



Installing ThingWorx 7.1

Version 1.5

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Document Revision History

Revision Date	Version	Description of Change
September 07, 2016	1.5	Updated wording for “production environments”
August 02, 2016	1.4	Updated RHEL commands
May 25, 2016	1.3	Fixed an error in RHEL PostgreSQL command.
May 23, 2016	1.2	Added a note for Tomcat Java options.
May 20, 2016	1.1	Updated Tomcat Java options.
April 14, 2016	1.0	Initial version for 7.1



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Installing ThingWorx

The ThingWorx Platform is currently supported on Windows, Ubuntu, and Red Hat Enterprise Linux.

Prerequisites

Prerequisite software includes Apache Tomcat, Oracle Java, and PostgreSQL. If you are installing ThingWorx for the first time, this document provides step-by-step installation instructions for your environment.

If you are upgrading to a newer version, refer to the [Upgrading ThingWorx](#) guide.

High Availability Option

With ThingWorx 7.0 and later, you can use PostgreSQL with an optional High Availability layer at the database level and/or at the ThingWorx level. Additional steps for HA are required and are located in the [ThingWorx High Availability Administrator's Guide](#).

For detailed software and hardware requirements, refer to the [ThingWorx System Requirements and Compatibility Matrix](#) document.

Installing ThingWorx for the First Time: PostgreSQL on Windows

Oracle Java, and Apache Tomcat, and PostgreSQL must be installed prior to installing ThingWorx.

Installing Oracle Java and Apache Tomcat (Windows)

1. Download and install the required version of Java from the [Oracle website](#).

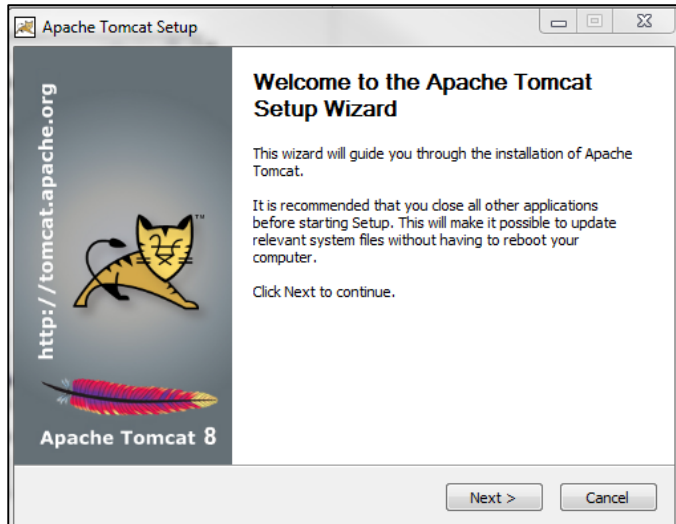
NOTE: Refer to the [System Requirements and Compatibility Matrix](#) document for version requirements.

2. Visit the [Tomcat website](#) to download the **32-bit/64-bit Windows Service Installer (pgp, md5, sha1)**.

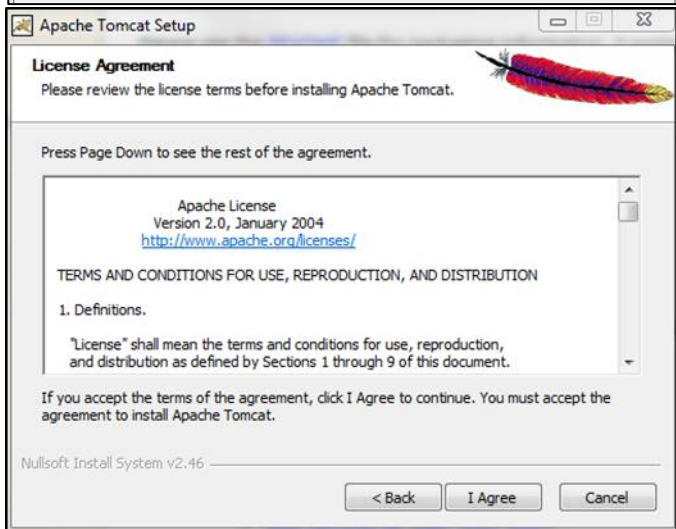
NOTE: Refer to the [System Requirements and Compatibility Matrix](#) document for version requirements.



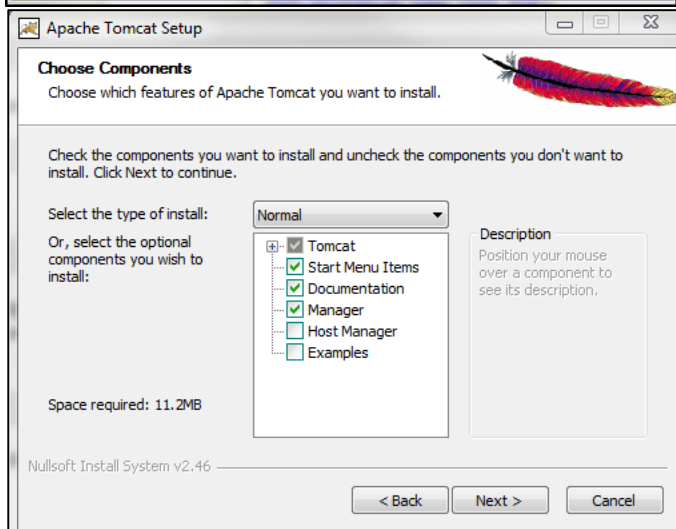
3. The Apache Tomcat Setup Wizard launches. Click **Next**.



4. Click **I Agree**.

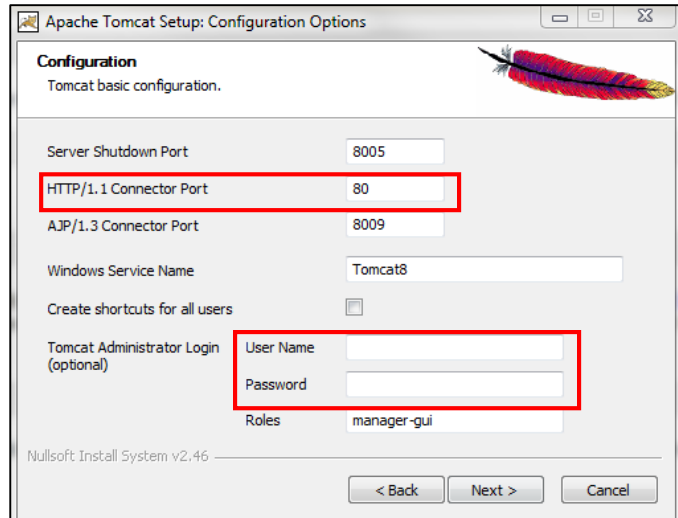


5. In the **Components** section, use the default settings.
6. Click **Next**.



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7. In the **HTTP/1.1 Connector Port** field, type **80 (or other available port)**.
8. In the **Tomcat Administrator Login** fields, type a **User Name** and **Password**.
9. Click **Next**.
10. Enter the path to the proper 64-bit Java installation directory.
11. Click **Next**.



Apache Tomcat Setup: Configuration Options

Configuration
Tomcat basic configuration.

Server Shutdown Port: 8005

HTTP/1.1 Connector Port: 80

AJP/1.3 Connector Port: 8009

Windows Service Name: Tomcat8

Create shortcuts for all users:

Tomcat Administrator Login (optional):

User Name:

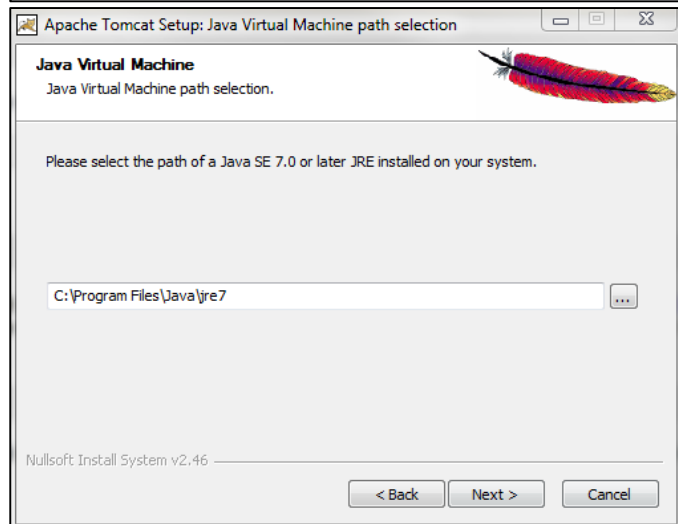
Password:

Roles: manager-gui

Nullsoft Install System v2.46

< Back Next > Cancel

12. Click **Install**.



Apache Tomcat Setup: Java Virtual Machine path selection

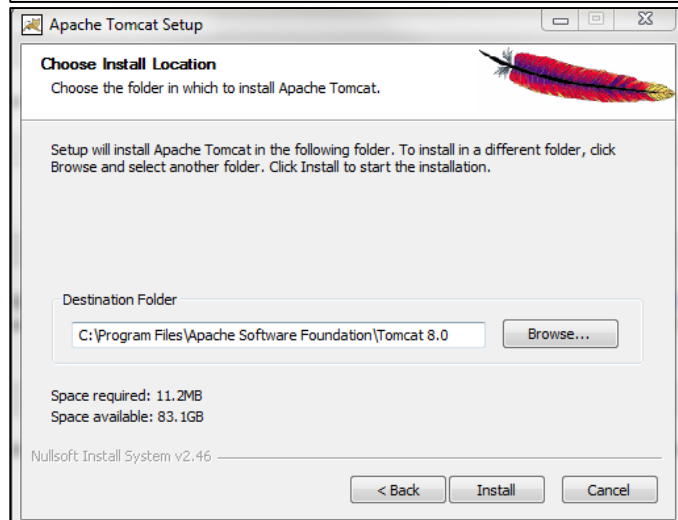
Java Virtual Machine
Java Virtual Machine path selection.

Please select the path of a Java SE 7.0 or later JRE installed on your system.

C:\Program Files\Java\jre7

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< Back Next > Cancel



Apache Tomcat Setup

Choose Install Location
Choose the folder in which to install Apache Tomcat.

Setup will install Apache Tomcat in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

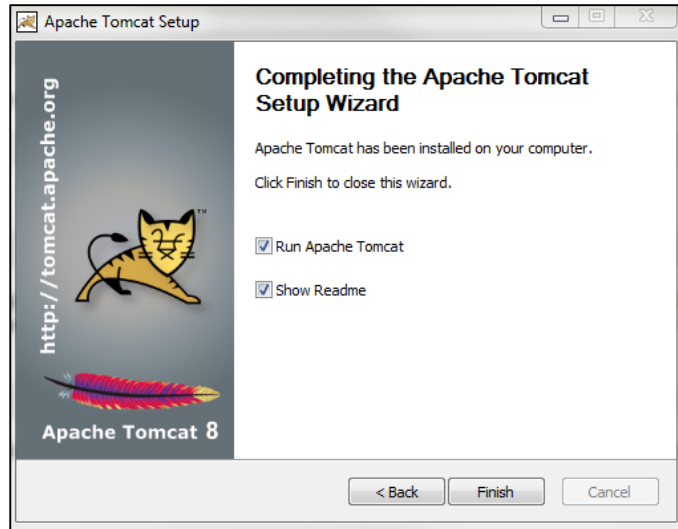
Destination Folder: C:\Program Files\Apache Software Foundation\Tomcat 8.0

Space required: 11.2MB
Space available: 83.1GB

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< Back Install Cancel

13. Click **Finish**.



14. Click **Start>Configure Tomcat**.

15. Open the **Java** tab.

16. In the Java Options field, add the following to the end of the options field:

-Dserver -Dd64
-XX:+UseNUMA
-XX:+UseConcMarkSweepGC
-Dfile.encoding=UTF-8

NOTE: For more information on these options and for additional options for hosted and/or public-facing environments, refer to the [Appendix: Tomcat Java Option Settings](#).

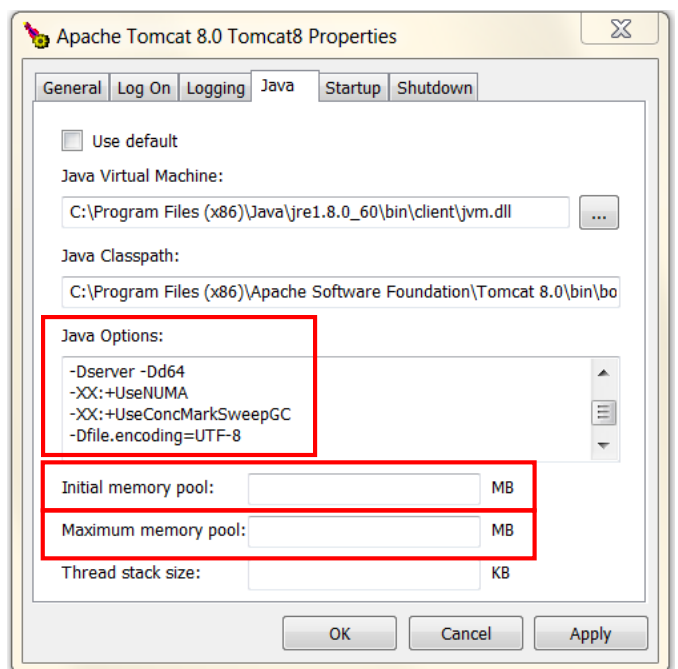
17. Clear any values in the **Initial memory pool** and **Maximum memory pool** fields.

18. Click **OK**.

19. Go to the location of the Tomcat installation and open the **server.xml** file in the **conf** folder. For example, C:\Program Files\Apache Software Foundation\Tomcat 8.0\conf\server.xml

20. Replace **HTTP/1.1** with **protocol="org.apache.coyote.http1.1.Http11NioProtocol"**

21. Save and close the file.



```
<!--
<Connector port="8443"
protocol="org.apache.coyote.http1.1.Http11NioProtocol"
      maxThreads="150" SSLEnabled="true" scheme="https"
secure="true"
      clientAuth="false" sslProtocol="TLS" />
-->
```


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22. OPTIONAL STEP: If you want to increase the default cache settings that affect static file caching, add the following line within the <context></context> tags in the \$TOMCAT_HOME/conf/context.xml file:
- ```
<Resources
cacheMaxSize="501200"
cacheObjectMaxSize="2048"
cacheTtl="60000"/>
```

## Installing and Configuring PostgreSQL (Windows)

The instructions provided below are intended for the PostgreSQL administrator (not the DB host servers).

NOTE: If you are including the HA layer to your implementation, refer to the [ThingWorx High Availability Administrator's Guide](#).

This section includes the following:

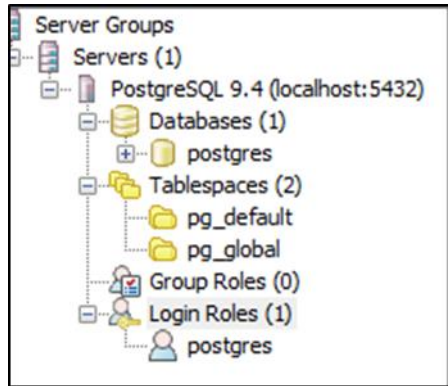
- Installing PostgreSQL
- Creating a new user role in PostgreSQL
- Configuring and executing the PostgreSQL database script (thingworxPostgresDBSetup.bat)
- Configuring and executing the model/data provider schema script (thingworxPostgresSchemaSetup.bat)
- Configuring platform-settings.json

## Installing PostgreSQL and Creating a New User Role in PostgreSQL (Windows)

1. Download and install the appropriate version of PostgreSQL from the following site: <http://www.postgresql.org/download/>
  - pgAdmin III Tool
    - PgAdmin III is an open source management tool for your databases that is included in the PostgreSQL download. The tool features full Unicode support, fast, multithreaded query, and data editing tools and support for all PostgreSQL object types.
2. Open PostgreSQL using pgAdmin III.

3. Create a new user role (in this example, it is **twadmin**):
  - a. Right click **PostgreSQL9.4** (localhost:5432).
  - b. Select **NewObject>New Login Role**. On the **Properties** tab, in the **Role name** field, type **twadmin**.
  - c. On the **Definition** tab, in the **Password** field, type **password** (must type **password** (must type twice)).
4. Click **OK**.

NOTE: Remember the user role name created in this step for later use.



### Configuring and Executing the PostgreSQL Database Script (Windows)

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

1. Add the **<postgres-installation>/bin** folder to your system path variable.
2. Create a directory named **ThingworxPostgresqlStorage** on your Thingworx Storage drive.

NOTE: If you create with the **-d<databasename>**, you do not have to use the postgres user.

NOTE: 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.

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.

3. Obtain and open **thingworxPostgresDBSetup.bat** from the ThingWorx software download package.
4. Configure the script. Reference the configuration options in the table below.

Various parameters such as **server**, **port**, **database**, **tablespace**, **tablespace location** and **thingworxusername** can be configured in the script, depending on the requirements. Execute this script with the **--help** option for usage information.

As an example, to set up the database and tablespace with a default Postgres installation that has a postgres database as well as a postgres user name and assuming the user created above is **twadmin**, enter:

**thingworxpostgresDBSetup -a postgres -u twadmin -l C:\ThingworxPostgresqlStorage**

where **twadmin** is the user name

5. Execute the script. Once executed, this creates a new database and tablespace with a default PostgreSQL installation in the PostgreSQL instance installed on the localhost.

NOTE: You may need to run the command prompt as admin.

**thingworxPostgresDBSetup.bat Script Options**

| Option   | Parameter           | Default                     | Description                                                                                     | Example      |
|----------|---------------------|-----------------------------|-------------------------------------------------------------------------------------------------|--------------|
| -t or -T | server              | localhost                   | Tablespace name                                                                                 | -t thingworx |
| -p or -P | port                | 5432                        | Port number of PostgreSQL                                                                       | -p 5432      |
| -d or -D | database            | thingworx                   | PostgreSQL Database name to create                                                              | -d thingworx |
| -h or -H | tablespace          | thingworx                   | Name of the PostgreSQL tablespace.                                                              | -h localhost |
| -l or -L | tablespace_location | /ThingworxPostgresqlStorage | Required. Location in the file system where the files representing database objects are stored. | -l or -L     |
| -a or -A | adminusername       | postgres                    | Administrator Name                                                                              | -a postgres  |
| -u or -U | thingworxusername   | twadmin                     | User name that has permissions to write to the database.                                        | -u twadmin   |

[Configuring and Executing the Model/Data Provider Schema Script \(Windows\)](#)

To set up the PostgreSQL model/data provider schema, the **thingworxPostgresSchemaSetup.bat** script must be configured and executed. This will set up the public schema under your database on the PostgreSQL instance installed on the localhost.

1. Obtain and open the **thingworxPostgresSchemaSetup.bat** from the ThingWorx software download package.

2. Configure the script. Reference the configuration options in the table below.

Various parameters such as **server**, **port**, **database**, **username**, **schema**, and **option** can be configured in the script depending on the requirements. Execute this script with **--help** option for usage information.

3. Execute the script.

NOTE: You may be prompted to provide your password three times.

**thingworxPostgresSchemaSetup.bat Script Options**

| Option   | Parameter | Default   | Description                                                                                                                                                                                                                                                                       | Example      |
|----------|-----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| -h or -H | server    | localhost | IP or host name of the database                                                                                                                                                                                                                                                   | -h localhost |
| -p or -P | port      | 5432      | Port number of PostgreSQL                                                                                                                                                                                                                                                         | -p 5432      |
| -d or -D | database  | thingworx | Database name to use                                                                                                                                                                                                                                                              | -d thingworx |
| -s or -S | schema    | public    | Schema name to use                                                                                                                                                                                                                                                                | -s mySchema  |
| -u or -U | username  | twadmin   | Username to update the database schema                                                                                                                                                                                                                                            | -u twadmin   |
| -o or -O | option    | all       | There are three options:<br><b>all</b> : Sets up the model and data provider schemas into the specified database.<br><b>model</b> : Sets up the model provider schema into the specified database.<br><b>data</b> : Sets up the data provider schema into the specified database. | -o data      |

## Configuring platform-settings.json (Windows)

1. To use the default ThingworxPlatform configuration directory, create a folder called **ThingworxPlatform** at the root of the drive where Tomcat was installed. Alternatively, if you want to specify the location where ThingWorx stores its settings, you can set the **THINGWORX\_PLATFORM\_SETTINGS** environment variable to the desired location.

Ensure that the folder referenced by **THINGWORX\_PLATFORM\_SETTINGS** exists and is writable by the Tomcat user. This environment variable should be configured as part of the system environment variables.

2. Create a file named **platform-settings.json** and place the file into the **ThingworxPlatform** folder.
3. Open **platform-settings.json** and configure as necessary. Refer to the configuration options in the table below. Reference [Appendix B: platform-settings.json sample](#).

| <b>platform-settings.json Options</b>                                                                                                                                               |                         |                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Setting                                                                                                                                                                             | Default                 | Description                                                                                                                                                  |
| <b>Core Platform Settings</b>                                                                                                                                                       |                         |                                                                                                                                                              |
| BackupStorage                                                                                                                                                                       | /ThingworxBackupStorage | The directory name where all backups are written to.                                                                                                         |
| DatabaseLogRetentionPolicy                                                                                                                                                          | 7                       | The number of days that database logs are retained.                                                                                                          |
| EnableBackup                                                                                                                                                                        | true                    | Determines whether backups are retained.                                                                                                                     |
| EnableHA                                                                                                                                                                            | false                   | Determines whether the Platform can be configured for a highly available landscape.                                                                          |
| EnableSystemLogging                                                                                                                                                                 | false                   | Determines whether system logging is enabled. NOTE: DO NOT TURN THIS ON UNLESS INSTRUCTED BY THINGWORX SUPPORT.                                              |
| HTTPRequestHeaderMaxLength                                                                                                                                                          | 2000                    | The maximum allowable length for HTTP Request Headers values.                                                                                                |
| HTTPRequestParameterMaxLength                                                                                                                                                       | 2000                    | The maximum allowable length for HTTP Request Parameter values.                                                                                              |
| Storage                                                                                                                                                                             | /ThingworxStorage       | The directory where all storage directories are created/located (excluding Backup Storage).                                                                  |
| <b>HA Settings</b><br>Settings specific to a PostgreSQL HA landscape configuration. All are optional, and are ignored if the <b>EnableHA</b> setting above is set to <b>false</b> . |                         |                                                                                                                                                              |
| CoordinatorConnectionTimeout                                                                                                                                                        | 15000                   | How long to wait (in milliseconds) for a connection to be established with process/server used to coordinate Platform leadership.                            |
| CoordinatorHosts                                                                                                                                                                    | 127.0.0.1:2181          | A comma-delimited list of server IP addresses on which the processes used to coordinate Platform leadership exist (e.g. "127.0.0.1:2181, 127.0.0.2:2181").   |
| CoordinatorMaxRetries                                                                                                                                                               | 3                       | The maximum allowable number of retries that will be made to establish a connection with the process/server used to coordinate Platform leadership.          |
| CoordinatorRetryTimeout                                                                                                                                                             | 1000                    | How long to wait (in milliseconds) for each retry attempt.                                                                                                   |
| CoordinatorSessionTimeout                                                                                                                                                           | 60000                   | How long the Platform's session is to wait (in milliseconds) without receiving a "heartbeat" from the process/server used to coordinate Platform leadership. |

|                                                                                                                                                                                            |                               |                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LoadBalancerBase64EncodedCredentials                                                                                                                                                       | QWRtaW5pc3RyYXRvcjphZG1pbG==" | The Base64-encoded credentials for the HA Load Balancer, in the format of <code>&lt;user&gt;:&lt;password&gt;</code> .<br><br>NOTE: You can use any utility that Base64 encodes the matching <code>&lt;user&gt;:&lt;password&gt;</code> string used in your load balancer setup. |
| <b>PersistenceProviderPackageConfigs</b><br>Settings for the persistence provider (PostgreSQL or Neo4j)                                                                                    |                               |                                                                                                                                                                                                                                                                                  |
| <b>PostgresPersistenceProviderPackage</b><br>PostgreSQL-specific persistence provider settings. If PostgreSQL is not the persistence provider, then this entire section should be ignored. |                               |                                                                                                                                                                                                                                                                                  |
| acquireIncrement                                                                                                                                                                           | 5                             | Determines how many connections at a time the platform will try to acquire when the pool is exhausted.                                                                                                                                                                           |
| acquireRetryAttempts                                                                                                                                                                       | 3                             | Defines how many times the Platform will try to acquire a new Connection from the database before giving up.                                                                                                                                                                     |
| acquireRetryDelay                                                                                                                                                                          | 10000                         | The time (in milliseconds) the Platform will wait between acquire attempts.                                                                                                                                                                                                      |
| checkoutTimeout                                                                                                                                                                            | 10000000                      | The number of milliseconds a client calling <code>getConnection()</code> will wait for a Connection to be checked-in or acquired when the pool is exhausted.                                                                                                                     |
| driverClass                                                                                                                                                                                | org.postgresql.Driver         | The fully-qualified class name of the JDBC driverClass that is expected to provide Connections.                                                                                                                                                                                  |
| fetchSize                                                                                                                                                                                  | 5000                          | The count of rows to be fetched in batches instead of caching all rows on the client side.                                                                                                                                                                                       |
| idleConnectionTestPeriod                                                                                                                                                                   | 60                            | If this is a number greater than 0, the Platform will test all idle, pooled but unchecked-out connections, every x number of seconds.                                                                                                                                            |
| initialPoolSize                                                                                                                                                                            | 5                             | Initial number of database connections created and maintained within a pool upon startup. Should be between <code>minPoolSize</code> and <code>maxPoolSize</code> .                                                                                                              |

|                                     |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>jdbcUrl</p>                      | <p>jdbc:postgresql://localhost:5432/thingworx”</p> | <p>The jdbc url used to connect to PostgreSQL.</p> <p>NOTE: If the default schema name is changed (from public), you must add<br/>&lt;dbname&gt;?currentSchema=&lt;name of schema&gt;</p> <p>For example, if the schema name is mySchema, it would be:</p> <p><b>jdbc:postgresql://&lt;DBServer&gt;:&lt;DBPort&gt;/&lt;dbname&gt;?currentSchema=mySchema</b></p> <p>NOTE: If you are configuring an HA solution, this should reflect the server IP that the pgPool process is running on. Change the port to the port that pgPool is serving.</p>              |
| <p>maxConnectionAge</p>             | <p>0</p>                                           | <p>Seconds, effectively a time to live. A Connection older than maxConnectionAge will be destroyed and purged from the pool.</p>                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>maxIdleTime</p>                  | <p>0</p>                                           | <p>Seconds a connection can remain pooled but unused before being discarded. Zero means idle connections never expire.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>maxIdleTimeExcessConnections</p> | <p>300</p>                                         | <p>The number of seconds that connections in excess of minPoolSize are permitted to remain in idle in the pool before being culled. Intended for applications that wish to aggressively minimize the number of open connections, shrinking the pool back towards minPoolSize if, following a spike, the load level diminishes and Connections acquired are no longer needed. If maxIdleTime is set, maxIdleTimeExcessConnections should be smaller to have any effect. Setting this to zero means no enforcement and excess connections are not idled out.</p> |



|                                  |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| maxPoolSize                      | 100      | Maximum number of Connections a pool will maintain at any given time.                                                                                                                                                                                                                                                                                                                                                                                                         |
| maxStatements                    | 100      | The size of the Platform's global PreparedStatement cache.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| minPoolSize                      | 5        | Minimum number of Connections a pool will maintain at any given time.                                                                                                                                                                                                                                                                                                                                                                                                         |
| numHelperThreads                 | 8        | The number of helper threads to spawn. Slow JDBC operations are generally performed by helper threads that don't hold contended locks. Spreading these operations over multiple threads can significantly improve performance by allowing multiple operations to be performed simultaneously.                                                                                                                                                                                 |
| password                         | password | The password used to log into the database.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| testConnectionOnCheckout         | false    | If true, an operation will be performed at every connection checkout to verify that the connection is valid.                                                                                                                                                                                                                                                                                                                                                                  |
| unreturnedConnectionTimeout      | 0        | The number of seconds to wait for a response from an unresponsive connection before discarding it. If set, if an application checks out but then fails to check-in a connection within the specified period of time, the pool will discard the connection. This permits applications with occasional connection leaks to survive, rather than eventually exhausting the Connection pool. Zero means no timeout, and applications are expected to close their own connections. |
| username                         | twadmin  | The user that has the privilege to modify tables. This is the user created on the database for the ThingWorx server.                                                                                                                                                                                                                                                                                                                                                          |
| <b>Stream Processor Settings</b> |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| maximumBlockSize                 | 2500     | The maximum number of stream writes to process in one block.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| maximumQueueSize                 | 250000   | The maximum number of stream entries to queue (will be rejected after that)                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                                                                                                                                                                    |        |                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------|
| maximumWaitTime                                                                                                                                                                    | 10000  | Number of milliseconds the system waits before flushing the stream buffer.       |
| numberOfProcessingThreads                                                                                                                                                          | 5      | The number of processing threads (cannot change for Neo4j).                      |
| scanRate                                                                                                                                                                           | 5      | The buffer status is checked at the specified rate value in milliseconds.        |
| sizeThreshold                                                                                                                                                                      | 1000   | Maximum number of items to accumulate before flushing the stream buffer.         |
| <b>Value Stream Processor Settings</b>                                                                                                                                             |        |                                                                                  |
| maximumBlockSize                                                                                                                                                                   | 2500   | Maximum number of value stream writes to process in one block.                   |
| maximumQueueSize                                                                                                                                                                   | 500000 | Maximum number of value stream entries to queue (will be rejected after that).   |
| maximumWaitTime                                                                                                                                                                    | 10000  | Number of milliseconds the system waits before flushing the value stream buffer. |
| numberOfProcessingThreads                                                                                                                                                          | 5      | The number of processing threads (cannot change for Neo4j).                      |
| scanRate                                                                                                                                                                           | 5      | The rate (in milliseconds) before flushing the stream buffer.                    |
| sizeThreshold                                                                                                                                                                      | 1000   | Maximum number of items to accumulate before flushing the value stream buffer.   |
| <b>NeoPersistenceProviderPackage</b><br>Contains Neo4j-specific Persistence Provider settings. If Neo is not the Persistence Provider, then this entire section should be ignored. |        |                                                                                  |
| <b>StreamProcessorSettings</b>                                                                                                                                                     |        |                                                                                  |
| maximumBlockSize                                                                                                                                                                   | 2500   | The maximum number of stream writes to process in one block.                     |
| maximumQueueSize                                                                                                                                                                   | 250000 | The maximum number of stream entries to queue (will be rejected after that).     |
| maximumWaitTime                                                                                                                                                                    | 10000  | The maximum wait time (in milliseconds) before flushing stream buffer.           |
| scanRate                                                                                                                                                                           | 5      | The rate (in milliseconds) at which to check the buffer status.                  |
| sizeThreshold                                                                                                                                                                      | 1000   | The maximum number of items to accumulate before flushing stream buffer.         |
| <b>ValueStreamProcessorSettings</b>                                                                                                                                                |        |                                                                                  |
| maximumBlockSize                                                                                                                                                                   | 2500   | The maximum number of stream writes to process in one block.                     |

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|                  |        |                                                                              |
|------------------|--------|------------------------------------------------------------------------------|
| maximumQueueSize | 500000 | The maximum number of stream entries to queue (will be rejected after that). |
| maximumWaitTime  | 10000  | The maximum wait time (in milliseconds) before flushing the stream buffer.   |
| scanRate         | 5      | The rate (in milliseconds) at which to check the buffer status.              |
| sizeThreshold    | 1000   | The maximum number of items to accumulate before flushing stream buffer.     |

## Installing ThingWorx (Windows)

1. Locate the appropriate **Thingworx.war** file.

NOTE: ThingWorx downloads are available in [PTC Software Downloads](#).

2. Copy the **Thingworx.war** file and place it in the following location of your Tomcat installation:  
**\Apache Software Foundation\Tomcat 8.0\webapps**
3. To launch ThingWorx, go to **<servername>/Thingworx** in a web browser.  
NOTE: Use a strong password. The login information below is for the Administrator user only.

Use the following login information:

**Login Name:** Administrator

**Password:** admin

## Installing ThingWorx for the First Time: PostgreSQL on Ubuntu

Oracle Java, and Apache Tomcat, and PostgreSQL must be installed prior to installing ThingWorx. Refer to the [System Requirements and Compatibility Matrix](#) for specific version requirements.

## Installing Oracle Java and Apache Tomcat (Ubuntu)

1. Update Ubuntu packages:

```
$ sudo apt-get update
```

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

```
$ sudo apt-get install ntp
```

NOTE: The default configuration for NTP is sufficient. For additional configuration information about NTP (beyond the scope of this documentation), refer to the following resources:

- [Time Synchronization with NTP](#)
- [How do I use pool.ntp.org?](#)

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

```
$ sudo apt-get install authbind
```

4. Download the Java (JDK) tar file from [Oracle's website](#) and upload it to the server using scp or sftp.

NOTE: Refer to the [System Requirements and Compatibility Matrix](#) document for specific version requirements.

5. Extract tar file:

```
$ tar -xf jdk-8u45-linux-x64.tar.gz
```

6. Create the directory by moving the JDK to

```
/usr/lib/jvm:
```

```
$ sudo mkdir -p /usr/lib/jvm
$ sudo mv jdk1.8.0_45/ /usr/lib/jvm/
```

7. Add alternatives to the system:

```
$ sudo update-alternatives --install "/usr/bin/java" "java"
"/usr/lib/jvm/jdk1.8.0_45/bin/java" 1
$ sudo update-alternatives --install "/usr/bin/keytool"
"keytool" "/usr/lib/jvm/jdk1.8.0_45/bin/keytool" 1
```

8. Change access permissions:

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

9. Change owner:

```
$ sudo chown -R root:root /usr/lib/jvm/jdk1.8.0_45/
```

10. Configure master links:

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

NOTE: Additional executables in `/usr/lib/jvm/jdk1.8.0_45/bin/` can be installed using the previous set of steps.

11. Verify Java version:

```
$ java -version
java version "1.8.0_45"
Java(TM) SE Runtime Environment (build 1.8.0_45-b14)
Java HotSpot(TM) 64-Bit Server VM (build 24.75-b04, mixed mode)
```

12. Download Apache Tomcat:

```
$ wget http://archive.apache.org/dist/tomcat/tomcat-8/v8.0.33/bin/apache-tomcat-8.0.33.tar.gz
```

13. Extract tar file:

```
$ tar -xf apache-tomcat-8.0.33.tar.gz
```

14. Move Tomcat to /usr/share/tomcat8:

```
$ sudo mkdir -p /usr/share/tomcat8
$ sudo mv apache-tomcat-8.0.33 /usr/share/tomcat8/8.0.33
```

15. Define environment variables in /etc/environment:

```
export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_45
export CATALINA_HOME=/usr/share/tomcat8/8.0.33
```

**NOTE:** /etc/environment is read at boot, so a reboot is necessary.

16. Change directory to \$CATALINA\_HOME:

```
$ cd $CATALINA_HOME
```

17. Add user and group to the system:

```
$ sudo addgroup --system tomcat8 --quiet
$ sudo adduser --system --home /usr/share/tomcat8/ --no-create-home --ingroup tomcat8 --disabled-password --shell /bin/false tomcat8
```

18. Change owner and access permissions of bin/ lib/ and webapps/ :

```
$ sudo chown -Rh tomcat8:tomcat8 bin/ lib/ webapps/
$ sudo chmod 775 bin/ lib/ webapps/
```

19. Change owner and access permissions of conf/ :

```
$ sudo chown -Rh root:tomcat8 conf/
$ sudo chmod 640 conf/*
```

20. Change access permissions of logs/, temp/, and work/:

```
$ sudo chown -R tomcat8:adm logs/ temp/ work/
$ sudo chmod 750 logs/ temp/ work/
```

21. In `bin/`, create `setenv.sh` with the following contents:

```
Java Options
export JAVA_OPTS="-Djava.awt.headless=true -
Djava.net.preferIPv4Stack=true -Dserver -Dd64 -XX:+UseNUMA -
XX:+UseConcMarkSweepGC -Dfile.encoding=UTF-8"
export JRE_HOME=/usr/lib/jvm/jdk1.8.0_45/jre
```

NOTE: For more information on these options and for additional options for hosted and/or public-facing environments, refer to the [Appendix: Tomcat Java Option Settings](#).

22. Change owner and access permissions of `bin/setenv.sh`:

```
$ sudo chown tomcat8:tomcat8 bin/setenv.sh
$ sudo chmod 775 bin/setenv.sh
```

23. Create self-signed certificate:

```
$ $JAVA_HOME/bin/keytool -genkey -alias tomcat8 -keyalg RSA
$ sudo cp ~/.keystore $CATALINA_HOME/conf/
$ sudo chown root:tomcat8 $CATALINA_HOME/conf/.keystore
$ sudo chmod 640 $CATALINA_HOME/conf/.keystore
```

24. Uncomment the `Manager` element in `context.xml` to prevent sessions from persisting across restarts:

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

25. Modify the shutdown string and protocol used by the SSL Connector in `conf/server.xml` (comment out the non-SSL Connector):

```
<Server port="8005" shutdown="TH!nGW0rX">

<Connector port="443"
protocol="org.apache.coyote.http11.Http11NioProtocol"
maxThreads="150" SSLEnabled="true" scheme="https" secure="true"
keystoreFile="${user.home}/8.0.33/conf/.keystore"
keystorePass="changeit" clientAuth="false" sslProtocol="TLS" />
```

26. Define a user in `conf/tomcat-users.xml`:

```
<user username="tomcat" password="tomcat" roles="manager"/>
```

NOTE: In hosted and/or public-facing environments, use of the manager web application is not recommended because it introduces a security risk. Similarly, the example web applications included in `/webapps` should be removed as they may introduce unnecessary security vulnerabilities into Tomcat.

27. Determine id of tomcat8 user:

```
$ id -u tomcat8
```

117

28. In `/etc/authbind/byuid/`, create id file (for example, 117) with the following contents:

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

29. Change owner and access permissions of `/etc/authbind/byuid/117`:

```
$ sudo chown tomcat8:tomcat8 /etc/authbind/byuid/117
$ sudo chmod 700 /etc/authbind/byuid/117
```

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

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

31. In `/etc/init.d`, create `tomcat8` file with the following contents:

```
CATALINA_HOME=/usr/share/tomcat8/8.0.33

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

32. Change access permissions of `etc/init.d/tomcat8` and create symbolic links:

```
$ sudo chmod 755 /etc/init.d/tomcat8
$ sudo ln -s /etc/init.d/tomcat8 /etc/rc1.d/K99tomcat
$ sudo ln -s /etc/init.d/tomcat8 /etc/rc2.d/S99tomcat
```

33. OPTIONAL: If you want to increase the default cache settings that affect static file caching, add the following line within the `<context></context>` tags in the `$TOMCAT_HOME/conf/context.xml` file:

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



## Installing and Configuring PostgreSQL (Ubuntu)

The instructions provided below are intended for the PostgreSQL administrator (not the DB host servers).

NOTE: If you are including the HA layer to your implementation, refer to the [ThingWorx High Availability Administrator's Guide](#).

This section includes the following:

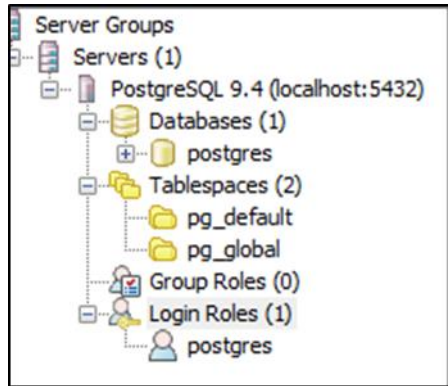
- Installing PostgreSQL
- Creating a new user role in PostgreSQL
- Configuring and executing the PostgreSQL database script (thingworxPostgresDBSetup.bat)
- Configuring and executing the model/data provider schema script (thingworxPostgresSchemaSetup.bat)
- Configuring platform-settings.json

## Installing PostgreSQL and Creating a New User Role in PostgreSQL (Ubuntu)

1. Download and install the appropriate version of PostgreSQL.  
  
In a Ubuntu environment, this can be installed directly from the package manager:  
  
**sudo apt-get install postgresql-9.4**
  2. Open PostgreSQL using pgAdmin III.  
In a Ubuntu 15.10 environment, it can be installed directly from the package manager:  
  
**sudo apt-get install pgadmin3**
- pgAdmin III Tool
    - PgAdmin III is an open source management tool for your databases that is included in the PostgreSQL download. The tool features full Unicode support, fast, multithreaded query, and data editing tools and support for all PostgreSQL object types.

3. Create a new user role (in this example, it is **twadmin**):
  - a. Right click **PostgreSQL9.4** (localhost:5432).
  - b. Select **NewObject>New Login Role**. On the **Properties** tab, in the **Role name** field, type **twadmin**.
  - c. On the **Definition** tab, in the **Password** field, type **password** (must type **password** (must type twice)).
4. Click **OK**.

NOTE: Remember the user role name created in this step for later use.



### Configuring and Executing the PostgreSQL Database Script (Ubuntu)

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

1. Add the **<postgres-installation>/bin** folder to your system path variable.
2. Create a directory named **ThingworxPostgresqlStorage** on your Thingworx Storage drive.

NOTE: 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. The folder needs have appropriate ownership and access rights. It should be owned by the postgres user and have the read, write, and execute assigned to the owner.

NOTE: If you create with the **-d<databasename>**, you do not have to use the postgres user.

3. Obtain and open **thingworxPostgresDBSetup.sh** from the ThingWorx software download package.
4. Configure the script. Reference the configuration options in the table below.

Various parameters such as **server**, **port**, **database**, **tablespace**, **tablespace location** and **thingworxusername** can be configured in the script, depending on the requirements. Execute this script with the **--help** option for usage information.

As an example, to set up the database and tablespace with a default Postgres installation that has a postgres database as well as a postgres user name and assuming the user created above is **twadmin**, enter:

```
thingworxpostgresDBSetup -a postgres -u twadmin -l C:\ThingworxPostgresqlStorage
```

where **twadmin** is the user name

- Execute the script. Once executed, this creates a new database and tablespace with a default PostgreSQL installation in the PostgreSQL instance installed on the localhost.

#### thingworxPostgresDBSetup.sh Script Options

Option	Parameter	Default	Description	Example
-t or -T	server	localhost	Tablespace name	-t thingworx
-p or -P	port	5432	Port number of PostgreSQL	-p 5432
-d or -D	database	thingworx	PostgreSQL Database name to create	-d thingworx
-h or -H	tablespace	thingworx	Name of the PostgreSQL tablespace.	-h localhost
-l or -L	tablespace_location	/ThingworxPostgresqlStorage	Required. Location in the file system where the files representing database objects are stored. *	-l or -L
-a or -A	adminusername	postgres	Administrator Name	-a postgres
-u or -U	thingworxusername	twadmin	User name that has permissions to write to the database.	-u twadmin

#### Configuring and Executing the Model/Data Provider Schema Script (Ubuntu)

To set up the PostgreSQL model/data provider schema, the **thingworxPostgresSchemaSetup.sh** script must be configured and executed. This will set up the public schema under your database on the PostgreSQL instance installed on the localhost.

- Obtain and open the **thingworxPostgresSchemaSetup.sh** from the ThingWorx software download package.
- Configure the script. Reference the configuration options in the table below.

Various parameters such as **server**, **port**, **database**, **username**, **schema**, and **option** can be configured in the script depending on the requirements. Execute this script with **--help** option for usage information.

- Execute the script.

**thingworxPostgresSchemaSetup.sh Script Options**

Option	Parameter	Default	Description	Example
-h or -H	server	localhost	IP or host name of the database	-h localhost
-p or -P	port	5432	Port number of PostgreSQL	-p 5432
-d or -D	database	thingworx	Database name to use	-d thingworx
-s or -S	schema	public	Schema name to use	-s mySchema
-u or -U	username	twadmin	Username to update the database schema	-u twadmin
-o or -O	option	all	There are three options: <b>all</b> : Sets up the model and data provider schemas into the specified database. <b>model</b> : Sets up the model provider schema into the specified database. <b>data</b> : Sets up the data provider schema into the specified database.	-o data

## Configuring platform-settings.json (Ubuntu)

1. Create a folder called **ThingworxPlatform** at the root (for example, `\ThingworxPlatform` or as a system variable (for example, `THINGWORX_PLATFORM_SETTINGS=/data/ThingworxPlatform`).
2. Create a file named **platform-settings.json** and place the file into the **ThingworxPlatform** folder.
3. Configure as necessary. Refer to the configuration options in the table below. Reference [Appendix C: Sample platform-settings.json](#).

platform-settings.json Options		
Setting	Default	Description
<b>Core Platform Settings</b>		
BackupStorage	/ThingworxBackupStorage	The directory name where all backups are written to.
DatabaseLogRetentionPolicy	7	The number of days that database logs are retained.
EnableBackup	true	Determines whether backups are retained.
EnableHA	false	Determines whether the Platform can be configured for a highly available landscape.
EnableSystemLogging	false	Determines whether system logging is enabled. NOTE: DO NOT TURN THIS ON UNLESS INSTRUCTED BY THINGWORX SUPPORT.
HTTPRequestHeaderMaxLength	2000	The maximum allowable length for HTTP Request Headers values.
HTTPRequestParameterMaxLength	2000	The maximum allowable length for HTTP Request Parameter values.
Storage	/ThingworxStorage	The directory where all storage directories are created/located (excluding Backup Storage).
<b>HA Settings</b>		
Settings specific to an HA landscape configuration. All are optional, and are ignored if the <b>EnableHA</b> setting above is set to <b>false</b> .		
CoordinatorConnectionTimeout	15000	How long to wait (in milliseconds) for a connection to be established with process/server used to coordinate Platform leadership.
CoordinatorHosts	127.0.0.1:2181	A comma-delimited list of server IP addresses on which the processes used to coordinate Platform leadership exist (e.g. "127.0.0.1:2181, 127.0.0.2:2181").
CoordinatorMaxRetries	3	The maximum allowable number of retries that will be made to establish a connection with the process/server used to coordinate Platform leadership.
CoordinatorRetryTimeout	1000	How long to wait (in milliseconds) for each retry attempt.
CoordinatorSessionTimeout	60000	How long the Platform's session is to wait (in milliseconds) without receiving a "heartbeat" from the process/server used to coordinate Platform leadership.

LoadBalancerBase64EncodedCredentials	QWRtaW5pc3RyYXRvcjphZG1pbG=="	The Base64-encoded credentials for the HA Load Balancer, in the format of <code>&lt;user&gt;:&lt;password&gt;</code> .  NOTE: You can use any utility that Base64 encodes the matching <code>&lt;user&gt;:&lt;password&gt;</code> string used in your load balancer setup.
<b>PersistenceProviderPackageConfigs</b> Settings for the persistence provider (PostgreSQL or Neo4j)		
<b>PostgresPersistenceProviderPackage</b> PostgreSQL-specific persistence provider settings. If PostgreSQL is not the persistence provider, then this entire section should be ignored.		
acquireIncrement	5	Determines how many connections at a time the platform will try to acquire when the pool is exhausted.
acquireRetryAttempts	3	Defines how many times the Platform will try to acquire a new Connection from the database before giving up.
acquireRetryDelay	10000	The time (in milliseconds) the Platform will wait between acquire attempts.
checkoutTimeout	10000000	The number of milliseconds a client calling <code>getConnection()</code> will wait for a Connection to be checked-in or acquired when the pool is exhausted.
driverClass	org.postgresql.Driver	The fully-qualified class name of the JDBC driverClass that is expected to provide Connections.
fetchSize	5000	The count of rows to be fetched in batches instead of caching all rows on the client side.
idleConnectionTestPeriod	60	If this is a number greater than 0, the Platform will test all idle, pooled but unchecked-out connections, every x number of seconds.
initialPoolSize	5	Initial number of database connections created and maintained within a pool upon startup. Should be between <code>minPoolSize</code> and <code>maxPoolSize</code> .

<p>jdbcUrl</p>	<p>jdbc:postgresql://localhost:5432/thingworx</p>	<p>The jdbc url used to connect to PostgreSQL.</p> <p>NOTE: If the default schema name is changed (from public), you must add &lt;dbname&gt;?currentSchema=&lt;name of schema&gt;</p> <p>For example, if the schema name is mySchema, it would be:</p> <p><b>jdbc:postgresql://&lt;DBServer&gt;:&lt;DBPort&gt;/&lt;dbname&gt;?currentSchema=mySchema</b></p> <p>NOTE: If you are configuring an HA solution, this should reflect the server IP that the pgPool process is running on. Change the port to the port that pgPool is serving.</p>
<p>maxConnectionAge</p>	<p>0</p>	<p>Seconds, effectively a time to live. A Connection older than maxConnectionAge will be destroyed and purged from the pool.</p>
<p>maxIdleTime</p>	<p>0</p>	<p>Seconds a connection can remain pooled but unused before being discarded. Zero means idle connections never expire.</p>
<p>maxIdleTimeExcessConnections</p>	<p>300</p>	<p>The number of seconds that connections in excess of minPoolSize are permitted to remain in idle in the pool before being culled. Intended for applications that wish to aggressively minimize the number of open connections, shrinking the pool back towards minPoolSize if, following a spike, the load level diminishes and Connections acquired are no longer needed. If maxIdleTime is set, maxIdleTimeExcessConnections should be smaller to have any effect. Setting this to zero means no enforcement and excess connections are not idled out.</p>

maxPoolSize	100	Maximum number of Connections a pool will maintain at any given time.
maxStatements	100	The size of the Platform's global PreparedStatement cache.
minPoolSize	5	Minimum number of Connections a pool will maintain at any given time.
numHelperThreads	8	The number of helper threads to spawn. Slow JDBC operations are generally performed by helper threads that don't hold contended locks. Spreading these operations over multiple threads can significantly improve performance by allowing multiple operations to be performed simultaneously.
password	password	The password used to log into the database.
testConnectionOnCheckout	false	If true, an operation will be performed at every connection checkout to verify that the connection is valid.
unreturnedConnectionTimeout	0	The number of seconds to wait for a response from an unresponsive connection before discarding it. If set, if an application checks out but then fails to check-in a connection within the specified period of time, the pool will discard the connection. This permits applications with occasional connection leaks to survive, rather than eventually exhausting the Connection pool. Zero means no timeout, and applications are expected to close their own connections.
username	twadmin	The user that has the privilege to modify tables. This is the user created on the database for the ThingWorx server.
<b>Stream Processor Settings</b>		
maximumBlockSize	2500	The maximum number of stream writes to process in one block.
maximumQueueSize	250000	The maximum number of stream entries to queue (will be rejected after that)



maximumWaitTime	10000	Number of milliseconds the system waits before flushing the stream buffer.
numberOfProcessingThreads	5	The number of processing threads (cannot change for Neo4j).
scanRate	5	The buffer status is checked at the specified rate value in milliseconds.
sizeThreshold	1000	Maximum number of items to accumulate before flushing the stream buffer.
<b>Value Stream Processor Settings</b>		
maximumBlockSize	2500	Maximum number of value stream writes to process in one block.
maximumQueueSize	500000	Maximum number of value stream entries to queue (will be rejected after that).
maximumWaitTime	10000	Number of milliseconds the system waits before flushing the value stream buffer.
numberOfProcessingThreads	5	The number of processing threads (cannot change for Neo4j).
scanRate	5	The rate (in milliseconds) before flushing the stream buffer.
sizeThreshold	1000	Maximum number of items to accumulate before flushing the value stream buffer.
<b>NeoPersistenceProviderPackage</b> Contains Neo4j-specific Persistence Provider settings. If Neo is not the Persistence Provider, then this entire section should be ignored.		
<b>StreamProcessorSettings</b>		
maximumBlockSize	2500	The maximum number of stream writes to process in one block.
maximumQueueSize	250000	The maximum number of stream entries to queue (will be rejected after that).
maximumWaitTime	10000	The maximum wait time (in milliseconds) before flushing stream buffer.
scanRate	5	The rate (in milliseconds) at which to check the buffer status.
sizeThreshold	1000	The maximum number of items to accumulate before flushing stream buffer.
<b>ValueStreamProcessorSettings</b>		
maximumBlockSize	2500	The maximum number of stream writes to process in one block.

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maximumQueueSize	500000	The maximum number of stream entries to queue (will be rejected after that).
maximumWaitTime	10000	The maximum wait time (in milliseconds) before flushing the stream buffer.
scanRate	5	The rate (in milliseconds) at which to check the buffer status.
sizeThreshold	1000	The maximum number of items to accumulate before flushing stream buffer.

### Installing ThingWorx (Ubuntu)

1. Create /ThingworxStorage and /ThingworxBackupStorage directories:

```
$ sudo mkdir /ThingworxStorage /ThingworxBackupStorage
```

2. Change owner and access permissions of /ThingworxStorage and /ThingworxBackupStorage:

```
$ sudo chown tomcat8:tomcat8 /ThingworxStorage
/ThingworxBackupStorage
$ sudo chmod 775 /ThingworxStorage /ThingworxBackupStorage
```

3. Unzip the ThingWorx zip archive and move to \$CATALINA\_HOME/webapps:

```
$ unzip Thingworx-Platform-7.1.0.latest.zip (or appropriate
version)
$ sudo mv Thingworx.war $CATALINA_HOME/webapps
$ sudo chown tomcat8:tomcat8
$CATALINA_HOME/webapps/Thingworx.war
$ sudo chmod 775 $CATALINA_HOME/webapps/Thingworx.war
```

4. Start Tomcat to deploy the ThingWorx web application:

```
$ sudo service tomcat8 start
```

NOTE: Use a strong password. The login information below is for the Administrator user only.

Username: **Administrator**

Password: **admin**

### Installing and Configuring ThingWorx for the First Time: PostgreSQL on Red Hat Enterprise Linux (RHEL)

Oracle Java, and Apache Tomcat, and PostgreSQL must be installed prior to installing ThingWorx.

#### Installing Oracle Java and Apache Tomcat (RHEL)

1. Download the Java installer. Open a terminal and run:

```
wget --no-check-certificate -c --header "Cookie: oraclelicense=accept-
securebackup-cookie" http://download.oracle.com/otn-pub/java/jdk/8u45-
b14/jdk-8u45-linux-x64.rpm
```

2. Run the Java installer:

```
sudo rpm -i jdk-8u45-linux-x64.rpm
```

3. Create the directory and move the JDK:

```
sudo mkdir -p /usr/lib/jvm
sudo mv /usr/java/jdk1.8.0_45/ /usr/lib/jvm/
```

4. Set the Java alternatives:

```
sudo alternatives --install /usr/bin/java java /usr/lib/jvm/jdk1.8.0_60/bin/java
1
sudo alternatives --install /usr/bin/keytool keytool
/usr/lib/jvm/jdk1.8.0_45/bin/keytool 1
```

5. Change access permissions:

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

6. Change Owner:

```
sudo chown -R root:root /usr/lib/jvm/jdk1.8.0_45/
```

7. Configure master links:

```
sudo alternatives --config java
* select the option that contains /usr/lib/jvm/jdk1.8.0_45/bin/java
sudo ln -s /usr/lib/jvm/jdk1.8.0_45/bin/keytool /usr/bin/keytool
sudo alternatives --config keytool
```

8. Verify Java version:

```
java -version
java version "1.8.0_45"
Java(TM) SE Runtime Environment (build 1.8.0_45-b14)
Java HotSpot(TM) 64-Bit Server VM (build 25.45-b02, mixed mode)
```

9. Install Tomcat. Download the Tomcat installer:

```
wget https://archive.apache.org/dist/tomcat/tomcat-8/v8.0.33/bin/apache-
tomcat-8.0.33.tar.gz
```

10. Extract the contents:

```
tar -xf apache-tomcat-8.0.33.tar.gz
```

11. Move Tomcat to /usr/share/tomcat8:

```
sudo mkdir -p /usr/share/tomcat8
sudo mv apache-tomcat-8.0.33 /usr/share/tomcat8/8.0.33
```

12. Change directory to /usr/share/tomcat8/8.0.33:

```
cd /usr/share/tomcat8/8.0.33
```

13. Add user and group to the system:

```
sudo groupadd -r tomcat8
sudo useradd -r -d /usr/share/tomcat8 -g tomcat8 -s /bin/false tomcat8
```

14. Change owner and access permissions of bin/ lib/ and webapps/

```
sudo chown -Rh tomcat8:tomcat8 bin/ lib/ webapps/
sudo chmod 775 bin/ lib/ webapps/
```

15. Change owner and access permissions of conf/:

```
sudo chown -Rh root:tomcat8 conf/
sudo chmod 640 conf/*
```

16. Change access permissions of logs/, temp/, and work/:

```
sudo chown -R tomcat8:adm logs/ temp/ work/
sudo chmod 750 logs/ temp/ work/
```

17. Create a bin/setenv.sh file and paste these contents:

```
sudo touch bin/setenv.sh
```

Open bin/setenv.sh in an editor (as root), paste the following and save:

```
Java Options
export JAVA_OPTS="-Djava.awt.headless=true -
Djava.net.preferIPv4Stack=true -Dserver -Dd64 -
XX:+UseNUMA -XX:+UseConcMarkSweepGC -
Dfile.encoding=UTF-8"
export JRE_HOME=/usr/lib/jvm/jdk1.8.0_45/jre
```

NOTE: For more information on these options and for additional options for hosted and/or public-facing environments, refer to the [Appendix: Tomcat Java Option Settings](#).

18. Change owner and access permissions of bin/setenv.sh:

```
sudo chown tomcat8:tomcat8 bin/setenv.sh
sudo chmod 775 bin/setenv.sh
```

19. Create self-signed certificate:

```
/usr/lib/jvm/jdk1.8.0_45/jre/bin/keytool -genkey -alias tomcat8 -keyalg RSA
```

Follow the instructions to complete the certificate creation process.

Set the keystore password to **changeit**

Set the tomcat8 user password to the same as the keystore password

```
sudo cp ~/.keystore /usr/share/tomcat8/8.0.33/conf/
sudo chown root:tomcat8 /usr/share/tomcat8/8.0.33/conf/.keystore
sudo chmod 640 /usr/share/tomcat8/8.0.33/conf/.keystore
```

20. Uncomment the Manager element in context.xml to prevent sessions from persisting across restarts.

Open **/usr/share/tomcat8/8.0.33/conf/context.xml** in a text editor (as root) and remove the '`<!--`' before '`<Manager pathname="" />`' and the '`-->`' after

21. Save the file.

22. Modify the shutdown string and protocol used by the SSL Connector in server.xml:

Open **/usr/share/tomcat8/8.0.33/conf/server.xml** in a text editor (as root)

Change '`<Server port="8005" shutdown="SHUTDOWN">`' to '`<Server port="8005" shutdown="TH!nGW0rX ">`'

Comment out or remove this section:

```
\ <Connector port="8080" protocol="HTTP/1.1"
connectionTimeout="20000" redirectPort="8443" />
```

Paste in this section directly below:

```
<Connector port="443"
protocol="org.apache.coyote.http11.Http11NioProto
col"
maxThreads="150" SSLEnabled="true" scheme="https"
secure="true"
 keystoreFile="${user.home}/8.0.33/conf/.keysto
re" keystorePass="changeit" clientAuth="false"
 sslProtocol="TLS" />
```

23. Save the file.
24. Define an Apache Manager user in tomcat-users.xml:

Open **/usr/share/tomcat8/8.0.33/conf/tomcat-users.xml** in a text editor (as root)

Just above the final line (`</tomcat-users>`) add the following line:

```
<user username="tomcat" password="tomcat"
roles="manager,manager-gui"/>
```

25. Save the file.  
NOTE: The roles included are for ease of testing and can be removed if security is a concern.

26. Set up Tomcat as a service to start on boot. First, build JSVC:

```

sudo yum install gcc
sudo rm /usr/java/latest
sudo ln -s /usr/lib/jvm/jdk1.8.0_45 /usr/java/latest
cd /usr/share/tomcat8/8.0.33/bin/
sudo tar xvfz commons-daemon-native.tar.gz
cd commons-daemon-*-native-src/unix
sudo ./configure --with-java=/usr/java/latest
sudo make
sudo cp jsvc ../..

```

27. Create the Tomcat service file:

```

sudo touch /usr/lib/systemd/system/tomcat.service

```

Open `/usr/lib/systemd/system/tomcat.service` in a text editor (as root) and paste in the following:

```

[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_45
Environment=CATALINA_HOME=/usr/share/tomcat8/8.0.33
Environment=CATALINA_BASE=/usr/share/tomcat8/8.0.33
Environment=CATALINA_OPTS=

ExecStart=/usr/share/tomcat8/8.0.33/bin/jsvc \
 -Dcatalina.home=${CATALINA_HOME} \
 -Dcatalina.base=${CATALINA_BASE} \
 -cp ${CATALINA_HOME}/bin/commons-
daemon.jar:${CATALINA_HOME}/bin/bootstrap.jar:${CATALINA_
HOME}/bin/tomcat-juli.jar \
 -user tomcat8 \
 -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

ExecStop=/usr/share/tomcat8/8.0.33/bin/jsvc \
 -pidfile /var/run/tomcat.pid \

```



```
-stop \
org.apache.catalina.startup.Bootstrap
```

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

28. Set Tomcat to run on system start up:

```
sudo systemctl enable tomcat.service
```

Note: This will allow the user to control the Tomcat service with the following commands:

```
systemctl start tomcat
systemctl stop tomcat
systemctl restart tomcat
systemctl status tomcat
```

29. Use the firewall to redirect port 80 to the secure Tomcat port:

```
sudo firewall-cmd --zone=public --add-forward-
port=port=80:proto=tcp:toport=443 --permanent
sudo firewall-cmd --reload
```

30. Start the Tomcat service and test:

```
sudo systemctl start tomcat
```

You should now be able to connect to the Tomcat server by entering **https://localhost** in a browser.

## Installing and Configuring PostgreSQL (RHEL)

The instructions provided below are intended for the PostgreSQL administrator (not the DB host servers).

NOTE: If you are including the HA layer to your implementation, refer to the [ThingWorx High Availability Administrator's Guide](#).

This section includes the following:

- Installing PostgreSQL
- Creating a new user role in PostgreSQL
- Configuring and executing the PostgreSQL database script (thingworxPostgresDBSetup.bat)

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- Configuring and executing the model/data provider schema script (thingworxPostgresSchemaSetup.bat)
- Configuring platform-settings.json

### Installing PostgreSQL and Creating a New User Role in PostgreSQL (RHEL)

1. Add the PostgreSQL repository to Yum and install:

```
rpm -Uvh http://yum.postgresql.org/9.4/redhat/rhel-7-x86_64/pgdg-redhat94-9.4-1.noarch.rpm
sudo yum install postgresql94 postgresql94-server postgresql94-contrib
```

2. Install PgAdmin III:

```
sudo yum install pgadmin3
```

3. Initialize and launch the database:

```
sudo /usr/pgsql-9.4/bin/postgresql94-setup initdb
```

4. Set the PostgreSQL service to start on boot:

```
sudo chkconfig postgresql-9.4 on
sudo service postgresql-9.4 start
```

5. Set up password for the postgres user:

```
sudo passwd postgres
```

Enter the password for the postgres user  
Take note of this password.

6. Set up postgres user in psql:

```
sudo -u postgres psql -c "ALTER ROLE postgres WITH password 'password'"
```

The password should be the same as in the step above.

7. Configure pgadmin3.

**sudo pgadmin3**

- \* In the pgAdminIII GUI, click on **file->Open postgresql.conf**
- \* Open **/var/lib/pgsql/9.4/data/postgresql.conf**
- \* Put a check next to **listen addresses** and **port**
  - The default settings of "localhost" and "5432" are usually sufficient.
- \* Save and close.
- \* Click on **file->Open pg\_hba.conf**
- \* Open **/var/lib/pgsql/9.4/data/pg\_hba.conf**
- \* Double-click on the line with address **127.0.0.1/32**
- \* Set Method to **md5**
- \* Double-click on the line with address **1/128**
- \* Set Method to **md5**
- \* Click **OK**
- \* Save and exit
- \* Close pgadmin3

8. Restart the PostgreSQL service:

**sudo service postgresql-9.4 restart**

9. Set up pgadmin3 to connect to the database.

**sudo pgadmin3**

Click the plug **Add a connection to a server** in the top left corner.

Fill out the following:

Name: PostgreSQL 9.4  
Host: localhost  
Port: 5432  
Service: <blank>  
Maintenance DB: postgres  
Username: postgres  
Password: <password as set in step above>  
Store password: Checked  
Group: ServersLocalhost

Click **OK**

10. Create a new user role (in this example, it is **twadmin**):

Right click **PostgreSQL9.4 (localhost:5432)**.

Note: It may be possible to activate some extensions. Click **Databases** and select **postgres** in the main window. A dialog displays. Click **Fix it!**

Select **NewObject>New Login Role**.

On the **Properties** tab, in the **Role name** field, type **twadmin**.

On the **Definition** tab, in the **Password** field, type password (must type twice).

11. Click **OK**.

12. Create the ThingworxPostgresqlStorage directory:

```
sudo mkdir /ThingworxPostgresqlStorage
sudo chmod 775 /ThingworxPostgresqlStorage
sudo chown postgres:postgres /ThingworxPostgresqlStorage/
sudo mkdir /ThingworxPlatform
sudo chmod 775 /ThingworxPlatform
sudo chown tomcat8:tomcat8 /ThingworxPlatform
```

13. Download the ThingWorx installer from the PTC downloads page:

NOTE: The file used in this example is **ThingWorx-Platform-Postgres-6-6-2 (MED-61111-CD-066\_SP2\_ThingWorx-Platform-Postgres-6-6-2.zip)**.

```
mkdir ~/Thingworx
cp MED-61111-CD-066_SP2_ThingWorx-Platform-Postgres-6-6-2.zip ~/Thingworx/
cd ~/Thingworx
unzip MED-61111-CD-066_SP2_ThingWorx-Platform-Postgres-6-6-2.zip
```

14. Execute the PostgreSQL Database Script:

```
cd install
sudo sh thingworxPostgresDBSetup.sh -a postgres -u twadmin -l
/ThingworxPostgresqlStorage
```

15. Execute the Model/Data Provider Schema Script:

```
sh thingworxPostgresSchemaSetup.sh
```

NOTE: When prompted, use the password for twadmin that was previously set up.

16. Startup configuration of platform-settings.json:

```
sudo cp ~/Thingworx/platform-settings.json /ThingworxPlatform/
```

## Installing ThingWorx (RHEL)

1. Create /ThingworxStorage and /ThingworxBackupStorage directories:

```
$ sudo mkdir /ThingworxStorage /ThingworxBackupStorage
```

2. Change owner and access permissions of /ThingworxStorage and /ThingworxBackupStorage:

```
$ sudo chown tomcat8:tomcat8 /ThingworxStorage/ThingworxBackupStorage
$ sudo chmod 775 /ThingworxStorage /ThingworxBackupStorage
```

3. Move Thingworx.war to Tomcat/webapps

```
sudo mv ~/Thingworx/Thingworx.war /usr/share/tomcat8/8.0.33/webapps/.
sudo chown tomcat8:tomcat8 /usr/share/tomcat8/8.0.33/webapps/Thingworx.war
udo chmod 775 /usr/share/tomcat8/8.0.33/webapps/Thingworx.war
```

4. Restart Tomcat to start ThingWorx:

```
sudo systemctl restart tomcat
```

5. Log into ThingWorx Composer:

In a browser, open <https://localhost/Thingworx/Composer/index.html>

NOTE: Use a strong password. The login information below is for the Administrator user only.

User: **Administrator**

Password: **admin**

NOTE: If you are performing an in-place migration, the following step is not necessary.

1. Import extensions. In Composer, click **Import/Export>Import**.

NOTE: Obtain and import the latest versions of the extensions. If you are upgrading to a major version (for example, from 6.x to 7.0, you must import the 7.x versions of the extensions.)

Extensions are available in [PTC Software Downloads](#) and the [ThingWorx Marketplace](#).

NOTE: For in-place migration from 6.5 to 7.0 for Neo4j with DataStax Enterprise (DSE), an additional Tomcat restart is required when you are installing the latest version of:

- DsePersistenceProvider\_ExtensionPackage.zip

NOTE: This extension must be requested from Support.

## Installing ThingWorx 7.1

2. For in-place migration from 6.5 to 7.0 for Neo4j/PostgreSQLwith DSE ONLY: Additional steps are required after importing the DsePersistenceProvider\_ExtensionPackage.zip extension.

NOTE: This extension must be requested from Support.

**Neo4j with DSE:** A “bulkInsertException” validation error may display when the extension is initially imported, but restarting Tomcat will clear the error.

**PostgreSQL with DSE:** An import error will display when the extension is initially imported. Restart Tomcat and reimport the extension.

NOTE: If you are performing an in-place migration, the following step is not necessary.

3. Import entities and data. In Composer, click **Import/Export>From ThingworxStorage**.

## Appendix A: Tomcat Java Option Settings

### Mandatory Settings

Setting	Description
-server	Explicitly tells the JVM to run in server mode. This is true by default when using 64-bit JDK, but it is best practice to declare it.
-d64	Explicitly tells the JVM to run in 64-bit mode. The current JVM automatically detects this, but it is best practice to declare it.
-XX:+UseNUMA	Tells the JVM to use the Non Uniform Memory Access Architecture if possible.
-XX:+UseConcMarkSweepGC	Tells the JVM to use the Concurrent Mark Sweep garbage collector - this is recommended by Neo.
-Dfile.encoding=UTF-8	Tells the JVM to use UTF-8 as the default character set so that non-Western alphabets are displayed correctly.
-Xms5g (for hosted and/or public-facing environments)	<p>Tells the JVM to allocate a minimum of 5GB of memory to the Tomcat process.</p> <p>NOTE: The amount of memory needs to be tuned depending on the actual environment. 5GB of memory is a good starting point for 100,000 things.</p>
-Xmx5g (for hosted and/or public-facing environments)	<p>Tells the JVM to limit the maximum of 5GB of memory to the Tomcat process.</p> <p>NOTE: The amount of memory needs to be tuned depending on the actual environment. 5GB of memory is a good starting point for 100,000 things.</p> <p>NOTE: The reason that the min and max amounts of memory are made equal is to reduce JVM having to re-evaluate required memory and resizing the allocation at runtime. While this is recommended for hosted and/or public-facing environments, for development and test systems using – <b>Xms512m</b> would suffice. Also, verify that there is enough memory left to allow the operating system to function.</p>

### Optional Settings to Enable JMX Monitoring for VisualVM or JConsole

Setting	Description
-Dcom.sun.management.jmxremote	Notifies the JVM that you plan to remote monitor it via JMX

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-Dcom.sun.management.jmxremote.port=22222	The port the JVM should open up for monitoring.
-Dcom.sun.management.jmxremote.ssl=false	No SSL usage.
-Dcom.sun.management.jmxremote.authenticate=false	No authentication required.
-Djava.rmi.server.hostname=&lt;host or IP>	The hostname or IP that the underlying RMI client connection will use.



## Appendix B: Sample platform-settings.json

```

{
 "PlatformSettingsConfig": {
 "BasicSettings": {
 "BackupStorage": "/ThingworxBackupStorage",
 "DatabaseLogRetentionPolicy": 7,
 "EnableBackup": true,
 "EnableHA": false,
 "EnableSystemLogging": false,
 "HTTPRequestHeaderMaxLength": 2000,
 "HTTPRequestParameterMaxLength": 2000,
 "Storage": "/ThingworxStorage"
 },

 "HASettings": {
 "CoordinatorConnectionTimeout": 15000,
 "CoordinatorHosts": "127.0.0.1:2181",
 "CoordinatorMaxRetries": 3,
 "CoordinatorRetryTimeout": 1000,
 "CoordinatorSessionTimeout": 60000,
 "LoadBalancerBase64EncodedCredentials":
"QWRtaW5pc3RyYXRvcjphZG1pbG=="
 }
 },

 "PersistenceProviderPackageConfigs": {

 "NeoPersistenceProviderPackage": {
 "StreamProcessorSettings": {
 "maximumBlockSize": 2500,
 "maximumQueueSize": 250000,
 "maximumWaitTime": 10000,
 "scanRate": 5,
 "sizeThreshold": 1000
 },

 "ValueStreamProcessorSettings": {
 "maximumBlockSize": 2500,
 "maximumQueueSize": 500000,
 "maximumWaitTime": 10000,
 "scanRate": 5,

```

```

 "sizeThreshold": 1000
 }
},

"PostgresPersistenceProviderPackage": {
 "ConnectionInformation": {
 "acquireIncrement": 5,
 "acquireRetryAttempts": 3,
 "acquireRetryDelay": 10000,
 "checkoutTimeout": 1000000,
 "driverClass": "org.postgresql.Driver",
 "fetchSize": 5000,
 "idleConnectionTestPeriod": 60,
 "initialPoolSize": 5,
 "jdbcUrl":
"jdbc:postgresql://localhost:5432/thingworx",
 "maxConnectionAge": 0,
 "maxIdleTime": 0,
 "maxIdleTimeExcessConnections": 300,
 "maxPoolSize": 100,
 "maxStatements": 100,
 "minPoolSize": 5,
 "numHelperThreads": 8,
 "password": "password",
 "testConnectionOnCheckout": false,
 "unreturnedConnectionTimeout": 0,
 "username": "twadmin"
 },

 "StreamProcessorSettings": {
 "maximumBlockSize": 2500,
 "maximumQueueSize": 250000,
 "maximumWaitTime": 10000,
 "numberOfProcessingThreads": 5,
 "scanRate": 5,
 "sizeThreshold": 1000
 },

 "ValueStreamProcessorSettings": {
 "maximumBlockSize": 2500,
 "maximumQueueSize": 500000,
 "maximumWaitTime": 10000,
 "numberOfProcessingThreads": 5,

```

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```
 "scanRate": 5,
 "sizeThreshold": 1000
 }
}
}
```