

# Installing LaBB-CAT on Red Hat Linux

Broad steps are:

- i. Install Apache Tomcat 9
- ii. Install MariaDB
- iii. Install third-party tools (Praat, ffmpeg, HTK if required)
- iv. Install LaBB-CAT webapp

Additional steps might include

- Setting up password protection
- Integrating Apache web server with Tomcat

## Tomcat

Install Tomcat 9, later versions are currently not tested.

- (1) Install JDK with the following command:

```
sudo dnf install wget java-11-openjdk-devel
```

- (2) Download and unpack the Tomcat software with the following commands:

```
cd /usr/local
```

```
sudo wget https://downloads.apache.org/tomcat/tomcat-9/v9.0.95/bin//apache-tomcat-9.0.95.tar.gz
```

```
sudo tar -xvf apache-tomcat-9.0.95.tar.gz
```

```
sudo mv apache-tomcat-9.0.95 tomcat9
```

- (3) Create a user for the Tomcat service with the following commands:

```
sudo useradd -r tomcat
```

```
sudo chown -R tomcat:tomcat /usr/local/tomcat9
```

- (4) Create a service file */etc/systemd/system/tomcat.service* with your favourite text editor, e.g.

```
sudo vim /etc/systemd/system/tomcat.service
```

The content should be:

```
[Unit]
```

```
Description=Apache Tomcat Server
```

```
After=syslog.target network.target
```

```
[Service]
```

```
Type=forking
```

```
User=tomcat
```

```
Group=tomcat
```

```
Environment=CATALINA_PID=/usr/local/tomcat9/temp/tomcat.pid
```

```
Environment=CATALINA_HOME=/usr/local/tomcat9
Environment=CATALINA_BASE=/usr/local/tomcat9
ExecStart=/usr/local/tomcat9/bin/catalina.sh start
ExecStop=/usr/local/tomcat9/bin/catalina.sh stop
RestartSec=10
Restart=always
[Install]
WantedBy=multi-user.target
```

- (5) Remove example webapps that are installed by default: `sudo rm -r /usr/local/tomcat9/webapps/docs`  
`sudo rm -r /usr/local/tomcat9/webapps/host-manager``sudo rm -r /usr/local/tomcat9/webapps/manager`
- (6) Enable/start the Tomcat service with the following commands: `sudo systemctl daemon-reload` `sudo systemctl enable tomcat.service` `sudo systemctl start tomcat.service`
- (7) Ensure Tomcat can receive requests from external clients: `sudo firewall-cmd --zone=public --permanent --add-port=8080/tcp` `sudo firewall-cmd --reload`

At this point, Tomcat should be working. You can check this by opening your browser and browsing to your server's host name, on port 8080, something like:

`http://example.com:8080/`

(Substitute *example.com* with the host name of your server.).

This should display the Apache Tomcat default page (and not an error).

- (8) Ensure Tomcat's *catalina.out* log file is rotated by creating a *logrotate* configuration file called */etc/logrotate.d/tomcat* with your favourite text editor, e.g.  
`sudo vim /etc/logrotate.d/tomcat`
- (9) Add the following content to the file, and save it:

```
/usr/local/tomcat9/logs/catalina.out {
    copytruncate
    daily
    rotate 7
    compress
    missingok
    size 5M
}
```

## MariaDB

### Tip

These steps for installation of the MariaDB on relation database management software assume that you want to run MariaDB on the same server as Tomcat.

You can run Tomcat and MariaDB on different servers, just take the following steps on the other server, and make sure communication between the Tomcat and MariaDB servers is enabled.

If you do this, then you will also have to execute the following commands on the MariaDB server:

1. `sudo firewall-cmd --zone=public --add-port=3306/tcp --permanent`
2. `sudo firewall-cmd --reload`

(10) Install MariaDB with the following command:

```
sudo yum install mariadb
```

(11) Enable and system its service with the following commands:

```
sudo systemctl enable mariadb
```

```
sudo systemctl start mariadb
```

```
sudo systemctl stop mariadb
```

## Third Party Tools

LaBB-CAT integrates with various third party software tools, which you can install now. These steps are optional.

### Praat

If you want to use LaBB-CAT's batch Praat processing functionality, you must install Praat on the server, with the following commands:

1. `sudo wget https://www.fon.hum.uva.nl/praat/praat6420_linux-intel64-barren.tar.gz`
2. `sudo tar zxvf praat6420_linux-intel64-barren.tar.gz`
3. `sudo cp praat_barren /usr/bin/praat`

## ffmpeg

If you want LaBB-CAT to be able to automatically convert media between formats (e.g. automatically extract a .wav audio file from uploaded videos) you must install Praat on the server, with the following commands:

1. `sudo dnf install epel-release`
2. `sudo dnf install https://download.fedoraproject.org/pub/epel/epel-release-latest-9.noarch.rpm`
3. `sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-next-release-latest-9.noarch.rpm`
4. `sudo dnf install --nogpgcheck https://mirrors.rpmfusion.org/free/el/rpmfusion-free-release-$(rpm -E %rhel).noarch.rpm`
5. `sudo dnf install https://mirrors.rpmfusion.org/nonfree/el/rpmfusion-nonfree-release-$(rpm -E %rhel).noarch.rpm`
6. `sudo dnf install https://mirror.stream.centos.org/9-stream/CRB/x86_64/os/Packages/ladspa-devel-4.0.0-1.el9.x86_64.rpm`
7. `sudo dnf install ffmpeg ffmpeg-devel`

## HTK

If you want to use HTK for forced alignment, you must install HTK on the server, using the following steps.

1. Ensure you have registered a username and password on <http://htk.eng.cam.ac.uk/register.shtml>
2. Install prerequisites for compiling HTK from source: `sudo yum -y install glibc-devel.i686 libX11-devel.i686 glibc-devel.i686 libstdc++-devel.i686`
3. Download and unpack the source code: `cd /tmp`
4. In the following command, replace *my-username* with the username you registered on the HTK site: `wget --user=my-username --ask-password http://htk.eng.cam.ac.uk/ftp/software/htk3.4.1.tar.gz`
5. Enter your HTK password when asked.
6. `tar -zxf HTK-3.4.1.tar.gz`
7. Prepare for compilation: `cd htk`
8. `./configure`
9. Open the *HLMTools/Makefile* file with your favourite text editor, e.g. `vim HLMTools/Makefile` ...and replace spaces on line 77 with a tab character. Then save the file.
10. Compile and install the software with the following commands: `make all sudo make install`

## LaBB-CAT webapp

Once Tomcat and MariaDB are installed, the LaBB-CAT web application can be installed, using the following steps:

- (I2) Download the most recent *labbbcat-server\_yyyymmdd.zip* file from SourceForge:  
<https://sourceforge.net/projects/labbbcat/files/install/>
- (I3) Unzip the resulting file, which will contain LaBB-CAT's Web Application Archive, called *labbbcat.war*
- (I4) Copy *labbbcat.war* into Tomcat's *webapps* directory with a command like:  

```
sudo cp labbbcat.war /usr/local/tomcat9/webapps/
```

Tomcat will automatically unpack the file into a subdirectory with the same name as the .war file. You can check this is successful with the following command:

```
sudo ls /usr/local/tomcat9/webapps/labbbcat/
```

...which should show a list of files, rather than returning an error.

- (I5) In your web browser, open the *labbbcat* webapp page, with a URL like:  
`http://example.com:8080/labbbcat/`  
(Substitute *example.com* with the host name of your server.)

You should see a page with the title: *web application self-installation* and a form asking for information for database information.

- (I6) Next to the title *LaBB-CAT Database Exists* there is an expandable section labelled:  
*A MySQL database and MySQL user can be pre-created*  
Click this section to expand it, revealing SQL statements for pre-creating the database.

There are four SQL commands that look something like this:

```
CREATE DATABASE IF NOT EXISTS labbbcat CHARACTER SET utf8mb4 COLLATE utf8mb4_general_ci;
CREATE USER 'labbbcat'@ '%' IDENTIFIED BY ...;
GRANT ALL PRIVILEGES ON labbbcat.* TO 'labbbcat'@ '%';
GRANT PROCESS ON *.* TO 'labbbcat'@ '%';
```

- (I7) Back in your command shell on the server on which MariaDB is installed, start the *mysql* command line interface with the following command:  

```
sudo mysql
```

  
This will display a command prompt something like: `MariaDB [(none)]>`
- (I8) Copy and paste the four SQL commands from your browser into the MariaDB command prompt, and hit return to execute all of them.
- (I9) Exit from the MariaDB command prompt with the following command:  

```
exit
```

(20) Back in your browser, on the *web application self-installation* page, tick the box labelled:

*The above database already exists, so don't create it.*

(21) Press the *install* button.

You should see a page listing steps that are being taken during the webapp installation, with *Installation is complete.*

...printed at the bottom.

After a short delay, the page will reload, and the LaBB-CAT home page will be displayed.

LaBB-CAT is now installed on your server, and can be accessed with the URL shown in your browser.

## Additional steps

### Password Protection

When first installed, LaBB-CAT can be accessed by anyone who has a browser connection to the server. You probably want to password-protect LaBB-CAT to restrict access.

Follow these optional steps to enable password protection:

- (22) Ensure that Tomcat itself can connect to the MariaDB database to authenticate users, using the following commands:  

```
sudo cp /usr/local/tomcat9/webapps/labbcats/WEB-INF/lib/mysql-connector-java-latest.jar /usr/local/tomcat9/lib/
```

```
sudo chown tomcat:tomcat /usr/local/tomcat9/lib/mysql-connector-java-latest.jar
```
- (23) Open LaBB-CAT's *WEB-INF/web.xml* file with your favourite text editor, e.g.  

```
sudo vim /usr/local/tomcat9/webapps/labbcats/WEB-INF/web.xml
```
- (24) Delete the lines that contain the phrase `USER-SECURITY` - there should be two lines, one that opens an XML comment, and one that closes it.
- (25) Save the *web.xml* file.
- (26) Restart Tomcat to ensure the changes take effect, using the following command:  

```
sudo systemctl restart tomcat.service
```
- (27) In your web browser, open LaBB-CAT's home-page (or reload the page if it's already displayed).  
You should be asked for a username and password.  
(If you see an error, close your browser completely down and start it up again)
- (28) Enter the username `labbcats` and the password `labbcats`.  
You should see a page asking you to change your password.
- (29) Set your `labbcats` user's password to something memorable, and the LaBB-CAT home page will be displayed.

LaBB-CAT is now password protected.

You can add new users using the *users* link at the top of the page:

1. Fill in the *User ID* box at the top of the page.
2. Press the *New* button on the right.
3. Set an initial password for the new user by entering it twice.
4. Press the *Save* button that appears after you've entered the same new password twice.

The new user will have read-only access to LaBB-CAT. If you want them to have more privileges, you need to tick corresponding *Roles* checkboxes for their user:

- *edit*: the user can upload transcripts, media, and transcript/participant meta-data.
- *admin*: the user can do anything at all, and
- *export*: the user can export a copy of the whole LaBB-CAT instance.

## Tomcat integration with Apache

Your server may already have Apache web server installed, e.g. for serving requests on the normal HTTP port and/or supporting encrypted HTTPS connections.

Tomcat can be integrated with Apache, so that HTTP/HTTPS requests received by Apache are handled by Tomcat.

Steps to integrate Apache Web Server with Tomcat are are:

1. Install package dependencies:

```
sudo dnf install httpd-devel apr apr-devel apr-util apr-util-devel gcc  
gcc-c++ make autoconf libtool httpd-devel.x86_64
```

2. Download and install Jk:

```
1. sudo mkdir -p /opt/mod_jk/  
2. cd /opt/mod_jk/  
3. sudo wget https://downloads.apache.org/tomcat/tomcat-connectors/jk/tomcat-connectors-  
4. sudo tar -xvzf tomcat-connectors-1.2.50-src.tar.gz  
5. cd tomcat-connectors-1.2.50-src/native  
6. sudo ./configure --with-apxs=/usr/bin/apxs  
7. sudo make  
8. sudo libtool --finish /usr/lib64/httpd/modules  
9. sudo cp ./apache-2.0/mod_jk.so /etc/httpd/modules/mod_jk.so
```

3. Configure Tomcat to accept connections from Apache:

1. Open `/etc/tomcat/server.xml` with your favourite text editor, e.g.

```
sudo vim /etc/tomcat/server.xml
```

2. Change the *Engine* tag to be:

```
<Engine name="Catalina" defaultHost="localhost" jvmRoute="jvm1">
```

3. Comment **out** the connector for port 8080:

```
<!-- <Connector port="8080" protocol="HTTP/1.1" redirectPort="8443"  
> -->
```

4. Comment **in** the connector for 8009, and set the attributes as follows:

```
<Connector protocol="AJP/1.3"  
    address="127.0.0.1"  
    port="8009"  
    maxParameterCount="-1"  
    redirectPort="8443"  
    secretRequired="false"/>
```



5. Save the file.
4. Create the Jk module configuration file */etc/httpd/conf.d/mod\_jk.conf* with the following content:

```
LoadModule jk_module "/etc/httpd/modules/mod_jk.so"
JkWorkersFile /etc/httpd/conf/workers.properties
JkShmFile      /var/run/httpd/mod_jk.shm
JkLogFile      /var/log/httpd/mod_jk.log
JkLogLevel     info
JkLogStampFormat "[%a %b %d %H:%M:%S %Y] "
#JkRequestLogFormat "%w %V %T"
#JkEnvVar SSL_CLIENT_V_START worker1
```

5. Create */var/run/mod\_jk*:

1. `sudo mkdir -p /var/run/mod_jk`
2. `sudo chown apache:apache /var/run/mod_jk`

6. Create the */etc/httpd/conf/workers.properties* file with the following content:

```
workers.apache_log=/var/log/httpd
worker.list=app1Worker
worker.stat1.type=status
worker.app1Worker.type=ajp13
worker.app1Worker.host=127.0.0.1
worker.app1Worker.port=8009
```

7. Create the */etc/httpd/conf.d/tomcat.conf* file with the following content (substituting *example.com* with your server's host name):

```
<VirtualHost *:80>
    ServerName example.com
    ServerAdmin webmaster@example.com
    LogFormat "%h %l %u %t \"%r\" %>s %b \"%{Referer}i\" \"%{User-agent}i\"" combined
    CustomLog /var/log/httpd/tomcat.log combined
    ErrorLog /var/log/httpd/tomcat.log
    <IfModule mod_jk.c>
        JkMount /* app1Worker
        # so that certbot works:
        JkUnMount /.well-known/* app1Worker
    </IfModule>
</VirtualHost>
```

8. Restart Tomcat and Apache Web Server:

1. `sudo service tomcat restart`
2. `sudo service httpd restart`

9. If you are using SELinux, you may see an error when restarting `httpd`. If so, execute the following commands:

1. `sudo ausearch -c 'httpd' --raw | audit2allow -M my-httpd`
2. `sudo semodule -i my-httpd.pp`
3. `sudo service httpd restart`

Now ordinary browser connections like `http://example.com/labbbcat` should show the LaBB-CAT home page, and if you have HTTPS configured with an SSL certificate, encrypted connections like `https://example.com/labbbcat` should work.