same Installation Directory	Different Installation Directory
		In all cases, migrating the database file is not applicable.	
True	Yes	Database file is upgraded to a new version, and the old database file is copied to the backup directory.	Database file is copied from the db-persistence directory of the previous release to the new directory. <ul style="list-style-type: none"> <li>• This database file is copied to the backup directory.</li> <li>• This database file is upgraded to the new version.</li> </ul>
True	No	Database file is upgraded to a new version, and the old database file is copied to the backup directory.	Database file is not copied from the previous release. New database file is created.
False	Yes	Database file is not upgraded, and a backup directory is not created.	Database file is copied from the db-persistence directory of the previous release to the new directory. Database file is not upgraded, and a backup directory is not created.
False	No	Database file is not upgraded, and a backup directory is not created.	Database file is not copied from the previous release. New database file is created.



## Before You Start

### Requirements



#### Note

For a list of system requirements and package dependencies, see the *System Requirements* document posted on [cisco.com](http://cisco.com).

- **System Requirements**—The installer checks for system requirements. If they are not met and if it is something the installer cannot address, such as memory issues, the installation process stops.
- **Package Dependencies**—For online installations, the installer checks for required packages. If the installer cannot install any RPM dependency, it reports an error and skips the corresponding RPM installation. You must then install these dependencies and re-run the installer.

There is one exception to this automatic package installation. For RHEL operating systems, you must manually install an RHEL package repository (createrepo) using the Red Hat installation DVD.

- **License**—A license determines which WAE features are available to use, and is a requirement for using the products. If you have questions about obtaining a license, contact your support representative.
- **Server time synchronization**—The NTP (Network Time Protocol) must be used to synchronize times on all routers, servers used in the collection and deployment process, and servers used in high-availability clusters. Failure to synchronize these clocks can produce such issues as the following.
  - Messages might expire prematurely, which manifests as an unresponsive WAE northbound interface. Depending on where the JMS messages expire, you may or may not see indications of this in the logs.
  - Certain collection tools, such as `sam_getplan` and `flow_get`, might produce inaccurate traffic tables.
  - Collection tools will produce an inaccurate `NetIntHistory` table.
  - All lines in the collection logs will have incorrect timestamps.
- **/etc/hosts requirements**—Various web services require the server's hostname to be present in the `/etc/hosts` file. This is standard configuration practice, but some Linux systems do not have it. Both the unqualified and fully-qualified hostnames must be present. Make sure that the following line is present in `/etc/hosts`.

```
<server IP address> <hostname> <fully-qualified hostname>
```

**Example:** `192.168.0.15 wae-server wae-server.my.company.com`

## Best Practices

- **Security**—The server's SSL certificate for a domain is customer specific. The web server installation is tied to a preferred Certification Authority (CA) provider, which in turn issues valid certificates to web clients. To prevent users from seeing messages for untrusted certificates, configure the certificate to be signed by one of the client's trusted CAs. The fully-qualified domain name (FQDN) of the WAE server should match the FQDN of the certificate issued by the CA.
- **BIOS setting (if applicable)**—To improve collection performance, change or disable the power management setting to permit maximum CPU performance.

## Pre-Installation

These pre-installation steps are valid for both online and offline installations.

- 
- Step 1** Download the WAE software package. In a web browser, go to the [Cisco download site](#), and use the Search feature to find the applicable product.
- Step 2** Log in to the server as root or a user with administrative capabilities.
- Step 3** Ensure there are no local firewalls blocking the services. This step is beyond the scope of these instructions, though following is an example. For a list of available ports, see the *System Requirements* document.

**Example:** This shows how to disable the iptables firewall as root.

```
service iptables save
service iptables stop
sudo chkconfig iptables off
```

## Change Default wae-web-server Parameters

If this is an upgrade and if you want to change the default manner in which the wae-web-server starts, or if you want to change the manner in which it restarts, edit the `/opt/cariden/etc/sysconfig/wae-web-server.cfg` file. The following are the most frequently used parameters.

Action	Parameter
Change the default HTTP port	http-port=8080
Change the default HTTPS port	https-port=8443
Enable (true) or disable (false) the automatic redirect from HTTP to HTTPS	http-redirect=true
Enable (true) or disable (false) the automatic upgrade of the Collector server database. For information on database upgrades, see the <a href="#">Collector Server Upgrades</a> chapter.	autoupgrade=true

**Note**

---

Ports 1 through 1023 are privilege ports and cannot be used without root access.

---





## Online Installation

- Step 1** Log in to the server as root or a user with administrative capabilities.
- Step 2** Go to the directory where you downloaded the software, and execute the installer as root using a bash command. The software package is, itself, the installer executable that automates the installation process.
- ```
sudo bash <package>.bin
```

| Installer Options                                                                   | Description                                                                                                     |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <code>sudo bash wae-k9-&lt;version&gt;.bin</code>                                   | Be prompted through the installation process.                                                                   |
| <code>sudo bash wae-k9-&lt;version&gt;.bin -d &lt;installation_directory&gt;</code> | Specify a different installation directory. You are prompted through the remainder of the installation process. |
| <code>sudo bash wae-k9-&lt;version&gt;.bin -h</code>                                | Shows a usage statement for the installer                                                                       |
| <code>sudo bash wae-k9-&lt;version&gt;.bin -y</code>                                | Automatically respond “yes” to all questions without being prompted.                                            |

The process verifies the integrity of the installation using checksums. If a checksum fails, error messages appear and the installation process is terminated.

Depending on what the installation process finds, it might prompt you throughout the process to continue or not.

- Step 3** The process prompts you for an installation directory. The default is `/opt/cariden`. If this is an upgrade, the recommendation is that you maintain the same installation directory as in the previous release. If this is a new installation, the recommendation is to keep this default.
- If the directory you entered does not exist, you are prompted as to whether to create it. If you answer, “yes,” an installation directory with root privileges is created.
- Step 4** The process prompts you for a WAE username.
- The default is “cariden” only if that username exists; its existing password remains intact. Otherwise, the default WAE username is “wae.” The default password for the wae username is “ciscowae.”

The recommendation is that you keep whichever default you receive. Also, consider that if you have previously installed the WAE Live datastore (mld), you cannot restart mld unless you start it with the same username used to install it.

**Step 5** The process prompts for whether to migrate (copy) the Collector server files from the previous release to the new one. This question is only applicable if you upgrading and if you are using a different installation directory than in the last release. For more details, see the [Collector Server Upgrades](#) chapter.

**Step 6** The process prompts for whether you want to start Automation services. The default is "No." Unless you have the appropriate license, this service is of no use, but will still uses memory and disk space. The recommendation is that you keep the default unless you have the necessary license. Following is a list of services started.

```
wae-appenginecore
wae-core
wae-db
wae-designapiserver
wae-messaging
wae-osc
```

**Step 7** Once the installation process stops, log out of the device or VM.

**Step 8** Log back in using the WAE username.



**Note**

If you chose to migrate the Collector server files during the installation process, then verify those files have been copied before stopping the web server. (See the [Collector Server Upgrades](#) chapter.) This is particularly important when installing or upgrading the WAE Live datastore, which requires that you first stop the web server.





## Offline Installation

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When installing online, the installer connects to the Internet and downloads missing packages. If the device or VM onto which you are installing cannot access the Internet, you must manually load these packages onto the device where you are installing the product.

This chapter describes a process that puts the packages where the installer can find them.

### Prerequisites

- You must have Internet access from another device so that you can download the required packages to a memory stick. Then transfer these libraries to the devices or VMs on which you are installing the product. All instructions assume you are doing this, and do not explicitly state as such.
- You must have the packages needed by the WAE software. You can download a CentOS DVD or an .iso file from <http://centos.org>. These instructions are based on you having the “minimal ISO” set of packages.
- Follow the pre-installation steps in the [Before You Start](#) chapter.

### Offline Installation

**Note**

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You must have root permission to perform the following instructions.

---

**Step 1** Create a `/media` directory.

```
mkdir /media
```

**Step 2** Mount either the physical CentOS DVD or the .iso file.

DVD: `mount /dev/cdrom /media`

.iso file: `mount -t iso9660 -o loop <iso_filename.iso> /media`

**Step 3** From the `/media/Packages` directory, execute the following `rpm -i` command to install the following packages. Repeat the command **for each package**.

```
rpm -i libedit-<version>.x86_64.rpm
rpm -i openssh-clients-<version>.x86_64.rpm
rpm -i libxml2-python-<version>.x86_64.rpm
rpm -i deltarpm-<version>.x86_64.rpm
rpm -i python-<version>.x86_64.rpm
rpm -i createrepo-<version>.noarch.rpm
```

```
rpm -i <package_name>.rpm
```

**Example:** `rpm -i libedit-2.11-4.20080712cvs.1.el6.x86_64.rpm`

**Step 4** Create a `localrepo` directory in the root directory.

```
cd /root
mkdir localrepo
```

**Step 5** Copy **all** packages from `/media/Packages` to `/localrepo`.

```
cp /media/Packages/* /root/localrepo
```

**Step 6** If configuring HA, download the following CentOS libraries to `/root/localrepo`. Retrieve these from an EPEL mirror, such as can be found on <https://fedoraproject.org/wiki/EPEL>.

- `ansible-<version>.noarch.rpm`
- `libyaml-<version>.x86_64.rpm`
- `python-crypto-<version>.x86_64.rpm`
- `python-httpplib-<version>.noarch.rpm`
- `python-jinja-<version>.x86_64.rpm`
- `python-keyczar-<version>.noarch.rpm`
- `PyYAML-<version>.x86_64.rpm`
- `sshpas-<version>.x86_64.rpm`

**Step 7** Create a yum local repository.

```
createrepo /root/localrepo
```

**Step 8** Go to the yum configuration directory.

```
cd /etc/yum.repos.d
```

**Step 9** Create a configuration file to define the yum `localrepo` directory.

```
vi /etc/yum.repos.d/local-repo.repo
```

Add these lines.

```
[local-repo]
name=local-repo
baseurl=file:///root/localrepo/
enabled=1
gpgcheck=0
```

- Step 10** Disable all \*.repo files in the /etc/yum.repos.d directory except for the local-repo.repo file you created. This step forces the installer to use only /root/localrepo.
- Open each \*.repo file and change all instances of enabled=1 to enabled=0. To find a list of the files you need to edit, enter the following.
- ```
grep enabled *
```
- Example:**
- ```
vi CentOS-Base.repo
```
- Search on enabled=1
- Change it to enabled=0
- Step 11** Update the repository so that yum knows which repository directory and file to use.
- ```
yum clean all
yum repolist
```
- Step 12** Run the installer by following all instructions in the [Online Installation](#) chapter. This process creates an epel.repo file /etc/yum.repos.d directory and sets enabled=1. This causes the installation to fail since it does not check /root/localrepo thereafter. When prompted whether to continue, select “no” to stop the installation.
- Step 13** Disable the epel.repo file from being used by the installer.
- ```
cd /etc/yum.repos.d
vi epel.repo
```
- Search on enabled=1
- Change each such instance to enabled=0
- Step 14** Rerun the installation by following all instructions in the [Online Installation](#) chapter.





## Post Installation

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- Step 1** Install the license or licenses. WAE Design, WAE Collector, and the web applications combined require one license. The WAE Core modules require that same license and an additional one. For information, see the [License Installation](#) chapter.
- Step 2** If you are administering floating licenses to WAE Design users, configure the FlexNet Publisher license server. For information, see the [WAE Design Floating License Server](#) chapter.
- Step 3** If using WAE Live, either start, upgrade, or install the WAE Live mld server. When starting or upgrading the mld server, you must use the same username as when you installed it. For more information, see the *WAE Live Configuration Guide*.



### Note

If you chose to migrate the Collector server files during the installation process, then verify those files have been copied before stopping the web server. (See the [Collector Server Upgrades](#) chapter.)

- a. If upgrading mld, stop it now.  

```
service wae-mld stop
```
- b. Stop all services, including the web server. For information on services, see the *WAE System Administration Guide*. The format for stopping services is as follows.  

```
service <service_name> stop
```

**Example:** `service wae-web-server stop`
- c. Install, start, or upgrade WAE Live mld server. Note that installing and upgrading the mld server also starts it.
  - Start an existing mld server: `service wae-mld start`
  - Upgrade an existing mld server and start it: `mld -action upgrade`
  - Install and start mld server: `mld -action install -size [DSML]`
- d. Start or restart the web server and another services that are needed.  

```
service <service_name> start
```

**Example:** `service wae-web-server start`

- Step 4** The `wae-web-server`, `wae-ni`, and System (`wae-svcs-*`) services are automatically started. Others may have been started, depending on how you responded when prompted during the installation process. If needed, start other services now. For information, see the *WAE System Administration Guide*.
- Step 5** The licensed features you have determines what needs to be configured. See the [Configurations](#) section for a list of these and pointers where to go for information.

## Configurations

The features that are in the licenses govern which of the following configurations are required after having installed the product.



### Note

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For WAE Design, no further configurations are required.

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- Configure system-wide parameters for clients using the local web UI—Navigate to the System->User Management page to change your credentials and set up users. See the [Log in to Web UI](#) section and the *WAE System Administration Guide* for more information.
  - Configure users and their roles.
  - If applicable, configure access to an LDAP server and mappings between LDAP groups and WAE roles.
  - Configure access to the SMTP server used for emailing WAE Live reports.
- **Best Practice:** Share the login and credential information with users so they know how to access the web UI.
- Configure the WAE platform—For information, see the *WAE Platform Configuration Guide*.
  - Configure WAE Collector to collect network data and traffic. You can configure collection using either the WAE Collector UI or using snapshot configuration files.
  - Configure other WAE platform modules, including the Deployer Module.
  - Configure WAE Network Interface (NI) server and WAE REST API passwords.
- Configure WAE Live—For information, see the *WAE Live Configuration Guide*.
  - Install and configure the datastore—Applicable if using WAE Live Explore and Analytics components.
  - Configure WAE Live to collect the data from WAE Collector—Applicable if using both WAE Live and WAE Collector.
  - Customize WAE Live application for its users
- Customize the WAE Design Archive application for its users—For information, see the *WAE Design Archive User and Administration Guide*.
- Enhance network visualization—Lay out the network topology for the plan file template used in the WAE Live and WAE Design Archive applications. For information, see the *WAE Network Visualization Guide*.

# Log in to Web UI

- 
- Step 1** Ensure all appropriate servers are running and start them if necessary. The `wae-web-server` (web server), `wae-ni` (WAE NI server), and all System services (`wae-svcs-*`) are automatically started by the installer. For detailed information on services, including how to start, stop, restart, and check their status, see the *WAE System Administration Guide*.
- Step 2** Open the web home page in a browser.  
`https://<server_IP>:8443`
- Step 3** Log in to the web server.  
Default administrative credentials  
Username: admin  
Password: cariden  
Default user credentials  
Username: user  
Password: cariden
- Step 4** Navigate to the desired function in the left navigation pane: WAE Collector UI, any web application, System UI, Statistics UI.







## License Installation

A license is required for all features except for sample plan files used in the WAE Design application. If you have questions about obtaining a license, contact your Cisco support representative or system administrator.

There are three methods of installing a license, and the method used depends on the type of license you are installing.

- Stand-alone WAE Design—Use either the WAE Design GUI or the CLI method. Both methods enable you to install dedicated and floating licenses. Floating licenses are only for use by WAE Design.
- WAE Collector and web applications—Use either the web UI or the CLI method.
- WAE Core—Use the CLI method.



### Note

All instructions and examples assume you used `/opt/cariden` as the default installation directory. If you did not, then substitute your installation directory for `/opt/cariden`.

## License Location Restrictions

The CLI gives you the option to store the license file in one of three locations.

- `$HOME/.cariden/etc`
- `/opt/cariden/etc`
- `/opt/cariden/software/mate/<package>/etc`

Both the WAE Design GUI and the web UI put licenses only in `$HOME/.cariden/etc`.

- If installing dedicated licenses for both WAE Core and non-WAE Core, you must install the licenses in the same directory and merge both license files into a single license.
- If installing a dedicated license for WAE Core and a floating license for WAE Design on the same server, you must install the licenses in different directories.
- You cannot install both a WAE Design dedicated and a WAE Design floating license.

# WAE Design Licenses

| Dedicated Licenses                                                                                                                                                                                                                              | Checked Out Floating Licenses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Borrowed Floating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Each license is unique to a specific device.</li> <li>Always available (until expiration).</li> <li>No network connectivity is required.</li> <li>Must be downloaded to an accessible device.</li> </ul> | <p>The FlexNet Publisher license server must be set up (usually by a system administrator). For information on setting up this license server, see the <a href="#">WAE Design Floating License Server</a> chapter.</p> <ul style="list-style-type: none"> <li>A single license is shared amongst users who have permission from the license server.</li> <li>You must have connectivity to the license server.</li> <li>There are a maximum number of licenses, and you cannot check out one if they are all in use.</li> <li>You must either download the floating license to an accessible device, or know the hostname and MAC address of the license server. To connect to a different port, you need to know the license server's port number.</li> <li>Regardless of the method used, you must install the license one time. Thereafter, it is automatically checked out from the server when starting the GUI or any CLI tool. When the GUI is closed or the tool stops, the license is checked in to the license server for use by others.</li> </ul> | <ul style="list-style-type: none"> <li>Users borrow licenses that are stored on the license server for a user-specified number of days. Other users cannot use the borrowed license.</li> <li>You must install the license one time. Thereafter, it is available for borrowing.</li> <li>After borrowing the license file once, it is available until you return it or until the number of days for which it is borrowed expires. If you do not return it, the license expires.</li> <li>Connectivity to the license server is required to borrow a license, but is not required when using a borrowed license. You must also have connectivity if returning a borrowed license prior to its expiration date.</li> <li>You cannot borrow a license if a dedicated license is already installed.</li> </ul> |

## Install License from WAE Design GUI

To use the WAE Design GUI, you need either a dedicated or a floating license. **Regardless of the license type or method of installation, you need only install it one time.** If it is a floating license, thereafter when you start WAE Design, the floating license will be available for checking out or borrowing.

To verify a license and its features, select the File->License Check menu.



### Note

If you have installed a license for use by the WAE Core modules, do not use the overwrite option when installing a WAE Design license.

If you are installing a dedicated license or if you are installing a floating license and you have it downloaded to an accessible device, follow these steps.

**Step 1** From the WAE Design GUI, select the File->Install License menu.

**Step 2** Select the "From license file" option.

- Step 3** Browse to the location or enter the name of the license file (.lic extension), and click Open.
- Step 4** Click OK to confirm the license installation. If there is already a license installed, you are prompted to either merge or replace the existing license. If you are uncertain whether you have a complete set of desired features in the new license, the best practice is to merge the licenses.

If you are installing a floating license from the license server (that is, you do not have the license file), follow these steps.

**Best practice:** If using Windows, it is recommended that you specify the port.

- 
- Step 1** Select the “Specify license file” option.
- Step 2** Enter both the hostname and the MAC address of the license server. The MAC address must be a 12-digit hexadecimal number without any colon ( : ) separators.
- Step 3** If the port is not specified, ports 27000-27009 are scanned to find the license server port and connect to it. Optionally, you can enter the license server’s TCP port number using a range of 1024 to 65535. The default license server port is 27000.
- Step 4** Click OK to confirm the license installation.

## Borrow and Return Floating Licenses

If you have installed a floating license, you can borrow a license from the server for up to 30 days. The license is automatically returned to the license server at 11:59 PM on the last day (based on the local time on the floating license server).

You must have connectivity to the floating license server to borrow a license or to return it prior to the specified date. Connectivity is not required, however, during the period of time for which you are borrowing the license.

## WAE Design GUI

The number of remaining available days for the license is listed directly in the File->License->Borrow menu. To determine the exact date on which the license will expire, use the File->License->Check menu.

To borrow a license, follow these steps.

- 
- Step 1** From the WAE Design GUI, select the File->License->Borrow menu.
- Step 2** Enter the number of days you want to borrow the license (integer from 1 to 30), and click OK.

To return a borrowed license, follow these steps.

- 
- Step 1** From the WAE Design GUI, select the File->License->Borrow menu.
- Step 2** Click OK in the confirmation message.

## CLI

To determine the number of days before the license expires and the exact date on which the license expires, use the `license_check` command.

To borrow a license, use the `license_borrow` command and specify the number of days (integer from 1 to 30).

**Example:** `license_borrow -num-days 23`

To return a license, use the `license_return` command. There are no required or optional options.

## Install License from CLI

You can use the CLI to install licenses for all products.



### Note

If you are installing both a WAE Core and a non-WAE Core license, you must use the default method that merges the licenses. You are given an option on where to put the license. Choose the same location for both licenses.

- For each license you are installing, run the `license_install` tool, passing it the name of the license file (.lic extension). By default, the tool merges the features granted by the new license with those in an existing license.

```
license_install -file <path>/<filename>.lic
```

When prompted, enter the number associated with the directory in which you want to install the license.

By default, when using `license_install -file`, the tool merges the features granted by the new license with those in an existing license. If you are using only non-WAE Core licenses, you can overwrite the existing license using the `-existing-lic overwrite` option. Before executing this option, be certain that the new license contains all the necessary features because previous features will no longer be available. Do not use this overwrite option if installing licenses for both non-WAE Core and WAE Core.

```
license_install -file <path>/<filename>.lic -existing-lic overwrite
```

**Example:** `license_install -file acme/setup/MATEDEDICATED12345678910111213.lic -existing-lic overwrite`

- If you are installing a floating license from the license server (that is, you do not have the license file), use both the `-server-host` and `-server-mac` options. The MAC address must be a 12-digit hexadecimal number without any colon ( : ) separators.

```
license_install -server-host <license_server_hostname> -server-mac  
<license_server_MAC_address>
```

If the `-server-port` option is not specified, ports 27000-27009 are scanned to find the license server port and connect to it. Optionally, you can enter the license server's TCP port number using a range of 1024 to 65535. The default license server port is 27000.

**Example:** `license_install -server-host lic.cisco.com -server-mac 1a2b3c4d5e6f -server-port 27000`

To verify a license and its features, run the `license_check` tool. To see descriptions of the license features, use the `-detail` option (which defaults to `true`).

**Example:** `license_check -detail`

# Install License from Web UI

**Note**

Do not use the web UI for WAE Core licenses or stand-alone WAE Design installations.

- 
- Step 1** Start the web server if it is not running.
- ```
service wae-web-server start
```
- Step 2** Select System->Licenses.
- Step 3** Click Upload Licenses.
- Step 4** Click Select Licenses.
- Browse to the location or enter the name of the license file (.lic extension), and click Open.
  - If there is already a license installed, the default is to overwrite the existing license. To merge the two licenses instead, select the merge option. If you are uncertain whether you have a complete set of desired features in the new license, best practice is to merge the licenses.
  - Click Upload License.
- Step 5** Verify the license installed correctly by locating it on the System->Licenses page.





## WAE Design Floating License Server

The FlexNet Publisher license server must be set up if WAE Design users are to use floating licenses. Using this server, you can control access to the licenses, monitor who has them checked out, and check log activity.

The FlexNet Publisher license server has two interfaces. One is a CLI, which requires that you start an `lmgrd` daemon so all users can access the floating licenses. The other is a web UI, wherein you must install and configure an `lmadmin` tool. Best practice is to use only one or the other interface (CLI or web) to administer the license server.



### Note

For information about FlexNet Publisher and for more details on all FlexNet Publisher CLI commands and GUI, refer to the *FlexNet Publisher License Administration Guide* (`FlexLM_EndUser_LicAdmin.pdf`). This is located in `$CARIDEN_HOME/docs`, which by default is `/opt/cariden/software/mate/current/docs`. This chapter includes some FlexNet Publisher instructions for both the CLI and GUI that could change without Cisco's knowledge.



### Note

All instructions and examples assume you used `/opt/cariden` as the default installation directory. If you did not, then substitute your installation directory for `/opt/cariden`.

## Prerequisites

- You must have the required packages installed. For a list of package dependencies, see the *System Requirements* document posted on [cisco.com](http://cisco.com).
- You must have a WAE Design floating license installed on the same device or VM as the FlexNet Publisher floating license server, which means you must have WAE Design installed. Contact your Cisco representative for this license, and reference the License Installation chapter to install this license.

## Best Practices

- If you are also installing a WAE package that requires servers, then install this first and install it on the same device as the FlexNet Publisher license server. Doing so simplifies administration tasks.
- Update the WAE user's `PATH` variable so you can invoke FlexNet commands without having to specify the full path.

**Example:** Edit ~/.profile.

```
export PATH=$PATH:$CARIDEN_ROOT/software/flexlm/current/bin
export PATH=$PATH:$CARIDEN_ROOT/software/flexlm/current/web
```

## Pre-Installation



### Note

If you are installing the FlexNet Publisher license server **on a different Linux device** than the one on which a WAE server installation resides, follow steps 1-4. Otherwise, skip to step 5. Follow all steps on the device where the FlexNet Publisher license server resides.

**Step 1** Log in to the FlexNet Publisher license server as root or as a user with administrative capabilities.

**Step 2** Create a lowercase, alphanumeric username where the first letter is an alphabetical character.

```
/usr/sbin/useradd <username>
```

**Step 3** Set a password.

```
passwd <username>
```

**Step 4** Create an installation directory that has root privileges. The best practice is to use the default installation directory, which is /opt/cariden.

```
cd ~/
mkdir -p /opt/cariden
```

**Step 5** Change the owner of the installation directory to the newly created user.

```
chown <username> /opt/cariden
```



### Note

Throughout this chapter, bin is /opt/cariden/software/flexlm/current/bin.

**Step 6** Ensure there are no local firewalls blocking the services. This step is beyond the scope of these instructions, though following is an example. For a list of ports used, see the *System Requirements* document.

**Example:** This shows how to disable the iptables firewall as root.

```
service iptables save
service iptables stop
sudo chkconfig iptables off
```

**Step 7** If you already have a license server installed and running, gracefully stop it.

```
bin/lmdown -c <license_file>
Or
bin/lmdown -all
```



If the server is distributing borrowed licenses, use the `-force` option.

```
bin/lmdown -c <license_file> -force
```

Or

```
bin/lmdown -all -force
```

- Step 8** Download the License Server Software package from the [Cisco download site](#). Navigate to the WAE Design License Server Software page. You must download a new license package regardless of whether this is an upgrade or a new installation.



**Note**

To enable borrow licenses:

- You must download the License Server Software Release 2.1 package. From the Cisco download site, navigate to **Routers > Service Provider Infrastructure Software > MATE Design > MATE License Server Software - 2.1**.
- If you have a floating license that was generated prior to May 2015, you must acquire a new floating license.

- Step 9** The WAE Design license file's SERVER statement must be the same hostname as the output from the hostname CLI command.

- a. Determine the hostname.

```
hostname
```

- b. Edit the `/etc/sysconfig/network` file to include the hostname returned in the above step.

```
HOSTNAME=<hostname>
```

- Step 10** Ensure the `/etc/hosts` file on the client devices contains the same hostname as identified in step 4. (Client devices are the devices that will be checking the licenses in and out of the server.)

## Install License Server

- Step 1** Go to the directory where you installed FlexNet Publisher license server package, and execute the installer. The package is, itself, the executable that automates the installation process.

```
chmod 755 ./<License server package>.sh; ./<License server package>.sh
```

**Example:**

```
chmod 755
./MATE_License_Server-2.0rc2-Linux-x86_64.sh; ./MATE_License_Server-2.0rc2-Linux-x86_64.sh
```

- Step 2** If you are going to run the license server web UI, run the `lmadmin` installer from the `/opt/cariden/software/flexlm/current/bin` directory.

Although the default is to install `lmadmin` into `/opt/FNPLicenseServerManager`, the best practice is to install it into `/opt/cariden/software/flexlm/current/web`.

```
chmod 755 ./<lmadmin_package>.bin; ./<lmadmin_package>.bin
```

**Example:** `chmod 755 ./lmadmin-i86_lsb-11_11_1_1.bin; ./lmadmin-i86_lsb-11_11_1_1.bin`

## Configure License Server Ports

To check out or borrow a floating license, client devices must establish two TCP connections to the license server. One connection is to the floating license server daemon. Unless otherwise configured, this daemon listens on the first available port in the range of 27000 and 27009. The other connection is to the Cisco daemon, which the license server randomly selects from the ephemeral range (which often ranges from 49152 to 65535).

If firewall policies block the above ports, you can change the ports by adding the port information to the floating license server's license file. By default, the file contains the following information.

SERVER <hostname> <MAC address>

VENDOR Cisco

Modify the above lines as follows to change the ports that these daemons use.

Port Type	Syntax	Example
Server daemon	SERVER <hostname> <MAC address> <port>	SERVER Centos10 525400232200 5053
Cisco daemon	VENDOR cisco PORT=<port>	VENDOR cisco PORT=27010

## Start License Server



### Note

The following instructions are for using either the CLI or license web server, but not both. The recommended practice is to install and use one or the other.

To start the license server, you must have access to its license file. Note that this is not the same as the WAE license.

Download the floating license server file (.lic extension) to a directory of your choice on the device where the license server will be installed. Best practice is to put it in `/opt/cariden/etc`.

## CLI

To start the license server daemon (lmgrd) and specify the lmgrd log file name and location, enter the following from `/opt/cariden/software/flexlm/current/bin`.

```
./lmgrd -c <license_filename> -l <log_path_filename>.log
```

**Example:** `/lmgrd -c /opt/cariden/etc/MATE_Floating.lic -l /opt/cariden/logs/lmgrd.log`

## Web UI

**Step 1** Create a backup of the Cisco daemon file so that it can be easily restored in case of failure.

```
cp /opt/cariden/software/flexlm/current/bin/cisco
/opt/cariden/software/flexlm/current/bin/cisco.bak
```

**Step 2** Copy the Cisco daemon files to the `flexlm/web` directory.

```
cp /opt/cariden/software/flexlm/current/bin/cisco
/opt/cariden/software/flexlm/web/cisco
```

- Step 3** To start the license server using the web UI, first configure the following parameters from the /opt/cariden/software/flexlm/web directory. For more information, see `lmadmin -help`.
- a. By default, the `lmadmin` server has a user named “admin” with a password of “admin.” If needed, add another user to this `lmadmin` server.
 

```
./lmadmin -useradd <username> - pass <password>
```
  - b. Import the WAE Design license file that was installed.
 

```
./lmadmin -import <path>/<license_filename>
```

**Example:** `lmadmin -import ~/.cariden/etc/MATE_Floating.lic`
  - c. Start the `lmadmin` process with its default settings.
 

```
./lmadmin
```
- Step 4** Start the license server web UI, which by default uses a non-secure port of 8090. By entering the following in a web browser, you are redirected to the secure port.
- ```
http:<server_hostname>:8091
```
- Step 5** Click the Administration link, and log in using the an administrative username and password. Both have a default of “admin.”
- Step 6** Click the Vendor Daemon Configuration tab, click the Administer link, and then click Start.

## Post-Installation

### Log Files

By default, the `lmadmin` logs are in /opt/cariden/software/flexlm/web/logs.

The `lmgrd` log files are located wherever you specified the `<log_path_filename>.log` when starting the `lmgrd daemon` (`lmgrd -l <log_path_filename>.log`).

### Port Verification

To verify the ports, you can use any of several methods, as follows.

- Verify the license server daemon port is running. For example, you can telnet to this port to verify that it is running.

```
telnet <license_server_IP_address> <license_server_daemon_port>
```

**Example:** `telnet 127.0.0.1 27000`

- Verify the license server is listening to the specified port.

**Example:** `netstat -a | egrep '27000[0-9]'`

|     |   |   |                 |                 |             |
|-----|---|---|-----------------|-----------------|-------------|
| tcp | 0 | 0 | *:27000         | *.*             | LISTEN      |
| tcp | 0 | 0 | localhost:48245 | localhost:27000 | ESTABLISHED |
| tcp | 0 | 0 | localhost:27000 | localhost:48245 | ESTABLISHED |

- View the `lmgrd` log file, which indicates on which ports the license server and Cisco daemons are listening.

**Example:**

```
13:00:14 (lmgrd) lmgrd tcp-port 27001
13:00:14 (lmgrd) cisco using TCP-port 42207
```

- For `lmadmin`, go to the admin page.
  - To verify the server daemon's port, select Administration->Server Configuration->License Server Configuration.
  - To verify the Cisco daemon's port, select Administration->Server Configuration->Vendor Daemon Configuration.

## Distribute Information to Clients

Either distribute the same floating .lic file that you installed to all WAE Design users who need it, or give them both the MAC address and hostname for the license server. Having users install licenses via the MAC address and port is the recommended practice since it eases administration.

After end users install the floating license once, the license is automatically validated from the server each time the user opens the WAE Design GUI or runs the CLI tools.

## Set Up Access Control List for Web Server

If you are using the web server to administer licenses, you can set up an access control list. This is optional, but doing so can improve the security of who can access the web server, as well as give you an easily maintainable list of license users. To do this, you need to know the user ID for all users who are checking out licenses from the license server. The user ID is what they use to log in to their operating systems.

---

**Step 1** Create and open a file named `cisco.opt` in `/opt/cariden/software/flexlm/current/bin`.

**Step 2** Create groups to make it easier and faster to configure inclusions and exclusions. You can then use these groups, rather than specifying individual users.

```
GROUP group_name user_name1 user_name2 user_username3..
```

**Example:** The group name is `akdevops`, and each name following it is a user.

```
GROUP akdevops theresa lone loretta byron patrick sharon
```

**Step 3** For each user or group that you want to grant license access, add an `INCLUDEALL` line.

```
INCLUDEALL type {user_name | group_name}
```

**Example:**

```
INCLUDEALL GROUP akdevops
INCLUDEALL USER gbd456
INCLUDEALL USER odd789
```

- Step 4** For each user or group you want to exclude from accessing the license server, add an `EXCLUDEALL USER` line.

```
EXCLUDEALL type {user_name | group_name}
```

**Example:**

```
EXCLUDEALL GROUP region_fea
EXCLUDEALL USER rgu456
EXCLUDEALL USER ilt789
```

- Step 5** Save the file.

## Configure Borrowing Parameters

**Note**

If you have a floating license that was generated prior to May 2015, you must acquire a new one to enable borrow licenses.

- Step 1** Configure the `/opt/cariden/bin/cisco.opt` file to define who is permitted to borrow licenses. Anyone not in an `INCLUDE_BORROW` statement is not permitted to borrow licenses. Thus, it is easier to use groups than user names.

The inclusion format is as follows. You must specify a line item for each feature. For a list of these features, use the `license_check` tool.

```
INCLUDE_BORROW feature type {user_name | group_name}
```

**Example:**

```
INCLUDE_BORROW MD_Layer1 USER ohara
INCLUDE_BORROW MD_SegmentRouting GROUP akdevops
```

- Step 2** You can refine this `INCLUDE_BORROW` list by excluding users. The `EXCLUDE_BORROW` has precedence over the `INCLUDE_BORROW` statements such that if a user or group is identified in both lists, that user or group will be excluded as specified.

```
EXCLUDE_BORROW feature type {user | group_name}
```

**Example:**

```
EXCLUDE_BORROW MD_VPN USER diana
EXCLUDE_BORROW MD_BGP GROUP acme
```

- Step 3** Optional: Specify the number of licenses for a feature that cannot be borrowed. This is useful for ensuring that users who need to check out licenses will have them available.

```
BORROW_LOWWATER feature number
```

**Example:** Save 23 MD\_Sim licenses for use by those who are not borrowing licenses

```
BORROW_LOWWATER MD_Sim 23
```

## Verify Licenses in Use

Use the `lmstat` command to summarize how many licenses are in the original license file and how many are in use.

```
lmstat -a
```

The results show how many licenses are checked out and borrowed. The output contains `*_Users` entries and entries for each feature. The `*_Users` is determined by the users who have access to the license. Each feature lists a set of licenses checked out for that feature.

### Example Output:

```
Users of MD_Users: (Total of 300 licenses issued; Total of 295 licenses in use)
"MD_Users" v5, vendor:cisco
```

Checked-out licenses are only displayed for `*_Users`, whereas borrowed licenses are shown for `*_Users`, as well as for individual features.

The output uses the following format, where `<time>` is the time at which the license was checked out or borrowed. The `<license_handle>` is a unique ID for the license. If a user has the same license checked out twice, for example, each instance has a unique `<license_handle>`.

```
<feature> <version> <vendor>
<username> <user_hostname> <display> (<license>/<port> <license_handle>) <time>
```

### Example Checked-Out License:

```
dusan md1 /dev/pts/0 (v5) (matelic.cisco.com/27000 37337), start Wed 5/20 11:50
```

Licenses that are borrowed are listed with a `(linger: #)` notation, where `#` is the number of seconds for which the license is borrowed.

```
<username> <user_hostname> <display> (<license>/<port> <license_handle>) <time> <linger>
```

### Example Borrowed License:

```
obi obi-mbpr /dev/pts/18 (v5) (matelic.cisco.com/27000 18848), start Fri 5/8 16:26
(linger: 2532780)
```

## Reclaim Unused Licenses

You can reclaim licenses that have been checked out or borrowed. This feature is useful when a license remains idle, such as when an employee is on vacation or accidentally has the license running on two devices.

Reclaiming licenses is only valid through the CLI `lmremove` command.

Use the `lmstat -a` command described in the [Verify Licenses in Use](#) section to identify the required inputs to the `lmremove` command.

## lmstat -a Output for Examples

In the next two sections, examples use the following `lmstat -a` output as their starting point. Compare the results of these examples to this output to see the differences between the two.

```
bin/lmstat -a
"MD_Users" v5, vendor:cisco
obi obi-mbpr /dev/pts/18 (v5) (matelic.cisco.com/27000 18848), start Fri 5/8 16:26
(linger: 2532780)
dusan mdl /dev/pts/0 (v5) (matelic.cisco.com/27000 37337), start Wed 5/20 11:50
dusan mdl /dev/pts/0 (v5) (matelic.cisco.com/27000 42295), start Wed 5/20 11:51
llonned woql077 /dev/tty (v5) (matelic.cisco.com/27000 50668), start Thu 5/14 13:53
(linger: 554760)
```

## Reclaim All Licenses for Specific User

To reclaim all licenses for a specific user, enter this command.

```
bin/lmremove <feature> <user> <user_host> <display>
```

**Example:** This example reclaims all licenses for the user named “dusan.”

```
bin/lmremove MD_Users dusan mdl /dev/pts/0
```

The `lmstat -a` command now shows dusan removed as a user.

```
obi obi-mbpr /dev/pts/18 (v5) (matelic.cisco.com/27000 18848), start Fri 5/8 16:26
(linger: 2532780)
llonned woql077 /dev/tty (v5) (matelic.cisco.com/27000 50668), start Thu 5/14 13:53
(linger: 554760)
```

## Reclaim License for a Specific Feature

To reclaim a license for a specific feature, enter this command.

```
bin/lmremove <feature> <server_host> <port> <license_handle>
```

**Example:** This example reclaims a single license from the user named “dusan.”

```
bin/lmremove MD_Users matelic.cisco.com 27000 37337
```

The `lmstat -a` command now shows the license 37337 removed for the user named dusan, though dusan still has use of license 42295.

```
obi obi-mbpr /dev/pts/18 (v5) (matelic.cisco.com/27000 18848), start Fri 5/8 16:26
(linger: 2532780)
dusan mdl /dev/pts/0 (v5) (matelic.cisco.com/27000 42295), start Wed 5/20 11:51
llonned woql077 /dev/tty (v5) (matelic.cisco.com/27000 50668), start Thu 5/14 13:53
(linger: 554760)
```

