ThingWorx Installation Guide : Dev and Test Environment

This document is intended to describe the procedure to install the Thermo Fisher Dev environment.

Requirements

Hardware Sizing

Aspect	Value	Comment
Memory	16 GB	Configuration will require a percent of dedicated memory to be allocated to the Java VM.
CPU(s)	4 Cores	Virtualized environments may have their own terminology for specifying how many CPUs/Cores are being provided. This must be taken into account when determining if the environment meets the minimum requirements. The amount of concurrent query activity, indexing and searching, as well as the amount of internal event and/or property data-change may warrant increased CPU resources.
Disk Type	*	Server-class hardware is recommended.

Disk Space	100GB	This size will accommodate the default ThingWorx web application installed in Tomcat, along with the initial ThingworxStorage (DB) directory and some initial configuration data. • This does NOT include the space required for the OS or other prerequisite software. • An additional 100GB of space is required if ThingWorx Flow is also installed (for a total minimum of 200GB of disk space). • The total disk space required for any given application depends on the amount of configuration and runtime data that will be maintained. Customers should work with Sales and Field Enablement to estimate space needs according to their application requirements.
Disk Speed	10000 RPM or SSD	Speed is important if you are storing data on the ThingWorx Core. ThingWorx recommends the fastest disk(s) you can afford, but you should not use disks slower than 10000 RPM. • You may wish to consider a RAID configuration to increase disk performance • If you will be executing regular system backups, it is HIGHLY recommended to use an additional physical disk on its own controller - not simply a separate partition on the same physical disk.

Required Software

For more information on required softwares, see Software Requirements in Thingworx.

Installing ThingWorx

Install Java and Apache Tomcat

1. Install and Configure Network Time Protocol (NTP) settings for time synchronization:

```
sudo yum install ntp
```

2. Edit AUTHBIND properties to allow Tomcat to bind to ports below 1024:

```
sudo yum install authbind
```

3. Download the Java JDK tar file from Oracle's website.

4. Extract tar file

```
tar -xvzf jdk-8u241-linux-x64.tar.gz
```

5. Create the directory by moving the JDK to `/usr/lib/jvm`:

```
sudo mkdir -p /usr/lib/jvm
mv jdk1.8.0_241/ /usr/lib/jvm/
```

6. Add alternatives to the system

```
sudo update-alternatives --install "/usr/bin/java" "java" "/usr/lib
/jvm/jdk1.8.0_241/bin/java" 1
sudo update-alternatives --install "/usr/bin/keytool" "keytool" "/usr
/lib/jvm/jdk1.8.0_241/bin/keytool" 1
```

7. Change access permissions

```
sudo chmod a+x /usr/bin/java
sudo chmod a+x /usr/bin/keytool
```

8. Change owner

```
sudo chown -R root:root /usr/lib/jvm/jdk1.8.0_241/
```

9. Configure master links

```
sudo update-alternatives --config java
sudo update-alternatives --config keytool
```

10. Verify Java version

```
java -version
```

This should return something similar to the following (build specifics may be different): `` `java version "1.8.0_xxx"` ``

```
Java(TM) SE Runtime Environment (build 1.8.0_xxx-bxx)
Java HotSpot(TM) 64-Bit Server VM (build xx.xx-bxx, mixed mode)
```

11. Download Apache Tomcat

12. Extract tar file

```
tar -xvzf apache-tomcat-9.0.30.tar.gz
```

13. Create and change the owner for `/usr/share/tomcat9.0` and move Tomcat to the following location. Add user and group to the system:

```
sudo mkdir -p /usr/share/tomcat9.0
sudo mv apache-tomcat-9.0.30 /usr/share/tomcat9.0/9.0.30
groupadd --system tomcat9.0
sudo adduser --system -d /usr/share/tomcat9.0/ --no-create-home -g
tomcat9.0 -s /bin/nologin tomcat9.0
sudo chown -R tomcat9.0:tomcat9.0 /usr/share/tomcat9.0
// add those 2 lines at the end of the /etc/bashrc
nano /etc/bashrc
```

14. Define environment variables in `/etc/environment`

```
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_241
export CATALINA_HOME=/usr/share/tomcat9.0/9.0.30
```

15. Change directory to `$CATALINA_HOME`

```
cd $CATALINA_HOME
```

16. Change owner and access permissions of `bin/, lib/, and webapps/`

```
sudo chown -Rh tomcat9.0:tomcat9.0 bin/ lib/ webapps/
sudo chmod 775 bin/ lib/ webapps/
```

17. Change owner and access permissions of `usr/share/tomcat9.0/9.0xx`

```
sudo chown -R tomcat9.0:tomcat9.0 /usr/share/tomcat9.0/9.0.30
sudo chmod -R 775 /usr/share/tomcat9.0/9.0.30
```

18. Change owner and access permissions of conf/

```
sudo chown -Rh root:tomcat9.0 conf/
sudo chmod -R 650 conf/
```

19. Change access permissions of logs/, temp/, and work/

```
sudo chown -R tomcat9.0:adm logs/ temp/ work/
sudo chmod 760 logs/ temp/ work/
```

20. Create self-signed certificate

```
sudo $JAVA_HOME/bin/keytool -genkey -alias tomcat9.0 -keyalg RSA -
keystore
```

21. Follow the instructions to complete the certificate creation process.

    1. Set the keystore password.
    2. Follow the prompts to set up your security certificate.
    3. Set the tomcat8.5 user password to the same as the keystore password:

    ```
    $CATALINA_HOME/conf/.keystore
    sudo chown root:tomcat9.0 $CATALINA_HOME/conf/.keystore
    sudo chmod 640 $CATALINA_HOME/conf/.keystore
    ```

22. For security reason desactivate AJP

```
nano $CATALINA_HOME/conf/context.xml
```

23. Uncomment the Manager element in `$CATALINA_HOME/conf/context.xml` to prevent sessions from persisting across restarts:

```
<Manager pathname="" />
```

24. In the location of the Tomcat installation, open `conf/server.xml` and search for the following line. If found, comment it out and save the file:

```
nano $CATALINA_HOME/conf/server.xml
 <!--  <Connector port="8009" protocol="AJP/1.3" redirectPort="8443"
/> -->
```

the following line for the HTTS

```
<Connector protocol="HTTP/1.1"  port="8443" maxThreads="200"
scheme="https" secure="true" SSLEnabled="true"
keystoreFile="conf/.keystore" keystorePass="xxxxxxxxxxx"
clientAuth="false" sslProtocol="TLS"/>

sudo touch $CATALINA_HOME/bin/setenv.conf
nano $CATALINA_HOME/bin/setenv.conf

CATALINA_OPTS="$CATALINA_OPTS -Djava.library.path=${CATALINA_BASE}
/webapps/Thingworx/WEB-INF/extensions \
-Djava.timezone=UTC"
JAVA_OPTS="$JAVA_OPTS -Djava.net.preferIPv4Stack=true -Djava.net.
preferIPv4Addresses=true"
```

If you receive an error that the directory doesn’t exist, use the following commands to ensure port 443 works:

```
sudo touch /etc/authbind/byport/443
sudo chmod 700 /etc/authbind/byport/443
sudo chown tomcat9.0:tomcat9.0 /etc/authbind/byport/443
```

25. Define a user in `$CATALINA_HOME/conf/tomcat-users.xml`

```
nano $CATALINA_HOME/conf/tomcat-users.xml
<user username="<Tomcat user name> " password="<Tomcat password> "
roles=
"manager"/>
```

26. Determine uid of tomcat9.0 user:

```
id -u tomcat9.0
```

27. Using this number, create an ID file in `/etc/authbind/byuid/`:

```
sudo touch /etc/authbind/byuid/<uid>
nano /etc/authbind/byuid/<uid>
```

28. Edit the file from the step above and paste in the following:

```
0.0.0.0/0:1,1023
```

29. Change owner and access permissions of /etc/authbind/byuid/<uid>:

```
sudo chown tomcat9.0:tomcat9.0 /etc/authbind/byuid/<uid>
sudo chmod 700 /etc/authbind/byuid/<uid>
```

30. Modify $CATALINA_HOME/bin/startup.sh to always use authbind:

    ```
    nano $CATALINA_HOME/bin/startup.sh
    ```

    Comment the following in the file:

    ```
    exec "$PRGDIR"/"$EXECUTABLE" start "$@"
    ```

31. Add the following to the end of the file:

    ```
    exec authbind --deep "$PRGDIR"/"$EXECUTABLE" start "$@"
    ```

32. In /etc/init.d, create tomcat9.0 file:

    ```
    touch /etc/init.d/tomcat9.0
    ```

33. Edit the file and enter the following contents:

    ```
    nano /etc/init.d/tomcat9.0
    ```

    ```
    CATALINA_HOME=/usr/share/tomcat9.0/9.0.30
    case $1 in
    start)
    /bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/startup.sh
    ;;
    stop)
    /bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/shutdown.sh
    ;;
    restart)
    /bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/shutdown.sh
    /bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/startup.sh
    ;;
    esac
    exit 0
    ```

34. Change access permissions of etc/init.d/tomcat8.5 and create symbolic links:

```
sudo chmod 755 /etc/init.d/tomcat9.0
sudo ln -s /etc/init.d/tomcat9.0 /etc/rc1.d/K99tomcat
sudo ln -s /etc/init.d/tomcat9.0 /etc/rc2.d/S99tomcat
```

35. Set up Tomcat as a service to start on boot. Build JSVC if it is not already installed on your system. If it is already installed, skip and go to the next step:

```
sudo yum install gcc
```

36. Set up the Tomcat service on boot:

```
cd /usr/share/tomcat9.0/9.0.30/bin/
sudo tar xvfz commons-daemon-native.tar.gz
cd commons-daemon-*-native-src/unix
sudo ./configure --with-java=$JAVA_HOME
sudo yum install make
sudo make
sudo cp jsvc ../..
```

37. Create the Tomcat service file

```
sudo touch /etc/systemd/system/tomcat9.0.service
```

38. Open /etc/systemd/system/tomcat9.0.service in a text editor (as root):

    1. Paste the following in the Tomcat service file:

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

[Service]
Type=forking
PIDFile=/var/run/tomcat.pid
Environment=CATALINA_PID=/var/run/tomcat.pid
Environment=JAVA_HOME=/usr/lib/jvm/jdk1.8.0_xxx
Environment=CATALINA_HOME=/usr/share/tomcat9.0/9.0.xx
Environment=CATALINA_BASE=/usr/share/tomcat9.0/9.0.xx
Environment=CATALINA_OPTS=

ExecStart=/usr/share/tomcat9.0/9.0.xx/bin/jsvc \
-Dcatalina.home=${CATALINA_HOME} \
-Dcatalina.base=${CATALINA_BASE} \
-Djava.awt.headless=true -Djava.net.preferIPv4Stack=true -
Dserver -Dd64 -XX:+UseNUMA \
-XX:+UseG1GC -Dfile.encoding=UTF-8 \
-Djava.library.path=${CATALINA_BASE}/webapps/Thingworx/WEB-INF
/extensions \
-cp ${CATALINA_HOME}/bin/commons-daemon.jar:${CATALINA_HOME}/bin
/bootstrap.jar:${CATALINA_HOME}/bin/tomcat-juli.jar \
-user tomcat9.0 \
-java-home ${JAVA_HOME} \
-pidfile /var/run/tomcat.pid \
-errfile ${CATALINA_HOME}/logs/catalina.out \
-outfile ${CATALINA_HOME}/logs/catalina.out \
$CATALINA_OPTS \
org.apache.catalina.startup.Bootstrap

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

2. If the Tomcat service doesn't automatically start after reboot and you receive following error, on executing sudo systemctl enable tomcat9.0.service:

   ```
   update-rc.d: error: tomcatx.x Default-Start contains no
   runlevels, aborting.
   ```

   Then the following step is required:

   ```
   Remove the tomcat9.0 file located at /etc/init.d and rerun
   following command:
   sudo systemctl enable tomcat9.0.service
   ```

39. Create a new file in the tomcat /bin file named setenv.sh:

```
sudo touch $CATALINA_HOME/bin/setenv.sh
nano $CATALINA_HOME/bin/setenv.sh
CATALINA_OPTS="$CATALINA_OPTS -Djava.library.path=${CATALINA_BASE}
/webapps/Thingworx/WEB-INF/extensions \
-Djava.timezone=UTC"
JAVA_OPTS="$JAVA_OPTS -Djava.net.preferIPv4Stack=true -Djava.net.
preferIPv4Addresses=true"
```

40. In the location of the Tomcat installation, open CATALINA_HOME/conf/web.xml. Replace the default error page (default is stacktrace) by adding the following into the web.xml file. Place the following within the web-app tag (after the welcome-file-list tag). A well-configured web application will override this default in CATALINA_HOME/webapps/APP_NAME/WEB-INF/web.xml so it won't cause problems.

```
<error-page><exception-type>java.lang.Throwable</exception-
type><location>/error.jsp</location></error-page>
```

41. In the location of the Tomcat installation, open CATALINA_HOME/conf/server.xml. Add the following inside the <Host> </Host> tags:

```
<Valve className="org.apache.catalina.valves.ErrorReportValve"
showReport="false" showServerInfo="false" />
```

42. Remove all the Tomcat webapps located in /<path_to_tomcat>/webapps/. Removing these apps prevents unnecessary access to Tomcat, specifically in the context that would allow users to view other users' cookies.

43. PTC strongly recommends the use of TLS when running ThingWorx. For detailed instructions on setting up TLS, refer to this technical support article.

44. If your application requires a specific cipher suite, refer to the following documentation for configuration information:

    https://www.jamf.com/jamf-nation/articles/384/configuring-supported-ciphers-for-tomcat-https-connections

45. (OPTIONAL STEP) To increase the default cache settings that affect static file caching, add the following line within the <context></context> tags in the $CATALINA_HOME/conf/context.xml file:

```
<Resources cacheMaxSize="501200" cacheObjectMaxSize="2048" cacheTtl="
60000"/>
```

    Increasing this setting improves performance and avoids the following message in Tomcat:
    WARNING: Unable to add the resource at [/Common/jquery/jquery-ui.js] to the cache because there was insufficient free space available after evicting expired cache entries - consider increasing the maximum size of the cache.

Install and Configure PostgreSQL

1. Download and install the appropriate version of PostgreSQL.

```
sudo yum install postgresql96
```

To set up the PostgreSQL database and tablespace, the `thingworxPostgresDBSetup` script must be configured and executed.

2. Create the `ThingworxPostgresqlStorage` folder on the drive that the `ThingworxStorage` folder is located (in the root directory by default). Note the following:

    1. If you create the folder using the `-d<databasename>` command, you do not have to use the PostgreSQL user.

    2. You must specify the `-l` option to a path that exists. For example, `-l D:\ThingworxPostgresqlStorage.` The script does not create the folder for you.
    3. The folder must have appropriate ownership and access rights. It should be owned by the same user who runs the PostgreSQL service, and have Full Control assigned to that user - this user is generally `NETWORK_SERVICE`, but may differ in your environment.

    ```
    // option -d database - U usernmae -h hostname
    psql -h cl-gss-thingworx-storage-data.cpuz5conexqr.us-east-1.rds.
    amazonaws.com -U twxadmin -d thingworx
    ```

3. If necessary, configure the script.

    ```
    sudo unzip MED-61111-CD-084_ThingWorx-Platform-Postgres-8-x-x.zip
    sudo yum install
    ```

4. To set up the database and tablespace with a default PostgreSQL installation that has a PostgreSQL database and a PostgreSQL user name, enter:

    ```
    sudo sh thingworxPostgresSchemaSetup.sh  -u twxadmin  -d thingworx
    ```

5. Execute the script.

Install ThingWorx

1. Create `/ThingworxStorage` and `/ThingworxBackupStorage` directories. If you haven't already done so, create the `/ThingworxPlatform`

    ```
    sudo mkdir /ThingworxStorage /ThingworxBackupStorage
    /ThingworxPlatform
    ```

2. If you have not already done so, obtain the `Thingworx.war` file from PTC Software Downloads.

3. Move the `Thingworx.war to $CATALINA_HOME/webapps`.

    ```
    sudo mv Thingworx.war $CATALINA_HOME/webapps
    sudo chown tomcat9.0:tomcat9.0 $CATALINA_HOME/webapps/Thingworx.war
    sudo chmod 775 $CATALINA_HOME/webapps/Thingworx.war
    ```

4. Place the `platform-settings.json` in the `ThingworxPlatform` folder.

5. Add the following `AdministratorUserSettings` section (in `PlatformSettingsConfig`) to your `platform-settings.json` file along with a password that is at least 14 characters long.

```
{
"PlatformSettingsConfig": {
"AdministratorUserSettings": {
                  "InitialPassword": "changeme"
                              }
                           }
}
```

If Tomcat fails to start and reports the error message: Check the InitialPassword setting in the AdministratorUserPassword section in platform-settings.json..., check the following:
• The password setting exists in platform-settings.json
• The password is valid (14 or more characters by default)
• The platform-settings.json file is formatted correctly - bad formatting could lead to errors

6. Enable extension import. By default, extension import is disabled for all users.

   Add the following to the `platform-settings.json file.` Update the following `ExtensionPackageImportPolicy` parameters to true to allow extensions to be imported.

```
"ExtensionPackageImportPolicy": {
                                  "importEnabled": <true or false>,
                                  "allowJarResources": <true or
false>,
                                  "allowJavascriptResources": <true
or false>,
                                  "allowCSSResources": <true or
false>,
                                  "allowJSONResources": <true or
false>,
                                  "allowWebAppResources": <true or
false>,
                                  "allowEntities": <true or false>,
                                  "allowExtensibleEntities": <true or
false>
                                  },
```

7. Configure licensing:

   Open the `platform-settings.json` file and add the following to the `PlatformSettingsConfig` section

```
"LicensingConnectionSettings":{
                                "username":"PTC Support site user
name",
                                "password":"PTC Support site password"
                                }
```

8. Start Tomcat. Verify that a license file (`successful_license_capability_response.bin`) is created in the `ThingworxPlatform` folder.

9. To launch ThingWorx, go to

   https://gss-twx.tfctest.thermofisher.net/Thingworx/Composer/ or

   https://gss-twx.tfcdev.thermofisher.net/Thingworx/Composer/

   in a Web browser.

10. Change the default password:

    1. In Composer, select Administrator > Change Password.
    2. In the Change Password window, enter Current Password, New Password, and Confirm Password.

11. Select Done.

12. (OPTIONAL STEP) To determine the status of your license, open the Monitoring>Subsystem>Licensing Subsystem Settings in Composer to confirm the list of features (licensed entities) included with the license. If there are no licensed entities present, you are in limited mode.

Required Files

setEnv.sh

setEnv.sh

```
CATALINA_OPTS="$CATALINA_OPTS -Djava.library.path=${CATALINA_BASE}/webapps/Thingworx/WEB-INF/extensions \

-Djava.timezone=UTC"

JAVA_OPTS="$JAVA_OPTS -Djava.net.preferIPv4Stack=true -Djava.net.preferIPv4Addresses=true"
```

tomcat9.0.init.d

tomcat9.0.init.d

```
CATALINA_HOME=/usr/share/tomcat9.0/9.0.30

case $1 in
```

```
start)
/bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/startup.sh
;;
stop)
/bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/shutdown.sh
;;
restart)
/bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/shutdown.sh
/bin/su -p -s /bin/sh tomcat8.5 $CATALINA_HOME/bin/startup.sh
;;
esac
exit 0
```

platform-settings.json

platform-settings.json

```
{
  "PlatformSettingsConfig": {
    "ExtensionPackageImportPolicy": {
      "importEnabled": true,
      "allowJarResources": true,
      "allowJavascriptResources": true,
      "allowCSSResources": true,
      "allowJSONResources": true,
      "allowWebAppResources": true,
      "allowEntities": true,
      "allowExtensibleEntities": true
    },
    "AdministratorUserSettings": {
      "InitialPassword": "xxxxxxxxxxxxxx"
    }
  },
  "ContentTypeSettings": {
    "supportedMediaEntityContentTypes": [
       "video/3gpp2",
       "x-unknown/x-unknown",
       "audio/x-aac",
       "audio/x-aiff",
       "video/x-ms-asf",
       "audio/basic",
       "video/x-msvideo",
       "image/cgm",
       "text/css",
       "application/vnd.ms-excel",
       "application/msword",
       "application/vnd.ms-word.document.macroenabled.12",
       "application/vnd.openxmlformats-officedocument.wordprocessingml.document",
       "application/vnd.ms-word.template.macroenabled.12",
      "application/vnd.openxmlformats-officedocument.wordprocessingml.template",
      "image/vnd.dwg",
      "image/vnd.dxf",
      "application/x-msmetafile",
      "audio/flac",
      "application/x-gtar",
      "application/x-gzip",
      "text/html",
      "image/x-icon",
      "model/iges",
      "application/x-iso9660-image",
      "application/json",
      "video/mpeg",
      "audio/x-mpegurl",
      "audio/mp4",
      "video/mp4",
      "audio/midi",
      "video/quicktime",
      "audio/mpeg",
      "application/msproject",
      "application/msoutlook",
      "application/octet-stream",
      "application/msonenote",
      "application/vnd.ms-powerpoint",
      "application/vnd.ms-powerpoint.template.macroenabled.12",
      "application/vnd.openxmlformats-officedocument.presentationml.template",
      "application/vnd.ms-powerpoint.addin.macroenabled.12",
           "application/vnd.ms-powerpoint.slideshow.macroenabled.12",
          "application/vnd.openxmlformats-officedocument.presentationml.slideshow",
          "application/vnd.ms-powerpoint.presentation.macroenabled.12",
          "application/vnd.openxmlformats-officedocument.presentationml.presentation",
          "x-ptc/x-part",
          "application/vnd.ms-publisher",
          "application/x-rar-compressed",
          "application/rsd+xml",
          "application/rtf",
          "text/richtext",
          "application/vnd.stardivision.draw",
          "application/vnd.stardivision.calc",
          "application/sdp",
          "application/vnd.stardivision.writer",
          "application/vnd.ms-powerpoint.slide.macroenabled.12",
          "application/vnd.openxmlformats-officedocument.presentationml.slide",
          "application/x-tar",
          "image/tiff",
          "text/plain",
          "application/visio",
          "audio/wav",
          "audio/x-ms-wax",
          "video/x-ms-wm",
          "audio/x-ms-wma",
          "application/x-ms-wmd",
          "video/x-ms-wmv",
          "video/x-ms-wmx",
          "application/vnd.ms-wpl",
          "video/x-ms-wvx",
          "application/vnd.ms-excel.addin.macroenabled.12",
          "application/vnd.ms-excel.sheet.binary.macroenabled.12",
          "application/vnd.ms-excel.sheet.macroenabled.12",
          "application/vnd.openxmlformats-officedocument.spreadsheetml.sheet",
          "application/vnd.ms-excel.template.macroenabled.12",
          "application/vnd.openxmlformats-officedocument.spreadsheetml.template",
         "text/xml",
         "application/vnd.ms-xpsdocument",
         "application/xml",
                  "application/zip",

                  "application/ed",

                  "application/octet-stream",

                  "image/svg+xml"

               ]

          },

      "PersistenceProviderPackageConfigs": {

      "PostgresPersistenceProviderPackage": {

      "ConnectionInformation": {

              "driverClass": "org.postgresql.Driver",

              "jdbcUrl": "jdbc:postgresql://cl-gss-thingworx-storage-data.cpuz5conexqr.us-east-1.rds.amazonaws.com:5432/cl-gss-thingworx-storage-
      data",

      "password": "xxxxxxxx",

      "username": "Admin"

      }

      }

      }

      }
```