Software Installation Guide

Exported on 03/20/2020

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2 Introduction

2.1 General information

The goal of this document is to provide a detailed guide for anybody planning to install and configure Omixon HLA Twin in their environment. The following chapters will explain the possible HLA Twin configurations and the way to configure them properly. For further information and assistance, please contact us at support@omixon.com.[1]

2.2 Updating from HLA Twin 3.1.3 or below

Please note that the update process is different than usual. To ensure a safe update without any data loss, please take the time to read the Installation and Configuration chapter that is relevant to you.

1 mailto:support@omixon.com.

3 Configurations

3.1 General information

This chapter explains the three possible configurations HLA Twin can be used in. Each of them is suitable for laboratories with different throughputs.

Each configuration will require a MySQL 8 database server to be installed either locally or remotely.

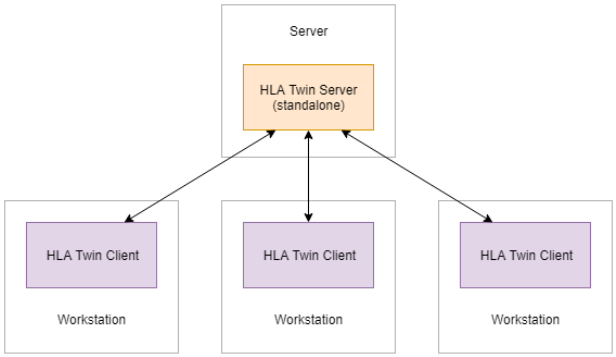
3.2 Desktop

- Suitable for smaller laboratories
- One user can be logged in at a time
- One sample can be analyzed at a time

The software runs on one computer, the users have to share the same computer to work with the software. HLA Twin has its own user management system, so it does not matter who is logged in in Windows, the user can work under their own identity in HLA Twin (this is important for audit, workflow and commenting features). If the same software is installed on another computer, the two pieces of software are unable to communicate, so the mentioned user information will be unavailable. We advise against it.

3.3 Server (standalone)

- Suitable for medium-throughput laboratories
- **Multiple users can work at the same time**
- One sample can be analyzed at a time



The HLA Twin Server (standalone):

- runs sample analyses
- prepares the information for the HLA Twin Client
- holds all user data

The HLA Twin Client

- controls the HLA Twin Server
- shows what the HLA Twin Server sends to it
- is "an empty shell"

Multiple HLA Twin Client software can connect to the HLA Twin Server at the same time.

The license is bound to the HLA Twin Server so the number of HLA Twin Clients is not limited.

3.4 Server (distributed)

- Suitable for high-throughput laboratories
- Multiple users can work at the same time

- **Multiple samples can be analyzed at the same time (depending on the number of Typers)**

The HLA Twin Server (distributed):

- **does not** run sample analyses
- controls the HLA Twin Typer instances
- prepares the information for the HLA Twin Client
- holds all user data

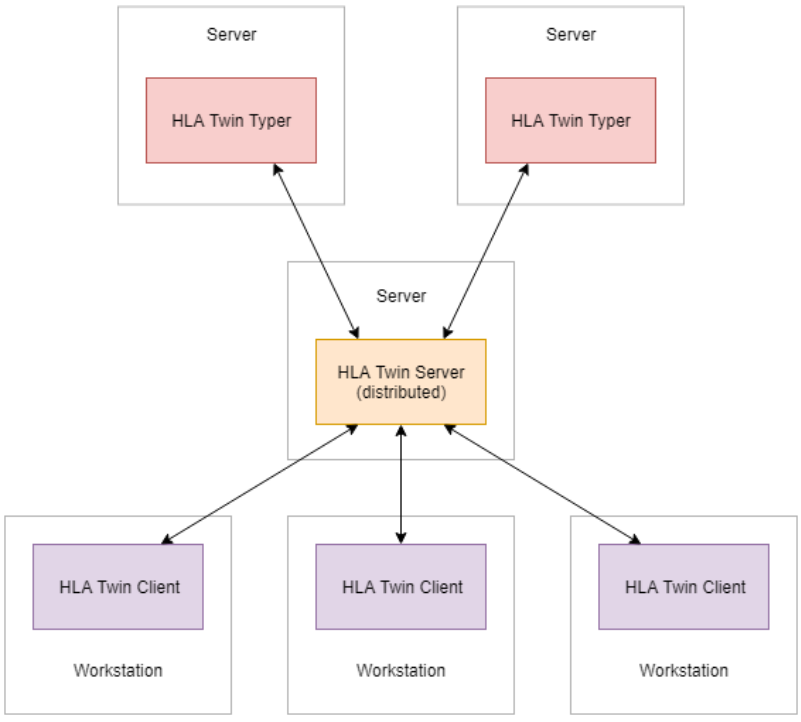
The HLA Twin Typer:

- runs sample analyses
- sends the analysis results to the HLA Twin Server

The HLA Twin Client

- controls the HLA Twin Server
- shows what the HLA Twin Server sends to it
- is "an empty shell"

Multiple HLA Twin Typers can be connected to one HLA Twin Server. An HLA Twin Server and an HLA Twin Typer instance can run on the same server.



4 Hardware requirements

4.1 HLA Twin Desktop

- **CPU**: 64bit CPU with at least 4 physical cores (8 threads or vCPUs)
- **OS**: Any 64bit operating system
- **RAM**: At least 14 GB for the software but 18 GB is recommended
- **Video**: OpenGL 2.0 compatible video card

4.2 HLA Twin Client

- **CPU**: 64bit CPU with at least 2 physical cores (4 is recommended)
- **OS**: Any 64bit operating system
- **RAM**: At least 4 GB for the software but 6 GB is recommended
- **Video**: OpenGL 2.0 compatible video card
- **Network:** At least a 100/1000 Mbps connection

4.3 HLA Twin Server (standalone)

- **CPU**: 64bit CPU with at least 4 physical cores (8 threads or vCPUs)
- **OS**: Any 64bit operating system (OSX not supported)
- **RAM**: At least 18 GB for the software but 26.5 GB is recommended
- **Network:** At least a 100/1000 Mbps connection

4.4 HLA Twin Server (distributed)

- **CPU**: 64bit CPU with at least 4 physical cores (8 threads or vCPUs)
- **OS**: Any 64bit operating system (OSX not supported)
- **RAM**: At least 6 GB for the software but 8 GB is recommended
- **Network:** At least a 100/1000 Mbps connection

4.5 HLA Twin Typer (distributed)

- **CPU**: 64bit CPU with at least 4 physical cores (8 threads or vCPUs)
- **OS**: Any 64bit operating system
- **RAM**: At least 16 GB for the software but 22 GB is recommended
- **Network:** At least a 100/1000 Mbps connection

5 Database

All editions of HLA Twin will rely on an external **MySQL 8** database that you need to set up before installing HLA Twin. This is a new improvement in HLA Twin to provide a more robust and more responsive user experience.

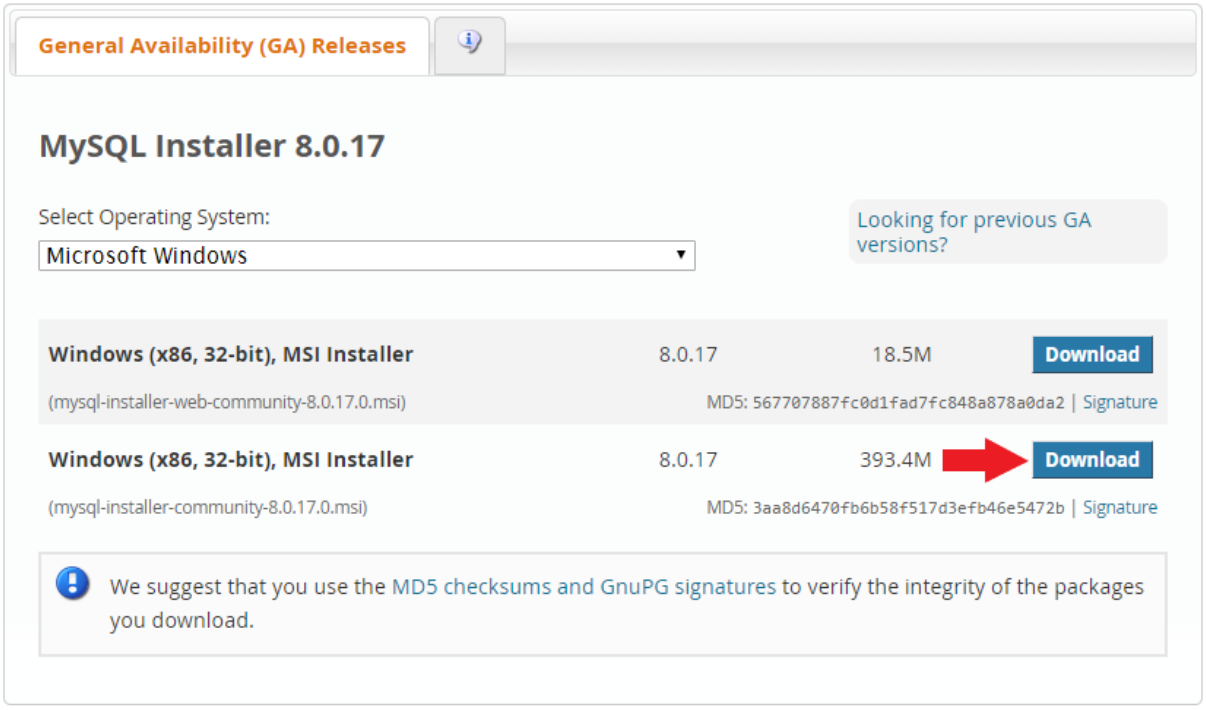
Please follow the instructions in this chapter prior to the installation of HLA Twin.

5.1 Windows

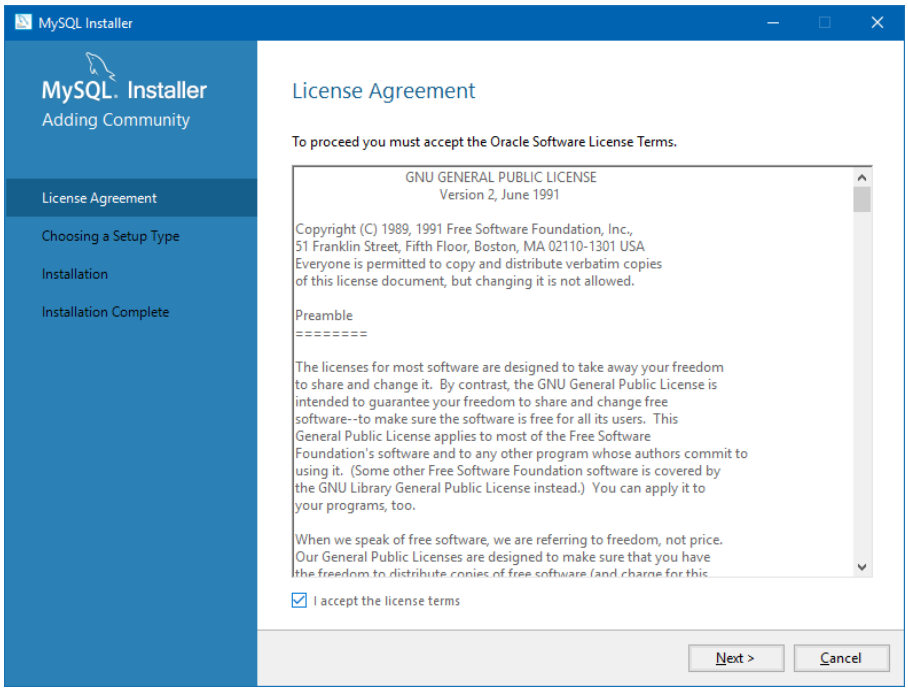
If you have a pre-existing **MySQL 8** server in your environment that you would like to use, please see Configuring a pre-existing MySQL database(see page 59). We suggest using a local instance of MySQL for HLA Twin Desktop users.

Please follow these steps to download and install MySQL 8 for Windows.

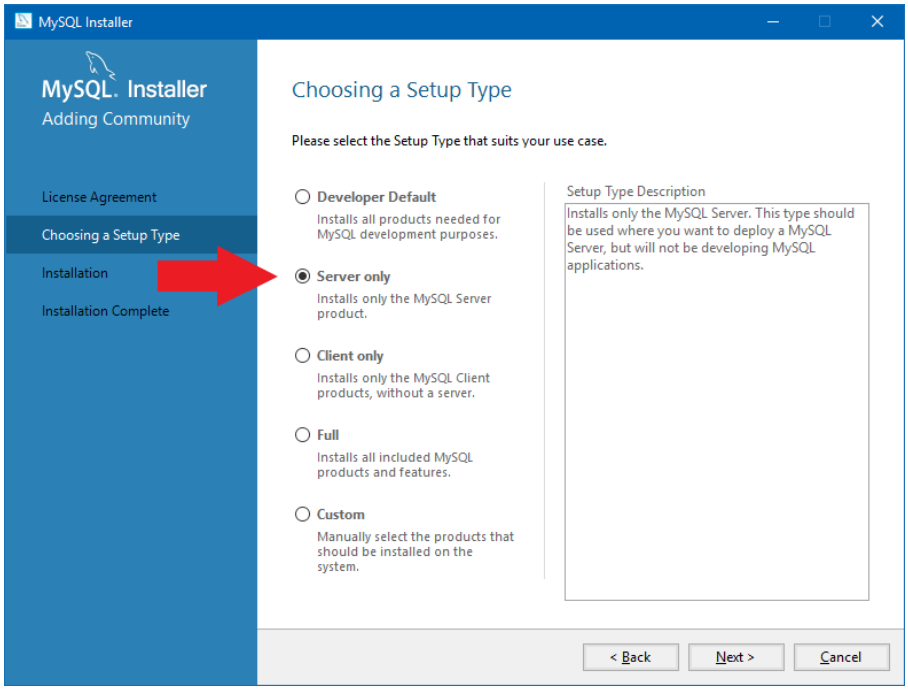
1. Go to https://dev.mysql.com/downloads/installer/
2. Download the "Windows (x86, 32-bit), MSI Installer" package



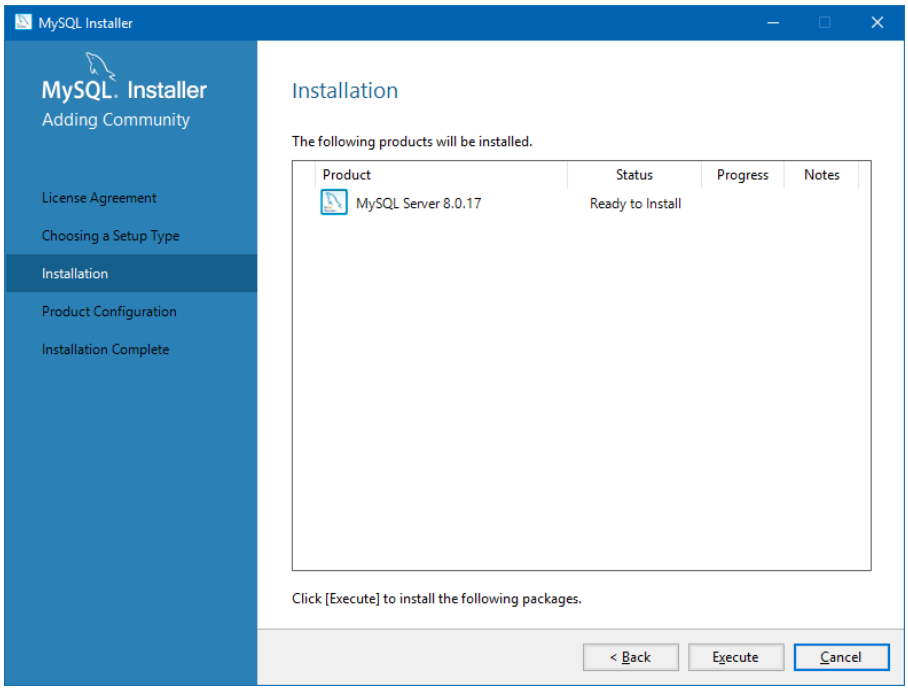
3. Once downloaded, start the installer, accept the license agreement, and click "Next"



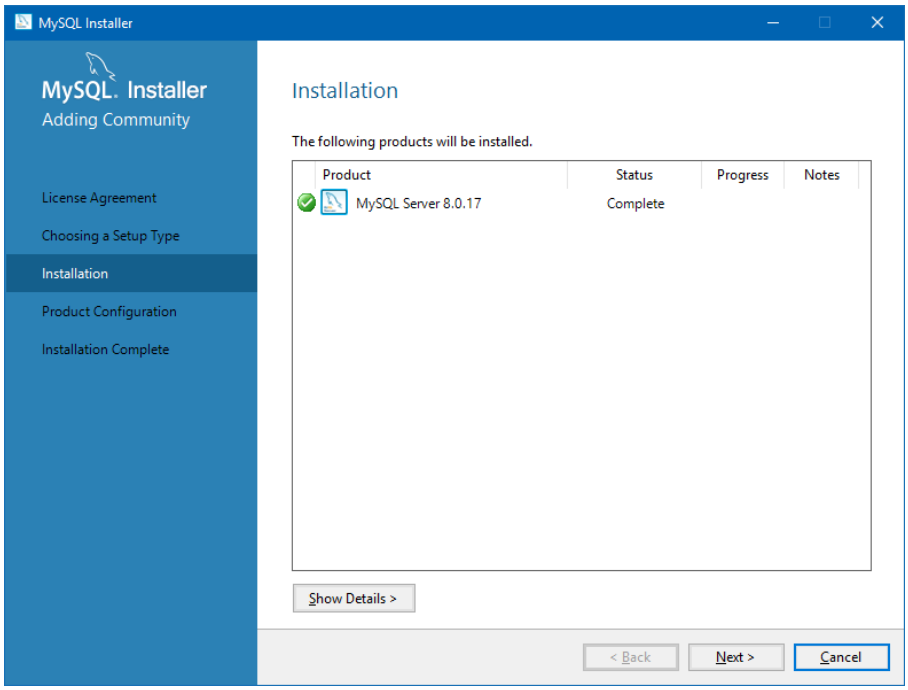
4. Select "Server only" and click "Next"



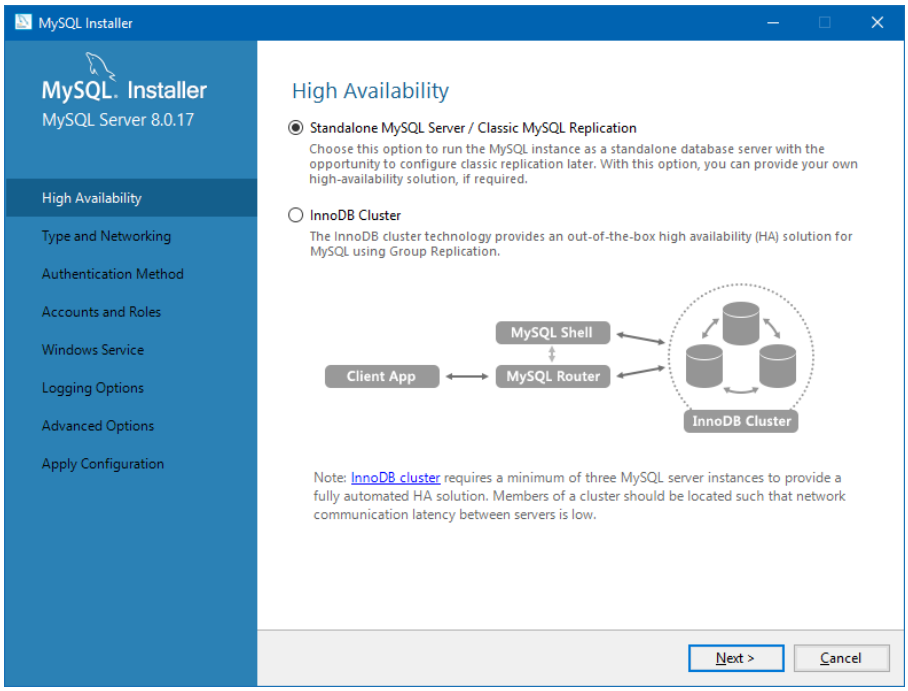
5. Click "Execute" (please note, that the installer might state that MySQL Server is not in "Ready to Install" status. Please click on it to see how to resolve the issue)



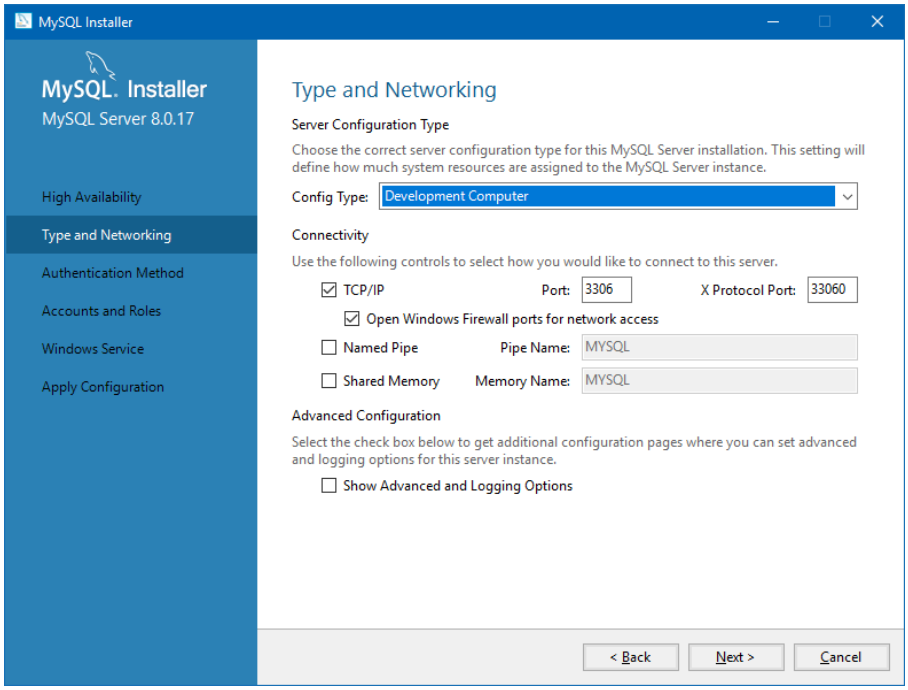
6. When the installation is done, you will see a green tick next to the MySQL icon. Click "Next", **and when the "Product Configuration" window appears, click "Next" again.**



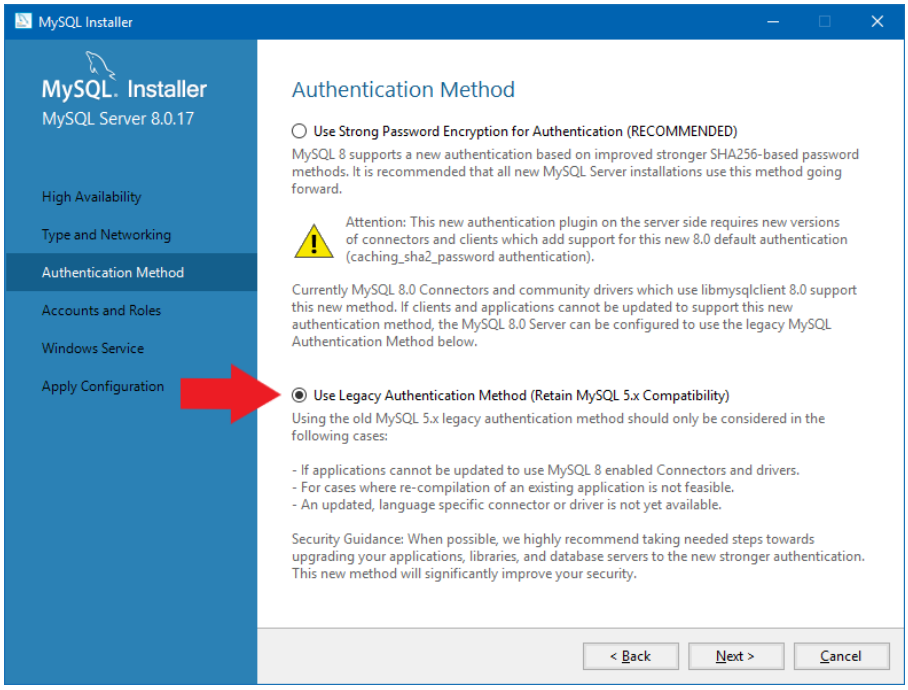
7. Select the default "Standalone MySQL Server / Classic MySQL Replication" option and click "Next"



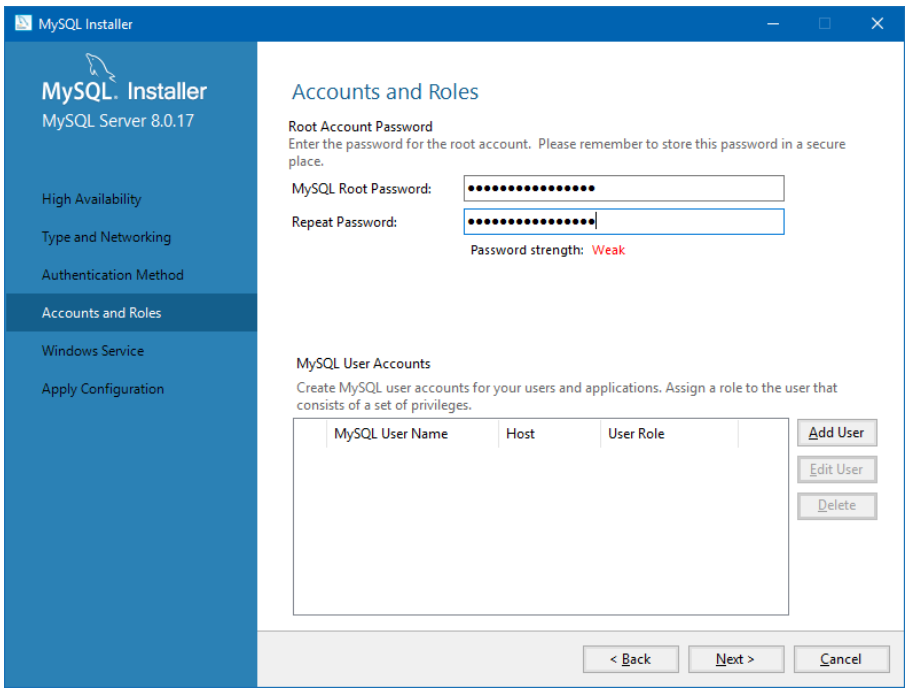
8. Please use the default values on the "Type and Networking" screen, then click "Next"



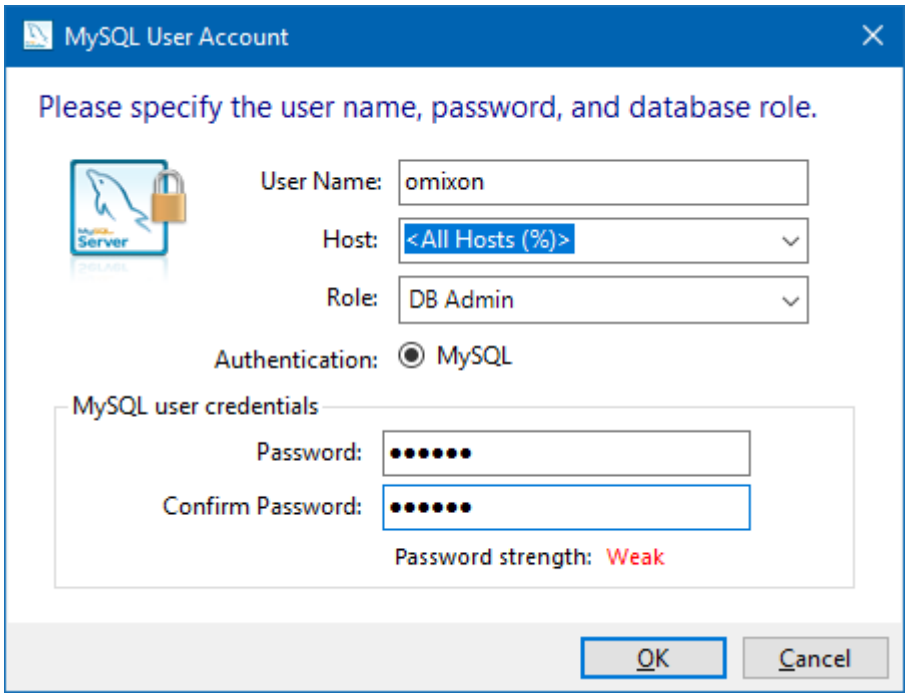
9. **Select "Use Legacy Authentication Method (Retain MySQL 5.x Compatibility), then click "Next"**



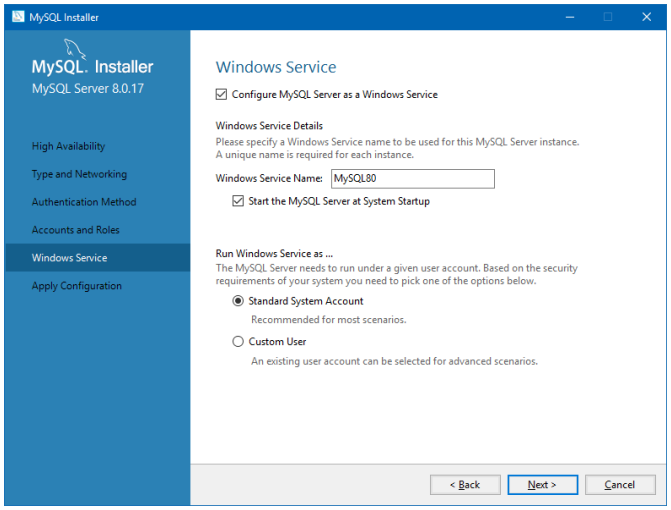
10. Specify the MySQL Root Password (**please make a note of this password)**, then click on **"Add User"**



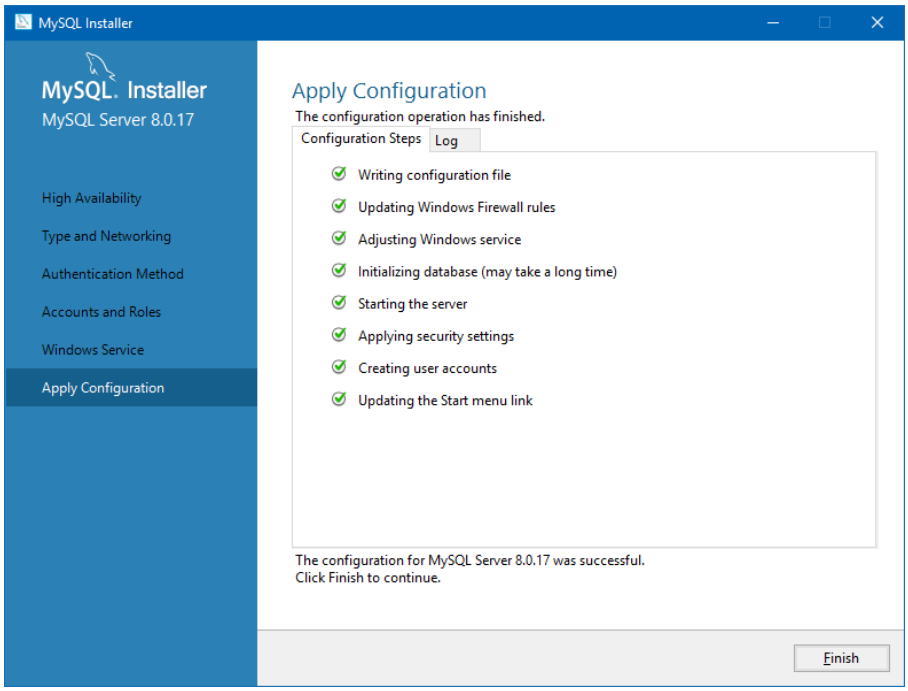
11. Type in "omixon" as the username **and the password** as well, then click "Ok" and "Next"



12. Please use the default values, and click "Next", then "Execute".



13. Click Finish when the configuration is complete, then click "Next" then "Finish".



MySQL is now configured properly. You can proceed to install HLA Twin.

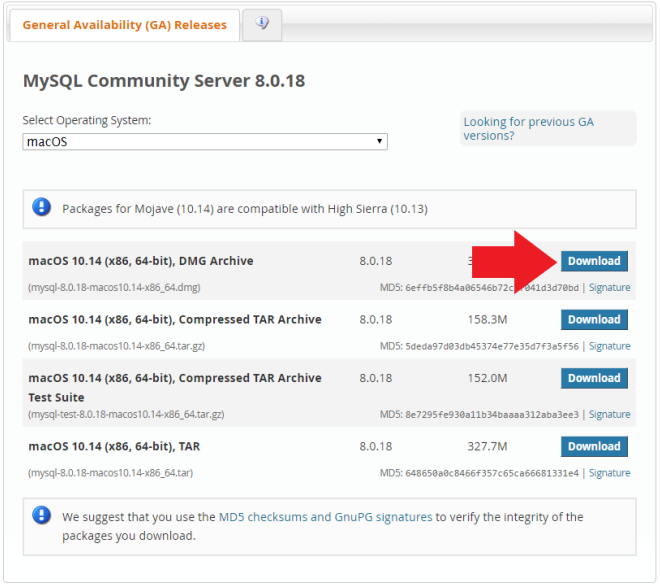
5.2 OSX

If you have a pre-existing **MySQL 8** server in your environment that you would like to use, please see Configuring a pre-existing MySQL database(see page 59). We suggest using a local instance of MySQL for HLA Twin Desktop users.

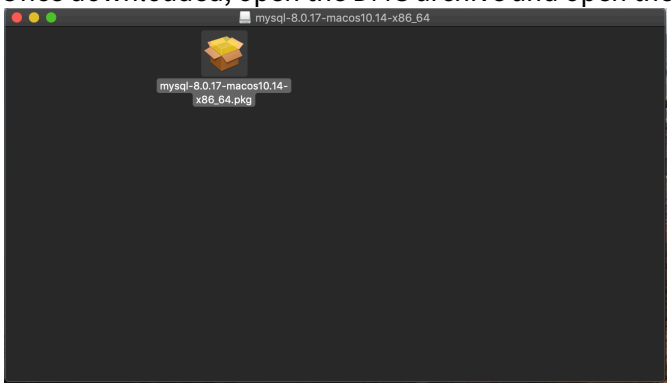
Please follow these steps to download and install MySQL 8 for OSX.

1. Go to https://dev.mysql.com/downloads/mysql/

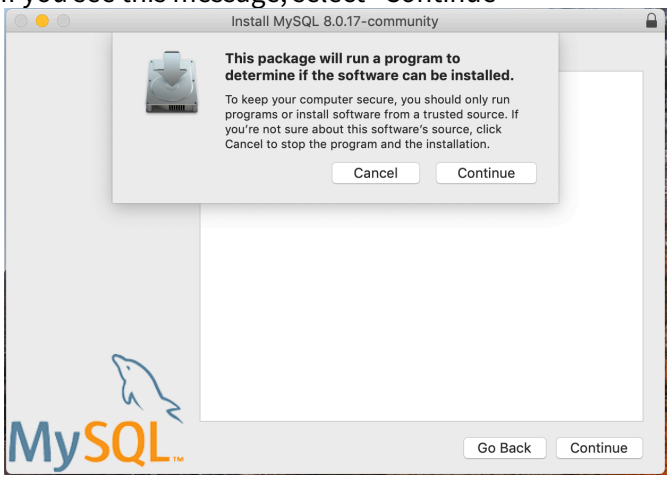
2. Download the "macOS 10.14 (x86, 64-bit), DMG Archive" package



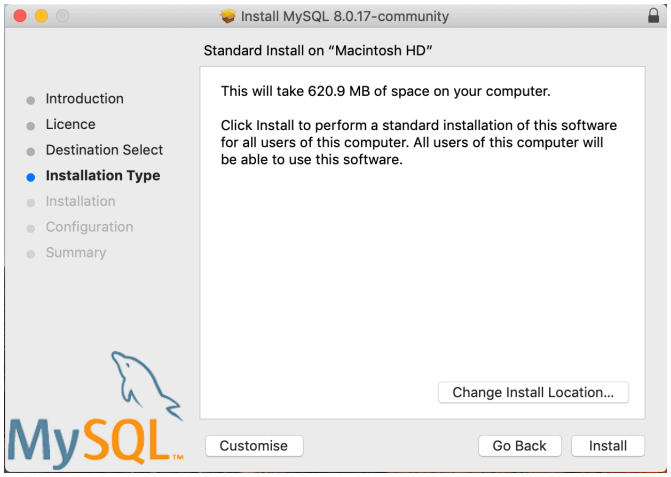
3. Once downloaded, open the DMG archive and open the PKG file in it



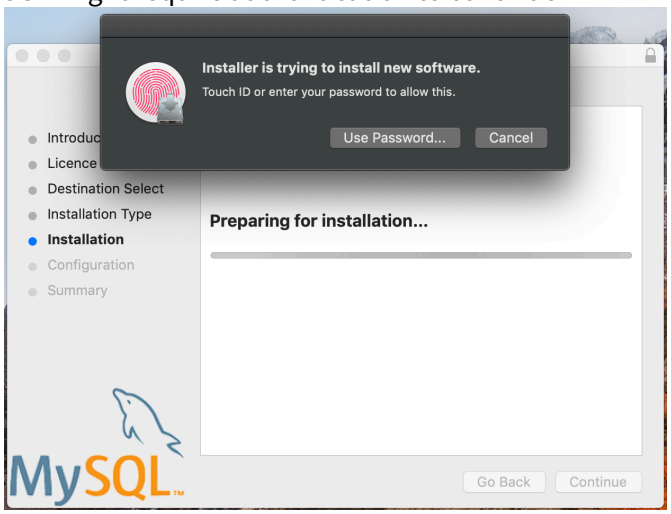
4. If you see this message, select "Continue"



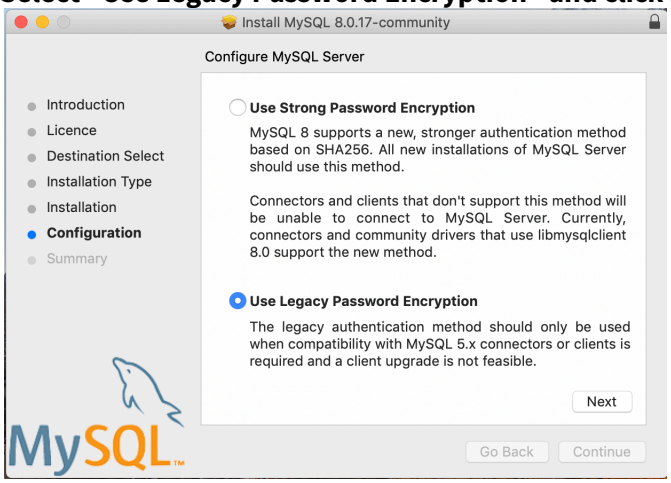
5. After going through the introduction and the license, select "Install" on the "Installation Type" window



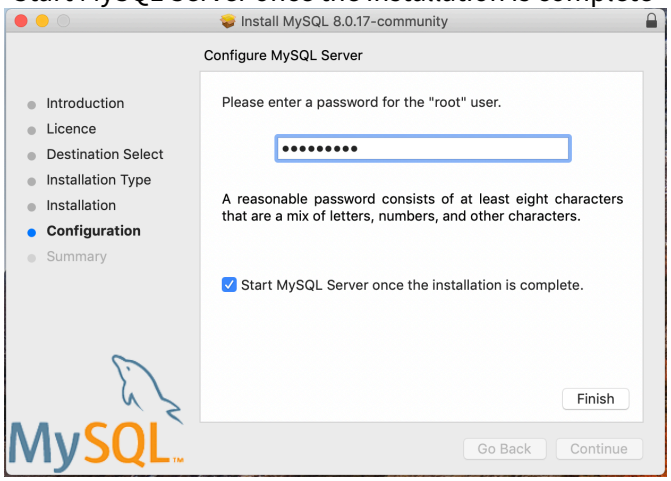
6. OSX might require authentication to continue



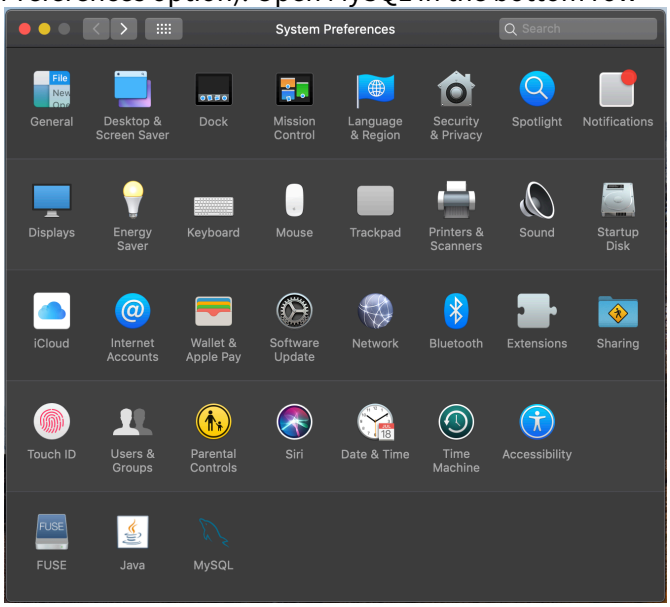
7. **Select "Use Legacy Password Encryption" and click next**



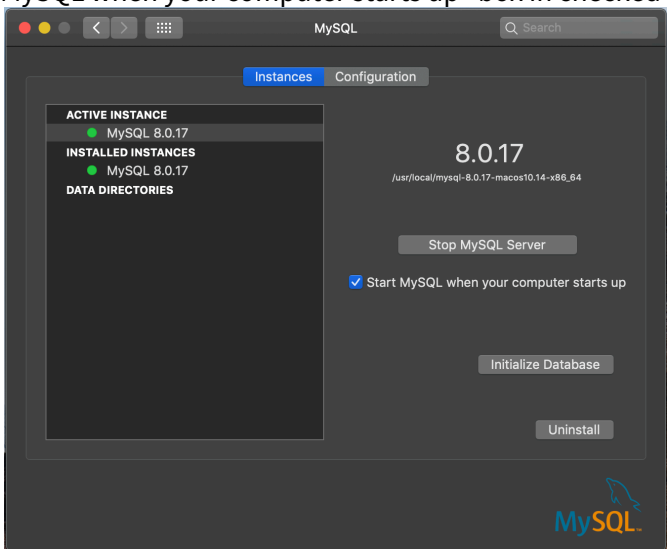
8. Specify the MySQL Root Password (**please make a note of this password**) and make sure that "Start MySQL Server once the installation is complete" is set, and click Finish



9. After the installation is done, open System Preferences (Apple menu on the top left, System Preferences option). Open MySQL in the bottom row

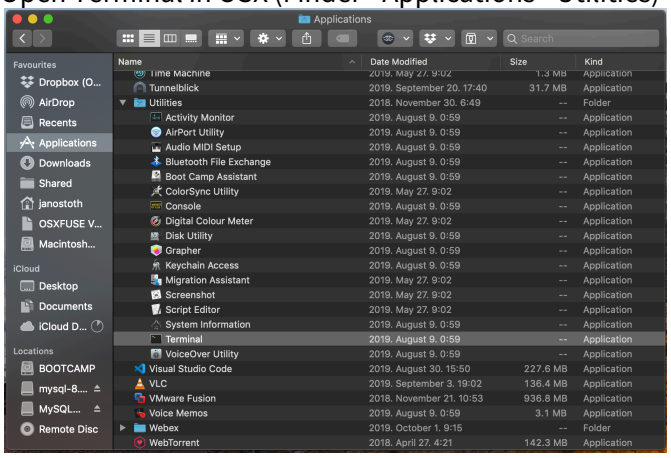


10. Make sure that MySQL is running (green dot next to it in the list to the left) and that the "Start MySQL when your computer starts up" box in checked to the right.

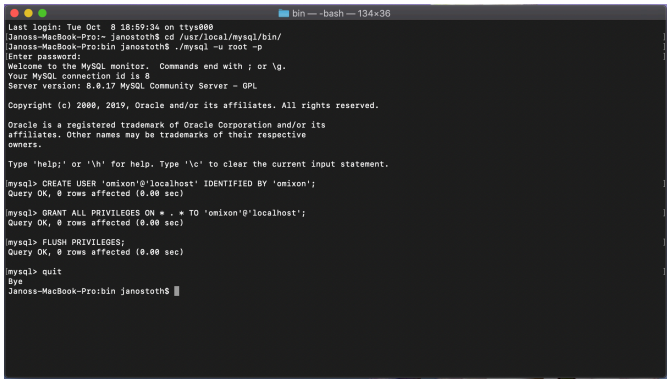


11. If everything is in order, please close this window

12. Open Terminal in OSX (Finder - Applications - Utilities)



13. Run the following commands in sequential order
    a. `cd /usr/local/mysql/bin`
    b. `./mysql -u root -p`
    c. type in the MySQL root password you have set in the installer
    d. `CREATE USER 'omixon'@'localhost' IDENTIFIED BY 'omixon';`
    e. `GRANT ALL PRIVILEGES ON omixon_database . * TO 'omixon'@'localhost';`
    f. `FLUSH PRIVILEGES;`
    g. `quit`



If the output looks the same as the screenshot, everything is configured properly.

You can proceed to install HLA Twin now.

5.3 Linux

If you have a pre-existing **MySQL 8** server in your environment that you would like to use, please see Configuring a pre-existing MySQL database(see page 59). We suggest using a local instance of MySQL for HLA Twin Desktop users.

Since there are a plethora of Linux repositories with different MySQL packages, this document will only provide a list of settings you will need to look out for during configuration:

- HLA Twin only works with version 8 of MySQL
- MySQL needs to use Legacy Password Encryption
- You might need to change the password policy in MySQL for allowing HLA Twin to connect

After you have installed the MySQL 8 server, make sure that you create a new user named omixon with the following commands typed in the terminal:

1. `mysql -u root -p`
2. `CREATE USER 'omixon'@'localhost' IDENTIFIED BY 'omixon';`
3. `GRANT ALL PRIVILEGES ON omixon_database . * TO 'omixon'@'localhost';`
4. `FLUSH PRIVILEGES;`

After setting the MySQL server up, you can proceed to install HLA Twin.

6 Installation and configuration

The scale of the HLA Twin version 4.0.0 update was so large, that reinstallation will be necessary for users who have HLA Twin version 3.1.3 below. HLA Twin 4.x will be installed independent of version 3.1.3 and below, so you might keep the older version of the as a backup, but you can also uninstall it manually.

Each edition has different factors to consider when updating, this chapter will contain information on those besides the step-by-step installation and configuration guide.

6.1 Desktop

6.1.1 Updating from HLA Twin 3.1.3 or below

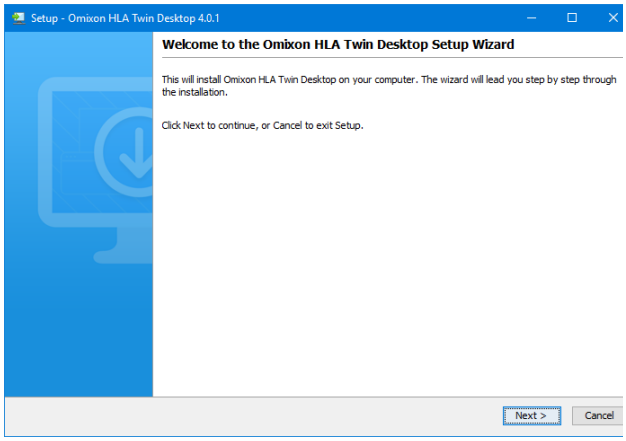
- You will not be able to upgrade your previous version of HLA Twin 3.1.3 Desktop as you could in previous versions.
- The internal database from your old installation needs to be migrated in order to keep your user data and audit information. The migration is part of the installation process (step 8). For further details, please see Database migration(see page 61).
- After a successful installation and migration, you can uninstall previous versions of HLA Twin Desktop from your computer.

6.1.2 Installing HLA Twin Desktop

You will need to install a MySQL 8 database server before being able to install HLA Twin! Please refer to this chapter for installation guides. (see page 9)

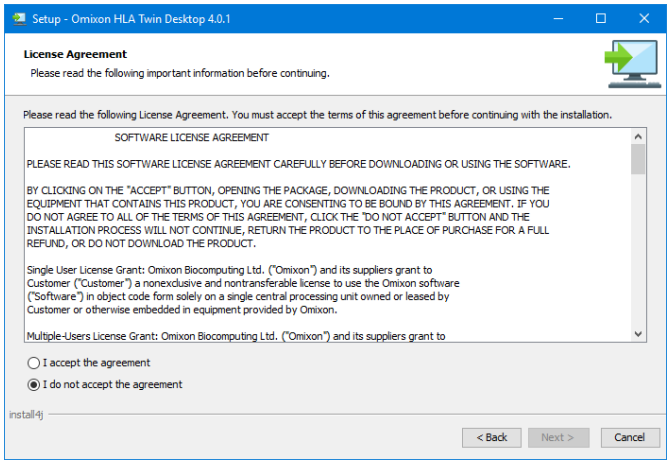
This step depends on the operating system you are using.

- **Windows users:** Open the installer (`omixon_hla_twin_XXX_windows-x64_with_jre-`**`desktop`**`.exe`)
- **Linux users:** Open a terminal window, get permissions to the installer (`chmod +x omixon_hla_twin_xxx_unix_with_jre-`**`desktop`**`.sh`) then run the installer.
- **OSX users:** Open the installer (`omixon_hla_twin_xxx_macos_with_jre-`**`desktop`**`.dmg`) (if you are using OSX 10.14.6 Mojave or above, you might get an error message. If so, please contact us at support@omixon.com[2])



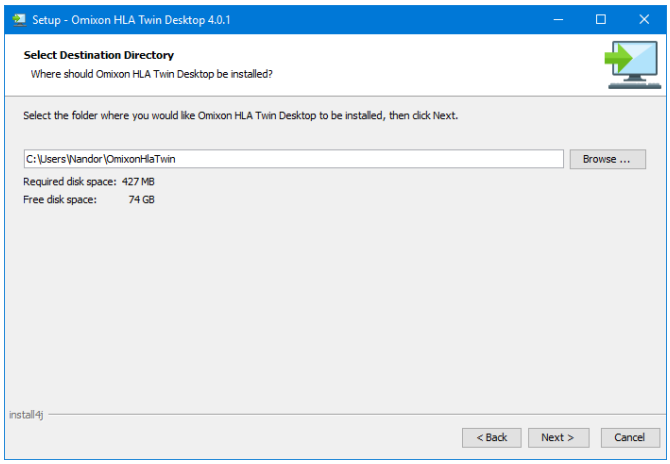
2 mailto:support@omixon.com

1. Accept the license agreement

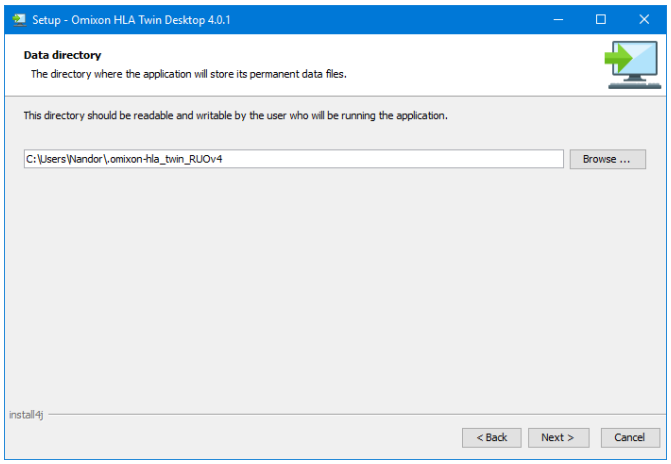


2. Select an installation folder.

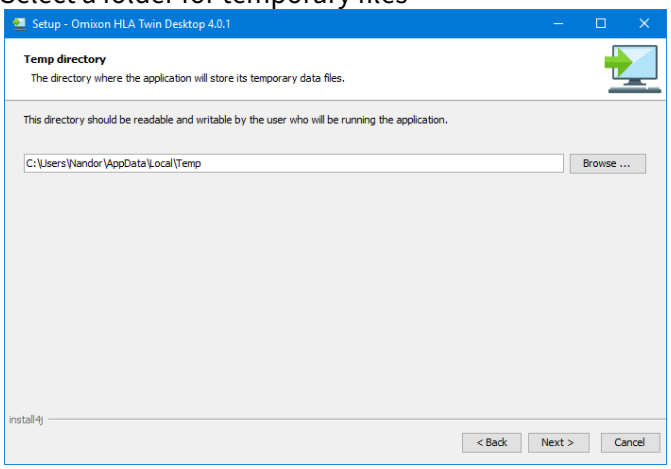
   Windows users, please keep in mind that you might want to change the destination directory so other users in Windows can access the software (the same applies to the other installation folders in the next steps as well).



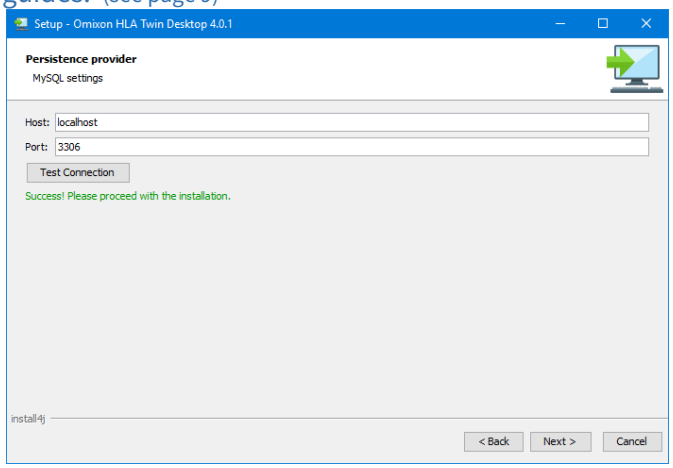
3. Select a folder for reference database files.



4. Select a folder for temporary files

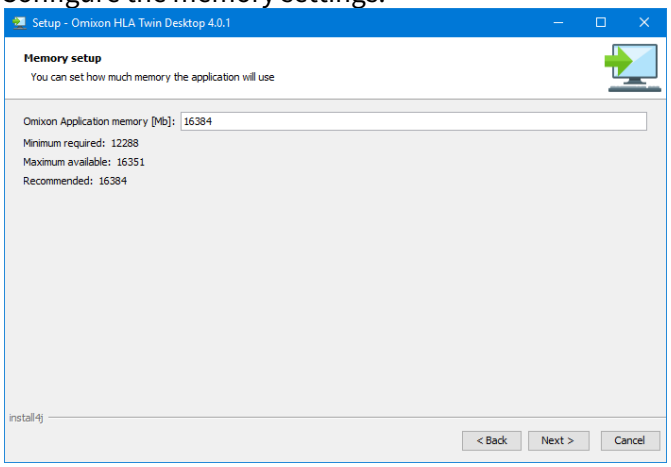


5. Specify the IP address and the port number for the MySQL database (the default settings should work fine if you have installed MySQL locally). Please refer to this chapter for installation guides. (see page 9)

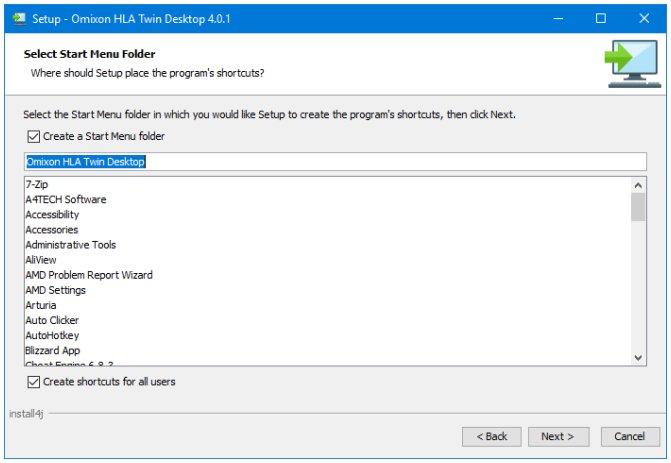


You **cannot proceed** until you get a successful connection test!

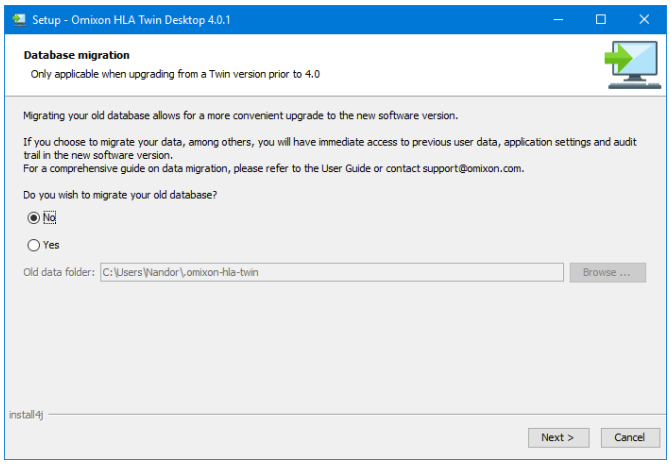
6. Configure the memory settings.



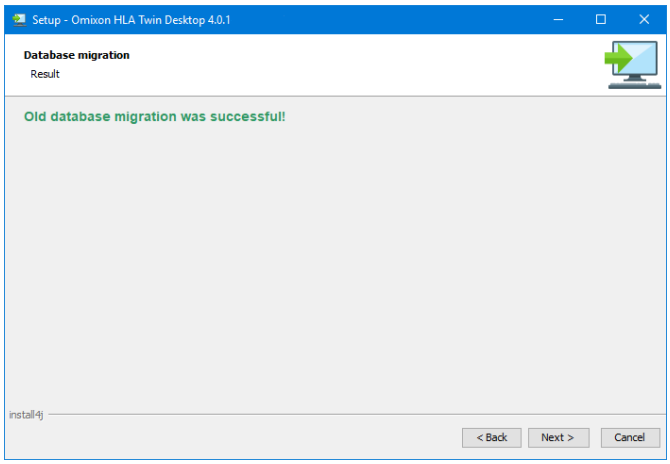
7. Select Start Menu folder



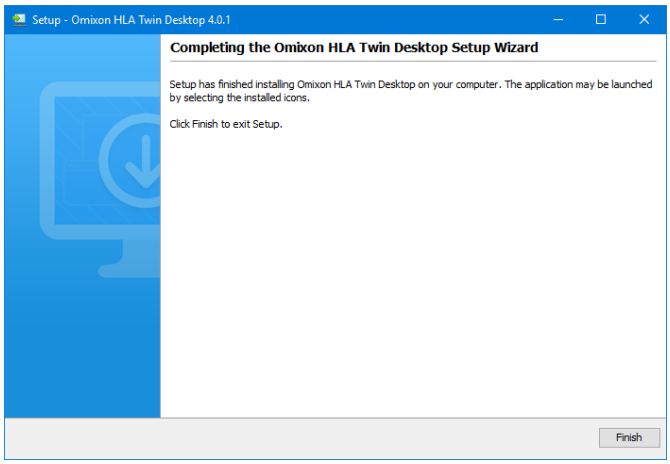
8. After the installation finishes, the installer gives you the option to migrate your old database.
   - **If you are a new user:** select "No" and click on next
   - **If you are updating from HLA Twin version 3.1.3 or below:** please consider migrating the old database to keep your audit information. For further details, please see Database migration(see page 61).



If you selected yes, the following message will be prompted after a successful migration.



9. Click Finish



6.2 Server (standalone)

6.2.1 Updating from HLA Twin 3.1.3 or below

- You will not be able to update your previous version of HLA Twin 3.1.3 Server as you could in previous versions. Also, the installer will not allow you to install HLA Twin 4.0.0 in the same folder where an older version was installed.
- The internal database from your old installation needs to be migrated in order to keep your user data and audit information. The migration is part of the installation process (step 11). For further details, please see Database migration(see page 61).
- After a successful installation and migration, you can uninstall previous versions of HLA Twin Server from your computer.
- Please keep in mind that the version of the HLA Twin Client and HLA Twin Server software needs to match.
- There is no HLA Twin Typer Server NG service in the new version of HLA Twin Server, one service will handle the analyses and the Clients.

6.2.2 Notes before installation

Database: You will need to install a MySQL 8 database server **before being able to install HLA Twin**! Please refer to this chapter for installation guides. (see page 9)

Networking: HLA Twin Server will communicate with HLA Twin Clients on ports 4380 and 4381 by default, so please make sure to allow them on your firewall.

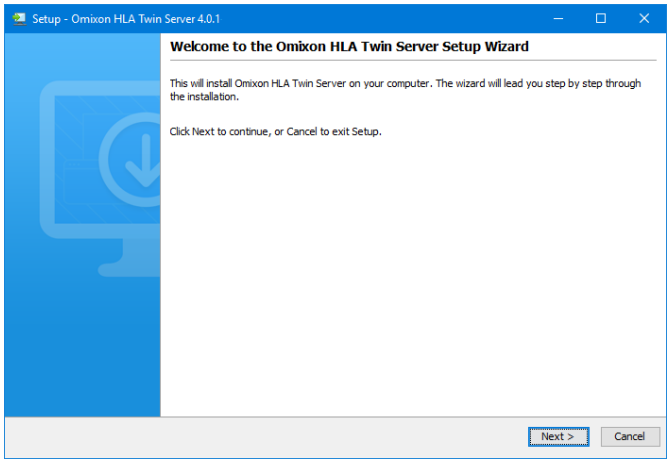
HTTPS: For a secure connection between the HLA Twin Server and HLA Twin Clients, please follow this chapter(see page 57) after the installation.

Windows Service: The HLA Twin Server will run as the `Omixon HLA Twin NG Server` service in Windows, which is set to automatic startup by default.

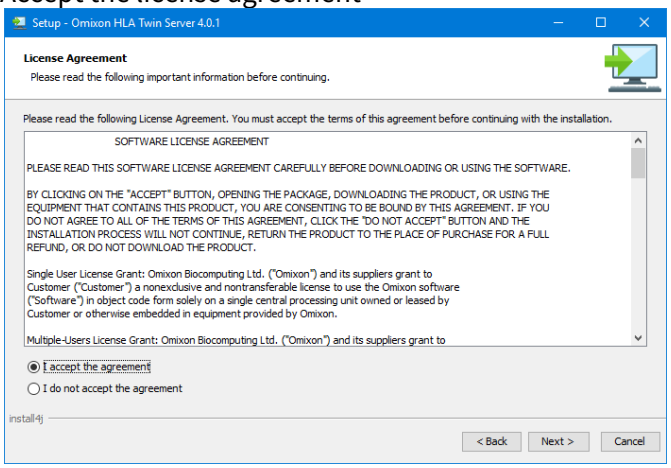
6.2.3 Installing HLA Twin Server

1. This step depends on the operating system you are using.

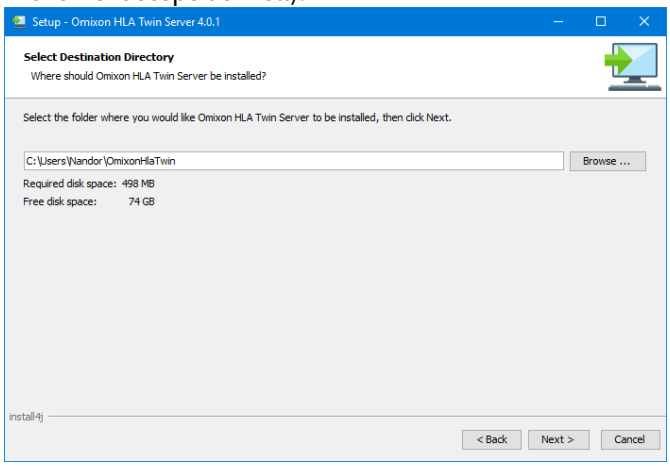
    - **Windows users:** Open the installer (`omixon_hla_twin_XXX_windows-x64_with_jre-`**`serverclient`**`.exe`)
    - **Linux users:** Open a terminal window, get permissions to the installer (`chmod +x omixon_hla_twin_xxx_unix_with_jre-`**`serverclient`**`.sh`) then run the installer.



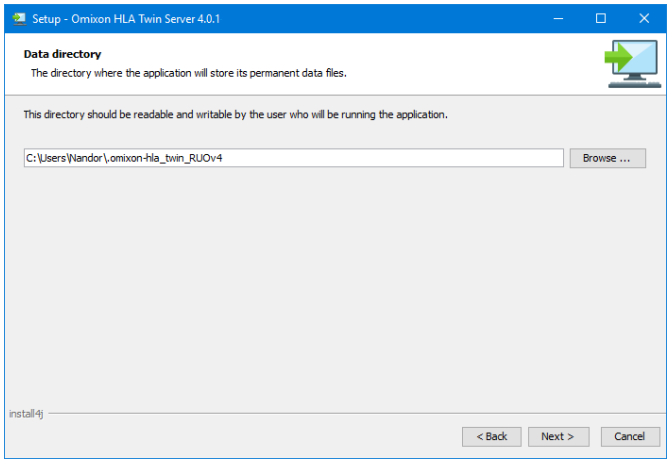
2. Accept the license agreement



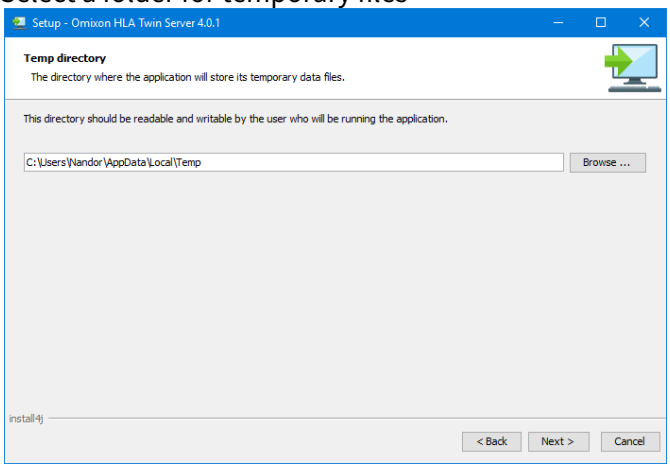
3. Select an installation folder.
   Windows users, please keep in mind that you might want to change the destination directory so other users in Windows can access the software (the same applies to the other installation folders in the next steps as well).



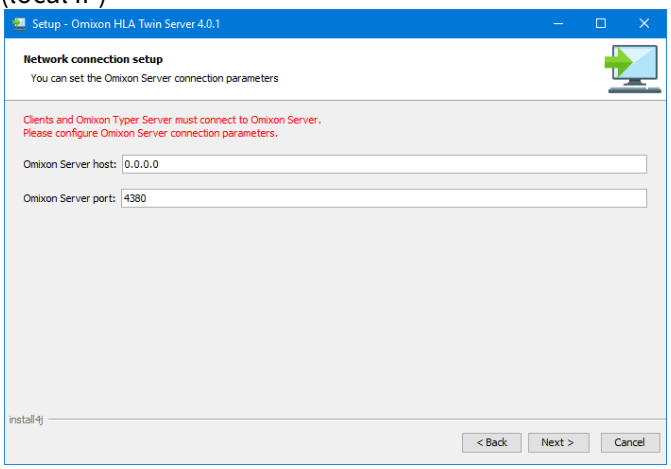
4. Select a folder for reference database files.



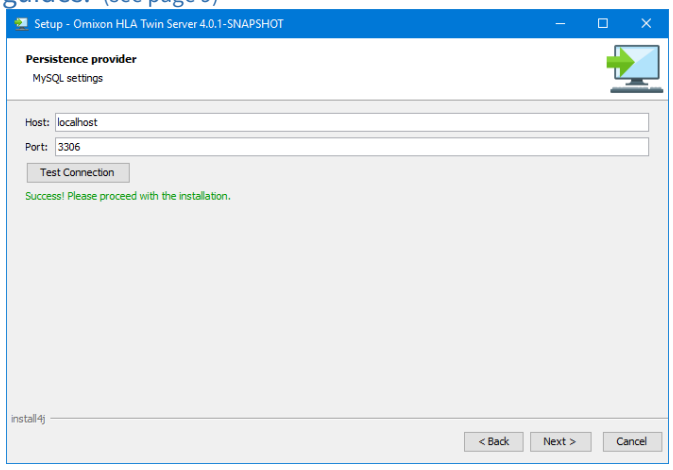
5. Select a folder for temporary files



6. Configure the IP address and port number that the HLA Twin Server will use for communication (local IP)

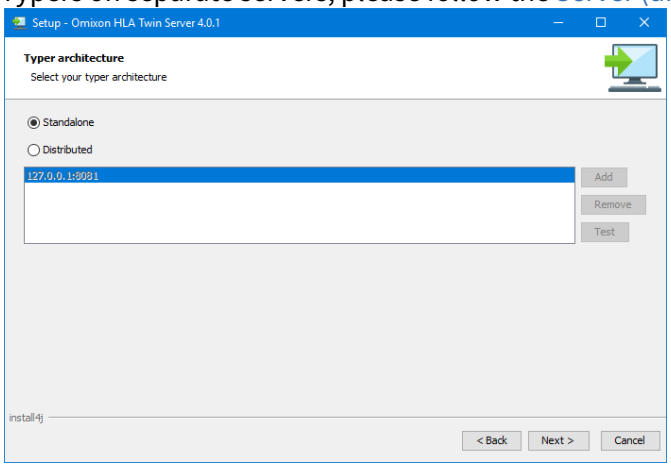


7. Specify the IP address and the port number for the MySQL database (the default settings should work fine if you have installed MySQL locally). Please refer to this chapter for installation guides. (see page 9)

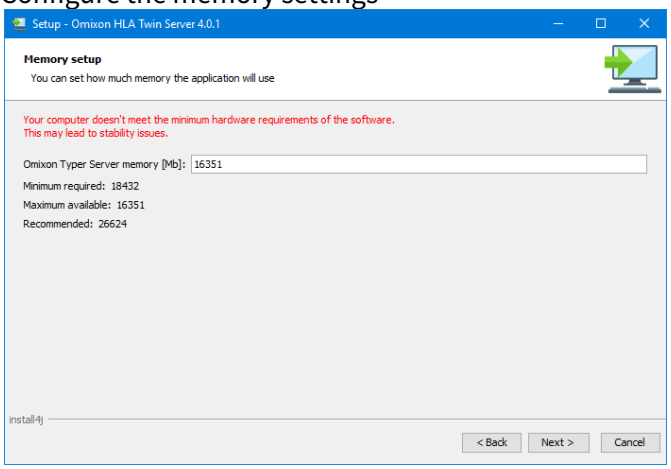


You **cannot proceed** until you get a successful connection test!

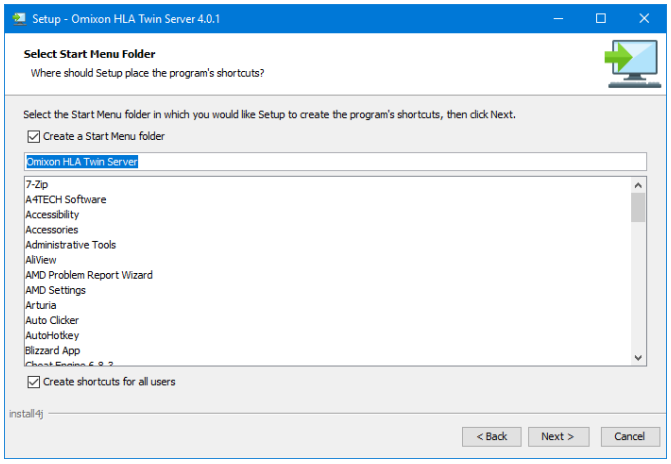
8. Select the standalone architecture (for the distributed configuration with multiple HLA Twin Typers on separate servers, please follow the Server (distributed)(see page 33) chapter)



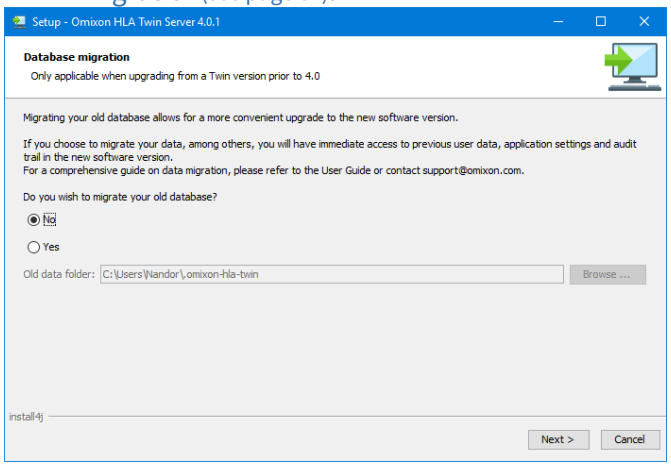
9. Configure the memory settings



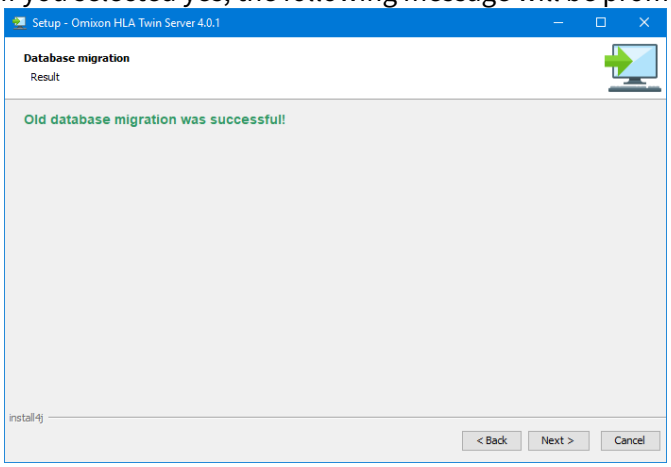
10. Select Start Menu folder



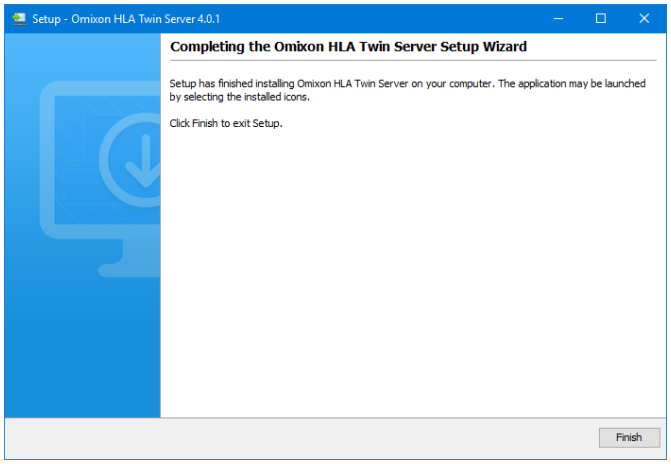
11. After the installation finishes, the installer gives you the option to migrate your old database.
    - **If you are a new user:** select "No" and click on next
    - **If you are updating from HLA Twin version 3.1.3 or below:** please consider migrating the old database to keep your audit information. For further details, please see Database migration(see page 61).



If you selected yes, the following message will be prompted after a successful migration.



12. Click Finish



6.3 Server (distributed)

6.3.1 Updating from HLA Twin 3.1.3 or below

- You will not be able to update your previous version of HLA Twin 3.1.3 Server as you could in previous versions. Also, the installer will not allow you to install HLA Twin 4.0.0 in the same folder where an older version was installed.
- The internal database from your old installation needs to be migrated in order to keep your user data and audit information. The migration is part of the installation process (step 11). For further details, please see Database migration(see page 61).
- After a successful installation and migration, you can uninstall previous versions of HLA Twin Server from your computer.
- Please keep in mind that the version of the HLA Twin Client and HLA Twin Server software needs to match.
- There is no HLA Twin Typer Server NG service in the new version of HLA Twin Server, one service will handle the analyses and the Clients.

6.3.2 Notes before installation

Database: You will need to install a MySQL 8 database server **before being able to install HLA Twin**! Please refer to this chapter for installation guides. (see page 9)

Typers: Please set up the Apache Tomcat server for the HLA Twin Typers(see page 40) **before installing the HLA Twin Server** for a more convenient installation process (you can install the Typers after the Server, but then you will need to perform additional configuration steps(see page 59))

Networking: HLA Twin Server will communicate with HLA Twin Clients on ports 4380 and 4381 by default and with HLA Twin Typers on port 8080 so please allow them on your firewall.

HTTPS: For a secure connection between the HLA Twin Server and HLA Twin Clients AND the Apache Tomcat servers, please follow this chapter(see page 57) after the installation.

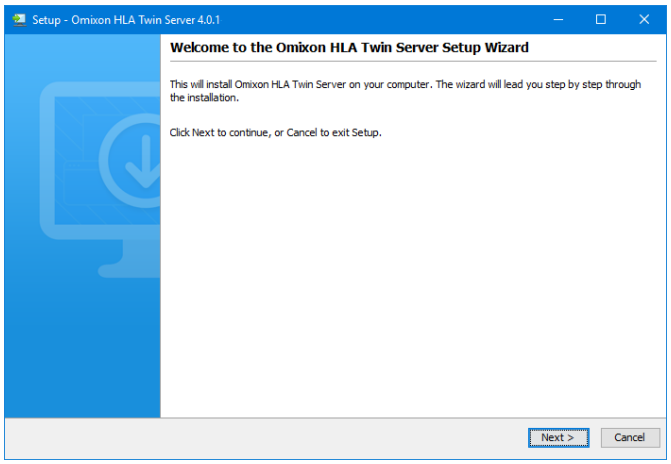
Windows Service: The HLA Twin Server will run as the `Omixon HLA Twin NG Server` service in Windows, which is set to automatic startup by default.

6.3.3 Installing HLA Twin Server

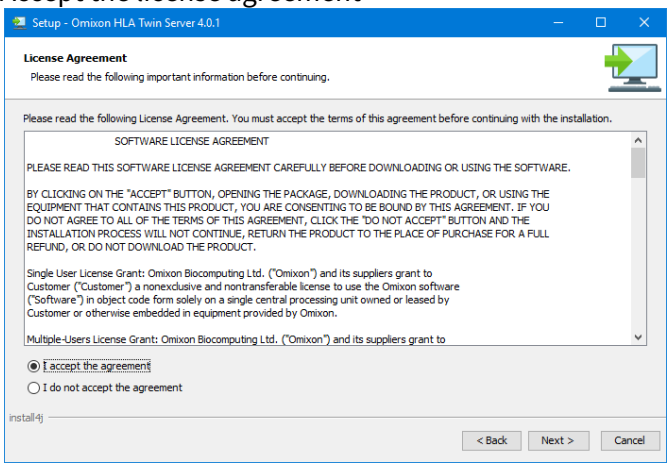
The steps below will show you how to install the HLA Twin Server version.

1. This step depends on the operating system you are using.

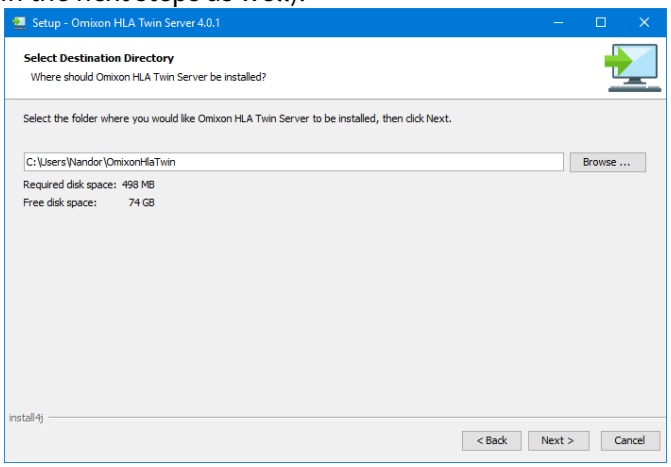
    - **Windows users:** Open the installer (`omixon_hla_twin_XXX_windows-x64_with_jre-`**`serverclient`**`.exe`)
    - **Linux users:** Open a terminal window, get permissions to the installer (`chmod +x omixon_hla_twin_xxx_unix_with_jre-`**`serverclient`**`.sh`) then run the installer.



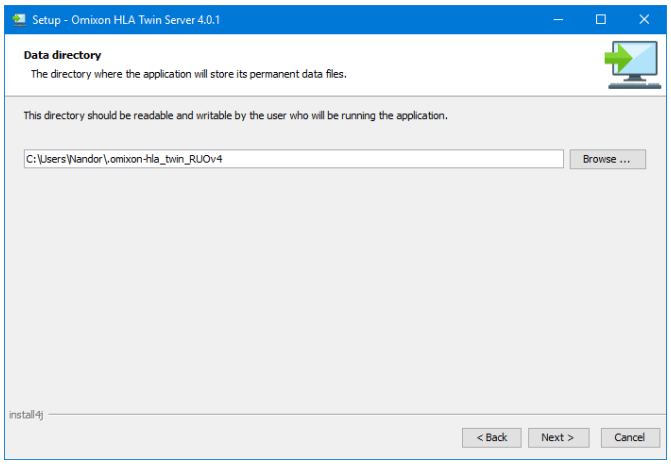
2. Accept the license agreement



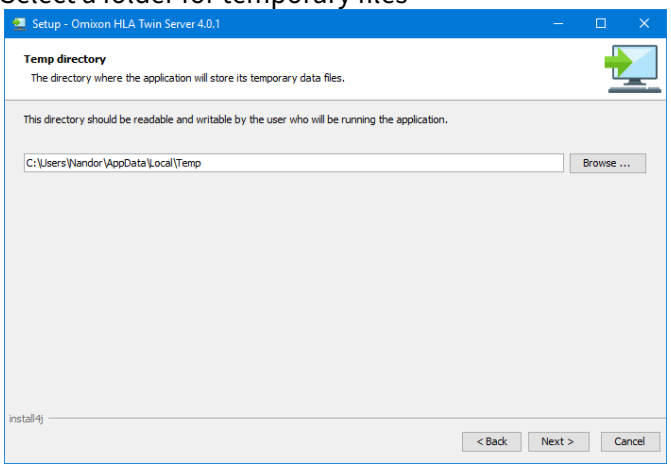
3. Select an installation folder.
   Windows users, please keep in mind that you might want to change the destination directory so other users in Windows can access the software (the same applies to the other installation folders in the next steps as well).



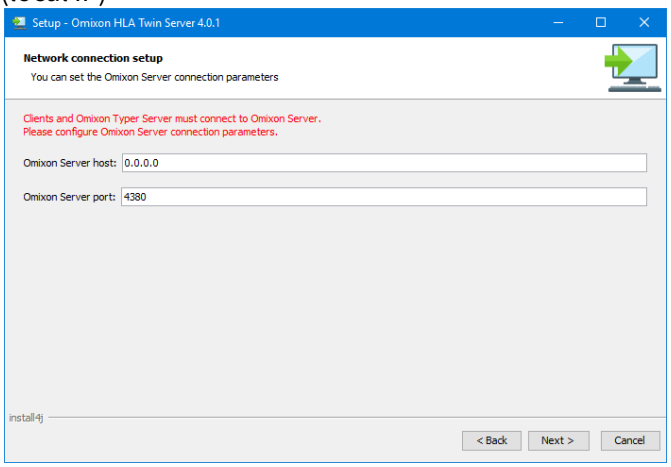
4. Select a folder for reference database files.



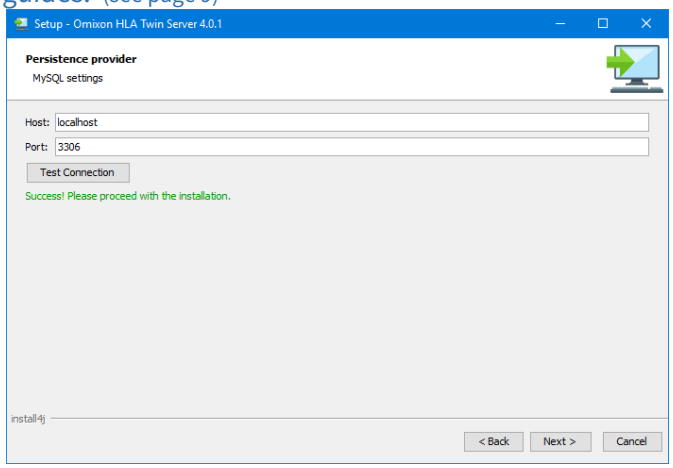
5. Select a folder for temporary files



6. Configure the IP address and port number that the HLA Twin Server will use for communication (local IP)



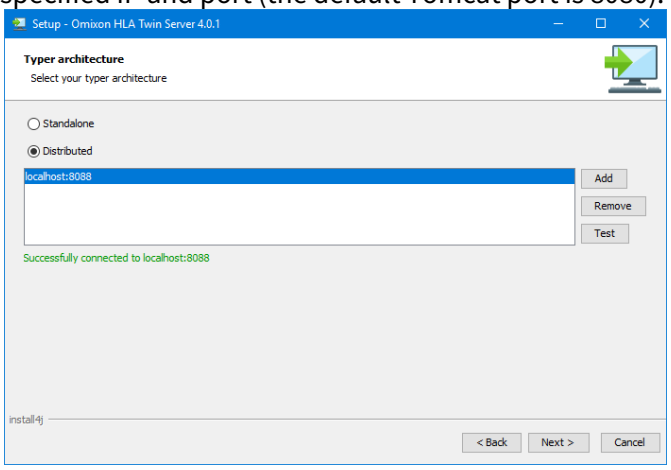
7. Specify the IP address and the port number for the MySQL database (the default settings should work fine if you have installed MySQL locally). Please refer to this chapter for installation guides. (see page 9)



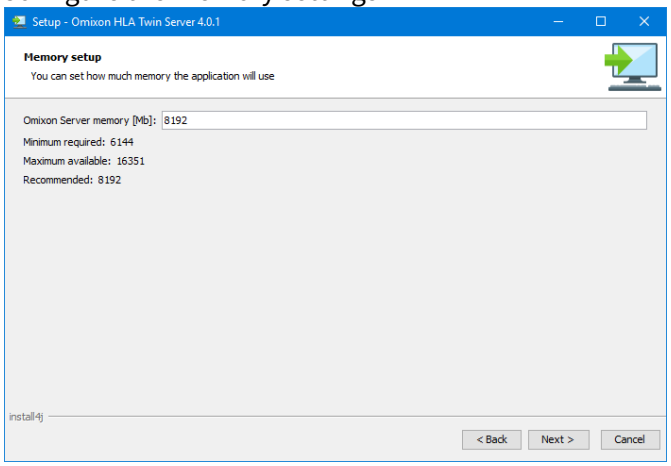
You **cannot proceed** until you get a successful connection test!

8. Select the Distributed architecture (for the standalone architecture with only one HLA Twin Type, please follow the Server (standalone)(see page 27) chapter).

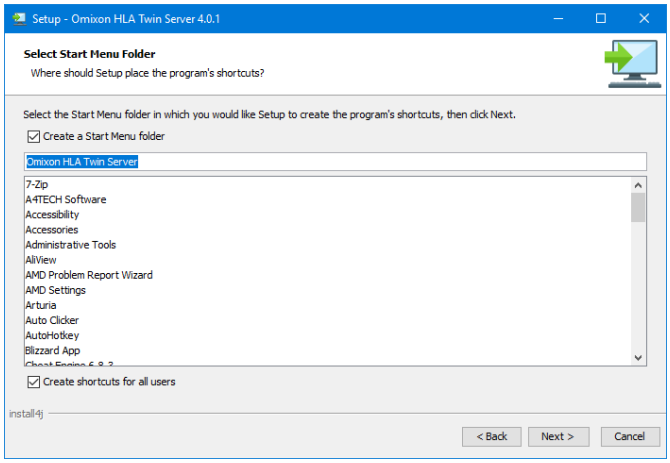
   You can add the IP addresses of the servers where HLA Twin Typers are running with the Add button. Clicking on the Test button will try to get an HTTP response from the Tomcat server on the specified IP and port (the default Tomcat port is 8080).



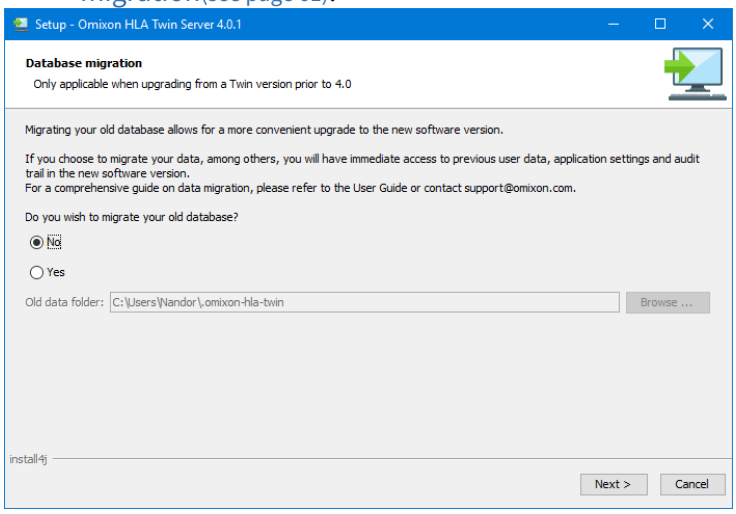
9. Configure the memory settings



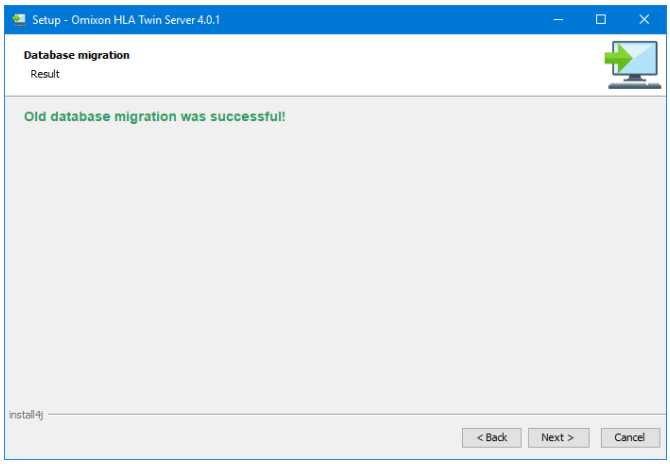
10. Select Start Menu folder



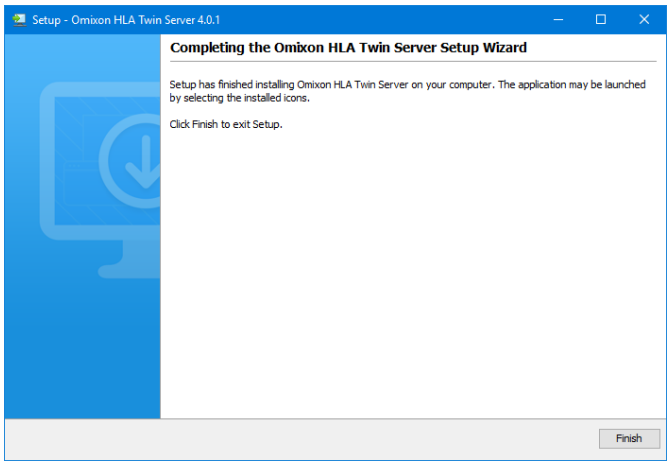
11. After the installation finishes, the installer gives you the option to migrate your old database.
    - **If you are a new user:** select "No" and click on next
    - **If you are updating from HLA Twin version 3.1.3 or below:** please consider migrating the old database to keep your audit information. For further details, please see Database migration(see page 61).



If you selected yes, the following message will be prompted after a successful migration.



12. Click Finish



6.4 Typer

HLA Twin Server can have multiple HLA Twin Typer instances connected to it to perform multiple analyses at the same time. The Omixon Twin Typer does not have a separate installer, because it is contained in a WAR (Web Application Resource) package that can be deployed through an HLA Twin Server. To deploy this package, an Apache Tomcat server needs to be running on the computer where the HLA Twin Typer is to be deployed to.

6.4.1 Configuring Apache Tomcat on Windows

Notes before installation

Java: Tomcat requires Java SE 8.0 or OpenJDK 8.0 installed on the server! For licensing information, please check the chapter on Java licensing(see page 61)**.**

Networking: HLA Twin Server will communicate with HLA Twin Typers on port 8080 so please allow them on your firewall.

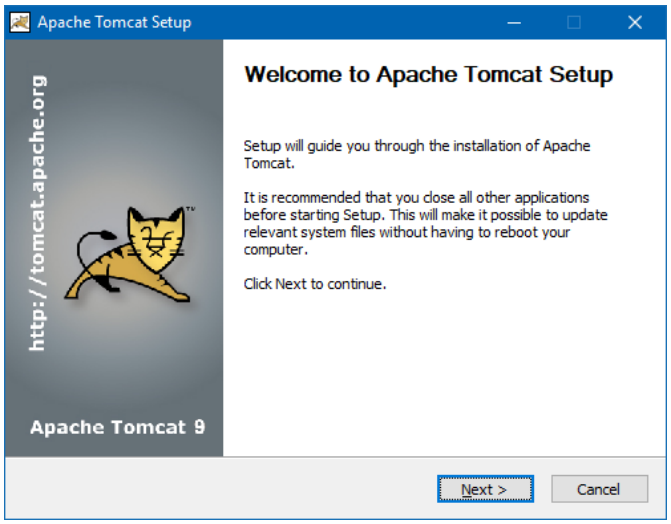
Typer deployment: After configuring Tomcat, please continue with the Deploying the Typer(see page 51) chapter.

HTTPS: For a secure connection between the HLA Twin Server and Apache Tomcat, please follow this chapter(see page 57) after the installation.

Installing Apache Tomcat on Windows

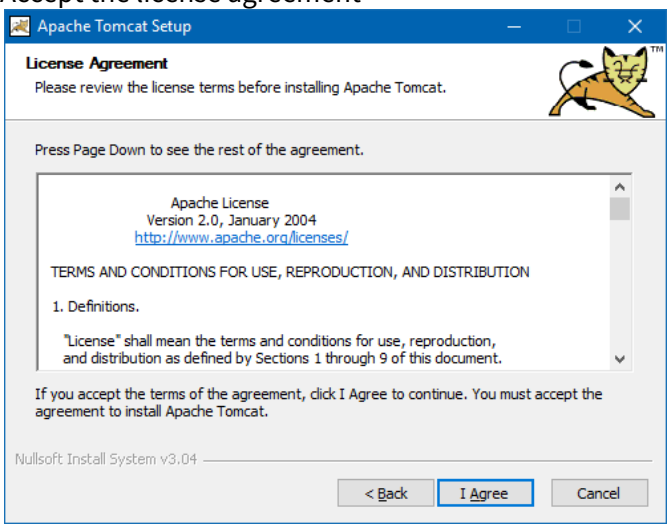
1. Download the latest distribution of Apache Tomcat 9 service installer here[3].

2. Start the installer

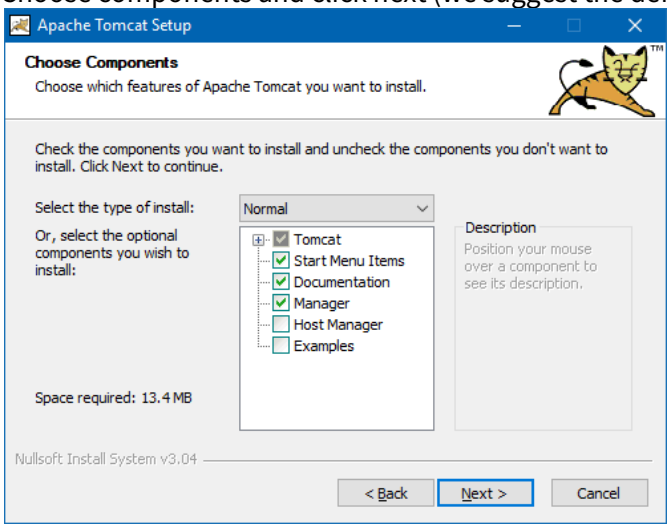


3 https://tomcat.apache.org/download-90.cgi

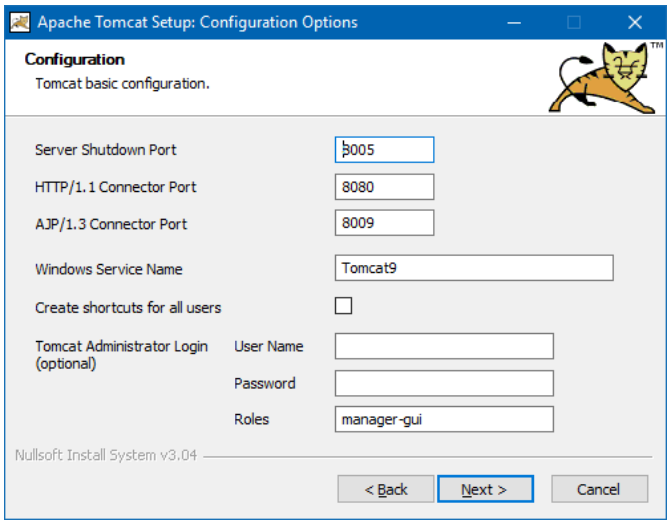
3. Accept the license agreement



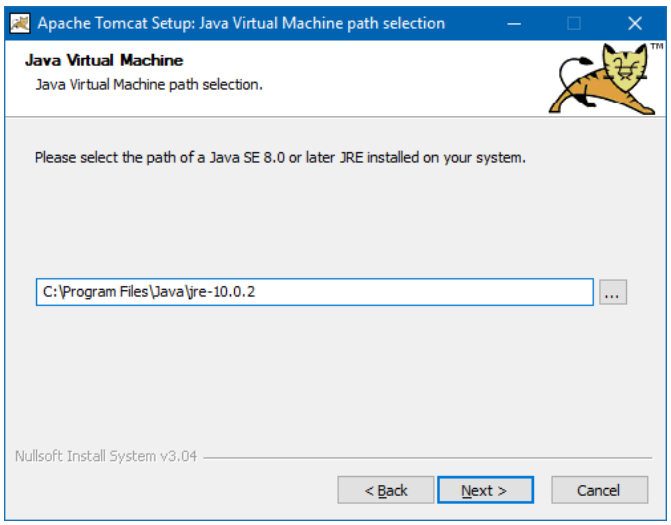
4. Choose components and click next (we suggest the default configuration for convenience)



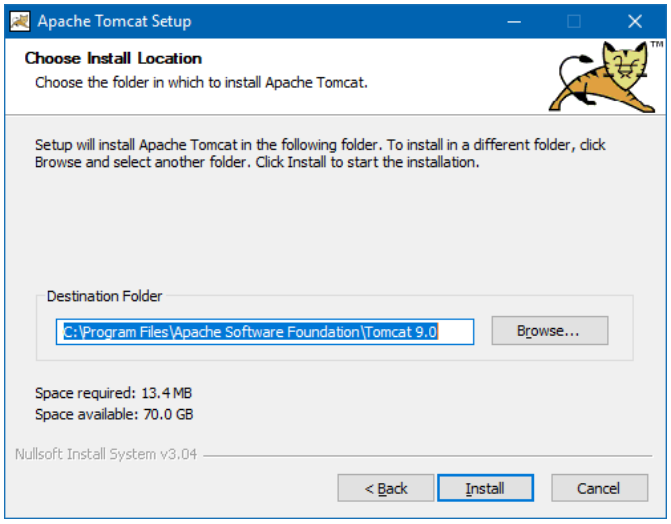
5. Configure the Tomcat server (the default configurations are suggested, but you might want to change the HTTP/1.1 Connector Port depending on which port you want to use for communication with the HLA Twin Server.



6. Select the path of the Java JRE. Please note that the 64-bit version of Java is needed. If the default path points to C:\Program Files(x86), you have the 32-bit version installed. In that case, please install the 64-bit version.



7. Select the install location

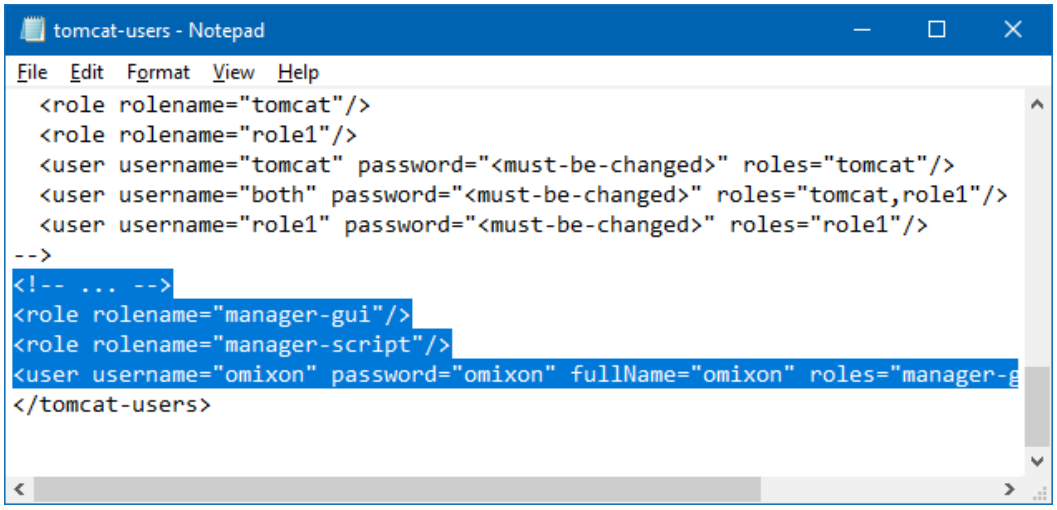


8. After the installation is done, navigate to `<Tomcat root>\conf\` in File Explorer and open `tomcat-users.xml` with a text editor. **Y ou will need admin privileges**.

   Add the following before </tomcat-users>

tomcat-users.xml

```
<role rolename="manager-gui"/>
<role rolename="manager-script"/>
<user username="omixon" password="omixon"
        fullName="omixon" roles="manager-gui,manager-script"/>
```



   Save the file.

9. Navigate to `<Tomcat root>\conf\Catalina\Localhost\` and create a new document with the name `manager.xml`. **You will need admin privileges**.
   If you are unable to create the file in this location, create it somewhere where you have rights to create a file then copy it over to the specified location.

   The contents of the file should be the following:

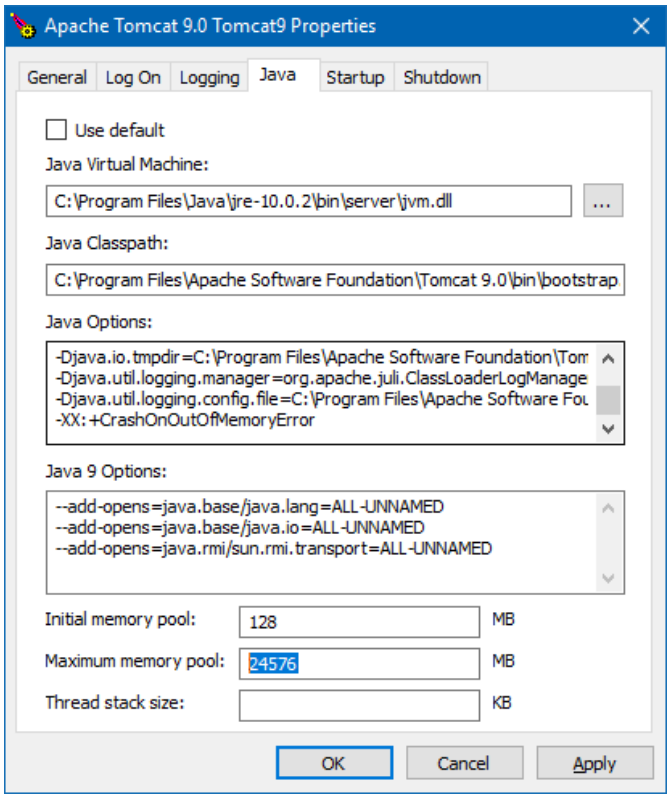
   manager.xml

   ```
   <Context privileged="true" antiResourceLocking="false">
   <Valve className="org.apache.catalina.valves.RemoteAddrValve" allow="^.*$" />
   </Context>
   ```

   Save the file
10. Open Tomcat Manager ("Configure Tomcat" in the Start Menu)

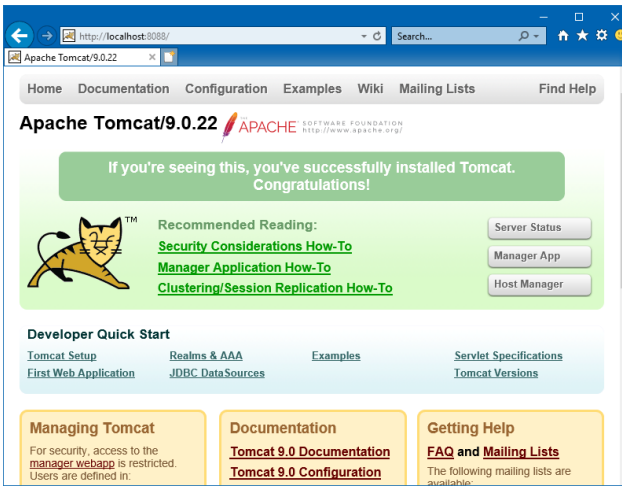
11. Open the Java tab and change the Maximum memory pool value.
    - Minimum value: 20480 MB
    - Recommended value: 24576 MB

      Please keep in mind that Windows will require at least 2 GB memory to efficiently!
12. Add the following lines to the Java Options list (in a new line):
    ```
    -XX:+HeapDumpOnOutOfMemoryError
    -XX:+PrintGCDetails
    -XX:+PrintGCTimeStamps
    -XX:+PrintGCDateStamps
    -Xloggc:gc.log
    -XX:+PrintReferenceGC
    -XX:+PrintTenuringDistribution
    -XX:+PrintGCApplicationStoppedTime
    -XX:+UseGCLogFileRotation
    -XX:NumberOfGCLogFiles=10
    -XX:GCLogFileSize=10M
    ```



13. Start (or Restart) the Tomcat service in the General tab

To test if Tomcat is up and running, open a web browser and try to reach http://localhost:8080[4] (or the port number you have selected). You should see the following site if Tomcat is running:



To test if the Tomcat server is reachable from another computer, you can also try this method with the server's IP.

Typer deployment: After configuring Tomcat, please continue with the Deploying the Typer(see page 51) chapter.

4 http://localhost:8080/

6.4.2 Configuring Apache Tomcat on Linux distributions

Notes before installation

Java: Tomcat requires OpenJDK 8.0 installed on the server!

Networking: HLA Twin Server will communicate with HLA Twin Typers on port 8080 so please allow them on your firewall.

Typer deployment: After configuring Tomcat, please continue with the Deploying the Typer(see page 51) chapter.

HTTPS: For a secure connection between the HLA Twin Server and Apache Tomcat, please follow this chapter(see page 57) after the installation.

Installing Apache Tomcat on Linux

1. Create a new user for Tomcat

   bash

   ```
   sudo useradd -r -m -U -d /home/tomcat -s /bin/false tomcat
   ```

2. Download the latest distribution of Apache Tomcat 9 core. You can find the link here[5].

   ```
   wget LINK -P /tmp
   ```

3. Extract the downloaded archive to `/home/tomcat`

   bash

   ```
   sudo tar xf /tmp/apache-tomcat-9*.tar.gz -C /home/tomcat
   ```

4. Create a symlink for handling different versions of Tomcat more easily

   ```
   sudo ln -s /home/tomcat/apache-tomcat-9.* /home/tomcat/latest
   ```

5. Change the ownership of the directory to the user and group tomcat

   bash

   ```
   sudo chown -RH tomcat: /home/tomcat/latest
   ```

6. The scripts inside the bin folder must have the executable flag

5 https://tomcat.apache.org/download-90.cgi

bash

```
sudo sh -c 'chmod +x /home/tomcat/latest/bin/*.sh'
```

7. We want Tomcat to run as a service, so we need to create a new unit file.

bash

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

The contents of this file should be the following. Be careful with line breaks while copying this: the line that ends with dev/urandom needs to have the next line (-Djava.awt...) after it. Also, the CATALINA_OPTS and its parameters (the -XX parameters) should be in the same line.

tomcat.service

```
[Unit]
Description=Tomcat 9 servlet container
After=network.target

[Service]
Type=forking

User=tomcat
Group=tomcat

Environment="JAVA_HOME=/usr/lib/jvm/default-java"
Environment="JAVA_OPTS=-Djava.security.egd=file:///dev/urandom
-Djava.awt.headless=true"

Environment="CATALINA_BASE=/opt/tomcat/latest"
Environment="CATALINA_HOME=/opt/tomcat/latest"
Environment="CATALINA_PID=/opt/tomcat/latest/temp/tomcat.pid"
Environment="CATALINA_OPTS=-Xms512M -Xmx24576M -server -XX:+UseParallelGC
-XX:+CrashOnOutOfMemoryError -XX:+HeapDumpOnOutOfMemoryError
-XX:+PrintGCDetails -XX:+PrintGCTimeStamps -XX:+PrintGCDateStamps
-Xloggc:gc.log -XX:+PrintReferenceGC -XX:+PrintTenuringDistribution
-XX:+PrintGCApplicationStoppedTime -XX:+UseGCLogFileRotation
-XX:NumberOfGCLogFiles=10 -XX:GCLogFileSize=10M"

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

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

Please note that the -Xmx value is the memory configuration for the software. The minimum value is 20480 MB but we recommend 24576 MB. Keep in mind that Linux will require at least 2 GB of memory to work efficiently.

8. Reload the system manager

bash

```
sudo systemctl daemon-reload
```

9. Edit the following file with a text editor: `/home/tomcat/latest/conf/tomcat-users.xml`

   Add the following before </tomcat-users>

   tomcat-users.xml

   ```
   <!-- ... -->
   <role rolename="manager-gui"/>
   <role rolename="manager-script"/>
   <user username="omixon" password="omixon"  fullName="omixon" roles="manager-gui,manager-script"/>
   ```

   Save the file!

10. Navigate to `/home/tomcat/latest/conf/Catalina/Localhost/` and create `manager.xml` (add the folders manually if they are missing).
    The contents of the file should be the following:

    manager.xml

    ```
    <Context privileged="true" antiResourceLocking="false">
    <Valve className="org.apache.catalina.valves.RemoteAddrValve" allow="^.*$" />
    </Context>
    ```

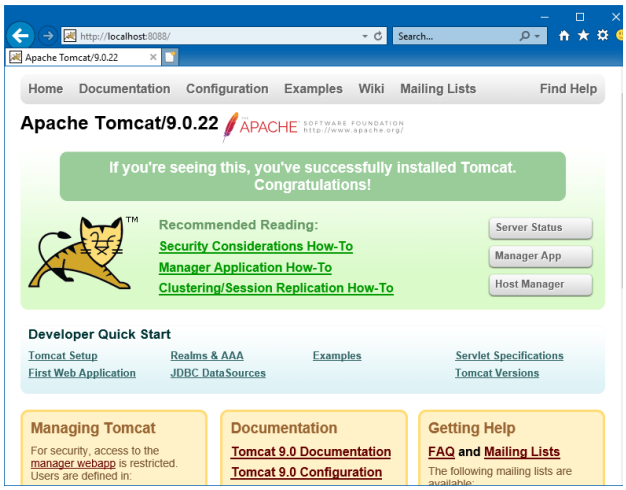
11. Start the Tomcat service

    bash

    ```
    sudo systemctl start tomcat
    ```

- To check the status of the Tomcat server, run `sudo systemctl status tomcat`
- To have Tomcat run on startup, run `sudo systemctl enable tomcat`

To test if Tomcat is up and running, open a web browser and try to reach http://localhost:8080/ (or the port number you have selected). You should see the following site if Tomcat is running:



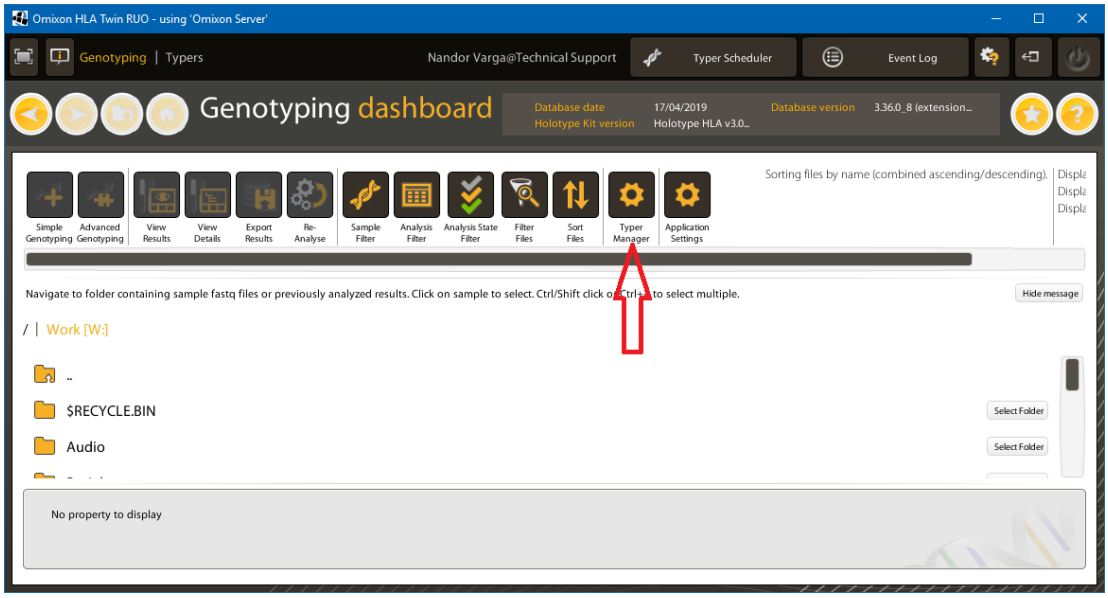
To test if the Tomcat server is reachable from another computer, you can also try this method with the server's IP.

Typer deployment: After configuring Tomcat, please continue with the Deploying the Typer(see page 51) chapter.

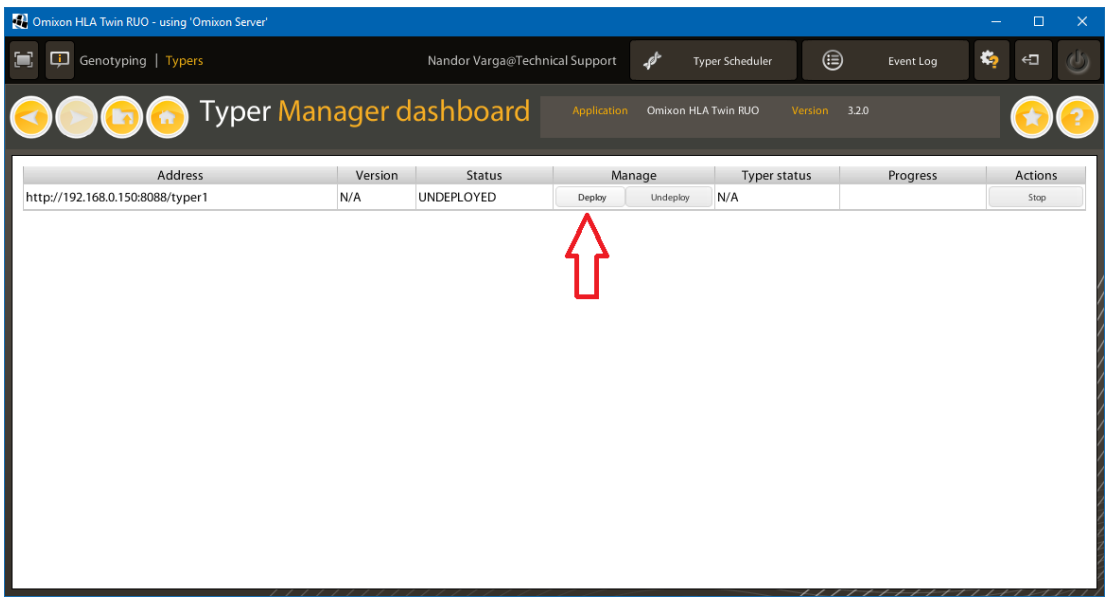
6.4.3 Deploying the Typer

After you have configured the Apache Tomcat server in the previous chapter, you need to deploy the HLA Twin Typer WAR from the HLA Twin Server.

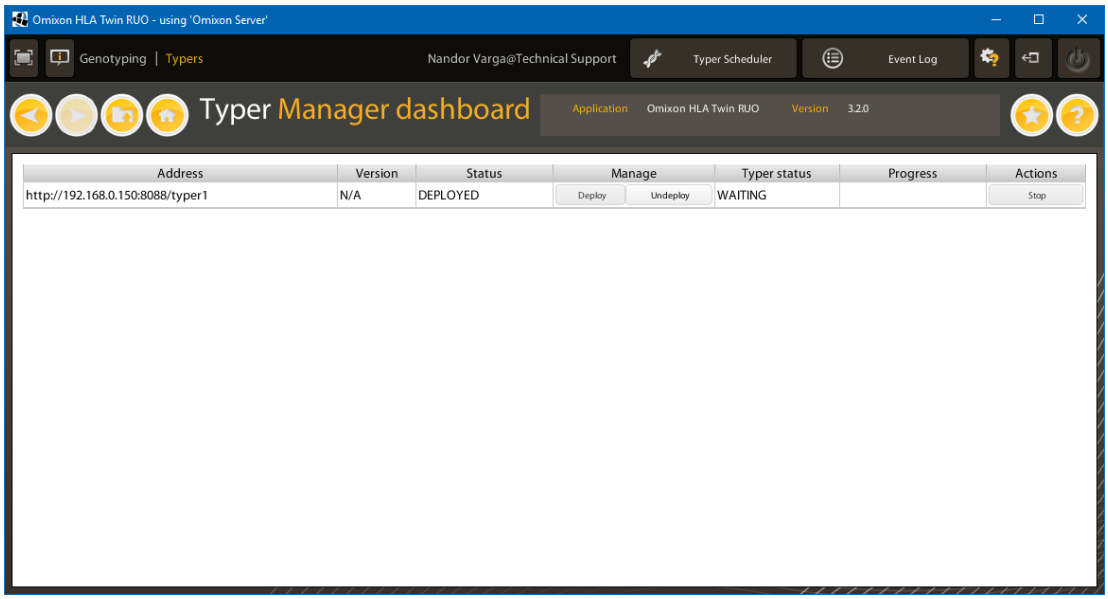
1. Open an HLA Twin Client and connect to the HLA Twin Server
2. Open Typer Manager



3. Click on Deploy for the server you want to set up an HLA Twin Typer. This will take approximately a minute (the HLA Twin Server sends the WAR file to the Tomcat server)



4. If the deployment was successful, you will see the following:



Now HLA Twin is ready for analysis.

6.5 Client

6.5.1 Updating from HLA Twin 3.1.3 or below

- You will not be able to update your previous version of HLA Twin 3.1.3 Client as you could in previous versions. Also, the installer will not allow you to install the new HLA Twin in the same folder where an older version was installed.
- Please keep in mind that the version of the HLA Twin Client and HLA Twin Server software needs to match.

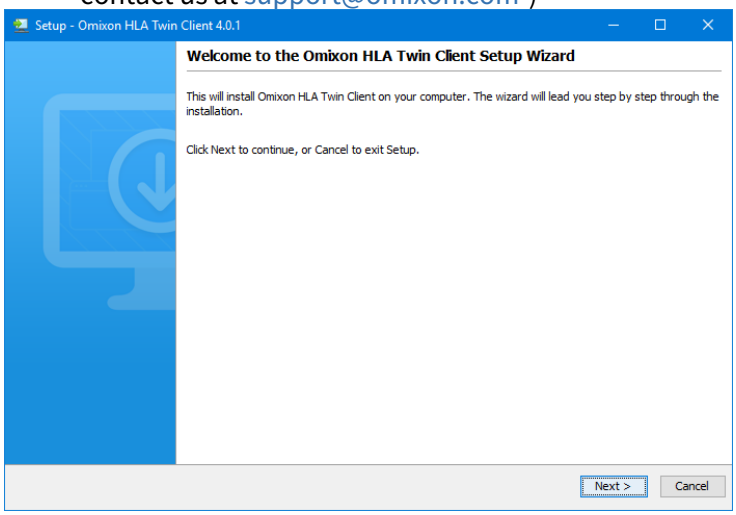
6.5.2 Notes before installation

Networking: HLA Twin Server will communicate with HLA Twin Clients on ports 4380 and 4381 by default, so please make sure to allow them on your firewall.

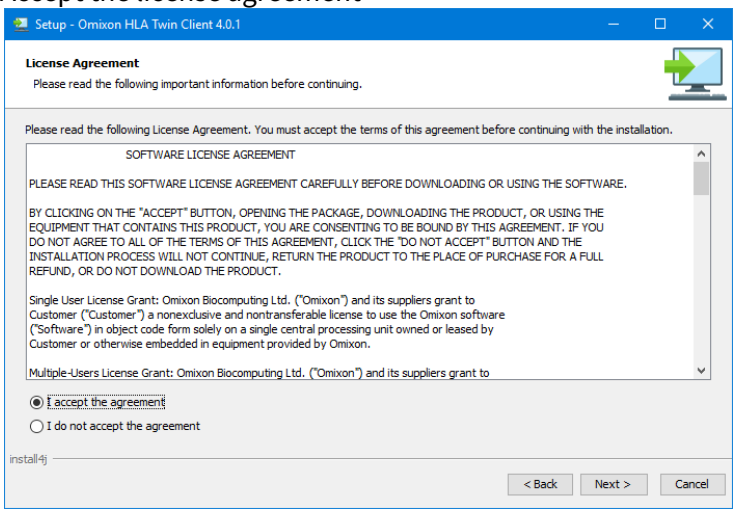
6.5.3 Installing HLA Twin Client

1. This step depends on the operating system you are running.

   - **Windows users:** Open the installer (`omixon_hla_twin_XXX_windows-x64_with_jre-`**`client`**`.exe`)
   - **Linux users:** Open a terminal window, get permissions to the installer (`chmod +x omixon_hla_twin_xxx_unix_with_jre-`**`client`**`.sh`) then run the installer.
   - **OSX users:** Open the installer (`omixon_hla_twin_xxx_macos_with_jre-`**`client`**`.dmg`) (if you are using OSX 10.14.6 Mojave or above, you might get an error message. If so, please contact us at support@omixon.com[6])



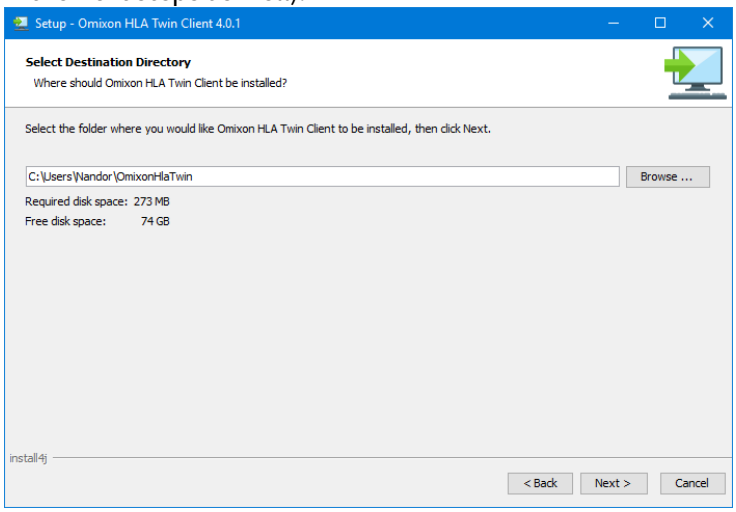
2. Accept the license agreement



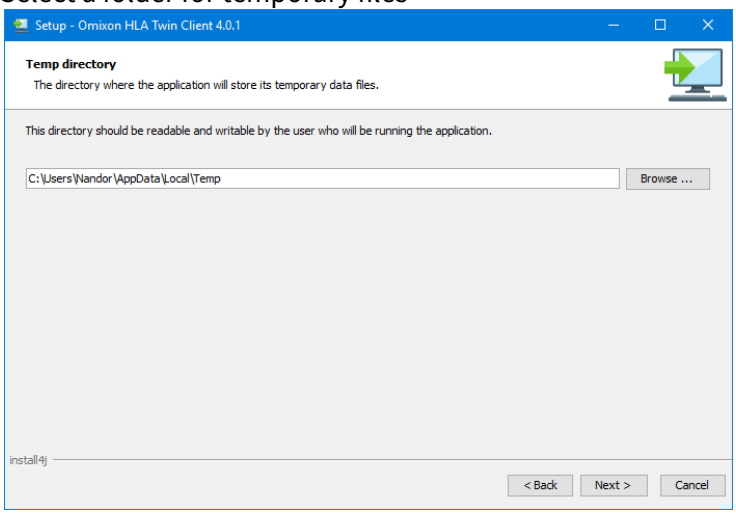
6 mailto:support@omixon.com

3. Select an installation folder.

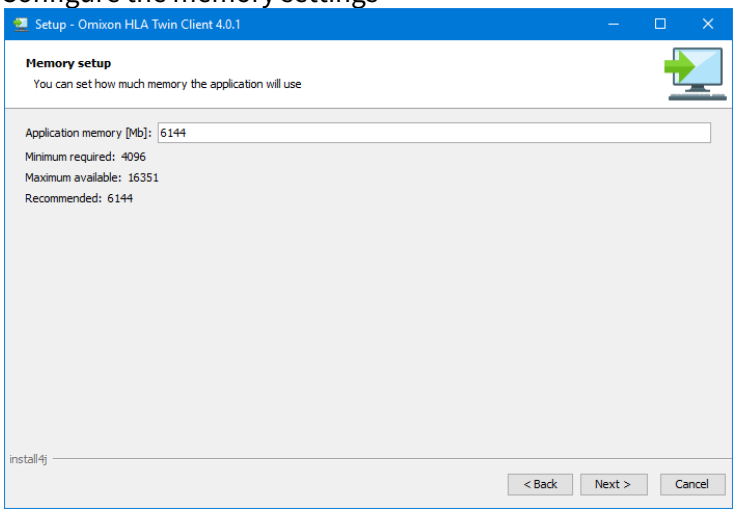
   Windows users, please keep in mind that you might want to change the destination directory so other users in Windows can access the software (the same applies to the other installation folders in the next steps as well).



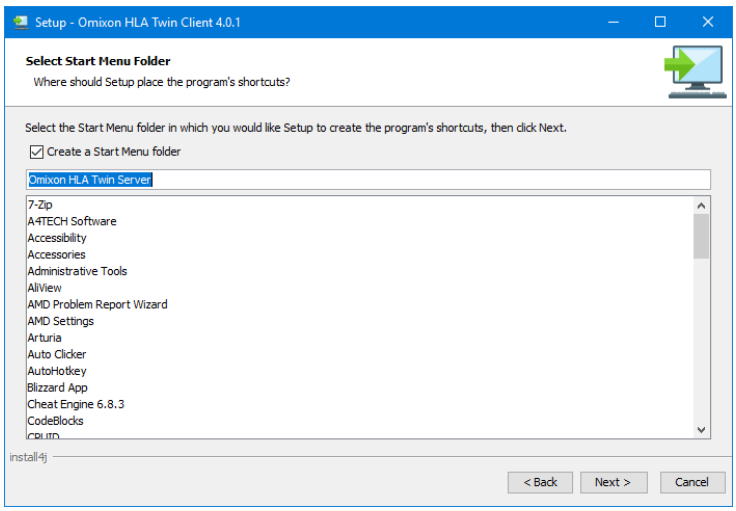
4. Select a folder for temporary files



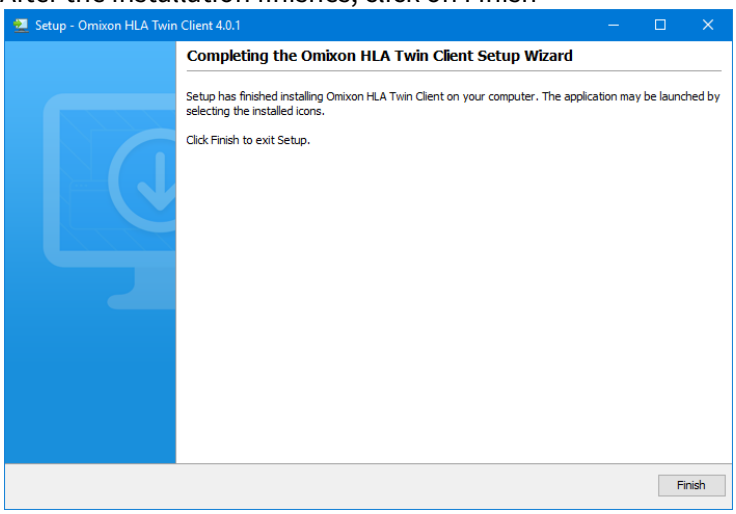
5. Configure the memory settings



6. Select Start Menu folder



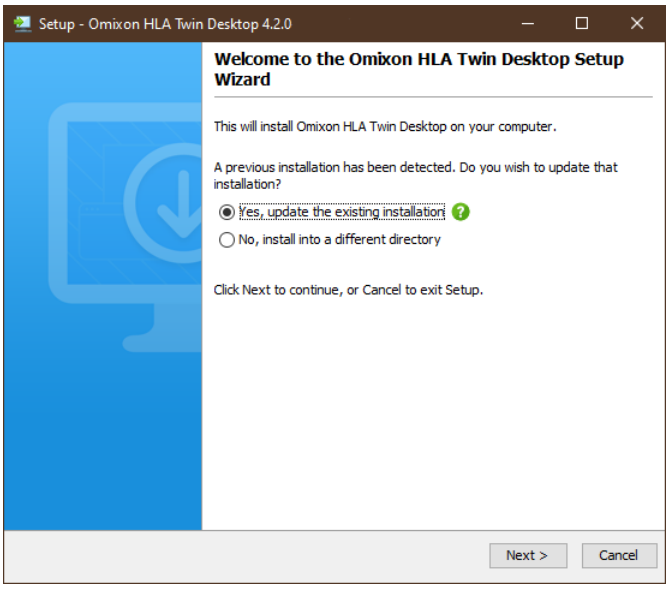
7. After the installation finishes, click on Finish



6.6 Updating from version 4.x

Note for distributed typer users: Apache Tomcat will not be updated. The HLA Twin Typer WAR package can be updated from the HLA Twin GUI.

If you already have HLA Twin version 4.x installed on your computer, the installer will detect the software and will offer to update your old installation while keeping your configurations.



Selecting **Yes, update the existing installation** will:

- overwrite the pre-existing HLA Twin installation
- keep the memory settings of the software
- keep the database settings of the software

Selecting **No, install into a different directory** will let you do a normal installation, providing the default configuration options.

7 Additional guides

7.1 HTTPS configuration

7.1.1 Introduction

Omixon HLA Twin supports secure SSL communication between parts of the software. There are two scenarios where this can be considered:

1. Communication between the HLA Twin Reporting server and the connecting HLA Twin Clients
2. Communication between the HLA Twin Reporting server in distributed mode and the connecting Apache Tomcat instances

Please note that if you use Omixon HLA Twin in distributed mode, you will need to set up SSL for **both the clients and Tomcat**.

The following guides will walk you through the configuration of both of these options.

The public and private keys will be stored in a single Java Keystore file, and this file **will be needed for all nodes** in the communication.

7.1.2 Generating the keys and keystore file

Note: you can your pre-existing keys in the keystore file, but that requires additional configuration steps and we advise against that. For further information, please contact support@omixon.com[7]

The following "keytool" command uses Java's keytool application. Since Omixon HLA Twin comes with a built-in Java Runtime Environment, the keytool application should already be on the computer. Please navigate to the <Omixon HLA Twin installation folder>\jre\bin folder in Command Prompt (or Terminal on Linux), then run the following:

```
keytool -genkey -v -alias omixon-keystore -keyalg RSA -keysize 1024 -keystore
omixon.keystore -validity 365 -keypass changeit -storepass changeit
-dname "CN=Omixon, OU=Omixon"
```

- the "validity" parameter specifies the expiration of the key, the default is 365 days
- the "keypass" and "storepass" parameters specify the password you can access your keys with. We suggest that you change it from the default "changeit" value

If everything was successful, a file named omixon.keystore should be available in the folder where you have ran the command. You will need this file for the next steps of the configuration.

7.1.3 Reporting Server

You will need to specify the path and the password for the keystore file in the HLA Twin Server's vmoptions file. Move to the Omixon HLA Twin installation folder and open omixon-hla_twin_RUO-server.vmoptions with a text editor.

The following parameters are already in the configuration file, but they are empty. You will need to specify these.

7 mailto:support@omixon.com

```
-Domixon.keystore=<keystore file location>/omixon.keystore
-Domixon.keystore.password=<password>
-Domixon.truststore=<keystore file location>/omixon.keystore
-Domixon.truststore.password=<password>
```

Note: the keystore and truststore parameters expect the full path of the file, which should be the same file used by the Omixon HLA Twin Clients (and Apache Tomcat).

After you have saved the changes in the configuration file, **restart the Omixon HLA Twin Server service**. The service will stop immediately if the configuration is wrong.

7.1.4 Client

This process is similar to the configuration of the reporting server. Navigate to the Omixon HLA Twin Client installation folder and open omixon-hla_twin_RUO-client.vmoptions with a text editor.

The following parameters are already in the configuration file, but they are empty. You will need to specify these.

```
-Domixon.truststore=<keystore file location>/omixon.keystore
-Domixon.truststore.password=<password>
```

Note: the keystore and truststore parameters expect the full path of the file, which should be the same file used by the Omixon HLA Twin Clients (and Apache Tomcat).

After you have saved the changes in the configuration file, **restart the Omixon HLA Twin Client software**. The application will throw an error message if the configuration is wrong.

7.1.5 Distributed typers (Tomcat)

Introduction

The following steps will guide you through configuring Apache Tomcat to use **the same keystore file** for communicating with the Omixon HLA Twin Server.

Please make sure that you have performed the previous configurations (for the Reporting Server(see page 57) and Client(see page 58)) before proceeding with this configuration.

Reporting server

The port number for the address where HLA Twin will try to connect with Tomcat will change to 8443, so first you will need to change these ports in the HLA Twin Server configuration file accordingly. Chapter Adding new Typers to HLA Twin Server(see page 59) will guide you through it, but make sure to **change the protocol from http to https in the address!** (please do not forget to restart the Omixon HLA Twin Server service after the configuration)

Tomcat

To configure SSL capability in Apache Tomcat, you will need to go to the Tomcat installation folder (C:\Program Files\Apache Software Foundation\Tomcat 9.0\conf\ by default) and open server.xml as Administrator. You will need to do this in all instances of Tomcat you wish to connect to HLA Twin.

You will find a line in the middle section of the file starting with "<Connector port="8443" protocol="org.apache.coyote.". Above this there is an XML comment tag: "<!–" and above that another "-->". Please insert the text below between these tags like so:

-->

configuration

<!--

```
<Connector port="8443"
    protocol="org.apache.coyote.http11.Http11NioProtocol"
    maxThreads="150"
    SSLEnabled="true">
  <SSLHostConfig>
    <Certificate certificateKeystoreFile="<keystore file location>/omixon.keystore"
        certificateKeystorePassword="<password>"
        truststoreFile="<keystore file location>/omixon.keystore"
        truststorePass="<password>"
        type="RSA" />
  </SSLHostConfig>
</Connector>
```

- please specify the path for the keystore file in the certificateKeystoreFile and truststoreFile parameters (if you put the keystore in this conf folder, you can write "conf/omixon.keystore")
- please specify the keystore password in the certificateKeystorePassword and truststorePass lines

Please save the file and restart the Apache Tomcat service. Now deploy a HLA Twin Typer from the reporting server, and the configuration is done.

7.2 Configuring a pre-existing MySQL database

HLA Twin Server has the ability to store its internal database (containing user data, reference databases, and audit information) in an already existing **MySQL 8** database. This way you would not need to set up a separate MySQL server for HLA Twin.

Please note that the responsiveness of the HLA Twin UI will depend on the network speed between MySQL and HLA Twin.

Your MySQL server needs to use **Legacy Password Encryption** for HLA Twin to interface with it.

You need to create a new user in your pre-existing database to allow HLA Twin to use it. For this, run the following commands:

1. `CREATE USER 'omixon'@'localhost' IDENTIFIED BY 'omixon';`
2. `GRANT ALL PRIVILEGES ON omixon_database . * TO 'omixon'@'localhost';`
3. `FLUSH PRIVILEGES;`

Now HLA Twin will be able to create its own database in MySQL.

7.3 Adding new Typers to HLA Twin Server

It is possible to add additional HLA Twin Typers to the HLA Twin Server after installation.

1. Open the typer.conf file in the HLA Twin Server installation folder with a text editor
2. Add another `${ tomcat9 }` line below the existing one(s):

```
typers = [
    ${ tomcat9 } { baseUrl = "http://192.168.0.5:8080/typer1" }
    ${ tomcat9 } { baseUrl = "http://192.168.0.6:8080/newtyper" }
]
```

Where

a. the IP address is the address of the computer where Apache Tomcat has already been installed
b. the port number is the port where Apache Tomcat was configured to listen on
c. "typer1" is a customizable name for the Typer instance that will be visible in the software

3. Save the file and restart the HLA Twin Server service

Now the new IP address will be visible in the Typer Manager dashboard in HLA Twin Server.

7.4 Database migration

This chapter is for users who plan to update from HLA Twin version 3.1.3 or below

7.4.1 Overview

The format of the internal database in HLA Twin 4.0.0 was changed for a more robust and efficient one (MySQL). This was necessary in order to provide a better user experience in the software.

Database migration is the process of transforming the data from your old HLA Twin database into the new one. We suggest that you do migrate your old database so the new version of HLA Twin will contain all the information that might be necessary for an audit.

7.4.2 Data to be migrated

The migration will basically transfer all data that is required for an audit. This entails:

- user accounts with their preferences
- global configurations such as automation configuration and scheduling, saved protocols, or the active reference database version
- analyses and their approval workflow information
- tasks regarding exports
- reference database imports

7.4.3 The migration process

The migration process is the last step of the HLA Twin installation. It will ask you to decide whether you would like to migrate your old database, and then it will ask you for the path where the old database is located.

The migration could take up to a few minutes. If you encounter an error, please contact us at support@omixon.com[8]

7.4.4 Old database location

The old database folder is `C:\Users\_username_\.omixon-hla-twin\` by default (where _username_ is the Windows user's name the software is installed under) or could be on a custom path typically close to the software installation folder.

7.5 Java licensing

This section describes options for customers that use the distributed typer(see page 40) configuration of HLA Twin, more specifically the JRE that is needed for Apache Tomcat.

Oracle has changed its licensing scheme[9] for Java SE on April 16, 2019. Because of this, commercial usage of Java SE is limited to versions prior to the licensing change.

An open-source alternative that is up to date and supported by Apache Tomcat is OpenJDK[10]. For easy installation, we suggest downloading a prebuilt installer from AdoptOpenJDK[11] (OpenJDK 8 with HotSpot JVM).

8 mailto:support@omixon.com
9 https://www.oracle.com/technetwork/java/javase/overview/oracle-jdk-faqs.html
10 https://jdk.java.net/
11 https://adoptopenjdk.net/