leostream®

Remote Desktop Access Platform

The Leostream® Connection Broker Application

Installation and Network Considerations, Console Administration, and Upgrades

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To submit an enhancement request, email features@leostream.com.
To request product information or inquire about our future directions, email sales@leostream.com.

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Chapter 1: Overview

Installing the Connection Broker

The Leostream® Connection Broker package can be installed on any virtual or physical machine running the latest Red Hat® Enterprise Linux® 8.x operating system and its derivatives such as Rocky Linux and AlmaLinux OS.

⚠ The Connection Broker does not install on CentOS 8 or any other Linux distribution.

The Connection Broker installation process automatically creates a user named `leo` and installs the Connection Broker in the `/var/lib/leo` directory.

⚠ You cannot install the Connection Broker in a different directory.

By default, the `leo` user does not have an assigned password.

If you need to log in as the `leo` user, log in as `root` and assign a password to the `leo` user using the following command.

```
passwd leo
```

If you do not want to setup a password for the `leo` user, you can access the administration menu using the following command:

```
su – leo
```

See the [Leostream Installation Guide](#) for complete instructions on installing the Connection Broker.

Hardware or Virtual Resource Requirements

Build your Linux machine to the specifications required by your selected operating system and apply the latest updates prior to installing Leostream. In addition to the operating system requirements, the Connection Broker requires the following resources.

- 2 vCPUs
- 8.0 GB of RAM
- At least 20 GB of hard drive space
- One NIC, optionally with Internet connectivity

The Connection Broker uses the operating system libraries, such as OpenSSL, whenever possible, with one exception. The Connection Broker application installs and uses Apache Web Server version 2.4.62. Manage updates to the operating system libraries in accordance with your corporate standard guidelines.

The Connection Broker Internal Database

The Connection Broker application includes a PostgreSQL database, which is adequate for proof-of-concept deployments. The internal database is running PostgreSQL version 14.19 and is not accessible from outside of the Connection Broker.

In production, Leostream recommends switching to an external Microsoft SQL Server or PostgreSQL database and creating a Connection Broker cluster for high availability. Leostream supports PostgreSQL version 13 or higher, Azure SQL, and Microsoft SQL Server when connecting to an external database. Leostream supports Microsoft SQL Server versions currently covered by Mainstream Support under the Microsoft Fixed Lifecycle Policy and versions in service under the Microsoft Modern Lifecycle Policy.

Connection Broker Status Checks

You can monitor your Connection Broker using Web queries. See "Using Web Queries to Obtain Connection Broker Status" in the Connection Broker Administrator Guide for a full description of the available queries and how to use them.

⚠️ If a Connection Broker is not responding to queries, check that your authentication servers and external database are healthy, communication from your Connection Broker to these systems is functioning properly, and all Connection Broker services are running. If the problem persists, please contact support@leostream.com prior to rebuilding your Connection Broker, as rebuilding the Connection Broker may destroy the records and logs required to diagnose the issue.

Connections to External Systems

The Connection Broker communicates with a number of external systems, such as:
- Authentication servers, such as Microsoft Active Directory servers
- Virtualization and cloud platforms, such as those provided by VMware or AWS
- Databases

Depending on what third-party systems are present in your environment, the Connection Broker requires outbound access to additional ports. The Connection Broker also requires access to additional ports to perform certain functions, such as checking the power status of a machine inventoried from an Active Directory center or determining if a desktop is ready to accept a remote desktop connection.

The following figure provides a schematic of the ports the Connection Broker uses to communicate with various systems.

For a detailed description of all ingress and egress ports used by the Connection Broker, please contact support@leostream.com.

Leostream – Architecture Diagram
(Connections are initiated in direction of arrows)

Key:
Ports are TCP unless specified as UDP
* Display protocol dependent
** User configurable

LDAP Authentication Server

HPE Moonshot System
Chassis Manager

Nutanix AHV

Microsoft RDS
Leostream Agent

Scale Computing Platform

VMware vSphere and vCenter Server

VergeIO

OpenStack Clouds

RADIUS Server MFA Authentication

SQL Server Azure SQL

PostgreSQL

SNMP Server

Syslog Server

Leostream Connect Thin Clients Web Clients

PCoIP Connection Manager and Security Gateway

PCoIP Clients

Leostream Connection Broker

Leostream Gateway

AWS EC2
Amazon WorkSpaces Core
Microsoft Azure
Windows 365
Google Cloud Platform

KubeVirt

Red Hat Virtualization

Outgoing Email Alerts

Leostream Agent

HP Anyware Agent

PCoIP Remote Workstation Card

IPMI

Remote Desktop

Client Device
Leostream Connect
RDP
DCV
TGX
VNC
Etc.

Leostream Connect (RDP, DCV ,TGX)

Web Browser (HTML5 RDP, VNC, or SSH)

Remote User's Network

1812** UDP
389/636
22
443
8080**
443
1433
1434 – SQL Server, only
5432
162
514 UDP
443
443
443
443
443
514 UDP
443
443
443
623 UDP
8080**
443
443
514 UDP
443
587
6443
443
443
5000
3389, 42966, etc.*
20020 Port for USB
3389, 42966, etc*
3389, etc*
443
443 and 20001 – 23000** or 3389, etc*

Chapter 2: Using the Administration Menu

The Connection Broker Administration Menu provides options for managing your Connection Broker application from the Linux console. Note that you configure your hosted desktop environment using the Connection Broker Administrator Web interface, not the Administration Menu.

Opening the Administration Menu

To access the Connection Broker Administrator Menu, log into the machine running your Connection Broker as the `root` user and issue the following command.

```
su - leo
```

The **Administration Menu**, shown in the following figure, opens.
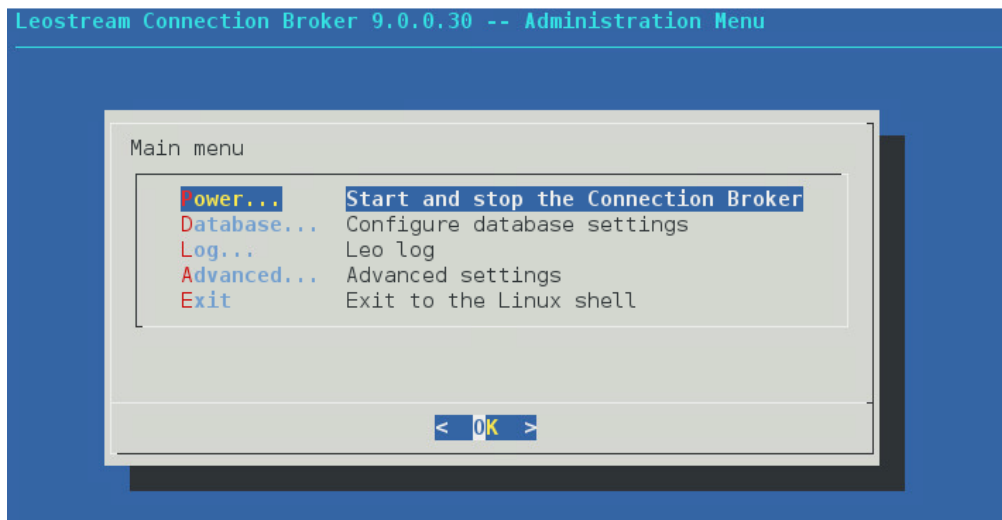
Main Menu Options

The following table describes the options available in the **Main menu**.

Menu Name	Description	Purpose
Power	Start and stop the Connection Broker	Opens the **Power menu**, which contains options for starting, stopping, or restarting the Connection Broker as a whole, or individual components
Database	Configure database settings	Opens the **Database menu**, which contains options for purging the internal database
Log	Leo log	Opens the **Log menu**, which contains options for viewing or clearing various Connection Broker logs.
Advanced	Advanced settings	Opens the **Advanced settings** menu, which contains options for enabling and disabling SSH and debug mode.
Exit	Exit to the Linux shell	Returns to the Linux shell

In all sub-menus, the **<== Back** option returns you to the parent menu.

Power Options

Selecting **Power** from the **Main menu** opens the **Power menu**, shown in the following figure.
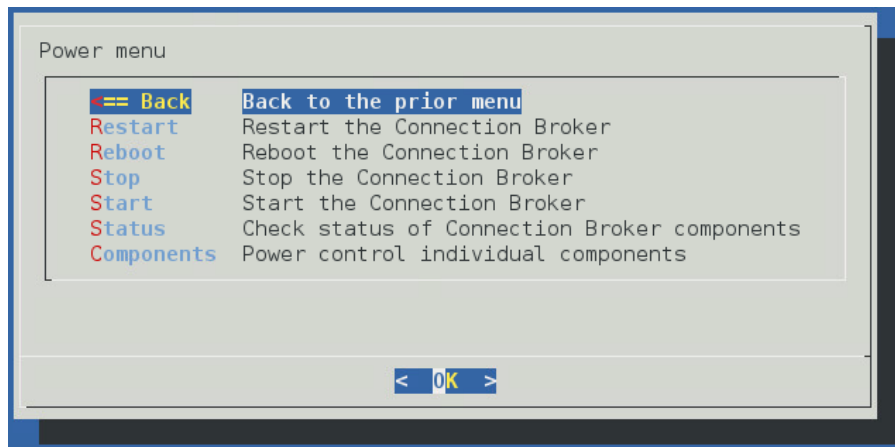
The following table describes the options available in the **Power menu**.

Menu Name	Description	Purpose
Restart	Restart the Connection Broker application	Restarts the Connection Broker application and all its components. When selected, a sub-menu prompts you to confirm or cancel the restart.
Reboot	Reboot the Connection Broker virtual machine	Power cycles the entire Connection Broker virtual machine.
Stop	Stop the Connection Broker	Stops the Connection Broker. When selected, a sub-menu prompts you to confirm or cancel the stop.
Start	Start the Connection Broker	Starts the Connection Broker. When selected, a sub-menu prompts you to confirm or cancel the start.
Status	Check status of Connection Broker components	Displays information about the status of the various Connection Broker components, including the network, internal database, redis, web server, and work queue.
Components	Power control individual components	Start, stop, or restart individual components of the Connection Broker. Opens the **Component power menu** for selecting which components to control. See the following table for a description of available components.

The following table lists the different components that can be restarted.

Component Name	Description
Httpd	Web server
Db	Internal database server
Queue	Work queue

Selecting any of these components opens a submenu with options to **Restart**, **Stop**, or **Start** the component.

Database Options

Selecting **Database** from the **Main menu** opens the **Database menu**, shown in the following figure.

```
Current database:
Internal

Database menu:

    <== Back    Back to the prior menu
    Purge       Purge the internal database




            <   OK   >
```
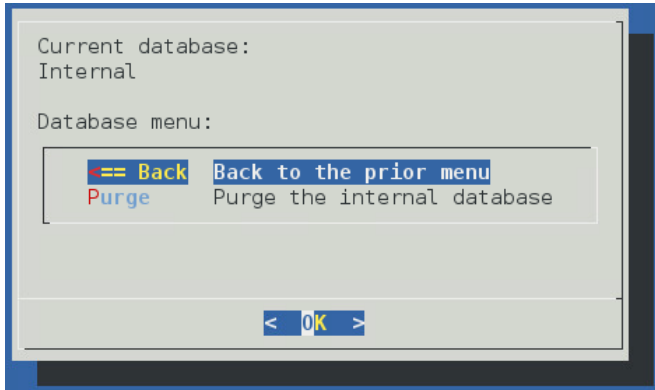
The following table describes the options available in the **Database menu**.

Menu Name	Description	Purpose
Purge	Purge the internal database	Clears all data from the internal database. This option does not apply if your Connection Broker is attached to an external PostgreSQL, Azure SQL, or Microsoft SQL Server database. A sub-menu prompts you to confirm or cancel the purge.
Switch	Switch to internal database	Switches the Connection Broker from storing information in an external database to storing in an internal database. This option does not appear if your Connection Broker is already pointing to an internal database. A sub-menu prompts you to confirm or cancel the switch. Switching back to the internal database does not copy any information from the current external database into the internal database.
Edit	Edit current external database	Updates the information associated with the current external database. Use this option to update the username and password used to connect to the database, or change the database name, database server, or port number. Saving the changes restarts the Connection Broker.

You can also switch between an internal and external database, or update the current database information, using the `switch_database` CLI. See Scripting Database Switches for more information.

Log Options

Selecting **Log** from the **Main menu** opens the **Leo menu**, shown in the following figure.
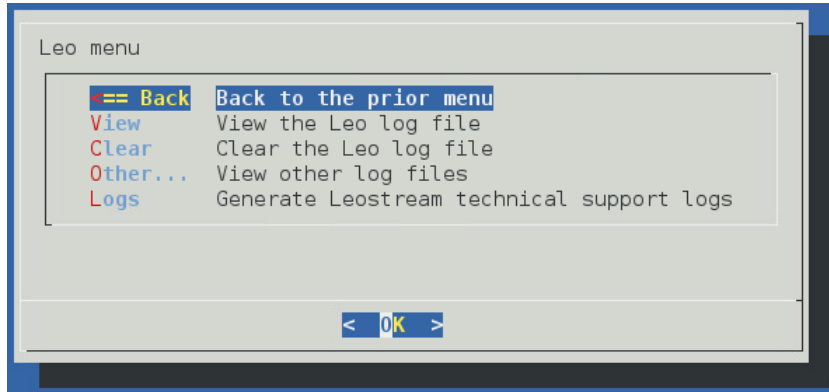
The following table describes the options available in the **Log menu**.

Menu Name	Description	Purpose
View	View the Leo log file	Displays the Leo log file in the console window. Press the space bar to scroll through the log. Press **<Enter>** to close the Leo log file and return to the **Log** menu.
Clear	Clear the Leo log file	Erases all entries in the Leo log file. When selected, a sub-menu prompts you to confirm or cancel the operation.
Other	View other log files	Opens a sub-menu listing other available logs. Select a log from the list to open that log file in the console. Press the space bar to scroll through the log. Press **<Enter>** to close the Leo log file and return to the **Log** menu.
Logs	Generate Leostream technical support logs	Packages the Connection Broker logs into a ZIP-file that can be sent to Leostream Technical Support. To obtain the ZIP-file, SSH into your Connection Broker (using a tool such as WinSCP) and navigate to the `/var/lib/leo` directory.

Advanced Settings

Selecting **Advanced** from the **Main menu** opens the **Advanced settings**, shown in the following figure.

```
+-------------------------------------------------------+
|                                                       |
| Advanced settings                                   | |
| +-------------------------------------------------+ | |
| |   <== Back   Back to the prior menu             | | |
| |   Debug      Disable debugging                  | | |
| |   Upgrade    Disable Connection Broker upgrade  | | |
| |   Admin      Disable "admin" login              | | |
| |   SSL        Uninstall the SSL certificate      | | |
| |   Cipher     Revert to the default SSL cipher suite | |
| |   Httpd      Disable smart card web client authentication | |
| +-------------------------------------------------+ | |
| |                                                 | |
| |                                                 | |
+-------------------------------------------------------+
| |                  <   OK   >                      | |
| -----------------------------------------------------+
+-------------------------------------------------------+
```
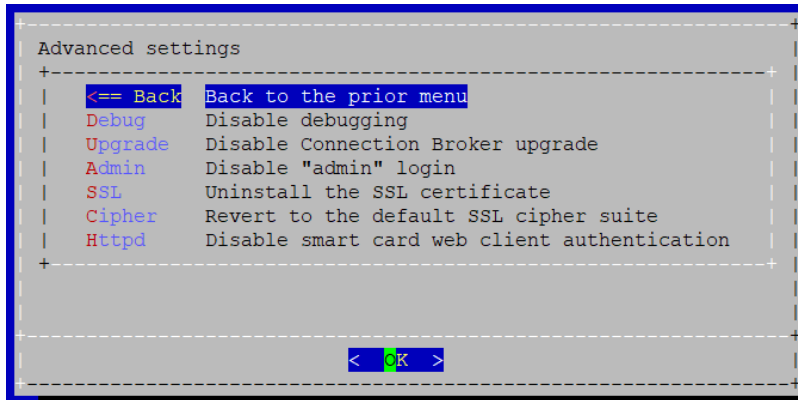
The following table describes the options available in the **Advanced settings menu**.

Menu Name	Description	Purpose
Debug	Enable debugging Disable debugging	Enables or disables debug-mode for your Connection Broker. Debug mode stores additional logs sometimes required by Leostream support.
Upgrade	Disable Connection Broker upgrade Enable Connection Broker upgrade	Toggles the availability of the **Check for updates** option on the **> System > Maintenance** page. Disable Connection Broker upgrades after moving your Connection Broker into production.
Admin	Disable "admin" login	Disables login to the Administrator Web interface for the default local Administrator admin user.
SSL	Uninstall the SSL certificate	Removes the SSL certificate from your Connection Broker, and restarts the Web service. **Note:** Selecting this option immediately removes the certificate without prompting for confirmation. This option appears only after you install an SSL certificate into your Connection Broker.
Cipher	Revert to the default SSL cipher suite	If you modified the **Web server "SSLCipherSUite" directive** on the Connection Broker Administrator Web interface **> System > Settings** page, select this option to revert to the current default SSL cipher suite. Leostream periodically updates the default SSL cipher suite when releasing new versions of the Connection Broker.

Menu Name	Description	Purpose
Httpd	Disable smart card web client authentication	If you enabled client-certificate based authentication by selecting the **Require client certificate-based authentication** option on the Connection Broker **> System > Settings** page, use this option to disable client certification authentication and return to username/password authentication.

Chapter 3: The Connection Broker CLI

The Connection Broker CLI allows you to script setup functionality, such as switching the Connection Broker database. You access the CLI as the `leo` user from within the Connection Broker console. The CLI is located in the `/bin` directory.

The following sections describe the options supported by the `leostream-broker` CLI. You can execute the following command at the Connection Broker machine console to see a list of the options described in the following sections.

```
leostream-broker --help
```

Querying for Connection Broker Information and Health

You can use the `leostream-broker` CLI to query for information about your Connection Broker environment, including if any core functionality is degraded due to the configuration of the underlying machine on which your Connection Broker operates.

The `--info` flag returns information related to the following.
- Your Leostream license, including serial number, installation code, and licensed quantities
- The Connection Broker version
- Your installed SSL certificates
- The current Connection Broker database
- Your DNS servers
- Network routing for your Connection Broker
- Your Connection Broker SRV record (see Setting Up Connection Broker DNS SRV Records)

The `--health` flag checks the configuration of the underlying operating system and hardware or virtual machine configuration, to ensure adequate memory, disk, permissions, etc., are available for proper Connection Broker operation. This option returns information about the following.

- Number of CPUs or vCPUs
- Amount of RAM
- Amount of disk space
- If the `leo` user is able to run `nmap`
- If the `leo` user has `sudoers` permissions
- Job queue lag over the last 14 days
- Firewall information

You can use this information to determine if the machine running your Connection Broker requires additional resources, or to see if any software managing your Linux operating systems removed `sudo` permission for the `leo` user, which the Connection Broker requires for proper operation.

Scripting Database Switches

Use the `switch_database` CLI to switch the Connection Broker between databases, for example, to perform any of the following tasks.

- Switch a Connection Broker configured using its internal database to a new external database for the purpose of creating a cluster

- Connect a new Connection Broker installation to an existing cluster

- Update the current external database parameters, for example, to change the password used to connect to the external database

- Switch a Connection Broker to its internal database, to remove that Connection Broker from a cluster

You can use the following syntax to query the current database information:

```
./switch_database.pl --show_current
```

Use the following syntax to switch a Connection Broker back to its internal database:

```
./switch_database.pl --to_internal [--force]
```

The following example switches the Connection Broker to a new external Microsoft SQL Server database:

```
./switch_database.pl --to_external new --db_vendor mssqlserver --db_name
leodb --db_host sqlserver.myorg.net --port 1433 --username
"sqlserver\administrator" --password <enter_password> --site_id 10
```

The `switch_database.pl` CLI accepts the following options:

`--show_current`: Show the current database information.

`--to_internal [--force]`: Switch to the internal database. Use the `--force` flag to switch to the internal database even if the current external database is unreachable. If the external database is unreachable, the Connection Broker record remains in the external database and continues to appear on the **> System > Cluster Management** page of other Connection Brokers in the cluster.

`--to_external [new|existing|copy_to_existing]`: Switch to an external database

- `new`: Creates the database if an empty database with the specified name does not exist then copies the current Leostream database into the empty database (must be used with a `db_vendor` of `postgres` or `mssqlserver`, only).

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- `existing`: Connect to an existing Leostream database.

- `copy_to_existing`: Copy current Leostream database into an existing, but empty Azure SQL database (must be used with a `db_vendor` of `azuresql`, only).

`--db_vendor [postgres|mssqlserver|azuresql]`: Database vendor name.

- `postgres`: PostgresSQL
- `mssqlserver`: Microsoft SQL Server
- `azuresql`: Azure SQL

`--db_name (string)`: Database name.

`--db_host (string)`: Hostname or IP address of the database server.

`--port (number)`: Database server port number, between 1 and 65535.

`--username (string)`: Username of a user with access to the database.

`--password (string)`: Plain text password of user with access to the database. The password is stored encrypted in the Connection Broker.

`--site_id (number)`: Unique Connection Broker site ID.

`--skip_confirmation`: Flag to skip the confirmation to proceed, in order to run the database upgrade script without human intervention.

`--allow_remote_upgrade`: Flag that allows the remote database schema to be automatically upgraded to a newer version. Without this flag, you cannot switch your Connection Broker to a database associated with an older version of the Connection Broker.

Querying and Setting License Information

You can use the `leostream-broker` CLI to query for your Connection Broker installation code, show current license information, and apply a new Leostream license. This functionality allows you to create scripts that initialize new Connection Broker installations, for example, in environments that use Ansible to rebuild Leostream deployments.

 You access the CLI as the `leo` user from within the Connection Broker console, in the `/bin` directory.

Finding Your Leostream Installation Code

To generate a new Leostream license key for your Leostream environment, you must know the installation code associated with your Connection Broker or Connection Broker cluster. You can use the following command to query for your installation code.

```
leostream-broker --installation_code
```

After you have your installation code and serial number, visit license.leostream.com to generate your Leostream license key.

Querying for License Information

Use the following syntax to view information about your currently installed Leostream license.

```
leostream-broker --show_license
```

The output displays the serial number and installation code associated with your licenses, as well as the expiration date and license limits for users or desktops, depending on the type of license you purchased.
The output also displays information on which features your license enables. To enable additional features, email sales@leostream.com.

Use the following syntax to query for license limits without displaying the list of licensed features.

```
leostream-broker --show_license_summary
```

Applying a New Leostream License

You can programmatically add a license to your Connection Broker either from a file or, if your Connection Broker has internet access, by submitting a request to generate and apply the license.

If you already have your Leostream license, use one of the following two methods to apply it to your Connection Broker.

```
leostream-broker --apply_license –file license_key_file
```

Where *license_key_file* is the full path to the file containing your license key. Alternatively, you can input the license key from STDIN using the following syntax.

```
leostream-broker --apply_license < license_key_file
```

If your Connection Broker has internet access, use the following syntax to submit your serial number and email address to the Leostream license server to generate a license key. The generated key is then locally applied to your Connection Broker.

```
leostream-broker --apply_license –serial_no serial_number –email email_address
```

Automatically Accepting the Leostream EULA

Use the `--accept` flag to indicate acceptance of the Leostream EULA without requiring intervention at the command prompt, for example:

```
leostream-broker --apply_license --accept –file license_key_file
```

If you do not include the `--accept` flag you are prompted to accept the EULA manually, which may cause a problem when writing scripts to apply Leostream licenses.

Requiring Reboots after Applying a License

Certain Leostream features require the Connection Broker be rebooted after the feature is enabled by your Leostream License. If your Leostream license includes any of the following features, you are prompted to reboot your Connection Broker to finalizing applying the new license.

- SAML-based authentication servers
- HP Anyware (formerly Teradici Cloud Access Software)
- PCoIP Remote Workstation Cards

To reboot the Connection Broker without being prompted, add the `--allow_reboot` flag to the command that applies the license, for example.

```
leostream-broker --apply_license –file license_key_file --allow _reboot
```

Working with JavaScript Settings

The Connection Broker allows Administrators to leverage JavaScript in certain text fields that are used to display messages to end users, such as the **> Dashboard > Message Board**. Check with your organization to ensure that the use of JavaScript is allowed by your corporate security policies.

Use one of the following two commands to query for the current state of JavaScript in your Connection Broker.

```
leostream-broker --show_javascript
leostream-broker --show_javascript_status
```

If JavaScript is currently disabled (the default for new Connection Broker installations), use the following command to enable it.

```
leostream-broker --enable_javascript
```

Use the following command to disable JavaScript.

```
leostream-broker --disable_javascript
```

⚠ If you deployed a Connection Broker cluster, ensure you set the JavaScript state on each Connection Broker in your cluster.

Chapter 4: Updating the Connection Broker

Leostream periodically provides updates for the Connection Broker application.

⚠️ Before updating your production environment, test the new Connection Broker version in a proof-of-concept environment.

Procedural Guidelines

Use the following guidelines when preparing for a Connection Broker update.

1. Determine a maintenance window when user activity will be low to update your Connection Brokers.

2. If you are running your Connection Broker on a virtual machine, use the tools provided in your virtualization platform to snap shot all Connection Brokers in the cluster.

   After you prove out your updated environment, you can delete any Connection Broker snapshots to minimize the disk footprint.

3. If you are using an external database, use your standard database backup mechanisms to backup the SQL Server database used by your Connection Broker cluster.

4. If replication is turned on for the SQL Server database, turn database replication off. If you are using a mirrored database, you do not need to disable database mirroring.

   ⚠️ Do not proceed with the upgrade if replication is turned on for the Connection Broker database.

5. Update one of your Connection Brokers as described in the following sections.

   The update process modifies the database schema to support the new Connection Broker version.

6. After the update of the first Connection Broker completes, log into that Connection Broker's Administrator Web interface and perform a spot check to ensure that the updated broker is functioning properly

7. If you have additional Connection Brokers, follow the update procedure for the remaining Connection Brokers in your cluster.

8. After all Connection Brokers are updated, go to the **> System > Job Queue** page. Ensure that all Pending jobs are associated with site IDs assigned to one of the Connection Brokers currently in the cluster.

If any Pending job is assigned to a site ID that is not associated with a Connection Broker currently in the cluster, use the **Settings** link on the **> System > Job Queue** page to delete all work queue jobs associated with that Site ID. The Connection Broker reassigns all Pending jobs to new site IDs.

Updating a Connection Broker

To upgrade your Connection Broker, download the latest RPM file from the Leostream downloads page, found at:

https://license.leostream.com/download.html

Do not uninstall or stop your existing Connection Broker before performing the upgrade.

After downloading the latest RPM from the Leostream downloads page, copy the file to your Connection Broker machine and run the following commands from the console.

```
sudo dnf -y install RPM-FILE-NAME
sudo /sbin/reboot
```

Chapter 5: Creating Production Deployments

To ensure a production-class environment, create systems that ensure the redundancy, resiliency, and scalability of your deployment, including:

- Create a Connection Broker cluster that contains sufficient Connection Brokers to handle user logins in the event that a server hosting one of the Connection Broker fails. For added resiliency, when building the Connection Broker cluster, ensure that you place individual Connection Brokers on different servers.

- Establish a schedule for backing up your Connection Broker database. Implement your site standard database backup procedure, to ensure that your data is protected.

- Create weekly snapshots of each Connection Broker virtual machine. By backing up the entire Connection Broker virtual machine, you do not need a separate backup procedure for the underlying Connection Broker operating system.

- Create monthly clones of each Connection Broker virtual machine. Leostream recommends storing these backups in an off-site location. Test your restore process to ensure that the media can be read, and that procedures are correctly documented.

- Use DNS to configure your Connection Broker IP addresses. Your DNS will round-robin between Connection Brokers during normal operation. For a more resilient environment, use a commercial load balancer distribute login load between Connection Brokers in a cluster.

- Never perform a Connection Broker upgrade, or an upgrade of the operating system, without first taking a snapshot of your existing Connection Broker virtual machine. Also, test upgrades in an isolated deployment, before rolling out to your production environment.