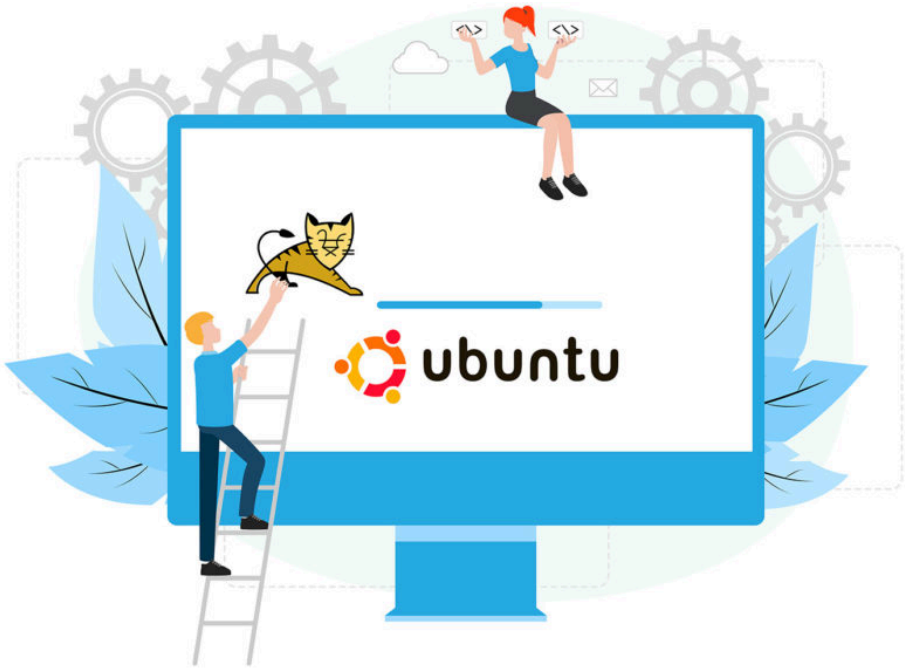

Installing Apache Tomcat 9 on Ubuntu 20.04

Apache Tomcat software (https://tomcat.apache.org/) is a Java-based HTTP server that can run Java technologies like Java Servlet, JavaServer Pages (JSP), and Java Expression Language. The advanced built-in customization options, high flexibility, and impressive stability make the software highly in-demand and a popular pick among developers globally. Let's see what makes Apache Tomcat stand out among competitors:

- **Open-Source**

Apache Tomcat is an open-source application. That means anyone can download, install and use the app free of cost.

- **Lightweight**

The lightweight feature counts as an added advantage when loading and redeployments as compared to competitors.

- **Flexibility**

The built-in customization option allows the user to customize the app to their liking based on their needs and project requirements.

- **Advanced Security**

Tomcat applications also offer an advanced level of security.

Since its first release (https://en.wikipedia.org/wiki/Apache_Tomcat) in 1998, the Apache Software Foundation has made incredible changes. As a result, the recent release is more stable than ever before. In this tutorial, **you will learn how to install Apache Tomcat 9 on Ubuntu 20.04.**

Prerequisites

Before we go ahead with installing Apache Tomcat on your Ubuntu system, make sure you have the following:

- An Ubuntu server- you can follow the steps to set up your server from our tutorial (https://blog.cloudsigma.com/how-to-set-up-your-ubuntu-18-04-server/).
- A non-root user with `sudo` (https://blog.cloudsigma.com/configuring-the-linux-sudoers-file/)privileges set up on your server (https://blog.cloudsigma.com/configuring-the-linux-sudoers-file/).

You are all set now. Next, keep following the steps below to install Apache Tomcat on Ubuntu 20.04

Step 1 — Install Java

First, verify if Java is already installed in your system using the command:

```
1 java -version
```

```
cloudsigma@server:~$ java -version

Command 'java' not found, but can be installed with:

sudo apt install openjdk-11-jre-headless  # version 11.0.14+9-0ubuntu2~20.04, or
```

(https://blog.cloudsigma.com/wp-content/uploads/3-1.jpg)

If Java is not installed in your system, then you need to install it in order to execute Java-based applications. You can install the Java Development Kit using the following command:

```
1 sudo apt install default-jre
```

```
cloudsigma@server:~$ sudo apt install default-jre
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  at-spi2-core ca-certificates-java default-jre-headless fontconfig-config
```

(https://blog.cloudsigma.com/wp-content/uploads/3.jpg)

Once the installation is complete, verify using the command:

```
java -version
```

```
cloudsigma@server:~$ java -version
openjdk version "11.0.14" 2022-01-18
OpenJDK Runtime Environment (build 11.0.14+9-Ubuntu-0ubuntu2.20.04)
OpenJDK 64-Bit Server VM (build 11.0.14+9-Ubuntu-0ubuntu2.20.04, mixed mode, sharing)
```

(https://blog.cloudsigma.com/wp-content/uploads/3-1-1.jpg)

Once the installation is complete, it's time to create a `tomcat` user account. For security purposes, it is advisable to run Tomcat with non-root privileges. Remember, if any of the page scripts have root privileges, you can easily modify the hard disk file completely with the page scripts. Next, we will create a new user and group that will run the Tomcat services.

Step 2 – Create & Set-Up Tomcat User

We will create a new user and group that will use all the Tomcat services. We will name the new group `tomcat` using the following command:

```
sudo groupadd tomcat
```

After creating a group name, we will create a new `tomcat` user and then add the user to the group `tomcat`:

- Create a new `tomcat` user.
- Add the user membership to the `tomcat` group.

When adding the user to the `tomcat` group, make sure to keep it confidential, so that no one can access your `tomcat` account. For security concerns, keep the user in the home directory where we are going to install `tomcat` (`/opt/tomcat`) and add a shell `/bin/false` :

```
sudo useradd -s /bin/false -g tomcat -d /opt/tomcat tomcat
```

Once our account setup is complete, let's move forward and install Tomcat:

```
cloudsigma@server:~$ sudo groupadd tomcat
cloudsigma@server:~$ sudo useradd -s /bin/false -g tomcat -d /opt/tomcat tomcat
cloudsigma@server:~$
```

(https://blog.cloudsigma.com/wp-content/uploads/3-2.jpg)

Step 3 – Install Tomcat

We are going to install Tomcat from Tomcat's official website (https://tomcat.apache.org/download-80.cgi). To harness its full potential, download the latest version. To upgrade to the most stable version available, go to the Binary **Distributions** section, scroll over to the **Core** list, and then copy the link to the **"tar.gz".** Once done, change the directory to `/tmp` :

```
1 cd /tmp
```

Next, using the `curl` command, download Tomcat from the official website as stated above:

```
1 sudo curl -O https://dlcdn.apache.org/tomcat/tomcat-9/v9.0.60/bin/apache-tomcat-9
```

Let's install Tomcat under the `/opt/tomcat` directory. After creating the directory, extract the archive using the following command:

```
1 sudo mkdir /opt/tomcat
2 sudo tar xzvf apache-tomcat-9.0.60.tar.gz -C /opt/tomcat --strip-components=1
```

(https://blog.cloudsigma.com/wp-content/uploads/3-3.jpg)

Step 4 – Update Permissions

After installing Tomcat in your system, you need to set permissions for the newly created `tomcat` user. Use the following command to change to the directory where we unpacked the Tomcat installation:

```
1 cd /opt/tomcat
```

Next, permit the `tomcat` group ownership over the entire installation directory:

```
1 sudo chgrp -R tomcat /opt/tomcat
2 sudo chmod -R g+r conf
3 sudo chmod g+x conf
```

Once done, make the `tomcat` user the owner of the `webapps` , `work` , `temp` , and `logs` directories:

```
1 sudo chown -R tomcat webapps/ work/ temp/ logs
```

```
cloudsigma@server:/tmp$ cd /opt/tomcat
cloudsigma@server:/opt/tomcat$ sudo chgrp -R tomcat /opt/tomcat
cloudsigma@server:/opt/tomcat$ sudo chmod -R g+r conf
cloudsigma@server:/opt/tomcat$ sudo chmod g+x conf
cloudsigma@server:/opt/tomcat$ sudo chown -R tomcat webapps/ work/ temp/ logs
```

(https://blog.cloudsigma.com/wp-content/uploads/3-4.jpg)

After setting up all the required permissions, the next step is to create a systemd service file to manage the Tomcat process and to run Tomcat as a service.

Step 5 – Create a systemd Unit File

Although we are done with installing Java, Tomcat needs to know where Java is installed. To know the Java installation location run the following command:

```
1 sudo update-java-alternatives -l
```

The output should look like this:

```
cloudsigma@server:/opt/tomcat$ sudo update-java-alternatives -l
java-1.11.0-openjdk-amd64      1111      /usr/lib/jvm/java-1.11.0-openjdk-amd64
```

(https://blog.cloudsigma.com/wp-content/uploads/3-5.jpg)

The highlighted part is `JAVA_Home` as shown below:

```
1 /usr/lib/jvm/java-1.11.0-openjdk-amd64
```

Next, we will create a systemd service file. Open a file named `tomcat.service` from the directory `/etc/systemd/system` using the following command:

```
1 sudo nano /etc/systemd/system/tomcat.service
```

Use VI editor to edit the file and modify the `JAVA_Home` by your `JAVA_Home` location:

```
[Unit]
Description=Apache Tomcat Web Application Container
After=network.target

[Service]
Type=forking Environment=JAVA_HOME=/usr/lib/jvm/java-1.11.0-openjdk-amd6 Environment
Environment='CATALINA_OPTS=-Xms512M -Xmx1024M -server -XX:+UseParallelGC'
Environment='JAVA_OPTS=-Djava.awt.headless=true -Djava.security.egd=file:/dev/./urar

ExecStart=/opt/tomcat/bin/startup.sh
ExecStop=/opt/tomcat/bin/shutdown.sh

User=tomcat
Group=tomcat
UMask=0007
RestartSec=10
Restart=always

[Install]
WantedBy=multi-user.target
```

```
GNU nano 4.8                    /etc/systemd/system/tomcat.service
[Unit]
Description=Apache Tomcat Web Application Container
After=network.target

[Service]
Type=forking

Environment=JAVA_HOME=/usr/lib/jvm/java-1.11.0-openjdk-amd64
Environment=CATALINA_PID=/opt/tomcat/temp/tomcat.pid
Environment=CATALINA_HOME=/opt/tomcat
Environment=CATALINA_BASE=/opt/tomcat
Environment='CATALINA_OPTS=-Xms512M -Xmx1024M -server -XX:+UseParallelGC'
Environment='JAVA_OPTS=-Djava.awt.headless=true -Djava.security.egd=file:/dev/./urandom'

ExecStart=/opt/tomcat/bin/startup.sh
ExecStop=/opt/tomcat/bin/shutdown.sh

User=tomcat
Group=tomcat
UMask=0007
RestartSec=10
Restart=always

[Install]
WantedBy=multi-user.target
```

(https://blog.cloudsigma.com/wp-content/uploads/3-6.jpg)

After adding `JAVA_Home`, save and close the file. Next, reload the systemd daemon so that it knows about our service file:

```
1 sudo systemctl daemon-reload
```

Next, start the Tomcat service using the following command:

```
1 sudo systemctl start tomcat
```

Step 6 – Firewall Configuration

After creating the systemd unit file, it's time to configure the firewalls. Firewall configurations are essential in enabling our requests and access to the Tomcat service. If you have correctly followed the guide, then it's certain that you already have a `ufw` firewall enabled.

Tomcat uses the port `8080` to accept conventional requests. Allow traffic to that port using the command:

```
1 sudo ufw allow 8080
```

```
cloudsigma@server:/opt/tomcat$ sudo ufw allow 8080
Rule added
Rule added (v6)
```

(https://blog.cloudsigma.com/wp-content/uploads/3-8.jpg)

The modified firewall enables you to access the default splash page in the IP address followed by `:8080`. You can open in a web browser by going to the IP as shown below:

```
1 http://server_domain_or_IP:8080
```

Once you open the link, you will find the default Tomcat splash page besides other relevant details. On clicking the Manager App link, you will see denied access. We can configure the access next. If you were able to successfully access Tomcat, it's time to enable the service file so that Tomcat automatically starts at boot:


```
1 sudo ufw allow 8080
```

Step 7 — Tomcat Web Management Interface Configuration

To use the manager web app that comes with Tomcat, we have to add a login to our Tomcat server. We can do that by editing the `tomcat-users.xml` file as shown below:

```
1 sudo nano /opt/tomcat/conf/tomcat-users.xml
```

```
 GNU nano 4.8                        /opt/tomcat/conf/tomcat-users.xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
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  contributor license agreements.  See the NOTICE file distributed with
  this work for additional information regarding copyright ownership.
  The ASF licenses this file to You under the Apache License, Version 2.0
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  distributed under the License is distributed on an "AS IS" BASIS,
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
  See the License for the specific language governing permissions and
  limitations under the License.
-->
<tomcat-users xmlns="http://tomcat.apache.org/xml"
              xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
              xsi:schemaLocation="http://tomcat.apache.org/xml tomcat-users.xsd"
```

(https://blog.cloudsigma.com/wp-content/uploads/1-44.png)

Tomcat comes up with web apps that enable the user to access the `manager-gui` and `admin-gui`. You can define a user between the `tomcat-users` tags as shown below:

```
1 <tomcat-users . . .>
2 <user username="admin" password="password" roles="manager-gui,admin-gui"/>
3 </tomcat-users>
```

```
<!--
  <role rolename="tomcat"/>
  <role rolename="role1"/>
  <user username="tomcat" password="<must-be-changed>" roles="tomcat"/>
  <user username="both" password="<must-be-changed>" roles="tomcat,role1"/>
  <user username="role1" password="<must-be-changed>" roles="role1"/>
-->
<tomcat-users>
  <user username="admin" password="password" roles="manager-gui,admin-gui"/>
</tomcat-users>
```

(https://blog.cloudsigma.com/wp-content/uploads/1-1-14.png)

Save and close the file once done.

All the recent versions of Tomcat restrict access to the Manager and Host Manager apps to connections coming from the server itself. To change the IP address restrictions on these, open the appropriate `context.xml` files. To access the Manager app, use the command:

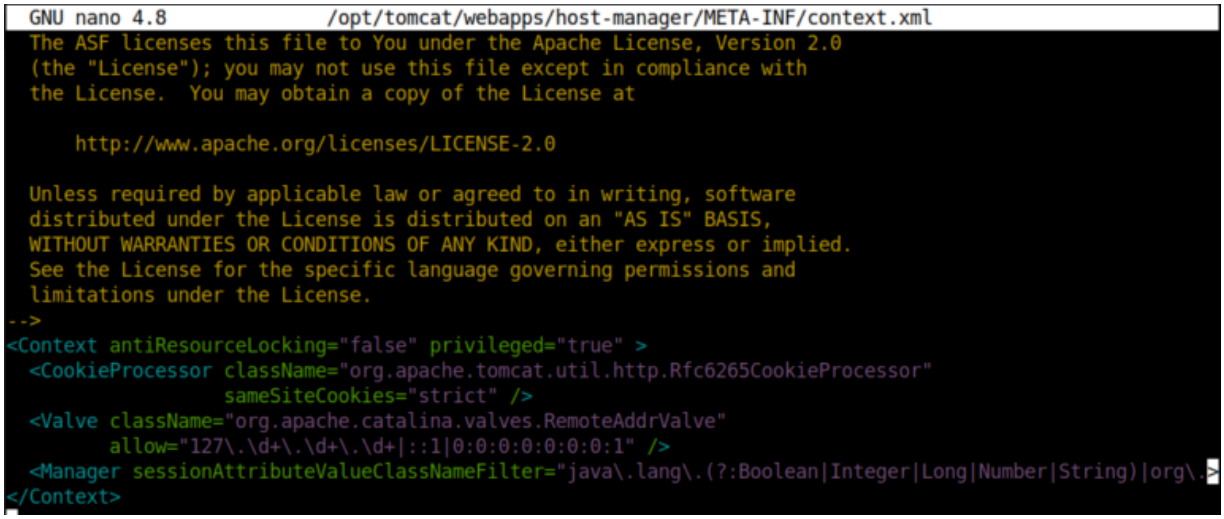
```
1 sudo nano /opt/tomcat/webapps/manager/META-INF/context.xml
```

Next, to access the Host Manager app, use the command:

```
1 sudo nano /opt/tomcat/webapps/host-manager/META-INF/context.xml
```

Based on your needs, you can choose to accept or deny connections. You can comment on the IP address restrictions to allow connections from anywhere. Otherwise, you can add the public IP address to the list to access connections coming from your IP address:

```
<Context antiResourceLocking="false" privileged="true" >
    <!--<Valve className="org.apache.catalina.valves.RemoteAddrValve"
    allow="127\.\d+\.\d+\.\d+|::1|0:0:0:0:0:0:0:1" />-->
</Context>
```



(https://blog.cloudsigma.com/wp-content/uploads/1-2-10.png)

Save and close the files when you are finished. To reflect the changes you have made, restart the Tomcat service using the following command:

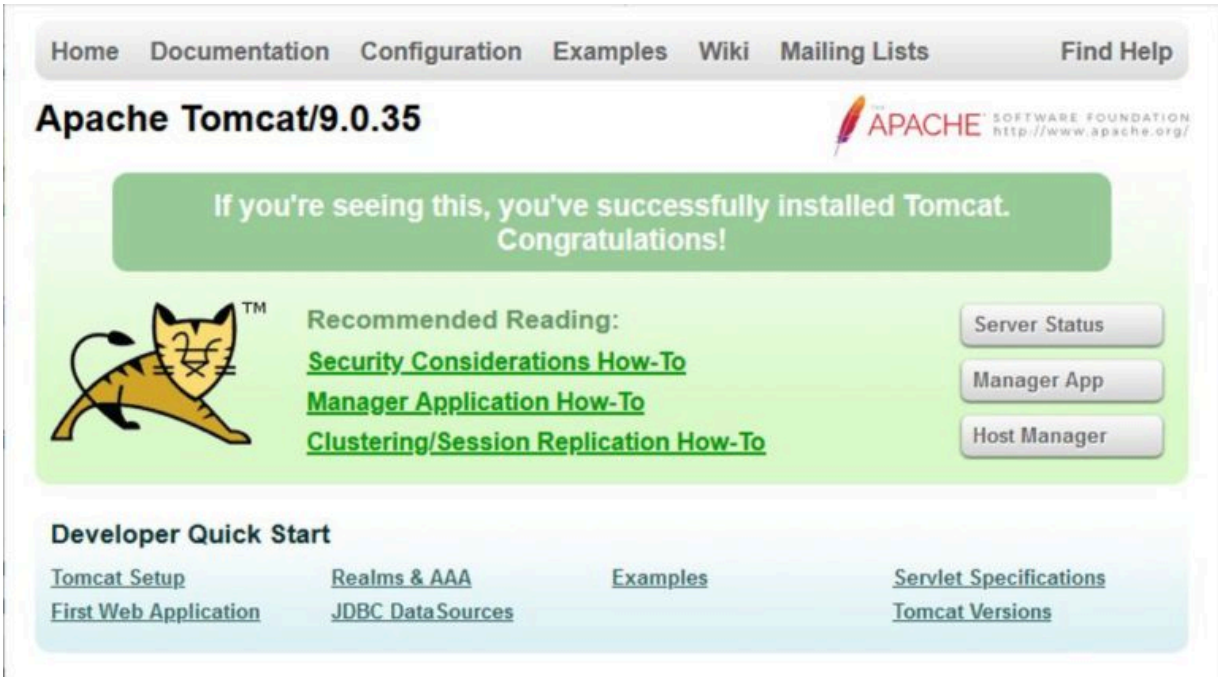
```
sudo systemctl restart tomcat
```

Step 8—Web Interface Access

After creating the Tomcat user, we can now access the web management interface. Once again, you can access the interface by going to the server's domain name or IP address followed by port `8080`:

```
http://server_domain_or_IP:8080
```

When you click on this url, you will see a page as shown below:

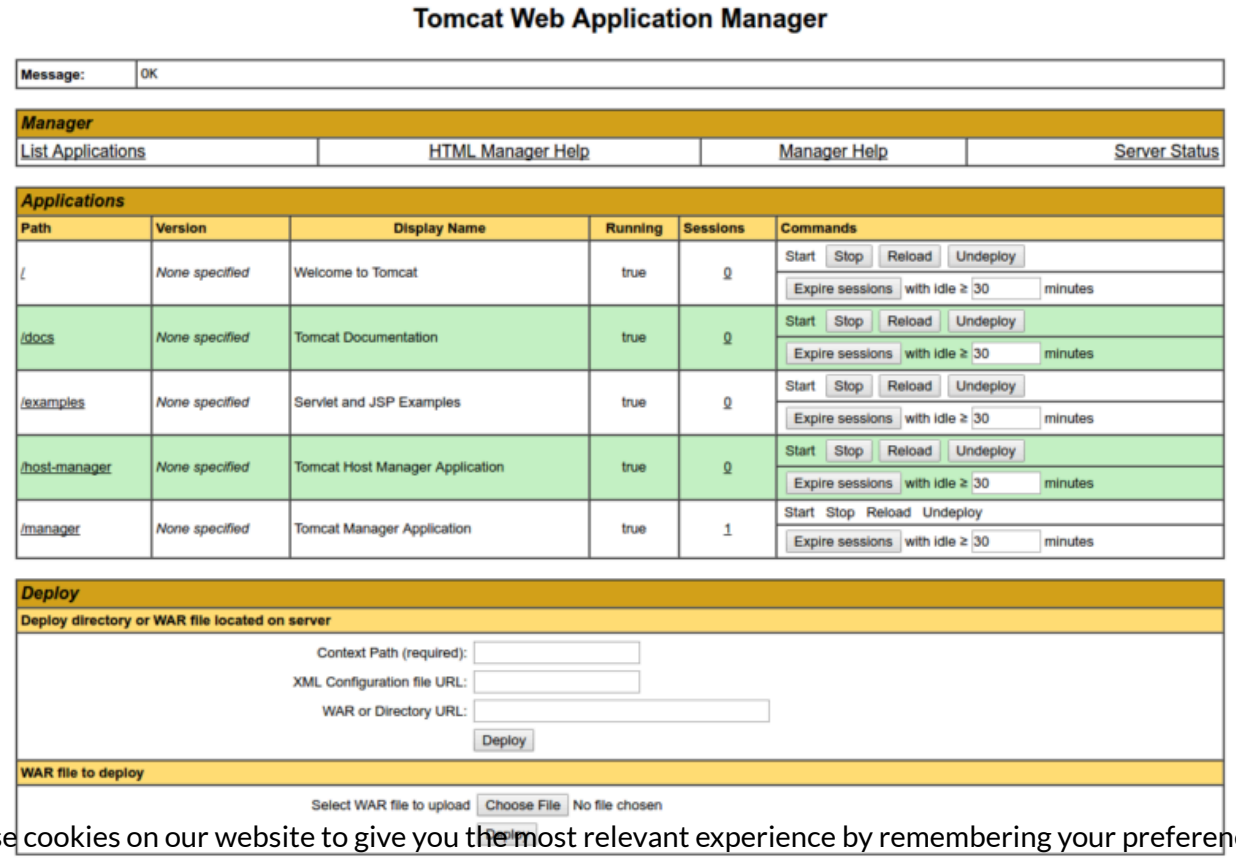


(https://blog.cloudsigma.com/wp-content/uploads/3-9.jpg)

You can access the Tomcat web apps by adding the account credentials that you added to the `tomcat-users.xml` . To access the Manager app, use the link:

```
1 http://server_domain_or_IP:8080/manager/html
```

When you click on this URL, you will see a page as shown below:

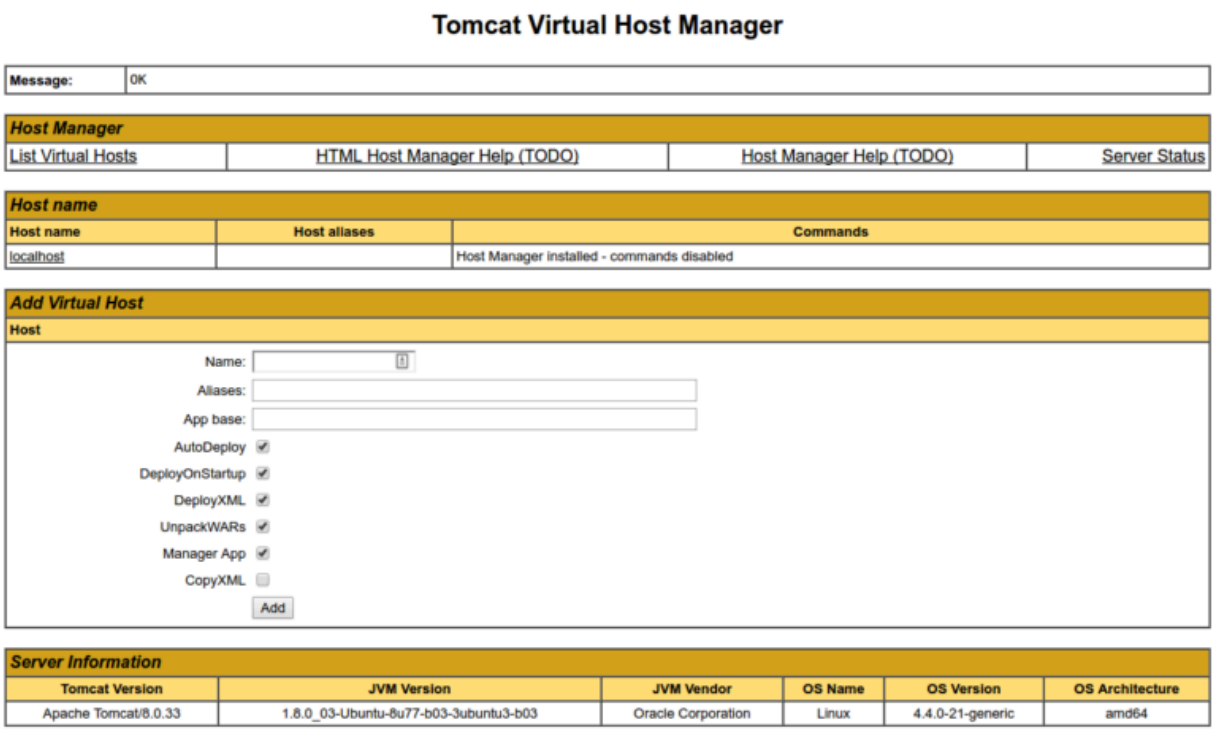


(https://blog.cloudsigma.com/wp-content/uploads/3-10-3.png)

To access the Host Manager app, use the link:

```
1 http://server_domain_or_IP:8080/host-manager/html
```

When you click on this URL, you will see a page as shown below:



(https://blog.cloudsigma.com/wp-content/uploads/3-11-2.png)

Conclusion

Your installation of Tomcat is now complete. You can freely deploy your own Java web applications and enhance your digital experience. You will find out that working on Apache Tomcat is much faster while loading and redeploying when compared to its alternatives. However, it is unsuitable when working with static pages.

For more resources on applying Apache-based servers check out our blog (https://blog.cloudsigma.com/blog/):

- A Guide on the mod_proxy Extension: Using Apache as a Reverse Proxy (https://blog.cloudsigma.com/a-guide-on-the-mod_proxy-extension-using-apache-as-a-reverse-proxy/)
- The World of Web Servers: Apache vs. Nginx (https://blog.cloudsigma.com/the-world-of-web-servers-apache-vs-nginx/)
- Setting Up Apache Virtual Hosts on Ubuntu 20.04 (https://blog.cloudsigma.com/setting-up-apache-virtual-hosts-on-ubuntu-20-04/)
- Installing the Apache Web Server on CentOS 7 (https://blog.cloudsigma.com/installing-the-apache-web-server-on-centos-7/)

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