VIRTUAL GPU LICENSE SERVER VERSION 2018.10

DU-07754-001 _v2018.10 Revision 05 | December 2019

User Guide

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Chapter 1.
INTRODUCTION TO THE NVIDIA VGPU SOFTWARE LICENSE SERVER

The NVIDIA vGPU software License Server is used to serve a pool of floating licenses to NVIDIA vGPU software licensed products. The license server is designed to be installed at a location that is accessible from a customer's network, and be configured with licenses obtained from the NVIDIA Licensing Portal.

1.1. Overview of NVIDIA vGPU software Licensing

NVIDIA vGPU software is a licensed product. Licensed vGPU functionalities are activated during guest OS boot by the acquisition of a software license served over the network from an NVIDIA vGPU software license server. The license is returned to the license server when the guest OS shuts down.
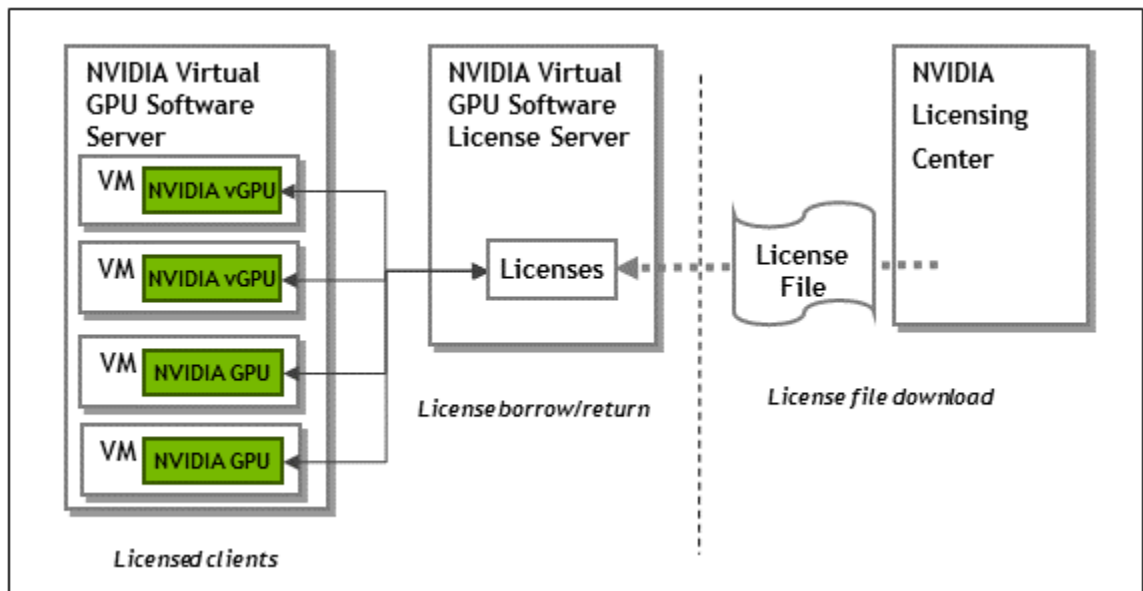
Figure 1   NVIDIA vGPU Software Licensing Architecture

The licenses served by the NVIDIA vGPU software license server are obtained from the NVIDIA Licensing Portal as downloadable license files, and installed into the license server through its management interface.

1.2. NVIDIA vGPU Software License Server High Availability

To provide NVIDIA vGPU software clients with continued access to NVIDIA vGPU software features if a single license server fails, you can configure the license server for high availability. High availability requires two license servers in a *failover* configuration:

▶ A *primary* license server, which is actively serving licenses to NVIDIA vGPU software clients
▶ A *secondary* license server, which acts as a backup for the primary license server

Configuring two servers in a failover configuration increases availability because simultaneous failure of two servers is rare. The primary and secondary license servers work together to ensure that licenses in the enterprise remain continually available to NVIDIA vGPU software clients.

If the primary license server fails, failover occurs and the secondary server can continue to serve licenses for up to the license server maintenance interval, which is three days.

> To ensure that licenses in the enterprise remain continually available after failure of the primary license server, return the primary server to service **within three days** of the failure. Furthermore, the remaining server becomes a single point of failure. Therefore, you should return the failed server to service as quickly as possible to restore high availability support for the license server.

During normal operation, the primary license server periodically updates the secondary server with information about the licenses that are being served to clients. However, when the primary server is returned to service after a failure, it is not updated with information from the secondary server about licenses that were served while the primary server was out of service.

For more information about configuring the license server for high availability, see High Availability Requirements.

1.3. Overview of the NVIDIA vGPU Software Licensing Process

The following table lists the major tasks in the process of licensing NVIDIA vGPU software and provides a cross-reference to instructions for performing each task.

> If you are configuring the license server for high availability, you must perform some tasks for both the primary license server and the secondary license server. For more information, see High Availability Requirements.

Task	Instructions
Get your NVIDIA vGPU software and NVIDIA vGPU software License Server software.	*Virtual GPU Software Quick Start Guide*
Install the NVIDIA vGPU software License Server software.	Installing the NVIDIA vGPU Software License Server
Access the management interface of the license server.	Accessing the License Server Management Interface
Get the MAC address of the license server.	Obtaining the License Server's MAC Address
HA license servers only: Enable failover support.	Enabling Failover Support on the Primary and Secondary License Servers
Register your license server, generate licenses, and download license files.	Managing your License Servers and Getting your License Files
Install a license.	Installing a License
View available licenses.	Viewing Information About Installed Licenses
Reserve and release licenses.	Reserving Licenses
Move a license to a new server.	1. Removing Licensed Products from a License Server 2. Adding Licensed Products to a License Server
Convert a trial license server to a permanent license server.	Converting an Evaluation License Server to a Permanent License Server
Configure licensed NVIDIA vGPU software products for use with license server.	*Virtual GPU Client Licensing User Guide*
Troubleshoot the license server.	Troubleshooting the NVIDIA vGPU Software License Server
Uninstall the license server software.	Uninstalling the NVIDIA vGPU Software License Server

Chapter 2.
INSTALLING THE NVIDIA VGPU SOFTWARE LICENSE SERVER

You can install the NVIDIA vGPU software license server on Windows and Linux systems that meet the license server's platform requirements. If you require high availability for the license server, you must install the license server both on the system that you will use as the primary license server **and** on the system that you will use as the secondary license server.

The license server requires a Java runtime environment and an Apache Tomcat server. Before you install the license server software, ensure that the required software is already installed on each license server host machine that you are using:

▸ On Windows, you need ensure only that the Java runtime environment is installed. The Apache Tomcat server is included in the license server installer for Windows.
▸ On Linux, you must ensure that both the Java runtime environment and the Apache Tomcat server are installed.

Also ensure that you have obtained your NVIDIA vGPU software and NVIDIA vGPU software License Server software. For more information, refer to *Virtual GPU Software Quick Start Guide*.

2.1. Platform Requirements

Before proceeding, ensure that you have a platform suitable for hosting the license server.

2.1.1. Hardware and Software Requirements

▸ The hosting platform may be a physical machine, an on-premises virtual machine (VM), or a VM on a supported cloud service. NVIDIA recommends using a host that is dedicated solely to running the license server.
▸ The recommended minimum configuration is 2 CPU cores and 4 Gbytes of RAM. A high-end configuration of 4 or more CPU cores with 16 Gbytes of RAM is suitable for handling up to 150,000 licensed clients.

▸ At least 1 Gbyte of hard drive space is required.
▸ On Window platforms, .NET Framework 4.5 or later is required.

> 💬 Before proceeding with the installation, refer to *Virtual GPU License Server Release Notes* for details of supported operating systems and known issues.

2.1.2. Platform Configuration Requirements

▸ The platform must have a fixed (unchanging) IP address. The IP address may be assigned dynamically by DHCP or statically configured, but must be constant.
▸ The platform must have at least one unchanging Ethernet MAC address, to be used as a unique identifier when registering the server and generating licenses in the NVIDIA Licensing Portal.
▸ The platform's date and time must be set accurately. NTP is recommended.

2.1.3. Network Ports and Management Interface

The license server requires TCP port 7070 to be open in the platform's firewall, to serve licenses to clients. By default, the installer will automatically open this port.

The license server's management interface is web-based, and uses TCP port 8080. The management interface itself does not implement access control; instead, the installer does not open port 8080 by default, so that the management interface is only available to web browsers running locally on the license server host. Access to the management interface is therefore controlled by limiting remote access (via VNC, RDP, etc.) to the license server platform.

> 💬 If you choose to open port 8080 during license server installation, or at any time afterwards, the license server's management interface is unprotected.

2.1.4. High Availability Requirements

If you plan to configure high availability for the license sever by configuring a primary server and a secondary server, these requirements must be met:

▸ Both servers must run the same version of the NVIDIA vGPU Software License Server software.
▸ The clocks on both servers must be accurate and synchronized. NTP is recommended.
▸ The same license configuration file must be installed on both servers. This file is configured to include the Ethernet MAC addresses of both servers.

If you are configuring the license server for high availability, you must perform the following tasks for both the primary license server and the secondary license server:

▸ Installing the license server:

   ▸ Installing the NVIDIA vGPU Software License Server on Windows
   ▸ Installing the NVIDIA vGPU Software License Server on Linux

▸ Obtaining the License Server's MAC Address
▸ Enabling Failover Support on the Primary and Secondary License Servers
▸ Managing your License Servers and Getting your License Files
▸ Installing a License
▸ Verifying High Availability Setup of the License Server
▸ Reserving Licenses

2.2. Installing the NVIDIA vGPU Software License Server on Windows

The license server requires a Java runtime environment, which must be installed separately before you install the license server.

> 💬 If you require high availability for the license server, you must install the license server both on the system that you will use as the primary license server **and** on the system that you will use as the secondary license server.

2.2.1. Installing the Java Runtime Environment on Windows

If a suitable 32-bit Java runtime environment (JRE) version is not already installed on your system, download a supported 32-bit Oracle Java SE JRE or OpenJDK JRE and install it before running the NVIDIA license server installer.

▸ Oracle Java SE JRE downloads are available from the java.com: Java + You website.
▸ OpenJDK JRE downloads are available from the Community builds using source code from OpenJDK project on GitHub.

If you are installing OpenJDK to migrate from Oracle Java SE JRE, see Migrating an Existing Installation of NVIDIA vGPU Software License Server to OpenJDK on Windows.

> 💬 Install the 32-bit Java runtime, regardless of whether your platform is 32-bit Windows or 64-bit Windows. If a 64-bit Java runtime is already installed, remove it before installing the 32-bit version to ensure that future updates to the Java software can be applied correctly.

Figure 2   Oracle Java SE 32-Bit Runtime Environment Installation on Windows

If you are using OpenJDK and have not yet installed the license server software, you must set `JAVA_HOME` before installing the license server software. For instructions see Setting the JRE and JVM locations for New Installations with OpenJDK.

2.2.2. Setting the JRE and JVM locations for New Installations with OpenJDK

The license server installer obtains the JRE and JVM locations that Apache Tomcat requires from a registry key. This registry key specifies the correct locations for the Oracle Java SE JRE. If you are using OpenJDK, you must update this registry key to specify the correct locations for the OpenJDK JRE before installing the license server software.

1. Open the Windows **Registry Editor** and navigate to `Computer \HKEY_LOCAL_MACHINE\SOFTWARE\WOW6432Node\JavaSoft\Java Runtime Environment`.
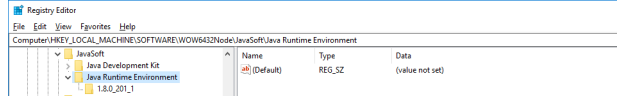
2. Add the registry key for Open JDK JRE version 1.8 and add the `JavaHome` and `RuntimeLib` string values to this key.

   a) If it does not exist already, add the key `1.8` as a subkey of `Java Runtime Environment`.

   b) To the key `1.8`, add new string values named `JavaHome` and `RuntimeLib`, and set their **Data** values as described in the following table.

Name	Data Value
`JavaHome`	The full path to the `jre` folder of your OpenJDK installation, for example, `C:\Program Files (x86)\ojdkbuild\java-1.8.0-openjdk-1.8.0.201-1\jre`. 💬 Ensure that the path does **not** include any trailing characters, such as a slash or a space. If the `JavaHome` string value already exits, edit its **Data** value to remove any trailing characters.
`RuntimeLib`	The full path to the JVM DLL file `jvm.dll` of your OpenJDK installation, for example, `C:\Program Files (x86)\ojdkbuild\java-1.8.0-openjdk-1.8.0.201-1\jre\bin\server\jvm.dll`.
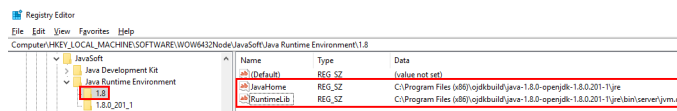
3. To the key `Java Runtime Environment`, add a new string value named `CurrentVersion` and set its **Data** value to `1.8`.
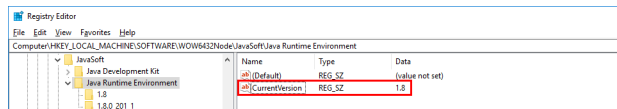
4. From the **View** menu, choose **Refresh** to confirm that the registry keys were added and updated as required.

Install the license server software as explained in the following topics:

▸ Installing the License Server Software on Windows in Graphical Mode
▸ Installing the License Server Software on Windows in Console Mode

2.2.3. Installing the License Server Software on Windows in Graphical Mode

1. Unzip the license server installer and run `setup.exe`.

2. Accept the EULA for the license server software and the Apache Tomcat software used to support the license server's management interface.
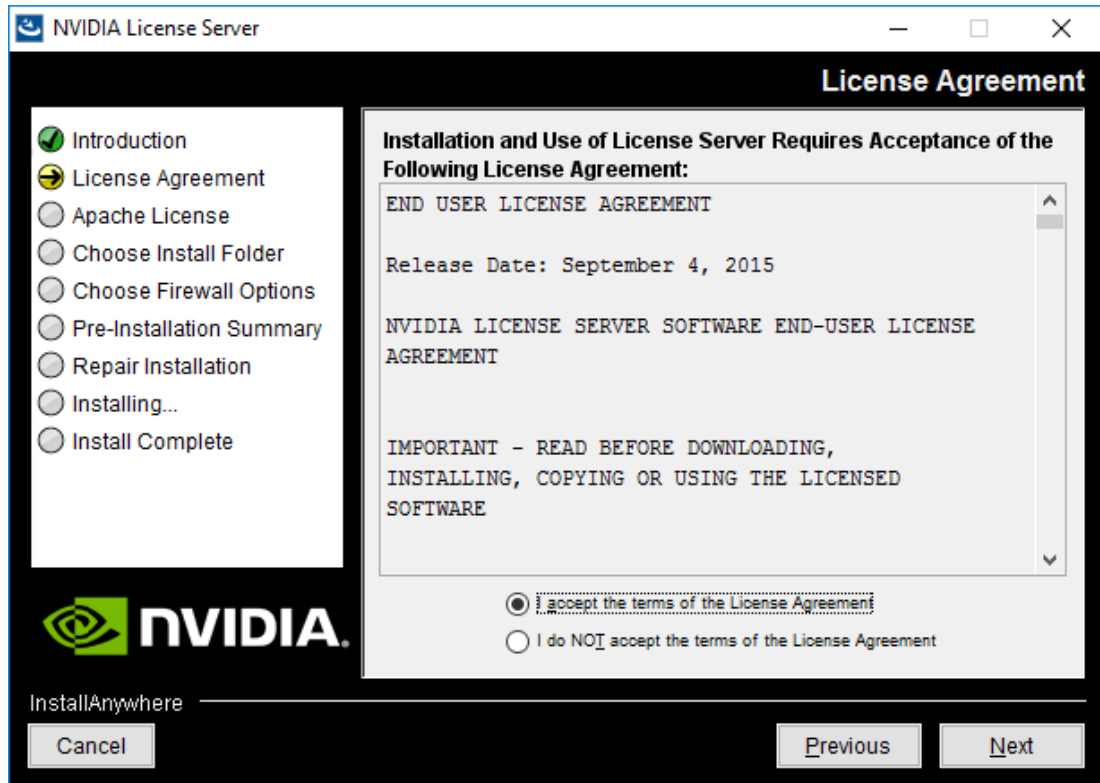
Figure 3   License Agreements on Windows

3. Choose the destination folder where you want the license server software to be installed.
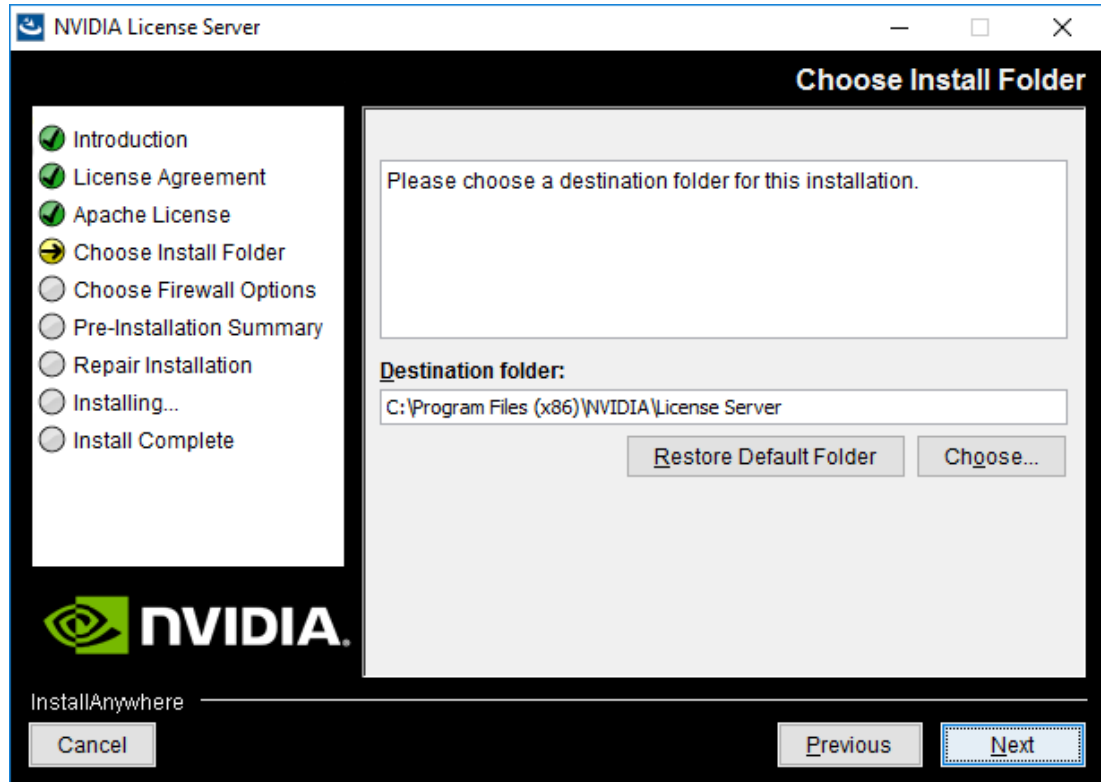
Figure 4 Destination Folder Selection on Windows

4. In the **Choose Firewall Options** dialog box, select the ports to be opened in the firewall.

To enable remote clients to access licenses from the server and prevent remote access to the management interface, use the default setting, which sets ports as follows:

▶   Port 7070 is open to enable remote clients to access licenses from the server.
▶   Port 8080 is closed to ensure that the management interface is available only through a web browser running locally on the license server host.
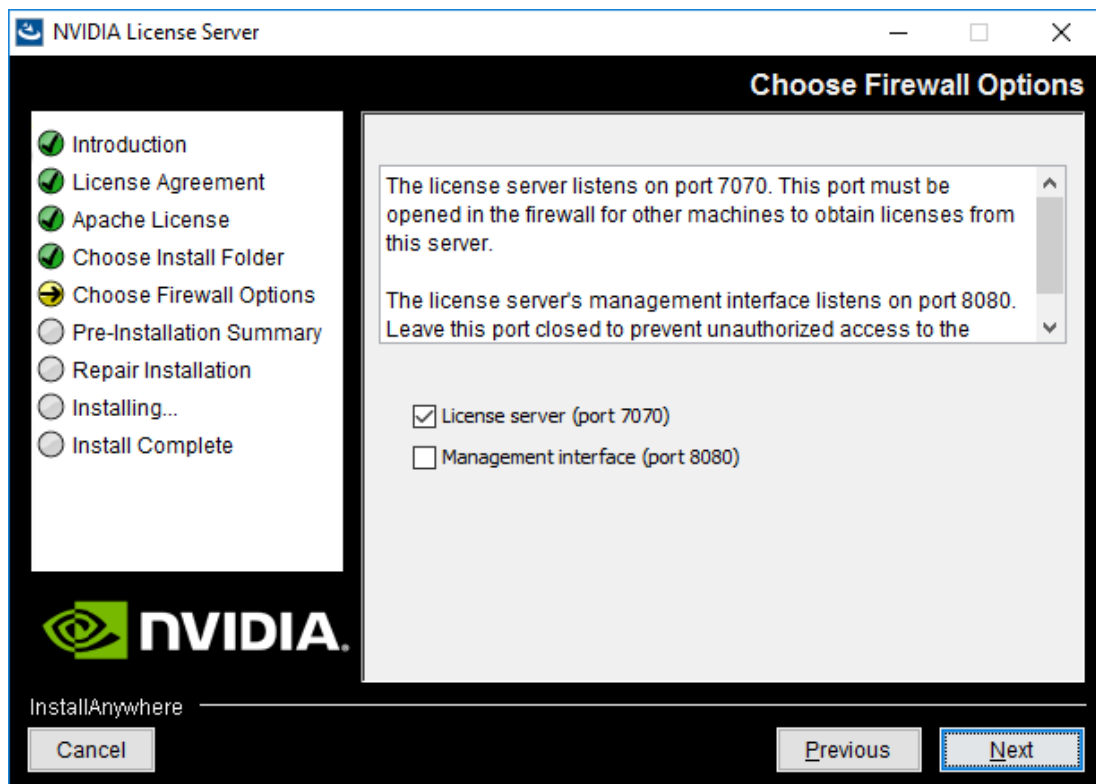
Figure 5   Firewall Settings on Windows

5. After installation has completed successfully, click **Done** to exit the installer.
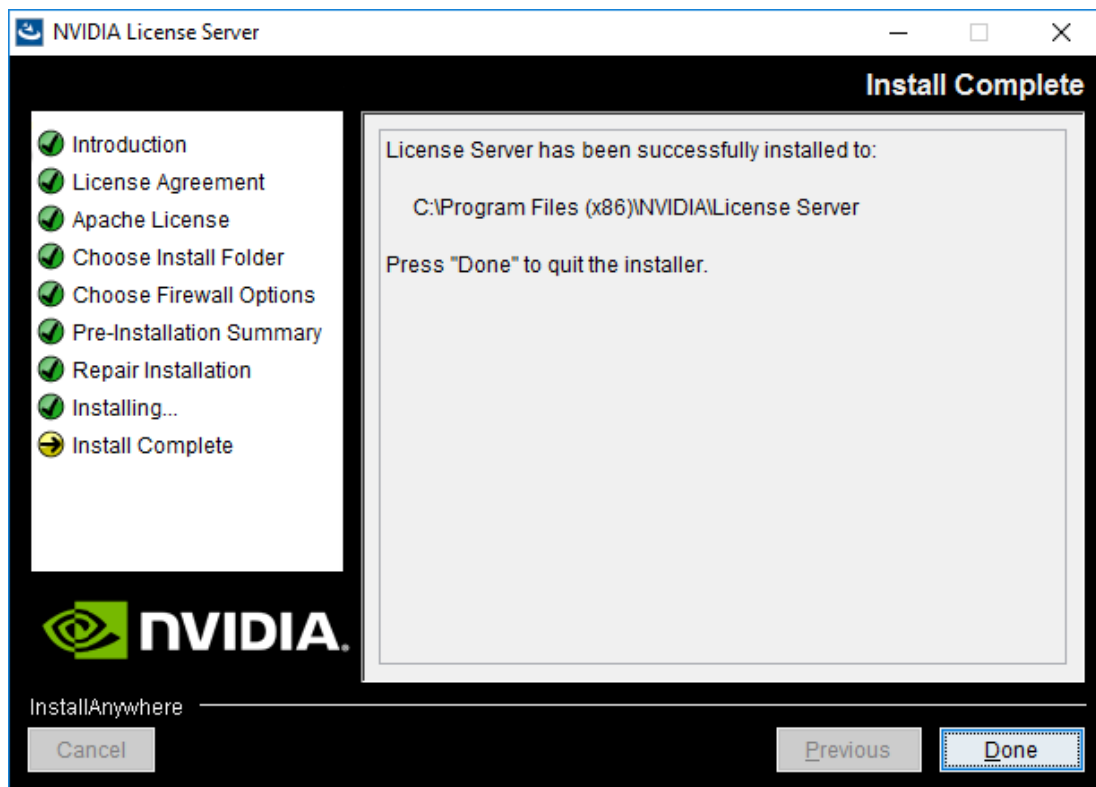
Figure 6   Completed License Server Installation on Windows

After quitting the installer, verify the installation by accessing the License Server management interface as explained in Accessing the License Server Management Interface.

2.2.4. Installing the License Server Software on Windows in Console Mode

> Support for installation in Windows console mode was introduced in license server release 2018.06. It is **not** supported in earlier license server releases. The license server installer for earlier releases must be run in a graphical desktop environment. Installation in silent mode is **not** supported in any release.

1. Extract the contents of the license server zip archive.
2. Run the extracted setup binary.

   ```
   C:\> setup.exe -i console
   ```

   The **Introduction** screen of the **InstallAnywhere** installer is displayed.
3. In the **Introduction** screen, press **Enter** to continue.

4. In the **License Agreement** screen, press **Enter** each time you are prompted to page through the license agreement.
    When you reach the end of the license agreement, you are prompted to accept its terms.

5. Type **y** to accept the terms of the license agreement and proceed with installation.

6. In the **Apache License Agreement** screen, press **Enter** each time you are prompted to page through the license agreement.
    When you reach the end of the license agreement, you are prompted to accept its terms.

7. Type **y** to accept the terms of the license agreement and proceed with installation.

8. In the **Choose Install Folder** screen, specify where you want the license server software to be installed:

    ▸ Press **Enter** to accept the default installation folder.
    ▸ Enter the absolute path to the destination folder where you want the license server software to be installed.

9. In the **Choose Firewall Options** screen box, select the ports to be opened in the firewall.

    The options for selecting ports to be opened in the firewall are presented as follows:

    ```
     ->1- License server (port 7070)
       2- Management interface (port 8080)
    ```

    ▸ Press **Enter** to accept the default setting.
    ▸ Enter a comma-separated list of numbers that represent your choice of ports to be opened.

    To enable remote clients to access licenses from the server and prevent remote access to the management interface, use the default setting, which sets ports as follows:

    ▸ Port 7070 is open to enable remote clients to access licenses from the server.
    ▸ Port 8080 is closed to ensure that the management interface is available only through a web browser running locally on the license server host.

10. In the **Pre-Installation Summary** screen, review your choices and press **Enter** to start the installation.
    After installation has completed successfully, the **Install Complete** screen is displayed.

11. In the **Install Complete** screen, press **Enter** to exit the installer.

After quitting the installer, verify the installation by accessing the license server management interface as explained in Accessing the License Server Management Interface.

2.2.5. Migrating an Existing Installation of NVIDIA vGPU Software License Server to OpenJDK on Windows

If you no longer want to use Oracle Java SE JRE with your existing installation of NVIDIA vGPU software license server, you can replace the Oracle Java SE JRE with the OpenJDK JRE.

1. Use the **Services** application to confirm that the **Apache Tomcat 8.5 Tomcat8** service is running.
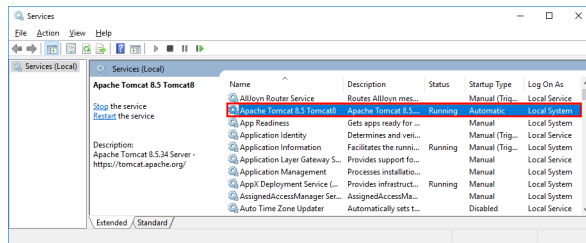
2. Use the **Services** application to confirm that the **FlexNet License Server - nvidia** service is running.
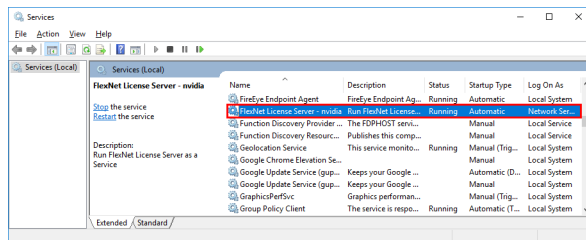
3. In the **Services** application, context-click the **FlexNet License Server - nvidia** service and choose **Stop**.

4. In the **Services** application, context-click the **Apache Tomcat 8.5 Tomcat8** service and choose **Stop**.

5. Uninstall Oracle Java SE JRE.

   a) Open **Windows Control Panel.** and under **Programs**, follow the **Uninstall a program link.**

   b) Context-click the installed Oracle Java SE JRE program, choose **Uninstall**, and if you are prompted to confirm that you want to uninstall the program, click **Yes**.
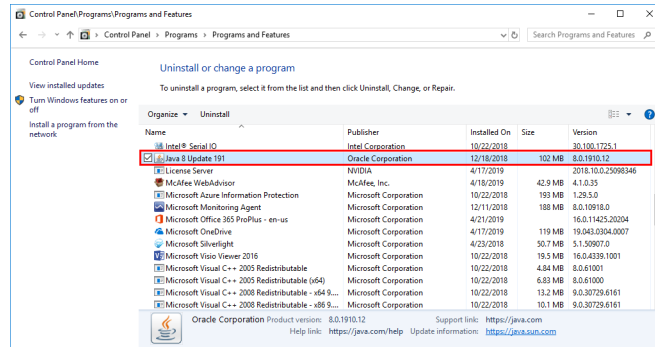
6. Install OpenJDK.

7. Ensure that Apache Tomcat can locate your OpenJDK JRE.

   a) In **Windows File Explorer**, navigate to the `bin` folder of your **Apache Tomcat** installation.

      By default, this folder is `%SystemDrive%:\Program Files (x86)\NVIDIA \License Server\Tomcat\bin`.

   b) Double-click the **Tomcat8w** application in this folder.

   c) In the **Apache Tomcat 8.5 Tomcat8 Properties** window that opens, click the **Java** tab.

   d) Deselect the **Use default** option, set **Java Virtual Machine** to the full path to the JVM DLL file `jvm.dll` of your OpenJDK installation, for example, `C:\Program Files (x86)\ojdkbuild\java-1.8.0-openjdk-1.8.0.201-1\jre\bin \server\jvm.dll`, and click **OK**.
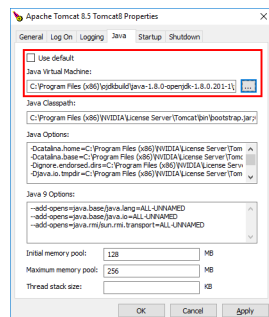
8. In the **Services** application, context-click the **Apache Tomcat 8.5 Tomcat8** service and choose **Start**.

9. In the **Services** application, context-click the **FlexNet License Server - nvidia** service and choose **Start**.

10. Confirm that the license server is working by accessing the license server management interface as explained in Accessing the License Server Management Interface.

2.3. Installing the NVIDIA vGPU Software License Server on Linux

The license server requires a Java runtime environment and an Apache Tomcat server, which must be installed separately before you install the license server software.

> If you require high availability for the license server, you must install the license server both on the system that you will use as the primary license server **and** on the system that you will use as the secondary license server.

2.3.1. Installing the Java Runtime Environment on Linux

If a suitable Java runtime environment (JRE) version is not already installed on your system, you can install OpenJDK from your Linux distribution's package repositories.

If you are installing OpenJDK to migrate from Oracle Java SE JRE, see Migrating an Existing Installation of NVIDIA vGPU Software License Server to OpenJDK on Linux.

> For information about installing Oracle Java SE JRE, see the Java Platform, Standard Edition Documentation in the Oracle Help Center.

1. Determine whether a version of Java is installed on your system.

   ```
   [nvidia@localhost ~]$ java -version
   ```

   If a Java version is installed, the version is shown as follows and no further action is required.

   ```
   java version "1.7.0_51"
   OpenJDK Runtime Environment (rhel-2.4.5.5.el7-x86_64 u51-b31)
   OpenJDK 64-Bit Server VM (build 24.51-b03, mixed mode)
   [nvidia@localhost ~]$
   ```

2. Use your Linux distribution's package manager to install OpenJDK.

   ▶ For distributions based on Red Hat, use the `yum` package manager to install the `java` package.

   ```
   [nvidia@localhost ~]$ sudo yum install java
   ```

   ▶ For distributions based on Debian, use the `apt` package manager to install the `default-jdk` package.

   ```
   [nvidia@localhost ~]$ sudo apt install default-jdk
   ```

2.3.2. Installing and Running the Apache Tomcat Server on Linux

The license server's management interface requires an Apache Tomcat server.

1. Use your Linux distribution's package manager to install the required Apache Tomcat packages.

   ▶ For distributions based on Red Hat, use the `yum` package manager to install the `tomcat` and `tomcat-webapps` packages.

   ```
   [nvidia@localhost ~]$ sudo yum install tomcat tomcat-webapps
   ```

   ▶ For distributions based on Debian, use the `apt` package manager to install the `tomcat`*release* package. For example, for Apache Tomcat 8, run:

   ```
   [nvidia@localhost ~]$ sudo apt install tomcat8
   ```

2. After installing the packages, enable the Tomcat service for automatic startup on boot.

   ▶ For distributions based on Red Hat, enable the `tomcat` service.

   ```
   [nvidia@localhost ~]$ sudo systemctl enable tomcat.service
   ```

   ▶ For distributions based on Debian, enable the `tomcat`*release* service. For example, for Apache Tomcat 8, run:

   ```
   [nvidia@localhost ~]$ sudo systemctl enable tomcat8.service
   ```

3. Start the Tomcat service.

   ▶ For distributions based on Red Hat, start the `tomcat` service.

   ```
   [nvidia@localhost ~]$ sudo systemctl start tomcat.service
   ```

   ▶ For distributions based on Debian, start the `tomcat`*release* service. For example, for Apache Tomcat 8, run:

   ```
   [nvidia@localhost ~]$ sudo systemctl start tomcat8.service
   ```

4. Verify that the Tomcat service is operational by opening the URL `http://localhost:8080` in a web browser.

   The home page of the default Tomcat web application should be displayed, as shown in Figure 7.
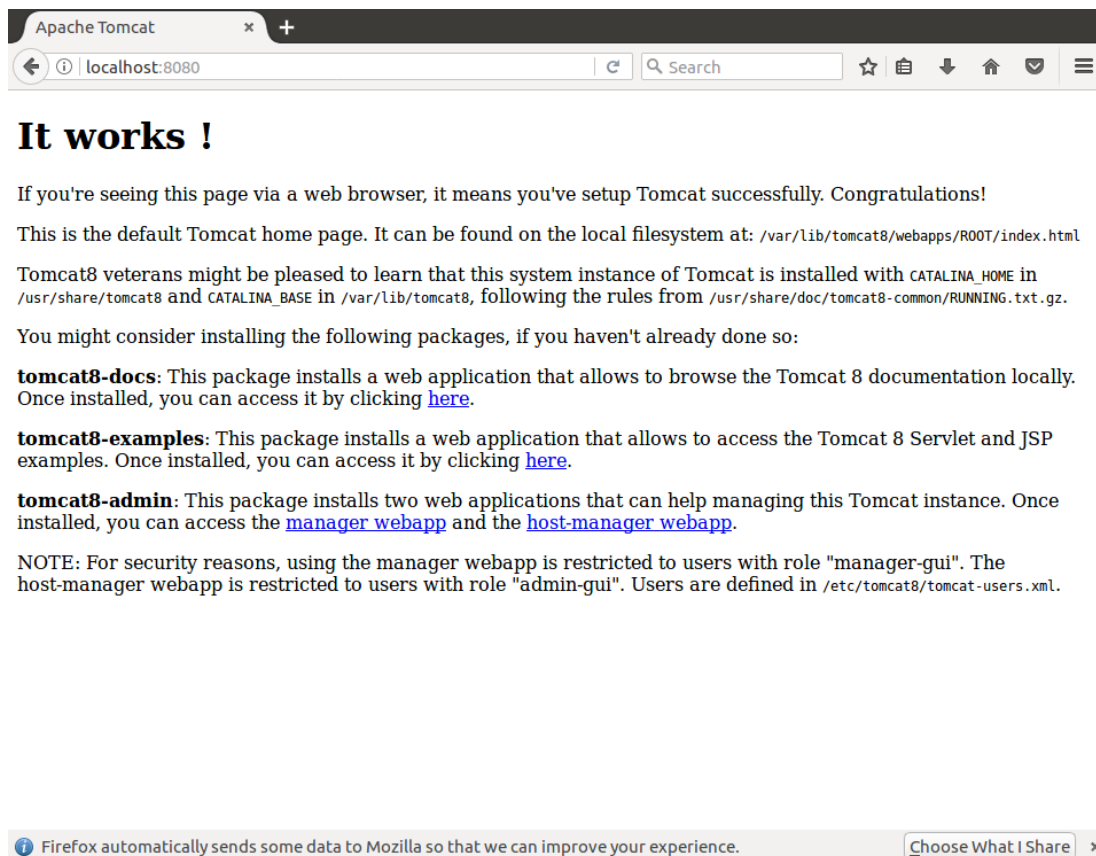
Figure 7 Verifying the Apache Tomcat Installation

> Do not relocate the `webapps` folder, which is where Web applications are deployed on Apache Tomcat Server. If you relocate this folder, the installation of the license server software may fail.

2.3.3. Installing the License Server Software on Linux in Graphical Mode

1. Extract the contents of the license server ZIP archive.

   ```
   [nvidia@localhost ~]$ unzip NVIDIA-ls-linux-2018.10.0.250983466.zip
   ```

2. Add execute permission to the extracted setup binary file.

   ```
   [nvidia@localhost ~]$ chmod +x setup.bin
   ```

3. As root, run the extracted setup binary.

   ```
   [nvidia@localhost ~]$ sudo ./setup.bin
   ```

4. Accept the EULA to proceed with installation.
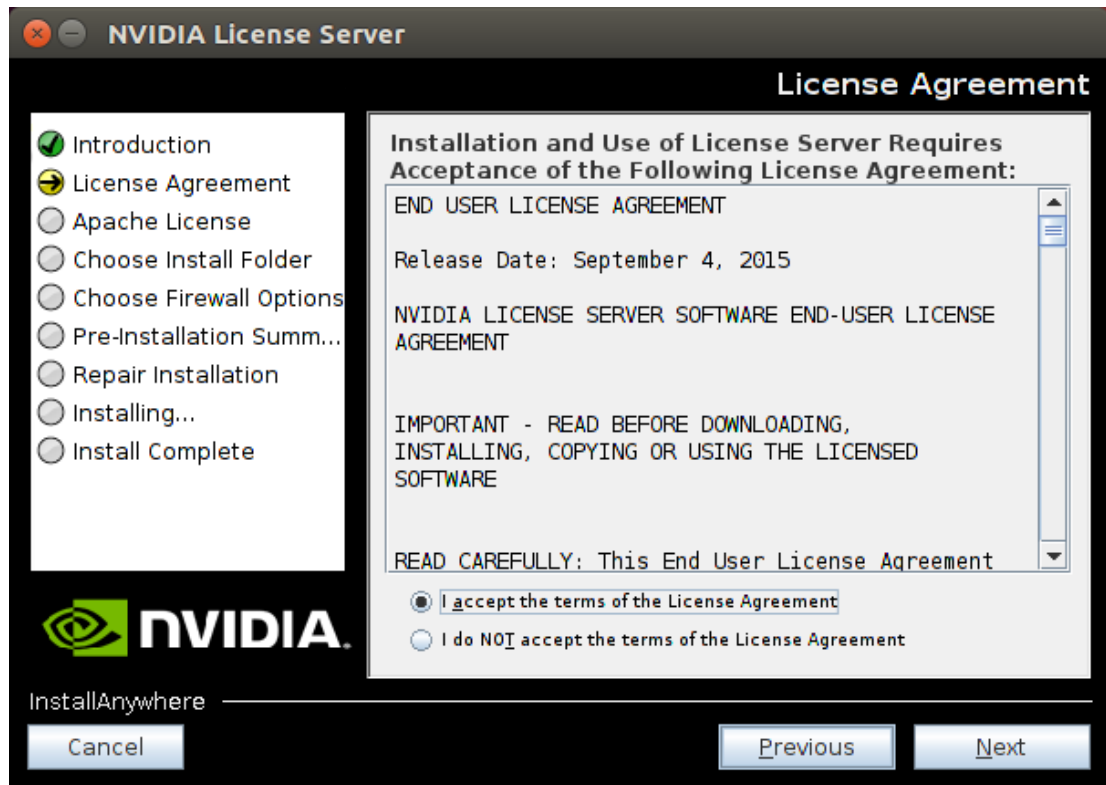
Figure 8   License Agreements on Linux

5. Choose the destination folder where you want the license server software to be installed.
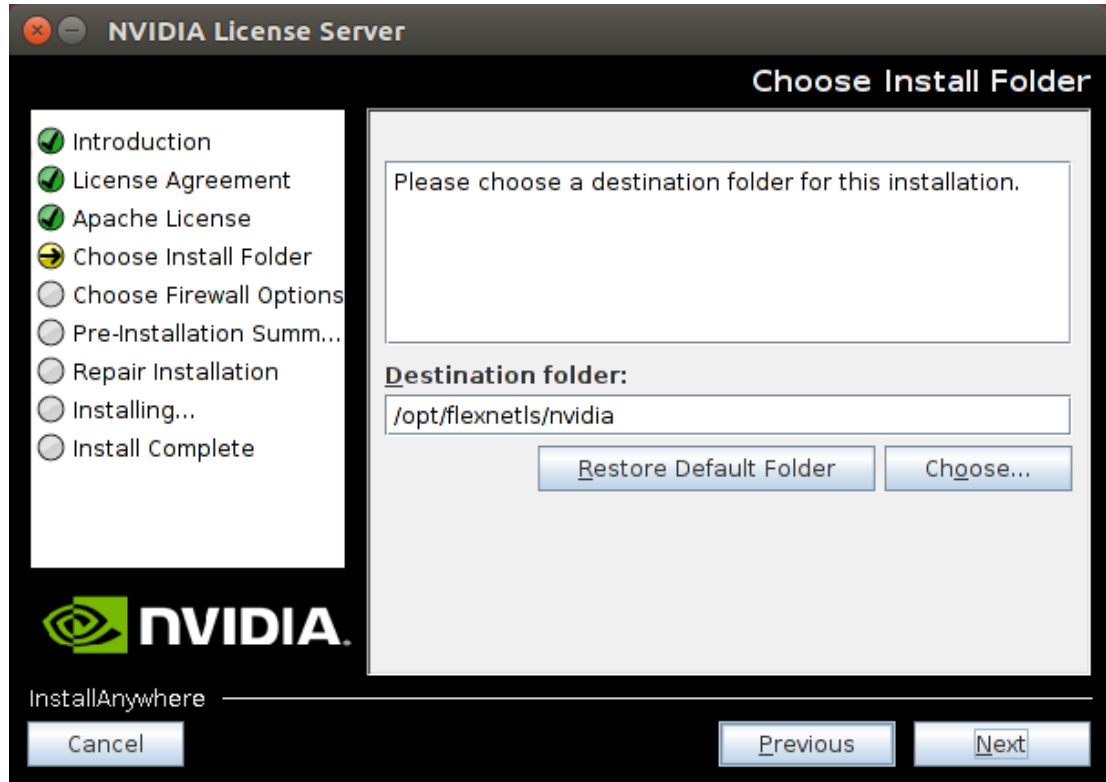
Figure 9   Destination Folder Selection on Linux

6. Specify the path to the folder on the local host that contains the `webapps` folder.

Web applications are deployed on Apache Tomcat Server to the `webapps` folder.

▶ For distributions based on Red Hat, the default path to this folder is `/usr/share/tomcat`.

▶ For distributions based on Debian, the default path to this folder is `/var/lib/tomcat`*release*, for example `/var/lib/tomcat8`, for Apache Tomcat 8.
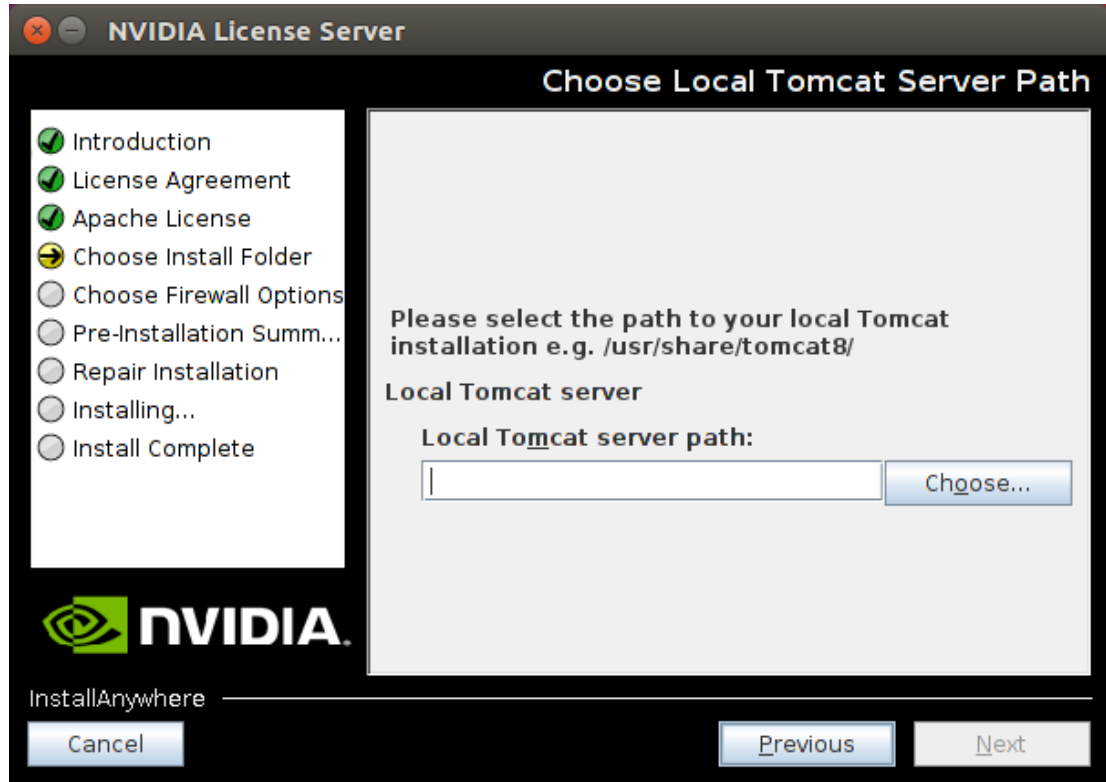
Figure 10   Apache Tomcat Server Path on Linux

7. In the **Choose Firewall Options** dialog box, shown in Figure 11, select the ports to be opened in the firewall.

To enable remote clients to access licenses from the server and prevent remote access to the management interface, use the default setting, which sets ports as follows:

▸ Port 7070 is open to enable remote clients to access licenses from the server.
▸ Port 8080 is closed to ensure that the management interface is available only through a web browser running locally on the license server host.
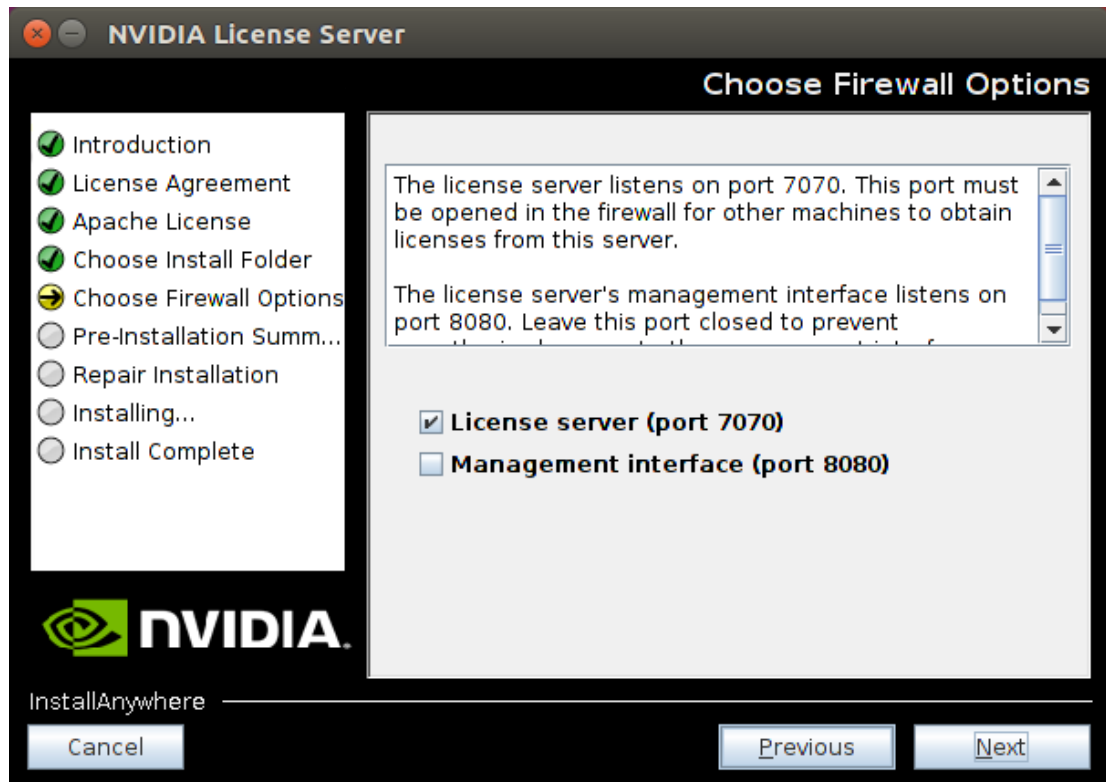
Figure 11 Firewall Settings on Linux

8. After installation has completed successfully, click **Done** to exit the installer.
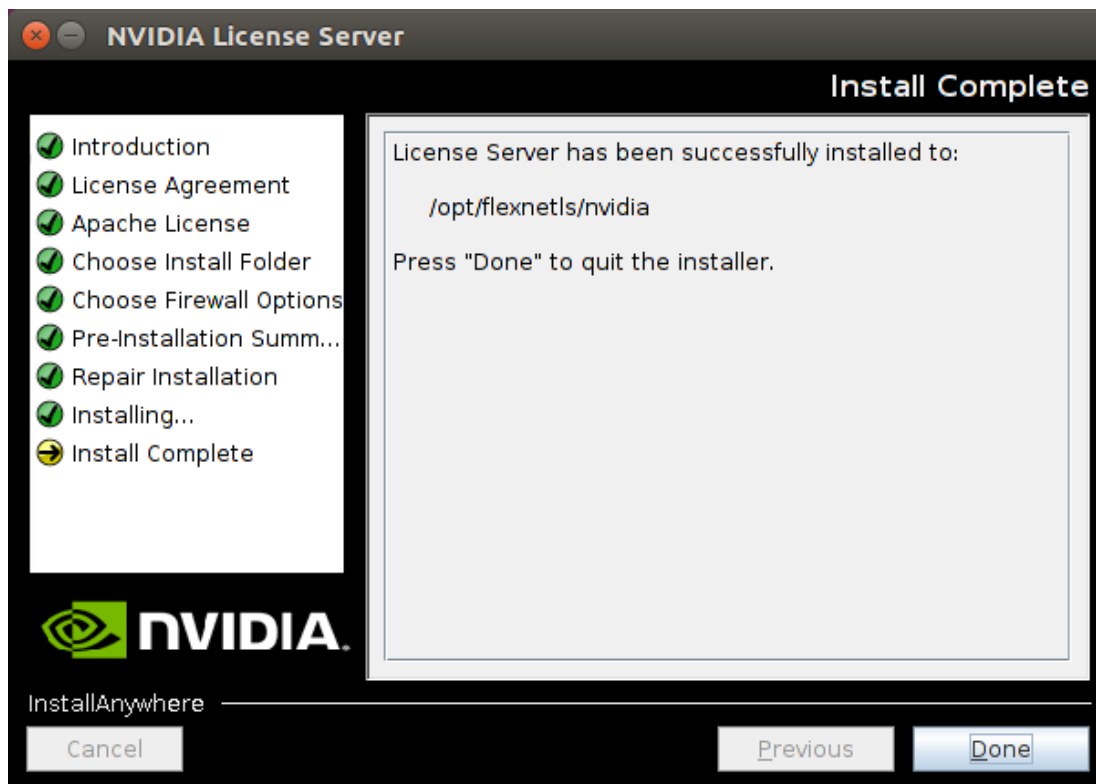
Figure 12 Completed License Server Installation on Linux

After quitting the installer, verify the installation by accessing the license server management interface as explained in Accessing the License Server Management Interface.

2.3.4. Installing the License Server Software on Linux in Console Mode

> Support for installation in Linux console mode was introduced in license server release 2018.06. It is **not** supported in earlier license server releases. The license server installer for earlier releases must be run in a graphical desktop environment. Installation in silent mode is **not** supported in any release.

1. Extract the contents of the license server ZIP archive.

   ```
   [nvidia@localhost ~]$ unzip NVIDIA-ls-linux-2018.10.0.250983466.zip
   ```
2. Add execute permission to the extracted setup binary file.

   ```
   [nvidia@localhost ~]$ chmod +x setup.bin
   ```
3. As root, run the extracted setup binary.

   ```
   [nvidia@localhost ~]$ sudo ./setup.bin -i console
   ```

The **Introduction** screen of the **InstallAnywhere** installer is displayed.

4. In the **Introduction** screen, press **Enter** to continue.

5. In the **License Agreement** screen, press **Enter** each time you are prompted to page through the license agreement.
When you reach the end of the license agreement, you are prompted to accept its terms.

6. Type **y** to accept the terms of the license agreement and proceed with installation.

7. In the **Choose Install Folder** screen, specify where you want the license server software to be installed:

   ▸ Press **Enter** to accept the default installation folder.
   ▸ Enter the absolute path to the destination folder where you want the license server software to be installed.

8. In the **Choose Local Tomcat Server Path** screen, enter the path to the folder on the local host that contains the `webapps` folder.

   Web applications are deployed on Apache Tomcat Server to the `webapps` folder.

   ▸ For distributions based on Red Hat, the default path to this folder is `/usr/share/tomcat`.
   ▸ For distributions based on Debian, the default path to this folder is `/var/lib/tomcat`*release*, for example `/var/lib/tomcat8`, for Apache Tomcat 8.

9. In the **Choose Firewall Options** screen box, select the ports to be opened in the firewall.

   The options for selecting ports to be opened in the firewall are presented as follows:

   ```
   ->1- License server (port 7070)
     2- Management interface (port 8080)
   ```

   ▸ Press **Enter** to accept the default setting.
   ▸ Enter a comma-separated list of numbers that represent your choice of ports to be opened.

   To enable remote clients to access licenses from the server and prevent remote access to the management interface, use the default setting, which sets ports as follows:

   ▸ Port 7070 is open to enable remote clients to access licenses from the server.
   ▸ Port 8080 is closed to ensure that the management interface is available only through a web browser running locally on the license server host.

10. In the **Pre-Installation Summary** screen, review your choices and press **Enter** to start the installation.
After installation has completed successfully, the **Install Complete** screen is displayed.

11. In the **Install Complete** screen, press **Enter** to exit the installer.

After quitting the installer, verify the installation by accessing the license server management interface as explained in Accessing the License Server Management Interface.

2.3.5. Migrating an Existing Installation of NVIDIA vGPU Software License Server to OpenJDK on Linux

If you no longer want to use Oracle Java SE JRE with your existing installation of NVIDIA vGPU software license server, you can replace the Oracle Java SE JRE with the OpenJDK JRE.

1. Check status of the Apache Tomcat service.

   ▸ For distributions based on Red Hat, check the status of the `tomcat` service.

   ```
   [nvidia@localhost ~]$ systemctl status tomcat.service
   ```

   ▸ For distributions based on Debian, check the status of the `tomcatrelease` service. For example, for Apache Tomcat 8, run:

   ```
   [nvidia@localhost ~]$ sudo systemctl status tomcat8.service
   ```

2. Check the status of the NVIDIA vGPU software license server `flexnetls-nvidia` service.

   ```
   [nvidia@localhost ~]$ systemctl status flexnetls-nvidia.service
   ```

3. Stop the NVIDIA vGPU software license server `flexnetls-nvidia` service.

   ```
   [nvidia@localhost ~]$ systemctl stop flexnetls-nvidia.service
   ```

4. Stop the Apache Tomcat service.

   ▸ For distributions based on Red Hat, stop the `tomcat` service.

   ```
   [nvidia@localhost ~]$ sudo systemctl stop tomcat.service
   ```

   ▸ For distributions based on Debian, stop the `tomcatrelease` service. For example, for Apache Tomcat 8, run:

   ```
   [nvidia@localhost ~]$ sudo systemctl stop tomcat8.service
   ```

5. Use your Linux distribution's package manager to install OpenJDK.

   ▸ For distributions based on Red Hat, use the `yum` package manager to install the `java` package.

   ```
   [nvidia@localhost ~]$ sudo yum install java
   ```

   ▸ For distributions based on Debian, use the `apt` package manager to install the `default-jdk` package.

   ```
   [nvidia@localhost ~]$ sudo apt install default-jdk
   ```

6. Optional: Uninstall Oracle Java SE JRE.

   For information about uninstalling Oracle Java SE JRE, see How do I uninstall Java for Linux ? on the java.com: Java + You website.

7. Ensure that Apache Tomcat can locate your OpenJDK JRE.

   a) Get the parent of the `jre` folder for your OpenJDK installation.

   The following example gets the parent of the `jre` folder for an installation of 64-bit OpenJDK 8.

```
[nvidia@localhost ~] update-java-alternatives -l
java-1.8.0-openjdk-amd64      1081      /usr/lib/jvm/java-1.8.0-
openjdk-amd64
```

b) Open the file `/etc/default/tomcat8` in a plain text editor and edit the value of the `JAVA_HOME` environment variable to specify the full path to the `jre` folder of your OpenJDK installation.

The following example sets `JAVA_HOME` for an installation of 64-bit OpenJDK 8.

```
JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64/jre
```

8. Start the Apache Tomcat service.

▸ For distributions based on Red Hat, start the `tomcat` service.

```
[nvidia@localhost ~]$ sudo systemctl start tomcat.service
```

▸ For distributions based on Debian, start the `tomcat`*`release`* service. For example, for Apache Tomcat 8, run:

```
[nvidia@localhost ~]$ sudo systemctl start tomcat8.service
```

9. Start the NVIDIA vGPU software license server `flexnetls-nvidia` service.

```
[nvidia@localhost ~]$ systemctl start flexnetls-nvidia.service
```

10. Confirm that the license server is working by accessing the license server management interface as explained in Accessing the License Server Management Interface.

2.4. Installing and Securing the License Server in the Cloud

To support bring your own license (BYOL) deployments of NVIDIA vGPU software on supported cloud services, you can host the license server on a VM on a supported cloud service.

> If you are using BYOL, you can host the license server on a physical machine or an on-premises VM if you prefer.

The following cloud services support NVIDIA vGPU software running in GPU pass-through mode:

▸ Amazon EC2
▸ Google Cloud Platform
▸ Microsoft Azure

For more information, see NVIDIA Virtual GPU Software Supported Cloud Services.

A license server that is hosted in the cloud is accessed over the public Internet. For increased security, protect the license server and the licenses installed on it as follows:

▸ Use the features of the license server to secure the license server as as explained in Securing the NVIDIA vGPU Software License Server.
▸ Restrict access to the license server by client machines in one of the following ways:

- ▶ Use firewall settings on the license server host or elsewhere to limit the machines that can access the license server.
- ▶ Configure the license server host and the licensed client VMs to operate within a virtual private network.

Chapter 3.
SECURING THE NVIDIA VGPU SOFTWARE LICENSE SERVER

3.1. Controlling Access to the License Server Management Interface

For increased security, you can control access to the license server management interface by allowing access only to authorized users. When access to the license server management interface is controlled, authorized users must authenticate themselves to manage licenses on the license server.

You control access to the license server management interface by using the `nvidialsadmin` command. For general information about the `nvidialsadmin` command that you need to complete this task, see:

▸ Running the nvidialsadmin Utility
▸ Setting the License Server Base URL for the nvidialsadmin Utility
▸ Getting Help for the nvidialsadmin Utility

3.1.1. Enabling Administrative Security for the License Server

When administrative security is enabled for the license server, any user attempting to administer the license server through the command line tool or the license server management interface must provide a set of authorization credentials. By default, administrative security is not enabled on the license server.

> **Caution** To protect sensitive data that is being transmitted during administrative operations, use the HTTPS protocol for communications between the license server and its management interface when administrative security is enabled for the license

server. For more information, see Configuring HTTPS for Connections Between the Management Interface and the License Server.

Perform this task in a command shell on the license server host.

Set the property `security.enabled` to `true`.

```
nvidialsadmin -config -set security.enabled=true

Updated the property:security.enabled with value:true successfully
```

In any subsequent `nvidialsadmin` command, users must provide the required credentials for authenticating with the license server. For more information, see Authenticating with the License Server.

If you no longer require administrative security to be enabled on the license server, set the property `security.enabled` to `false`.

```
nvidialsadmin -authorize admin admin-password -config -set
 security.enabled=false
User authentication succeeded.

Updated the property:security.enabled with value:false successfully
```

After setting the property `security.enabled` to `false`, restart the Apache Tomcat server and the `flexnetls-nvidia` service.

3.1.2. Default License Server Administrative Credentials

When the license server is started, the default administrator account is created and assigned super user role. This account is inactive until administrative security is enabled for the license server. By default, administrative security is **not** enabled for the license server.

When administrative security is enabled for the license server, the default administrator account grants a full range of privileges to administer the license server, including authorization to create and manage other user accounts that have limited administrative privileges or other license server administrator accounts.

The default credentials for the license server administrator account are as follows:

▶ **User name: `admin`**
▶ **Password: `Admin@123`**

For increased security, reset the administrator password immediately after enabling administrative security for the license server. For instructions, see Resetting the Default Administrator Password for the License Server.

3.1.3. License Server Password Requirements

To help you set strong passwords, the license server enforces some requirements on the length and complexity of passwords.

A license server password must be 8-64 characters long, contain no white space, and contain all of the following:

▸ At least one lowercase character
▸ At least one uppercase character
▸ At least one number
▸ At least one special character (for example, `^`, `*`, `$`, `-`, `+`, `?`, `_`, `&`, `=`, `!`, `%`, `{`, `}`, `/`, and `#`)

The password is case sensitive.

3.1.4. Resetting the Default Administrator Password for the License Server

When the license server is started, the default administrator account is created and assigned super user role. For increased security, reset the administrator password immediately after enabling administrative security for the license server.

Perform this task in a command shell on the license server host.

Change the password of the `admin` user.

```
nvidialsadmin -authorize admin Admin@123 -users -edit admin new-password
```

new-password
> Your choice of new password for the default administrator account. The password is case sensitive and must be a strong password that meets the requirements in License Server Password Requirements.

3.1.5. Listing All License Server User Accounts

Perform this task in a command shell on the license server host.

> 💬 For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with only the `-users` option and no other options.

```
nvidialsadmin -users
```

3.1.6. Creating a License Server User Account

Perform this task in a command shell on the license server host.

> 💬 For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with the `-users` and `-create` options.

```
nvidialsadmin -users -create new-username new-user-password[ roles]
```

new-username

Your choice of user name for the user that you are adding.

new-user-password

Your choice of password for authenticating the user that you are adding. The password is case sensitive and must be a strong password that meets the requirements in License Server Password Requirements.

roles

One or more roles that determine operations allowed by the user for managing licenses on the license server:

- ▶ ROLE_READ grants the user privileges to perform read-only operations on the license server, for example, to query features, licenses, license reservations, or license server status. This role is assigned by default.
- ▶ ROLE_RESERVATIONS grants the user privileges to create and manage license reservations.
- ▶ ROLE_ADMIN grants the user administrator privileges to update license server policies (local license server only), create and manage other user accounts, and perform other administrative tasks.

You can assign multiple roles to a user by separating each role with the + sign, for example, **ROLE_READ+ROLE_RESERVATIONS**.

This example adds the user lsmgr with the password 3Nt3rl5vr and the ROLE_ADMIN role.

```
nvidialsadmin -users -create lsmgr 3Nt3rl5vr ROLE_ADMIN
```

3.1.7. Modifying a License Server User Account

You can modify the account of an existing license server user to change the password or the roles for the account.

Perform this task in a command shell on the license server host.

> 💬 For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the nvidialsadmin utility with the -users and -edit options.

```
nvidialsadmin -users -edit username user-password[ new-roles]
```

username

The user name of the user whose account you are modifying.

user-password

The password for authenticating the user whose account you are modifying.

You must specify the password, even if you are not changing it.

▸ To leave the password unchanged, specify the user's existing password.

▸ To change the password, specify a new password. The password is case sensitive and must be a strong password that meets the requirements in License Server Password Requirements.

new-roles

The new roles that determine operations allowed by the user for managing licenses on the license server.

Specify new roles only if you want to change the roles for the account. To leave the user's existing roles unchanged, do not specify any roles in the command.

You can assign multiple roles to a user by separating each role with the + sign, for example, **ROLE_READ+ROLE_RESERVATIONS**.

This example changes role of the user `lsmgr` to the `ROLE_RESERVATIONS` role. Because the user's existing password `3Nt3rl5vr` is specified, the password is not changed.

```
nvidialsadmin -users -edit lsmgr 3Nt3rl5vr ROLE_RESERVATIONS
```

3.1.8. Deleting a License Server User Account

Perform this task in a command shell on the license server host.

> For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with the `-users` and `-delete` options.

```
nvidialsadmin -users -delete username
```

username

The user name for the user whose account you are deleting.

This example deletes the user account `lsmgr` from the license server.

```
nvidialsadmin -users -delete lsmgr
```

3.2. Configuring HTTPS for Connections Between the Management Interface and the License Server

By default, the license server management interface connects to the license server over the HTTP protocol. This connection is for communications between two processes that are running on the same host machine. For increased security, you can specify that the license server management interface connects to the license server over HTTPS.

To configure HTTPS for connections between the management interface and the license server, follow this sequence of instructions:

1. Obtaining an SSL Certificate for the License Server
2. Configuring the License Server with an SSL Certificate
3. Setting the License Server Connection Protocol to HTTPS

You can also specify HTTPS for users' connections from a web browser to the license server management interface. See Specifying HTTPS for Connections from a Web Browser to the License Server Management Interface.

3.2.1. Obtaining an SSL Certificate for the License Server

1. Request an SSL certificate from a certificate authority (CA) in Java keystore format (not a PEM text file) and secured with a password.

   In the certificate, you can choose to identify the license server host through either its host name or its fully qualified domain name. In your certificate signing request (CSR) to the CA, ensure that the Common Name (CN) attribute of the CSR matches how the license server is identified in the certificate. For example, if the license server is identified in the certificate through its fully qualified domain name, set the CN attribute to the fully qualified domain name of the license server.

   If necessary, contact the CA that will provide your certificate for information about how to request a certificate in Java keystore format or convert an existing certificate to this format.

2. Store the SSL certificate in the appropriate directory on the license server host.

   ▸ On Linux, store the SSL certificate in the `/opt/flexnetls/nvidia/` directory.
   ▸ On Windows, store the SSL certificate in the directory that contains the `flexnetls.settings` file.

3. Optional: To prevent the password from being stored in plain text in license server configuration files, obfuscate the password.

```
java -jar flexnetls.jar --password=password
```

password
   The password with which the certificate is secured.

This example obfuscates the password `abracadabra`.

```
java -jar flexnetls.jar --password=abracadabra
abracadabra => OBF:1ri71v1r1v2n1ri71shq1ri71shs1ri71v1r1v2n1ri7
```

3.2.2. Configuring the License Server with an SSL Certificate

Before configuring the license server with an SSL certificate, ensure that the following prerequisites are met:

▸ You have obtained the certificate from a trusted CA.
▸ The license server is **not** blocked by a firewall.

How to configure the license server with an SSL certificate depends on whether the license server is running on a Windows or Linux platform.

3.2.2.1. Configuring the License Server with an SSL Certificate on Windows

1. In the folder where the SSL certificate file is stored, create a license server configuration file in plain text that provides access to the certificate.

   Give the configuration file a meaningful name with the `.cfg` extension, for example, `https-config.cfg`.

   In this file, set the following properties:

   ▸ The name of the SSL certificate file for the license server on the license server host
   ▸ The password with which the certificate is secured
   ▸ The port number for incoming HTTPS requests

   ```
   keystore.path=server-certificate-file-name
   keystore.password=password
   https.port=https-port
   ```

   server-certificate-file-name
   The name of the SSL certificate file for the license server on the license server host. Do **not** include the path to this file.

   password
   The password with which the certificate is secured. If the password is obfuscated, specify the entire obfuscated string, including the `OBF:` prefix, for example, `OBF:1ri71v1r1v2n1ri71shq1ri71shs1ri71v1r1v2n1ri7`.

   > 💬 To protect this password, ensure that the file that contains the password is appropriately secured. Specifically, limit access to the file that contains the password so that it can be read only by the user that the Tomcat process runs as and the administrator user on Windows or the root user on Linux.

   https-port
   The port number for incoming HTTPS requests, for example, 443.

   This example provides access to the SSL certificate file `keystore.jks`, which is protected by an obfuscated password. The port number for incoming HTTPS requests is 443.

   ```
   keystore.path=keystore.jks
   keystore.password=OBF:1ri71v1r1v2n1ri71shq1ri71shs1ri71v1r1v2n1ri7
   https.port=443
   ```

2. In the `flexnetls.settings` file, add the option that specifies the name of the configuration file that you created in the previous step.

   ```
   HTTPS_SERVER_CONFIG=configuration-file-name
   ```

   configuration-file-name
   The name of the configuration file that you created in the previous step. Do **not** include the path to this file.

This example specifies the name of the configuration file `https-config.cfg`.

```
HTTPS_SERVER_CONFIG=https-config.cfg
```

3. Open a **Command Prompt** window and change to the *license-server-installation-folder*\server folder.

license-server-installation-folder
> The folder in which the license server software is installed. The default license server installation folder is `%SystemDrive%:\Program Files (x86)\NVIDIA\License Server`.

For example:

```
C:\>cd C:\Program Files (x86)\NVIDIA\License Server\server
C:\Program Files (x86)\NVIDIA\License Server\server>
```

4. In the **Command Prompt** window, run the commands to update the license server with your configuration changes and start the license server.

   a) Update the license server with your configuration changes.

   ```
   C:\Program Files (x86)\NVIDIA\License Server\server>flexnetls.bat -update
   ```

   b) Start the license server.

   ```
   C:\Program Files (x86)\NVIDIA\License Server\server>flexnetls.bat -start
   ```

3.2.2.2. Configuring the License Server with an SSL Certificate on Linux

1. In the `/opt/flexnetls/nvidia/local-configuration.yaml` file, edit the `https-in` section to set attributes that provide access to the certificate.

   Specifically, set the following attributes:

   ▶ Enable HTTPS
   ▶ The port number for incoming HTTPS requests
   ▶ The name of the SSL certificate file for the license server on the license server host
   ▶ The password with which the certificate is secured

   ```
   https-in:
   # Set to true to enable HTTPS
   enabled: true
   # HTTPS listening port
   port: https-port
   # Path to keystore
   keystore-path: server-certificate-file-name
   # Keystore password. You can obfuscate this with java -jar flexnetls.jar -
   password your-password-here
   keystore-password: password
   ```

   https-port
   > The port number for incoming HTTPS requests, for example, 1443. To avoid the need to run the license server from a privileged account, use a port number greater than or equal to 1024. On Linux systems, access to ports below 1024 is restricted to processes that run with root user privileges.

The default port for HTTPS requests is 443. If you use a different port, you can re-direct incoming HTTPS requests for the default port to the port that you are using.

server-certificate-file-name
The name of the SSL certificate file for the license server on the license server host. Do **not** include the path to this file.

password
The password with which the certificate is secured. If the password is obfuscated, specify the entire obfuscated string, including the `OBF:` prefix, for example, `OBF:1ri71v1r1v2n1ri71shq1ri71shs1ri71v1r1v2n1ri7`.

> 💬 To protect this password, ensure that the file that contains the password is appropriately secured. Specifically, limit access to the file that contains the password so that it can be read only by the user that the Tomcat process runs as and the administrator user on Windows or the root user on Linux.

This example provides access to the SSL certificate file `keystore.jks`, which is protected by an obfuscated password. The port number for incoming HTTPS requests is 1443.

```
https-in:
# Set to true to enable HTTPS
enabled: true
# HTTPS listening port
port: 1443
# Path to keystore
keystore-path: keystore.jks
# Keystore password. You can obfuscate this with java -jar flexnetls.jar -
password your-password-here
keystore-password: OBF:1ri71v1r1v2n1ri71shq1ri71shs1ri71v1r1v2n1ri7
```

2. Restart the license server.

```
[nvidia@localhost ~]$ systemctl restart flexnetls-nvidia
```

3. Optional: If necessary, use the `iptables` command to re-direct incoming HTTPS requests from the local host for the default port to the port that you specified earlier.

Perform this step if you are not using the default port for incoming HTTPS requests (443) and cannot guarantee that all incoming HTTPS requests will specify the port number.

To re-direct incoming HTTPS requests from the local host, use the `OUTPUT` chain.

For example, to re-direct incoming HTTPS requests from the local host for port 443 to 1443, type this command:

```
[nvidia@localhost ~]$ sudo iptables -t nat -A OUTPUT -o lo -p tcp \
--dport 443 -j REDIRECT --to-port 1443
```

3.2.3. Setting the License Server Connection Protocol to HTTPS

1. In the license server management interface, select **Settings**.
The **Settings** page opens.
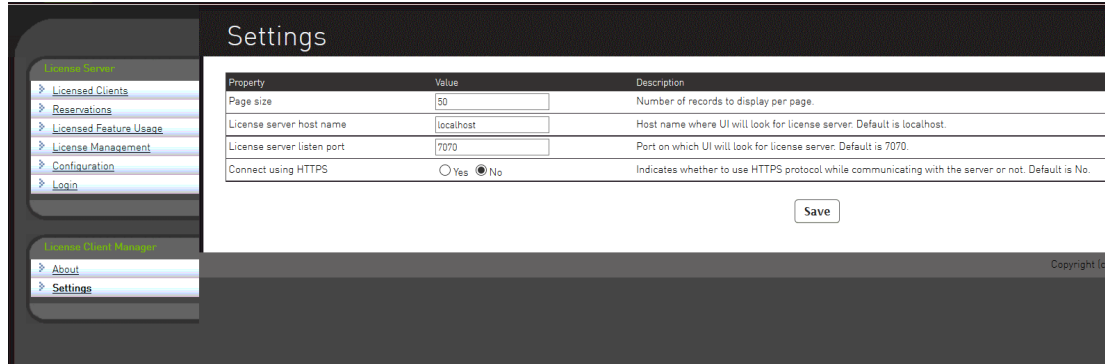
Figure 13 License Server Settings for Setting the Connection Protocol

2. In the **Settings** page, set the properties for connecting to the license server over HTTPS and click **Save**.

a) Set the **License server host name** property to the value of the CN attribute in the certificate signing request for your license server certificate.

For example, if the CN attribute was set to the fully qualified domain name, set **License server host name** to the fully qualified domain name of the license server.

b) Set the **License server listen port** property to the port number for incoming HTTPS requests, for example, 443 or 1443.

The port number is set in the license server configuration files. If necessary, ask the system administrator who configured the license server for the port number.

c) Set the **Connect using HTTPS** property to **Yes**.

The license server management interface will now connect to the license server over HTTPS.

To specify that the license server management interface connects to the license server over HTTP, set the **License server listen port** to the port number for incoming HTTP requests, for example, 7070, set. the **Connect using HTTPS** property to **No**, and click **Save**.

3.3. Specifying HTTPS for Connections from a Web Browser to the License Server Management Interface

By default, users connect from a web browser to the license server management interface over the HTTP protocol. For increased security, particularly if the license server is accessed over the public Internet, you can specify HTTPS for users' connections from a web browser to the license server management interface. Specifying HTTPS for these connections involves configuring an HTTPS connector for the Apache Tomcat server that the license server management interface uses.

1. In the Tomcat configuration file `catalina-base/conf/server.xml`, add a `Connector` element to define an SSL Coyote HTTP/1.1 connector on a specific port, for, example, 8443.

   catalina-base
   > The base directory of the Apache Tomcat instance.

   ```
   <!-- Define a SSL Coyote HTTP/1.1 Connector on the specified port -->
   <Connector
       protocol="org.apache.coyote.http11.Http11NioProtocol"
       port="port"
       maxThreads="200"
       scheme="https"
       secure="true"
       SSLEnabled="true"
       keystoreFile="path-to-server-certificate"
       keystorePass="password"
       clientAuth="false"
       sslProtocol="TLS"
   />
   ```

   port
   > The HTTPS port for users' connections from a web browser to the license server management interface, for example, 8443.
   >
   > Ensure that the port is not already in use by another service. For example, do **not** use the port for accessing the license server SSL certificate as described in Configuring the License Server with an SSL Certificate on Windows and Configuring the License Server with an SSL Certificate on Linux.

   path-to-server-certificate
   > The full path to the certificate file on the license server host.

   password
   > The password with which the certificate is secured. The password must be specified in plain text. You cannot use an obfuscated password.

   > 💬 To protect this password, ensure that the file that contains the password is appropriately secured. Specifically, limit access to the file that contains the password so that it can be read only by the user that the Tomcat process runs as and the administrator user on Windows or the root user on Linux.

   > For additional information about how to obscure the password, see Apache Tomcat Passwords FAQ.

   > For more information, see Edit the Tomcat Configuration File in the *Apache Tomcat SSL/TLS Configuration HOW-TO*.

2. Restart the Apache Tomcat service.

Users now must access the license server management interface from a web browser through HTTPS on the specified port, for example, port 8443.

Chapter 4.
MANAGING LICENSES ON THE NVIDIA VGPU SOFTWARE LICENSE SERVER

Managing licenses on the NVIDIA vGPU software license server involves installing licenses on the license server and controlling and monitoring the usage of installed licenses. You manage the license server in a web browser through the license server management interface.

You can also manage the license server from the command line.

4.1. Accessing the License Server Management Interface

Access the license server management interface to verify that the license server is operating correctly or to manage licenses on the license server.

1. In a web browser, visit the home page for the license server management interface.

    ▸ If the license server host does not permit remote access, open a web browser on the license server host and connect to one of the following URLs, depending on whether the connection protocol is HTTP or HTTPS:

        ▸ HTTP: `http://localhost:8080/licserver`
        ▸ HTTPS: `https://localhost:`*`https-port`*`/licserver`

    ▸ If the license server host's network firewall is configured to permit remote access to the license server, open a web browser on a remote machine and connect to one of the following URLs, depending on whether the connection protocol is HTTP or HTTPS:

        ▸ HTTP: `http://`*`hostname`*`:8080/licserver`
        ▸ HTTPS: `https://`*`hostname`*`:`*`https-port`*`/licserver`

    https-port
    The HTTPS port for users' connections from a web browser to the license server management interface, for example, 8443. This port is specified in the Apache

Tomcat configuration as explained in Specifying HTTPS for Connections from a Web Browser to the License Server Management Interface.

hostname

The fully-qualified domain name or IP address of the license server host.

the **Login** page is displayed.

2. If administrative security is enabled for the license server, log in to the license server.

   a) In the license server management interface, select **Login**.

   b) In the **Login** page that is displayed, enter your user name and password for logging in to the license server and click **Authorize**.
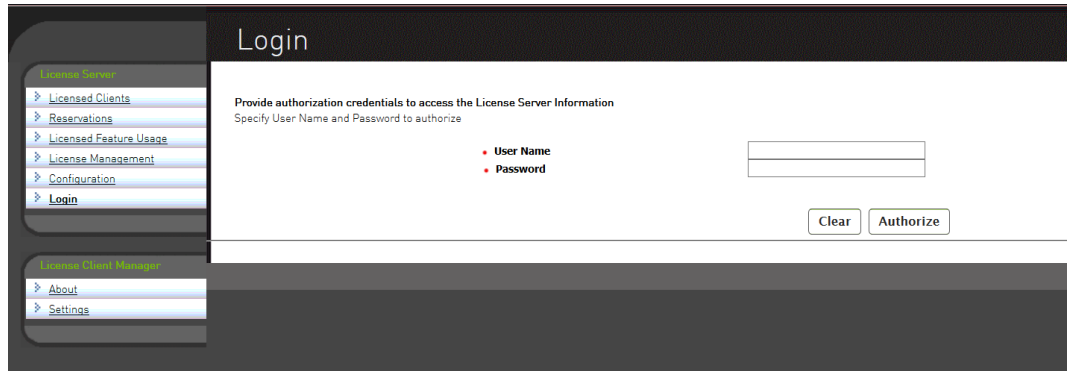
Figure 14   License Server **Login** Page

If administrative security is not enabled for the license server and you try to log in, the license server reports that the login failed. However, you can ignore the login failure and continue to use the license server management interface.

The browser should display the home page for the license server management interface, as shown in Figure 15.
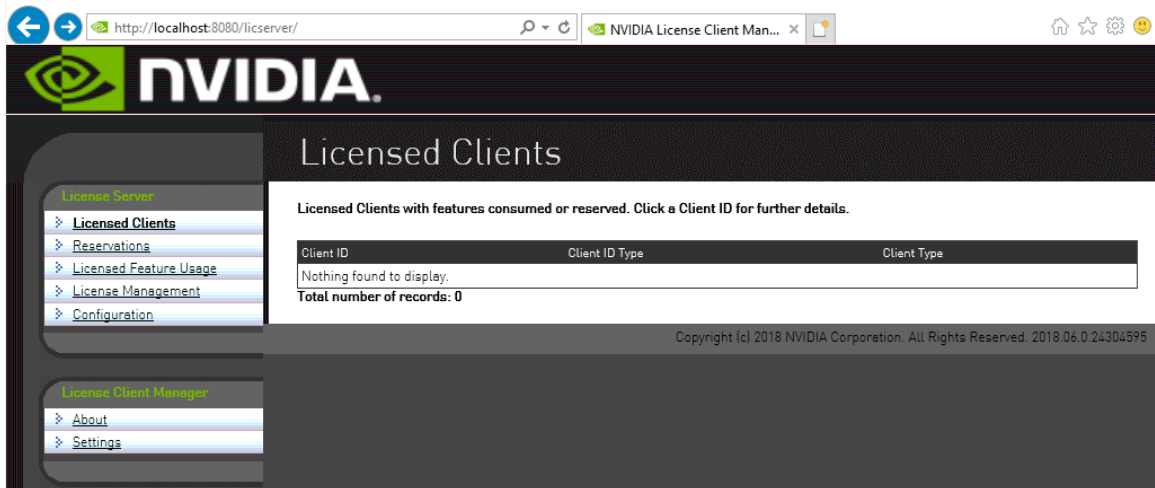
Figure 15   License Server Management Interface

If the management interface is not displayed, consult Management Interface Connection Errors for troubleshooting steps.

4.2. Obtaining the License Server's MAC Address

The license server's Ethernet MAC address uniquely identifies your server to the NVIDIA Licensing Portal. You will need this address to register your license server with the NVIDIA Licensing Portal to generate license files.

> 💬 If you are configuring the license server for high availability, you will need the MAC address of both the primary license server and the secondary license server.

1. In the license server management interface, select **Configuration**.
2. On the **License Server Configuration** page that opens, in the **Server host ID** drop-down list, select the platform's ETHERNET address.
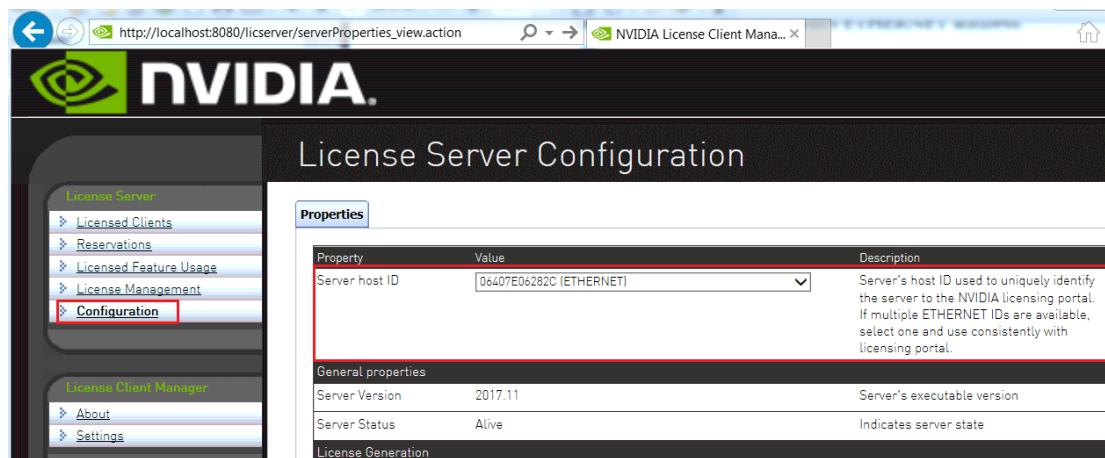
Figure 16 Obtaining the License Server's MAC Address

> 💬 You must use the same ETHERNET ID to consistently identify the server when generating licenses on the NVIDIA Licensing Portal. If your platform has multiple Ethernet interfaces, multiple ETHERNET entries may be displayed in the **Server host ID** drop-down list. To ensure that you use the same ETHERNET ID to consistently to identify the server, select one entry that corresponds to a primary (nonremovable) interface on the platform.

4.3. Enabling Failover Support on the Primary and Secondary License Servers

If you are configuring high availability for the license server, you must enable failover support on both the primary license server **and** on the secondary license server. Set the same options on **both** servers.

1. In the license server management interface, select **Configuration**.
   The **License Server Configuration** page opens.
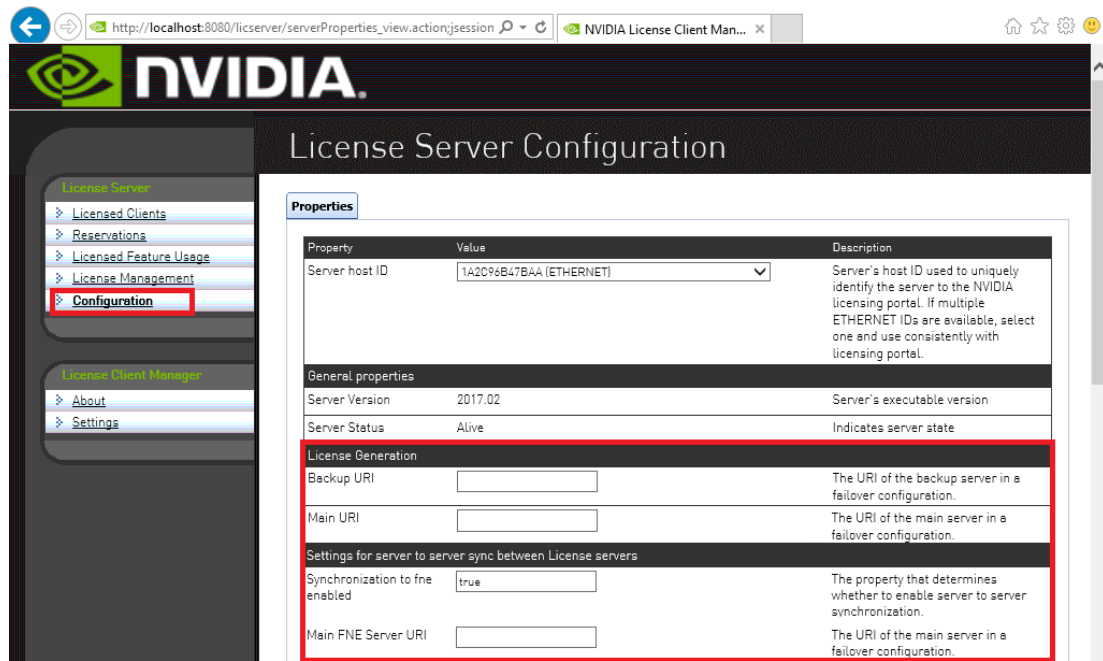
Figure 17 License Server Settings for Enabling Failover Support

2. Under **License Generation**, use the **Backup URI** and **Main URI** fields to set the URI to each server in a failover configuration.

   a) In the **Backup URI** field, enter `http://secondary-server:7070/fne/bin/capability`.

   b) In the **Main URI** field, enter `http://primary-server:7070/fne/bin/capability`.

   secondary-server
      The fully-qualified domain name (for example, `gridlicense2.example.com`) or the IP address (for example, `10.31.20.46`) of the secondary license server.

   primary-server
      The fully-qualified domain name (for example, `gridlicense1.example.com`) or the IP address (for example, `10.31.20.45`) of the primary license server.

3. Set the options under **Settings for server to sync between License servers** as follows:

   a) Set the **Synchronization to fne enabled** option to **true**.

b) In the **Main FNE Server URI** field, enter `http://`*`primary-server`*`:7070/fne/bin/capability`.

    primary-server
        The fully-qualified domain name (for example, `gridlicense1.example.com`) or the IP address (for example, `10.31.20.45`) of the primary license server.

4. Click **Save**.

4.4. Managing your License Servers and Getting your License Files

To be able to download NVIDIA vGPU software licenses, you must create at least one license server on the NVIDIA Licensing Portal and allocate licenses to the server. After creating a license server and allocating licenses to it, you can download your license file.

You can also distribute your licenses across multiple license servers as necessary, add new licensed products to an existing server, delete license servers that you no longer require, and add users to help you administer your license servers.

4.4.1. Creating a License Server on the NVIDIA Licensing Portal

To be able to download NVIDIA vGPU software licenses, you must create at least one license server on the NVIDIA Licensing Portal. Creating a license server on the NVIDIA Licensing Portal registers your license server host with the NVIDIA Licensing Portal through the MAC address of the host.

You can also create multiple servers on the NVIDIA Licensing Portal and distribute your licenses across them as necessary, for example to group licenses functionally or geographically.

1. If you are not already logged in, log in to the NVIDIA Enterprise Application Hub and click **NVIDIA LICENSING PORTAL** to go to the NVIDIA Licensing Portal. If no license servers have been created for your account, the NVIDIA Licensing Portal dashboard displays a message asking if you want to create a license server.
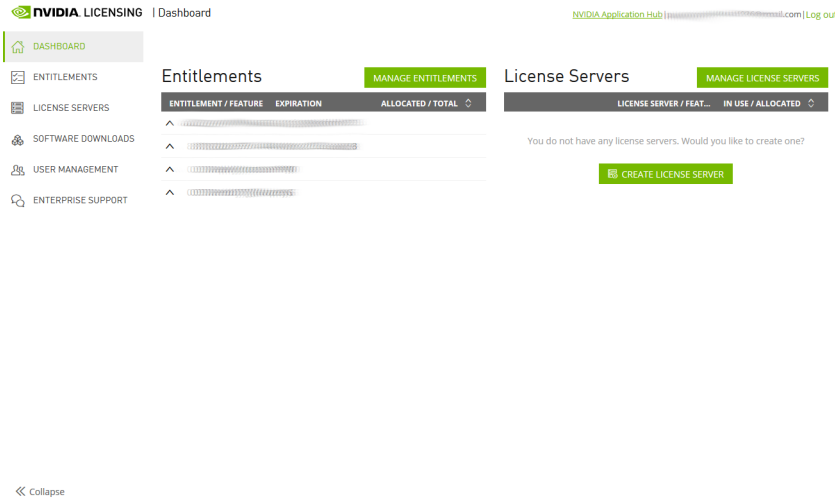
2. On the NVIDIA Licensing Portal dashboard, click **CREATE LICENSE SERVER**.

If you are adding a license server to an account for which a license server has already been created, click the **Add License Server** icon at the bottom right of the page.

The **Create License Server** pop-up window opens.

3. Provide the details of your primary license server.
   a) In the **Server Name** field, enter the host name of the primary license server.
   b) Optional: In the **Description** field, enter a text description of the license server.

      This description will be displayed on the details page for the license server that you are creating.
   c) In the **MAC Address** field, enter the MAC address of your primary license server.

4. Add the licenses that you want to allocate to this license server.
   a) From the **Product** drop-down list, select the product for which you want to add licenses.

   b) In the **Licenses** field, enter the number of licenses for the product that you want to add.

   c) To add licenses for an additional product, click the plus (**+**) icon next to the **Licenses** field and use the **Product** and **Licenses** fields that are added to the window to select the product and enter the number of licenses.

5. Optional: Provide the details of your secondary license server.

   a) In the **Secondary License Server** field, enter the host name of the secondary license server.

     If you have only one license server configured, leave this field unset.

   b) In the **Secondary MAC Address** field, enter the MAC address of your secondary license server.

     If you have only one license server configured, leave this field unset.

6. Click **Create**.

4.4.2. Downloading a License File

Each license server that you create has license file associated with it. The license file contains all the licenses that you allocated to the license server. After downloading the license file, you can install it on the license server host associated with the license server on the NVIDIA Licensing Portal.

1. If you are not already logged in, log in to the NVIDIA Enterprise Application Hub and click **NVIDIA LICENSING PORTAL** to go to the NVIDIA Licensing Portal.

2. In the list of license servers on the NVIDIA Licensing Portal dashboard, select the license server whose associated license file you want to download.

3. In the details page for the license server that opens, review the licenses allocated to the license server.

If necessary, add or remove licenses on the server as explained in Managing Licenses on a License Server.

4. Click **DOWNLOAD LICENSE FILE** and save the `.bin` license file to your license server for installation.

## 4.4.3. Managing Licenses on a License Server

Manage licenses on a license server if you need to add or remove licenses for a specific product on the server.

If you want to remove licensed products from a license server to return all licenses for the product to the entitlement, see Removing Licensed Products from a License Server.

1. If you are not already logged in, log in to the NVIDIA Licensing Portal.
2. In the list of license servers on the NVIDIA Licensing Portal dashboard, select the license server to which you want to add or from which you want to remove licenses.
3. In the details page for the license server that opens, click **MANAGE LICENSES**.
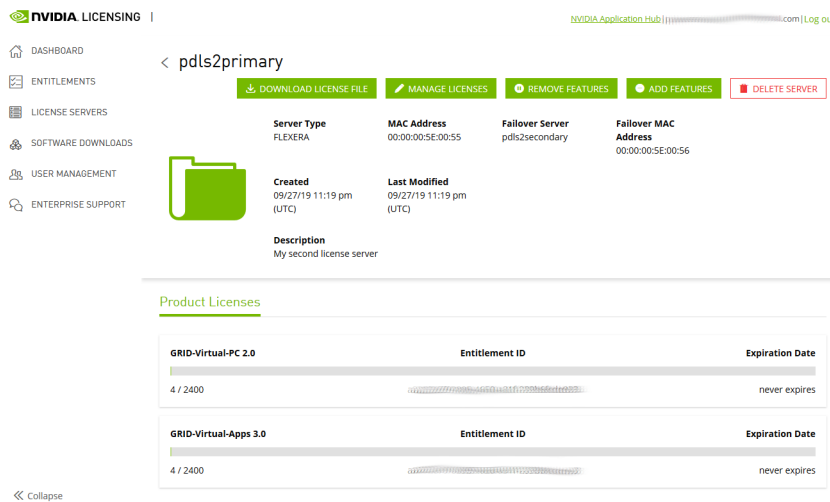
4. In the **Manage Licenses** pop-up window that opens, add or remove licenses as follows:
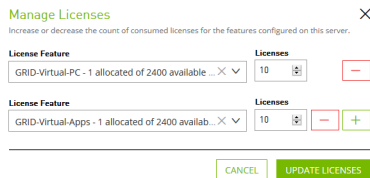
a) From the **License Feature** drop-down list, select the product for which you want to add or remove licenses.
b) In the **Licenses** field, enter the number of licenses for the product that you want to **remain on the server after updating licenses**.

▶ To **add** licenses to the server, enter a number **greater** than the number already allocated to the server, but less than or equal to the total number of licenses available.

If you enter a number greater than the total number of licenses available, an error occurs.

▶ To **remove** licenses from the server, enter a number **less** than the number already allocated to the server but greater than 0.

For example, to remove 4 licenses from a server to which 10 licenses are allocated, leaving 6 licenses allocated to the server, enter **6** in the **Licenses** field.

If you enter **0**, an error occurs. You must leave at least 1 license on the license server. If you want to remove all licenses for a product from the license server, you must follow the instructions in Removing Licensed Products from a License Server.

c) To add or removes licenses for an additional product, click the plus (**+**) icon next to the **Licenses** field and use the **License Feature** and **Licenses** fields that are added to the window to select the product and enter the number of licenses.

d) Click **UPDATE LICENSES**.

To ensure that the correct licenses are available on your license server host, download and install the license file after you add or remove licenses.

4.4.4. Adding Licensed Products to a License Server

You can add a new licensed product to a license server after the license server has been created. When you add a licensed product to a license server, you must also set the number of consumed licenses.

1. If you are not already logged in, log in to the NVIDIA Licensing Portal.
2. In the list of license servers on the NVIDIA Licensing Portal dashboard, select the license server to which you want to add licensed products.
3. In the details page for the license server that opens, click **ADD FEATURES**.

4. In the **Add Features** pop-up window that opens, add licensed products as follows:

a) From the **New Entitlement Feature** drop-down list, select the licensed product that you want to add to the license server.

b) In the **Licenses** field, enter the number of licenses for the product that you want to allocate to the server.

c) To add an additional licensed product, click the plus (**+**) icon next to the **Licenses** field and use the **New Entitlement Feature** and **Licenses** fields that are added to the window to select the product and enter the number of licenses.

d) Click **ADD LICENSES**.

4.4.5. Removing Licensed Products from a License Server

Remove licensed products from a license server if they are no longer needed or in preparation for migrating them to a new server. All licenses for the products that you remove are returned to the entitlement.
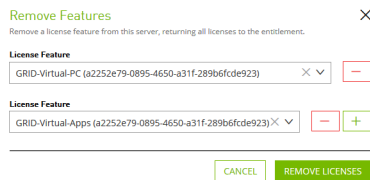
1. If you are not already logged in, log in to the NVIDIA Licensing Portal.

2. In the list of license servers on the NVIDIA Licensing Portal dashboard, select the license server from which you want to remove licensed products.

3. In the details page for the license server that opens, click **REMOVE FEATURES**.

4. In the **Remove Features** pop-up window that opens, remove licensed products as follows:

a) From the **License Feature** drop-down list, select the licensed product that you want to remove.

b) To remove an additional product, click the plus (**+**) icon next to the **Licenses** field and use the **License Feature** field that is added to the window to select the product.

c) Click **REMOVE LICENSES**.

If you removed licenses in preparation for migrating them to a new server, add them to the new server as explained in Adding Licensed Products to a License Server.

4.4.6. Deleting a License Server

1. If you are not already logged in, log in to the NVIDIA Licensing Portal.

2. In the list of license servers on the NVIDIA Licensing Portal dashboard, select the license server that you want to delete.

3. In the details page for the license server that opens, click **DELETE SERVER**.
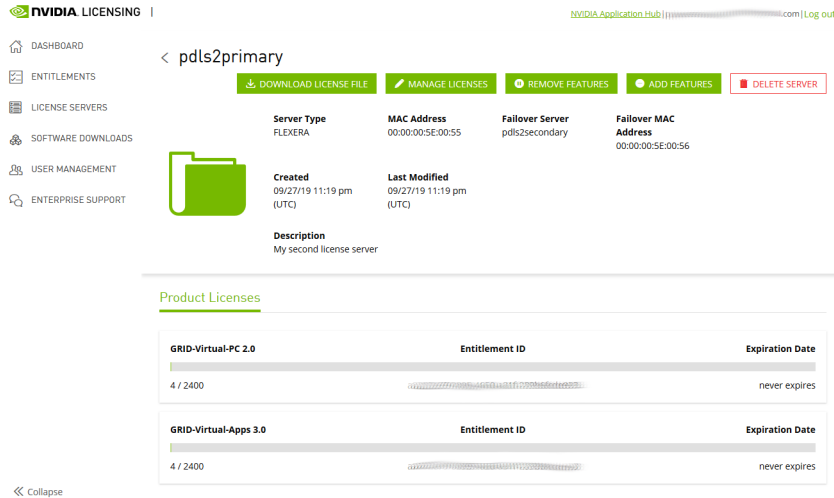
4. When asked to confirm that you want to delete the license server, click **DELETE SERVER**.

4.4.7. Managing Users on the NVIDIA Licensing Portal

To assist you with administering licenses on the NVIDIA Licensing Portal, you can add users to your account on the NVIDIA Licensing Portal. You can also remove users who no longer require access from your account on the NVIDIA Licensing Portal.

You can add the following types of users to your account on NVIDIA Licensing Portal:

Base user
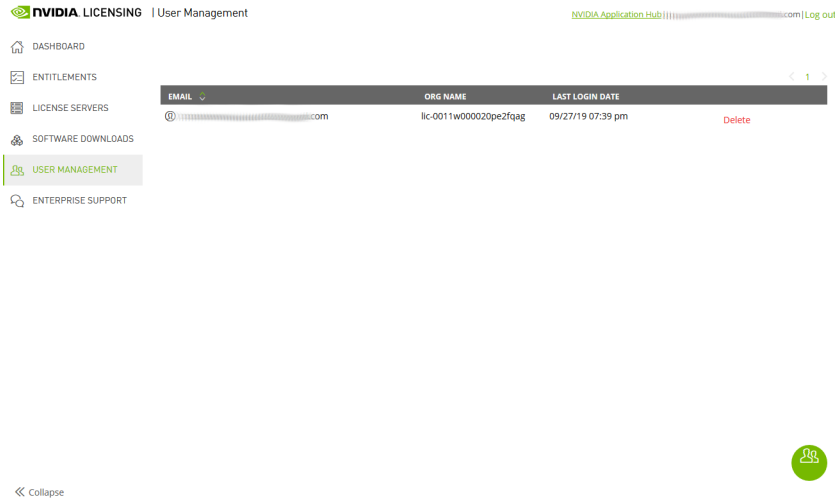   A base user **cannot** manage users on NVIDIA Licensing Portal.

Admin user
    An admin user can manage users on NVIDIA Licensing Portal.

4.4.7.1. Adding a User to the NVIDIA Licensing Portal

To complete this task, you need **admin user** privileges. Base users **cannot** manage users on the NVIDIA Licensing Portal.

1. If you are not already logged in, log in to the NVIDIA Licensing Portal.
2. In the left navigation pane of the NVIDIA Licensing Portal dashboard, click **USER MANAGEMENT**.

3. In the **USER MANAGEMENT** page that opens, click the **Add User** icon at the bottom right of the page.

4. In the **Add User** pop-up window that opens, provide the e-mail address and the name of the user, select the user's role, and click **SEND INVITATION**.

Select one of the following roles for the user:

Base user
A base user **cannot** manage users on NVIDIA Licensing Portal.
Admin user
An admin user can manage users on NVIDIA Licensing Portal.

An e-mail is sent to the user at the e-mail address that you provided.

NVIDIA

Welcome to NVIDIA Licensing Portal!

Dear

Welcome to the NVIDIA Licensing Portal, an online software delivery service that helps you manage and stay current with your NVIDIA vGPU products.

Please click the following link to complete your registration and be added to the account.

In order for your registration to be valid, you must use the email address that this email was sent to. If you input a different email during the registration process, it will invalidate your registration.

NVIDIA ENTERPRISE ACCOUNT REGISTRATION

This link will only be active for <u>7 days</u> from the receipt of this email.

Questions? Please visit our NVIDIA Enterprise Support Portal.

NVIDIA Customer Support

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NVIDIA Corporation, 2788 San Tomas Expressway, Santa Clara, CA 95051.

💬 **The link to the NVIDIA Enterprise Support Portal in this e-mail provides information about how to contact NVIDIA Enterprise Support.**

Notify the user that you added to follow the directions in the e-mail to create an NVIDIA Enterprise Account as explained in *Virtual GPU Software Quick Start Guide*.

4.4.7.2. Removing a User from the NVIDIA Licensing Portal

To complete this task, you need **admin user** privileges. Base users **cannot** manage users on the NVIDIA Licensing Portal.

1. If you are not already logged in, log in to the NVIDIA Licensing Portal.
2. In the left navigation pane of the NVIDIA Licensing Portal dashboard, click **USER MANAGEMENT**.
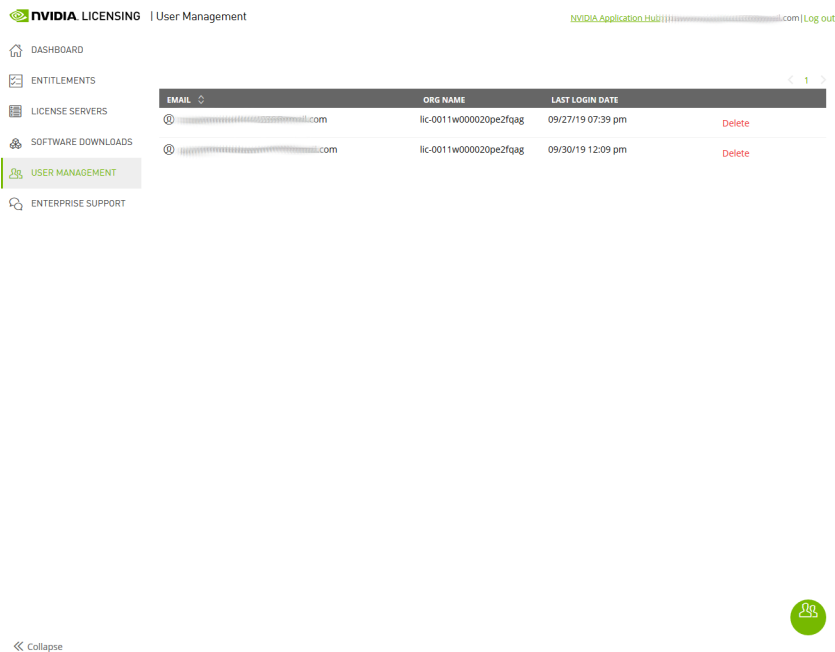
3. In the list of users in **USER MANAGEMENT** page that opens, click **Delete** for the user that you want to remove .

4. When asked to confirm that you want to remove the user, click **DELETE USER**.

The user is removed from the list of users on the **USER MANAGEMENT** page.

4.5. Installing a License

NVIDIA vGPU software licenses are distributed as `.bin` files for download from the NVIDIA Licensing Portal.

> 💬 If you have configured high availability for the license server, you must install the license both on the primary license server **and** on the secondary license server.

Before installing a license, ensure that you have downloaded the license file from the NVIDIA Licensing Portal.

1. In the license server management interface, select **License Management**.
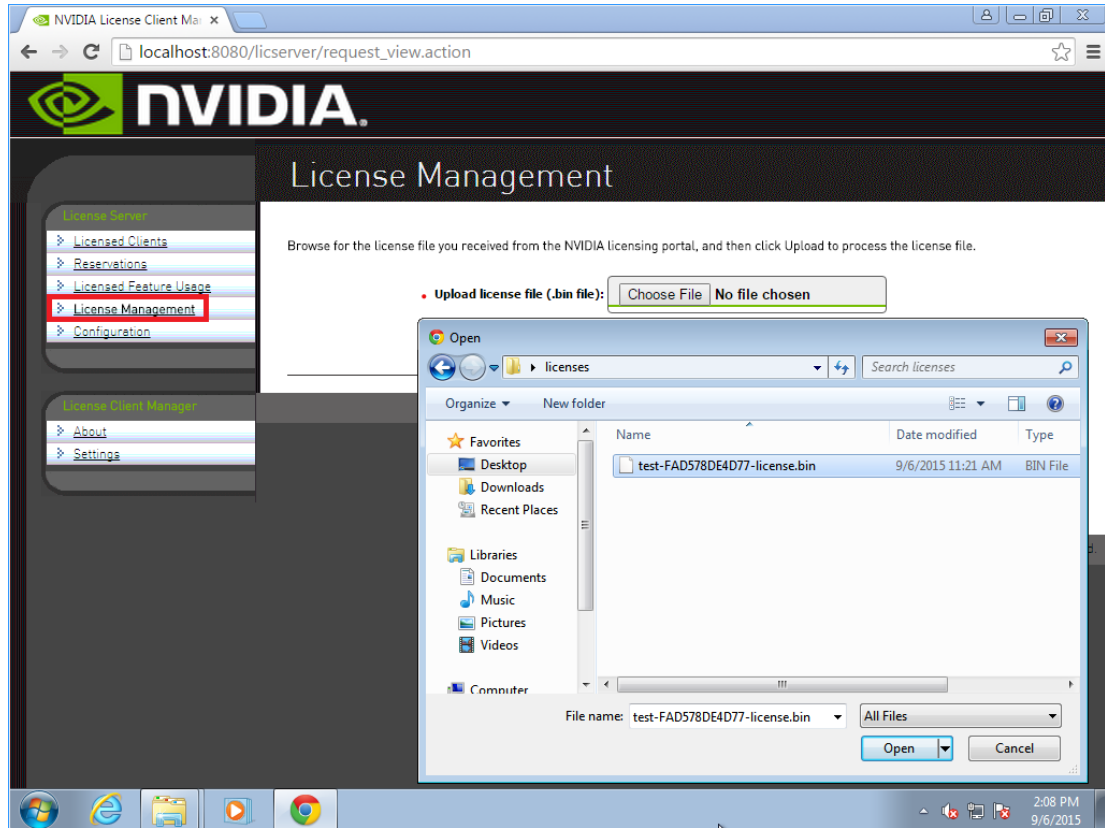2. On the **License Management** page that opens, click **Choose File**.

Figure 18   Selecting a License File

3. In the file browser that opens, select the `.bin` file and click **Open**.

4. Back on the **License Management** page, click **Upload** to install the license file on the license server.
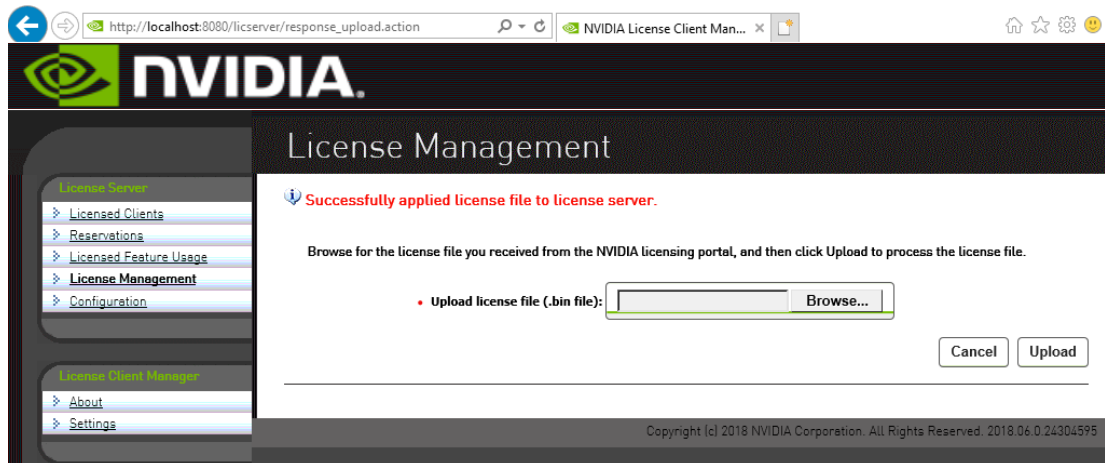   The license server should confirm successful installation of the license file.

Figure 19   Successful Upload of a License File

5. If you have configured high availability for the license server, restart the license server service on the primary license server **and** on the secondary license server.

▸ On Windows, use the **Service Manager**, which is accessible from **Task Manager**, to restart the **FNLS-nvidia** service.
▸ On Linux, as root, restart the `flexnetls-nvidia` service.

```
[nvidia@localhost ~]$ sudo systemctl restart flexnetls-nvidia
```

4.6. Verifying High Availability Setup of the License Server

The license server log file indicates the failover role of the given license server and its synchronization status.

For the location of the log file on your platform, refer to Log File Locations and Types.

In the license server log file, search for the string that designates the server role. The line that contains the string and the lines that follow it indicate the role and status of the server.

▸ For the primary server, search for the string `main server`.

```
23:29:25,655 INFO   Server is designated as a main server in a failover
 configuration
23:29:29,041 INFO   Received sync request from the backup server
23:34:31,815 INFO   Generated sync message for the backup server
```

▸ For the secondary server, search for the string `backup server`.

```
00:39:53,290 INFO   Server is designated as a backup server in a failover
 configuration
00:39:55,388 INFO   Starting sync from main server
00:39:56,784 INFO   Successfully completed sync from main server
```

> 💬 **Tip** When a client acquires a license from the primary server, the number of available licensed features is reduced by 1 on both the primary and the secondary servers. When the license server is operating, you can verify its high availability setup by confirming that the count of available licenses on the primary and the secondary servers changes as expected as clients acquire licenses from the server.

4.7. Viewing Information About Installed Licenses

From the license server management interface, you can find out which licenses are installed on the server, view detailed information about individual licenses, and see how licensed clients are using the installed licenses.

4.7.1. Viewing the Properties of All Installed Licensed Features

By viewing licensed feature properties, you can see the licenses that are installed on the server and get detailed information about each installed license feature.

In the license server management interface, select **Licensed Feature Usage**.

The **Licensed Feature Usage** page that opens lists all licensed features installed on the license server.
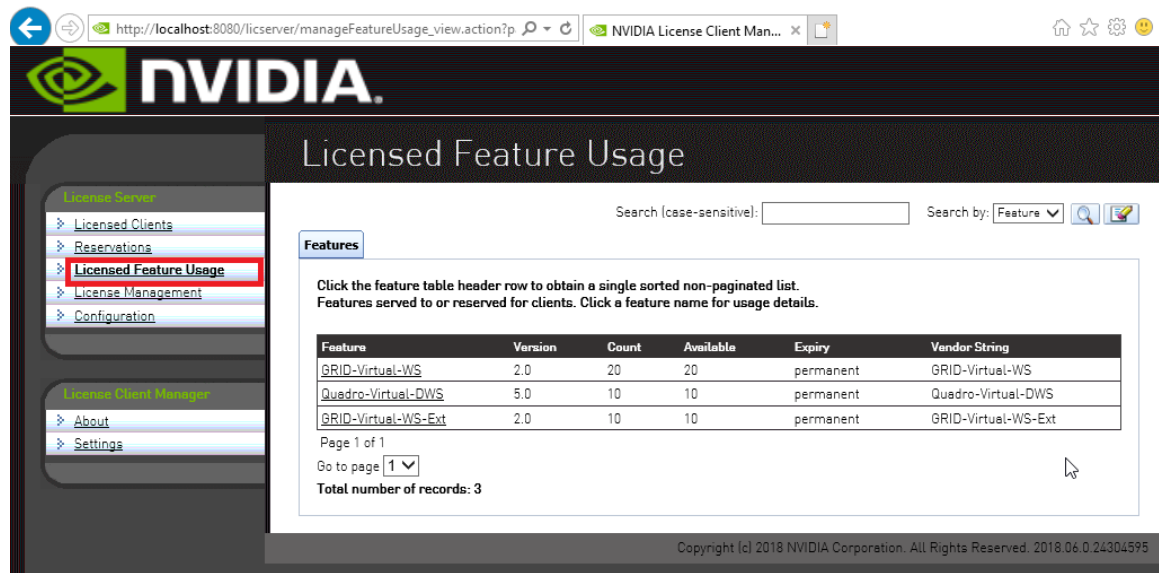

Figure 20   Viewing Licensed Feature Properties

For each licensed feature, the properties in the following table are displayed.

Table 1   Licensed Feature Properties

Property	Description
Feature	An abbreviated name for the feature.
Version	The version number associated with the feature.
Count	The number of licenses for the feature that are currently installed on the license server. Each concurrent user of a feature normally consumes one license.
Available	The number of licenses for the feature that are currently available to borrow from the server. This number decreases as users borrow licenses from the server, and increases as licenses are returned.

Property	Description
Expiry	The date on which the right to use the licensed feature expires. If the licenses are perpetual use licenses, they have no expiration date. Perpetual licenses are indicated by `permanent` in place of an expiration date.

4.7.2. Viewing the Details of a Single Licensed Feature

For each installed license feature, you can view detailed information about the feature.

1. In the license server management interface, select **Licensed Feature Usage**.
2. On the **Licensed Feature Usage** page that opens, click the individual licensed feature about which you want detailed information.
The **Licensed Feature Details** page that opens shows information about the feature.
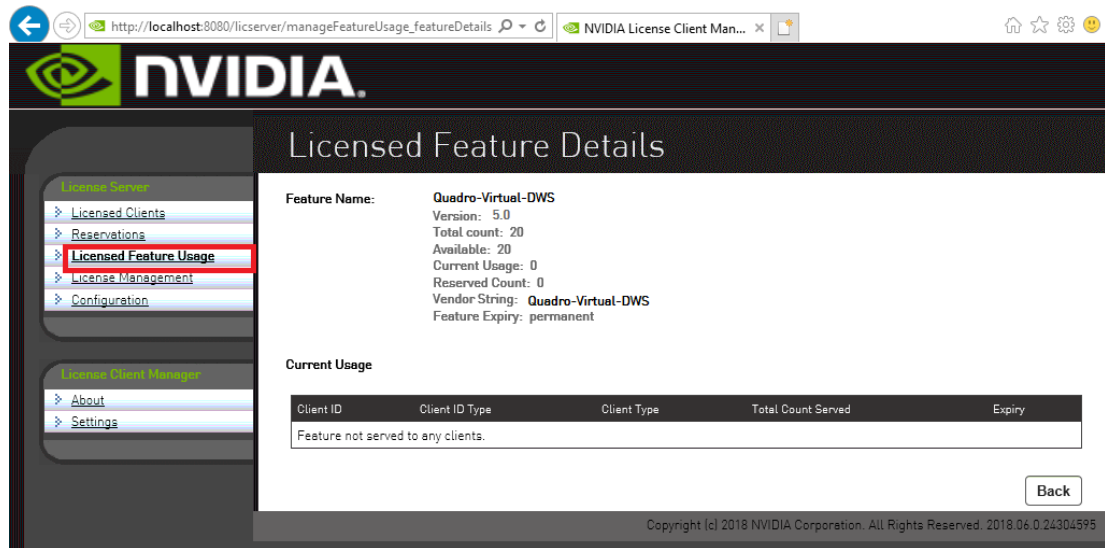

Figure 21   Licensed Feature Usage Details

4.7.3. Viewing Information About All Borrowed Licenses

By viewing information about all borrowed licenses, you can find out which licenses have been borrowed from the license server and are in use by a licensed client.

In the license server management interface, select **Licensed Clients**.

The **Licensed Clients** page that opens lists the NVIDIA vGPU software client virtual machines are using licensed features.

The example in Figure 22 shows that one NVIDIA vGPU software client virtual machine is using a Quadro-Virtual-DWS license.
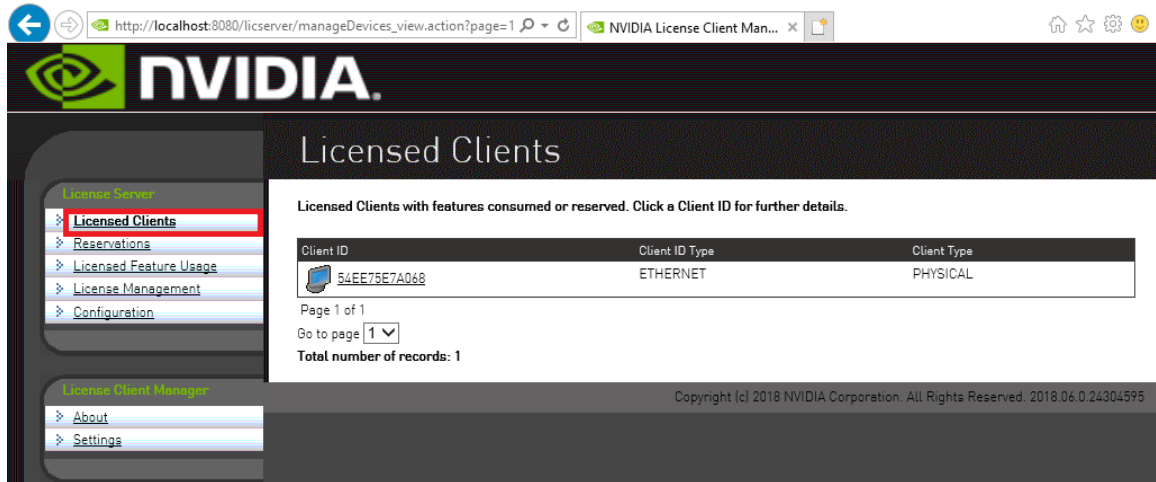
Figure 22   Viewing License Usage

4.7.4. Viewing the Details of a Single Licensed Client

1. In the license server management interface, select **Licensed Clients**.
2. On the **Licensed Clients** page that opens, click the **Client ID** of the licensed client about which you want detailed information.
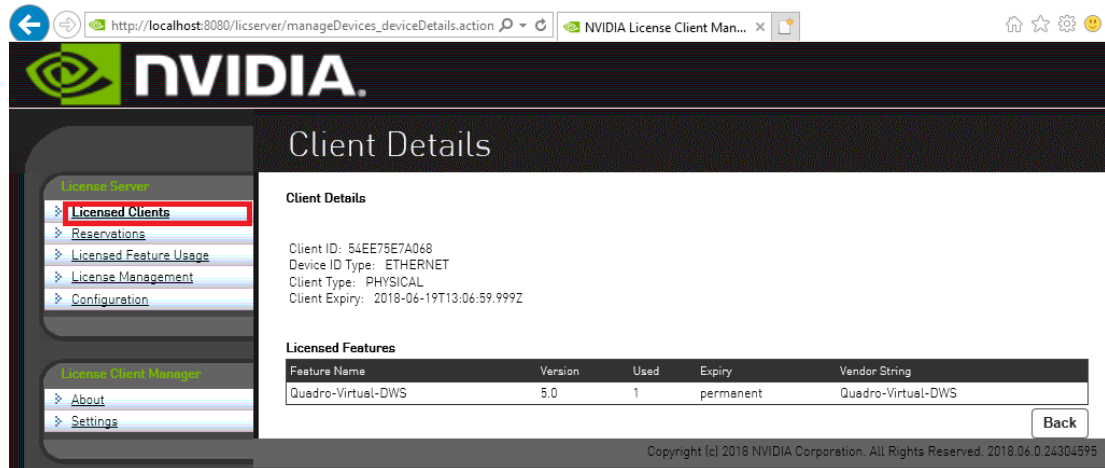   The **Client Details** page opens to show detailed information about the licensed client.

Figure 23   Licensed Client Details

4.7.5. About the License Borrow Period

At the end of the borrow period, typically multiple days, a borrowed license is automatically freed by the license server for use by other clients, and becomes unavailable on the licensed client that previously held it. While active, a licensed client renews its license periodically to ensure the borrow period does not expire, if it continues to use the license and has ongoing network connectivity to the license server.

4.8. Reserving Licenses

Licenses are normally distributed to clients on a first-come, first-served basis. Reservations allow licenses to be set aside for specific clients, ensuring that those clients can always obtain a license.

4.8.1. Creating License Reservations

The license server management interface enables you to set up several new reservations and submit them to the license server in a single group.

> After creating a group of license reservations, you cannot use the management UI to delete individual reservations in the group or to add new reservations to the group. If you try to use the management UI to delete a single entry from the **Reservation** page, all entries on the page are deleted. For more information about this issue and its workaround, see *Virtual GPU License Server Release Notes*.

> In an HA configuration, create identical license reservations on the primary license server and the secondary license server. To ensure that the license reservations are identical on both servers, you can export reservations from one server and import them into the other server as explained in Exporting and Importing License Reservations.

1. In the license server management interface, select **Reservations**.
   The **License Reservations** page opens.
2. Add each reservation that you want to create to the list of pending reservations.

Figure 24   Adding a License Reservation

   a) On the **License Reservations** page, click **Add**.

   b) On the **Add Reservation** page that opens, provide the details of the client for which you are creating the reservation and click **Add**.

Group Name

(Optional) Enter the name you want to assign to this reservation group.

Client ID

Enter the client's Ethernet MAC address without spaces. All letters in the MAC address **must** be in upper case.

Feature Name

Enter the licensed feature name as listed on the **Licensed Feature Usage** page, which is shown in Viewing the Properties of All Installed Licensed Features.

Version

Enter the version number listed for the feature listed on the **Licensed Feature Usage** page.

Count

Set to the number of licenses that you want to reserve for the client.

3. After adding all reservations that you want to create, click **Submit** to commit the pending reservations to the license server.
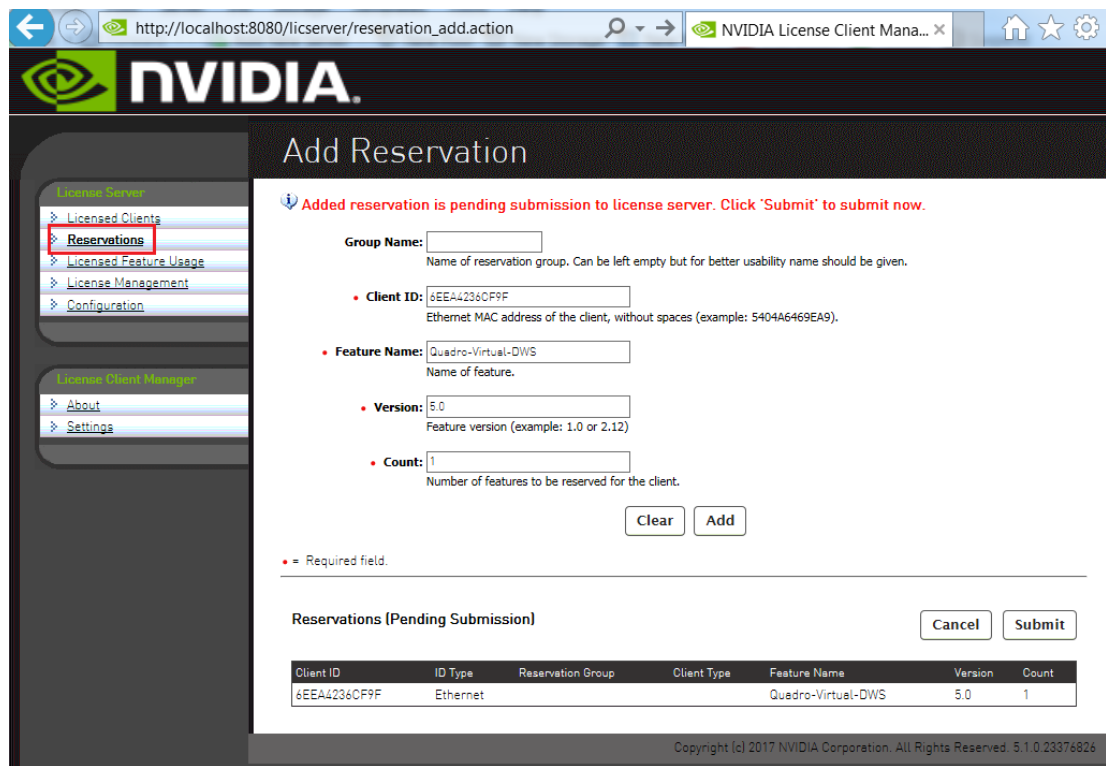

Figure 25   Submitting a Pending Reservation

After the reservations are submitted, the **License Reservations** page shows a list of currently stored reservations on the server.
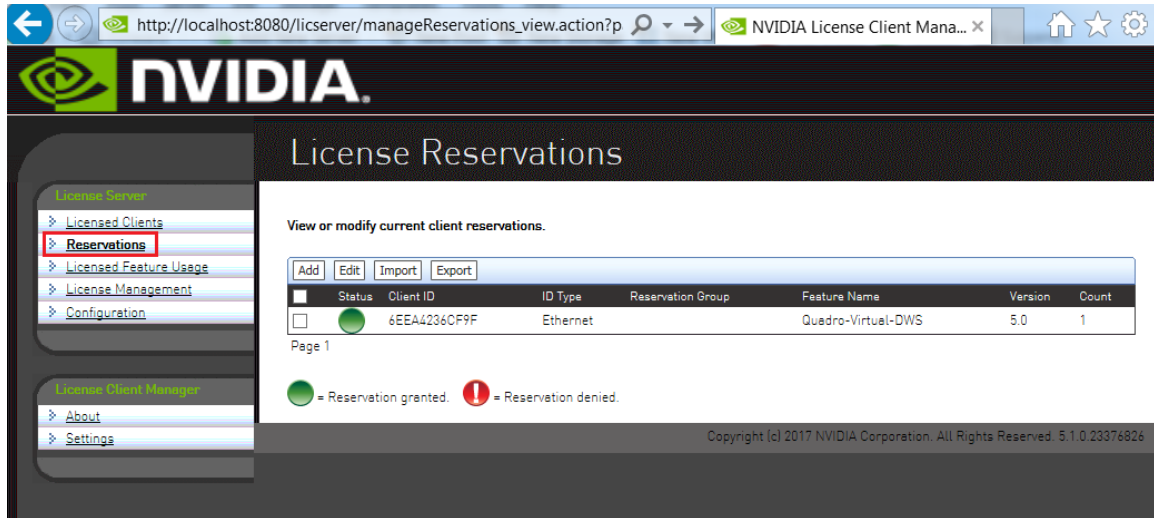
Figure 26 Listing Reservations

> If GRID Virtual Workstation licenses and licenses are available on the same license server, GRID Virtual Workstation licenses are assigned first, even to clients that have reserved licenses.

4.8.2. Deleting License Reservations

If a client no longer requires a license that is reserved for it, delete the reservation to release the license for distribution to other clients.

1. In the license server management interface, select **Reservations**.
2. On the **License Reservations** page that opens, select the reservations that you want to delete and click **Edit**.

   The **License Reservations** page is updated to replace the existing buttons on the page with the **Delete** button.
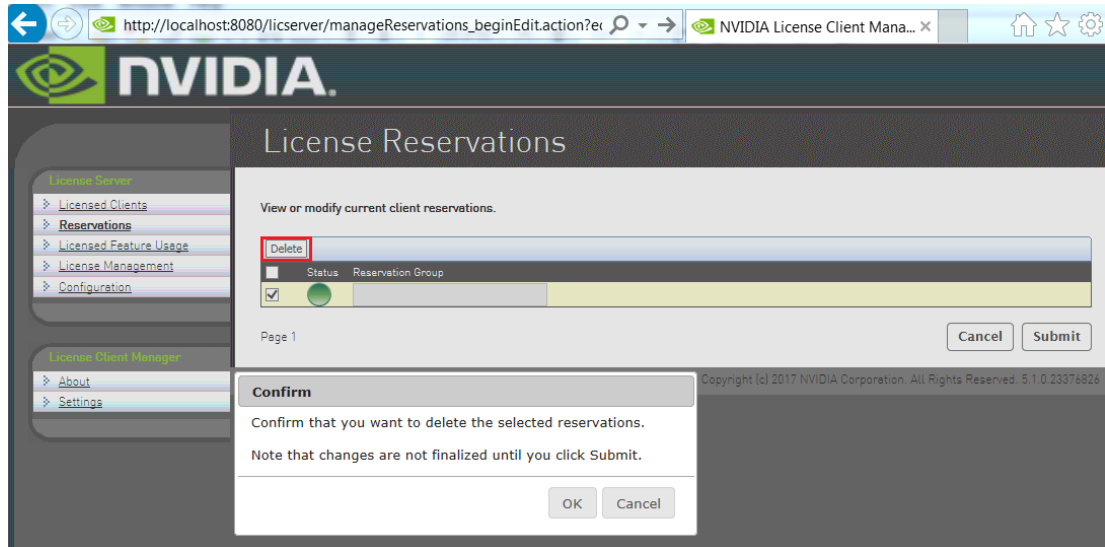3. On the updated **License Reservations** page, click **Delete**.

Figure 27   Deleting a Reservation

4. In the confirmation dialog box that opens, click **OK**.

4.8.3. Exporting and Importing License Reservations

Exporting license reservations downloads the current reservation list as an XML file through your web browser. Importing license reservations from an XML file replaces the license server's current reservation list with the contents of the file.

> Because importing license reservations from a file replaces the license server's current reservation list, any reservations on the server that are not in the file are lost.

1. In the license server management interface, select **Reservations**.
2. On the **License Reservations** page that opens, do one of the following:
    ▸ To export license reservations, click **Export**.
    ▸ To import license reservations, click **Import**, browse to the XML file that contains the reservations, and click **Upload**.
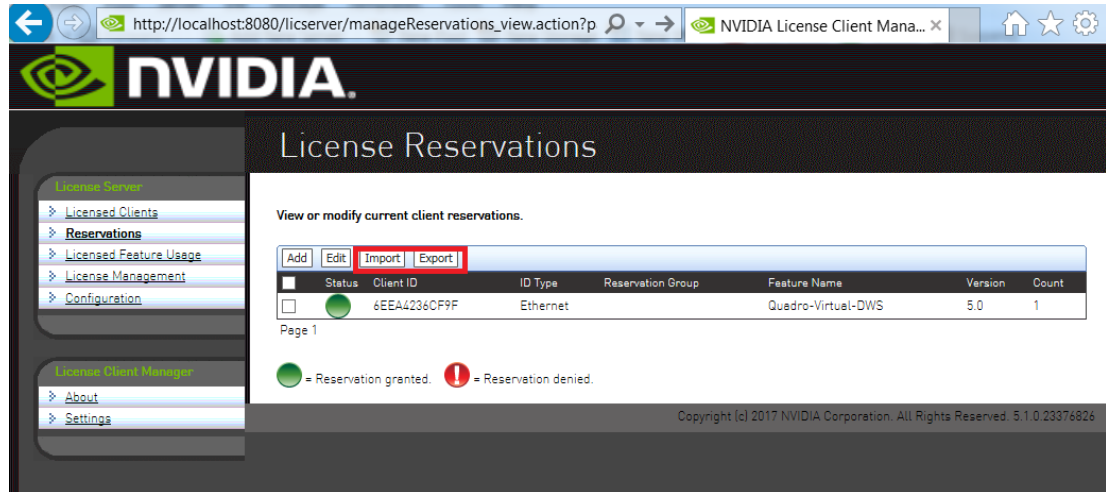
Figure 28   Exporting and Importing License Reservations

4.9. Converting an Evaluation License Server to a Permanent License Server

If you purchase NVIDIA vGPU software licenses after evaluating the software, you can use the same license server that you created for your evaluation licenses to serve your permanent licenses.

1. Log in to the NVIDIA Licensing Portal with the account that you created for getting your evaluation licenses.

2. Get the NVIDIA vGPU software for the licenses that you purchased.

   For instructions, refer to *Virtual GPU Software Quick Start Guide*.

3. Add the licenses that you purchased to your license server on the NVIDIA Licensing Portal as explained in Adding Licensed Products to a License Server.

4. Download your new license file as explained in Downloading a License File.

Chapter 5.
TROUBLESHOOTING THE NVIDIA VGPU SOFTWARE LICENSE SERVER

You can troubleshoot some common issues with the license server yourself without the need to obtain help from NVIDIA.

> Before troubleshooting, review *Virtual GPU License Server Release Notes* for information about known issues and potential workarounds.

5.1. Obtaining Diagnotsic Information from the License Server Log files

The license server log files contain diagnostic information to help with troubleshooting. If necessary, you can increase the amount of information in the log files by changing the log level of the license server.

5.1.1. Log File Locations and Types

Log files from the installer and license server are in the locations in the following table.

Table 2 Log File Locations

Host OS	Log	Location
Windows	Installer	`%SystemDrive%:\Program Files (x86)\NVIDIA\License Server\Logs`
	License server	`%SystemDrive%:\Windows\ServiceProfiles\NetworkService\flexnetls\nvidia\logs`
Linux	Installer	`/opt/flexnetls/nvidia/Logs/`
	License server	`/var/opt/flexnetls/nvidia/logs`

To confirm the location of the license server log files, use the license server management interface: Select **Configuration** and click the **Properties** tab.

The location of the log files is displayed on the **License Server Configuration** page in the **Logging Directory** field.
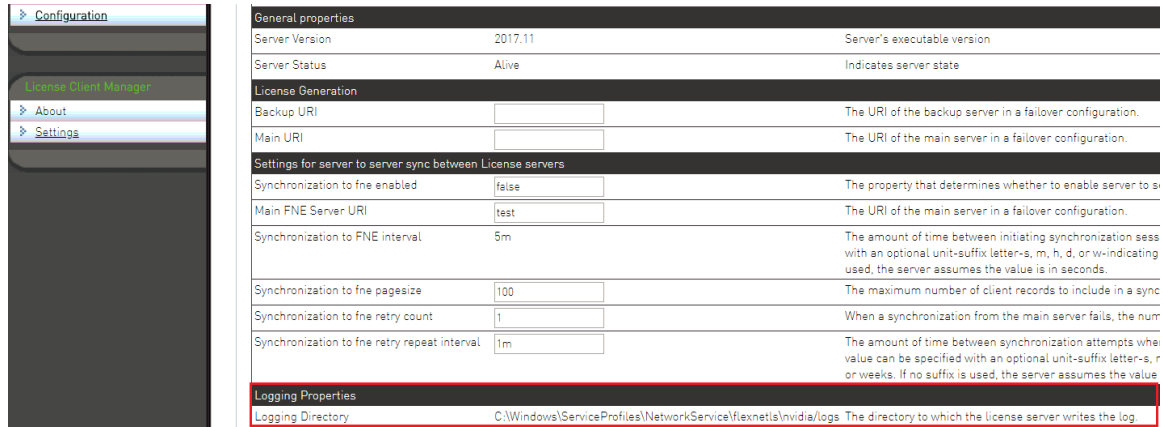
The license server generates these types of runtime log files:

▸ Management interface accesses are recorded in `access_*.request.log` files.
▸ License server activity is recorded in `flexnetls_*.log` files.

5.1.2. Changing the License Server Log Level

The default log level of the license server is **INFO**.

To adjust the amount of information in the log files, set the log level to a different level.

1. In the license server management interface, select **Configuration** and click the **Properties** tab.
2. On the **License Server Configuration** page, in the **Logging Threshold** field, enter a new log level, for example **WARN** or **ERROR**, and click **Save**.
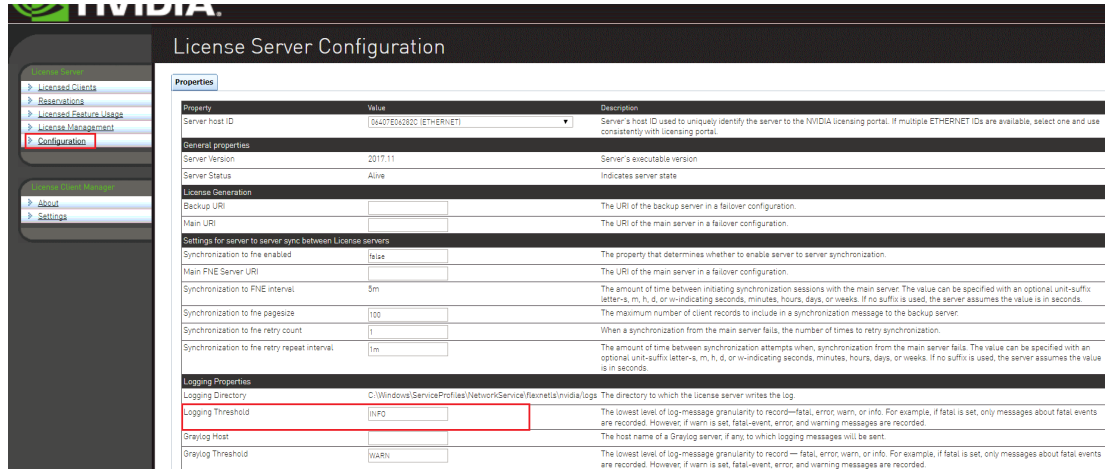
Figure 29   Changing the License Server Log Level

All messages at or below the level you set are recorded in the log file. For example, if you set the log level to **WARN**, fatal-event, error, and warning messages are recorded.

5.2. Management Interface Connection Errors

The management interface at `http://`*`hostname`*`:8080/licserver` might be unreachable because the license server host's firewall disallows remote access to server TCP port 8080 or because the Apache Tomcat service is not running on the server.

1. If you are trying to access the management interface from a remote machine, try accessing the interface locally from the license server host.

   To access the interface locally, open a web browser on the license server host and connect to the URL `http://localhost:8080/licserver`.

2. If you can access the management interface locally, ensure that the license server host's firewall is configured to allow remote access to server TCP port 8080.

3. If you cannot access the management interface locally, verify that the Apache Tomcat service is running on the license server host.

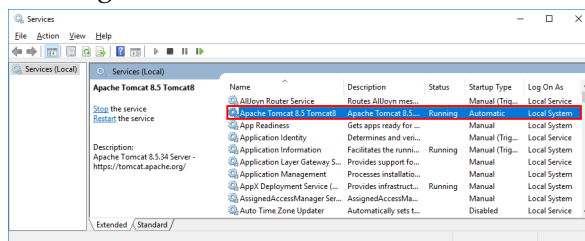   ▶ On Windows, use the **Services** application to restart the service if it is not running.

Figure 30   Apache Tomcat Status in the Windows Services Application

   ▶ On Linux, check the status of the `tomcat` service.

```
[nvidia@localhost ~]$ systemctl status tomcat.service
tomcat.service - Apache Tomcat Web Application Container
   Loaded: loaded (/usr/lib/systemd/system/tomcat.service; enabled)
   Active: active (running) since Fri 2019-04-19 07:39:11 PDT; 9h ago
 Main PID: 1373 (java)
   CGroup: /system.slice/tomcat.service
           └─1373 java -classpath /usr/share/tomcat/bin/bootstrap.jar:/
usr/sh...
```

5.3. License Server Connection Errors

If the license server's management interface cannot establish a connection to the license server, the management interface displays an error message.
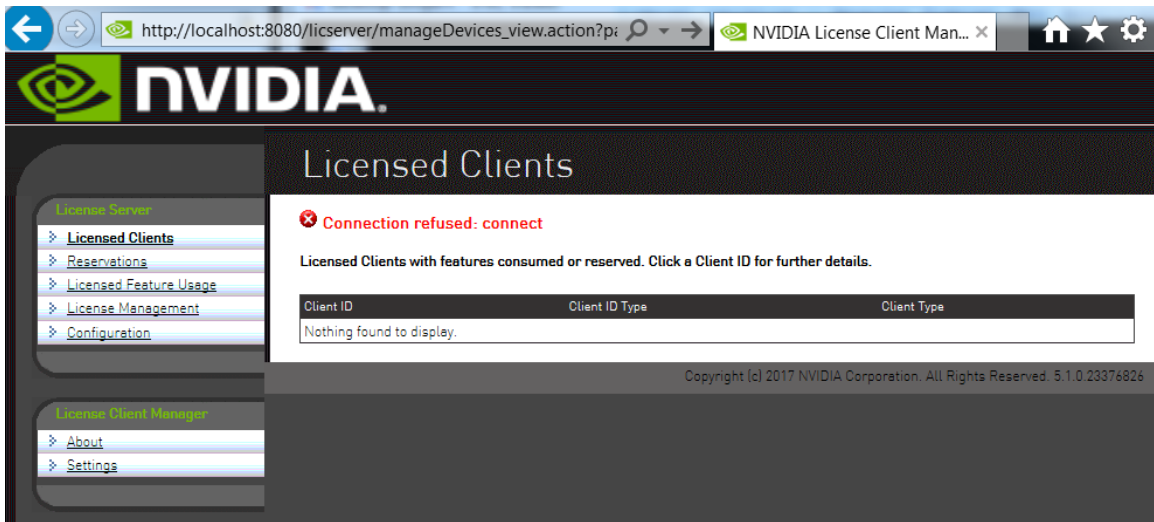

Figure 31   License Server Connection Error

1. Verify that the license service is running.

   ▸ On Windows, use the **Services** application to restart the service if it is not running.
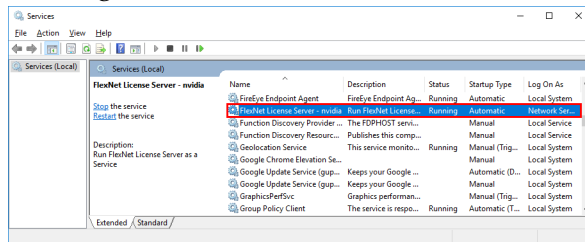

   Figure 32   License Server Status in the Windows **Services** Application

   ▸ On Linux, check the status of the flexnetls-nvidia service.

```
[nvidia@localhost ~]$ systemctl status flexnetls-nvidia.service
flexnetls-nvidia.service - LSB: start and stop FlexNet License Server
   Loaded: loaded (/etc/rc.d/init.d/flexnetls-nvidia)
```

```
   Active: active (running) since Fri 2019-04-19 14:44:34 PDT; 2h 49min
ago
 Process: 4502 ExecStart=/etc/rc.d/init.d/flexnetls-nvidia start
(code=exited, status=0/SUCCESS)
   CGroup: /system.slice/flexnetls-nvidia.service
           ├─4567 java -Dbase.dir=/var/opt/flexnetls/nvidia -jar /opt/
flexnet...
           └─4609 java -Dbase.dir=/var/opt/flexnetls/nvidia -jar /opt/
flexnet...
```

2. Inspect the license server log files, which are described in Log File Locations and Types.

5.4. License Upload Failures

Errors may occur during an attempt to upload a license file to the license server.

5.4.1. License Response Fails Trust Criteria

The license server reports a trust failure if it attempts to reload a license file that's already loaded.

Verify that the license file being uploaded is not already active on the server.

5.4.2. Capability Response Rejected - Response Time Too Old

The license server reports this error if the license file you are attempting to upload has expired. Licenses generated on the NVIDIA licensing portal must be installed onto your license server within 24 hours of generation.

Generate a new license file on the licensing portal and promptly upload the new file to your license server.

5.4.3. Capability Response Rejected – Update Time Invalid

The license server reports this error if the license server is already configured with a license file that is newer than the license file you are attempting to upload.

You cannot roll back an active license to an older license file.

5.4.4. Capability Response Rejected - Response Enterprise ID Does Not Match the Server

The license server reports this error if you are trying to download a license file to a license server on which licenses from a different customer account are installed.

To resolve this issue:

1. Stop the license server.
2. Delete the license server's trusted storage database.

3. Restart the license server.
4. Download and install the new license.

5.5. Trusted Storage Database Errors

Errors in the trusted storage database, such as corruption of the database, can prevent the license server from reading the database. If it cannot read the database, the license server cannot start.

You can correct errors in the trusted storage database in one of the following ways:

▸ Restoring the database from a backup
▸ Deleting the database and then reinstalling licenses on the license server

5.5.1. Restoring the Trusted Storage Database from a Backup

The license server automatically backs up the database after every 1,000 license checkouts or after every five-minute interval in which a change has taken place, whichever event occurs first. If no change to the database occurs during a five-minute interval, the database is not backed up. Backups are triggered by changes such as the checkout, renewal, or release of a license.

5.5.1.1. Restoring the Trusted Storage Database from a Backup on Windows

Before restoring the trusted storage database from a backup, ensure that the following prerequisites are met:

▸ The `JAVA_HOME` environment variable is set to the folder where the Java runtime environment is installed on the license server host.

▸ The `TRUSTED_STORAGE_DIR` environment variable is set to `%SystemDrive%:\Windows\ServiceProfiles\NetworkService\flexnetls\nvidia`, which is the folder that contains the trusted storage database files.

1. Open a **Command Prompt** window and change to the *license-server-installation-folder*`\server` folder.

   license-server-installation-folder
   The folder in which the license server software is installed. The default license server installation folder is `%SystemDrive%:\Program Files (x86)\NVIDIA\License Server`.

   For example:

   ```
   C:\>cd C:\Program Files (x86)\NVIDIA\License Server\server
   C:\Program Files (x86)\NVIDIA\License Server\server>
   ```

2. In the **Command Prompt** window, run the command to restore the database.

```
C:\Program Files (x86)\NVIDIA\License Server\server>flexnetls.bat -restore-
database
```

The database is restored to the location defined in the TRUSTED_STORAGE_DIR environment variable.

5.5.1.2. Restoring the Trusted Storage Database from a Backup on Linux

Before restoring the trusted storage database from a backup, ensure that the following prerequisites are met:

▸ The JAVA_HOME environment variable is set to the directory where the Java runtime environment is installed on the license server host.

▸ The TRUSTED_STORAGE_DIR environment variable is set to /var/opt/ flexnetls/nvidia/, which is the directory that contains the trusted storage database files.

1. Change to the *license-server-installation-dir*/server directory.

   license-server-installation-dir
   > The directory in which the license server software is installed. The default license server installation directory is /opt/flexnetls/nvidia.

   For example:

   ```
   $ cd /opt/flexnetls/nvidia/server
   ```
2. Run the command to restore the database.

   ```
   $ flexnetls --restore-database
   ```

The database is restored to the location defined in the TRUSTED_STORAGE_DIR environment variable.

5.5.2. Deleting the Trusted Storage Database

Deleting the trusted storage database clears all information about license assignments and allocations.

After deleting the trusted storage database, reinstall your licenses on the license server as explained in Installing a License.

5.5.2.1. Deleting the Trusted Storage Database on Windows

1. Close any web browser windows that are accessing the license server.
2. Stop the FlexNet License Server - nvidia service.
   a) Start **Task Manager** and in the **Windows Task Manager** window that opens, click the **Services** button.
   b) In the **Services** window that opens, context-click **FlexNet License Server - nvidia** and from the menu that pops up, choose **Stop**.

3. Delete all files in the `%SystemDrive%:\Windows\ServiceProfiles` `\NetworkService\flexnetls\nvidia` folder, which contains the trusted storage database files.

4. Start the `FlexNet License Server - nvidia` service.

   a) Start **Task Manager** and in the **Windows Task Manager** window that opens, click the **Services** button.

   b) In the **Services** window that opens, context-click **FlexNet License Server - nvidia** and from the menu that pops up, choose **Start**.

5.5.2.2. Deleting the Trusted Storage Database on Linux

This task requires system administrator privileges.

1. Close any web browser windows that are accessing the license server.

2. Stop the `flexnetls-nvidia` service.

   ```
   # sudo systemctl stop flexnetls-nvidia.service
   ```

3. Delete all files in the `/var/opt/flexnetls/nvidia/` directory, which contains the trusted storage database files.

   ```
   # sudo \rm -rf /var/opt/flexnetls/nvidia/*
   ```

4. Start the `flexnetls-nvidia` service.

   ```
   # sudo systemctl start flexnetls-nvidia.service
   ```

5.6. Issues when the License Server Is Used with Security Software

When the license server is used with security software, such as a firewall or antivirus software, issues may occur if the security software blocks certain applications or functionality.

The following issues are examples of the kinds of issues that may occur if security software blocks certain applications or functionality:

▶ Failure of the license server to start

▶ Access violation exceptions

▶ Core dumps by the JRE

To determine whether security software is causing these issues, test your license server setup with the security software disabled or removed. If disabling or removing the security software resolves the issue, consider one of the following long-term fixes:

▶ If your organization's software security policies allow, add an exception rule for the license server application.

▶ Otherwise, contact NVIDIA Enterprise Support for assistance in determining the root cause of the issue. When you contact NVIDIA Enterprise Support, provide a detailed description of the symptoms of the issue and the exact versions of any security software that you are using on the license server host.

Chapter 6.
UNINSTALLING THE NVIDIA VGPU SOFTWARE LICENSE SERVER

You can uninstall the NVIDIA vGPU software License Server when it is no longer required.

6.1. Uninstalling the NVIDIA vGPU Software License Server on Windows

1. Start the license server uninstaller.

   You can start the license server uninstaller in **Windows Control Panel** or in **Windows Explorer** from the license server installation directory.

   ▸ In **Windows Control Panel**, open the **Programs and Features** pane, select **License Server** from the publisher NVIDIA, and click **Uninstall/Change**.
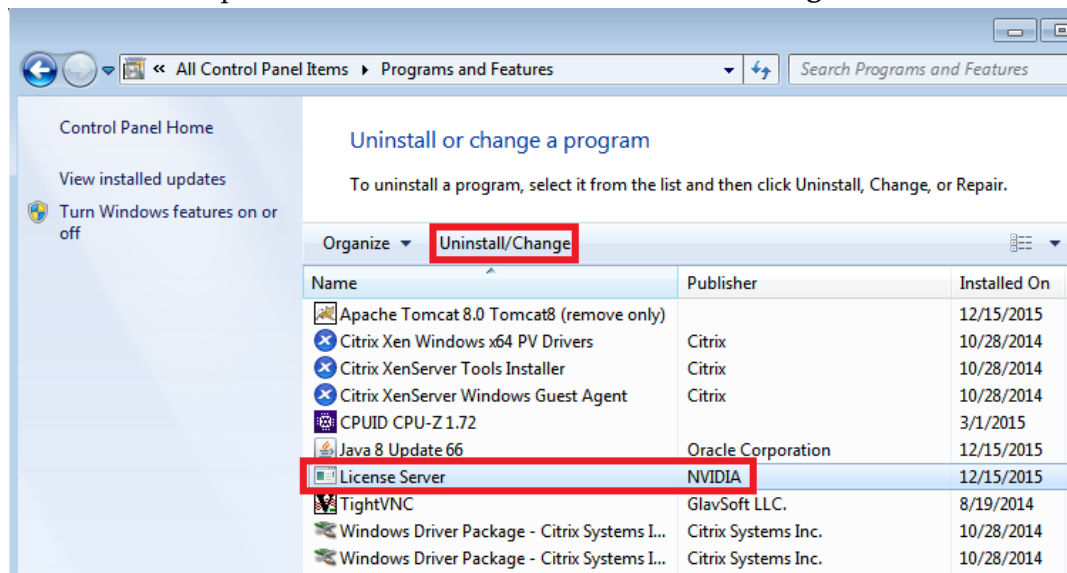
Figure 33   Starting the Uninstaller from Windows Control Panel

‣ In **Windows Explorer**, open the license server installation directory and double-click the **Change License Server Installation** application.

The default license server installation directory is `C:\Program Files (x86)\NVIDIA\License Server`.
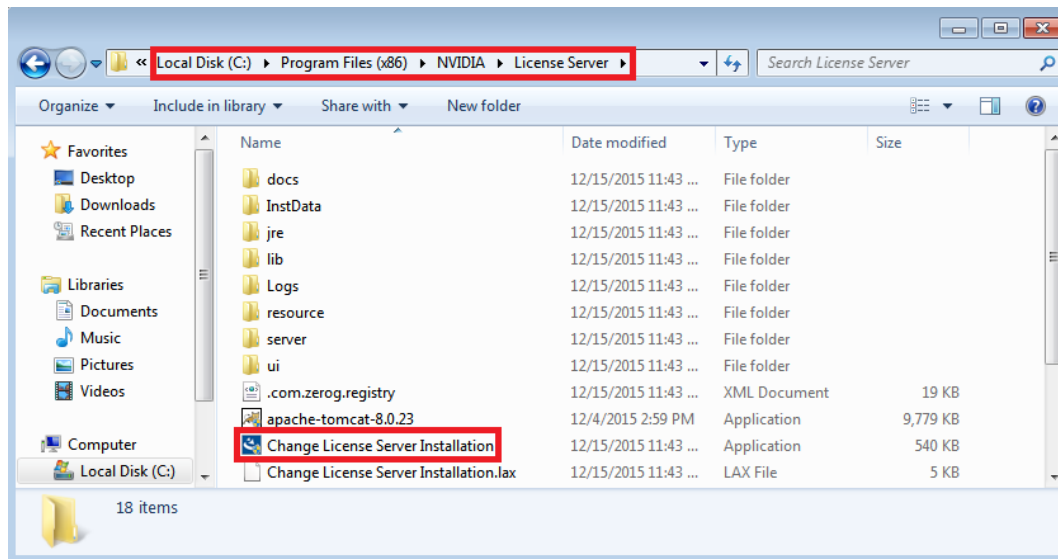

Figure 34 Starting the Uninstaller in Windows Explorer from the License Server Installation Directory

If the license server software was installed in console mode, the uninstaller runs in console mode. Otherwise, the **Configure License Server** dialog box opens.

2. If the **Configure License Server** dialog box opens, ensure that the **Uninstall Product** option is selected and click **Next**.
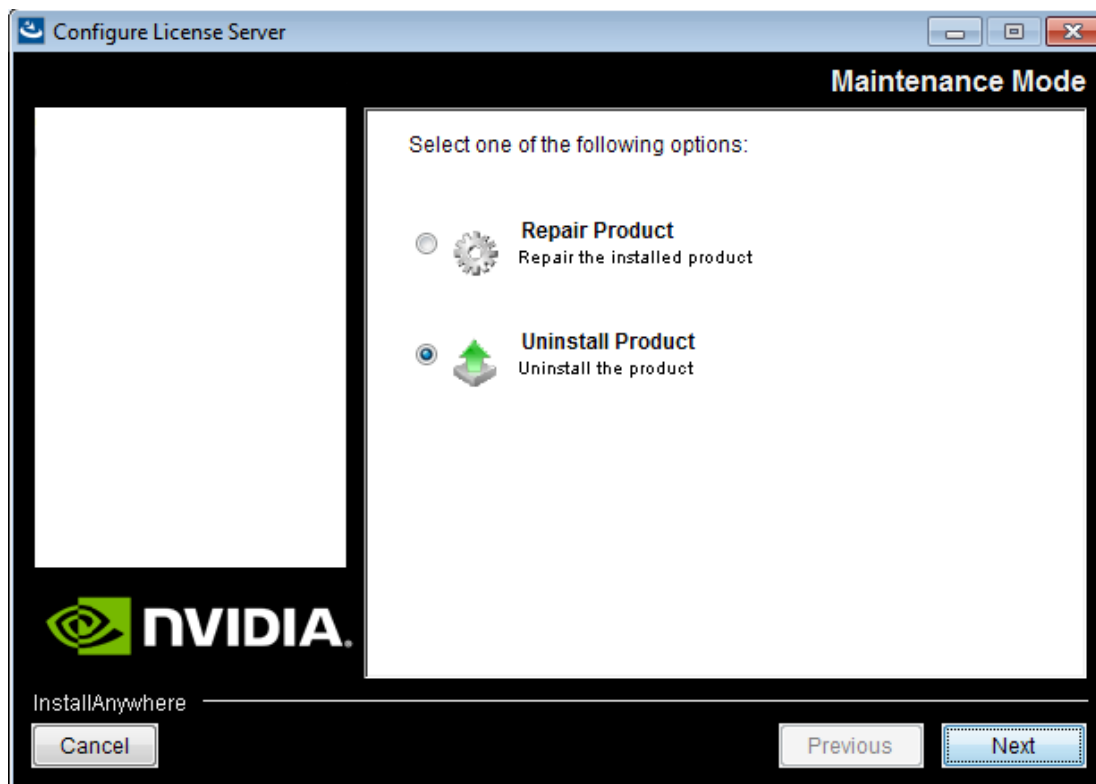
Figure 35   Running the License Server Uninstaller on Windows

3. When prompted, confirm that you want to uninstall the license server.

6.2. Uninstalling the NVIDIA vGPU Software License Server on Linux

1. Start the license server uninstaller.

   a) Change to the license server installation directory.

      The default license server installation directory is /opt/flexnetls/nvidia.

      ```
      [nvidia@localhost ~]$ cd /opt/flexnetls/nvidia
      ```

   b) As root, run the Change License Server Installation command.

      ```
      [nvidia@localhost ~]$ sudo ./Change\ License\ Server\ Installation
      ```

   If the license server software was installed in console mode, the uninstaller runs in console mode. Otherwise, the **Configure License Server** window opens.

2. If the **Configure License Server** window opens, ensure that the **Uninstall Product** option is selected and click **Next**.
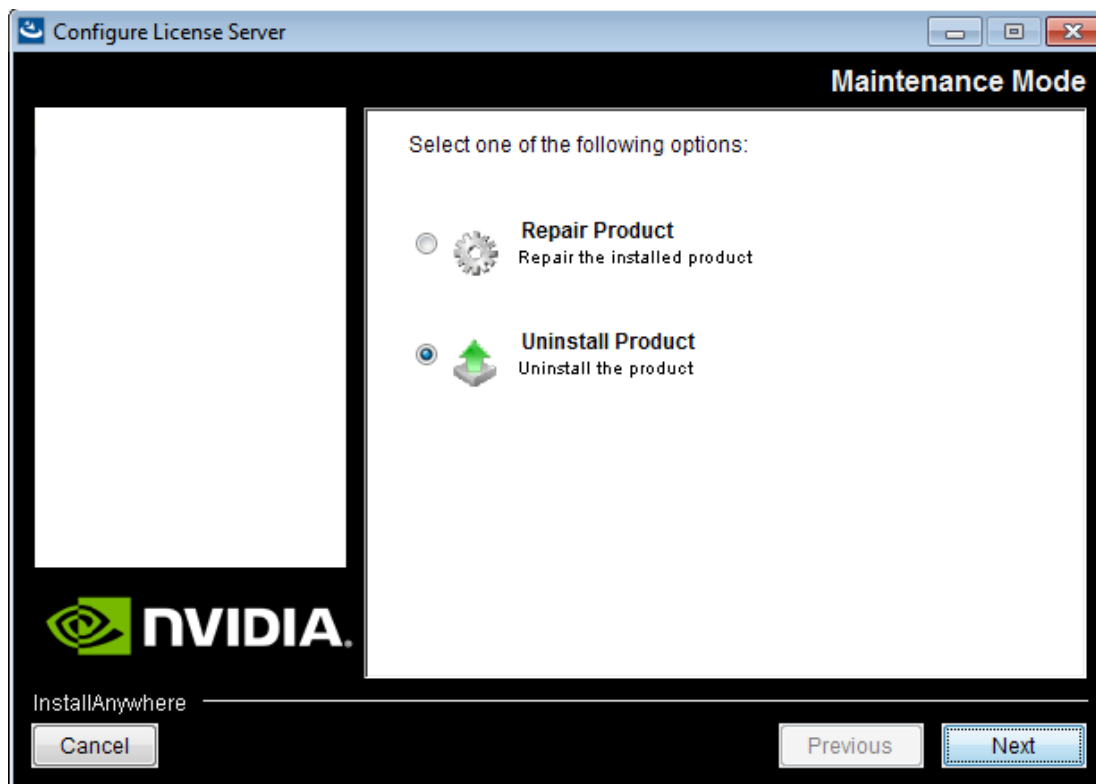
Figure 36   Running the License Server Uninstaller on Linux

3. When prompted, confirm that you want to uninstall the license server.

Appendix A.
ADMINISTERING THE LICENSE SERVER FROM THE COMMAND LINE

The `nvidialsadmin` utility provides options for administering the license server from the command line.

Options are available for the following administrative operations:

▸ Maintaining the license server
▸ Managing administrative security
▸ Viewing features installed on the license server
▸ Monitoring license distribution to clients

A.1. Running the `nvidialsadmin` Utility

The `nvidialsadmin` utility is distributed as the `nvidialsadmin.bat` batch file on Windows and as the `nvidialsadmin.sh` shell script on Linux.

Before attempting to run the `nvidialsadmin` utility, ensure that the `JAVA_HOME` environment variable is set to the folder where the Java runtime environment is installed on the license server host.

Run the `nvidialsadmin` utility in a Windows or Linux command shell from the folder that contains the `nvidialsadmin.bat` batch file or the `nvidialsadmin.sh` shell script.

The `nvidialsadmin` utility is contained in the folder *license-server-installation-folder*/enterprise.

license-server-installation-folder
   The folder in which the license server software is installed.

The default folders for the Windows and Linux platforms are as follows:

▸ **Windows:** `%SystemDrive%:\Program Files (x86)\NVIDIA\License Server\enterprise`

▸ **Linux:** `/opt/flexnetls/nvidia/enterprise`

> 💬 You must run the `nvidialsadmin` utility from the folder that contains the `nvidialsadmin.bat` batch file or the `nvidialsadmin.sh` shell script. If you try to run the utility from another folder by specifying the path to the utility either in the `PATH` variable or on the command line, the attempt fails and the following error message is displayed:
>
> ```
> Error: Unable to access jarfile nvidialsadmin.jar
> ```

A.2. Setting the License Server Base URL for the `nvidialsadmin` Utility

All `nvidialsadmin` commands require the base URL of the license server.

The format of the base URL of the license server is as follows:

```
scheme://address:port/api/version/instances/~
```

scheme
    The URL scheme, which is either `http` or `https`.
address
    The address of the license server, which can be a fully-qualified domain name such as `gridlicense1.example.com`, or an IP address such as `10.31.20.45`.
port
    The port number through which the `nvidialsadmin` utility accesses the licence server. The default depends on whether *scheme* is `http` or `https`.

    ▸ For `http`, the default is 7070.
    ▸ For `https`, the default is 443.

version
    The API version of the license server, for example, 1.0.

The following examples show the different ways of specifying the address of the license server in the base URL:

▸ **Fully-qualified domain name:**

  ▸ `http://gridlicense1.example.com:7070/api/1.0/instances/~`
  ▸ `https://gridlicense1.example.com:443/api/1.0/instances/~`

▸ **IP address:**

  ▸ `http://10.31.20.45:7070/api/1.0/instances/~`
  ▸ `https://10.31.20.45:443/api/1.0/instances/~`

Set the license server base URL for the `nvidialsadmin` utility in one of the following ways:

▸ Globally for all `nvidialsadmin` commands by specifying the `FLEXNETLS_BASEURL` environment variable

▸ Individually in each `nvidialsadmin` command by setting the `-server` option

A.3. Getting Help for the `nvidialsadmin` Utility

For details about the `nvidialsadmin` utility and its options, get help information for the utility by entering the following command in a command shell on the license server host:

```
nvidialsadmin -help
```

A.4. Authenticating with the License Server

When administrative security is enabled for the license server, the `-authorize` option with your credentials must be the first option that you specify in any `nvidialsadmin` command.

▸ To provide your password in the command, specify the credentials as follows:

```
nvidialsadmin -authorize username password
```

▸ To be prompted for your password and avoid typing the password in clear text in the command, provide the `-passwordConsoleInput` option .

```
nvidialsadmin -authorize username -passwordConsoleInput
```

username
  Your user name for authenticating with the license server.
password
  Your password for authenticating with the license server.

> 💬 If you specify the wrong credentials more than three times, your license server user account is blocked for 10 minutes and a message similar to the following example is displayed:
>
> ```
> Too many failed logins for user admin on instance WX0EDD7ALYMN.
> Logins will be blocked for 10 minutes
> ```

A.5. Checking the Status of the License Server

You can perform a status check to confirm that the license server is running correctly.

This check tells you whether the license server is active and provides additional information, such as:

▸ Version information for the license server

▶ The URLs for the main license server and, if HA is configured for the license server, the back-up license server

Perform this task in a command shell on the license server host.

> 💬 For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with the `-status` option.

```
nvidialsadmin  -status
Copyright (c) 2015-2018 Flexera LLC. All Rights Reserved.

(version) Version          : 2018.09
(buildVersion) Build Version : 237146

The server is in active state.

Server: http://localhost:7070/ active
Backup Server: Not configured
```

A.6. Getting General Configuration Information for the License Server

You can get general informaton about the configuration of the license server, such as the IP address and host name of the server.

Perform this task in a command shell on the license server host.

> 💬 For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with the `-config` option and set the `-filter` option to `general`.

```
nvidialsadmin -config -filter general
General License Server Information
----------------------------------
(license_server_url) IP              : 127.0.0.1
(host_name) Host Name                : localhost
(publisher_name) Publisher Name      : nvidia
(host_id) Binding ID                 : ETHERNET (482AE30D8299)
(license_server_port) Port           : 7070
(licensing.backup.uri)               : Not Configured
----------------------------------
```

A.7. Listing Features Installed on the License Server

Perform this task in a command shell on the license server host.

> For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with the `-features` option.

```
nvidialsadmin -features
=================================================================================
Name                Count           Version         Type            Expiration
=================================================================================

Quadro-Virtual-DWS 75000             5.0             CONCURRENT      permanent

Total number of features : 1
```

A.8. Listing the Distribution of License Server Features

Perform this task in a command shell on the license server host.

> For clarity, required options for authenticating the administrator user and specifying the license server URL are omitted from this example.

Run the `nvidialsadmin` utility with the `-licenses` and `-verbose` options.

```
nvidialsadmin -licenses -verbose
=================================================================================
Feature ID     Feature Name        Feature Version     Feature Count Used/
Available
=================================================================================
1              vGPU-virtual            3.0                 0/25
2              Quadro-Virtual-DWS      5.0                 1/24
=================================================================================

Device Information:

---------------------------------------------------------------
Device Name                     Feature Registered(Used Count)
---------------------------------------------------------------
5C5F67C3836D                        Quadro-Virtual-DWS(1)
=================================================================================

        Total feature count         : 50
        Total feature count used    : 1
        Total uncounted features    : 0
=================================================================================
```