APELON

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# DTS: 4.8.0 Installation Guide

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***A Note Before We Begin***: As of the release of DTS version 4.8.0, Apelon Customer Support will officially support installations of DTS 4.7.2 and DTS 4.8.0. If you are running an older version of DTS 4, consult the latter sections of this guide to upgrade your installation to a current version

## A. Introduction

This Installation Guide provides detailed descriptions of the steps required to install the DTS 4.8.0 software and install and configure the associated JBoss, WildFly and GlassFish application servers. The guide was prepared to help new and experienced administrators successfully perform all operations necessary to install the Apelon DTS product.

The ***Apelon DTS Installation*** section gives the hardware and software requirements for DTS 4.8.0 and presents the software installation process.

Refer to the section ***Preparing Your Knowledgebase*** for procedures and tools which assist in generating the required DTS database tables (DTS 4 schema). For instructions on populating the DTS tables with vocabulary subscription data provided by Apelon, please refer to section ***Populating the DTS Knowledgebase***.

The Apelon DTS Server section gives descriptions of the architecture of the DTS 4.8.0 Server and detailed instructions for downloading, installing, and configuring JBoss, WildFly and GlassFish Application Servers.

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# B. Apelon DTS Installation

This section details the procedures necessary to install Apelon DTS. These procedures assume that the prerequisite software (listed below) has been installed and is capable of supporting these applications.

## B.1 Installation Requirements

The following are recommended/minimum system and software requirements to install and run DTS.

**Recommended System Hardware Requirements (DTS Server)**

- *CPU*
  - 1 or more Dual Core - Minimum
  - 1 or more Quad Core - Recommended
- *System Memory*
  - 8GB RAM – Minimum
  - 16GB RAM – Recommended (minimum if both Server and Database are on same machine and using Classification)
- *Available hard drive space*
  - 100GB Minimum and 150GB+ Recommended
  - This is the recommended available hard drive space, based on a single hard drive being used for both the DTS Server and a DTS knowledgebase configured with SNOMED CT
  - Actual available hard drive space must be sufficient to accommodate the DTS installation (~900M) as well as the space requirements for your specific knowledgebase configuration

**DTS 4 Editor & Browser Client Software Requirements**

- *Operating Systems:*
  - Windows 10 Professional or Windows 11 Professional
  - Windows Server 2016 or Windows Server 2019
- *Web Browser (for DTS Browser):*
  - Microsoft Edge 44+
  - Firefox 81+
  - Chrome 85+

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**DTS Server Software Requirements (only 64-bit supported for DTS Server)**

- *Operating Systems:*
    - Windows 10 Professional or Windows 11 Professional
    - Windows Server 2016 or Windows Server 2019
    - Redhat Enterprise Linux 6 or 7. CentOS 6 or 7
- *Database Management System:*
    - Oracle 12c Standard Edition 2 or Enterprise Edition (DTS 4.7 verified against 12.1.0.2, version 12.2 or later not currently supported) **(NOTE: DTS 4.8.0 is the last version where Oracle will be supported)**
    - MS SQL Server 2016 (Express Edition not supported. Must be hosted on a Windows Server)
    - MS SQL Server 2019 (Express Edition not supported. Must be hosted on a Windows Server)
    - MySQL Community Server 5.6 (5.6 is the only version 5 supported) **(NOTE: DTS 4.8.0 is the last version where MySQL 5.6 will be supported)**
    - MySQL Community Server 8.0
- *Application Server:*
    - JBoss EAP 7.1.0 Application Server **(NOTE: DTS 4.8.0 is the last version where JBoss Eap 7.1.0 will be supported)**
        - JBoss EAP 7.1.0 only supported on JDK 1.8
    - JBoss EAP 7.4.0 Application Server
        - JBoss EAP 7.4.0 only supported on JDK 1.8
    - WildFly 12.0.0 Final Application Server **(NOTE: DTS 4.8.0 is the last version where WildFly 12.0.0 will be supported)**
        - WildFly 12.0.0 only supported on JDK 1.8
    - WildFly 23.0.2 Final Application Server
        - WildFly 23.0.2 only supported on JDK 1.8
    - GlassFish 3.1.22 Application Server
        - GlassFish Application Server version 3.1.2.2 (Full Platform) (only this version is supported)
        - GlassFish 3.1.22 only supported on JDK 1.8
        - **NOTE: DTS 4.8.0 is the last version where GlassFish will be supported**

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- *Runtime Environment:*
    - The DTS 4 Windows installation includes Version 1.8 of the Sun Java Runtime Environment (JRE).
        - The JRE 1.8 included with the DTS 4 Windows installation is only used by DTS 4 – it is not for use by the JBoss EAP, WildFly, or GlassFish application servers (existing Java installations on the target machine are not affected)

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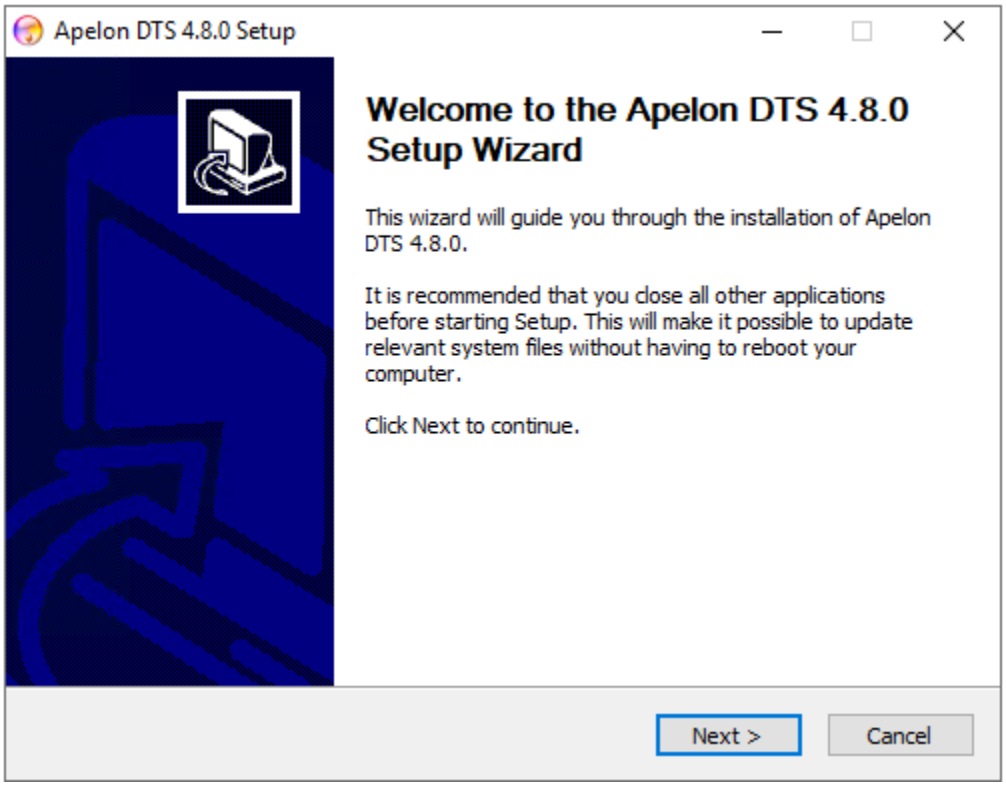
## B.2 Installing Apelon DTS for Windows

Follow this procedure to install DTS on Windows. The installation process creates DTS directories on your machine and populates them with the files required to run DTS.
**Note**: You can retain previous versions of DTS on the same machine (i.e., there is no requirement to uninstall earlier DTS versions).

1. Download the dts_64bit_4.X.X.X.exe (dts_32bit_4.X.X.X.exe for DTS 4 Editor Client installations only) installation file from the Apelon DTS download page – http://www.apelondts.org . **Note:** The Apelon DTS Server installer includes the installation of Java JVM. Use of the 32-bit installer only supported for DTS 4 Editor Client installations.

2. Double click on the installation file to run the installation wizard, which guides you through the installation process.

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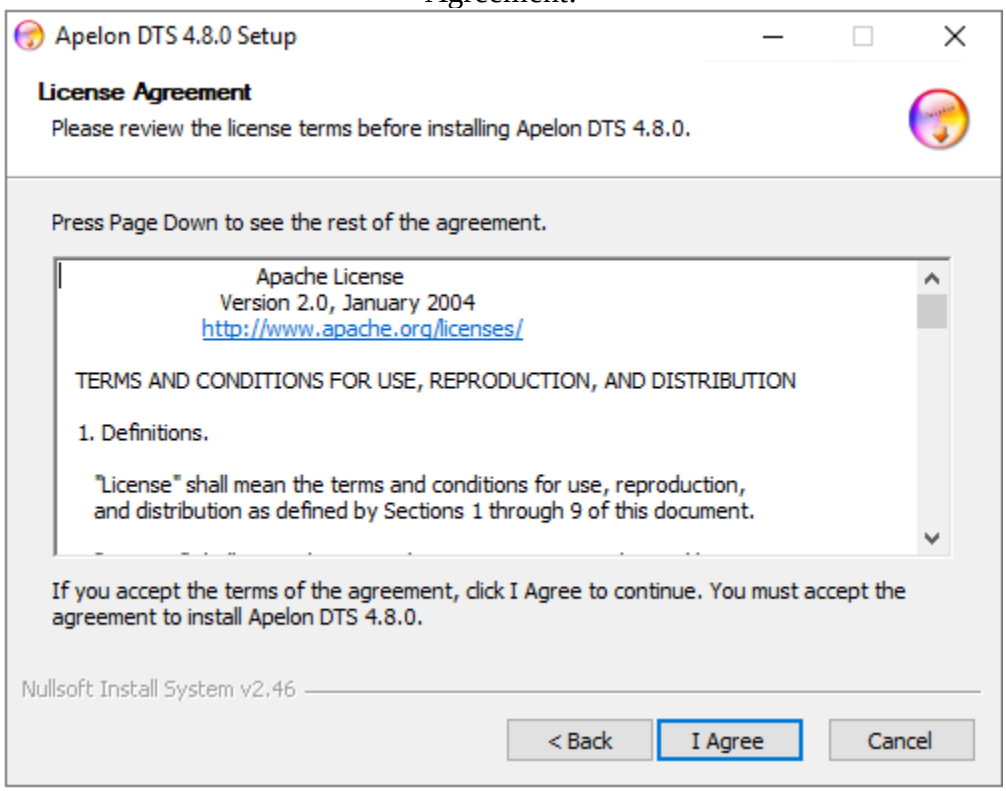
3. Click **Next** in the *Welcome* window. Then choose "I Agree" to the Apache License Agreement.




4. At this point the *Choose Components* window displays. As part of the installation, you are asked to select which of the Apelon DTS components you want installed. The DTS components are listed here:

   - **Editor** (Includes the DTS 4 Editor)
   - **Server** (Includes DTS Browser support)
   - **Administration** (Includes DTS content administration tools)
   - **Documentation** (Includes DTS API Documentation) (NOTE: The latest DTS 4 documentation can be obtained at ApelonDTS.org)
   - **Database -** Specify the database on which you maintain your DTS Knowledgebase and the driver through which the Application Server will access the data; the appropriate DTS configuration files are updated to reflect this selection.

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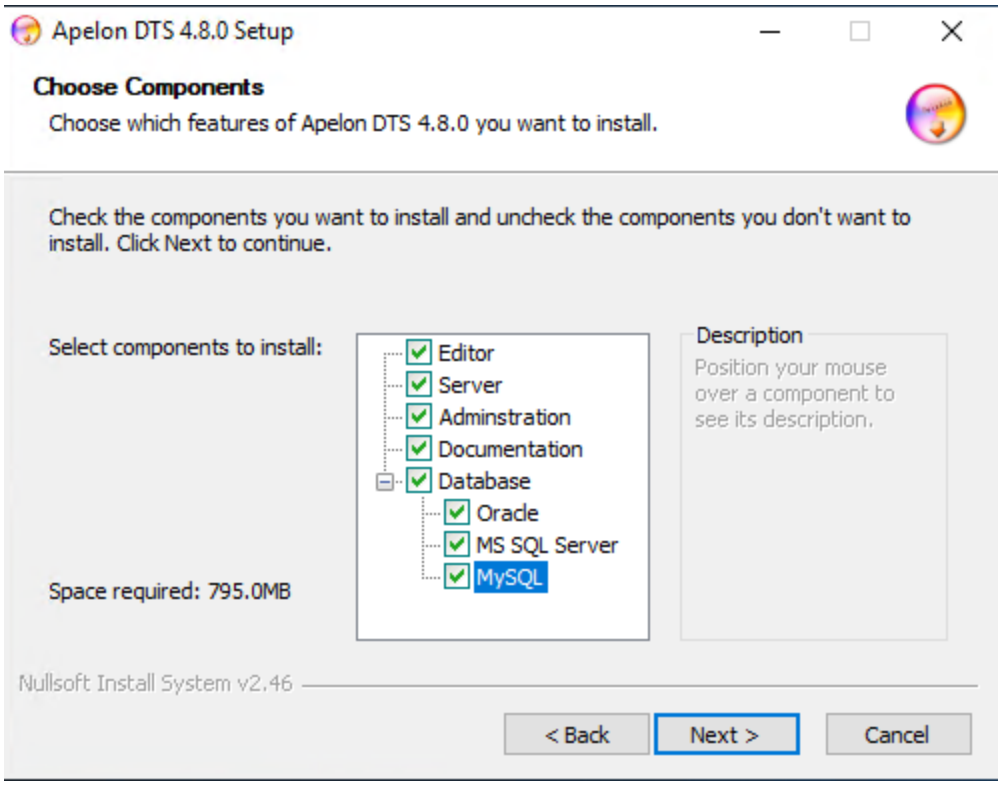


The default is to install all the DTS components. Click the corresponding checkbox to deselect each undesired component.

You can install all the DTS components on the same machine, or install one or more components on separate machines. If you install components on separate machines, these machines must be connected by a network.

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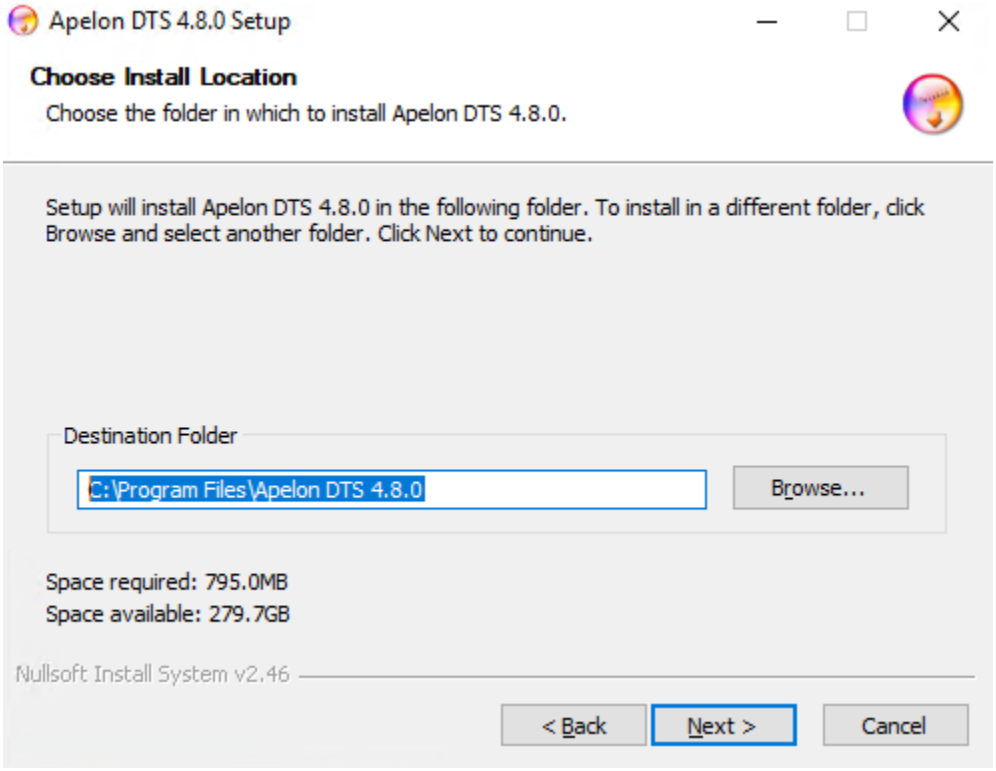
5. When the *Choose Install Location* window displays, note that there is a default installation path which will be referred to as **<*DTS_HOME*>** throughout this document.




Earlier DTS versions, installed in other folders, may remain on the same machine.

6. Click **Next** to install Apelon DTS in the default destination folder. Otherwise, manually edit the folder destination or click **Browse** to select another folder, then click **Next**.
7. When the *Choose Start Menu Folder* window displays, choose the default Start Menu folder in which to create the program's shortcuts.

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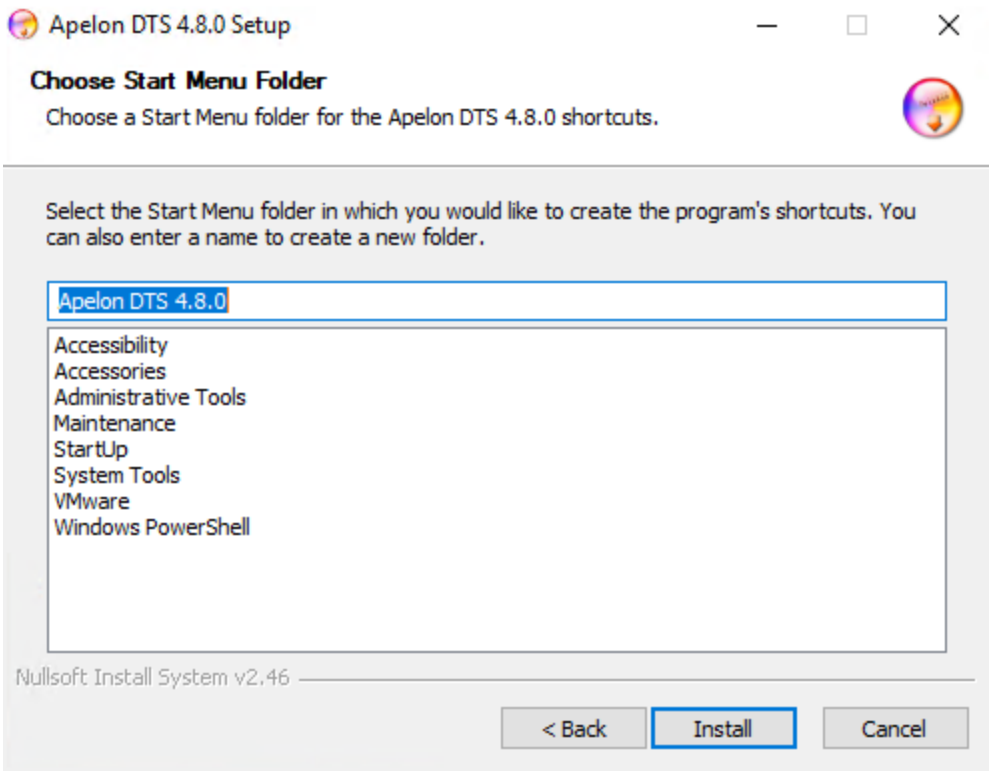
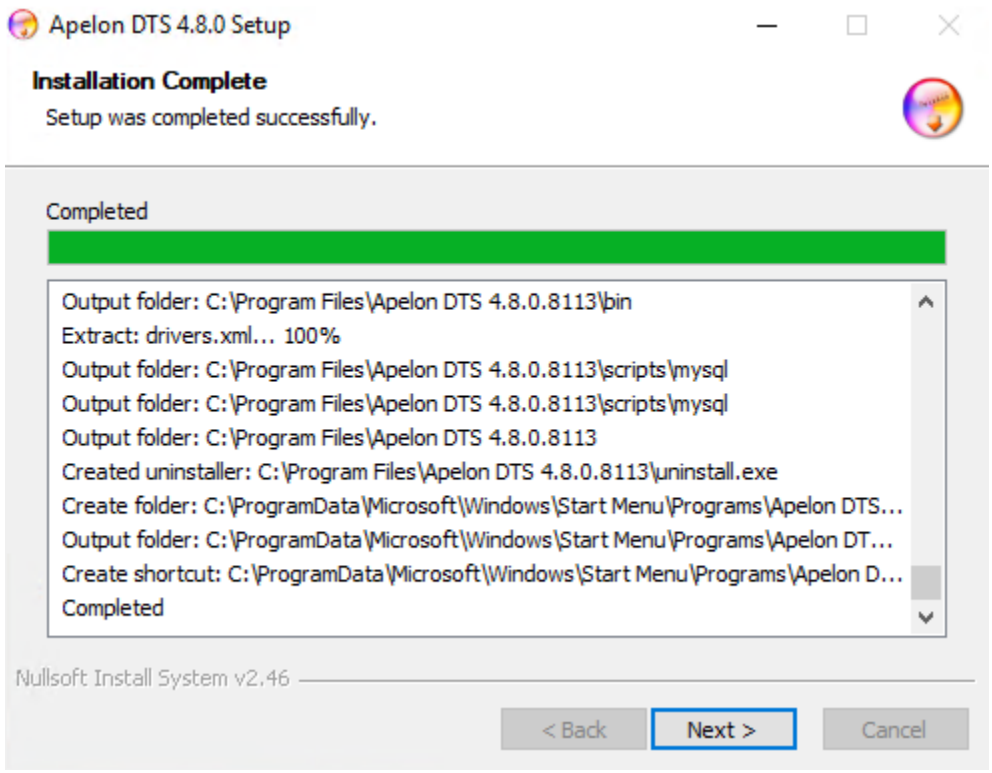



8. Click **Install** to begin installing the selected components in the location you specified. When the *Install Complete* window displays, click **Next**.

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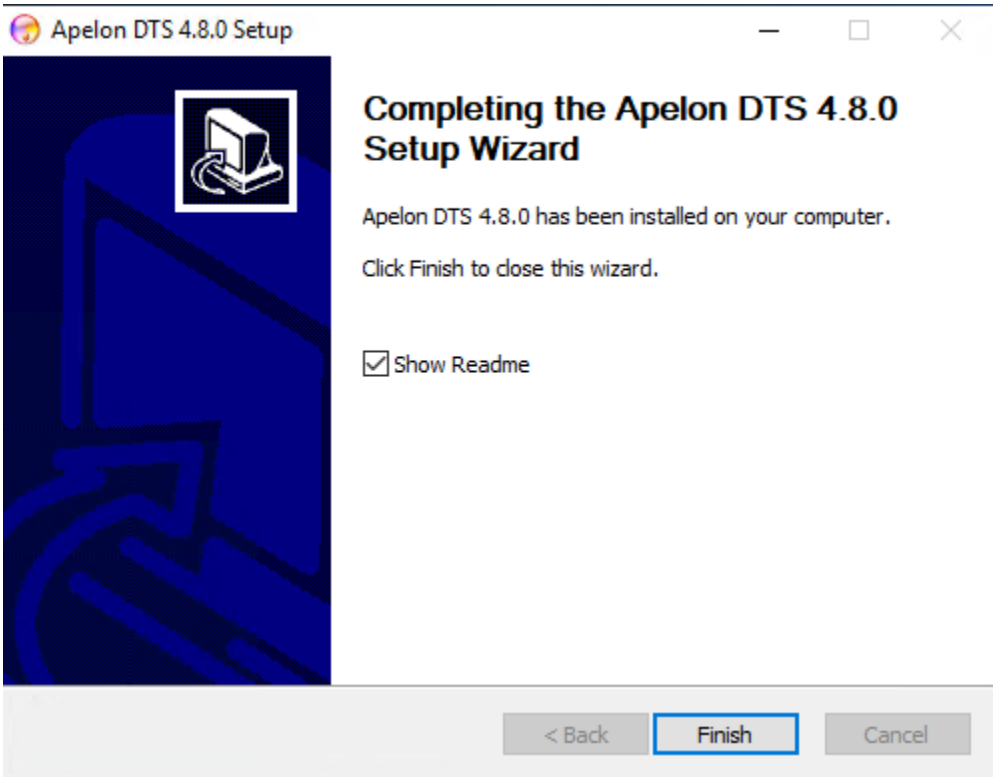
9. Click Finish to close the installation and open the Readme document.




### B.2.1 DTS Editor High Resolution Compatibility

The DTS Editor may experience display issues on high resolution screens. To fix these display issues, follow these steps.

1. Go to <DTS Home>\java\jre\bin and find the java.exe and javaw.exe files. For each file, perform the following.
2. Right-click on the file and select Properties
3. Go to Compatibility tab
4. Click Change high DPI settings

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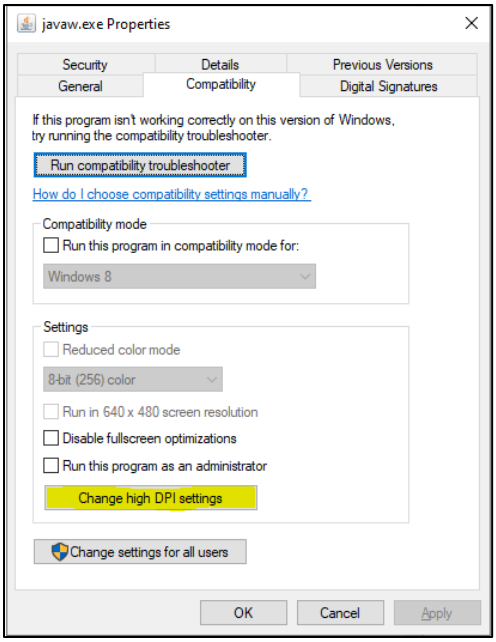
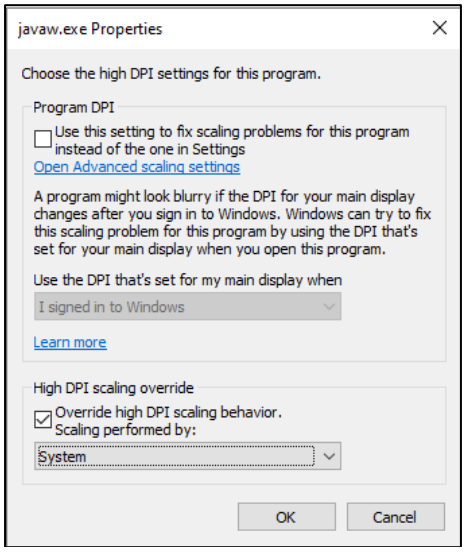



5. Check the Override high DPI scaling behavior checkbox
6. In the Scaling performed by dropdown, select System

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## B.3 Installing Apelon DTS for Linux

Follow this procedure to install DTS 4 on Linux. The installation process creates the DTS 4 directories on your machine and populates them with the files required to run DTS.
**Note**: You can retain previous versions of DTS 4 on the same machine (i.e., there is no requirement to uninstall earlier DTS 4 versions).

1. The DTS 4 Linux installation is contained in a tar file called **dts-linux_v.v.v-xxxx.tar.gz** (where **v.v.v** represents the version number, **xxxx** represents the build number) that you can download from Apelon DTS download page - – http://www.apelondts.org. Create the target DTS 4 directory to which you will download and uncompress this tar file. It is recommended that the DTS installation directory name should **not** contain any spaces.

2. Download the current version of Apelon DTS 4 to the target DTS 4 directory you created.

3. Untar (i.e., uncompress) the tar file from Apelon with the following command.

   **tar -zxvf dts-linux_v.v.v-xxxx.tar.gz**

4. After you uncompress the tar file, the DTS installation directory should contain the following directories:
   - bin
   - doc
   - javadoc
   - lib
   - scripts
   - server

5. You must obtain and install Version 1.8 of the **Oracle Java Development Kit** (JDK) for Linux that is appropriate for the Application Server being installed as indicated in the **Minimum Software Requirements (Server)** section of this documentation. **NOTE, Open JDK is not recommended.**

***NOTE:*** *See section* Java Environment Setup for a Server *regarding more information on Java installation.*

- Edit the login script **.bash_profile** to export environment variables **JAVA_HOME** and **PATH**

```
JAVA_HOME=/usr/java/jdk1.8.0_311
PATH=$JAVA_HOME/bin:$PATH:$HOME/bin
export JAVA_HOME
export PATH
```

- **JAVA_HOME** is the directory where you installed your JDK

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# C. Preparing Your Knowledgebase

## C.1 Create DTS Database User and DTS Schema

The following database setup procedure uses **Oracle** as an example. If you are installing on **MySQL**, please refer to the **MySQL Installation Guide** at this point. You will return to this document in the Populating the DTS Knowledgebase section below. If installing on **MS SQL Server**, skip to section Create DTS Knowledgebase Schema below.

### C.1.1 Oracle 12c PGA_AGGREGATE_LIMIT

*Note: For Oracle 12c, the* `PGA_AGGREGATE_LIMIT` needs to be set to 0.

*For example, from a SQL Plus prompt, to check the current value please enter:*

```
SHOW PARAMETER PGA_AGGREGATE_LIMIT
```

*If not already set to 0, set the PGA_AGGREGATE LIMIT to 0 by entering the following:*

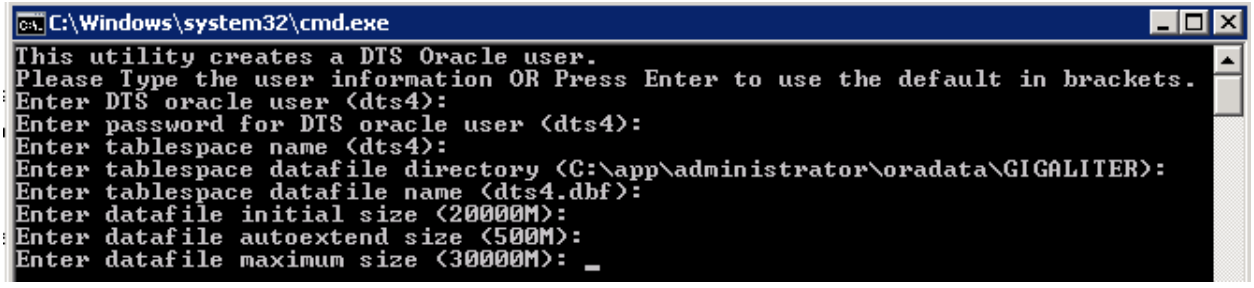
```
ALTER SYSTEM SET PGA_AGGREGATE_LIMIT = 0;
```

### C.1.2 Overview

Regardless of where the information comes from, to populate the DTS knowledgebase (either by migrating data from existing databases or performing a complete import of new subscription data) a database must first be setup. Regardless of which database engine is used (Oracle, MySQL or MSSQL Server) the setup consists of two parts: 1) establishing a database user and allocating physical disk storage space and 2) creating a DTS schema (tables, indexes, functions, stored procedures, etc.) which includes the DTS-specific database objects that are required for storing terminology content and proper API function.

### C.1.3 Create Oracle Database User and Tablespace

You must define a user and create a tablespace before the DTS 4.8.0 tables can be created. If you prefer, DTS provides a utility to assist in creating an Oracle user and tablespace. Navigate to the directory where DTS 4.8.0 was installed (this directory will be referred to as **<*DTS_HOME*>** for the remainder of this document). In the **<*DTS_HOME*>\scripts\oracle** directory, run the **userCreate.bat** (**userCreate.**sh on Linux) file. You are prompted for the following information; note that values from the previous user and tablespace that were created will be displayed as the default values.




**Enter DTS oracle user:** Specify the name of the new Oracle user who will have the DTS schema

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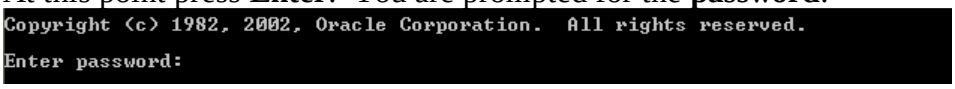
**Enter password for DTS oracle user:** Enter the password for the new Oracle user that you specified
**Enter tablespace name:** Enter the name of the tablespace which will hold the DTS schema for the specified Oracle user
**Enter tablespace datafile directory:** Specify the directory of the datafile in which the tablespace will be created
**Enter tablespace datafile name:** Specify the name of the datafile which the specified tablespace will use
**Enter datafile initial size:** Specify the size of the datafile, in bytes (use K or M to specify the size in kilobytes or megabytes, respectively)
**Enter datafile autoextend size:** Specify the size, in bytes, of the next increment of disk space to be allocated automatically to the datafile (use K or M to specify this size in kilobytes or megabytes, respectively)
**Enter datafile maximum size:** Specify the maximum disk space allowed, in bytes, for automatic extension of the datafile (use K or M to specify this size in kilobytes or megabytes, respectively). If you plan to load a large subscription namespace, such as SNOMED, you may wish to use a larger maximum datafile size such as 32GB

At this point press **Enter**. You are prompted for the **password**:




The new Oracle DTS user and tablespace are created.

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### C.1.4 Create DTS Knowledgebase Schema

After you create the **Oracle** tablespace or **MS SQL Server** database, you must create the DTS tables, or **schema**. Before you can run the Knowledgebase Create utility to create the schema, you must follow this procedure to configure the parameters by which the schema will be created, and by which a connection will be made to the DTS 4 database.

1. Go to <DTS_HOME>\bin\kb. If 'target-connection.xml' is not there, copy target-connection-<database>.xml (where <database> is 'oracle' for Oracle, 'sql2k' for MS SQL Server, and 'mysql' for MySQL) as 'target-connection.xml'.

2. Open the **target-connection.xml** file (**<*DTS_HOME*>\bin\kb**) where you set the values for the **database** connection. Note in this illustration we are setting up a connection to an Oracle database.

```
<!--  Oracle connection.  -->
<connection>
  <property name="direction" value="target"/>
  <property name="type" value="oracle"/>
  <property name="user" value="dts4"/>
  <property name="pass" value="dts4"/>
  <property name="host" value="localhost"/>
  <property name="databaseName" value="ORCL"/>
  <property name="databasePort" value="1521"/>
  <property name="jdbcDriver" value="oracle.jdbc.driver.OracleDriver"/>
  <property name="url_template" value="jdbc:oracle:thin:@[HOST]:[PORT]:[DATABASE]"/>
  <property name="blockSize" value="256"/>
</connection>
```

   For the **user** and **pass** property values (highlighted) enter a valid username and password for the database user you created (when you executed **userCreate.bat** for Oracle). Also, be sure to update the **host**, **databaseName**, and **databasePort** (highlighted) if different from the default. When you run the Knowledgebase Create utility, a database connection will be established based on the values in this file.

3. Save the **target-connection.xml** file.

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4. Run the file **kbcreate.bat** (**<*DTS_HOME*>\bin\kb\create**) (or **kbcreate.sh for Linux**) to start the Knowledgebase Create utility. If this is the first time **kbcreate.bat** is being run, the utility creates all the tables required to load DTS 4 data into the knowledgebase.
5. If **kbcreate.bat** was run previously, the Knowledgebase Create utility checks for existing tables. **Important Note**: If one or more tables are missing from an existing set, the utility automatically drops all existing tables, then recreates them all (without displaying any user prompts).

   If all the tables exist, the utility prompts you to drop, or not drop, existing tables.

   **All the tables exist. Do you want to drop all tables (y/n)?**

   If you type **y**, the utility drops all existing tables, then recreates them all. Type **n** to bypass the drop of existing tables and creation of new ones, and to exit the utility.

The results of running the Knowledgebase Create utility are written to the log file (the default log file is **kbcreate.log** in **<*DTS_HOME*>\bin\logs**. If a different log file name and location are specified in the log configuration file **kbcreatelog.xml** (**<*DTS_HOME*>\bin\kb\create**) the results are written to that file.
If an error occurs in the knowledgebase creation process, the utility stops and updates the log file to reflect the error.

If you prefer to start loading subscription content provided by Apelon, please continue on to the ***Populating the DTS Knowledgebase*** section below and then proceed to setup the Apelon DTS Server.
**NOTE:** After generation of the DTS tables you can jump to section Apelon DTS Server to install and setup the Apelon DTS Server using the WildFly, JBoss EAP or GlassFish application server.

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## D. Populating the DTS Knowledgebase

After the DTS database user and DTS schema have been established as described above, the knowledgebase can be loaded with data. Apelon offers a Content Support service which provides subscription-like updates to most standard medical terminologies as soon as they are released.

If you have a Content Support contract with Apelon, all Apelon-provided terminologies are distributed through the Apelon Content Portal and imported into your DTS 4 database through a DTS Distribution Client software interface. As soon as is convenient, contact Apelon Client Services for assistance with the DTS Distribution Client initial installation and Content Portal configuration.

The DTS Distribution Client application works hand-in-hand with our Content Portal server to help make the task of keeping your terminologies current as easy as possible. It lets you choose which standard terminologies (namespaces) you would like to have and then it downloads them for you automatically – including updates as they become available. It also gives you the flexibility of running Change Summary Reports and/or applying the regular updates only when you are ready.

To load your own data into DTS in bulk see the documentation on plugins, in particular the TQL and Import Wizard plugins, on ApelonDTS.org.

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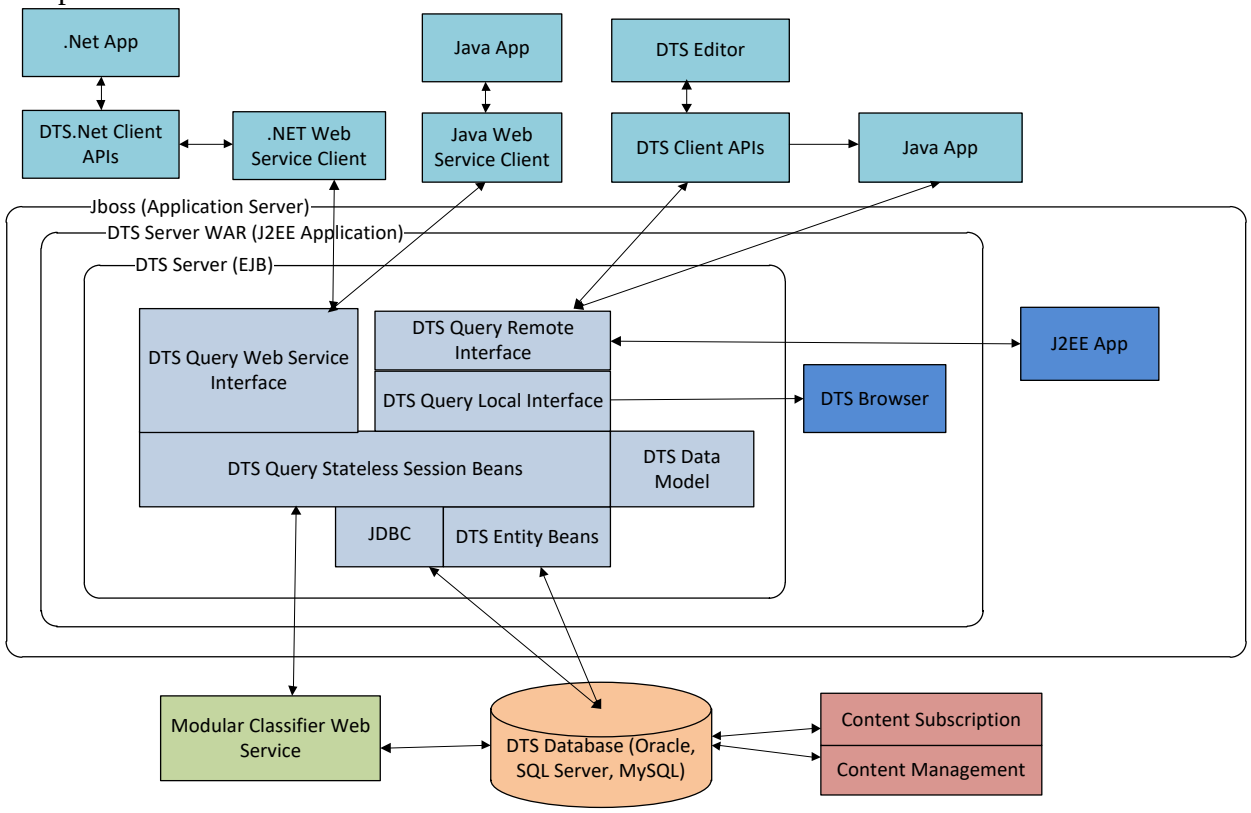
## E. Apelon DTS Server

The Apelon DTS Server is a web application that consists of the following components:

- A set of Enterprise JavaBeans (EJB) to provide access to the DTS terminology knowledgebase residing in a database.
- A web browser for viewing terminology content.

The figure below shows the relationship between the DTS Server and other application components.




DTS 4 Architecture

The following sections describe how to install the DTS server and required supporting software.

### E.1 Getting Started with Apelon DTS Server

To prepare the Apelon DTS Server, the following steps must be performed:

- Set up Java 8 JDK environment.
- Set up WildFly, JBoss EAP, or GlassFish.
- Configure WildFly, JBoss EAP, or GlassFish to run the Apelon DTS Server.

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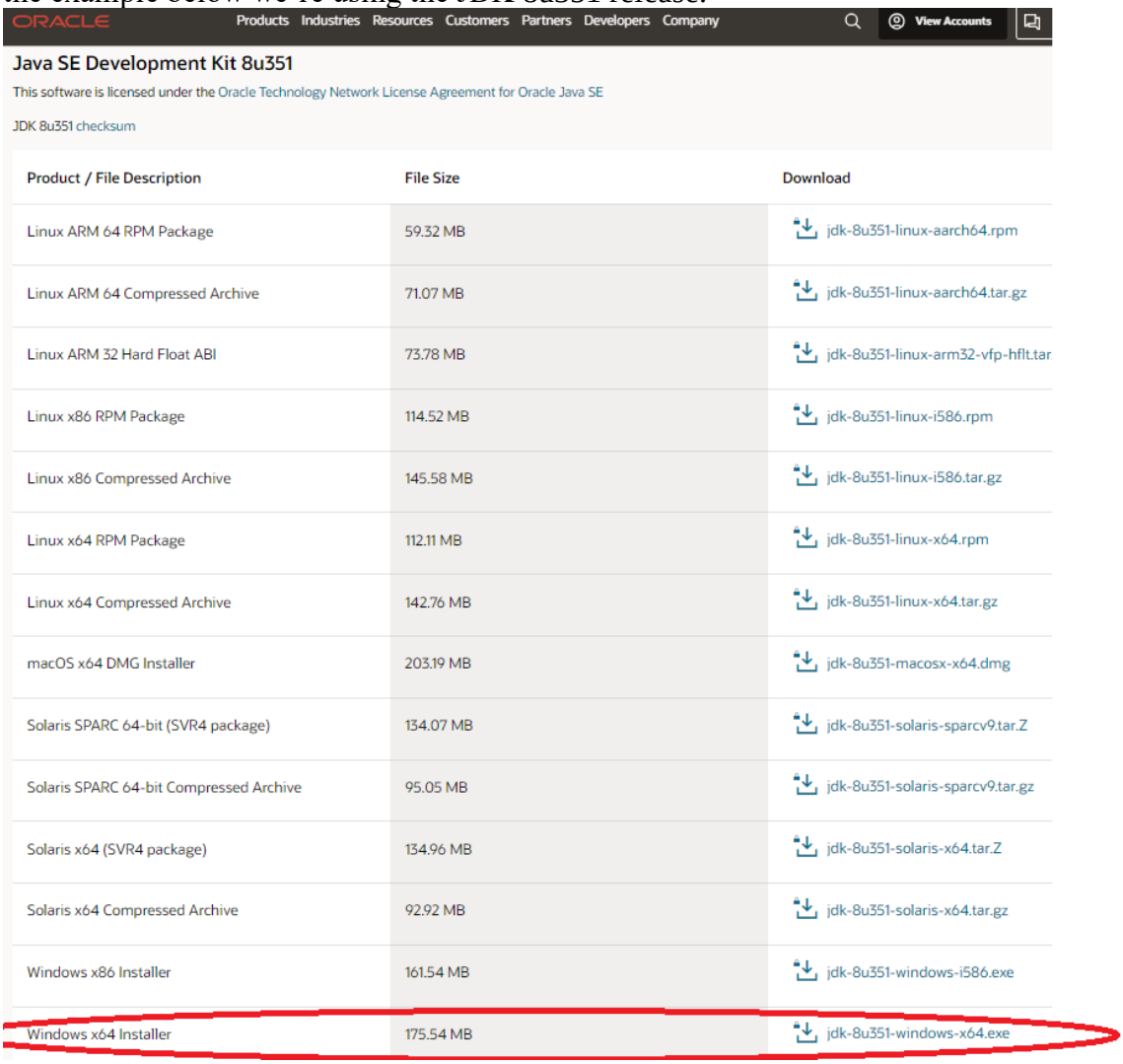
## E.2 Java Environment Setup for a Server

**WildFly, JBoss EAP, and GlassFish server installations require Java SE 8 JDK.** We recommend using Java SE 8 JDK 8u211 or later. Must use the 64-bit version of the JDK.
***NOTE1:*** *Please do NOT use the 8u331 release of JDK because it will not work with JBoss EAP and WildFly.*
***NOTE2:*** *DTS 4.8 has been verified against the following releases: 8u311, 8u341, and 8u351.*
These steps are only required for server installations. The DTS 4 Editor installation includes a JRE during the installation on Windows, so if you are not setting up the server, you do not need to manually install Java on Windows.
Download the Java SE 8 JDK from the Oracle download page linked here for your convenience: https://www.oracle.com/java/technologies/javase/javase8u211-later-archive-downloads.html. In the example below we're using the JDK 8u351 release.




Select `jdk-8u351-windows-x64.exe` for 64-bit Windows OS.
While installing the JDK, unselect the `Source Code` option as shown below.

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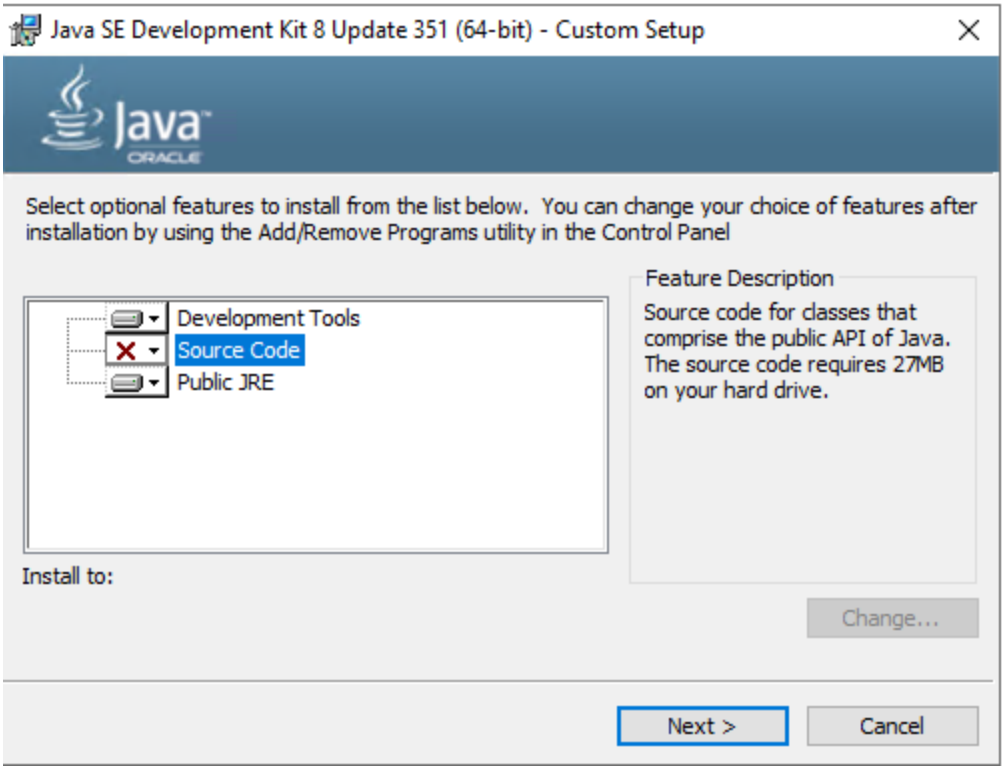


When the installation is complete, add an environment variable named `JAVA_HOME`, which is directly referenced by JBoss EAP, WildFly and GlassFish startup scripts.
For Windows Server 2016, Windows Server 2019, Windows 10 Professional, or Windows 11 Professional, follow these steps:

1. Search for **Environment Variables** and choose the **Edit the system environment variables** in Control panel.
2. Click on **Environment Variables…** button.
3. In the **System variables** section click on **New…** button.

Give the **Variable name** a value of 'JAVA_HOME' and give the **Variable value** a value of the path to your Java 8 JDK installation. An example is shown below:

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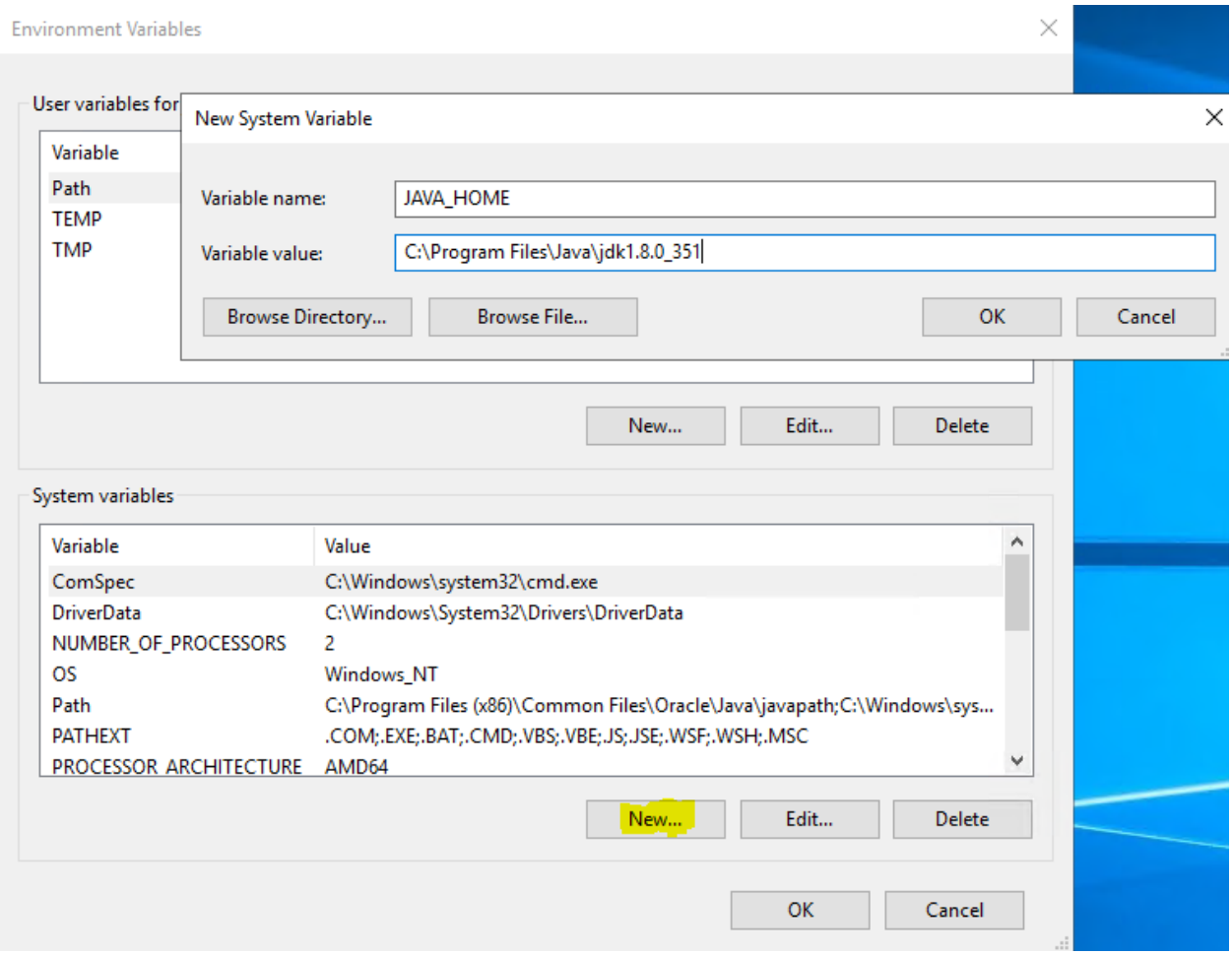


If you are installing on Linux and you have not yet set up Java as part of DTS installation, export environment variable JAVA_HOME in login script .bash_profile as follows:

```
JAVA_HOME=/usr/java/jdk1.8.0_351
export JAVA_HOME
```

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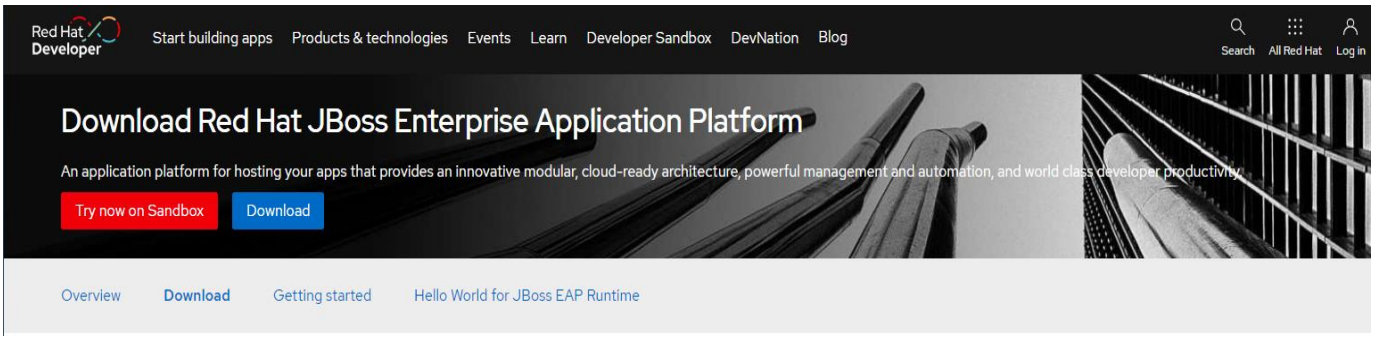
## F. JBoss EAP 7.4 Setup

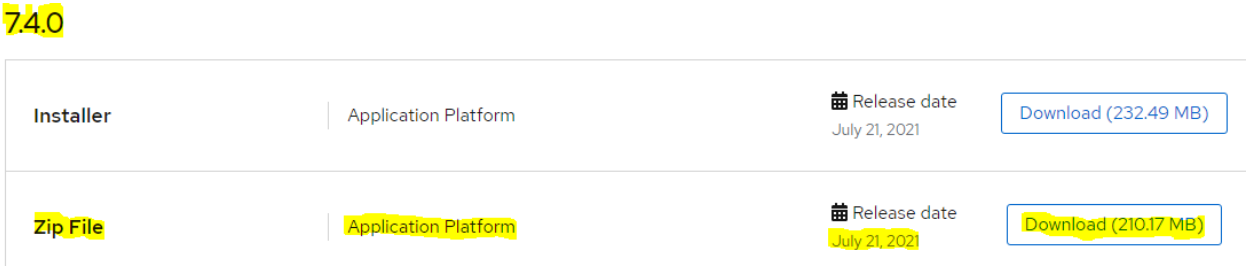
***Note: JBoss EAP 7.4 requires the use of Java 8 JDK. See Java Environment Setup for a Server section above for additional details.***

The JBoss EAP 7.4 Application Server can be downloaded from the Red Hat Developer download site: https://developers.redhat.com/products/eap/download/

If deploying JBoss EAP into a production environment, you can obtain a Red Hat subscription which will give you access to customer support from Red Hat for your JBoss EAP production environment.




For Windows and Linux, select the **7.4.0 July 21, 2021 Application Platform ZIP file** to download.




To install JBoss EAP 7.4.0 just extract the compressed archive. **Unzip the JBoss EAP 7.4.0 archive into a folder with a pathname that does NOT contain any spaces.** For example, extracting to the `C:\Tools` folder will place the JBoss EAP 7.4.0 files in the `C:\Tools\jboss-eap-7.4` folder. We will identify this folder in the rest of the document as <JBossEAP74_HOME>. It is not necessary to create <JBossEAP74_HOME> as an environment variable.

To verify the JBoss EAP 7.4 install, go to the `<JBossEAP74_HOME>\bin` folder and run `standalone.bat` (or `standalone.sh` for Linux).

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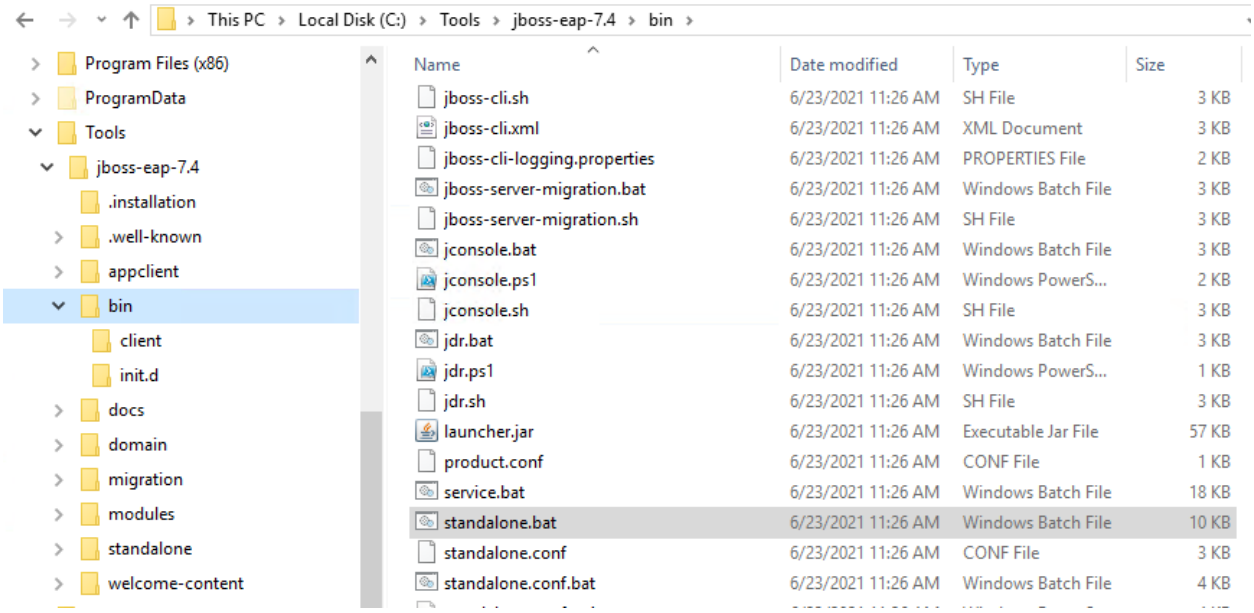
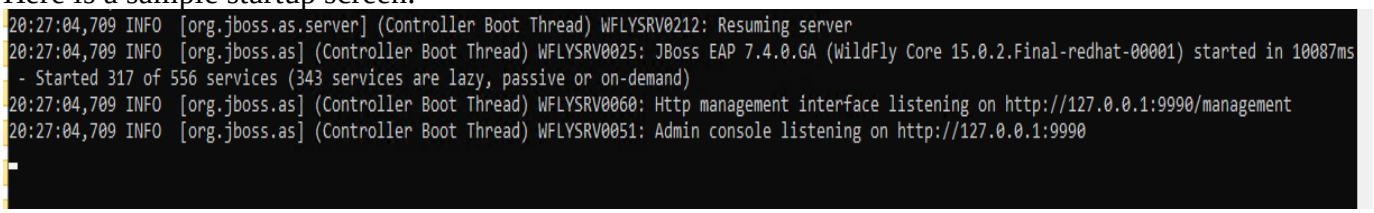
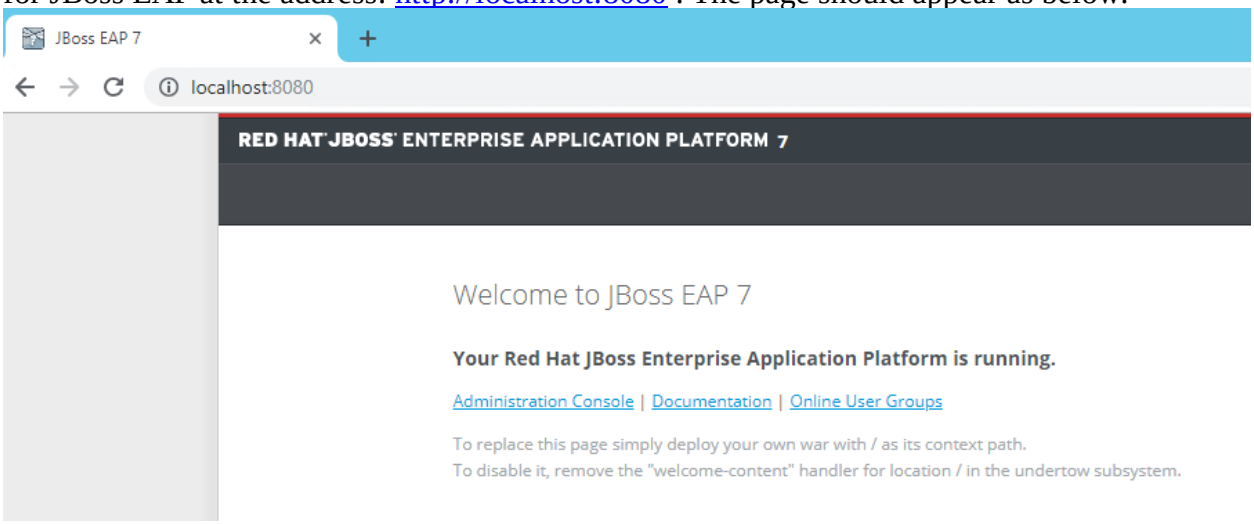



Upon successful start, the message in the last line will indicate success.
Here is a sample startup screen:




To verify that the server is reachable, you can point your browser to the default welcome page for JBoss EAP at the address: http://localhost:8080 . The page should appear as below:




After you have verified the server is reachable select the JBoss EAP command window and then press `Ctrl+C`. You will be prompted to terminate the batch job, type **y** and hit **enter** to stop JBoss EAP.

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## F.1 Memory Configuration

The Apelon DTS Server performs better when additional memory is assigned to JBoss EAP. To increase the memory utilized, open <JBossEAP74_HOME>\bin\standalone.conf.bat (or `standalone.conf` for Linux ) and modify the JVM memory allocation pool parameters as shown below:

***NOTE:*** *We recommend a memory limit of at least 4GB. If your DTS environment will be running Modular Classification, you will require a larger allocation to your JVM. On systems utilizing Modular Classification with 16 GB of RAM or more a setting of at least 8GB (4 GB min) is recommended.*

For Windows:

```
rem # JVM memory allocation pool parameters - modify as appropriate.
set "JAVA_OPTS=-Xms1G -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G"
```

For Linux:

```
# Specify options to pass to the Java VM.
#
if [ "x$JAVA_OPTS" = "x" ]; then
   JAVA_OPTS="-Xms1303m -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G
```

## F.2 JBoss EAP Management User

You must create a JBoss EAP Management user (e.g., **apelonadmin/apelon**) – This user administers the JBoss EAP server. Go to **<JBossEAP74_HOME>\bin** and click on **add-user.bat** (or **add-user.sh** for Linux). Follow the steps below.

- Select Management User. **(a):** hit **enter** to accept default

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): a
```

- Realm (**ManagementRealm)** will be used by default.
- Enter the desired Username. i.e., **apelonadmin**

```
Username : apelonadmin
```

- Enter the desired Password. The password cannot be same as the username. i.e., **apelon**
- *Note: JBoss EAP will prompt you if your password doesn't meet the recommended criteria. You may type "**yes**" and press "**enter**" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no?
```

- Re-enter Password. i.e., **apelon**

```
Password :
Re-enter Password :
```

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- JBoss EAP will prompt you to add the user to any groups. For the Application Server administrator user, no groups are necessary, you may hit "**enter**" to proceed.
- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'apelonadmin' for realm 'ManagementRealm'
Is this correct yes/no? yes
```

- JBoss EAP supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "**no**" and press "**enter**".

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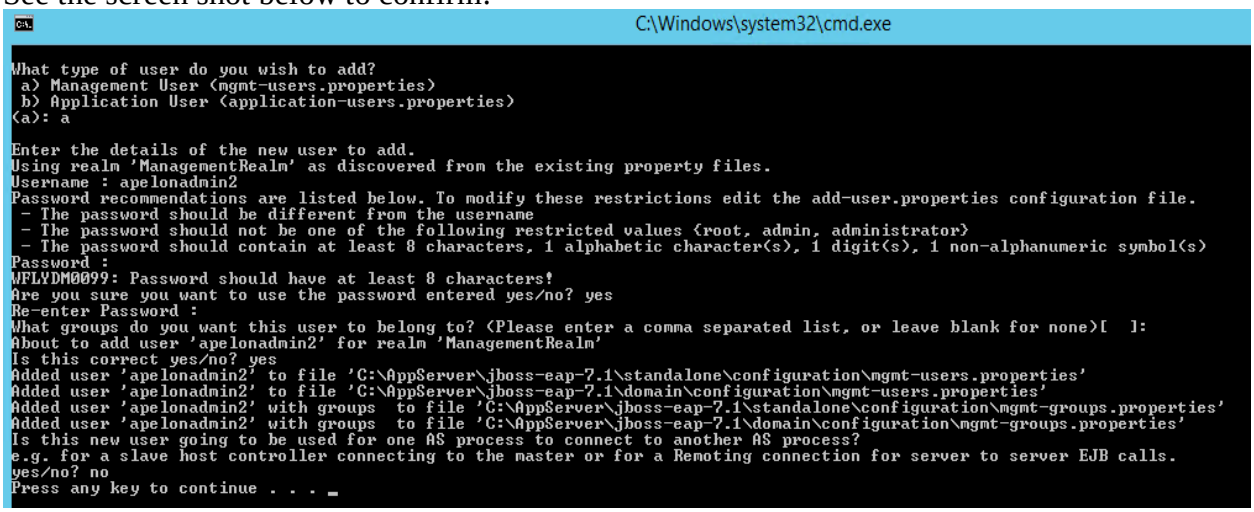
See the screen shot below to confirm:




## F.3 JBoss EAP Configuration for Apelon DTS Server

If you are currently Running DTS and are setting up JBoss EAP 7.4 to replace your existing JBoss EAP 7.1 or WildFly 12 environment, you can migrate your existing DTS users by performing the following steps:

1. Ensure the new JBoss EAP Application Server is stopped.
2. Locate the **application-roles.properties**, **application-users.properties**, and **mgmt.-users.properties** files in your existing Application Server installation directory. There are 2 instances of each of these files, one in **<AppServer Home>\domain\configuration** and the other in **<AppServer Home>\standalone\configuration**.
3. Copy these files, and place them (overwriting if prompted) in **<JBossEAP74_HOME>\domain\configuration** and **<JBossEAP74_HOME>\standalone\configuration** respectively.
4. Start the JBoss EAP Application Server

*Note: Since the DTS User Manager is contained within the DTS Database, no modifications will be necessary, provided the Application Server users migrate successfully*

### F.3.1 JBoss EAP DTS Admin User Configuration

JBoss EAP Application Users must be created for every individual who will connect to *the **Apelon DTS Server via the DTS Browser or DTS Editor*** and will require access to the ***DTS Editor User Manager*** to setup ***DTS User Roles and Permissions***. These JBoss EAP users must have the group "**apelondtsadmin**".

Go to <JBossEAP74_HOME>`\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

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- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g., **dtsadminuser**

```
Username : dtsadminuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dtsadmin**
- *Note: JBoss EAP will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g, **dtsadmin**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- JBoss EAP will prompt you to add the user to any groups. For the DTS administrator user, you will need to add to the "apelondtsadmin" and optionally "apelondts" groups, separated by a comma.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondtsadmin,apelondts
```

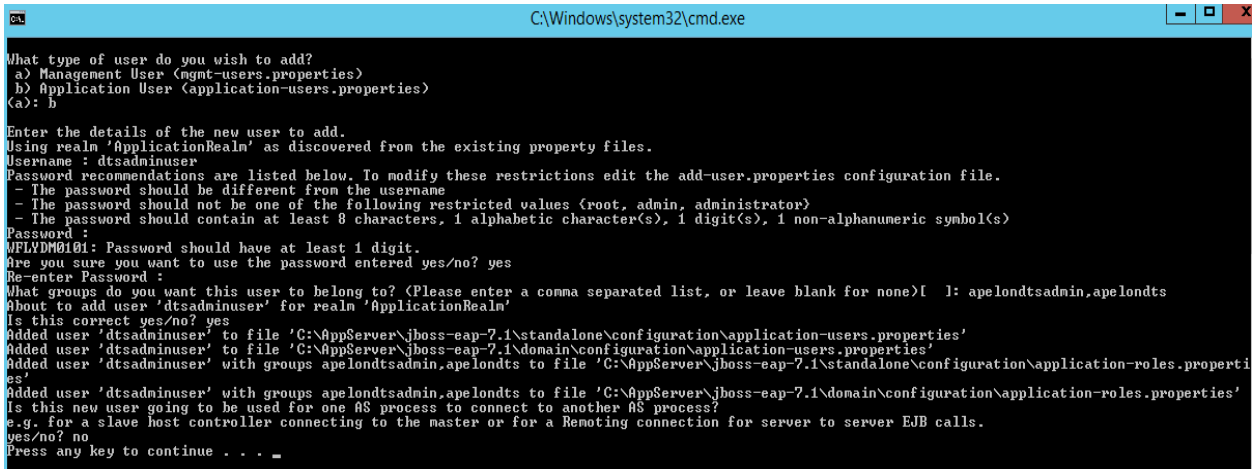
- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

- JBoss EAP supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "no" and press enter.

```
Is this new user going to be used for one AS process to connect to another AS process?
e.g. for a slave host controller connecting to the master or for a Remoting connection for server to
 server EJB calls.
yes/no? no
```

See the screen shot below to confirm:

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### F.3.2 JBoss EAP DTS User Configuration

JBoss EAP Application Users must be created for every individual who will connect to the ***Apelon DTS Server via either the DTS Browser or DTS Editor*** and ***will not require access to the DTS Editor User Manager***. These JBoss EAP users must have the group **"apelondts".**
Go to <JBossEAP74_HOME>`\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g, **dtsuser**

```
Username : dtsuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dts**
- *Note: JBoss EAP will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g., **dts**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- JBoss EAP will prompt you to add the user to any groups. For the standard DTS users, you will need to add to the "apelondts" group.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondts
```

- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

- JBoss EAP supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "no" and press enter.

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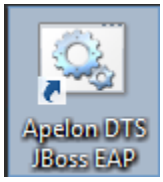
## F.4 Apelon DTS Server Deployment

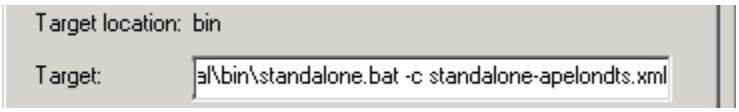
1. Copy the **standalone-apelondts.xml** file from
   `<DTS_HOME>\server\jboss-eap\standalone\configuration`
   to the <JBossEAP74_HOME>**`\standalone\configuration`** folder.

2. Create a shortcut for **<JBossEAP74_HOME>`\bin\standalone.bat`.** Rename this to "Apelon DTS JBoss EAP".




3. Right-click on the shortcut and go to Properties. Modify target as follows:

```
<JBossEAP74_HOME>\bin\standalone.bat -c standalone-
apelondts.xml
```




5. Use this "Apelon DTS JBoss EAP" shortcut for running JBoss EAP configured for Apelon DTS.

6. For launching on Linux use the following command from terminal window:

   `<JBossEAP74_HOME>/bin/standalone.sh -c standalone-apelondts.xml`

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### F.4.1 Data Source Configuration

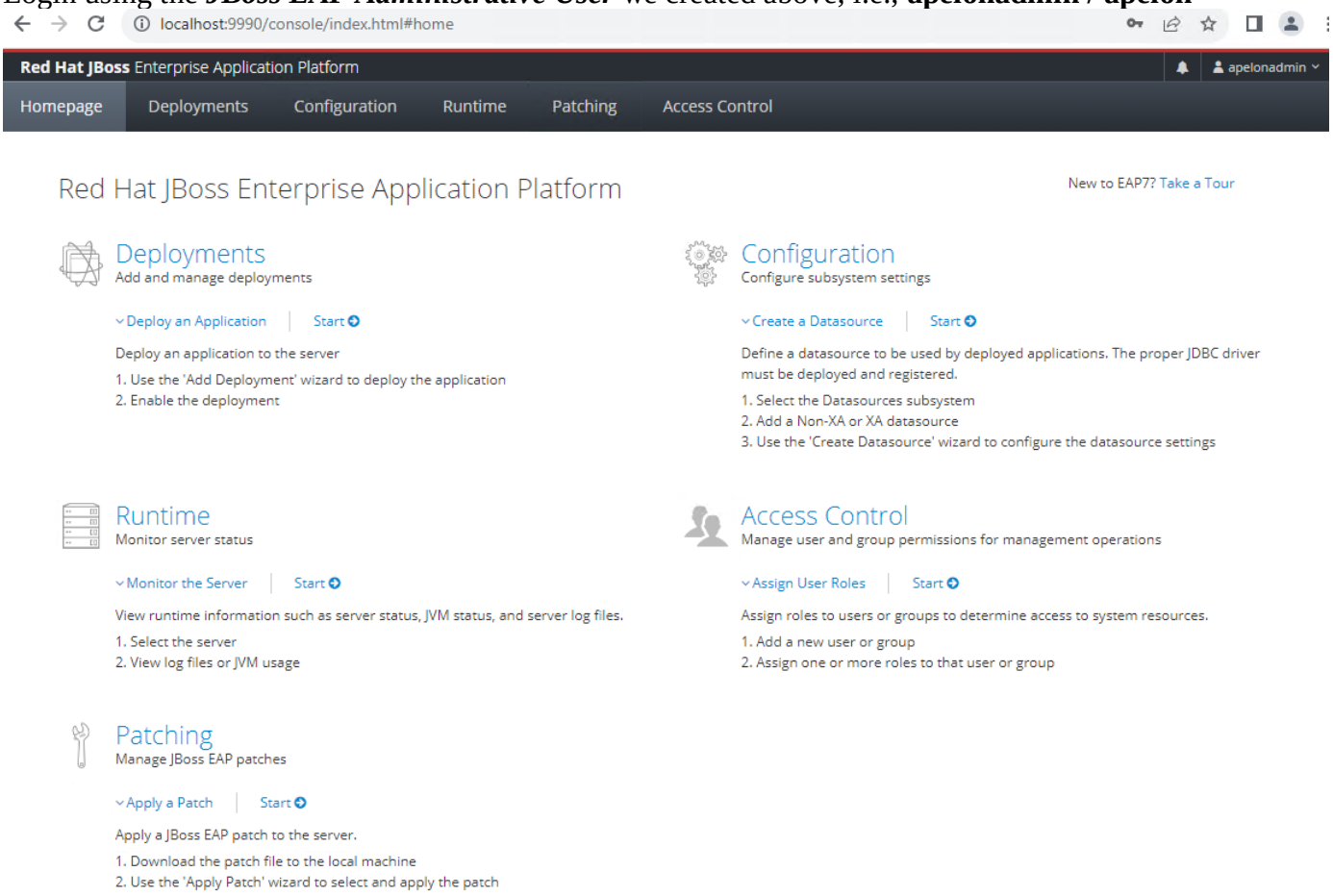
Apelon DTS Server requires a data source configured with JBoss EAP to connect to the database. The necessary steps are:

- Deploy database driver.
- Configure data source.

### F.4.2 Deploy Database Driver

Start JBoss EAP using the "Apelon DTS JBoss EAP" shortcut for Windows (or from terminal window for Linux) created in the previous step. Open a browser and go to the default JBoss EAP Management URL: `http://localhost:9990/console/index.html`

Login using the ***JBoss EAP Administrative User*** we created above, i.e., **apelonadmin / apelon**




If your view does not display as shown above, refresh your browser or clear your browser cache.

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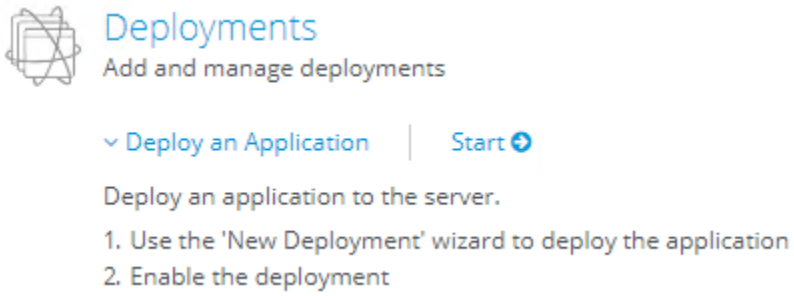
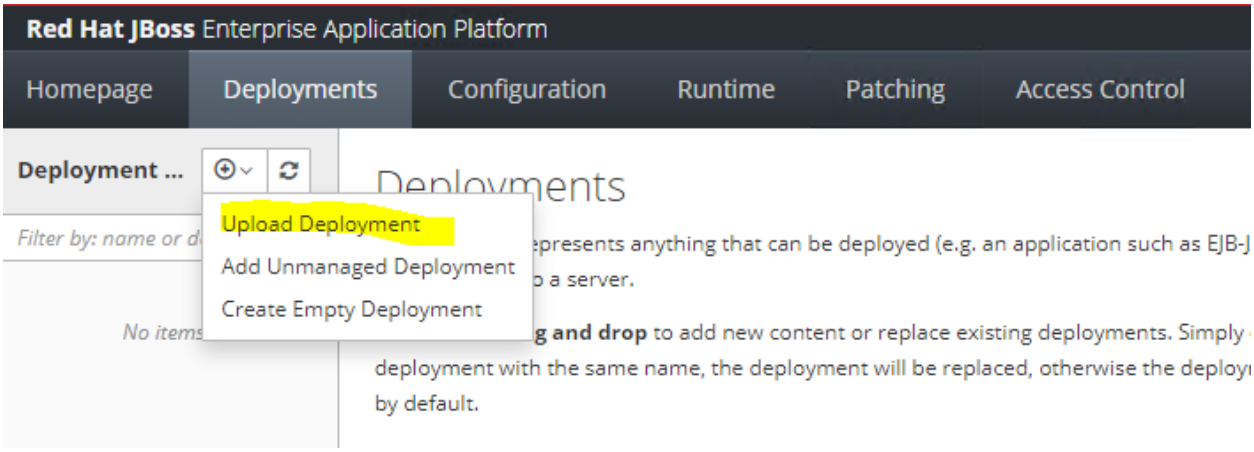
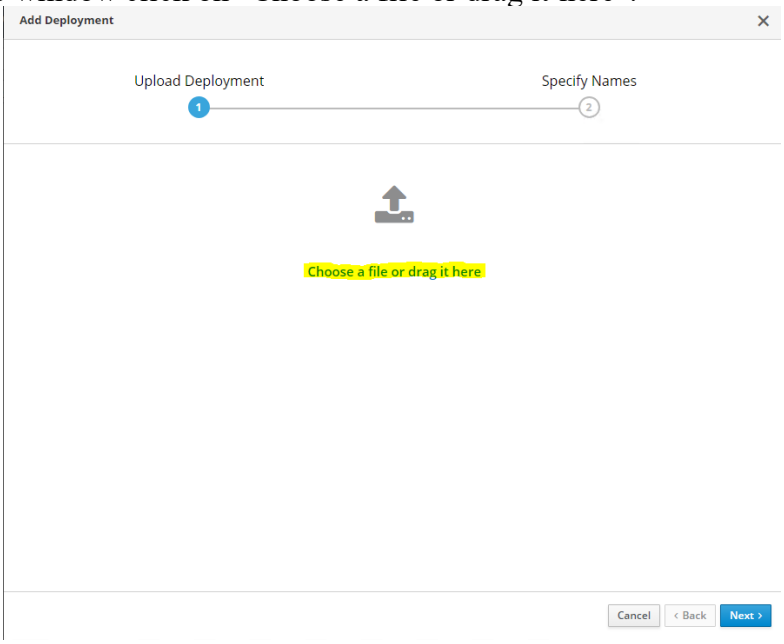
Then Under the “Deployments” header, next to “Deploy an Application” click on the Start arrow.




Then click on the dropdown button to the right of **Deployment…** in the upper left. In the pop-up window click on “Upload deployment” as shown below.




In the next pop-up window click on “Choose a file or drag it here”.

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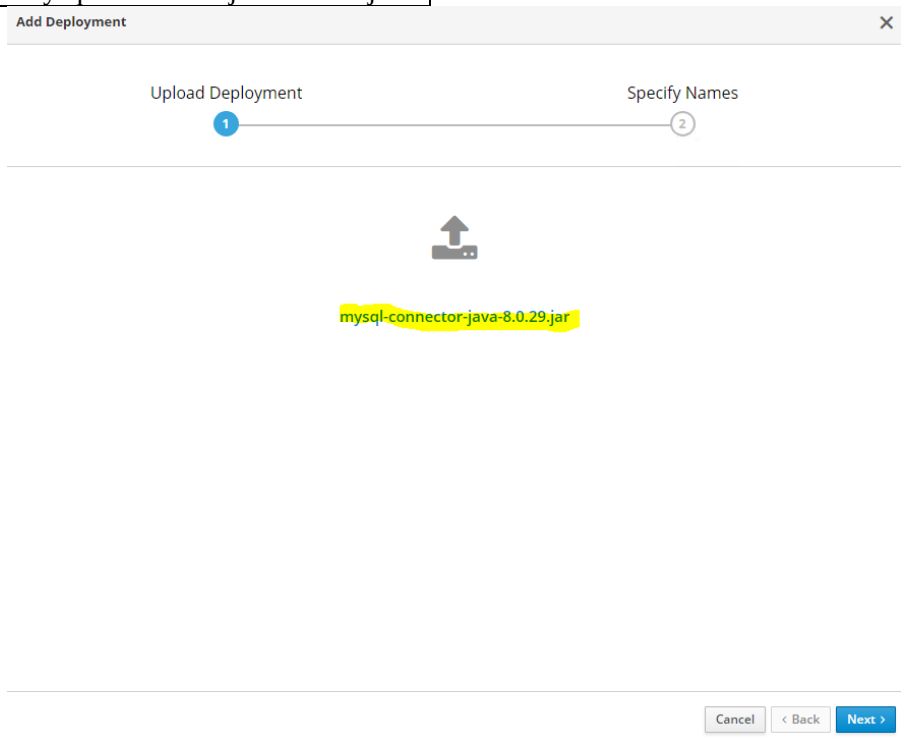
Navigate to the **<DTS_HOME>\lib** folder.
Select a Driver .jar file for the database as given below and click **Next**.

- ***Note:*** *For Oracle 12c see Oracle 12c PGA_AGGREGATE_LIMIT*

| Database | Driver |
|---|---|
| **Oracle 12c** | ojdbc7-4.1.jar |
| **MS SQL Server 2016** | mssql-jdbc-9.4.1.jre8.jar |
| **MS SQL Server 2019** | mssql-jdbc-9.4.1.jre8.jar |
| **MySQL 8** | mysql-connector-java-8.0.29.jar |
| **MySQL 5.6** | mysql-connector-java-8.0.29.jar |

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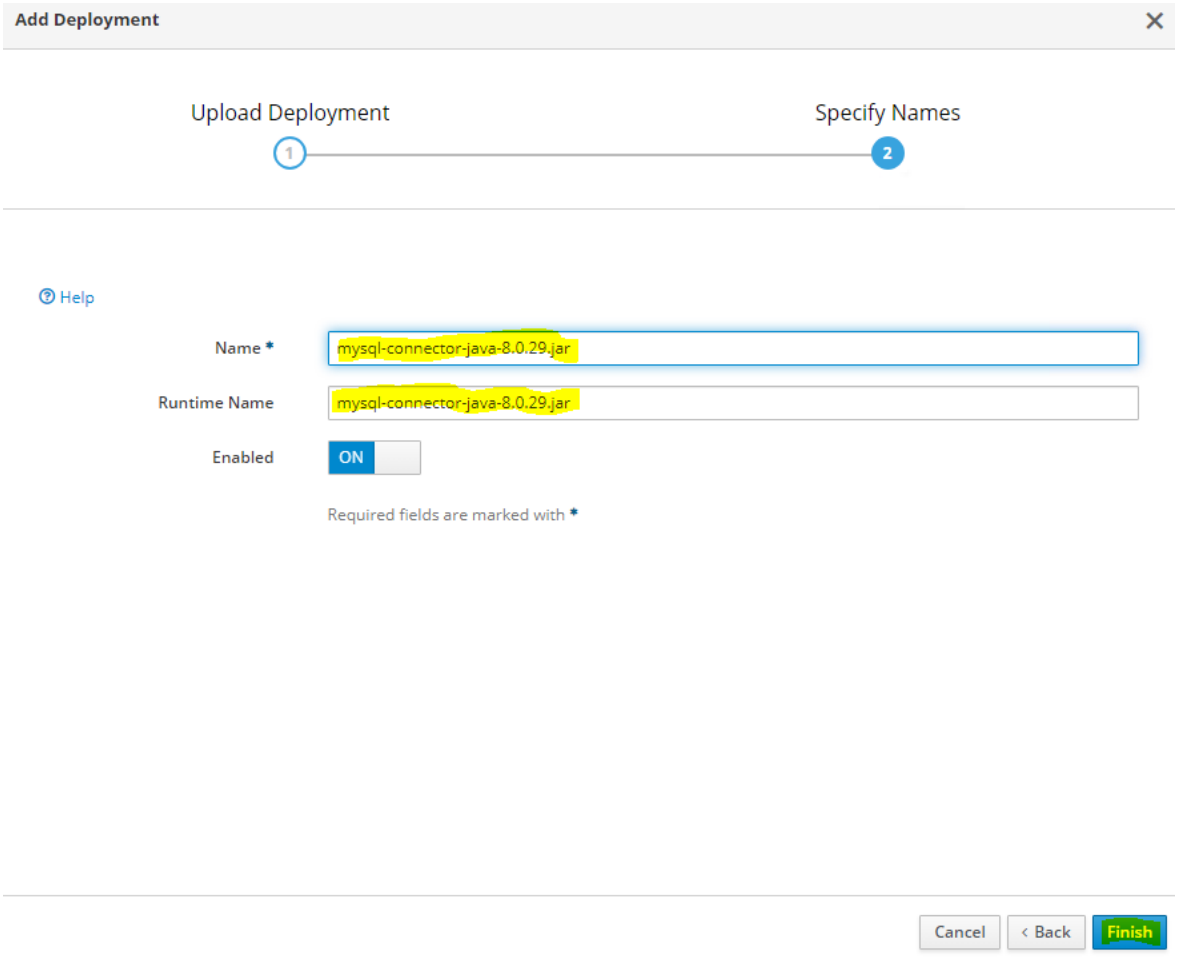
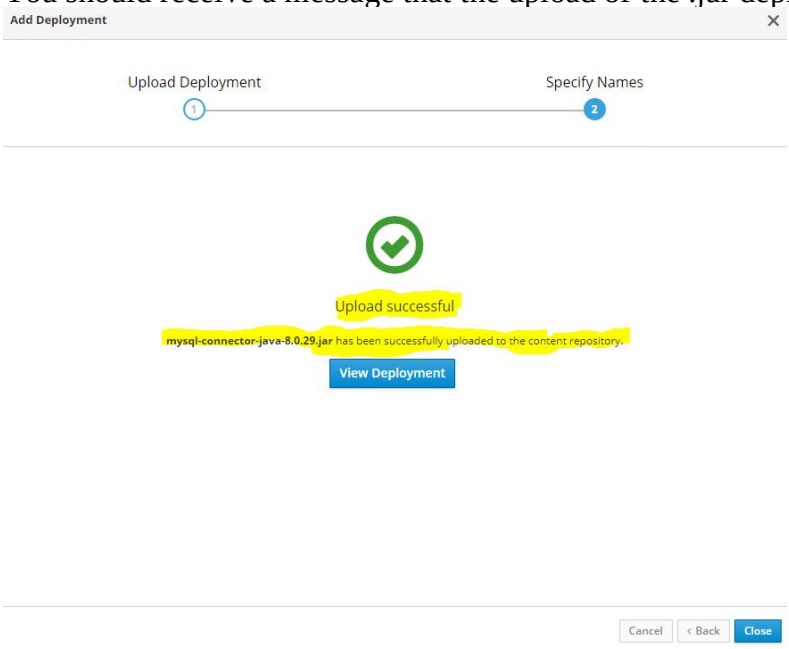
Ensure the **`Enable`** is **ON** and click “Finish”.




You should receive a message that the upload of the .jar deployment was successful.

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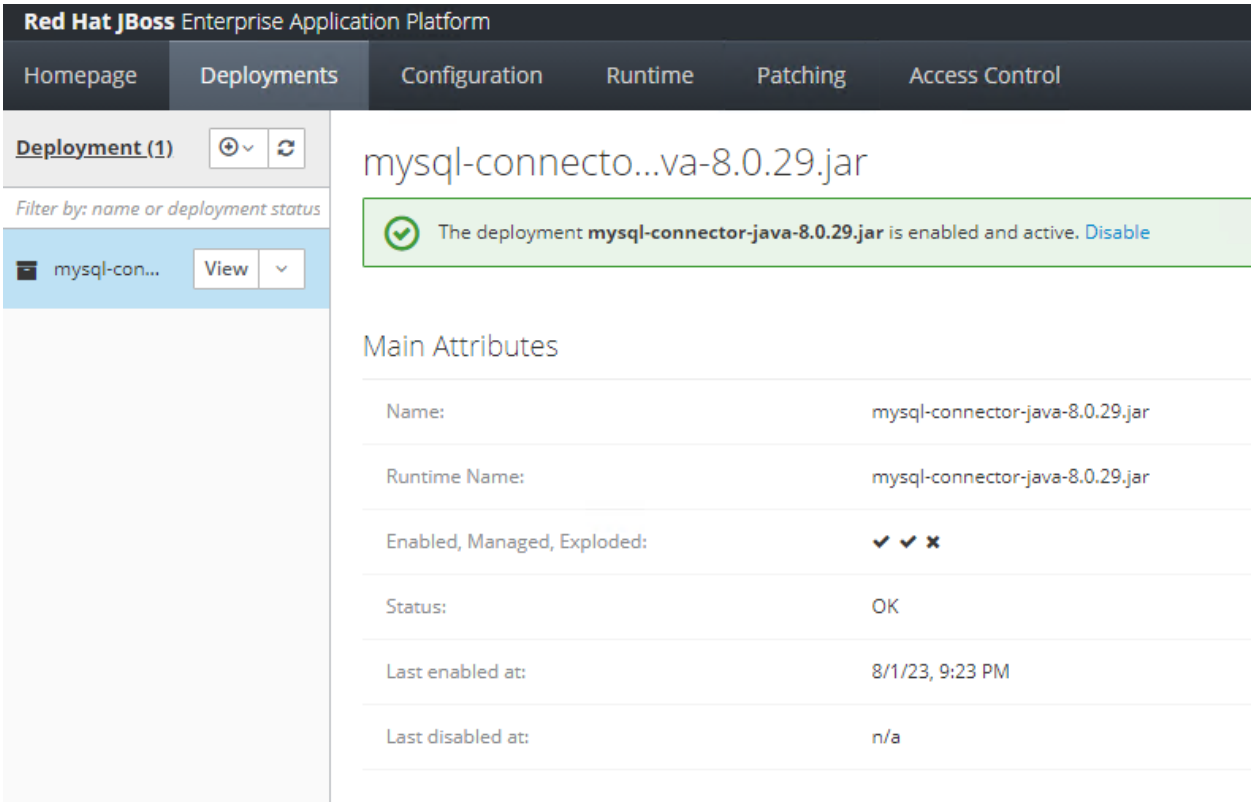


### F.4.3 Configure Data Source

The Apelon DTS Server requires a data source named "**ApelonDtsDS**". This data source must be set up similar to the examples given below (*ensure the appropriate User, Password, and database name are used if they are not the default "dts4" used as an example in this documentation*).

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

To create the **`ApelonDtsDS`** data source, navigate back to "Homepage" in the JBoss EAP administration console, and under the "Configuration" header, select the Start arrow next to "Create a Datasource":

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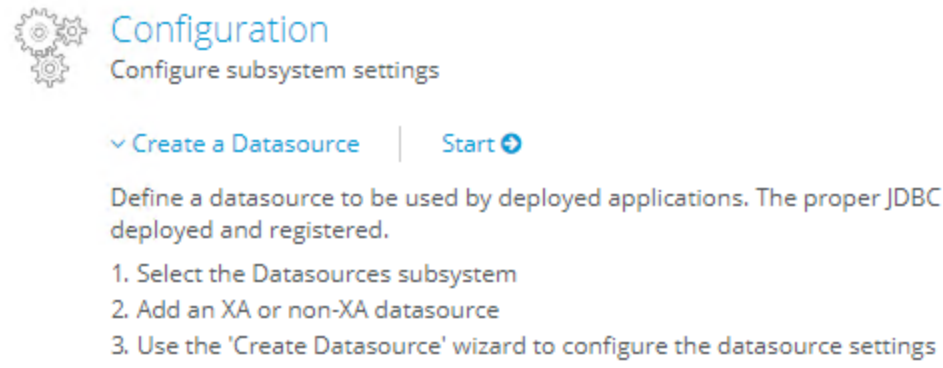
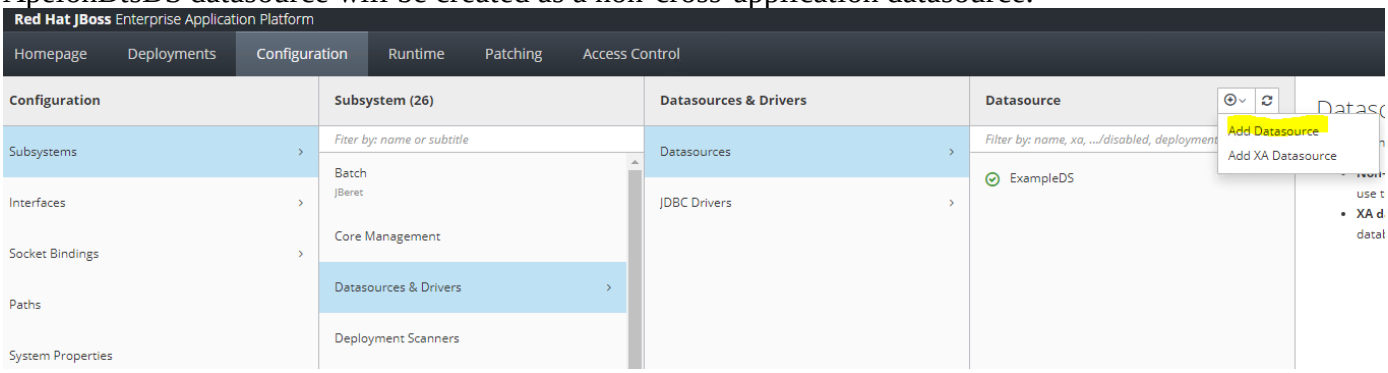



In the “Configuration” column, select the “Subsystems” tab. Under the “Subsystem” column, select the “Datasources & Drivers” tab. Under the “Datasources & Drivers" column, select the “Datasources” tab.
In the “Datasource” column click on the dropdown and choose “Add Datasource”, where the ApelonDtsDS datasource will be created as a non-cross-application datasource.




In the next popup, select the database type for your Datasource (Oracle, MySQL, Microsoft SQLServer) and click **Next**.

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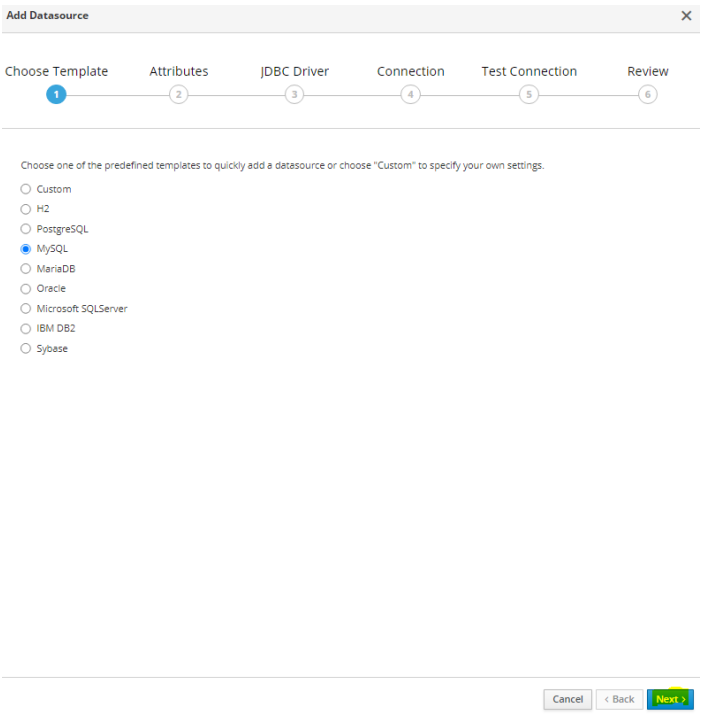
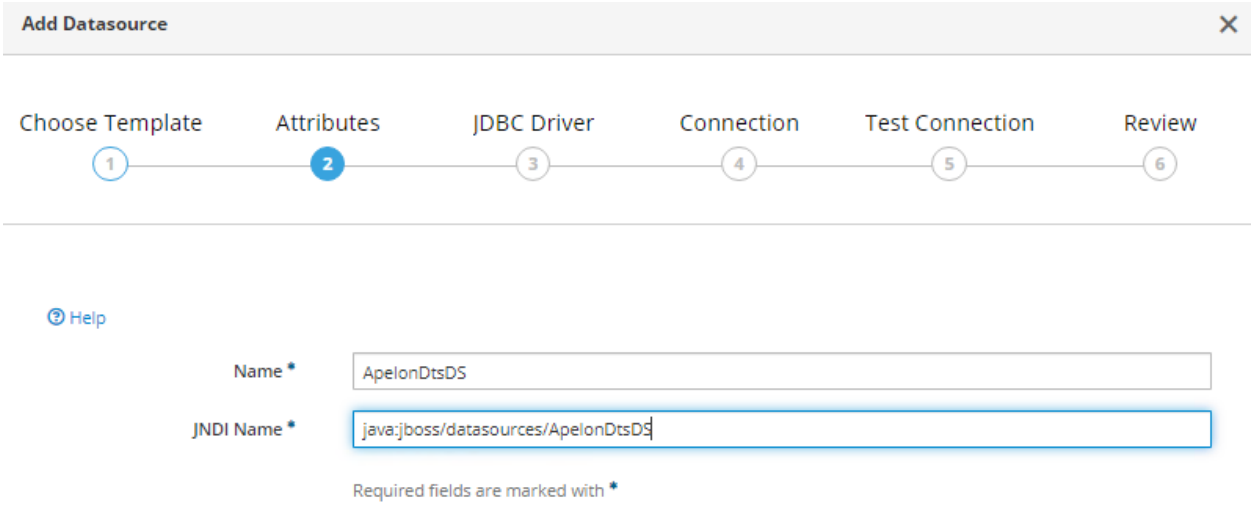



Edit the Datasource Attributes **Name** and **JNDI Name**, then **Next** (*Note: these values are Case-Sensitive*).
The **Name** should be: "ApelonDtsDS"
The **JNDI Name** should be: "java:jboss/datasources/ApelonDtsDS"




In the next window, select the database driver from the **Driver Name** dropdown. Choose the database driver you added to JBoss EAP in an earlier step and hit "Next".

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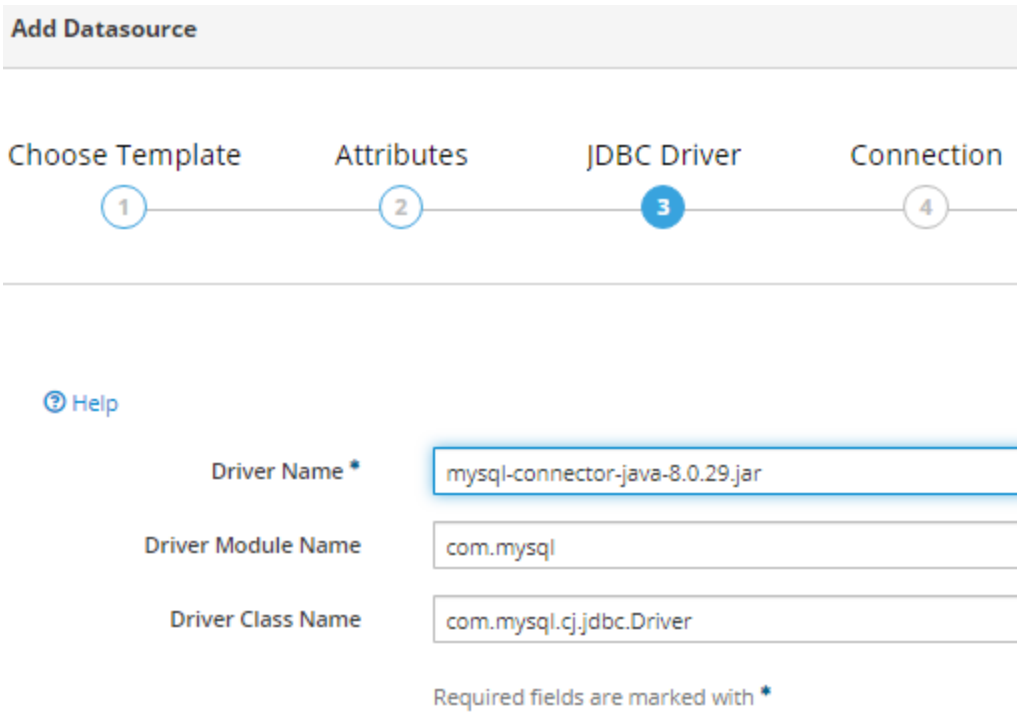


On the next window, enter the appropriate Connection URL, Username, and Password for your database environment. Examples are again presented below, but you should enter the parameters which are correct for your database.

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

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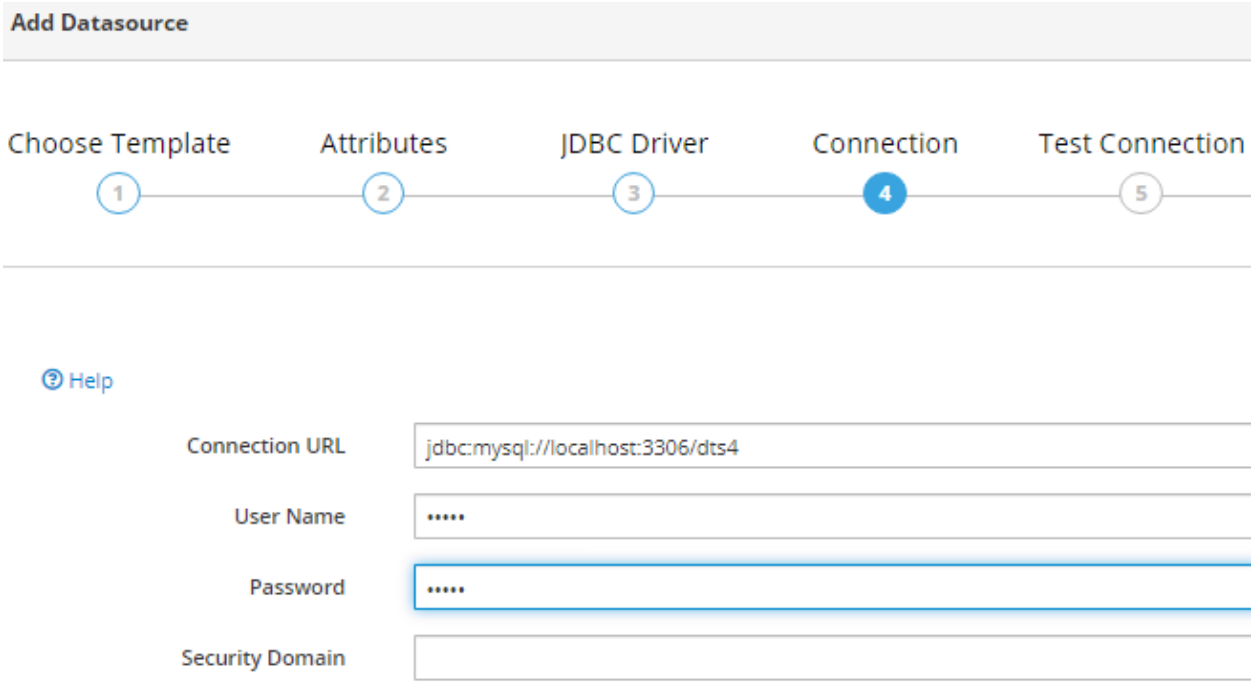
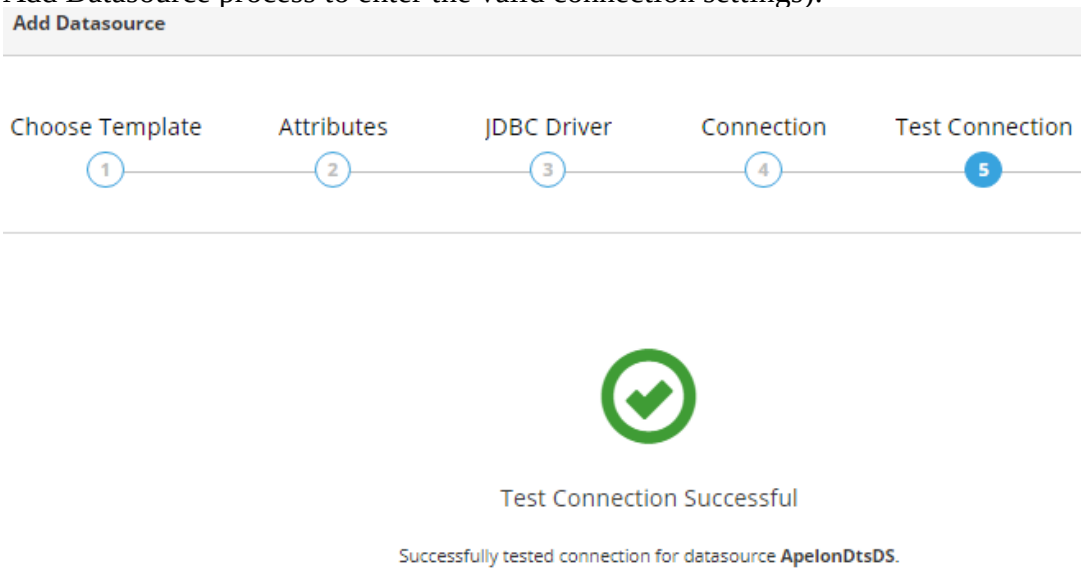



The next window will provide a Test Connection option. Click on the "Test Connection" button to ensure the above entered connection settings are valid. If the connection test is successful click "Next". If the connection test fails, click "Back" and correct the connection settings (NOTE: the connection settings may get cashed by the browser so you may need to restart the Add Datasource process to enter the valid connection settings).




On the next window, JBoss EAP will provide you a summary of the Datasource settings. Click "Finish" to accept, or "back" to make any revisions.

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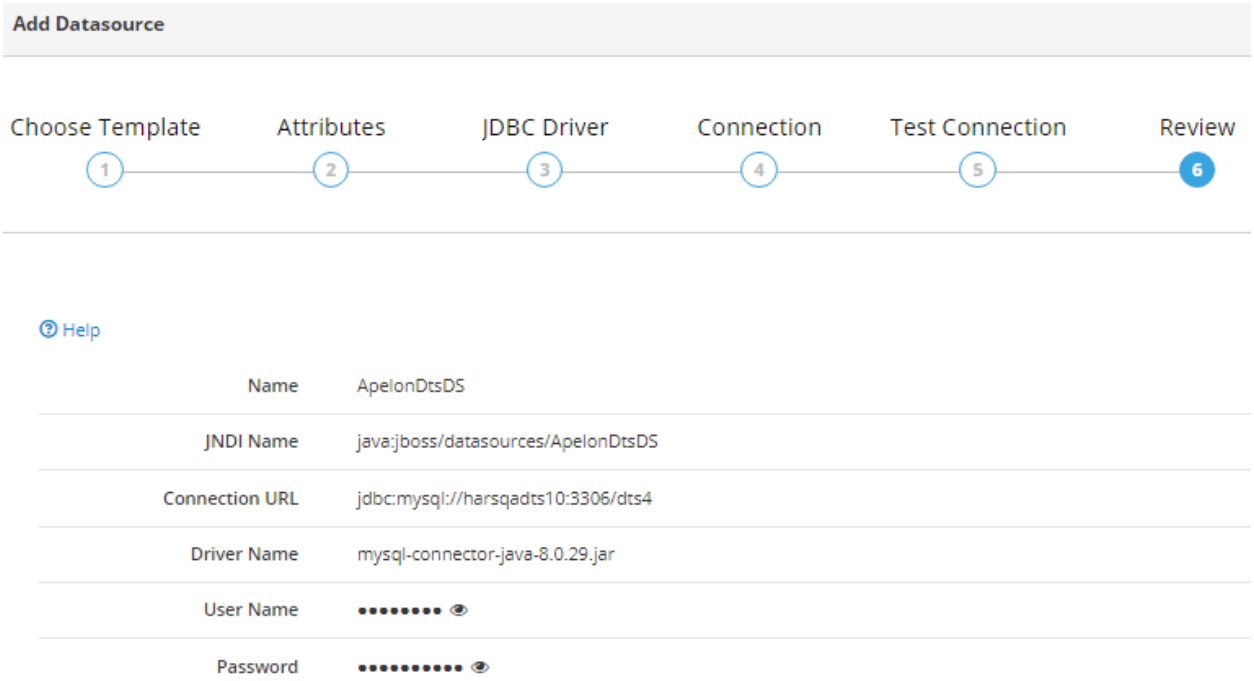
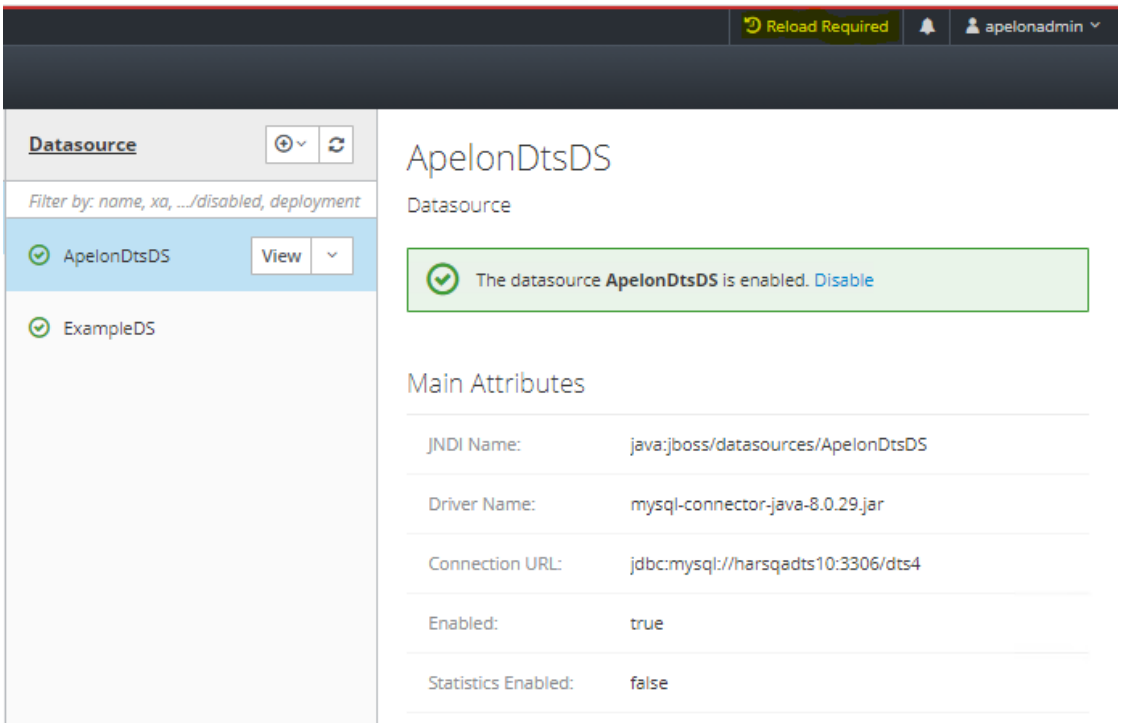



After clicking "Finish" a pop-up message will be displayed indicating the server configuration changed and to reload the server. Click "Reload". If you miss the Reload pop-up, click on the Reload Required link in the upper right of the Management Console.




You should receive a message that the Server was successfully loaded.
Now that the Datasource has been created, you may test the connection once again, from the dropdown next to it from the "Datasource" column.

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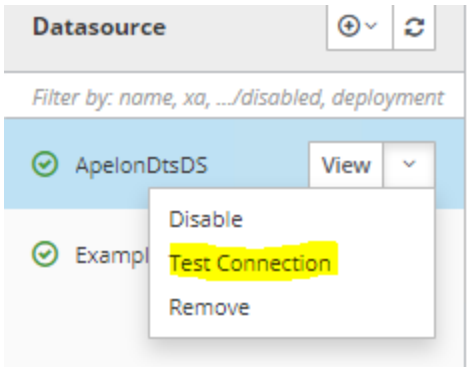
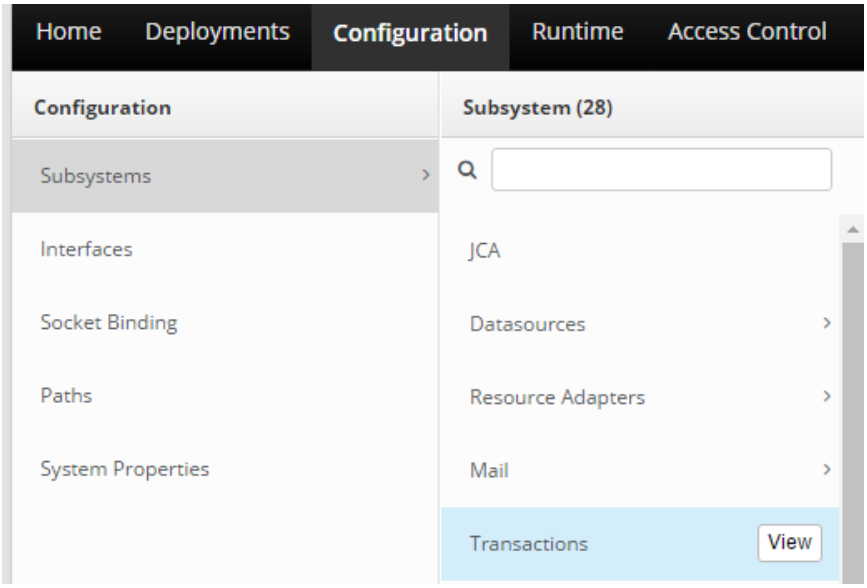



Ensure the connection test is successful before continuing.

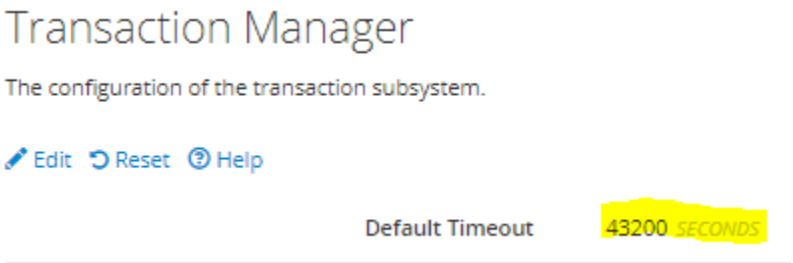
## F.5 Check JBoss EAP Transaction Timeout Default

The JBoss EAP Transaction Timeout Default is **set to 43200 seconds** to accommodate long running DTS transactions.

To edit or view the JBoss EAP Transaction Timeout Default, from the "Configuration" column select "Subsystems">"Transactions" and click "View".




Then click "Edit" and enter the new timeout value.




Then click "Save". The JBoss EAP server must be restarted for the change to take effect.

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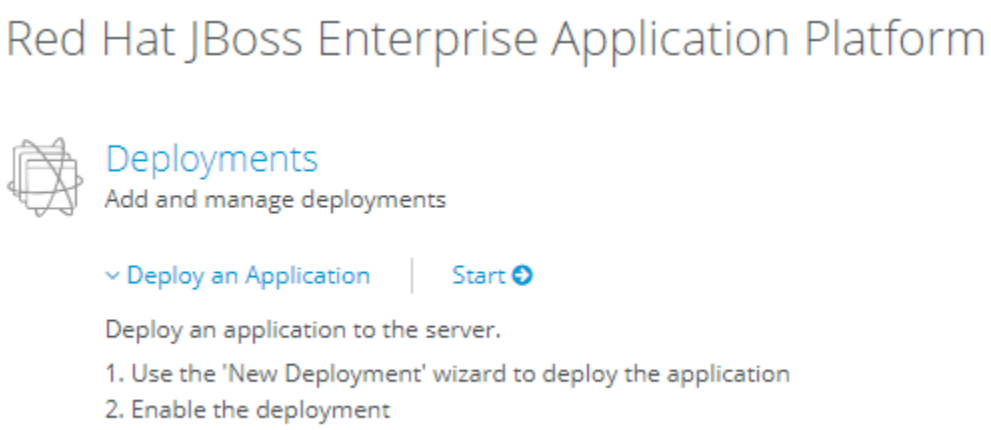
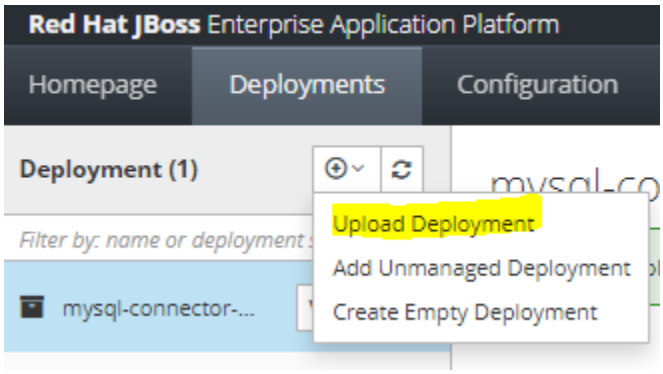
## F.6 Deploy Apelon DTS Server

To deploy the Apelon DTS Server EAR file, click the Start arrow next to "Deploy an application" under the Deployments header from the Homepage tab.




Click the dropdown button in the upper left and choose "Upload Deployment" to begin the deployment process.




On the next window, click on "Choose a file or drag it here".

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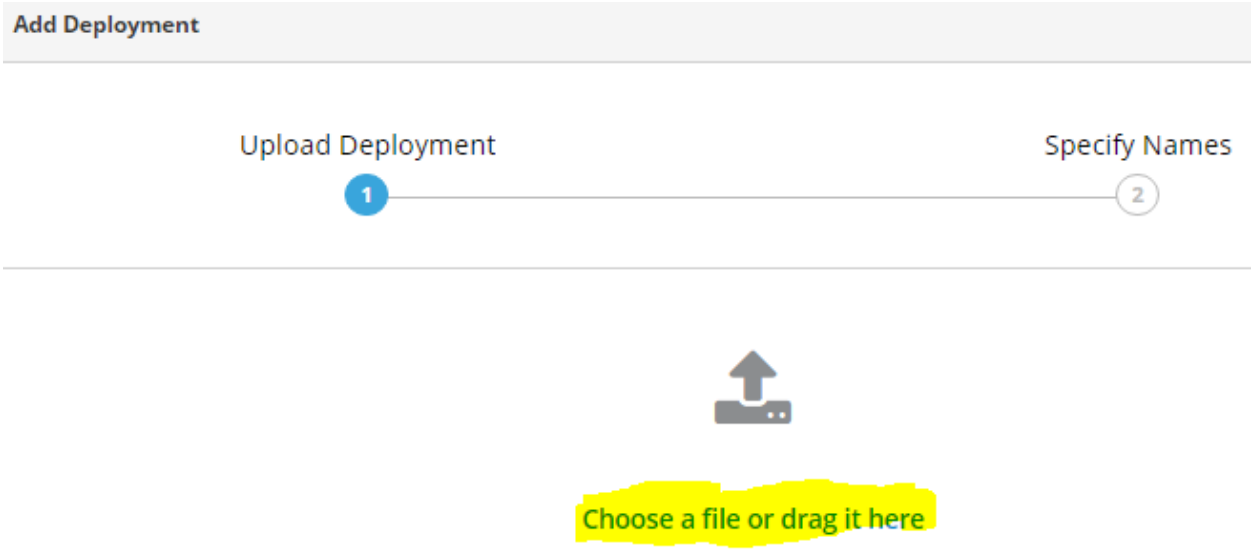
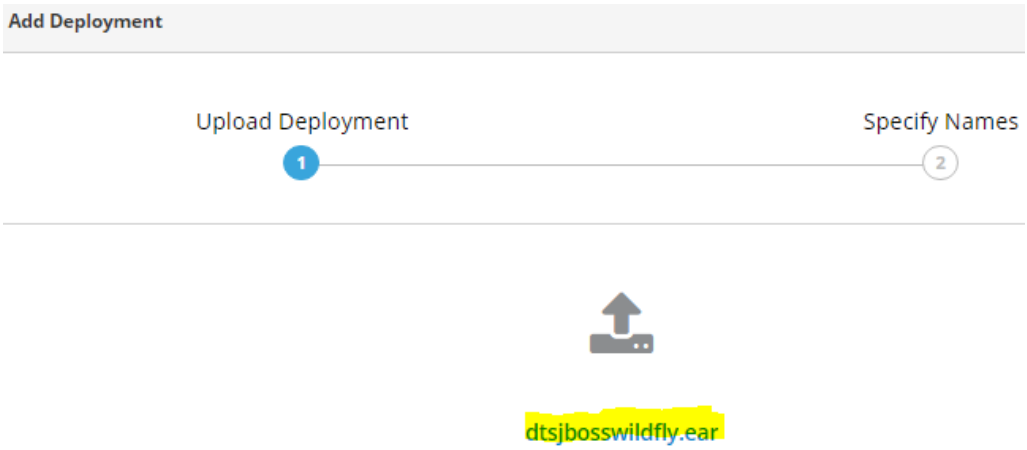



Navigate to the `<DTS_HOME>\server\jboss-eap\standalone\deployments` directory and select **`dtsjbosswildfly.ear,`** `then click` **`Next`**(This is not a typo, WildFly is in reality the next open source iteration of JBoss EAP, and as such the .ear file contains "wildfly" in the name).

**NOTE:** For **Microsoft SQL Server** a `dtsjbosswildflyforsqlserver.ear` file that is specific to Microsoft SQL Server must be used.

- The MS SQL Server specific `"dtsjbosswildflyforsqlserver.ear"` file is in the following location:
  `<DTS_HOME>\server\jboss-eap\standalone\deployments\sqlserver\`




In the next window ensure "Enable" is set to **ON** and then click "Finish".

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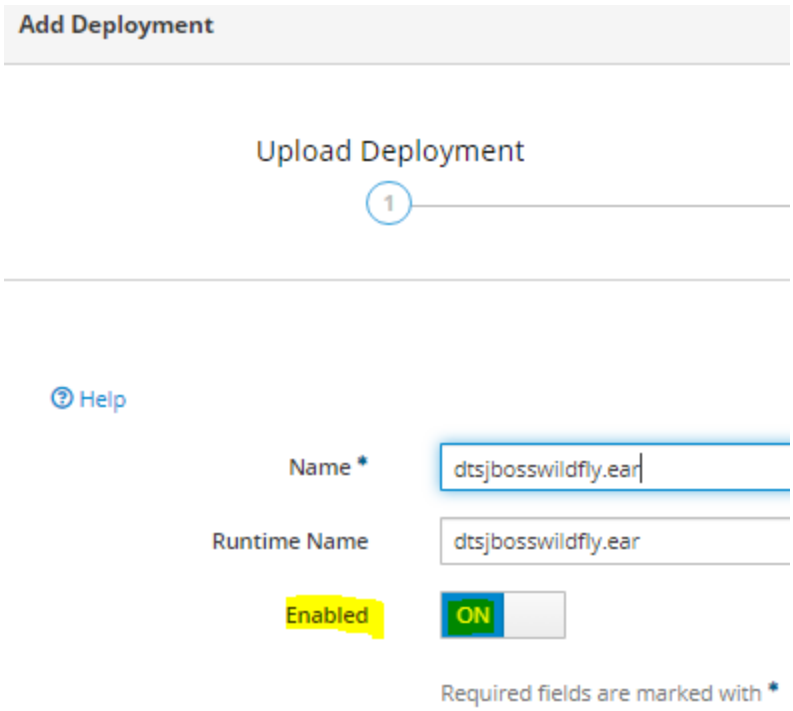


JBoss EAP will report that the deployment is in process. NOTE: you may see a message that "…management operations are running longer than expected…" but you can ignore this message.

****IMPORTANT****

**In the case of upgrading an earlier DTS schema version, Do Not Restart JBoss EAP until the Deployment has completely finished and you have verified that the Database Schema is fully deployed to the correct version (See section: Upgrade Apelon DTS 4.7.0 - 4.7.2 JBoss EAP Server & schema to DTS 4.8.0). Once the correct schema version is verified, SHUT DOWN and RESTART the JBoss EAP server to ensure the changes are integrated.**

## F.7 Verify DTS Browser & Editor connections to JBoss EAP DTS Server

### F.7.1 Verify the DTS Browser

You can access the DTS Browser from: http://localhost:8080/dtsserverws.

To login to the DTS Browser, you will need to enter user credentials created in the JBoss EAP Configuration for Apelon DTS Server section.

**Note:** If you used the example users defined in the guide, the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.

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### F.7.2 Verify the DTS Editor connection

Run the DTS Editor shortcut ( DTS Editor ) provided by the DTS 4 installation.
Connect to the JBoss EAP server by using an **Instance** of '**dtsjboss**' and default **Port** number '**8080'** along with the user credentials created in the JBoss EAP Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in this guide the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.
Click "Connect".

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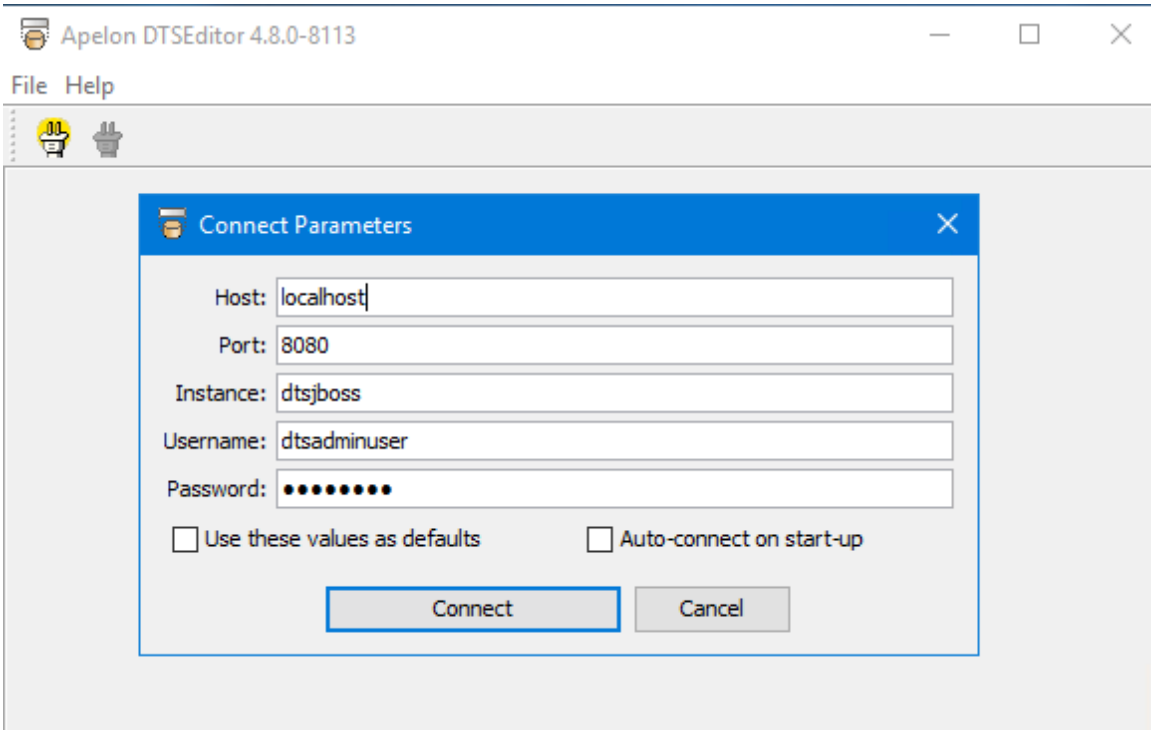


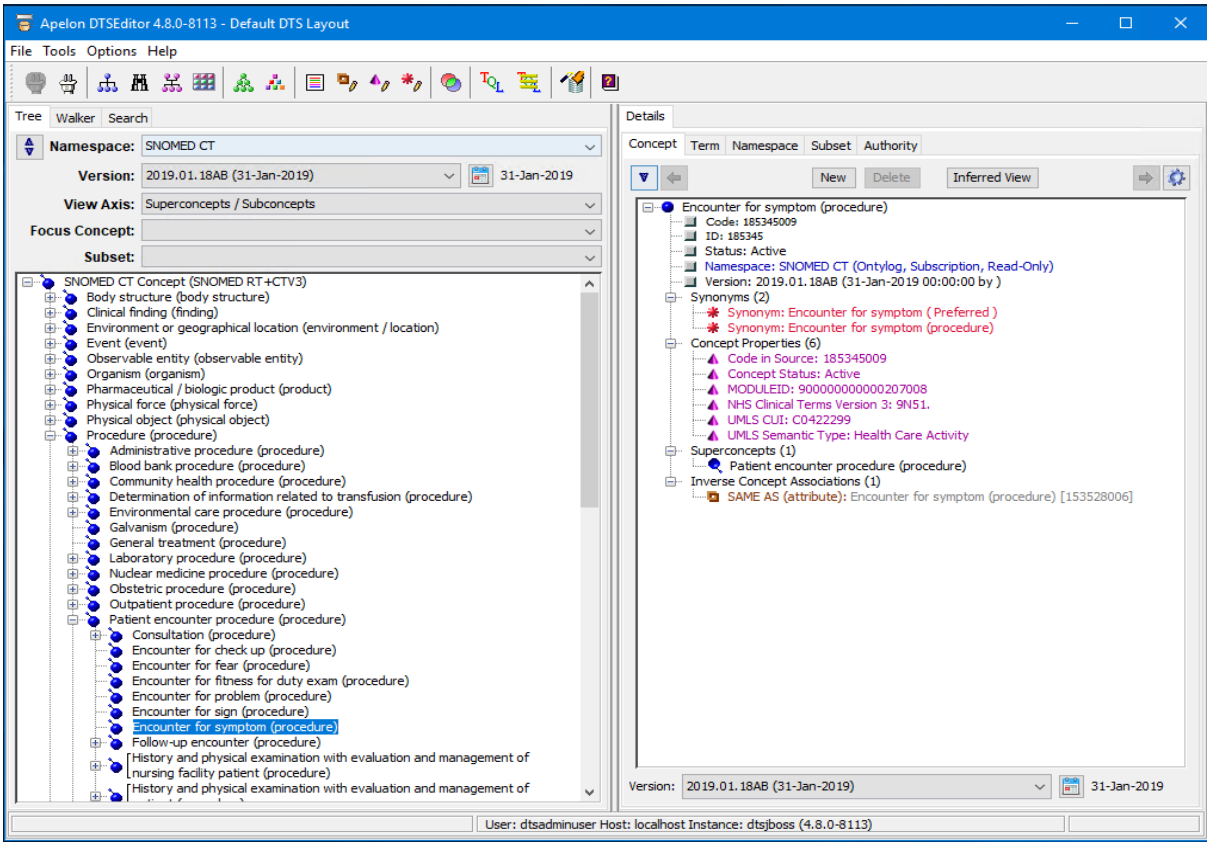


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## F.8 Setup JBoss EAP and DTS to start as a Windows Service

To have JBoss EAP and DTS start as a service you will need to download the **"commons-daemon-1.1.0-bin-windows.zip"** file from the Apelon DTS download page – http://www.apelondts.org.

Follow these steps to get your JBoss EAP server running as a windows service.

Steps:

1. Unzip **commons-daemon-1.1.0-bin-windows.zip** into your **<JBossEAP74_HOME>\bin** folder, where **<JBossEAP74_HOME>** represents the base JBoss EAP 7.4 folder specified in the JBoss EAP 7.4 Setup i.e., **C:\Tools\jboss-eap-7.4** folder.
2. Open the **service.bat** file located in the **<JBossEAP74_HOME>/bin folder**.
3. In the service.bat file, locate the "**CONFIG**" variable and set its value equal to the DTS server configuration file name "**standalone-apelondts.xml":**
   **set CONFIG= standalone-apelondts.xml**
4. Also, update the windows service variable values.
   e.g.:
   **set SHORTNAME= DTS4JBossEAP7**
   **set DISPLAYNAME= DTS4_JBossEAP7**
   **set DESCRIPTION= DTS4 JBoss Enterprise Application Platform 7**
   *Note1: If present, please be sure to remove the quotations surrounding the Description value.*
   *Note2: If the JBoss Management Port Number specified in the **standalone-apelondts.xml** provided by DTS4 is changed (i.e. from* `jboss.management.http.port:9990` to `jboss.management.http.port:XXXX`*), then the Controller Port Number specified in the **services.bat** found in the following line must be changed to match the JBoss Management Port Number:*

   ```
   CONTROLLER=localhost:9990
   ```

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```
rem defaults
set SHORTNAME=DTS4JBossEAP7
set DISPLAYNAME=DTS4_JBossEAP7
rem NO quotes around the description here !
set DESCRIPTION=DTS4 JBoss Enterprise Application Platform 7
set CONTROLLER=localhost:9990
set DC_HOST=master
set IS_DOMAIN=false
set LOGLEVEL=INFO
set LOGPATH=
set JBOSSUSER=
set JBOSSPASS=
set SERVICE_USER=
set SERVICE_PASS=
set STARTUP_MODE=manual
set ISDEBUG=
set CONFIG=standalone-apelondts.xml
```

5. Open a command prompt (as administrator) and change directory to the **<JBossEAP74_HOME>\bin** directory
6. To install the JBoss Service enter and execute the following command: >**service install**

7. After the JBoss EAP service is installed, close the *Command Prompt* window**.**
8. Search for **Services** and select the Services app. Find the **"DTS4_JBossEAP7"** service. Right click and select **Properties**.

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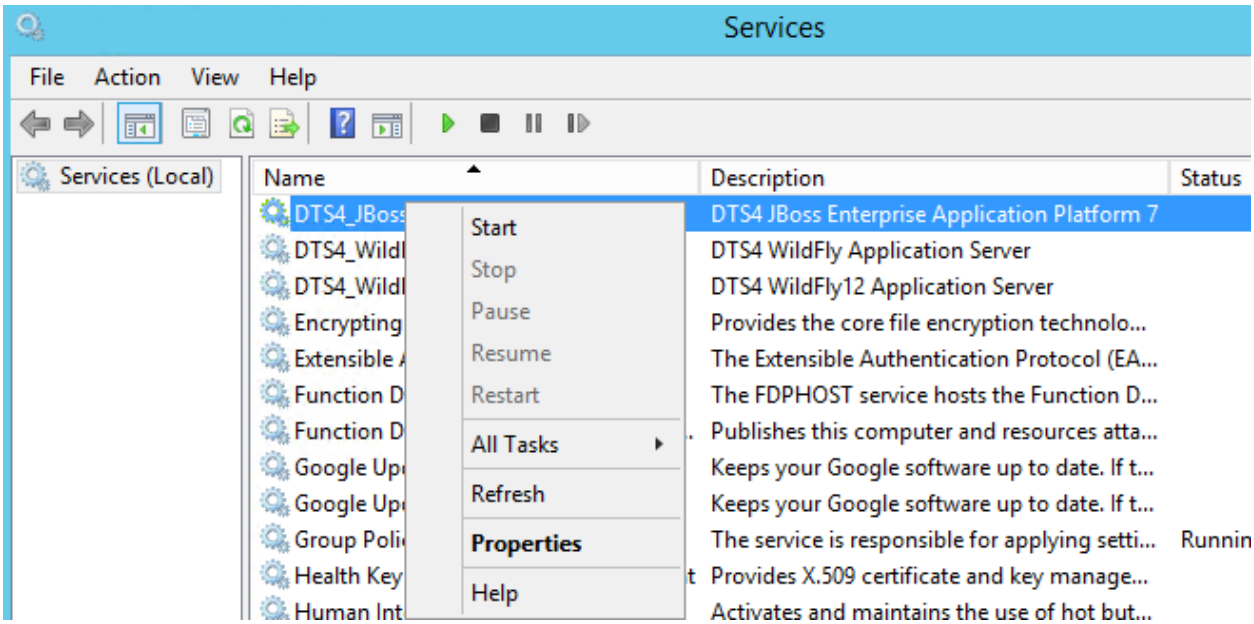


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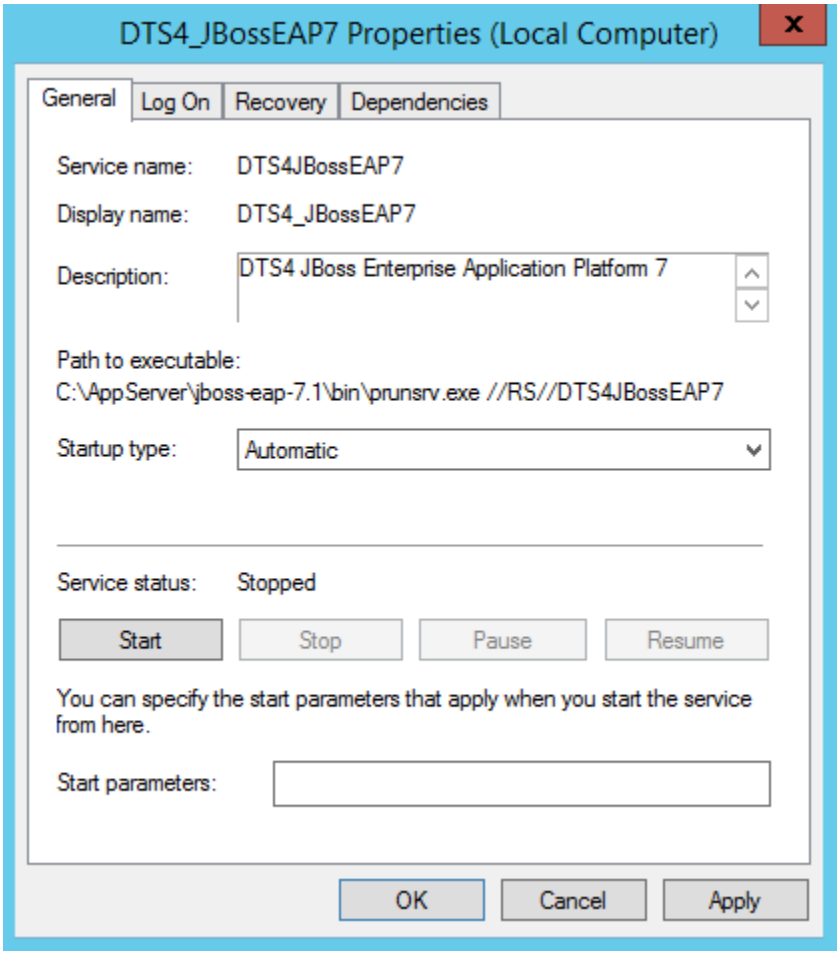
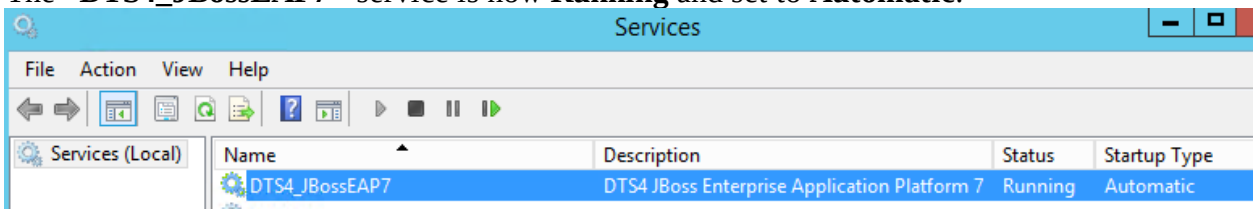
9. Perform the following:
    a. Set the *Startup type* to **Automatic or Automatic (Delayed Start)**
    b. **Start** the Service.
    c. Click **Apply**
    d. Click **OK**




10. The **"DTS4_JBossEAP7"** service is now **Running** and set to **Automatic**.

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## F.9 Setup JBoss EAP and DTS to start as a Linux Service

To install DTS as a daemon service on Linux, you will need to copy and configure the service launching scripts that are included with JBoss EAP.

Follow this procedure to configure the service.

1. Create a new user which will be used to launch the service. For example:
   ```
   => useradd -r -d /tmp/ jbossas
   ```

2. The `jbossas` user needs to have permission to read, write and execute to the path where JBoss EAP was installed. One option to grant this permission is to change the ownership of the JBoss EAP installation folder to the new user that was created. For example:
   ```
   => chown -R jbossas /opt/jboss-eap-7.4/
   ```

3. Optionally change the group membership of the JBoss EAP installation folder to the newly created user. For example:
   ```
   => chgrp -R jbossas /opt/jboss-eap-7.4/
   ```

   Alternatively, add the jbossas user to a shared users group, and change the group of the JBoss EAP installation folder to this shared group.

4. Copy the "**<JBossEAP74_HOME>/bin/init.d/jboss-eap.conf**" file to the folder "**/etc/default**". For example:
   ```
   => cp /opt/jboss-eap-7.4/bin/init.d/jboss-eap.conf
   /etc/default/
   ```

5. Add or update the following lines in the newly created "**/etc/default/jboss-eap.conf**" file, customizing as necessary for your installation.

```
# The username that should own the process
JBOSS_USER=jbossas

## The amount of time to wait for startup
STARTUP_WAIT=90

# The installation path of JBoss
JBOSS_HOME=/opt/jboss-eap-7.4

# The name of the server config file to use for your Database.
JBOSS_CONFIG=standalone-apelondts.xml
```

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6. Copy the "**<JBossEAP74_HOME>/bin/init.d/jboss-eap-rhel.sh**" file to the folder "**/etc/init.d**" and rename it to "**jbossas**"
   ```
   => cp /opt/jboss-eap-7.4/bin/init.d/jboss-eap-rhel.sh
   /etc/init.d/jbossas
   ```

7. Modify the file "**<JBossEAP74_HOME>/bin/standalone.conf**" to specify the Java JVM to use during when the service starts. Add a `JAVA_HOME` parameter to your file, customizing as necessary for your installation. Note – this parameter may already exist in the file – if it does – you can either modify the existing one, or comment it out. For example:

   ```
   # Specify the location of the Java home directory.
   #If set then $JAVA will be defined to $JAVA_HOME/bin/java, else
   #$JAVA will be "java".
   #
   #JAVA_HOME="/opt/java/jdk"
   JAVA_HOME=/opt/java/jdk1.8.0_351
   ```

8. Create the necessary links to the **/etc/init.d/jbossas** script so it starts and stops at the appropriate runlevels.
   ```
   => chkconfig jbossas on
   ```

9. The server is now configured to automatically start and stop with the system. To manually start the server, execute:
   ```
   => /etc/init.d/jbossas start
   ```

   To manually stop the server, execute:
   ```
   => /etc/init.d/jbossas stop
   ```

   To check the status of the server, execute:
   ```
   => /etc/init.d/jbossas status
   ```

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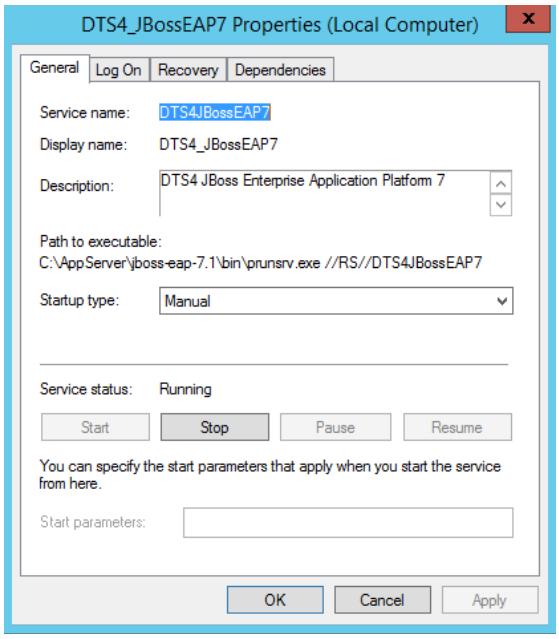
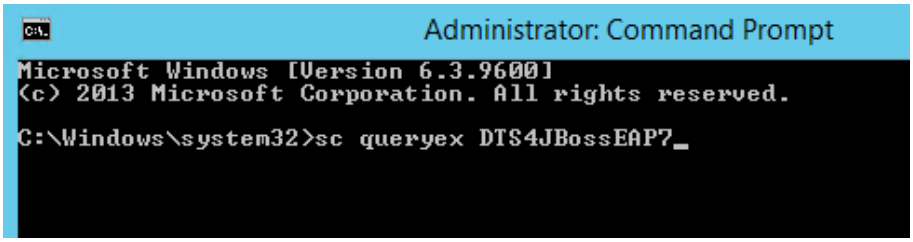
## F.10 Terminating the JBoss EAP Service using taskkill

Stopping the Jboss EAP Service in the Services Window sometimes does not shut down in a timely manner, sometimes returning an error that the service is not responding. In this case, using a taskkill command to terminate the service is an effective way of circumventing this Services issue. Here are the instructions for doing so:

1. In the Services Window, right-click on the JBoss EAP Service and choose Properties.
2. In the Properties Window, identify the Service Name and copy it.




3. Open a Command Window and type the following: `sc queryex [Service Name]`




4. This should produce information about the JBoss EAP Service, including the PID.
5. Type the following in the Command Window: `taskkill /pid [PID] /f`

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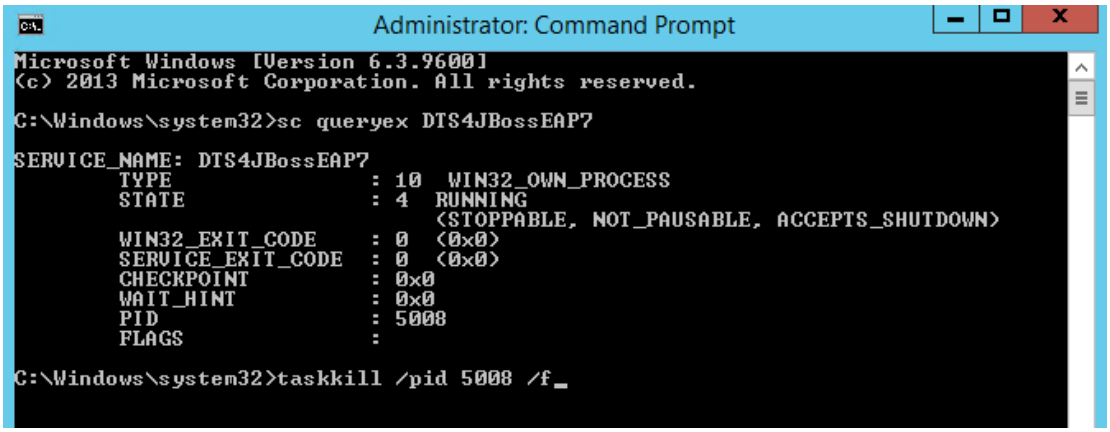
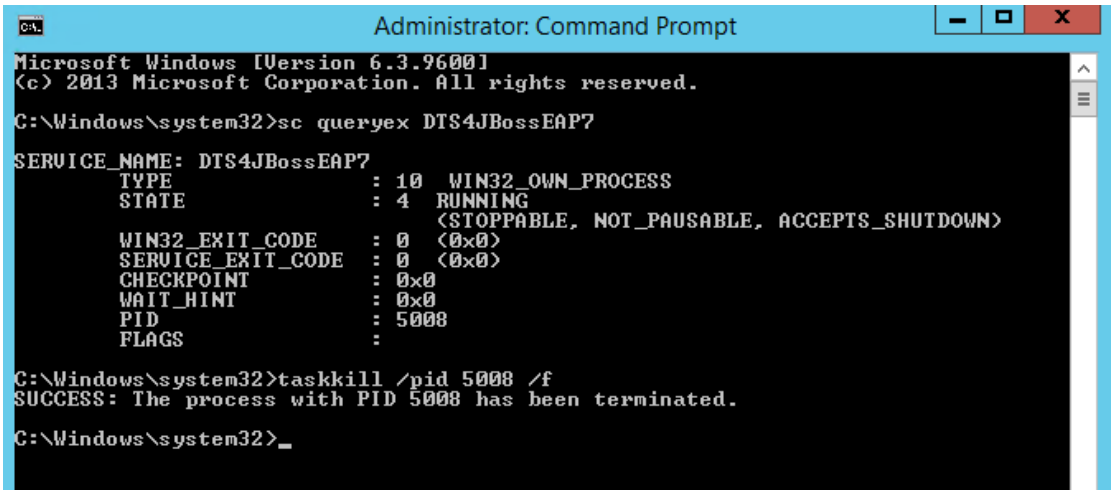



6. The Service should be terminated, as confirmed by the following message:

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## F.11 Upgrade Apelon DTS 4.7.0 - 4.7.2 JBoss EAP Server & schema to DTS 4.8.0

Perform the following steps to upgrade your Apelon DTS 4.7 JBoss schema to Apelon DTS 4.8.0 JBoss EAP **(Note: DTS 4.7.1 – 4.7.2 has the same schema version as DTS 4.8.0)**:

- Follow instructions in Section B for installing DTS 4.8.0 on the server to be upgraded.
- Stop the Apelon DTS JBoss EAP service.
- Copy the JBoss EAP configuration file from the DTS 4.8.0 home directory `<DTS_HOME>\server\jboss-eap\standalone\configuration` to the <JBossEAP74_HOME>`\standalone\configuration` folder. Replace the existing file with this new JBoss EAP configuration file.
- Restart the Apelon DTS JBoss EAP service.
- Review the Notes below before continuing to the next steps.
- Follow steps **F.4.2**(Deploy Database Driver) through **F.7**(Verify DTS Browser & Editor connections to JBoss EAP DTS Server) to finish configuring the Apelon DTS 4.8.0 JBoss EAP server.
- **NOTE1:** If upgrading from a DTS 4.7.0 schema to DTS 4.8.0, as instructed in section **F.6**(Deploy Apelon DTS Server), when deploying the "`dtsjbosswildfly.ear`" **Do NOT shut down or restart the JBoss EAP service while the schema is being upgraded**. This step could take some time, especially when upgrading DTS schemas in MySQL and SQL Server.
- **To verify the correct DTS 4.8.0 schema version, perform the following steps:**
    1. View the "server.log" file located in the <JBossEAP74_HOME>**`\standalone\log`** directory. Search the JBoss EAP "server.log" file for the statement:
        - "Schema Upgrade to 4.0.29 complete" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
        - "Schema Upgrade to 4.0.30 complete" – for MySQL 5.6 or MySQL 8.
    2. A second way to determine the schema upgrade was successful is via the DTS 4.8.0 DTS Editor.
        - Connect to the Apelon DTS JBoss EAP server.
        - Once the connection is established choose: **Help>About Apelon DTSEditor…**
        - In the help window that is launched click on the "*Details>>*" label. In the "Server Configuration:" section is displayed a "schema.version" value. The schema version should read:
            - "4.0.29" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
            - "4.0.30" – for MySQL 5.6 or MySQL 8.
- **NOTE2 - SQL Server Schema Upgrade:** If upgrading from a version older than DTS 4.4, not only may the SQL Server schema upgrade to version 4.0.29 take up to or longer than an hour, it may also require about as much available drive space for its database log file as is being used by the database prior to the schema upgrade. Consult with your SQL

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Server Database Administrator regarding the available drive space and the possibility of shrinking the database log after the schema is successfully upgraded to version 4.0.29.

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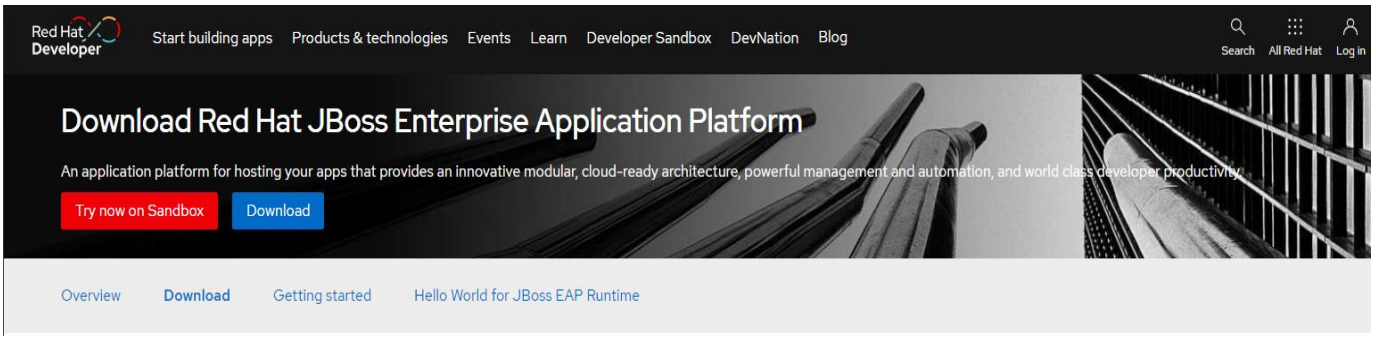
## G. JBoss EAP 7.1 Setup

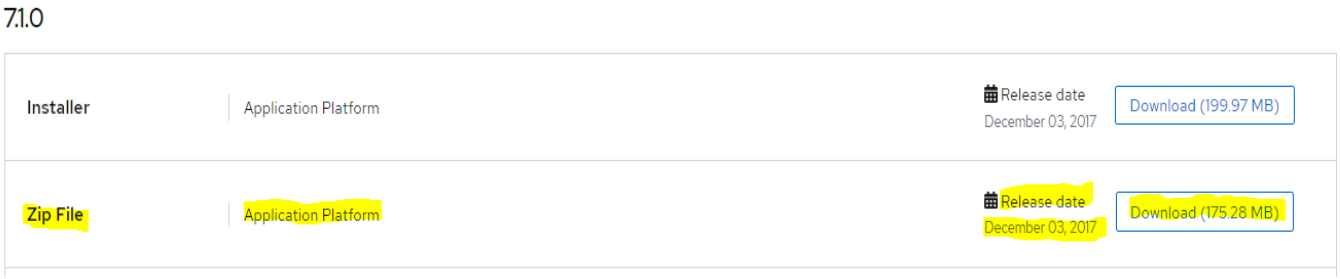
***Note: JBoss EAP 7.1 requires the use of Java 8 JDK. See Java Environment Setup for a Server section above for additional details.***

The JBoss EAP 7.1 Application Server can be downloaded from the Red Hat Developer download site: https://developers.redhat.com/products/eap/download/

If deploying JBoss EAP into a production environment, you can obtain a Red Hat subscription which will give you access to customer support from Red Hat for your JBoss EAP production environment.




For Windows and Linux, select the **`7.1.0` December 03, 2017 Application Platform ZIP file** to download.




To install JBoss EAP 7.1.0 just extract the compressed archive. **Unzip the JBoss EAP 7.1.0 archive into a folder with a pathname that does NOT contain any spaces.** For example, extracting to the `C:\Tools` folder will place the JBoss EAP 7.1.0 files in the `C:\Tools\jboss-eap-7.1` folder. We will identify this folder in the rest of the document as <JBossEAP_HOME>. It is not necessary to create <JBossEAP_HOME> as an environment variable.

To verify the JBoss EAP 7.1 install, go to the `<JBossEAP_HOME>\bin` folder and run `standalone.bat` (or `standalone.sh` for Linux).

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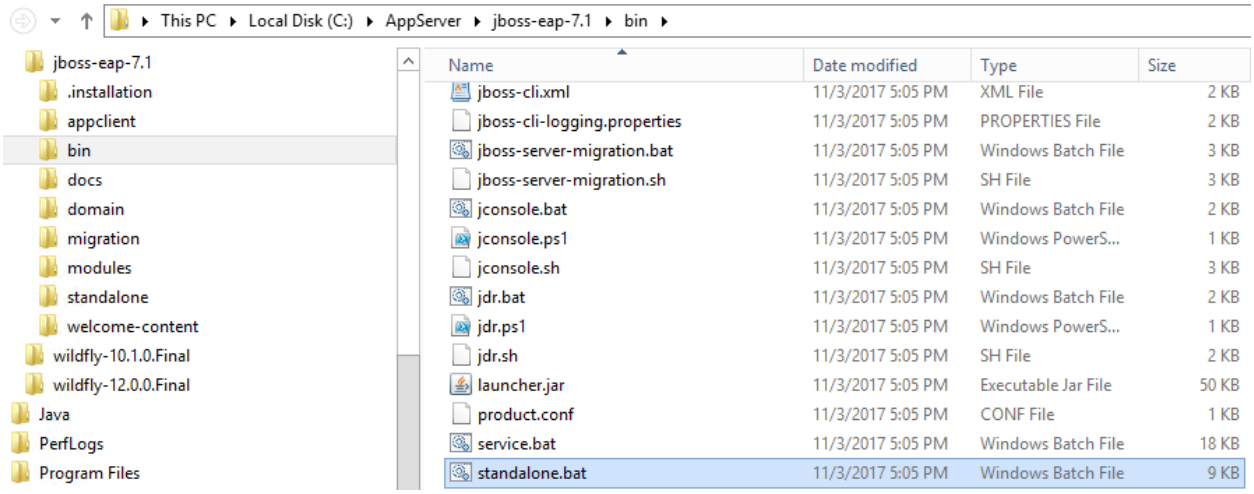
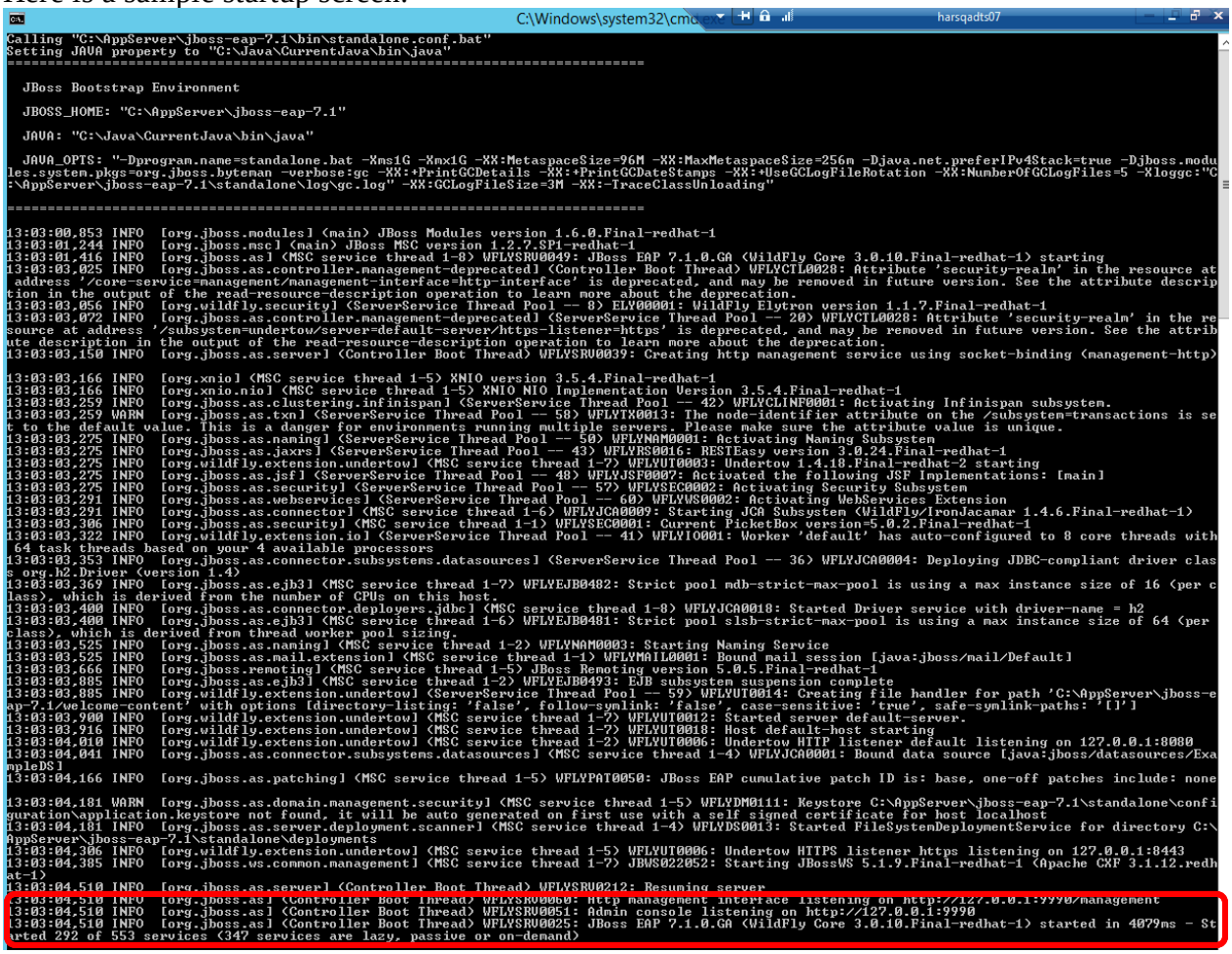



Upon successful start, the message in the last line will indicate success.
Here is a sample startup screen:




To verify that the server is reachable, you can point your browser to the default welcome page for JBoss EAP at the address: http://localhost:8080 . The page should appear as below:

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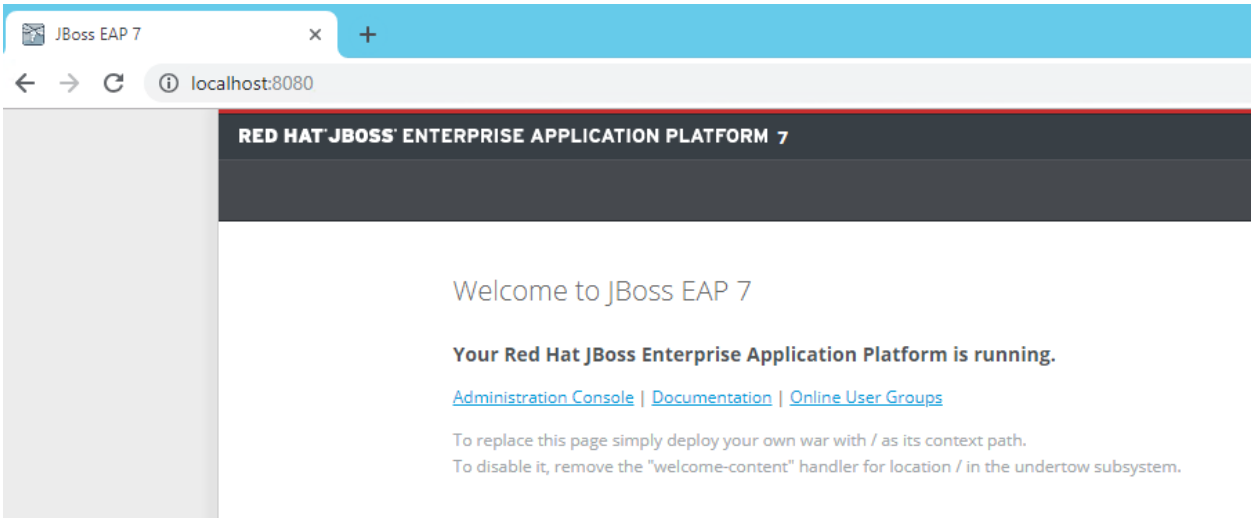


After you have verified the server is reachable select the JBoss EAP command window and then press `Ctrl+C`. You will be prompted to terminate the batch job, type **y** and hit **enter** to stop JBoss EAP.

## G.1 Memory Configuration

The Apelon DTS Server performs better when additional memory is assigned to JBoss EAP. To increase the memory utilized, open `<JBossEAP_HOME>\bin\standalone.conf.bat` (or `standalone.conf` for Linux ) and modify the JVM memory allocation pool parameters as shown below:

***NOTE:*** *We recommend a memory limit of at least 4GB. If your DTS environment will be running Modular Classification, you will require a larger allocation to your JVM. On systems utilizing Modular Classification with 16 GB of RAM or more a setting of at least 8GB (4 GB min) is recommended.*

For Windows:

```
rem # JVM memory allocation pool parameters - modify as appropriate.
set "JAVA_OPTS=-Xms1G -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G"
```

For Linux:

```
# Specify options to pass to the Java VM.
#
if [ "x$JAVA_OPTS" = "x" ]; then
   JAVA_OPTS="-Xms1303m -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G
```

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## G.2 JBoss EAP Management User

You must create a JBoss EAP Management user (e.g., **apelonadmin/apelon**) – This user administers the JBoss EAP server. Go to **<JBossEAP_HOME>\bin** and click on **add-user.bat** (or **add-user.sh** for Linux). Follow the steps below.

- Select Management User. **(a):** hit **enter** to accept default

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): a_
```

- Realm (**ManagementRealm)** will be used by default.
- Enter the desired Username. i.e., **apelonadmin**

```
Username : apelonadmin
```

- Enter the desired Password. The password cannot be same as the username. i.e., **apelon**
- *Note: JBoss EAP will prompt you if your password doesn't meet the recommended criteria. You may type "**yes**" and press "**enter**" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. i.e., **apelon**

```
Password :
Re-enter Password :
```

- JBoss EAP will prompt you to add the user to any groups. For the Application Server administrator user, no groups are necessary, you may hit "**enter**" to proceed.
- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'apelonadmin' for realm 'ManagementRealm'
Is this correct yes/no? yes_
```

- JBoss EAP supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "**no**" and press "**enter**".

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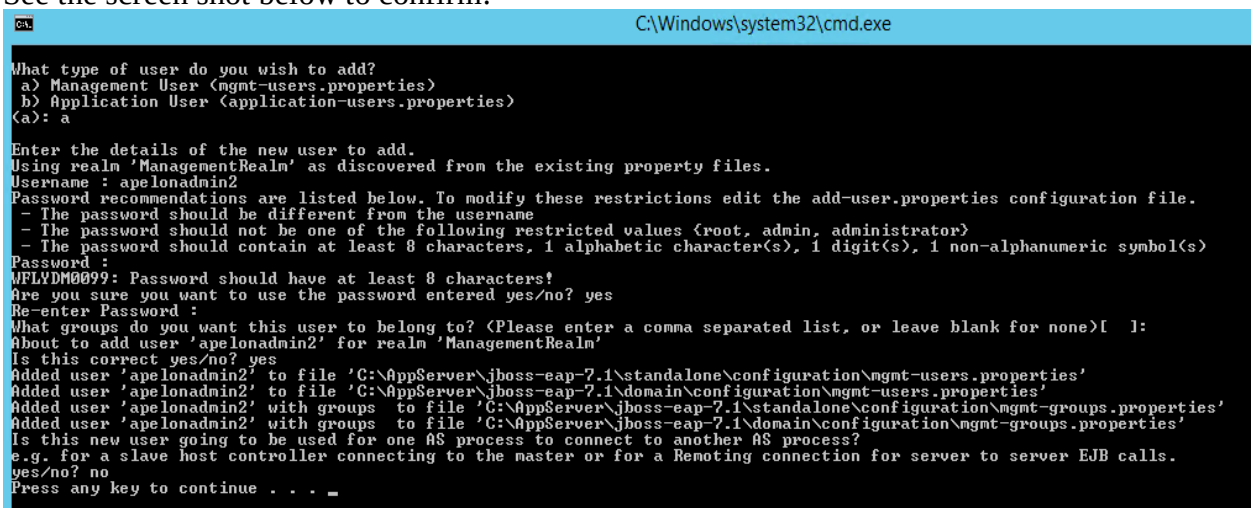
See the screen shot below to confirm:




## G.3 JBoss EAP Configuration for Apelon DTS Server

If you are currently Running DTS and are setting up JBoss EAP 7.1 to replace your existing JBoss 7.1.1, WildFly 10, or WildFly 12 environment, you can migrate your existing DTS users by performing the following steps:

1. Ensure the new JBoss EAP Application Server is stopped.
2. Locate the **application-roles.properties**, **application-users.properties**, and **mgmt.-users.properties** files in your existing Application Server installation directory. There are 2 instances of each of these files, one in **<AppServer Home>\domain\configuration** and the other in **<AppServer Home>\standalone\configuration**.
3. Copy these files, and place them (overwriting if prompted) in **<JBoss EAP Home>\domain\configuration** and **<JBoss EAP Home>\standalone\configuration** respectively.
4. Start the JBoss EAP Application Server

*Note: Since the DTS User Manager is contained within the DTS Database, no modifications will be necessary, provided the Application Server users migrate successfully*

### G.3.1 JBoss EAP DTS Admin User Configuration

JBoss EAP Application Users must be created for every individual who will connect to *the **Apelon DTS Server via the DTS Browser or DTS Editor*** and will require access to the ***DTS Editor User Manager*** to setup ***DTS User Roles and Permissions***. These JBoss EAP users must have the group "**apelondtsadmin**".

Go to `<JBossEAP_HOME>\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

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- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g., **dtsadminuser**

```
Username : dtsadminuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dtsadmin**
- *Note: JBoss EAP will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g, **dtsadmin**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- JBoss EAP will prompt you to add the user to any groups. For the DTS administrator user, you will need to add to the "apelondtsadmin" and optionally "apelondts" groups, separated by a comma.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondtsadmin,apelondts
```

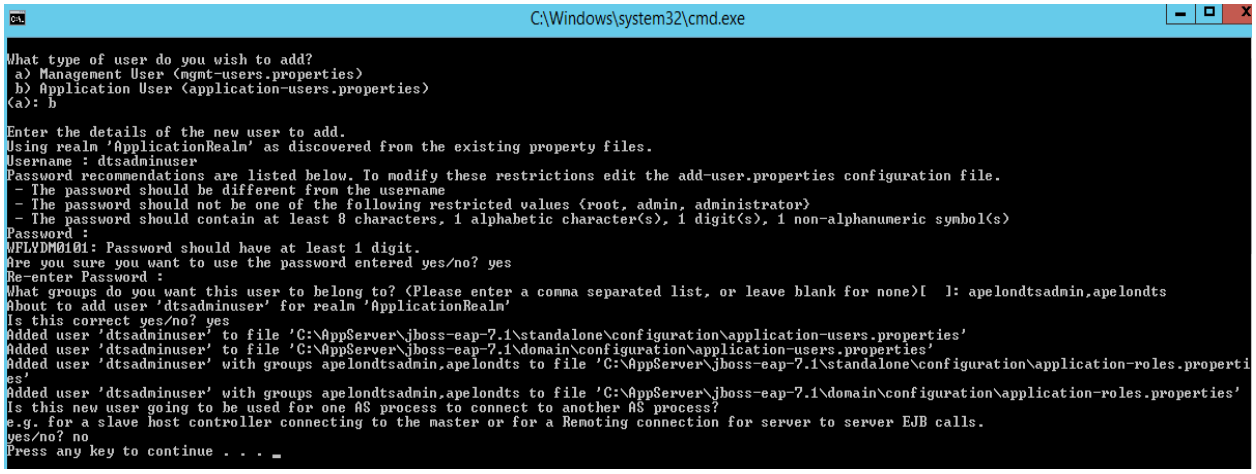
- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

- JBoss EAP supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "no" and press enter.

```
Is this new user going to be used for one AS process to connect to another AS process?
e.g. for a slave host controller connecting to the master or for a Remoting connection for server to
 server EJB calls.
yes/no? no
```

See the screen shot below to confirm:

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### G.3.2 JBoss EAP DTS User Configuration

JBoss EAP Application Users must be created for every individual who will connect to the ***Apelon DTS Server via either the DTS Browser or DTS Editor*** and ***will not require access to the DTS Editor User Manager***. These JBoss EAP users must have the group **"apelondts".**
Go to `<JBossEAP_HOME>\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g, **dtsuser**

```
Username : dtsuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dts**
- *Note: JBoss EAP will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g., **dts**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- JBoss EAP will prompt you to add the user to any groups. For the standard DTS users, you will need to add to the "apelondts" group.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondts
```

- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

- JBoss EAP supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "no" and press enter.

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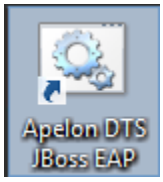
## G.4 Apelon DTS Server Deployment

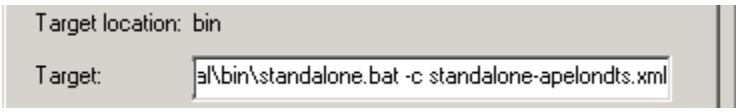
7. Copy the **standalone-apelondts.xml** file from
   `<DTS_HOME>\server\jboss-eap\standalone\configuration`
   to the **<JBossEAP_HOME>\standalone\configuration** folder.

8. Create a shortcut for **<JBossEAP_HOME>\bin\standalone.bat.** Rename this to "Apelon DTS JBoss EAP".




9. Right-click on the shortcut and go to Properties. Modify target as follows:

```
<JBossEAP_HOME>\bin\standalone.bat -c standalone-apelondts.xml
```




11. Use this "Apelon DTS JBoss EAP" shortcut for running JBoss EAP configured for Apelon DTS.

12. For launching on Linux use the following command from terminal window:

    `<JBossEAP_HOME>/bin/standalone.sh -c standalone-apelondts.xml`

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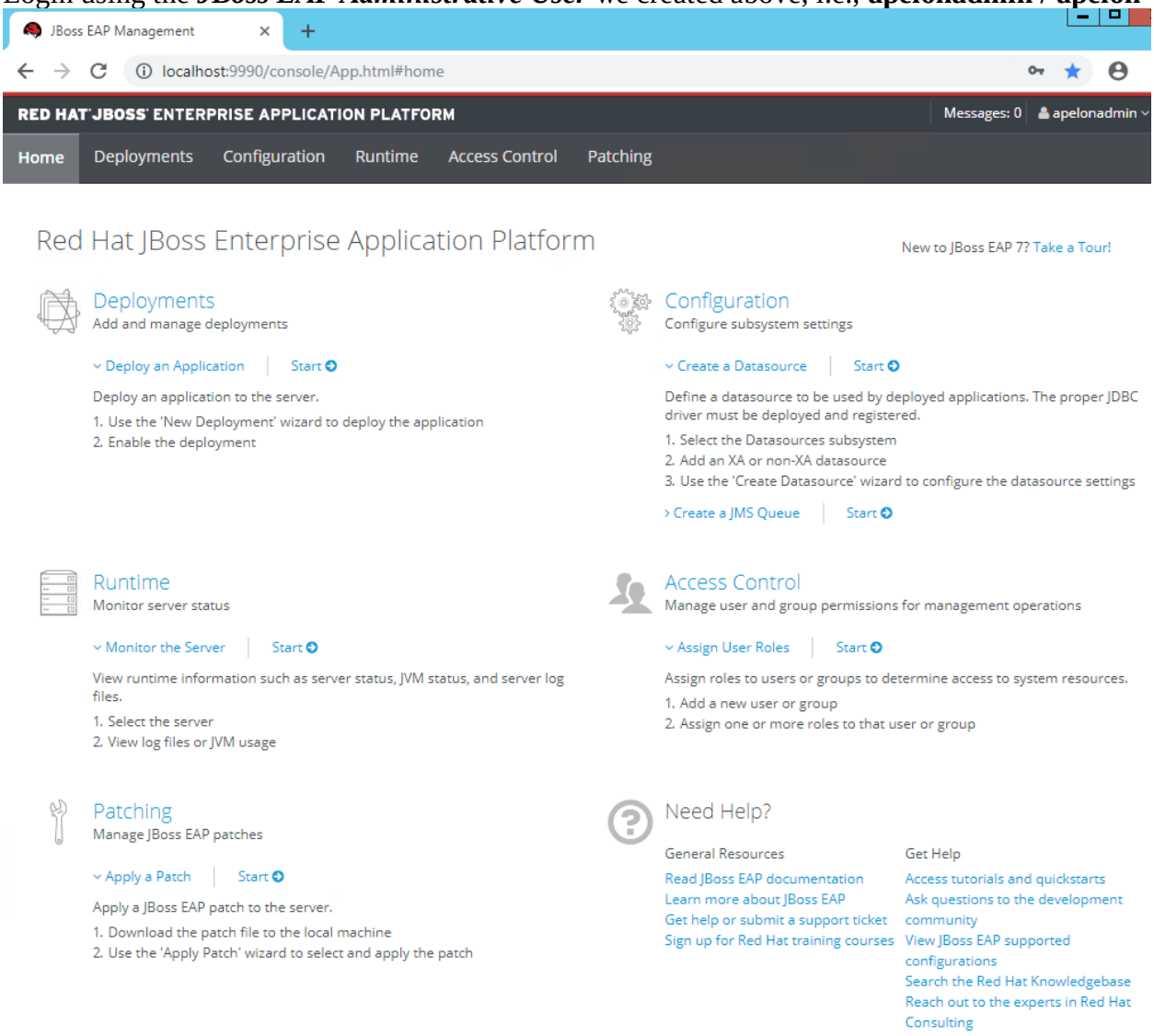
### G.4.1 Data Source Configuration

Apelon DTS Server requires a data source configured with JBoss EAP to connect to the database. The necessary steps are:

- Deploy database driver.
- Configure data source.

### G.4.2 Deploy Database Driver

Start JBoss EAP using the "Apelon DTS JBoss EAP" shortcut for Windows (or from terminal window for Linux) created in the previous step. Open a browser and go to the default JBoss EAP Management URL: `http://localhost:9990/console/App.html#home`
Login using the ***JBoss EAP Administrative User*** we created above, i.e., **apelonadmin / apelon**




If your view does not display as shown above, refresh your browser.

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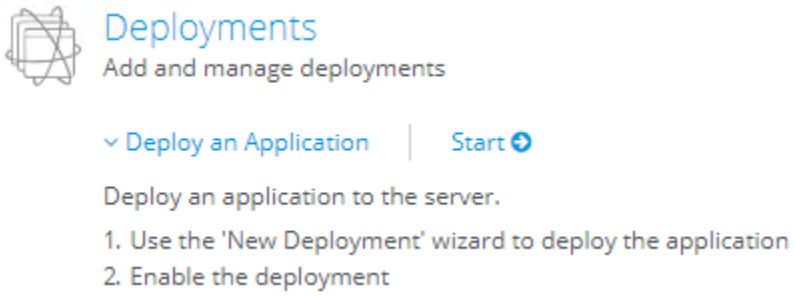
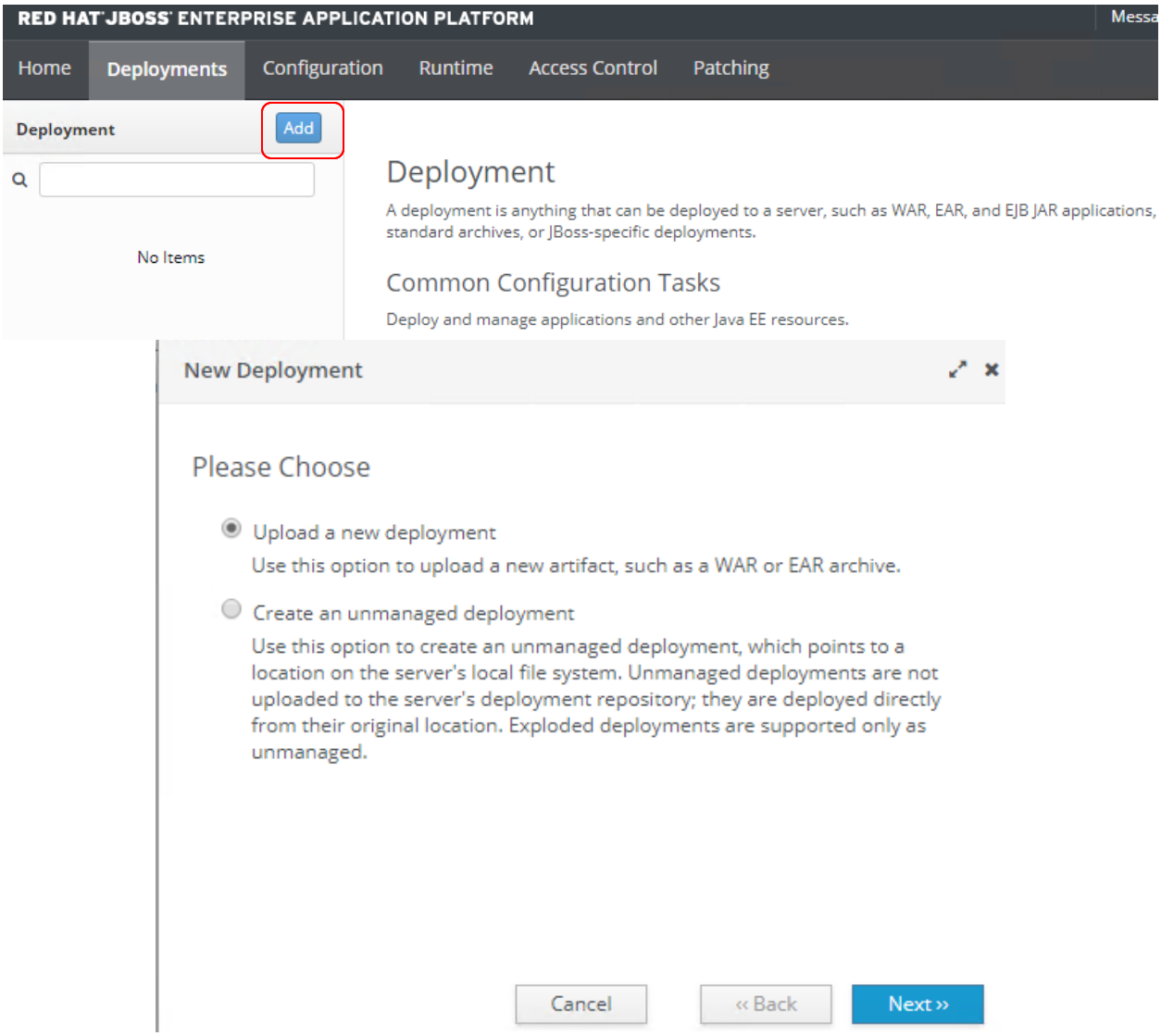
Then Under the “Deployments” header, next to “Deploy an Application” click on the Start arrow.




Then click on the **Add** button in the upper left. In the next pop up window, ensure “Upload a new deployment” is selected, and click “Next”.

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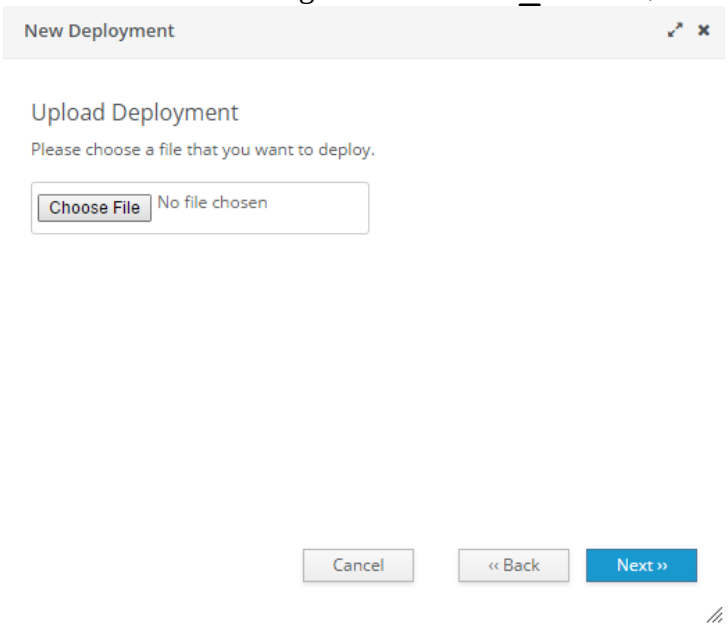
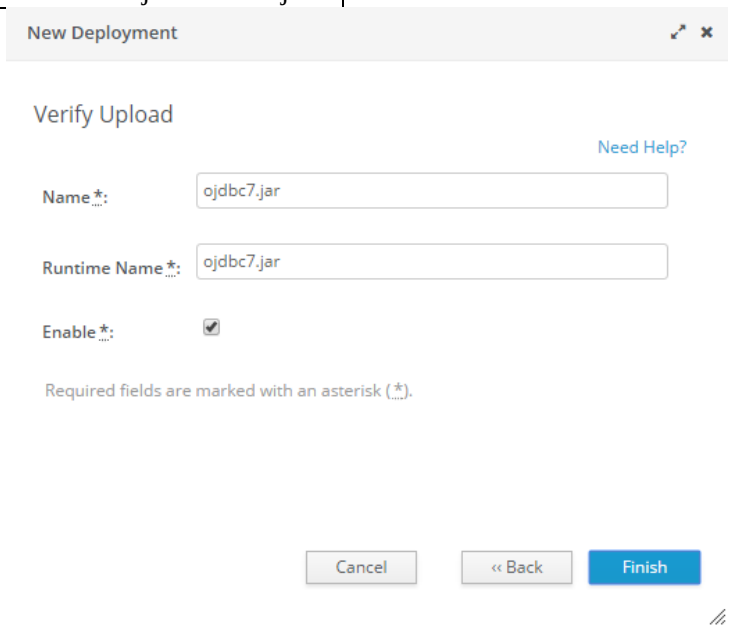
Click the **`Choose File`** button and navigate to the **`<DTS_HOME>\lib`** folder.




Select a Driver .jar file for the database as given below.

- ***Note:*** *For Oracle 12c see Oracle 12c PGA_AGGREGATE_LIMIT*

| Database | Driver |
|---|---|
| **Oracle 12c** | ojdbc7-4.1.jar |
| **MS SQL Server 2016** | mssql-jdbc-9.4.1.jre8.jar |
| **MS SQL Server 2019** | mssql-jdbc-9.4.1.jre8.jar |
| **MySQL 8** | mysql-connector-java-8.0.29.jar |
| **MySQL 5.6** | mysql-connector-java-8.0.29.jar |

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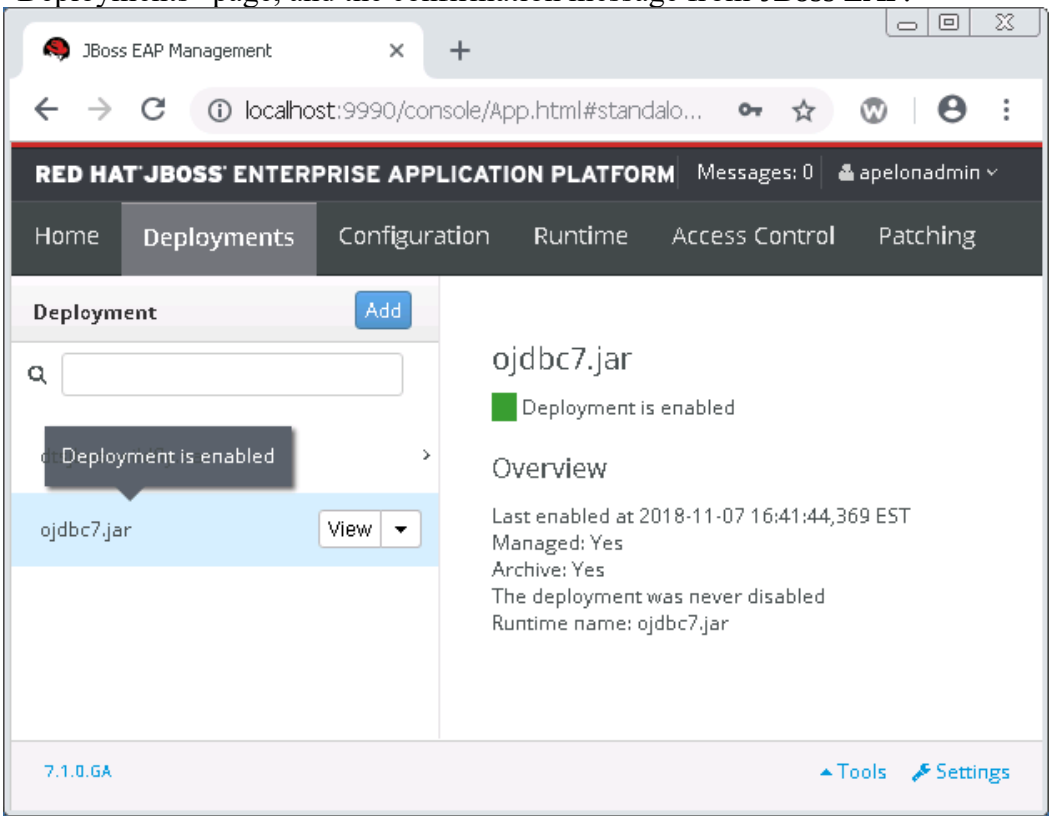
Ensure the **`Enable`** box is checked, and click “Finish”.
Verify the presence of the .jar deployment by seeing it on the list on the left of the “Deployments” page, and the confirmation message from JBoss EAP.




### G.4.3 Configure Data Source

The Apelon DTS Server requires a data source named “**ApelonDtsDS**”. This data source must be set up similar to the examples given below (*ensure the appropriate User, Password, and database name are used if they are not the default “dts4” used as an example in this documentation*).

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

To create the **`ApelonDtsDS`** data source, navigate back to “Home” in the JBoss EAP administration console, and under the “Configuration” header, select the Start arrow next to “Create a Datasource”:

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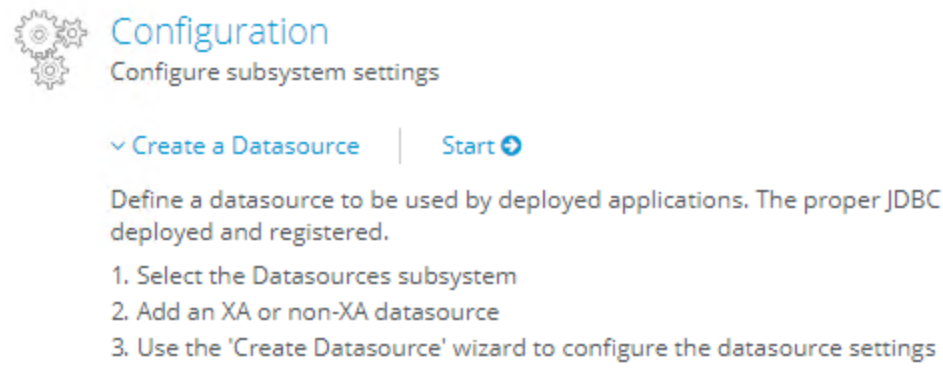
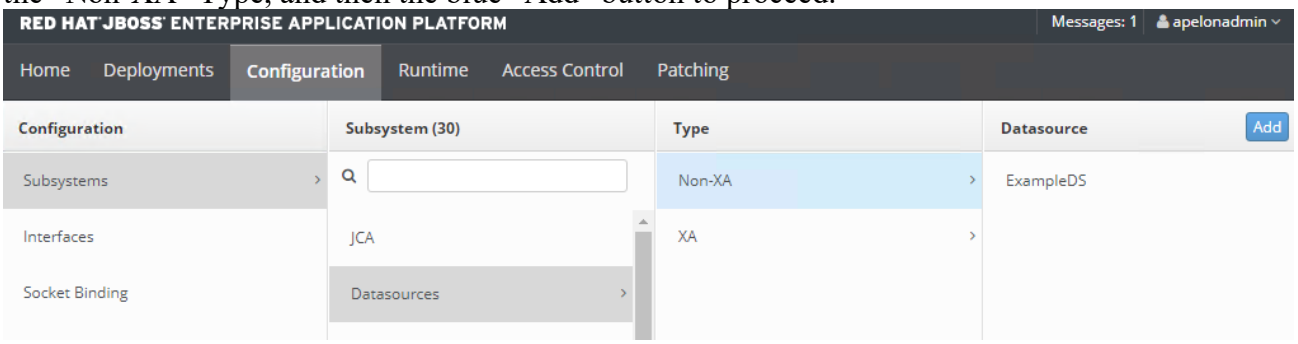
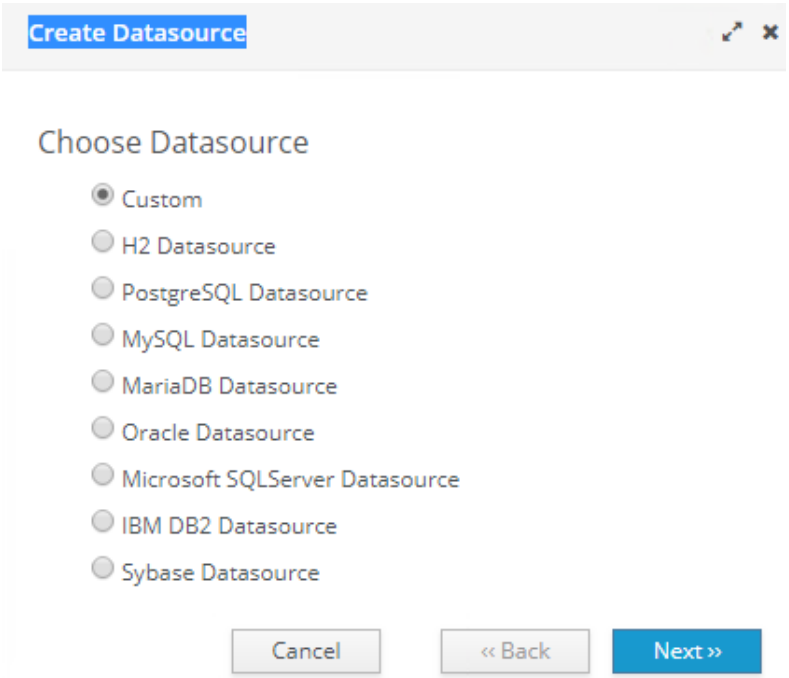



Select the "Subsystems" tab. Under the "Subsystems" column, select the "Datasources" tab. The ApelonDtsDS datasource should be created as a non-cross-application datasource. Select the "Non-XA" Type, and then the blue "Add" button to proceed.




In the next popup, select the database type for your Datasource (Oracle, MySQL, Microsoft SQLServer) and click next.




Edit the Datasource Attributes **Name** and **JNDI Name** (*Note: these values are Case-Sensitive*). The **Name** should be: "ApelonDtsDS"

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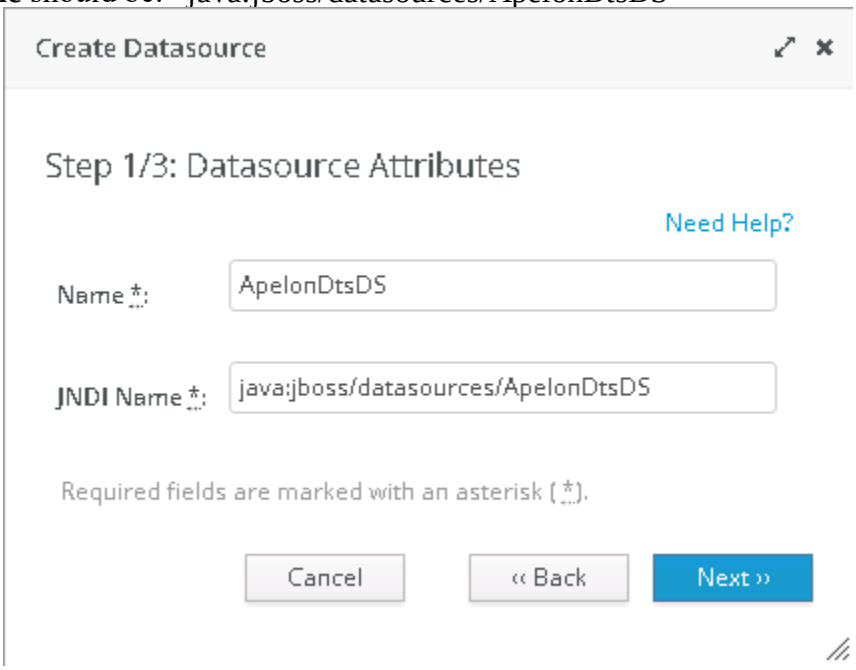
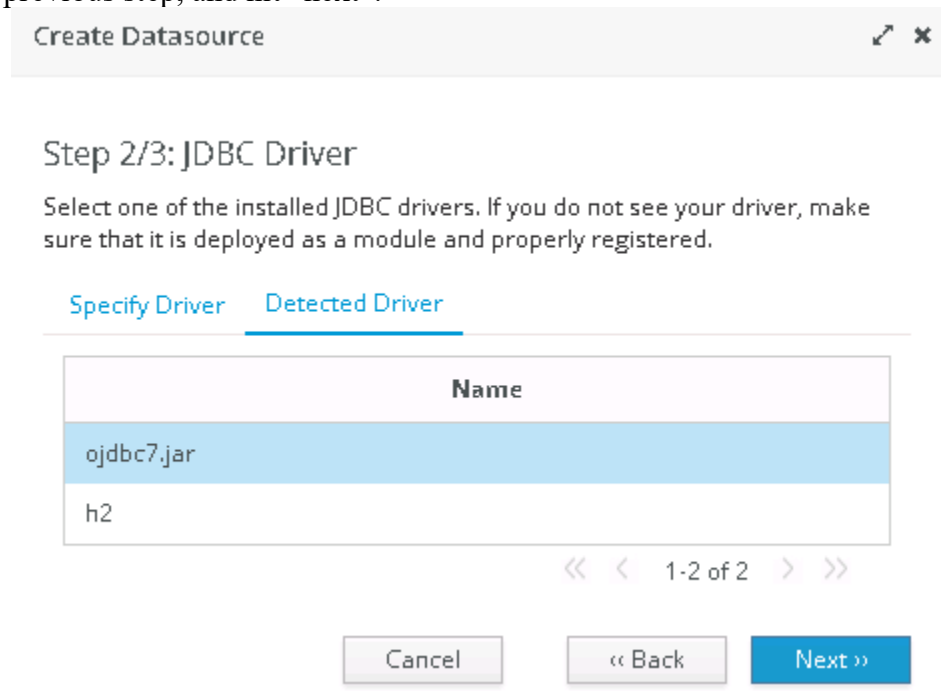
The **JNDI Name** should be: “java:jboss/datasources/ApelonDtsDS”




In the next window, select “Detected Driver” and choose the database driver you added to JBoss EAP in the previous step, and hit “next”.




On the next window, enter the appropriate Connection URL, Username, and Password for your database environment. Examples are again presented below, but you should enter the parameters which are correct for your database.

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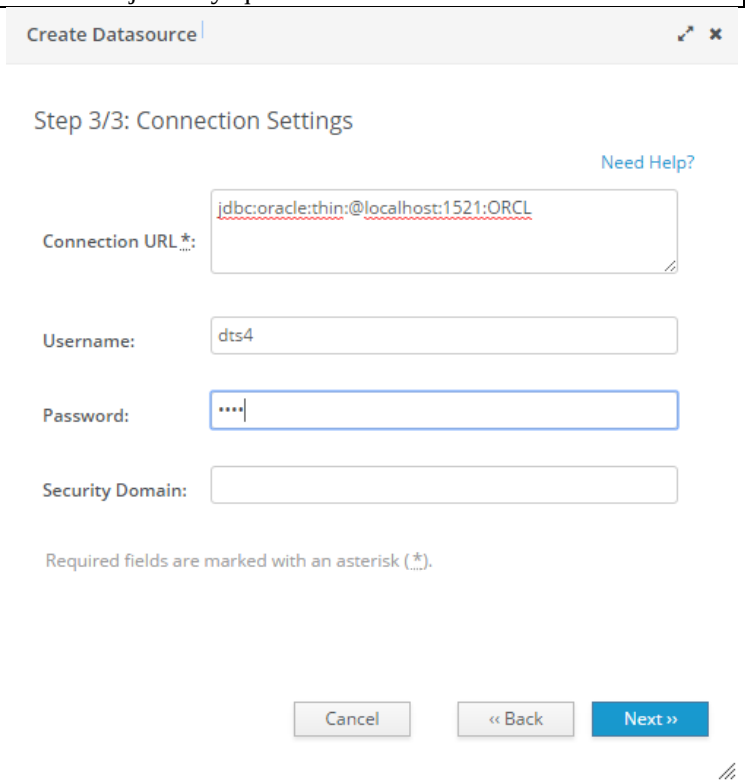
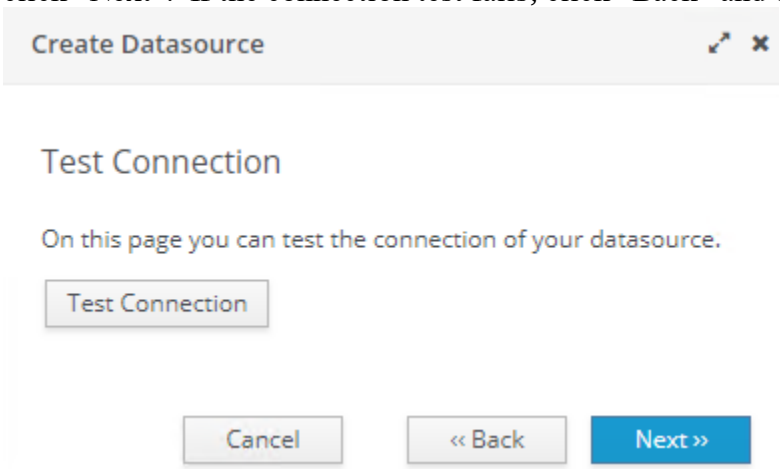
| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |




The next window will provide a Test Connection option. Click on the "Test Connection" button to ensure the above entered connection settings are valid. If the connection test is successful click "Next". If the connection test fails, click "Back" and correct the connection settings.




On the next window, JBoss EAP will provide you a summary of the Datasource settings. Click "Finish" to accept, or "back" to make any revisions.

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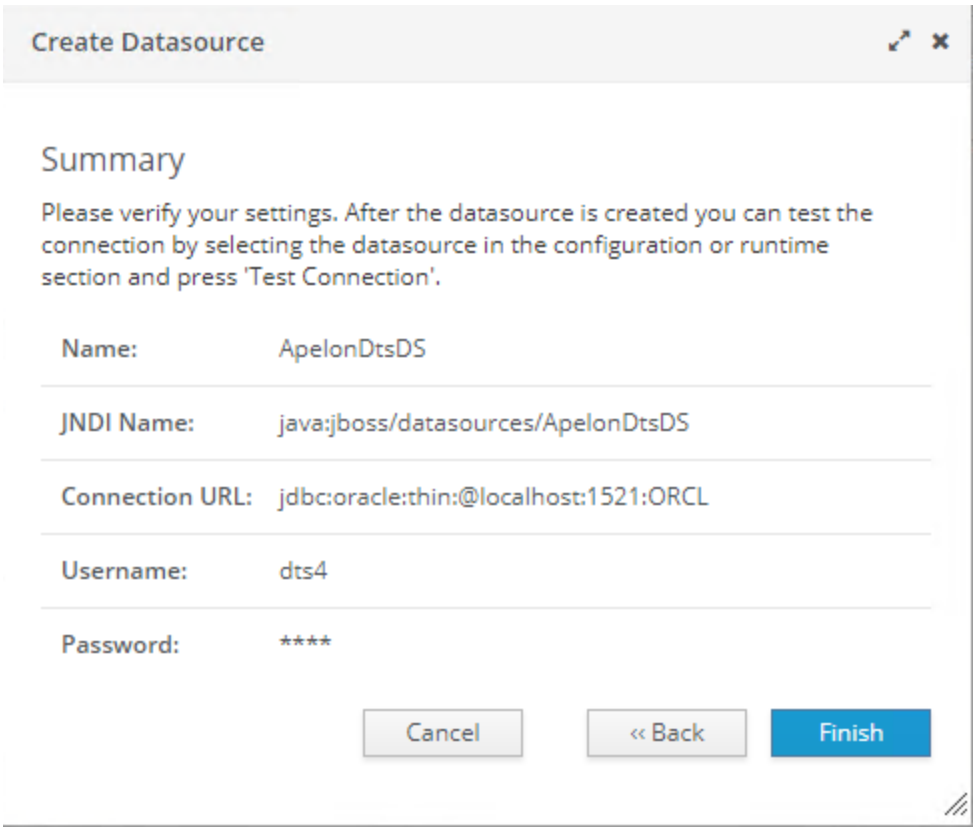
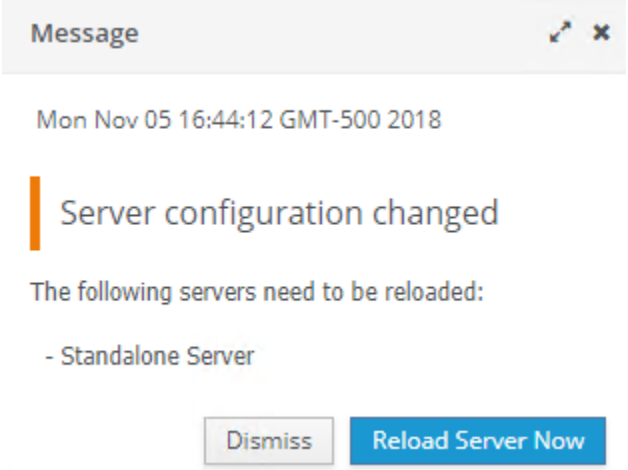



After clicking "Finish" a message will be displayed indicating the server configuration changed and to reload the server. Click "Reload Server Now".




You should receive a message that the Server was successfully loaded.
Now that the Datasource has been created, you may test the connection once again, from the dropdown next to it from the "Datasource" column in the "Configuration" tab.

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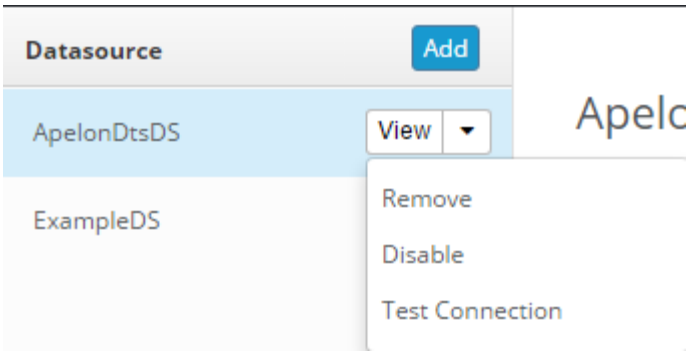
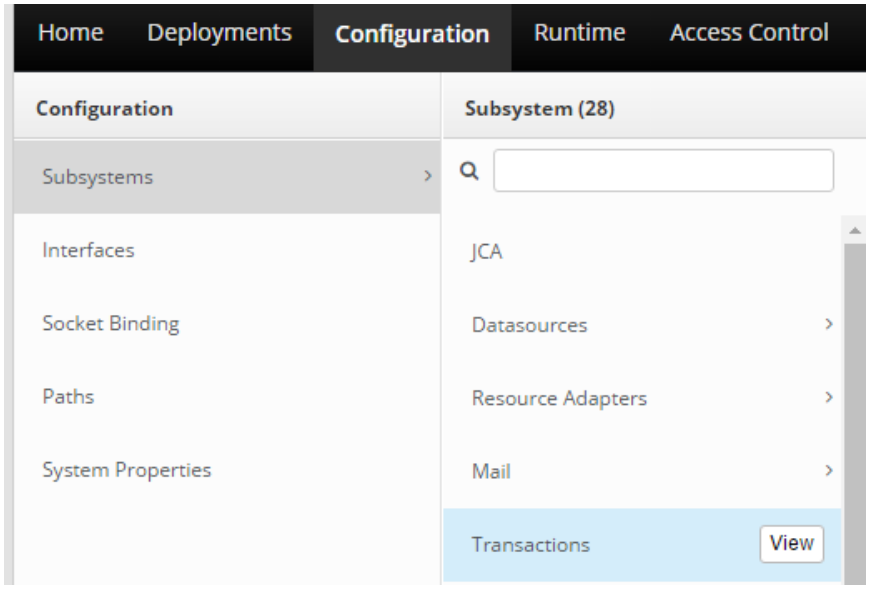



Ensure the connection test is successful before continuing.

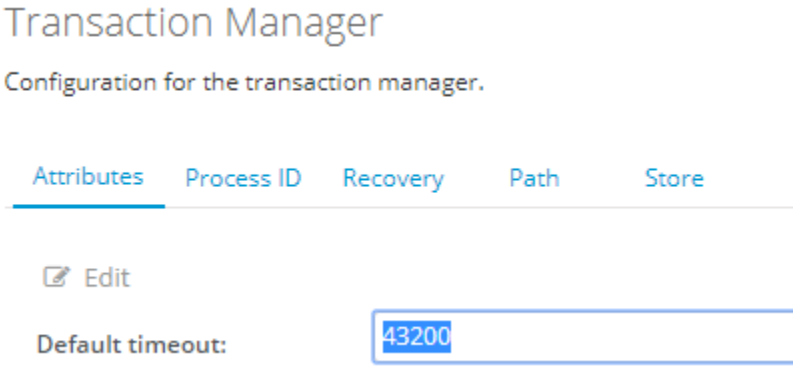
## G.5 Check JBoss EAP Transaction Timeout Default

The JBoss EAP Transaction Timeout Default is **set to 43200 seconds** to accommodate long running DTS transactions.

To edit or view the JBoss EAP Transaction Timeout Default, from the "Configuration" tab select "Subsystems">"Transactions" and click "View".




Then click "Edit" and enter the new timeout value.




Then click "Save". The JBoss EAP server must be restarted for the change to take effect.

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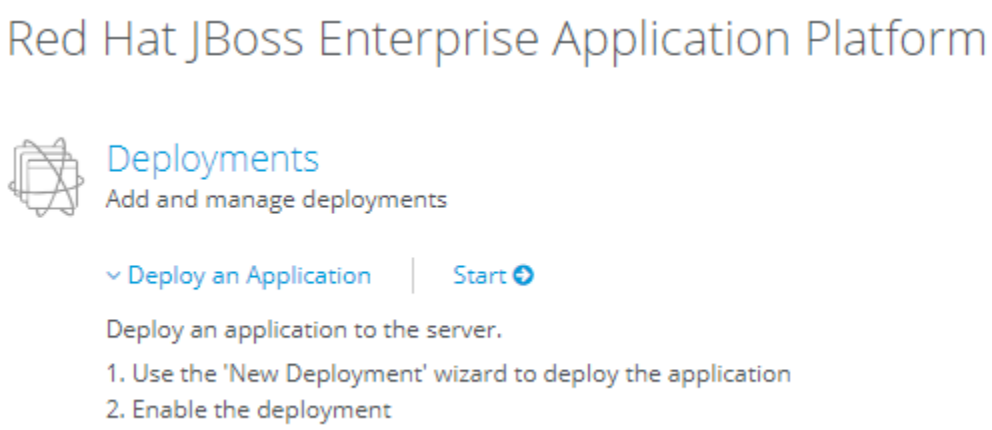
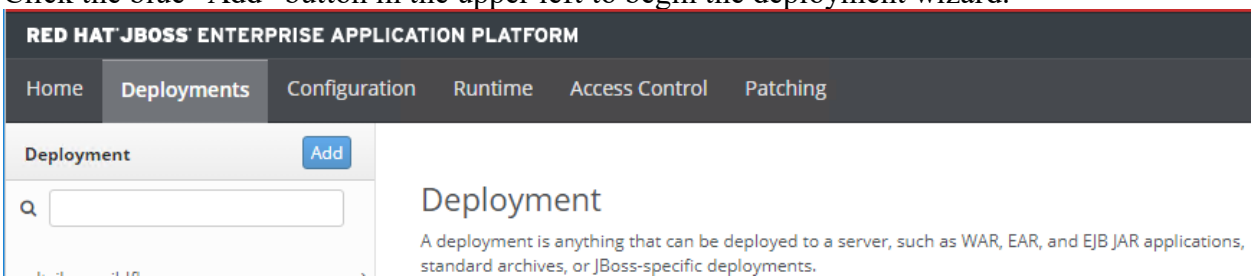
## G.6 Deploy Apelon DTS Server

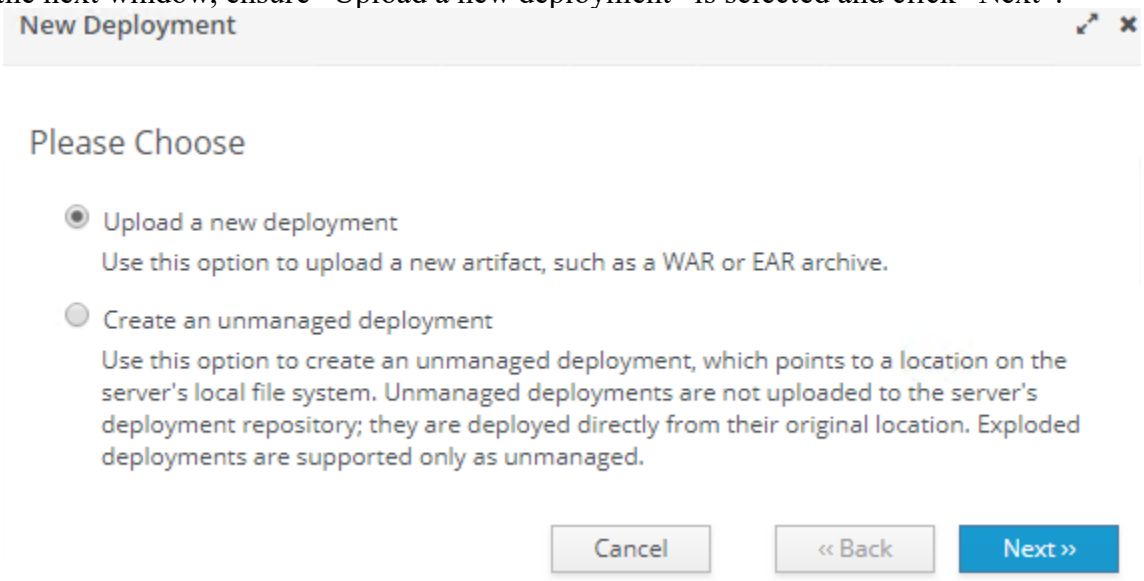
To deploy the Apelon DTS Server EAR file, click the Start arrow next to "Deploy an application" under the Deployments header from the Home tab.




Click the blue "Add" button in the upper left to begin the deployment wizard.




On the next window, ensure "Upload a new deployment" is selected and click "Next".

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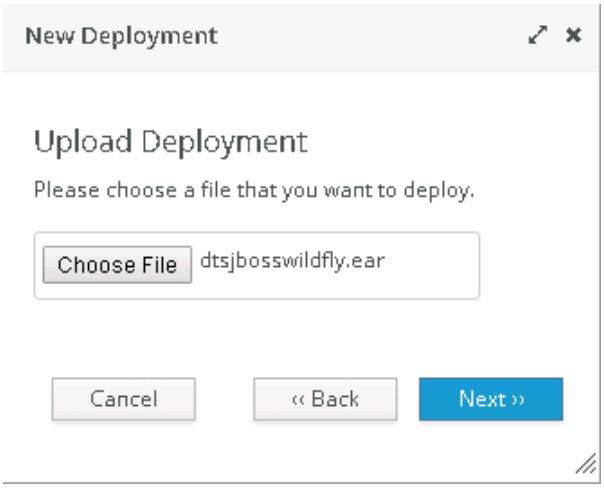
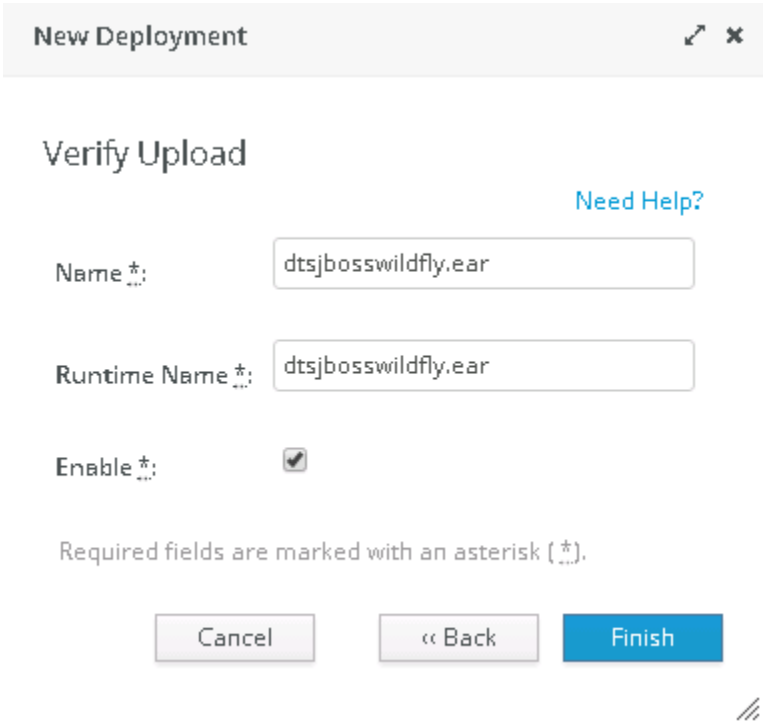
Click on “Choose File” to navigate to the `<DTS_HOME>\server\jboss-eap\standalone\deployments` directory and select **`dtsjbosswildfly.ear`** (This is not a typo, WildFly is in reality the next open source iteration of JBoss EAP, and as such the .ear file contains “wildfly” in the name).

**NOTE:** For **Microsoft SQL Server** a `dtsjbosswildflyforsqlserver.ear` file that is specific to Microsoft SQL Server must be used.

- The MS SQL Server specific ”`dtsjbosswildflyforsqlserver.ear`” file is in the following location:
  `<DTS_HOME>\server\jboss-eap\standalone\deployments\sqlserver\`




In the next window ensure the “Enable” check box is checked and then click “Finish”.

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JBoss EAP will report that the deployment is in process.
****IMPORTANT****
**In the case of upgrading an earlier DTS schema version, Do Not Restart JBoss EAP until the Deployment has completely finished and you have verified that the Database Schema is fully deployed to the correct version (See section: Upgrade Apelon DTS 4.7.0 - 4.7.2 JBoss EAP Server & schema to DTS 4.8.0). Once the correct schema version is verified, SHUT DOWN and RESTART the JBoss EAP server to ensure the changes are integrated.**

## G.7 Verify DTS Browser & Editor connections to JBoss EAP DTS Server

### G.7.1 Verify the DTS Browser

You can access the DTS Browser from: http://localhost:8080/dtsserverws.
To login to the DTS Browser, you will need to enter user credentials created in the JBoss EAP Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in the guide, the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.

### G.7.2 Verify the DTS Editor connection

Run the DTS Editor shortcut ( DTS Editor ) provided by the DTS 4 installation.
Connect to the JBoss EAP server by using an **Instance** of '**dtsjboss**' and default **Port** number '**8080**' along with the user credentials created in the JBoss EAP Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in this guide the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.
Click "Connect".

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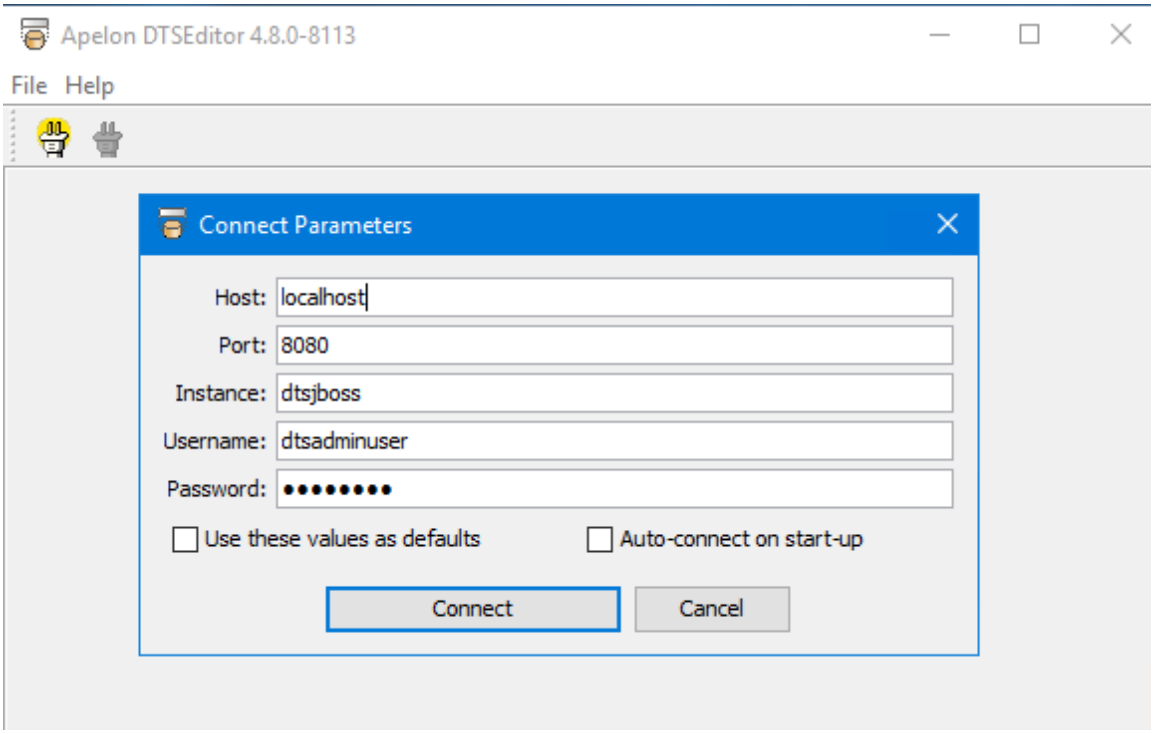


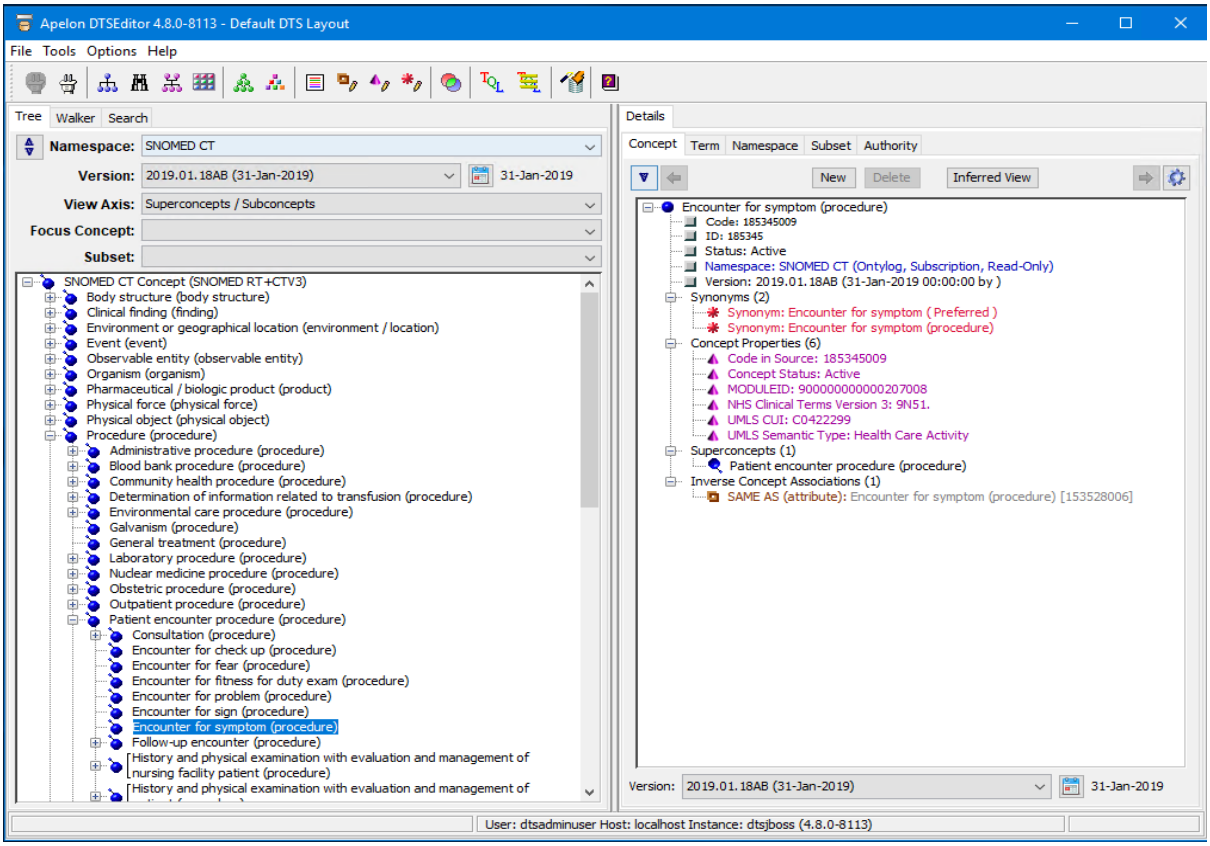


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## G.8 Setup JBoss EAP and DTS to start as a Windows Service

To have JBoss EAP and DTS start as a service you will need to download the **"commons-daemon-1.1.0-bin-windows.zip"** file from the Apelon DTS download page – http://www.apelondts.org.

Follow these steps to get your JBoss EAP server running as a windows service.

Steps:

11. Unzip **commons-daemon-1.1.0-bin-windows.zip** into your **<JBossEAP_HOME>\bin** folder, where **<JBossEAP_HOME>** represents the base JBoss EAP 7.1 folder specified in the JBoss EAP 7.1 Setup i.e., **C:\Tools\jboss-eap-7.1** folder.
12. Open the **service.bat** file located in the **<JBossEAP_HOME>/bin folder**.
13. In the service.bat file, locate the "**CONFIG**" variable and set its value equal to the DTS server configuration file name "**standalone-apelondts.xml":**
    **set CONFIG= standalone-apelondts.xml**
14. Also, update the windows service variable values.
    e.g.:
    **set SHORTNAME= DTS4JBossEAP7**
    **set DISPLAYNAME= DTS4_JBossEAP7**
    **set DESCRIPTION= DTS4 JBoss Enterprise Application Platform 7**
    *Note1: If present, please be sure to remove the quotations surrounding the Description value.*
    *Note2: If the JBoss Management Port Number specified in the **standalone-apelondts.xml** provided by DTS4 is changed (i.e. from* `jboss.management.http.port:9990` to `jboss.management.http.port:XXXX`*), then the Controller Port Number specified in the **services.bat** found in the following line must be changed to match the JBoss Management Port Number:*

    ```
    CONTROLLER=localhost:9990
    ```

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```
rem defaults
set SHORTNAME=DTS4JBossEAP7
set DISPLAYNAME=DTS4_JBossEAP7
rem NO quotes around the description here !
set DESCRIPTION=DTS4 JBoss Enterprise Application Platform 7
set CONTROLLER=localhost:9990
set DC_HOST=master
set IS_DOMAIN=false
set LOGLEVEL=INFO
set LOGPATH=
set JBOSSUSER=
set JBOSSPASS=
set SERVICE_USER=
set SERVICE_PASS=
set STARTUP_MODE=manual
set ISDEBUG=
set CONFIG=standalone-apelondts.xml
```

15. Open a command prompt (as administrator) and change directory to the **<JBossEAP_HOME>\bin** directory
16. To install the JBoss Service enter and execute the following command: >**service install**

17. After the JBoss EAP service is installed, close the *Command Prompt* window**.**
18. Search for **Services** and select the Services app. Find the **"DTS4_JBossEAP7"** service. Right click and select **Properties**.

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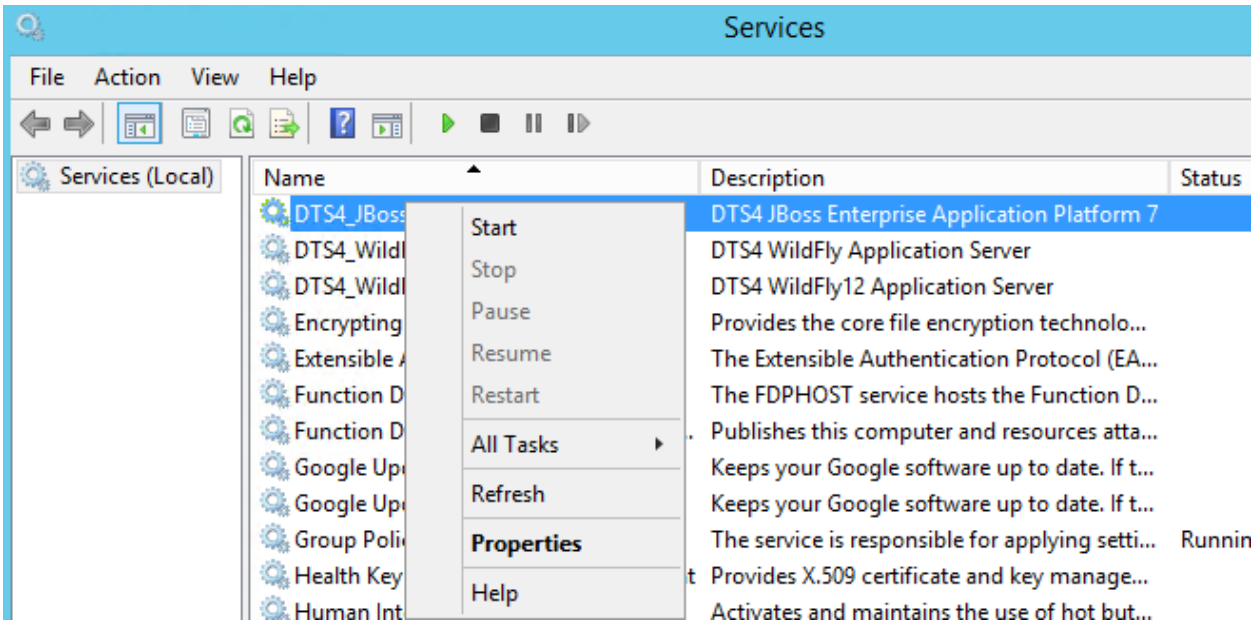


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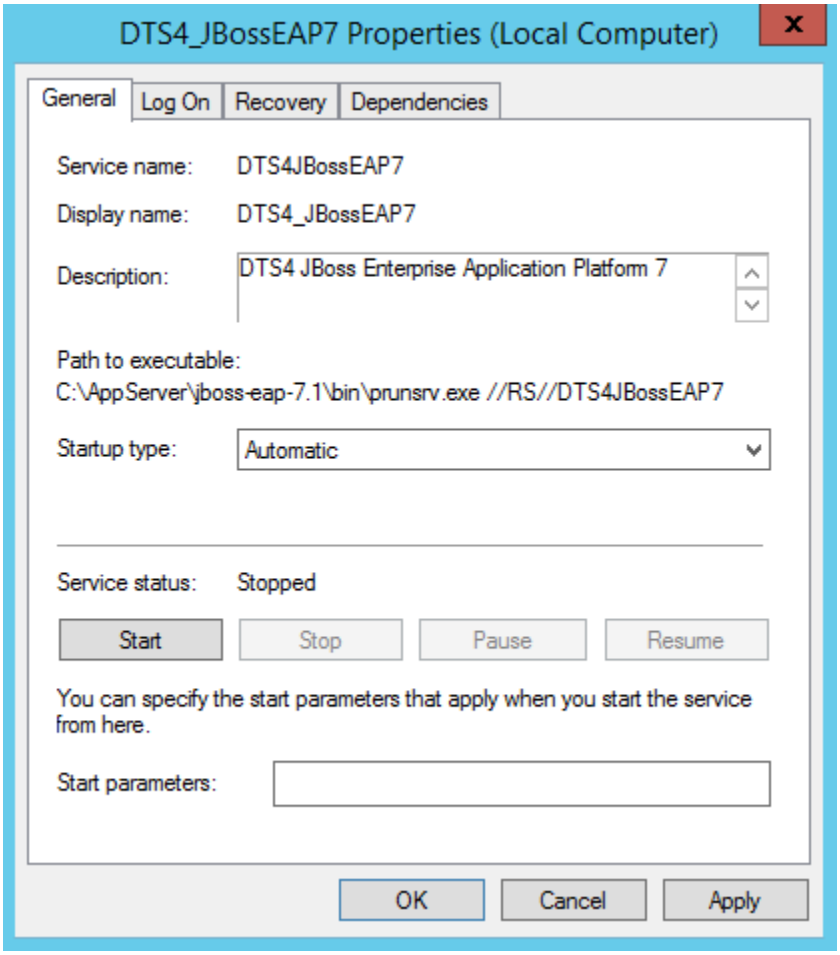
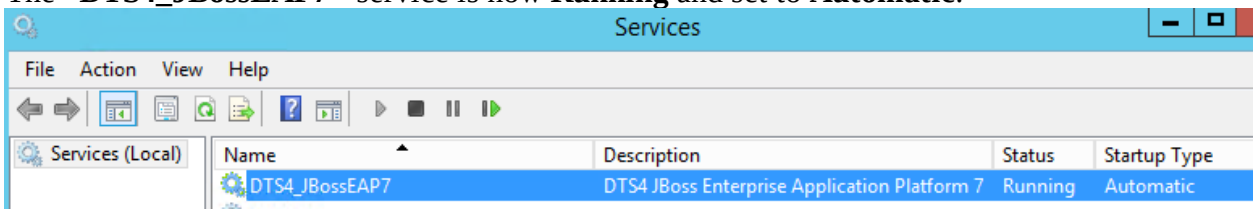
19. Perform the following:
    a. Set the *Startup type* to **Automatic or Automatic (Delayed Start)**
    b. **Start** the Service.
    c. Click **Apply**
    d. Click **OK**




20. The **"DTS4_JBossEAP7"** service is now **Running** and set to **Automatic**.

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## G.9 Setup JBoss EAP and DTS to start as a Linux Service

To install DTS as a daemon service on Linux, you will need to copy and configure the service launching scripts that are included with JBoss EAP.

Follow this procedure to configure the service.

10. Create a new user which will be used to launch the service. For example:
    ```
    => useradd -r -d /tmp/ jbossas
    ```

11. The `jbossas` user needs to have permission to read, write and execute to the path where JBoss EAP was installed. One option to grant this permission is to change the ownership of the JBoss EAP installation folder to the new user that was created. For example:
    ```
    => chown -R jbossas /opt/jboss-eap-7.1/
    ```

12. Optionally change the group membership of the JBoss EAP installation folder to the newly created user. For example:
    ```
    => chgrp -R jbossas /opt/jboss-eap-7.1/
    ```

    Alternatively, add the jbossas user to a shared users group, and change the group of the JBoss EAP installation folder to this shared group.

13. Copy the "**<JBoss EAP Installation>/bin/init.d/jboss-eap.conf**" file to the folder "**/etc/default**". For example:
    ```
    => cp /opt/jboss-eap-7.1/bin/init.d/jboss-eap.conf
    /etc/default/
    ```

14. Add or update the following lines in the newly created "**/etc/default/jboss-eap.conf**" file, customizing as necessary for your installation.

```
# The username that should own the process
JBOSS_USER=jbossas

## The amount of time to wait for startup
STARTUP_WAIT=90

# The installation path of JBoss
JBOSS_HOME=/opt/jboss-eap-7.1

# The name of the server config file to use for your Database.
JBOSS_CONFIG=standalone-apelondts.xml
```

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15. Copy the "**<JBoss EAP Installation>/bin/init.d/jboss-eap-rhel.sh**" file to the folder "**/etc/init.d**" and rename it to "**jbossas**"
```
=> cp /opt/jboss-eap-7.1/bin/init.d/jboss-eap-rhel.sh
/etc/init.d/jbossas
```

16. Modify the file "**<JBoss EAP Installation>/bin/standalone.conf**" to specify the Java JVM to use during when the service starts. Add a `JAVA_HOME` parameter to your file, customizing as necessary for your installation. Note – this parameter may already exist in the file – if it does – you can either modify the existing one, or comment it out. For example:

```
# Specify the location of the Java home directory.
#If set then $JAVA will be defined to $JAVA_HOME/bin/java, else
#$JAVA will be "java".
#
#JAVA_HOME="/opt/java/jdk"
JAVA_HOME=/opt/java/jdk1.8.0_131
```

17. Create the necessary links to the **/etc/init.d/jbossas** script so it starts and stops at the appropriate runlevels.
```
=> chkconfig jbossas on
```

18. The server is now configured to automatically start and stop with the system. To manually start the server, execute:
```
=> /etc/init.d/jbossas start
```

To manually stop the server, execute:
```
=> /etc/init.d/jbossas stop
```

To check the status of the server, execute:
```
=> /etc/init.d/jbossas status
```

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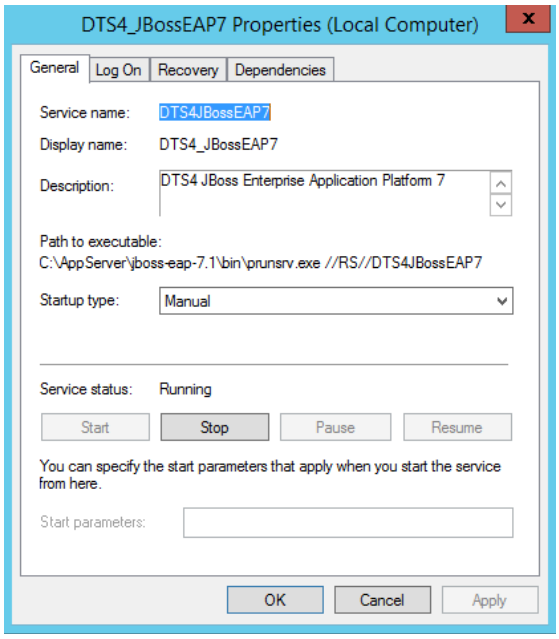
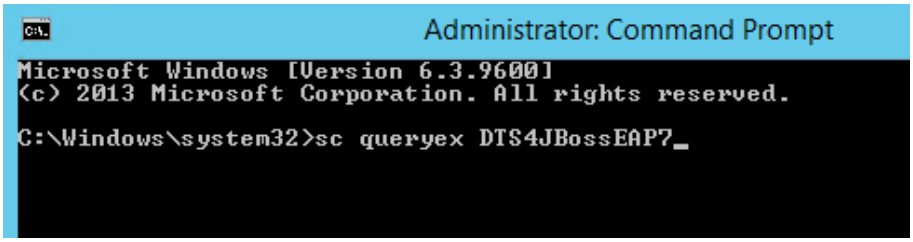
## G.10 Terminating the JBoss EAP Service using taskkill

Stopping the Jboss EAP Service in the Services Window sometimes does not shut down in a timely manner, sometimes returning an error that the service is not responding. In this case, using a taskkill command to terminate the service is an effective way of circumventing this Services issue. Here are the instructions for doing so:

7. In the Services Window, right-click on the JBoss EAP Service and choose Properties.
8. In the Properties Window, identify the Service Name and copy it.




9. Open a Command Window and type the following: `sc queryex [Service Name]`




10. This should produce information about the JBoss EAP Service, including the PID.
11. Type the following in the Command Window: `taskkill /pid [PID] /f`

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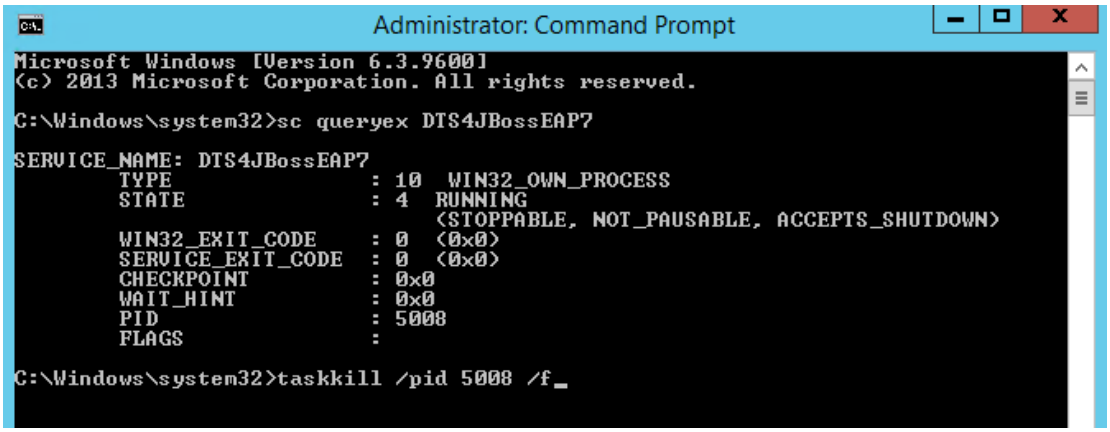
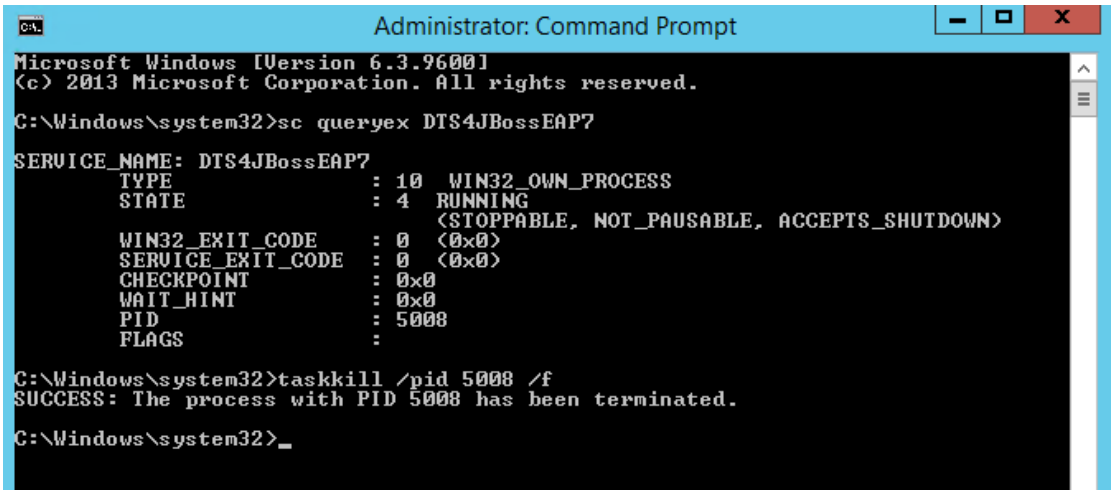



12. The Service should be terminated, as confirmed by the following message:

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## G.11 Upgrade Apelon DTS 4.7.0 - 4.7.2 JBoss EAP Server & schema to DTS 4.8.0

Perform the following steps to upgrade your Apelon DTS 4.7 JBoss schema to Apelon DTS 4.8.0 JBoss EAP **(Note: DTS 4.7.1 – 4.7.2 has the same schema version as DTS 4.8.0)**:

- Follow instructions in Section B for installing DTS 4.8.0 on the server to be upgraded.
- Stop the Apelon DTS JBoss EAP service.
- Copy the JBoss EAP configuration file from the DTS 4.8.0 home directory `<DTS_HOME>\server\jboss-eap\standalone\configuration` to the `<JBOSSEAP_HOME>\standalone\configuration` folder. Replace the existing file with this new JBoss EAP configuration file.
- Restart the Apelon DTS JBoss EAP service.
- Review the Notes below before continuing to the next steps.
- Follow steps **G.4.2**(Deploy Database Driver) through **G.7**(Verify DTS Browser & Editor connections to JBoss EAP DTS Server) to finish configuring the Apelon DTS 4.8.0 JBoss EAP server.
- **NOTE1:** If upgrading from a DTS 4.7.0 schema to DTS 4.8.0, as instructed in section **G.6**(Deploy Apelon DTS Server), when deploying the "`dtsjbosswildfly.ear`" **Do NOT shut down or restart the JBoss EAP service while the schema is being upgraded**. This step could take some time, especially when upgrading DTS schemas in MySQL and SQL Server.
- **To verify the correct DTS 4.8.0 schema version, perform the following steps:**
    1. View the "server.log" file located in the **`<JBossEAP_HOME>\standalone\log`** directory. Search the JBoss EAP "server.log" file for the statement:
        - "Schema Upgrade to 4.0.29 complete" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
        - "Schema Upgrade to 4.0.30 complete" – for MySQL 5.6 or MySQL 8.
    2. A second way to determine the schema upgrade was successful is via the DTS 4.8.0 DTS Editor.
        - Connect to the Apelon DTS JBoss EAP server.
        - Once the connection is established choose: **Help>About Apelon DTSEditor…**
        - In the help window that is launched click on the "*Details>>*" label. In the "Server Configuration:" section is displayed a "schema.version" value. The schema version should read:
            - "4.0.29" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
            - "4.0.30" – for MySQL 5.6 or MySQL 8.
- **NOTE2 - SQL Server Schema Upgrade:** If upgrading from a version older than DTS 4.4, not only may the SQL Server schema upgrade to version 4.0.29 take up to or longer than an hour, it may also require about as much available drive space for its database log file as is being used by the database prior to the schema upgrade. Consult with your SQL

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Server Database Administrator regarding the available drive space and the possibility of shrinking the database log after the schema is successfully upgraded to version 4.0.29.

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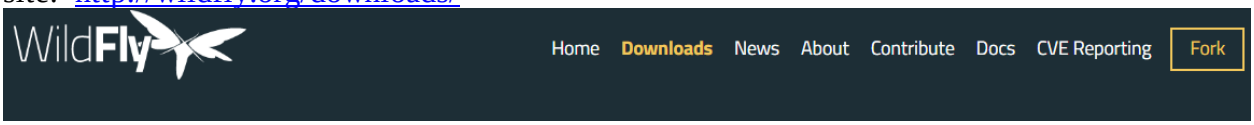
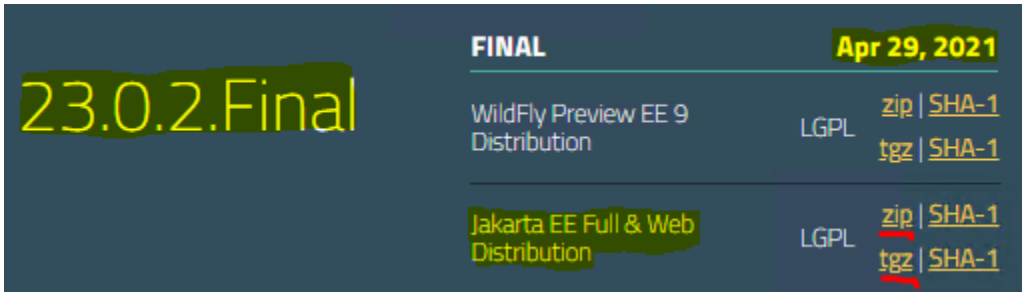
## H. WildFly 23 Setup

***Note: WildFly 23 requires the use of Java 8 JDK. See Java Environment Setup for a Server section above for additional details.***

The WildFly Application Server can be downloaded from the WildFly community download site: http://wildfly.org/downloads/

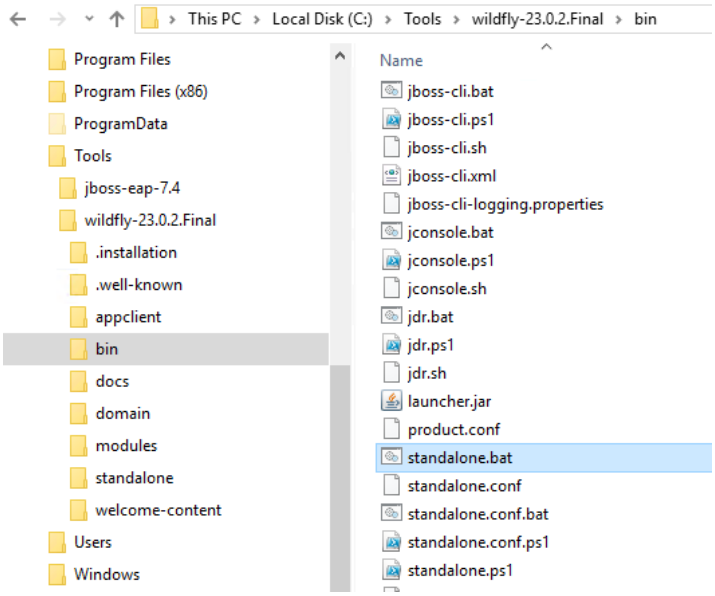



For **Windows**, select the **`23.0.2.Final` Apr 29, 2021 Jakarta EE Full & Web Distribution ZIP** file to download. For **Linux** use the **`23.0.2.Final Apr 29, 2021` Jakarta EE Full & Web Distribution TGZ** file.




WildFly 23 does not come with an installer; just extract the compressed archive. **Unzip the WildFly 23 archive into a folder with a pathname that does NOT contain any spaces.** For example, extracting to the `C:\Tools` folder will place the WildFly 23.0.2 Final files in the `C:\Tools\wildfly-23.0.2.Final` folder. We will identify this folder in the rest of the document as <WILDFLY23_HOME>. It is not necessary to create <WILDFLY23_HOME> as an environment variable.

To verify the WildFly 23 install, go to the `<WILDFLY23_HOME>\bin` folder and run `standalone.bat` (or `standalone.sh` for Linux).

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Upon successful start, the message in the last line will indicate success.
Here is a sample startup screen:

```
14:09:17,613 INFO  [org.jboss.as] (Controller Boot Thread) WFLYSRV0025: WildFly Full 23.0.2.Final (WildFly Core 15.0.1.Final) started in 9723ms
- Started 319 of 558 services (344 services are lazy, passive or on-demand)
14:09:17,628 INFO  [org.jboss.as] (Controller Boot Thread) WFLYSRV0060: Http management interface listening on http://127.0.0.1:9990/management
14:09:17,628 INFO  [org.jboss.as] (Controller Boot Thread) WFLYSRV0051: Admin console listening on http://127.0.0.1:9990
```

To verify that the server is reachable, you can point your browser to the default welcome page for WildFly at the address: http://localhost:8080 . The page should appear as below:

After you have verified the server is reachable, select the WildFly command window and then press `Ctrl+C`. You will be prompted to terminate the batch job, type **y** and hit **enter** to stop WildFly.

```
Terminate batch job (Y/N)? y
```

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## H.1 Memory Configuration

The Apelon DTS Server performs better when additional memory is assigned to WildFly. To increase the memory utilized, open <WILDFLY23_HOME>\bin\standalone.conf.bat (or `standalone.conf` for Linux ) and modify the JVM memory allocation pool parameters as shown below:

***NOTE:*** *We recommend a memory limit of at least 4GB. If your DTS environment will be running Modular Classification, you will require a larger allocation to your JVM. On systems utilizing Modular Classification with 16 GB of RAM or more a setting of at least 8GB (4 GB min) is recommended.*

For Windows:

```
rem # JVM memory allocation pool parameters - modify as
appropriate.
set "JAVA_OPTS=-Xms512M -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G"
```

For Linux:

```
# Specify options to pass to the Java VM.
#
if [ "x$JAVA_OPTS" = "x" ]; then
   JAVA_OPTS="-Xms512m -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G
```

## H.2 WildFly 23 Management User

You must create a WildFly Management user (e.g., **apelonadmin/apelon**) – This user administers the WildFly server. Go to **<WILDFLY23_HOME>\bin** and click on **add-user.bat** (or **add-user.sh** for Linux). Follow the steps below.

- Select Management User. **(a):** hit **enter** to accept default

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): a_
```

- Realm (**ManagementRealm)** will be used by default.
- Enter the desired Username. i.e., **apelonadmin**

```
Username : apelonadmin
```

- Enter the desired Password. The password cannot be same as the username. i.e., **apelon**
- *Note: WildFly will prompt you if your password doesn't meet the recommended criteria. You may type "**yes**" and press "**enter**" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. i.e., **apelon**

```
Password :
Re-enter Password :
```

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- WildFly will prompt you to add the user to any groups. For the Application Server administrator user, no groups are necessary, you may hit "**enter**" to proceed.
- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'apelonadmin' for realm 'ManagementRealm'
Is this correct yes/no? yes_
```

- WildFly supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "**no**" and press "**enter**".

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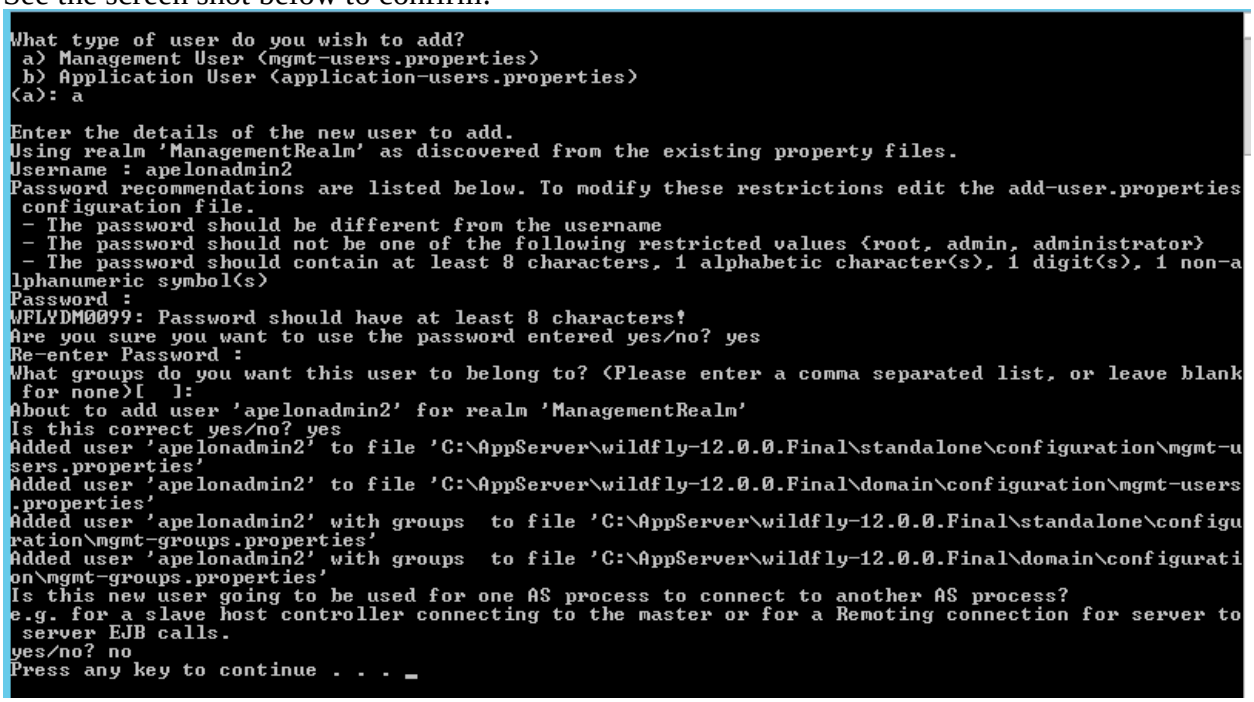
See the screen shot below to confirm:




## H.3 WildFly 23 Configuration for Apelon DTS Server

If you are currently Running DTS and are setting up WildFly23 to replace your existing WildFly 12 or JBoss EAP 7.1 environment, you can migrate your existing DTS users by performing the following steps:

1. Ensure the new WildFly23 Application Server is stopped.
2. Locate the **application-roles.properties**, **application-users.properties**, and **mgmt.-users.properties** files in your existing Application Server installation directory. There are 2 instances of each of these files, one in **<AppServer Home>\domain\configuration** and the other in **<AppServer Home>\standalone\configuration**.
3. Copy these files and place them (overwriting if prompted) in **<WildFly23_Home>\domain\configuration** and **<WildFly23_Home>\standalone\configuration** respectively.
4. Start the WildFly23 Application Server

*Note: Since the DTS User Manager is contained within the DTS Database, no modifications will be necessary, provided the Application Server users migrate successfully*

### H.3.1 WildFly 23 DTS Admin User Configuration

WildFly Application Users must be created for every individual who will connect to *the **Apelon DTS Server via the DTS Browser or DTS Editor*** and will require access to the ***DTS Editor User Manager*** to setup ***DTS User Roles and Permissions***. These WildFly users must have the group "**apelondtsadmin**".

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Go to <WILDFLY23_HOME>\bin and click on add-user.bat (or add-user.sh for Linux). Follow the steps below.

- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g., **dtsadminuser**

```
Username : dtsadminuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dtsadmin**
- *Note: WildFly will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g, **dtsadmin**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- WildFly will prompt you to add the user to any groups. For the DTS administrator user, you will need to add to the "apelondtsadmin" and optionally "apelondts" groups, separated by a comma.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondtsadmin,apelondts
```

- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

- WildFly supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "no" and press enter.

```
Is this new user going to be used for one AS process to connect to another AS process?
e.g. for a slave host controller connecting to the master or for a Remoting connection for server to
 server EJB calls.
yes/no? no
```

See the screen shot below to confirm:

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```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b

Enter the details of the new user to add.
Using realm 'ApplicationRealm' as discovered from the existing property files.
Username : dtsadmin
Password recommendations are listed below. To modify these restrictions edit the add-user.properties configuration file.
 - The password should be different from the username
 - The password should not be one of the following restricted values (root, admin, administrator)
 - The password should contain at least 8 characters, 1 alphabetic character(s), 1 digit(s), 1 non-alphanumeric symbol(s)
Password :
WFLYDM0102: Password should have at least 1 non-alphanumeric symbol.
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank for none)[  ]: apelondtsadmin,apelondts
About to add user 'dtsadmin' for realm 'ApplicationRealm'
Is this correct yes/no? yes
Added user 'dtsadmin' to file 'C:\AppServer\wildfly-12.0.0.Final\standalone\configuration\application-users.properties'
Added user 'dtsadmin' to file 'C:\AppServer\wildfly-12.0.0.Final\domain\configuration\application-users.properties'
Added user 'dtsadmin' with groups apelondtsadmin,apelondts to file 'C:\AppServer\wildfly-12.0.0.Final\standalone\configuration\application-roles.prope
rties'
Added user 'dtsadmin' with groups apelondtsadmin,apelondts to file 'C:\AppServer\wildfly-12.0.0.Final\domain\configuration\application-roles.propertie
s'
Is this new user going to be used for one AS process to connect to another AS process?
e.g. for a slave host controller connecting to the master or for a Remoting connection for server to server EJB calls.
yes/no? no
Press any key to continue . . .
```

### H.3.2 WildFly 23 DTS User Configuration

WildFly Application Users must be created for every individual who will connect to the ***Apelon DTS Server via either the DTS Browser or DTS Editor*** and ***will not require access to the DTS Editor User Manager***. These WildFly users must have the group **"apelondts".**
Go to <WILDFLY23_HOME>`\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g, **dtsuser**

```
Username : dtsuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dts**
- *Note: WildFly will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g., **dts**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- WildFly will prompt you to add the user to any groups. For the standard DTS users, you will need to add to the "apelondts" group.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondts
```

- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

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- WildFly supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type “no” and press enter.

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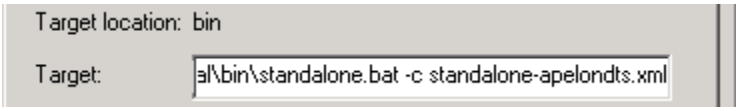
## H.4 Apelon DTS Server Deployment

13. Copy the **standalone-apelondts.xml** file from
    `<DTS_HOME>\server\wildfly\standalone\configuration`
    to the <WILDFLY23_HOME>**`\standalone\configuration`** folder.

14. Create a shortcut for **<WILDFLY23_HOME>`\bin\standalone.bat`.** Rename this to "Apelon DTS WildFly".

15. Right-click on the shortcut and go to Properties. Modify target as follows:

```
<WILDFLY23_HOME>\bin\standalone.bat -c standalone-apelondts.xml
```




17. Use this "Apelon DTS WildFly" shortcut for running WildFly configured for Apelon DTS.

18. For launching on Linux use the following command from terminal window:

    `<WILDFLY23_HOME>/bin/standalone.sh –c standalone-apelondts.xml`

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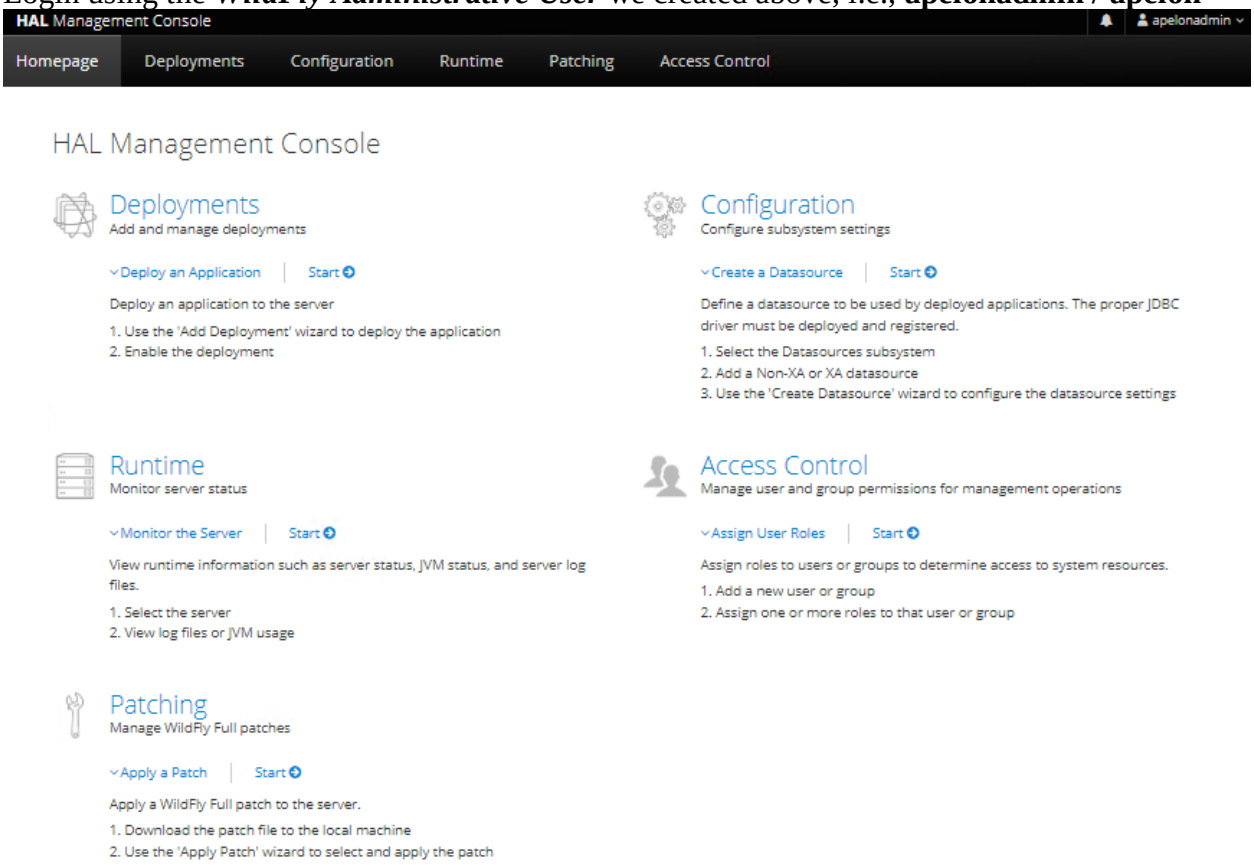
### H.4.1 Data Source Configuration

Apelon DTS Server requires a data source configured with WildFly to connect to the database. The necessary steps are:

- Deploy database driver.
- Configure data source.

### H.4.2 Deploy Database Driver

Start WildFly 23 using the "Apelon DTS WildFly" shortcut for Windows (or from terminal window for Linux) created in the previous step. Open a browser and go to the default WildFly Management URL: `http://localhost:9990/console/index.html`
Login using the ***WildFly Administrative User*** we created above, i.e., **apelonadmin / apelon**




If your view does not display as shown above, refresh your browser or clear your browser cache.

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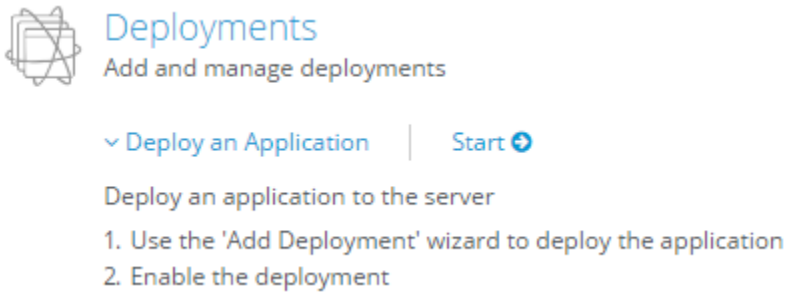
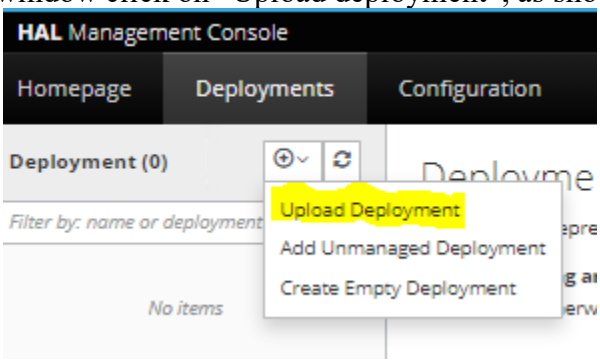
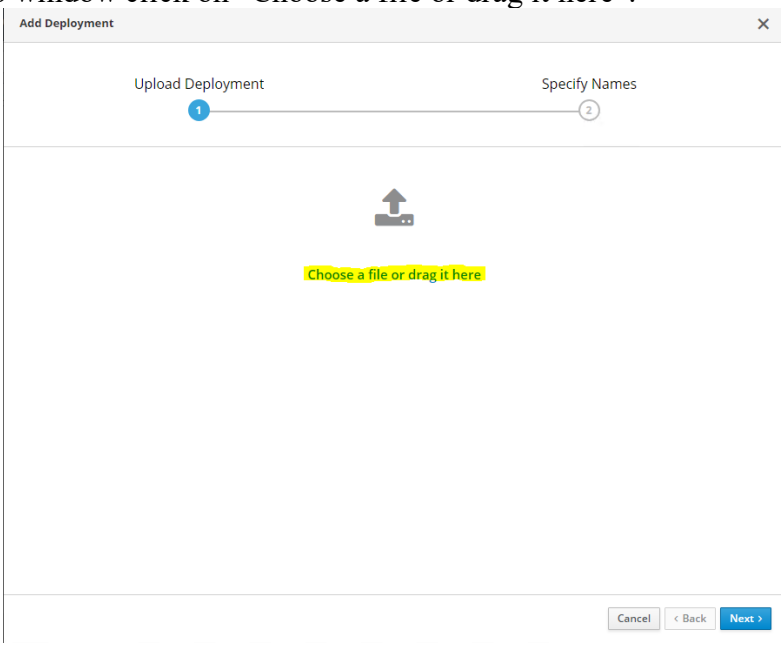
Then Under the “Deployments” header, next to “Deploy an Application” click on the Start arrow.




Then click on the dropdown button to the right of **Deployment…** in the upper left. In the pop-up window click on “Upload deployment”, as shown below.




In the next pop-up window click on “Choose a file or drag it here”.




Navigate to the **`<DTS_HOME>\lib`** folder.
Select a Driver .jar file for the database as given below and click **Next**.

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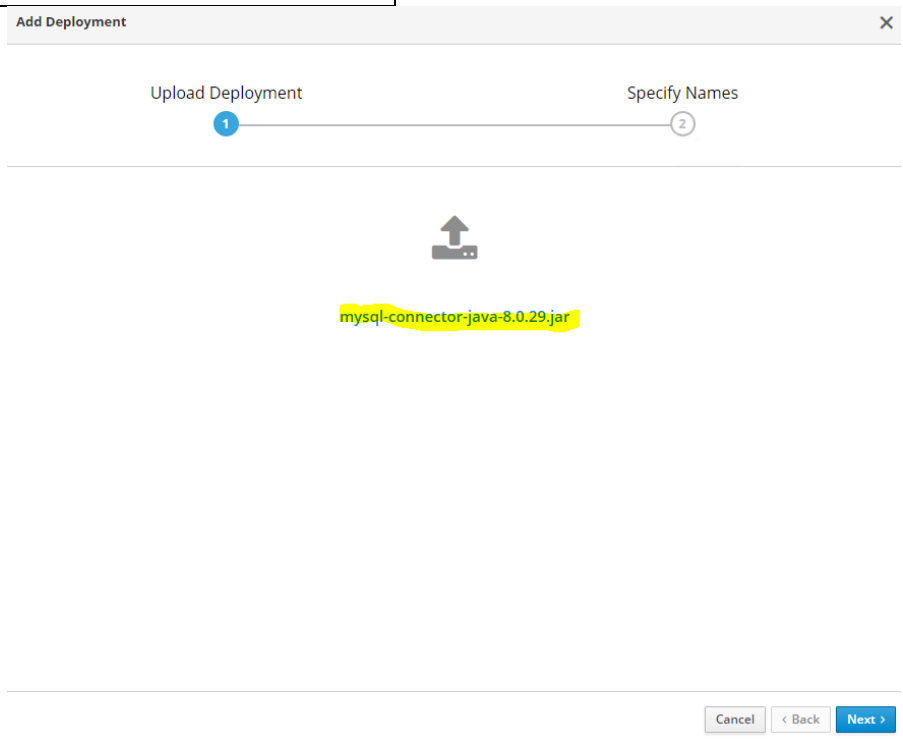
- ***Note:*** *For Oracle 12c see [Oracle 12c PGA_AGGREGATE_LIMIT]*

| Database | Driver |
|---|---|
| **Oracle 12c** | ojdbc7-4.1.jar |
| **MS SQL Server 2016** | mssql-jdbc-9.4.1.jre8.jar |
| **MS SQL Server 2019** | mssql-jdbc-9.4.1.jre8.jar |
| **MySQL 8** | mysql-connector-java-8.0.29.jar |
| **MySQL 5.6** | mysql-connector-java-8.0.29.jar |

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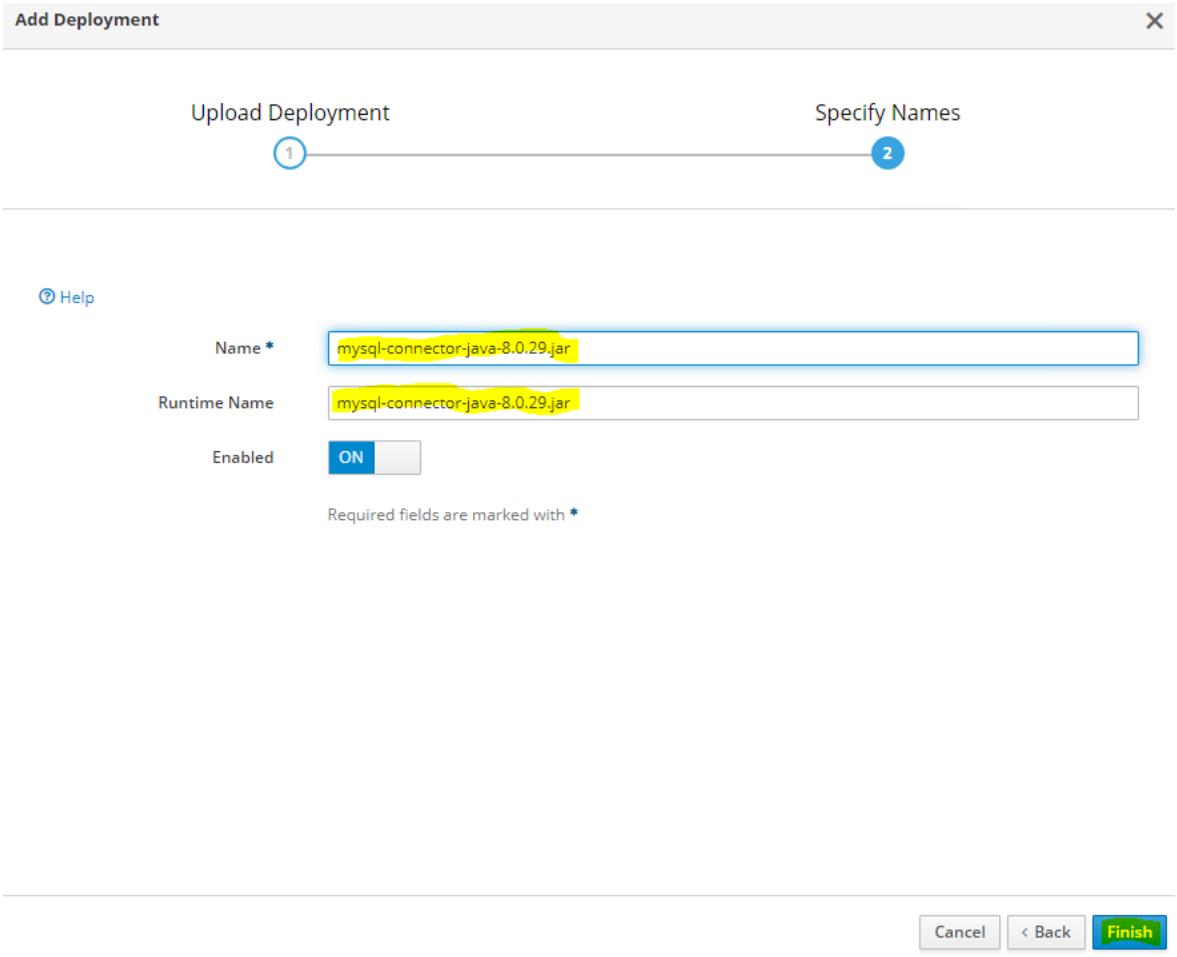
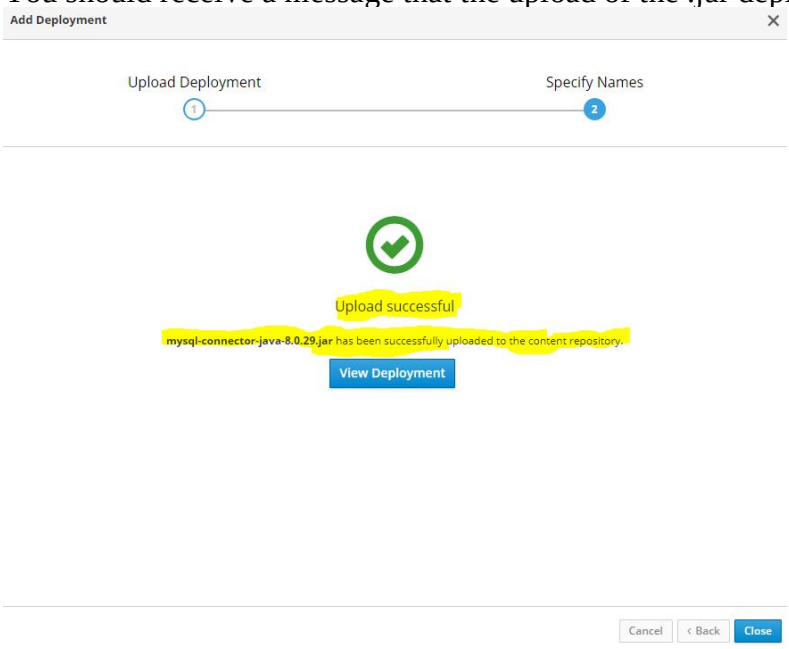
Ensure the **`Enable`** is **ON** and click “Finish”.




You should receive a message that the upload of the .jar deployment was successful.

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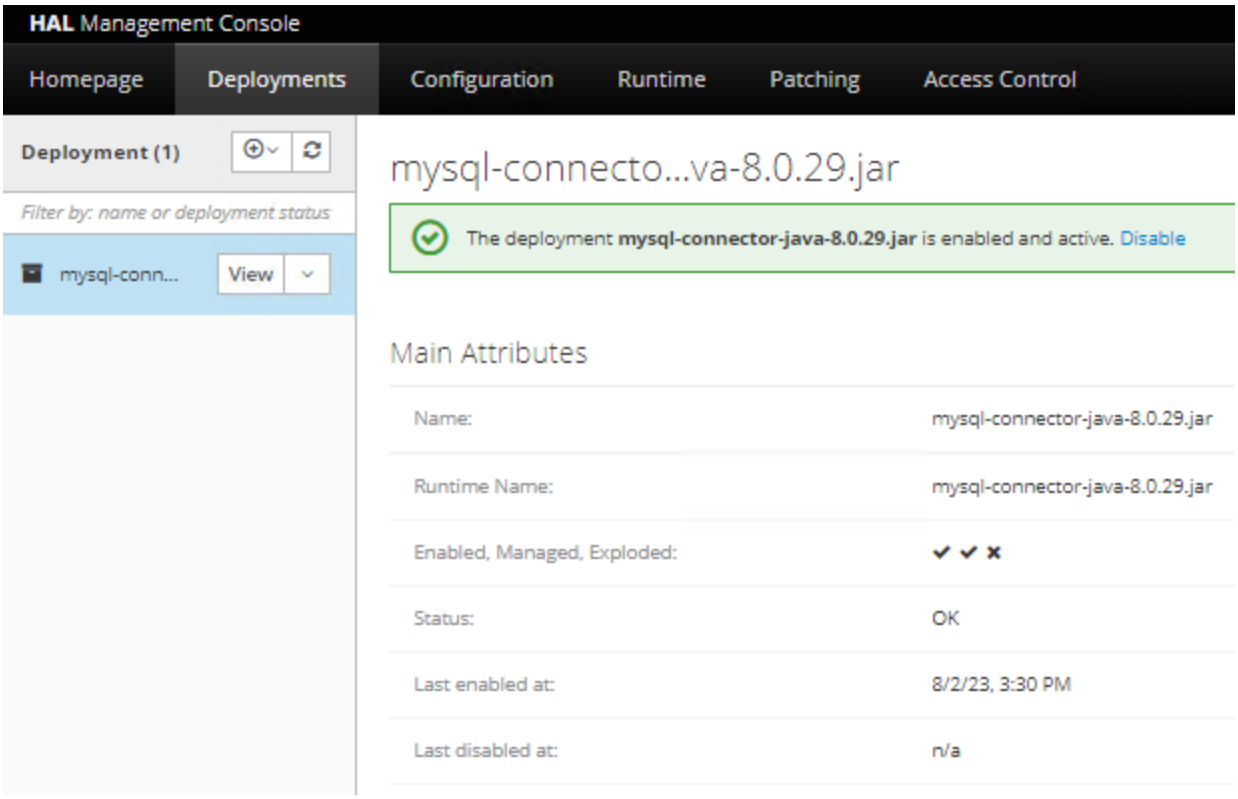


### H.4.3 Configure Data Source

The Apelon DTS Server requires a data source named "**ApelonDtsDS**". This data source must be set up similar to the examples given below (*ensure the appropriate User, Password, and database name are used if they are not the default "dts4" used as an example in this documentation*).

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

To create the **`ApelonDtsDS`** data source, navigate back to "Homepage" in the WildFly 23 administration console, and under the "Configuration" header, select the Start arrow next to "Create a Datasource":

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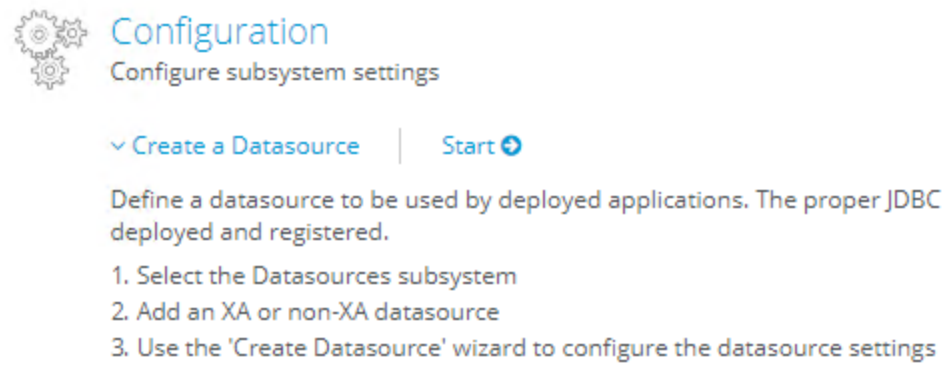
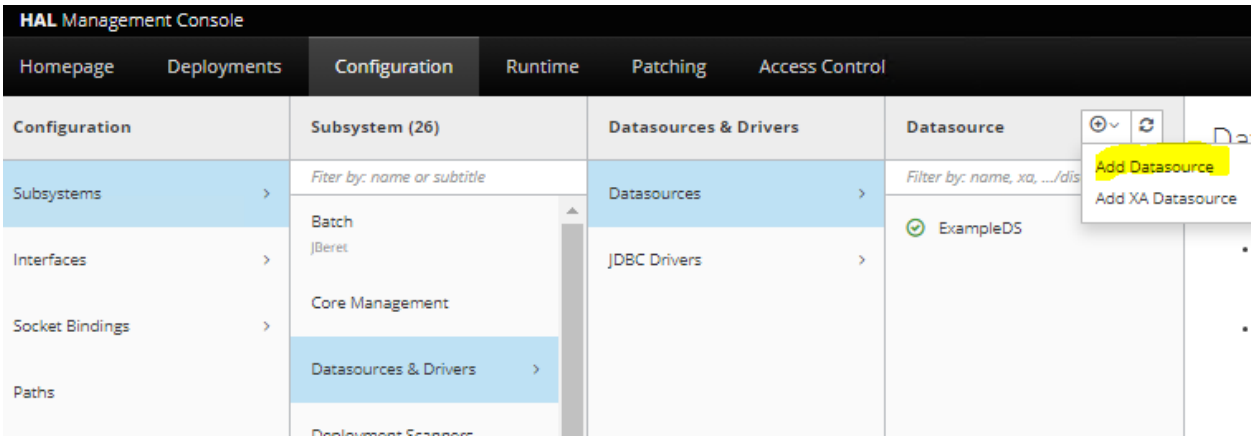



In the “Configuration” column, select the “Subsystems” tab. Under the “Subsystem” column, select the “Datasources & Drivers” tab. Under the “Datasources & Drivers" column, select the “Datasources” tab.
In the “Datasource” column click on the dropdown and choose “Add Datasource”, where the ApelonDtsDS datasource will be created as a non-cross-application datasource.




In the next popup, select the database type for your Datasource (Oracle, MySQL, Microsoft SQLServer) and click **Next**.

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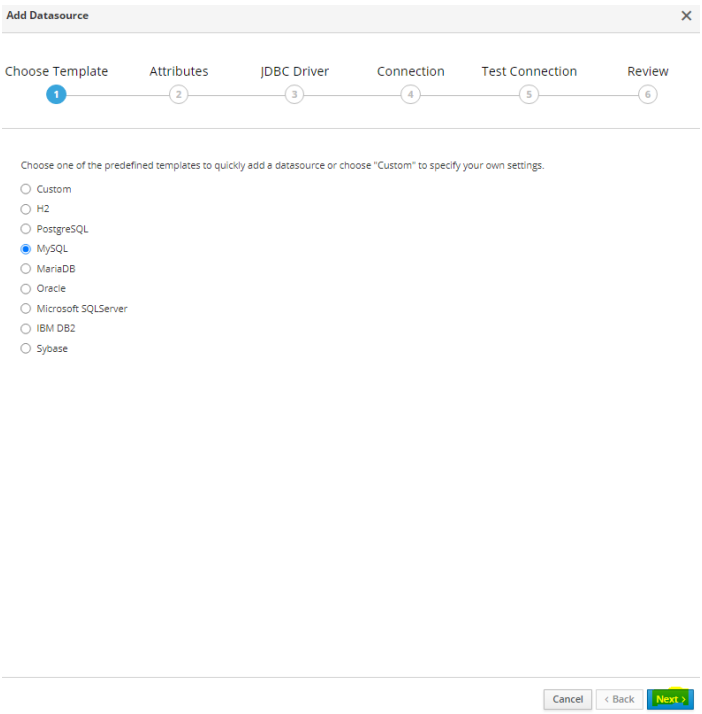
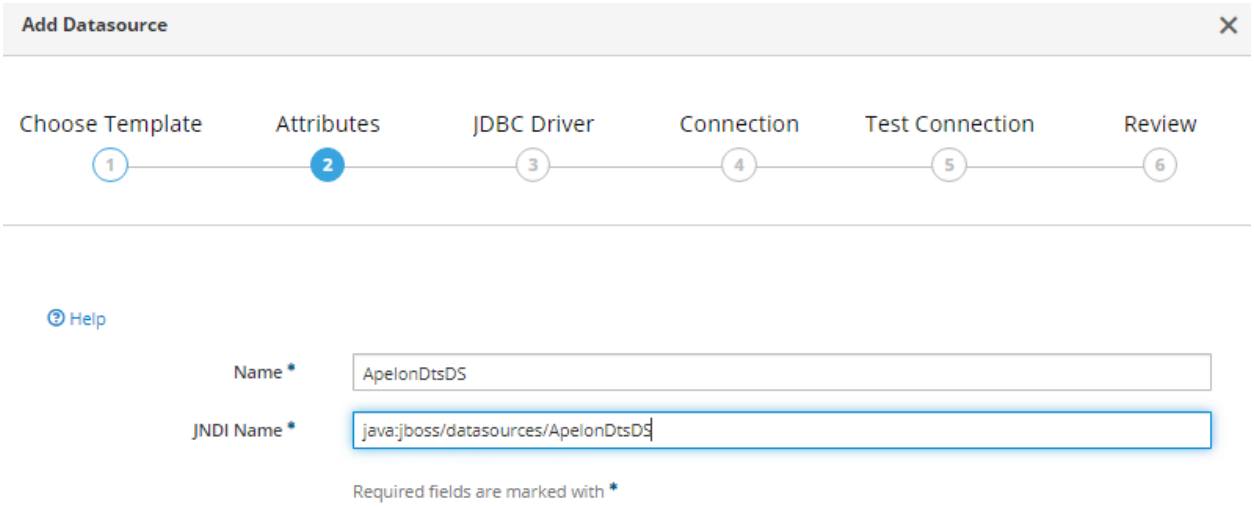



Edit the Datasource Attributes **Name** and **JNDI Name** (*Note: these values are Case-Sensitive*).
The **Name** should be: "ApelonDtsDS"
The **JNDI Name** should be: "java:jboss/datasources/ApelonDtsDS"




In the next window, select the database driver from the **Driver Name** dropdown. Choose the database driver you added to WildFly 23 in an earlier step and hit "Next".

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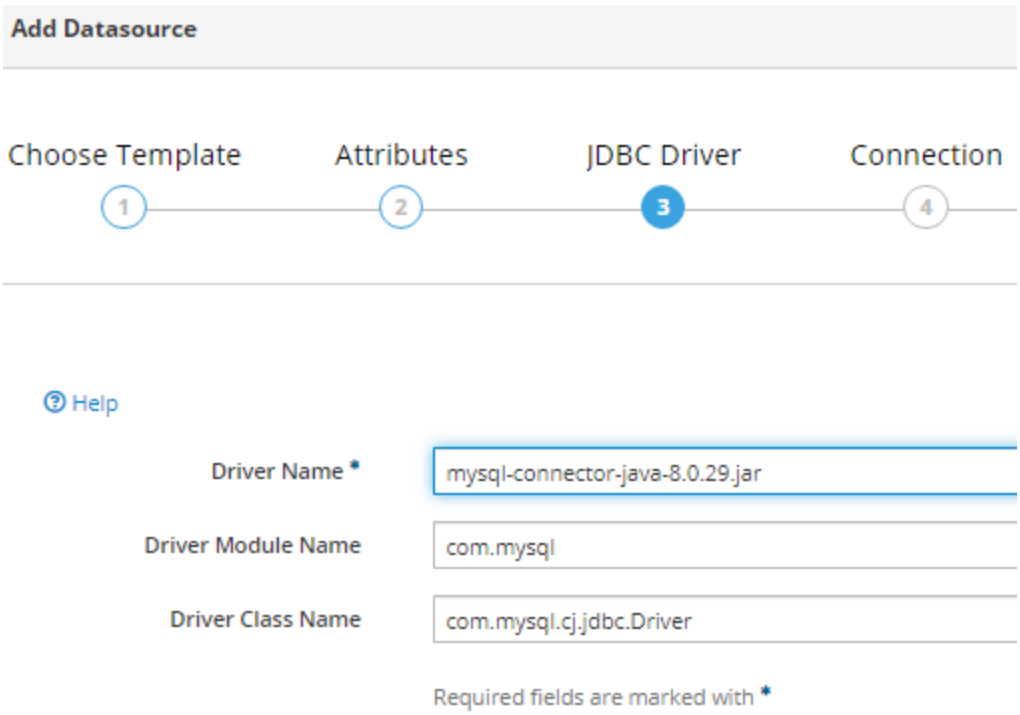


On the next window, enter the appropriate Connection URL, Username, and Password for your database environment. Examples are again presented below, but you should enter the parameters which are correct for your database.

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

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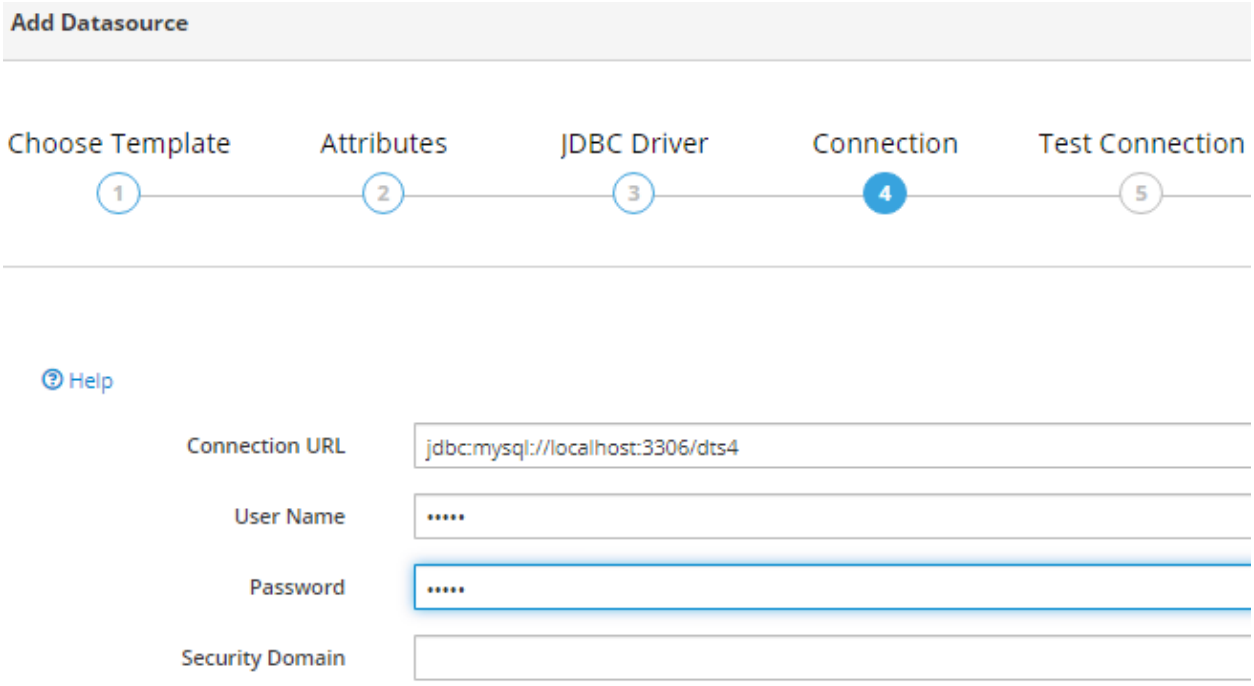
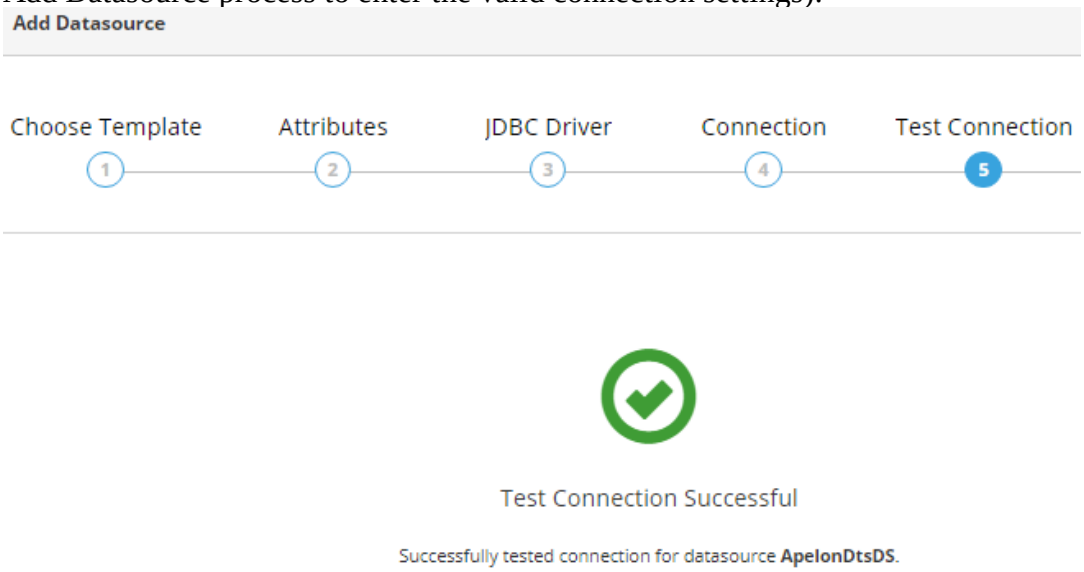



The next window will provide a Test Connection option. Click on the "Test Connection" button to ensure the above entered connection settings are valid. If the connection test is successful click "Next". If the connection test fails, click "Back" and correct the connection settings (NOTE: the connection settings may get cashed by the browser so you may need to restart the Add Datasource process to enter the valid connection settings).




On the next window, WildFly 23 will provide you a summary of the Datasource settings. Click "Finish" to accept, or "back" to make any revisions.

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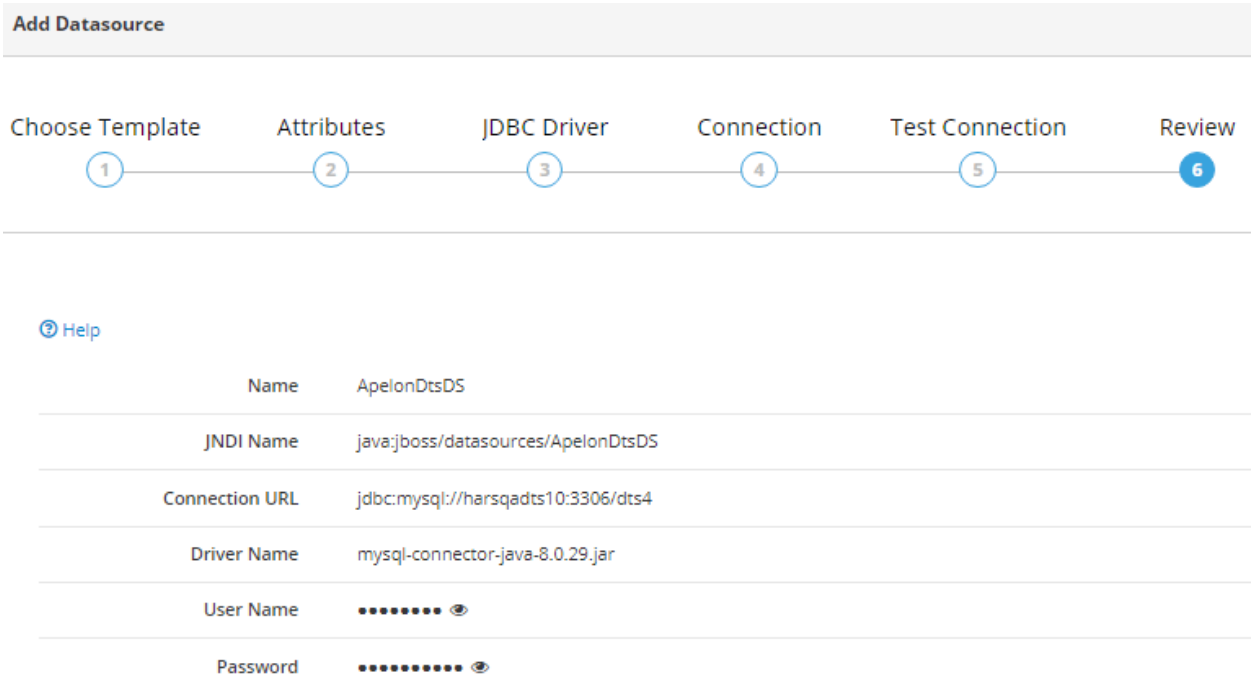
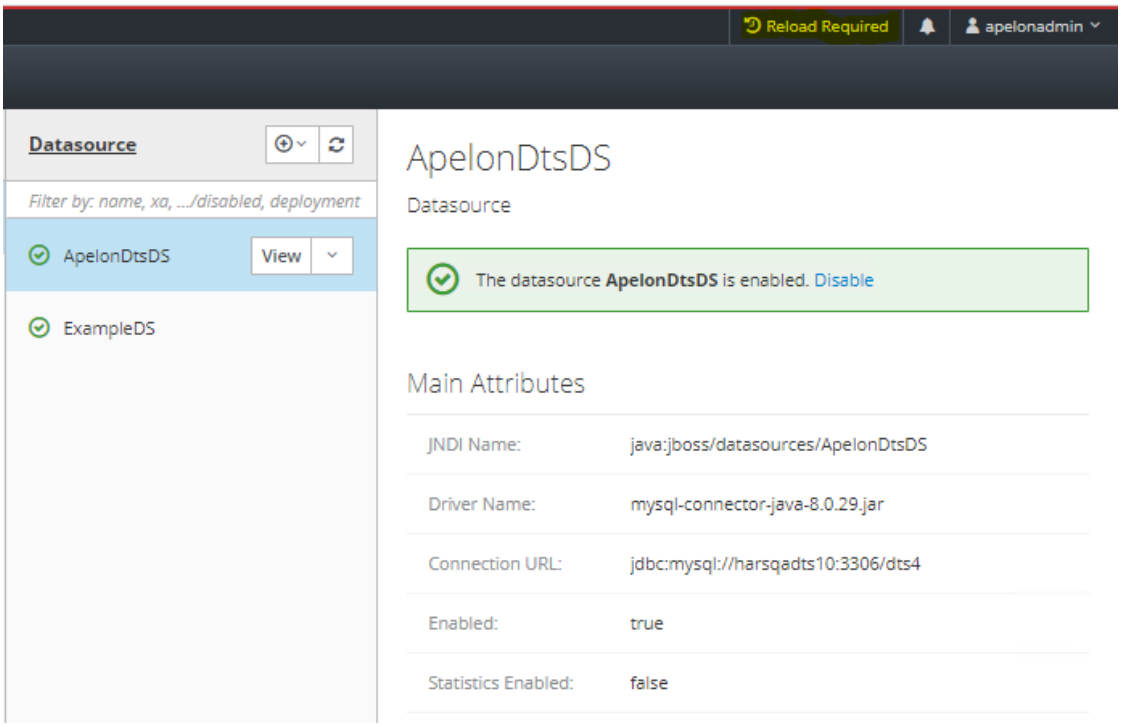



After clicking "Finish" a pop-up message will be displayed indicating the server configuration changed and to reload the server. Click "Reload". If you miss the Reload pop-up, click on the **Reload Required** link in the upper right of the Management Console.




You should receive a message that the Server was successfully loaded.
Now that the Datasource has been created, you may test the connection once again, from the dropdown next to it from the "Datasource" column.

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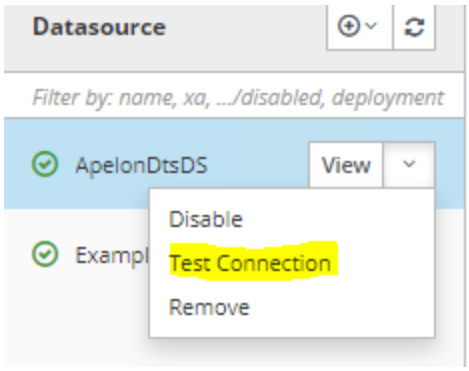
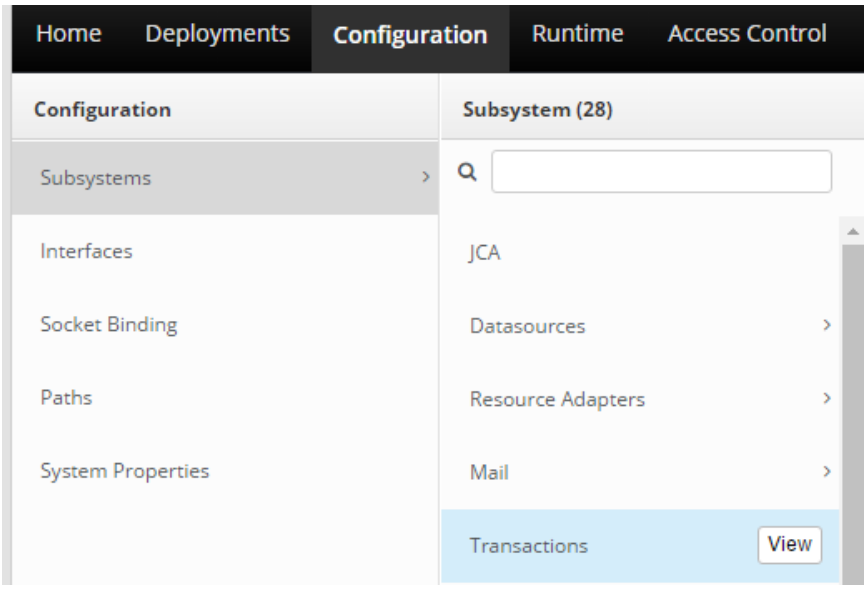



Ensure the connection test is successful before continuing.

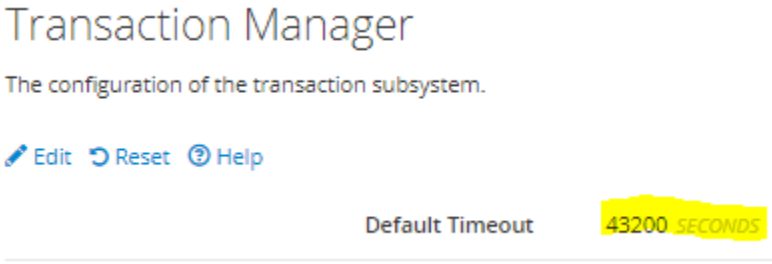
## H.5 Check WildFly Transaction Timeout Default

The WildFly Transaction Timeout Default is **set to 43200 seconds** to accommodate long running DTS transactions.

To edit or view the WildFly 23 Transaction Timeout Default, from the "Configuration" column select "Subsystems">"Transactions" and click "View".




Then click "Edit" and enter the new timeout value.




Then click "Save". The JBoss EAP server must be restarted for the change to take effect.

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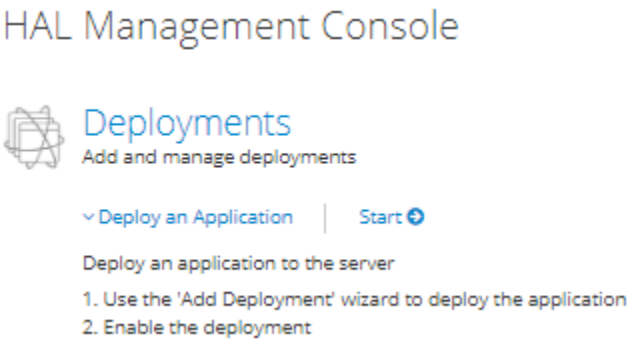
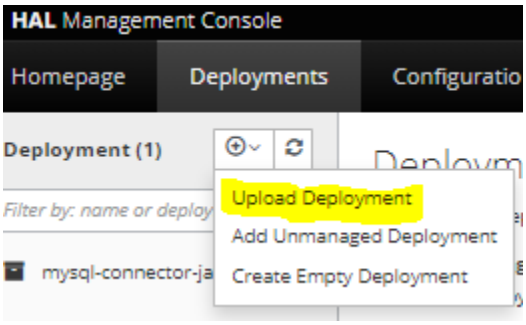
## H.6 Deploy Apelon DTS Server

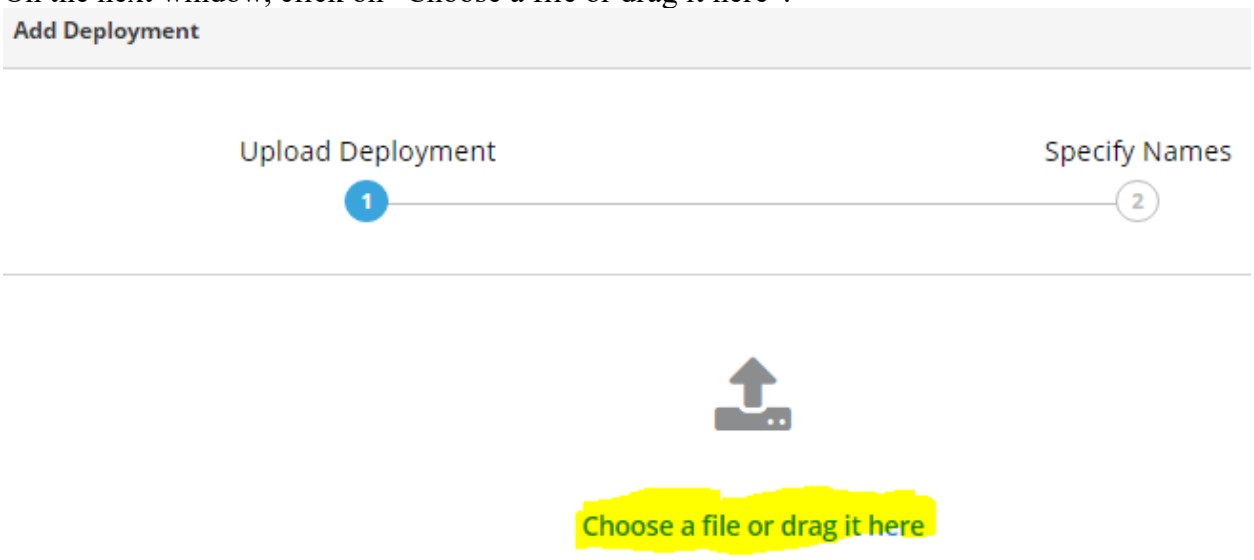
To deploy the Apelon DTS Server EAR file, click the Start arrow next to "Deploy an application" under the Deployments header from the Homepage tab.




Click the dropdown button in the upper left and choose "Upload Deployment" to begin the deployment process.




On the next window, click on "Choose a file or drag it here".




Navigate to the `<DTS_HOME>\server\wildfly\standalone\deployments` directory and select **`dtsjbosswildfly.ear`** (This is not a typo, WildFly is in reality the

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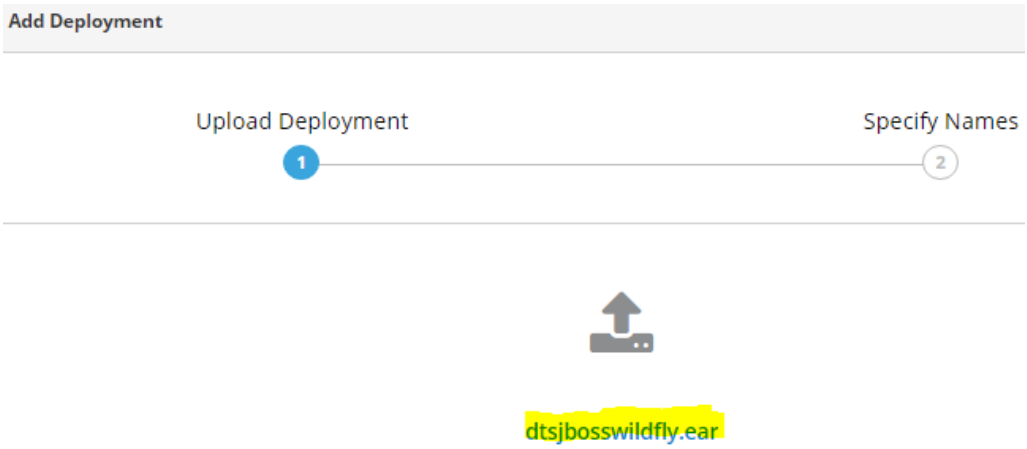
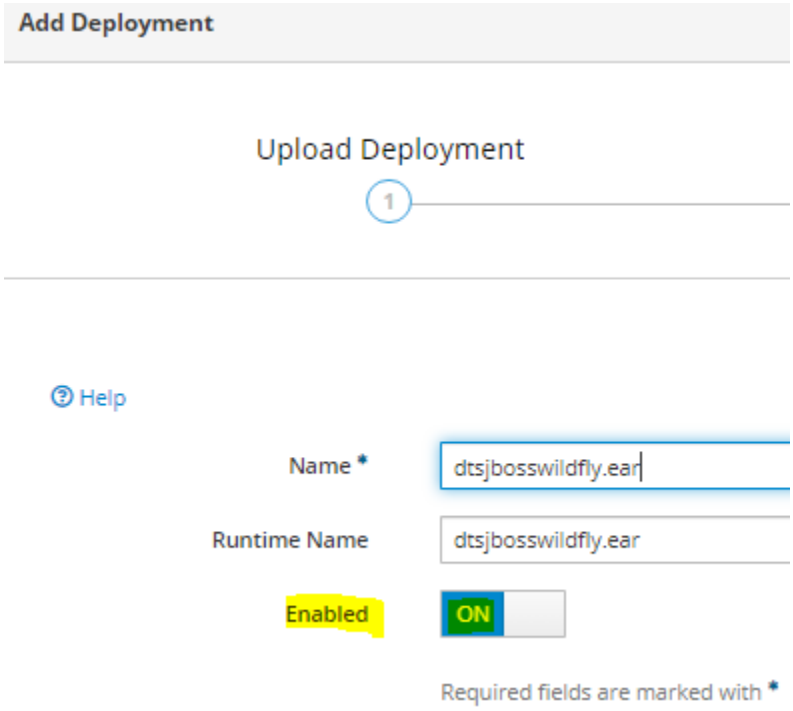
next iteration of JBoss, and as such the .ear file and deployed application still contain “jboss” in the name).

**NOTE:** For **Microsoft SQL Server** a `dtsjbosswildflyforsqlserver.ear` file that is specific to Microsoft SQL Server must be used.

- The SQL Server specific `”dtsjbosswildflyforsqlserver.ear”` file is in the following location:
  `<DTS_HOME>\server\wildfly\standalone\deployments\sqlserver\`




In the next window ensure “Enable” is set to **ON** and then click “Finish”.




WildFly 23 will report that the deployment is in process. NOTE: you may see a message that “…management operations are running longer than expected…” but you can ignore this message.

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****IMPORTANT****
**In the case of upgrading an earlier DTS schema version, Do Not Restart WildFly 23 until the Deployment has completely finished and you have verified that the Database Schema is fully deployed to the correct version (See section: Upgrade Apelon DTS 4.7.0 - 4.7.2 WildFly Server & schema to DTS 4.8.0). Once the correct schema version is verified, SHUT DOWN and RESTART the WildFly server to ensure the changes are integrated.**

## H.7 Verify DTS Browser & Editor connections to WildFly 23 DTS Server

### H.7.1 Verify the DTS Browser

You can access the DTS Browser from:
`http://localhost:8080/dtsserverws`.
To login to the DTS Browser, you will need to enter user credentials created in the WildFly 23 Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in the guide, the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.

### H.7.2 Verify the DTS Editor connection

Run the DTS Editor shortcut ( DTS Editor ) provided by the DTS 4 installation.
Connect to the WildFly 23 server by using an **Instance** of '**dtsjboss**' and default **Port** number '**8080'** along with the user credentials created in the WildFly 23 Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in this guide the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.
Click "Connect".

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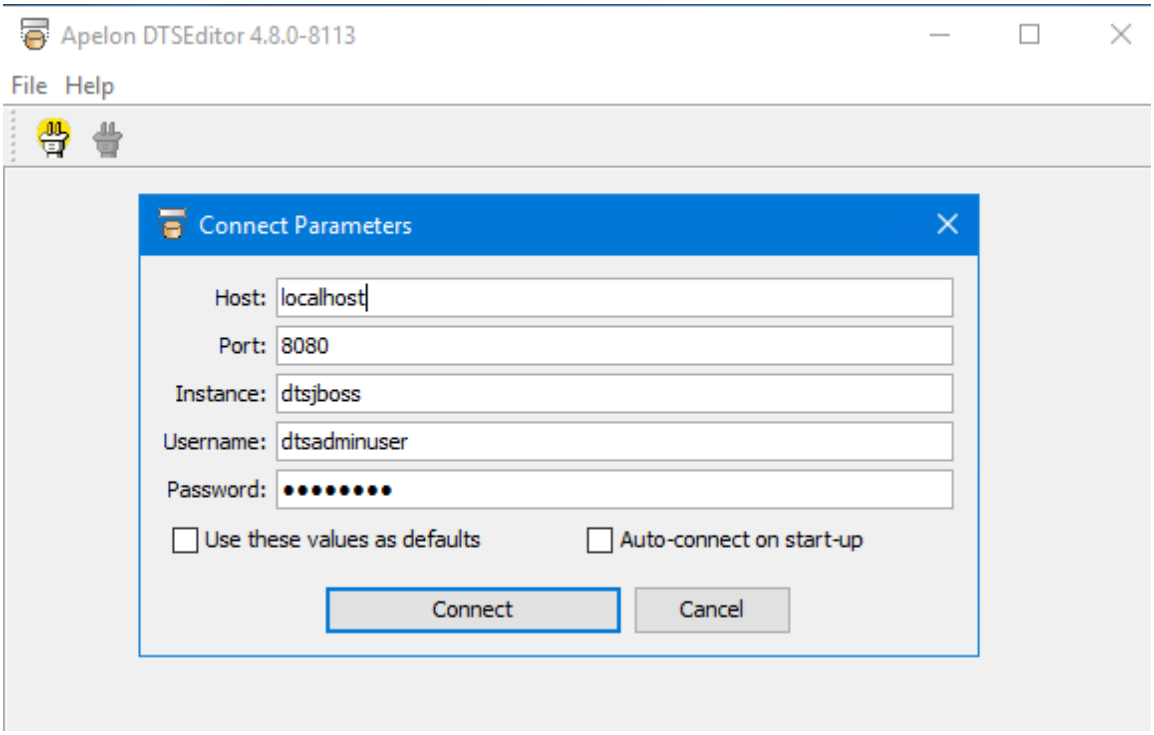


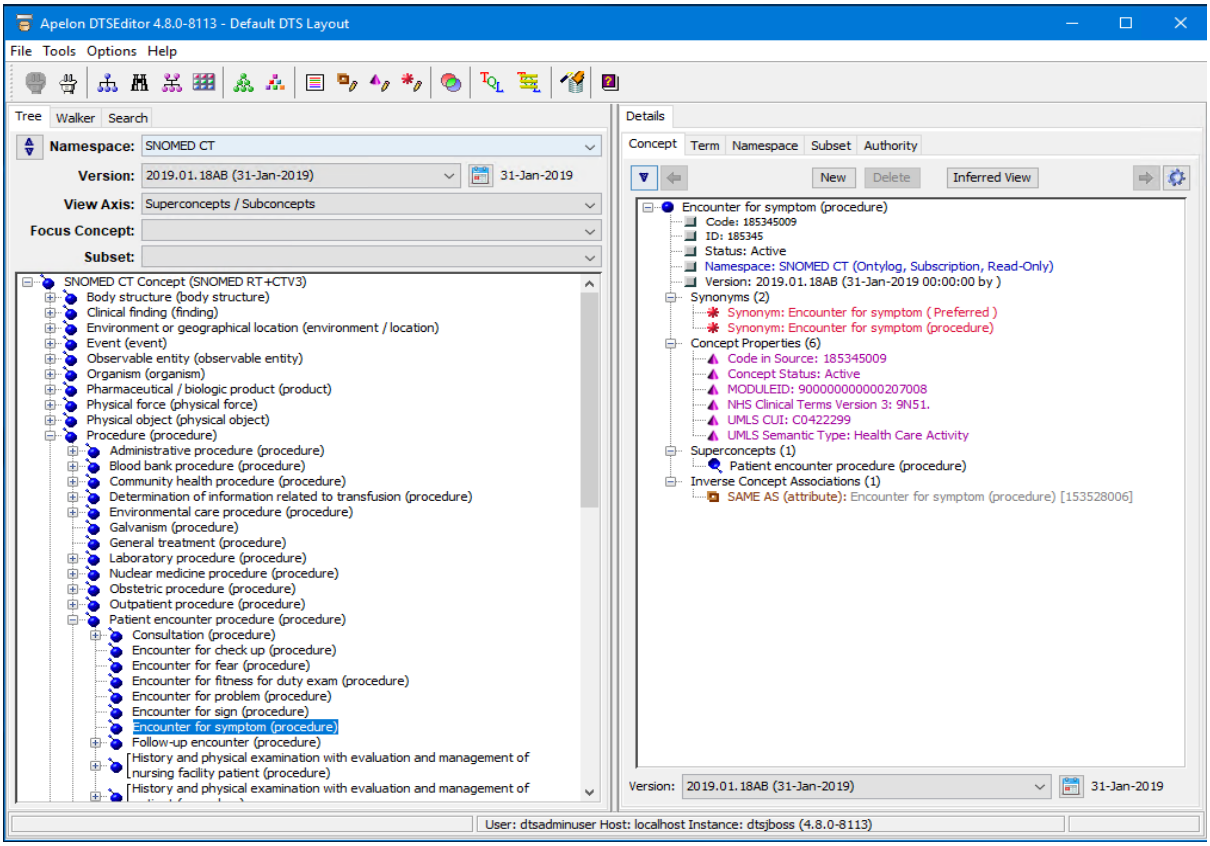


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## H.8 Setup WildFly 23 and DTS to start as a Windows Service

Follow these steps to get your WildFly 23 server running as a windows service.

1. Copy the **service** directory from **<WILDFLY23_HOME>\docs\contrib\scripts** to **<WILDFLY23_HOME>\bin**

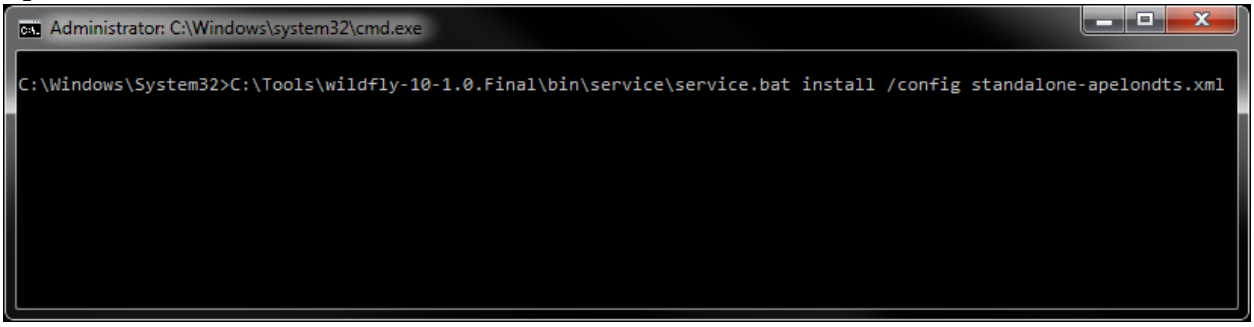
2. Edit service.bat file and set the windows service variables.
e.g.:
**set SHORTNAME=DTS48WildFly23**
**set DISPLAYNAME=DTS48_WildFly23**
**set DESCRIPTION=DTS48 WildFly23 Application Server**

*Note1: If present, please be sure to remove the quotations surrounding the Description value.*
*Note2: If the JBoss Management Port Number specified in the **standalone-apelondts.xml** provided by DTS4 is changed (i.e. from* `jboss.management.http.port:9990` *to* `jboss.management.http.port:XXXX`*), then the Controller Port Number specified in the **services.bat** found in the following line must be changed to match the JBoss Management Port Number:*

```
CONTROLLER=localhost:9990
```

3. Open a command prompt (as administrator) and change directory to the **<WILDFLY23_HOME>\bin\service** directory.

4. Issue the command: `service.bat install /config standalone-apelondts.xml`




If the command return is a success you will be able to manage your WildFly 23 server from the Windows Services console.

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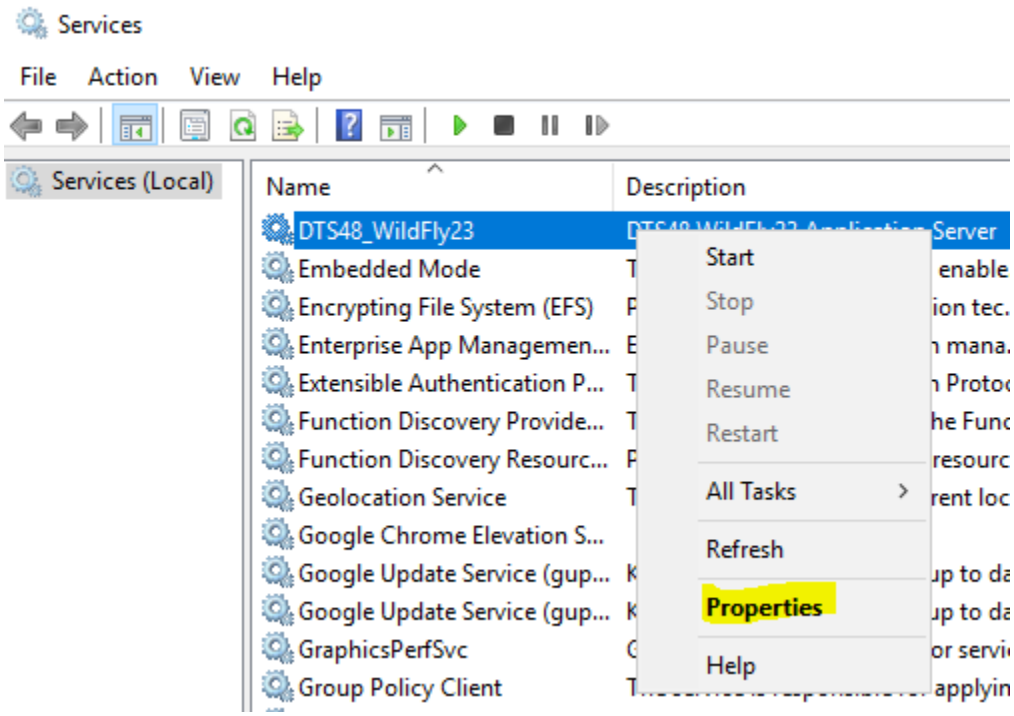
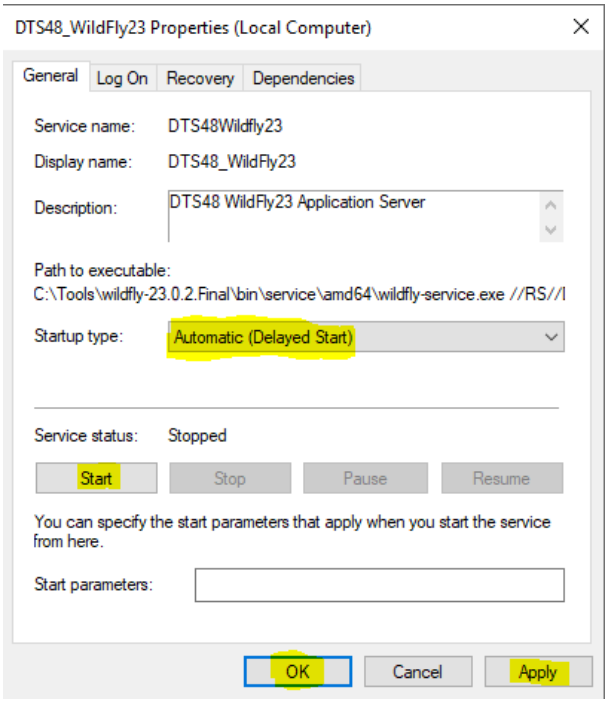
5. Search for **Services** and select the Services app. Find the **"DTS48_WildFly23"** service. Right click and select **Properties**.




6. Perform the following:
   Set the *Startup type* to **Automatic or Automatic (Delayed Start)**
   **Start** the Service.
   Click **Apply**
   Click **OK**

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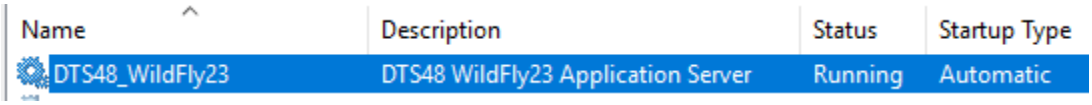
7. The "**DTS48_WildFly23"** service is now **Running** and set to **Automatic**.

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## H.9 Setup WildFly 23 and DTS to start as a Linux Service

To install DTS as a daemon service on Linux, you will need to copy and configure the service launching scripts that are included with WildFly 23.

Follow this procedure to configure the service.

1. Create a new user which will be used to launch the service. For example:
   ```
   => useradd -r -d /tmp/ jbossas
   ```

2. The `jbossas` user needs to have permission to read, write and execute to the path where WildFly 23 was installed. One option to grant this permission is to change the ownership of the WildFly 23 installation folder to the new user that was created. For example:
   ```
   => chown -R jbossas /opt/wildfly-23.0.2.Final/
   ```

3. Optionally change the group membership of the WildFly 23 installation folder to the newly created user. For example:
   ```
   => chgrp -R jbossas /opt/wildfly-23.0.2.Final/
   ```

   Alternatively, add the jbossas user to a shared users group, and change the group of the WildFly 23 installation folder to this shared group.

4. Copy the "**<WildFly23_HOME>/docs/contrib/scripts/init.d/wildfly.conf**" file to the folder "**/etc/default**" and rename it to just "**wildfly**". For example:
   ```
   => cp /opt/wildfly-
   23.0.2.Final/docs/contrib/scripts/init.d/wildfly.conf
   /etc/default/wildfly
   ```

5. Add or update the following lines in the newly created "**/etc/default/wildfly**" file, customizing as necessary for your installation.

```
# The username that should own the process
JBOSS_USER=jbossas

## The amount of time to wait for startup
STARTUP_WAIT=90

# The installation path of JBoss
JBOSS_HOME=/opt/wildfly-23.0.2.Final

# The name of the server config file to use for your Database.
JBOSS_CONFIG=standalone-apelondts.xml
```

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6. Copy the "**<WildFly23_HOME>/docs/contrib/scripts/init.d/wildfly-init-redhat.sh**" file to the folder "**/etc/init.d**" and rename it to "**wildfly**"
   ```
   => cp /opt/wildfly-23.0.2.Final/docs/contrib/scripts/init.d/wildfly-init-redhat.sh /etc/init.d/wildfly
   ```

7. Modify the file "**<WildFly23_HOME>/bin/standalone.conf**" to specify the Java JVM to use during when the service starts. Add a `JAVA_HOME` parameter to your file, customizing as necessary for your installation. Note – this parameter may already exist in the file – if it does – you can either modify the existing one, or comment it out. For example:

   ```
   # Specify the location of the Java home directory.
   #If set then $JAVA will be defined to $JAVA_HOME/bin/java, else
   #$JAVA will be "java".
   #
   #JAVA_HOME="/opt/java/jdk"
   JAVA_HOME=/opt/java/jdk1.8.0_351
   ```

8. Create the necessary links to the **/etc/init.d/wildfly** script so it starts and stops at the appropriate runlevels.
   ```
   => chkconfig wildfly on
   ```

9. The server is now configured to automatically start and stop with the system. To manually start the server, execute:
   ```
   => /etc/init.d/wildfly start
   ```

   To manually stop the server, execute:
   ```
   => /etc/init.d/wildfly stop
   ```

   To check the status of the server, execute:
   ```
   => /etc/init.d/wildfly status
   ```

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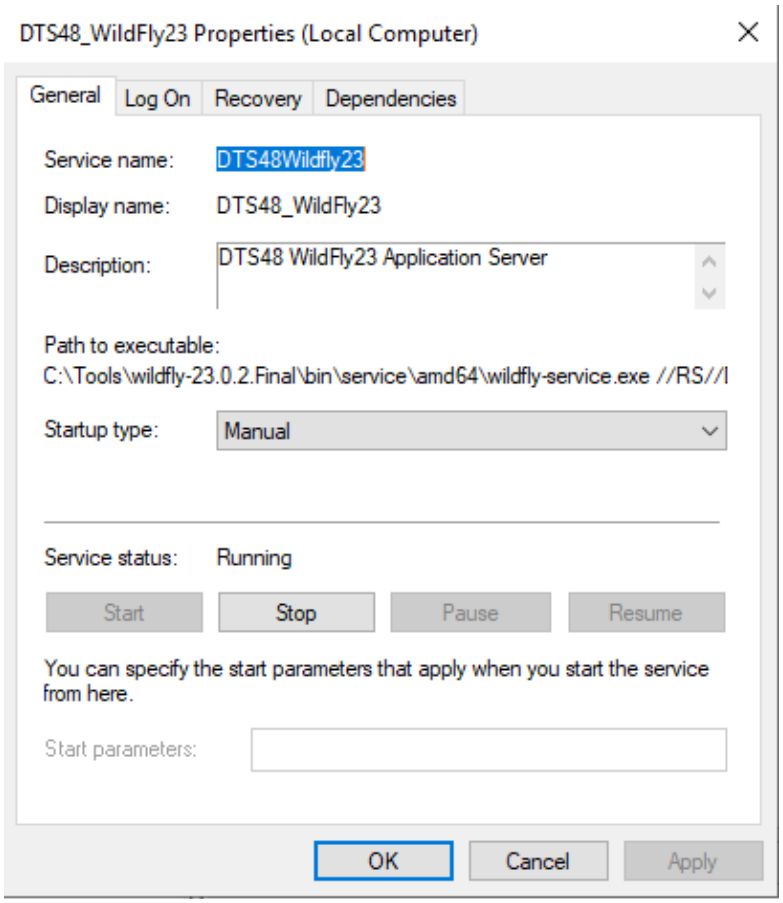
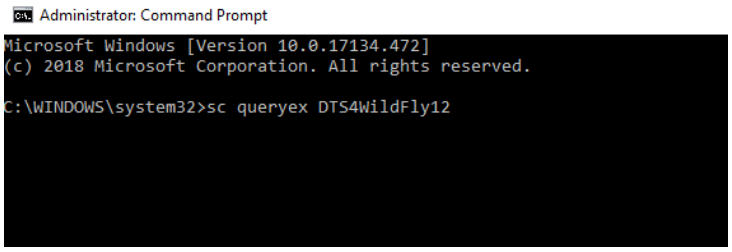
## H.10 Terminating the WildFly 23 Service using taskkill

Stopping the WildFly 23 Service in the Services Window sometimes does not shut down in a timely manner, sometimes returning an error that the service is not responding. In this case, using a taskkill command to terminate the service is an effective way of circumventing this Services issue. Here are the instructions for doing so:

13. In the Services Window, right-click on the WildFly 23 Service and choose Properties.
14. In the Properties Window, identify the Service Name and copy it.




15. Open a Command Window and type the following: `sc queryex [Service Name]`




16. This should produce information about the WildFly 23 Service, including the PID.
17. Type the following in the Command Window: `taskkill /pid [PID] /f`

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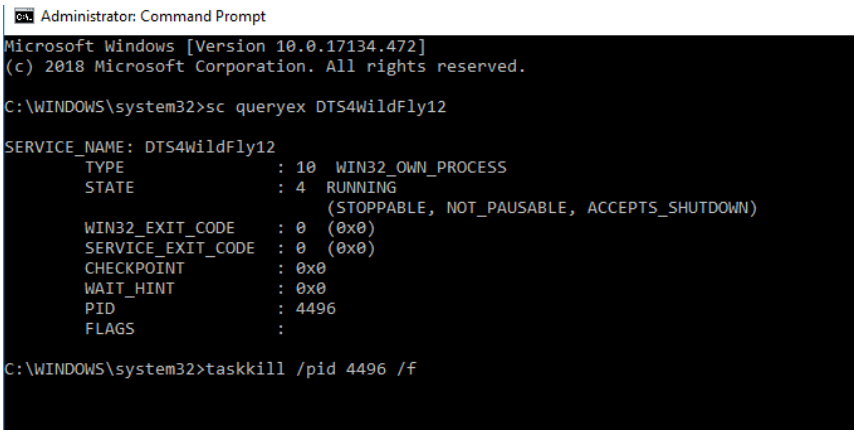
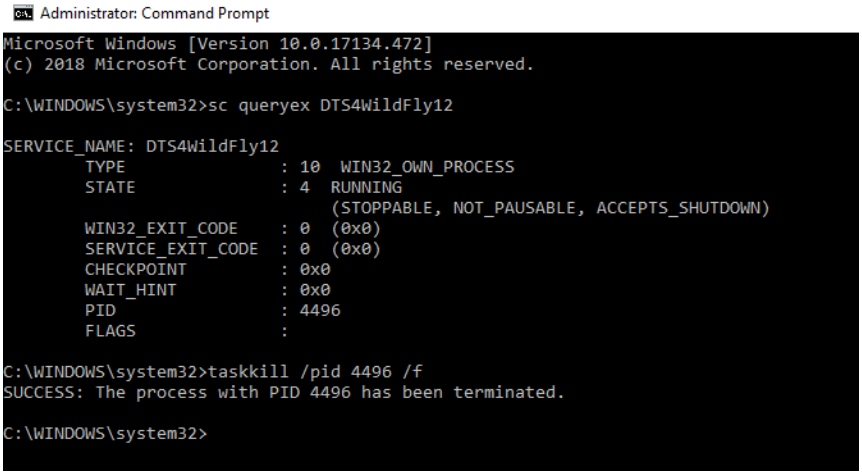



18. The Service should be terminated, as confirmed by the following message:

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## H.11 Upgrade Apelon DTS 4.7.0 - 4.7.2 WildFly Server & schema to DTS 4.8.0

Perform the following steps to upgrade your Apelon DTS 4.7 WildFly schema to Apelon DTS 4.8.0 WildFly **(Note: DTS 4.7.1 and DTS 4.7.2 have the same schema version as DTS 4.8.0)**:

- Follow instructions in Section B for installing DTS 4.8.0 on the server to be upgraded.
- Stop the Apelon DTS WildFly service.
- Copy the WildFly configuration file from the DTS 4.8.0 home directory `<DTS_HOME>\server\wildfly\standalone\configuration` to the <WILDFLY23_HOME>**`\standalone\configuration`** folder. Replace the existing file with this new WildFly configuration file.
- Restart the Apelon DTS WildFly service.
- Review the Notes below before continuing to the next steps.
- Follow steps **H.4.2**(Deploy Database Driver) through **H.7**(Verify DTS Browser & Editor connections to WildFly 23 DTS Server) to finish configuring the Apelon DTS 4.8.0 WildFly server.
- **NOTE1:** If upgrading from a DTS 4.7.0 schema to DTS 4.8.0, as instructed in section **H.6(**Deploy Apelon DTS Server**),** when deploying the "**`dtsjbosswildfly.ear`**" **Do NOT shut down or restart the WildFly service while the schema is being upgraded**. This step could take some time, especially when upgrading DTS schemas in MySQL and SQL Server.
- **To verify the correct DTS 4.8.0 schema version, perform the following steps:**
    1. View the "server.log" file located in the <WILDFLY23_HOME>**`\standalone\log`** directory. Search the WildFly 23 "server.log" file for the statement:
        - "Schema Upgrade to 4.0.29 complete" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
        - "Schema Upgrade to 4.0.30 complete" – for MySQL 5.6 or MySQL 8.
    2. A second way to determine the schema upgrade was successful is from the DTS 4.8.0 DTS Editor.
        - Connect to the Apelon DTS WildFly 23 server.
        - Once the connection is established choose: **Help>About Apelon DTSEditor…**
        - In the help window that is launched click on the "*Details>>*" label. In the "Server Configuration:" section is displayed a "schema.version" value. The schema version should read:
            - "4.0.29" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
            - "4.0.30" – for MySQL 5.6 or MySQL 8.
- **NOTE2 - SQL Server Schema Upgrade:** If upgrading from a version older than DTS 4.4, not only may the SQL Server schema upgrade to version 4.0.29 take up to or longer than an hour, it may also require about as much available drive space for its database log file as is being used by the database prior to the schema upgrade. Consult with your SQL

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Server Database Administrator regarding the available drive space and the possibility of shrinking the database log after the schema is successfully upgraded to version 4.0.29.

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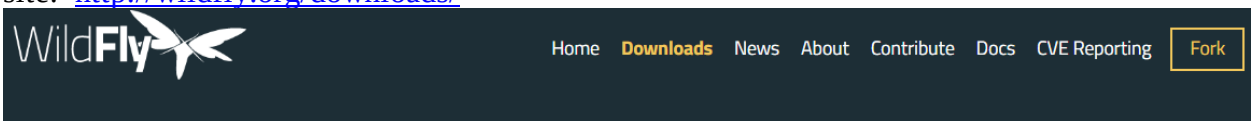
# I. WildFly 12 Setup

***Note: WildFly 12 requires the use of Java 8 JDK. See Java Environment Setup for a Server section above for additional details.***

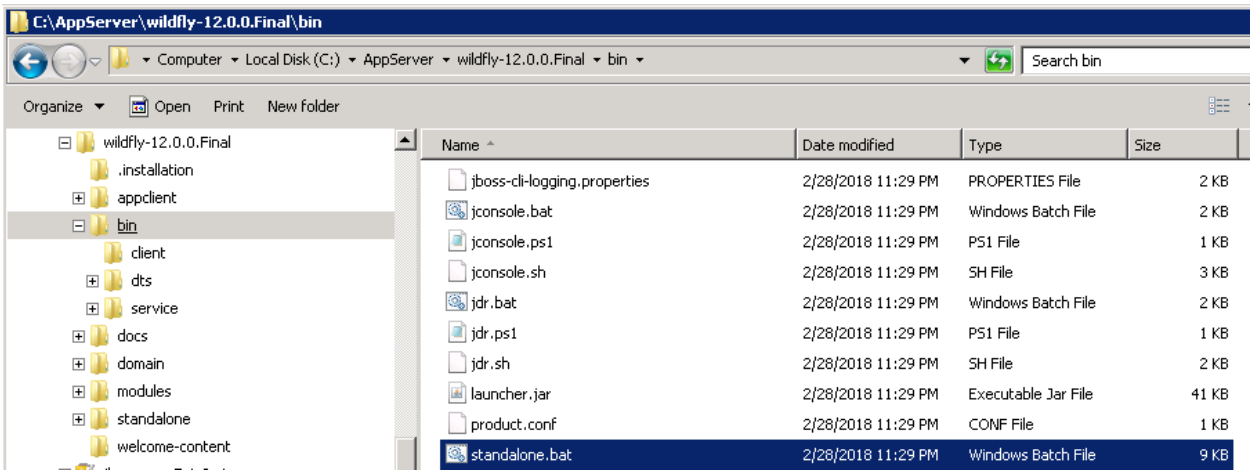
The WildFly Application Server can be downloaded from the WildFly community download site: http://wildfly.org/downloads/




For **Windows**, select the **`12.0.0.Final` Feb 28, 2018 Java EE7 Full & Web Distribution ZIP** file to download. For **Linux** use the **`12.0.0.Final Feb 28, 2018` Java EE7 Full & Web Distribution TGZ** file.

WildFly 12 does not come with an installer; just extract the compressed archive. **Unzip the WildFly archive into a folder with a pathname that does NOT contain any spaces.** For example, extracting to the `C:\Tools` folder will place the WildFly 12.0.0 Final files in the `C:\Tools\wildfly-12.0.0.Final` folder. We will identify this folder in the rest of the document as <WILDFLY12_HOME>. It is not necessary to create <WILDFLY12_HOME> as an environment variable.

To verify the WildFly 12 install, go to the `<WILDFLY12_HOME>\bin` folder and run `standalone.bat` (or `standalone.sh` for Linux).




Upon successful start, the message in the last line will indicate success.

Here is a sample startup screen:

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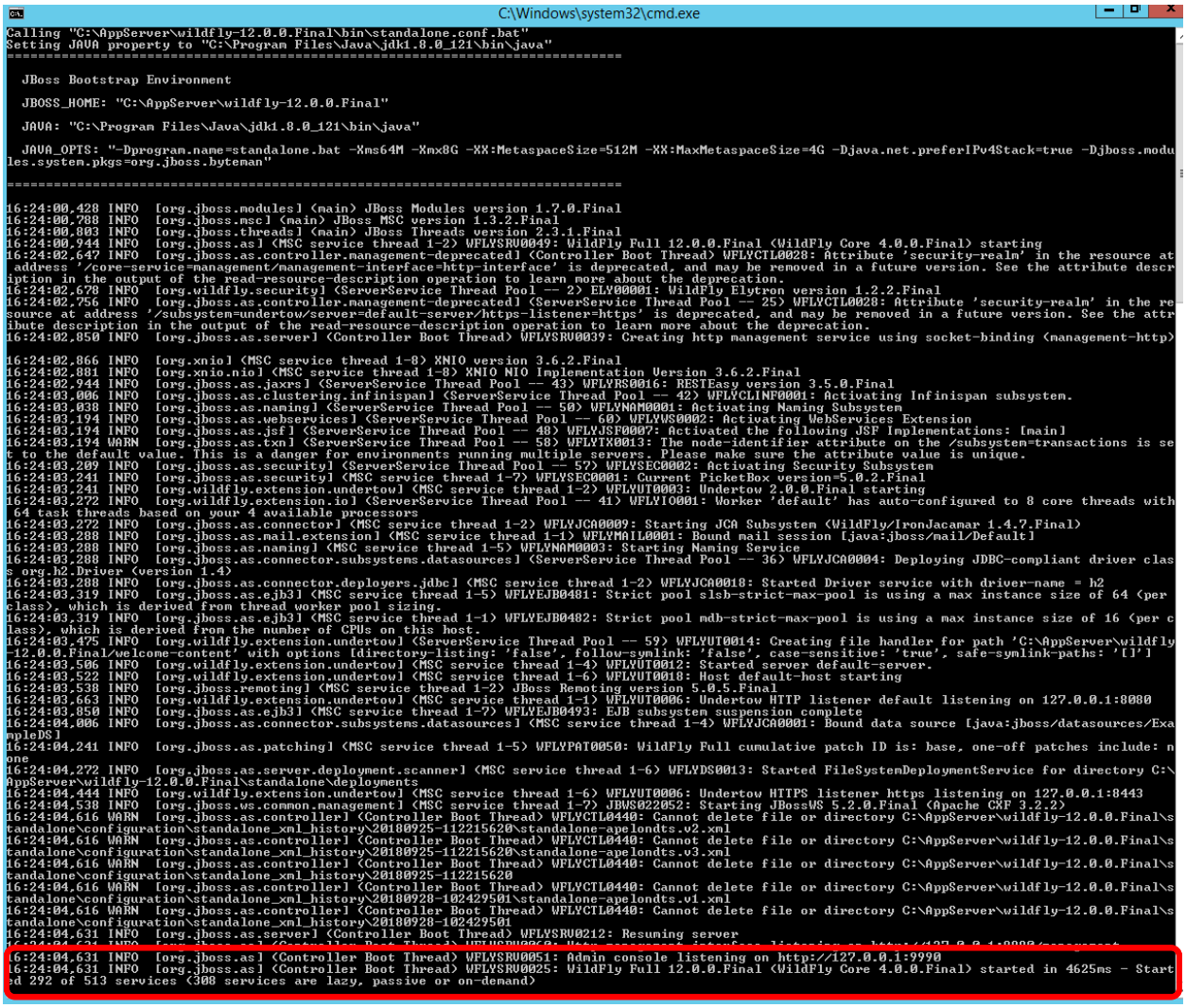


To verify that the server is reachable, you can point your browser to the default welcome page for WildFly at the address: [http://localhost:8080](http://localhost:8080) . The page should appear as below:

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Note, the Welcome to WildFly page that appears incorrectly indicates WildFly 11 instead of WildFly 12. After you have verified the server is reachable select the WildFly command window and then press `Ctrl+C`. You will be prompted to terminate the batch job, type **y** and hit **enter** to stop WildFly.

```
Terminate batch job (Y/N)? y
```

## I.1 Memory Configuration

The Apelon DTS Server performs better when additional memory is assigned to WildFly. To increase the memory utilized, open `<WILDFLY12_HOME>\bin\standalone.conf.bat` (or `standalone.conf` for Linux ) and modify the JVM memory allocation pool parameters as shown below:

***NOTE:*** *We recommend a memory limit of at least 4GB. If your DTS environment will be running Modular Classification, you will require a larger allocation to your JVM. On systems utilizing Modular Classification with 16 GB of RAM or more a setting of at least 8GB (4 GB min) is recommended.*

For Windows:

```
rem # JVM memory allocation pool parameters - modify as
appropriate.
set "JAVA_OPTS=-Xms512M -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G"
```

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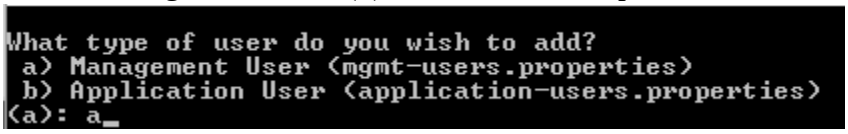
For Linux:

```
# Specify options to pass to the Java VM.
#
if [ "x$JAVA_OPTS" = "x" ]; then
   JAVA_OPTS="-Xms512m -Xmx4G -XX:MetaspaceSize=512M -
XX:MaxMetaspaceSize=4G
```

## I.2 WildFly 12 Management User

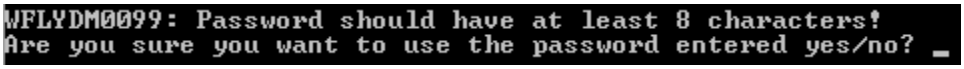
You must create a WildFly Management user (e.g., **apelonadmin/apelon**) – This user administers the WildFly server. Go to **<WILDFLY12_HOME>\bin** and click on **add-user.bat** (or **add-user.sh** for Linux). Follow the steps below.

- Select Management User. **(a):** hit **enter** to accept default



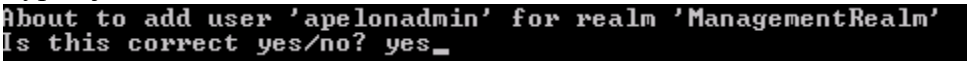

- Realm (**ManagementRealm)** will be used by default.
- Enter the desired Username. i.e., **apelonadmin**

- Enter the desired Password. The password cannot be same as the username. i.e., **apelon**
- *Note: WildFly will prompt you if your password doesn't meet the recommended criteria. You may type "**yes**" and press "**enter**" to accept the password, despite this.*




- Re-enter Password. i.e., **apelon**

- WildFly will prompt you to add the user to any groups. For the Application Server administrator user, no groups are necessary, you may hit "**enter**" to proceed.
- Type "**yes**" to add the user and hit **enter**.




- WildFly supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "**no**" and press "**enter**".

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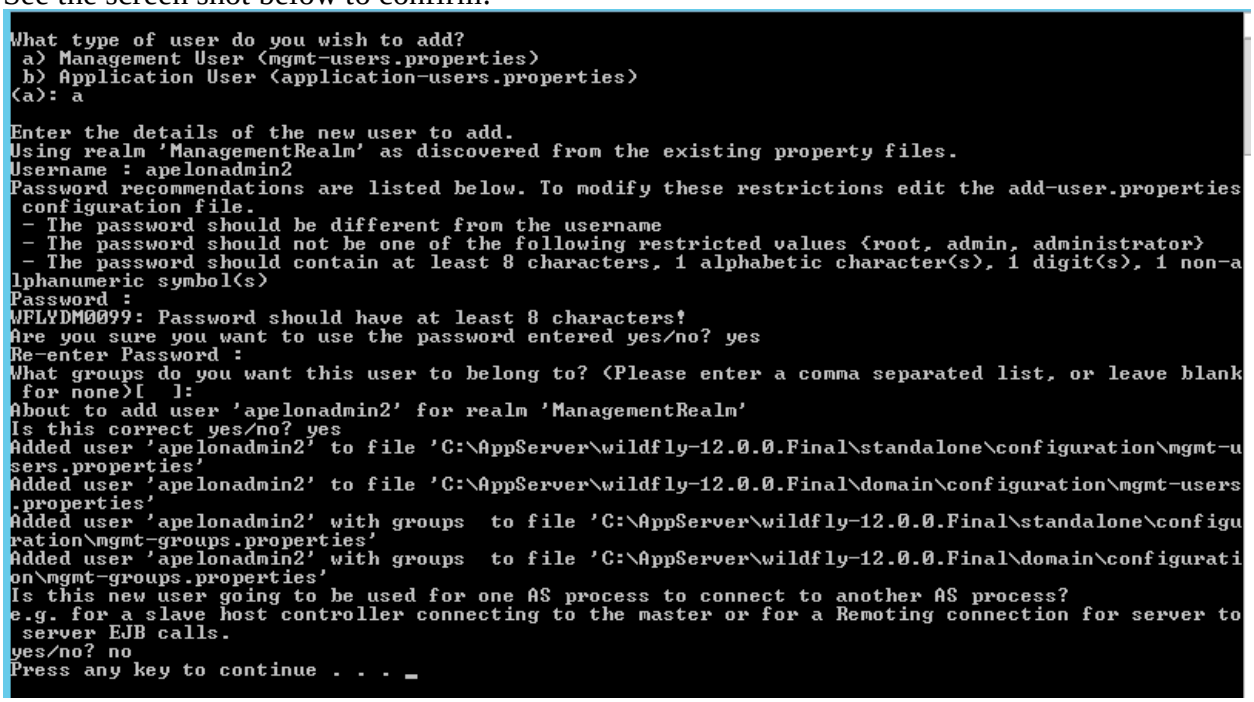
See the screen shot below to confirm:




## I.3 WildFly 12 Configuration for Apelon DTS Server

If you are currently Running DTS and are setting up WildFly12 to replace your existing JBoss 7.1.1, JBossEap 7.1, or WildFly 10 environment, you can migrate your existing DTS users by performing the following steps:

1. Ensure the new WildFly12 Application Server is stopped.
2. Locate the **application-roles.properties**, **application-users.properties**, and **mgmt.-users.properties** files in your existing Application Server installation directory. There are 2 instances of each of these files, one in **<AppServer Home>\domain\configuration** and the other in **<AppServer Home>\standalone\configuration**.
3. Copy these files, and place them (overwriting if prompted) in **<WildFly12 Home>\domain\configuration** and **<WildFly12 Home>\standalone\configuration** respectively.
4. Start the WildFly12 Application Server

*Note: Since the DTS User Manager is contained within the DTS Database, no modifications will be necessary, provided the Application Server users migrate successfully*

### I.3.1 WildFly DTS Admin User Configuration

WildFly Application Users must be created for every individual who will connect to *the **Apelon DTS Server via the DTS Browser or DTS Editor*** and will require access to the ***DTS Editor User Manager*** to setup ***DTS User Roles and Permissions***. These WildFly users must have the group "**apelondtsadmin**".

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Go to `<WILDFLY12_HOME>\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g., **dtsadminuser**

```
Username : dtsadminuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dtsadmin**
- *Note: WildFly will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g, **dtsadmin**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- WildFly will prompt you to add the user to any groups. For the DTS administrator user, you will need to add to the "apelondtsadmin" and optionally "apelondts" groups, separated by a comma.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondtsadmin,apelondts
```

- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

- WildFly supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type "no" and press enter.

```
Is this new user going to be used for one AS process to connect to another AS process?
e.g. for a slave host controller connecting to the master or for a Remoting connection for server to
 server EJB calls.
yes/no? no
```

See the screen shot below to confirm:

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```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b

Enter the details of the new user to add.
Using realm 'ApplicationRealm' as discovered from the existing property files.
Username : dtsadmin
Password recommendations are listed below. To modify these restrictions edit the add-user.properties configuration file.
 - The password should be different from the username
 - The password should not be one of the following restricted values {root, admin, administrator}
 - The password should contain at least 8 characters, 1 alphabetic character(s), 1 digit(s), 1 non-alphanumeric symbol(s)
Password :
WFLYDM0102: Password should have at least 1 non-alphanumeric symbol.
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank for none)[  ]: apelondtsadmin,apelondts
About to add user 'dtsadmin' for realm 'ApplicationRealm'
Is this correct yes/no? yes
Added user 'dtsadmin' to file 'C:\AppServer\wildfly-12.0.0.Final\standalone\configuration\application-users.properties'
Added user 'dtsadmin' to file 'C:\AppServer\wildfly-12.0.0.Final\domain\configuration\application-users.properties'
Added user 'dtsadmin' with groups apelondtsadmin,apelondts to file 'C:\AppServer\wildfly-12.0.0.Final\standalone\configuration\application-roles.prope
rties'
Added user 'dtsadmin' with groups apelondtsadmin,apelondts to file 'C:\AppServer\wildfly-12.0.0.Final\domain\configuration\application-roles.propertie
s'
Is this new user going to be used for one AS process to connect to another AS process?
e.g. for a slave host controller connecting to the master or for a Remoting connection for server to server EJB calls.
yes/no? no
Press any key to continue . . .
```

### I.3.2 WildFly 12 DTS User Configuration

WildFly Application Users must be created for every individual who will connect to the ***Apelon DTS Server via either the DTS Browser or DTS Editor*** and ***will not require access to the DTS Editor User Manager***. These WildFly users must have the group **"apelondts".**
Go to `<WILDFLY12_HOME>\bin` and click on `add-user.bat` (or `add-user.sh` for Linux). Follow the steps below.

- Select Application User. Type **b** and hit **enter**

```
What type of user do you wish to add?
 a) Management User (mgmt-users.properties)
 b) Application User (application-users.properties)
(a): b
```

- Realm (**ApplicationRealm)** is used by default.
- Enter the desired Username. e.g, **dtsuser**

```
Username : dtsuser
```

- Enter the desired Password. The password cannot be same as the username. e.g., **dts**
- *Note: WildFly will prompt you if your password doesn't meet the recommended criteria. You may type "yes" and press "enter" to accept the password, despite this.*

```
WFLYDM0099: Password should have at least 8 characters!
Are you sure you want to use the password entered yes/no? _
```

- Re-enter Password. e.g., **dts**

```
Are you sure you want to use the password entered yes/no? yes
Re-enter Password :
```

- WildFly will prompt you to add the user to any groups. For the standard DTS users, you will need to add to the "apelondts" group.

```
What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank
 for none)[  ]: apelondts
```

- Type "**yes**" to add the user and hit **enter**.

```
About to add user 'dtsadminuser' for realm 'ApplicationRealm'
Is this correct yes/no? yes
```

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- WildFly supports an AS to AS configuration between multiple instances of the application server. When prompted if the user will be used to connect another AS process, for DTS purposes, you may type “no” and press enter.

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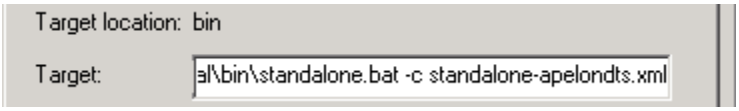
## I.4 Apelon DTS Server Deployment

19. Copy the **standalone-apelondts.xml** file from
    `<DTS_HOME>\server\wildfly\standalone\configuration`
    to the <**`WILDFLY12_HOME>\standalone\configuration`** folder.

20. Create a shortcut for **`<WILDFLY12_HOME>\bin\standalone.bat.`** Rename this to "Apelon DTS WildFly".

21. Right-click on the shortcut and go to Properties. Modify target as follows:

```
<WILDFLY12_HOME>\bin\standalone.bat -c standalone-apelondts.xml
```




23. Use this "Apelon DTS WildFly" shortcut for running WildFly configured for Apelon DTS.

24. For launching on Linux use the following command from terminal window:

    `<WILDFLY12_HOME>/bin/standalone.sh –c standalone-apelondts.xml`

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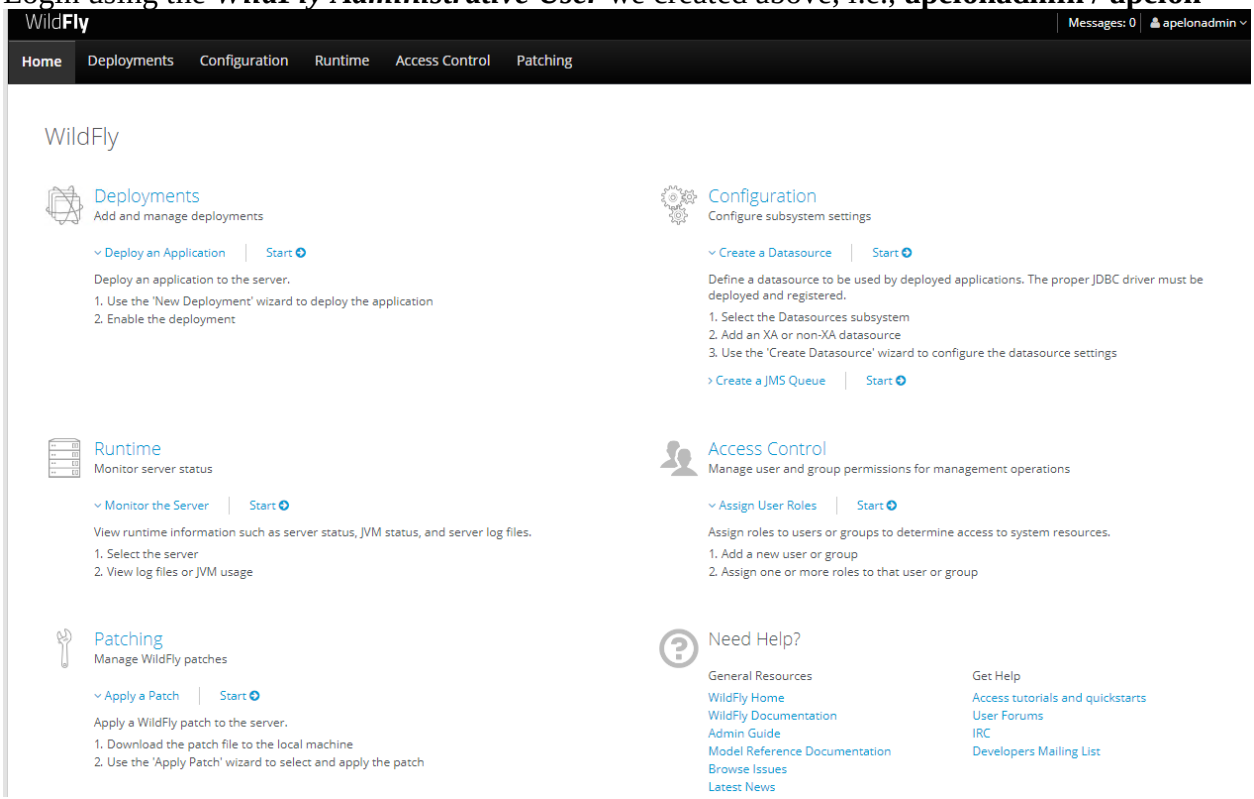
### I.4.1 Data Source Configuration

Apelon DTS Server requires a data source configured with WildFly to connect to the database. The necessary steps are:

- Deploy database driver.
- Configure data source.

### I.4.2 Deploy Database Driver

Start WildFly using the "Apelon DTS WildFly" shortcut for Windows (or from terminal window for Linux) created in the previous step. Open a browser and go to the default WildFly Management URL: `http://localhost:9990/console/App.html#home`
Login using the ***WildFly Administrative User*** we created above, i.e., **apelonadmin / apelon**




If your view does not display as shown above, refresh your browser.

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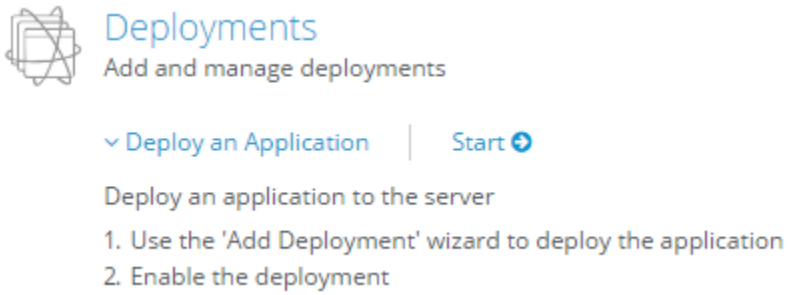
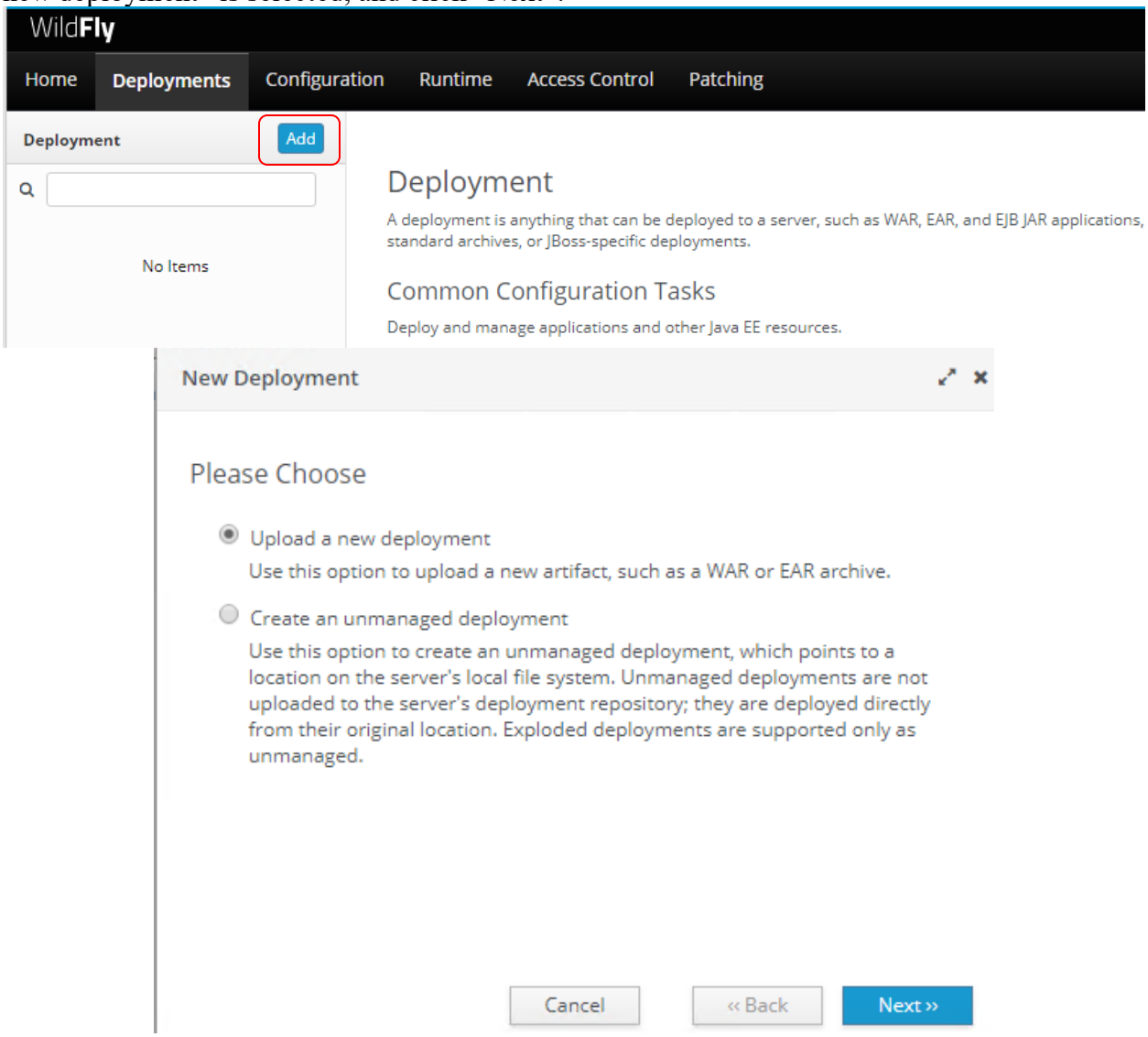
Then Under the “Deployments” header, next to “Deploy an Application” click on the Start arrow.




Then click on the **Add** button in the upper left. In the next pop up window, ensure “Upload a new deployment” is selected, and click “Next”.

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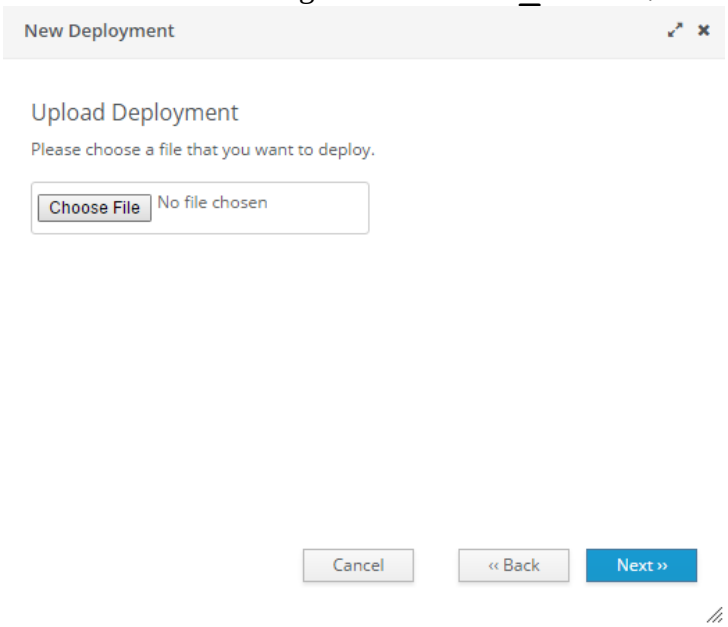
Click the **`Choose File`** button and navigate to the **`<DTS_HOME>\lib`** folder.




Select a Driver .jar file for the database as given below.

- ***Note:*** *For Oracle 12c see* *Oracle 12c PGA_AGGREGATE_LIMIT*

| Database | Driver |
|---|---|
| **Oracle 12c** | ojdbc7-4.1.jar |
| **MS SQL Server 2016** | mssql-jdbc-9.4.1.jre8.jar |
| **MS SQL Server 2019** | mssql-jdbc-9.4.1.jre8.jar |
| **MySQL 8** | mysql-connector-java-8.0.29.jar |
| **MySQL 5.6** | mysql-connector-java-8.0.29.jar |

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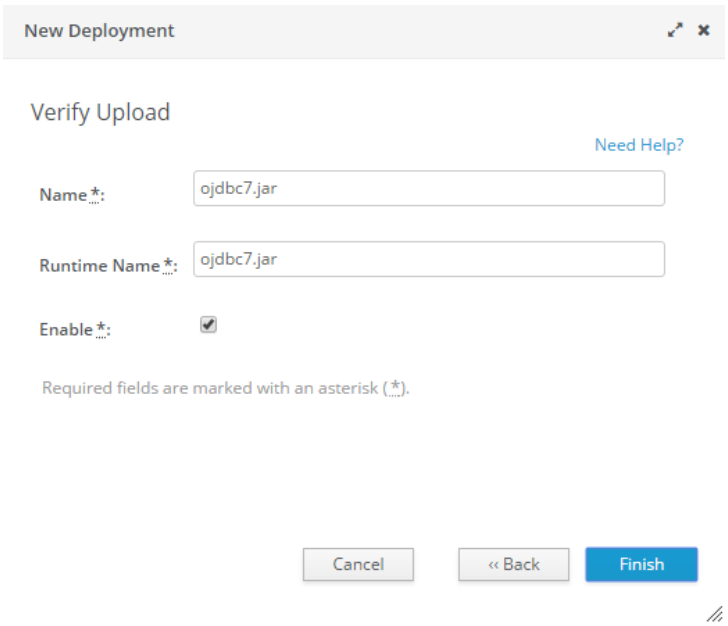
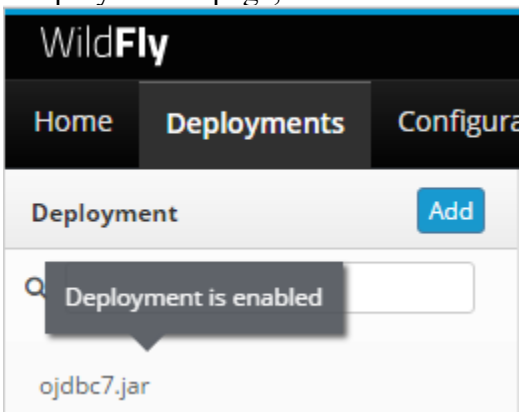
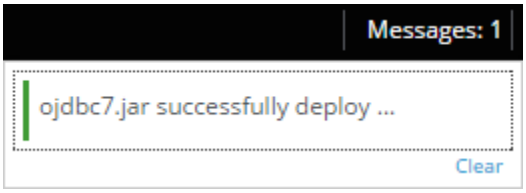



Ensure the **`Enable`** box is checked, and click "Finish".
Verify the presence of the .jar deployment by seeing it on the list on the left of the "Deployments" page, and the confirmation message from WildFly.




### I.4.3 Configure Data Source

The Apelon DTS Server requires a data source named "**ApelonDtsDS**". This data source must be set up similar to the examples given below (*ensure the appropriate User, Password, and database name are used if they are not the default "dts4" used as an example in this documentation*).

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

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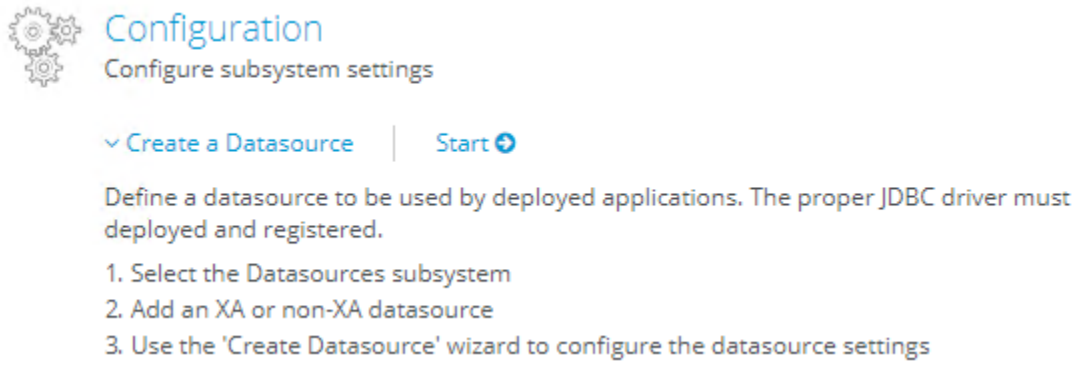
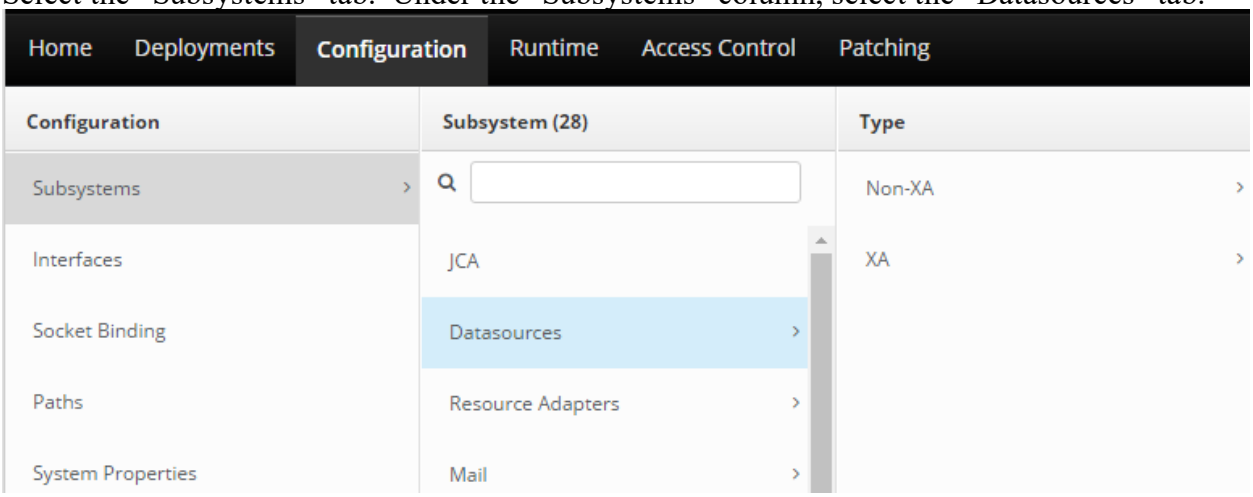
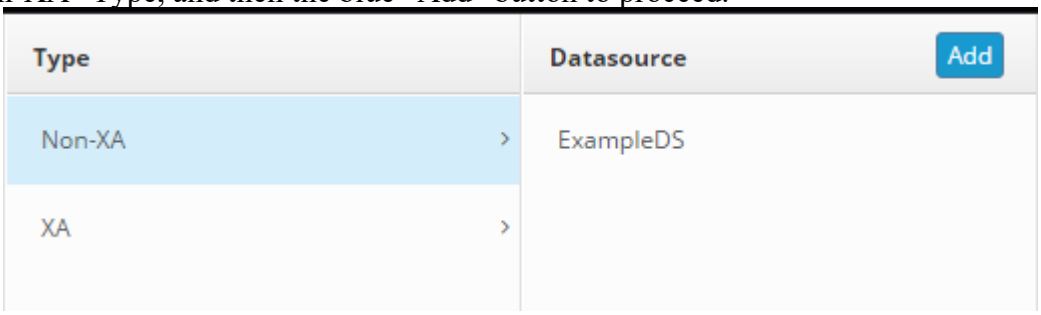
To create the **`ApelonDtsDS`** data source, navigate back to "Home" in the WildFly administration console, and under the "Configuration" header, select the Start arrow next to "Create a Datasource":




Select the "Subsystems" tab. Under the "Subsystems" column, select the "Datasources" tab.




The ApelonDtsDS datasource should be created as a non-cross-application datasource. Select the "Non-XA" Type, and then the blue "Add" button to proceed.




In the next popup, select the database type for your Datasource (Oracle, MySQL, Microsoft SQLServer) and click next.

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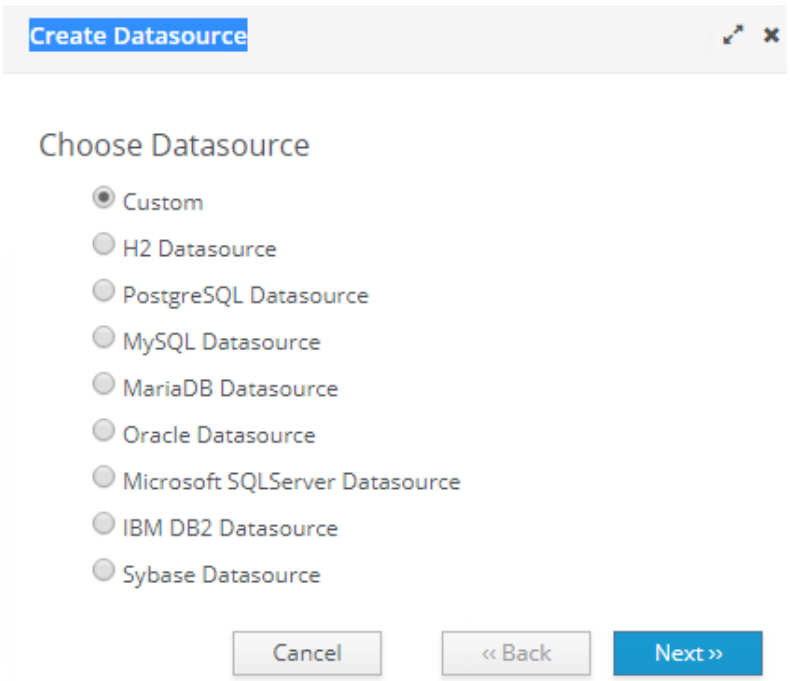
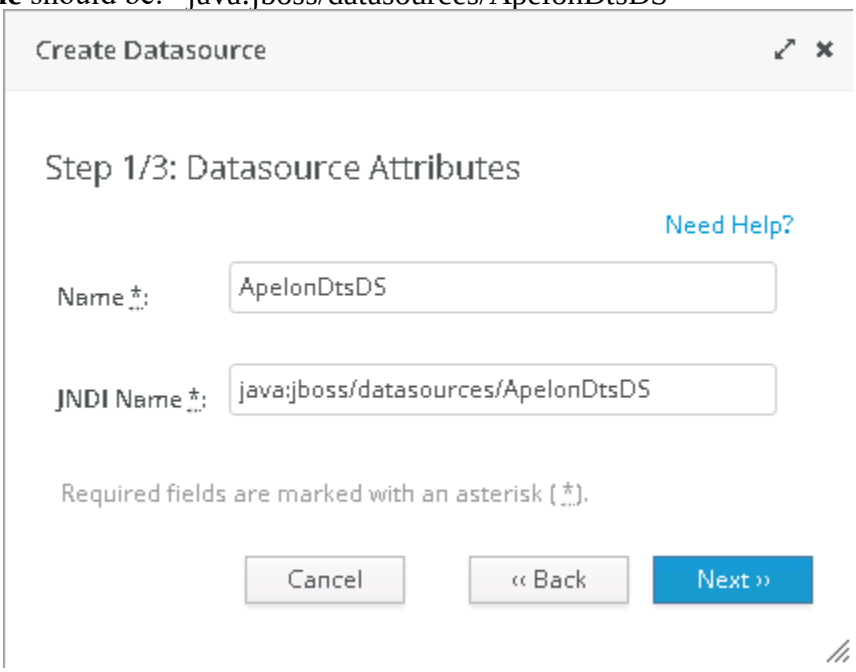



Edit the Datasource Attributes **Name** and **JNDI Name** (*Note: these values are Case-Sensitive*).
The **Name** should be: "ApelonDtsDS"
The **JNDI Name** should be: "java:jboss/datasources/ApelonDtsDS"




In the next window, select "Detected Driver" and choose the database driver you added to WildFly in the previous step, and hit "next".

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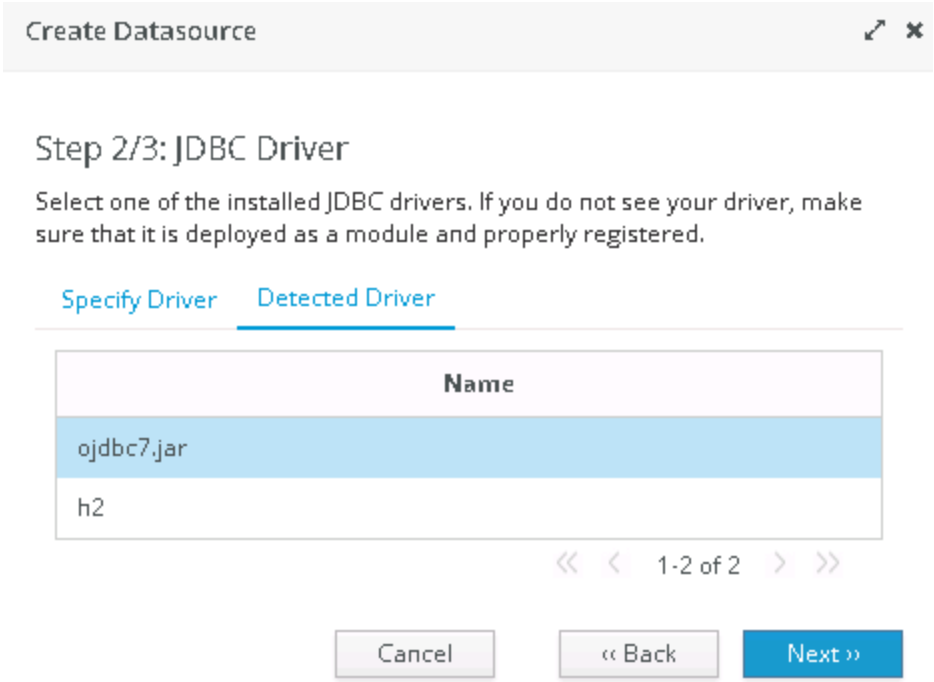


On the next window, enter the appropriate Connection URL, Username, and Password for your database environment. Examples are again presented below, but you should enter the parameters which are correct for your database.

| Database | User | Password | Connection URL |
|---|---|---|---|
| **Oracle** | dts4 | dts4 | jdbc:oracle:thin:@localhost:1521:ORCL |
| **MS SQL Server** | dts4 | dts4 | jdbc:sqlserver://localhost:1433;databasename=dts4 |
| **MySQL** | dts4 | dts4 | jdbc:mysql://localhost:3306/dts4 |

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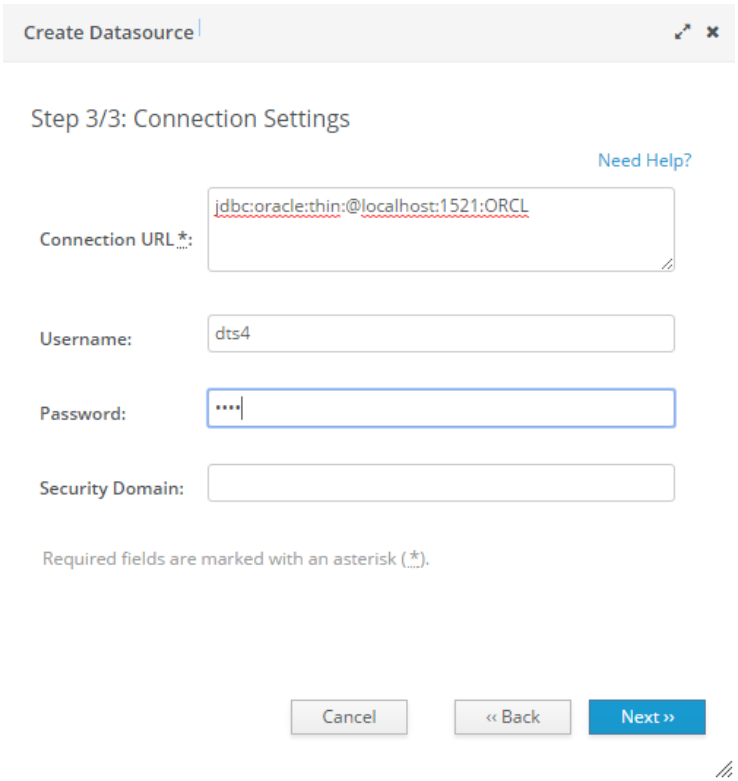
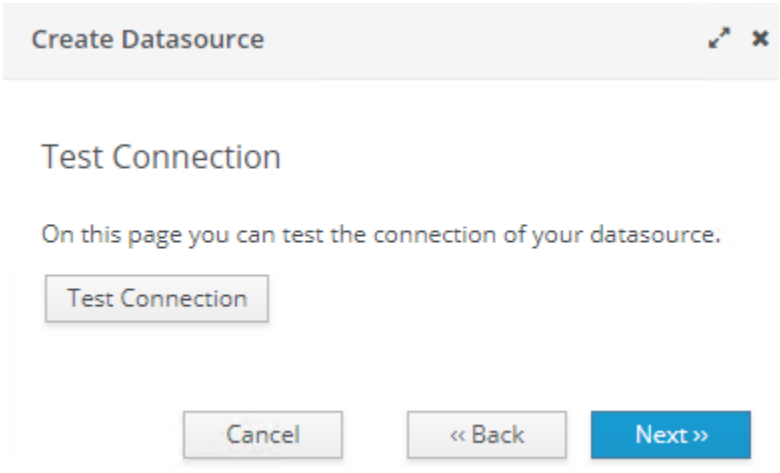



The next window will provide a Test Connection option. Click on the "Test Connection" button to ensure the above entered connection settings are valid. If the connection test is successful click "Next". If the connection test fails click "Back" and correct the connection settings.




On the next window, WildFly will provide you a summary of the Datasource settings. Click "Finish" to accept, or "back" to make any revisions.

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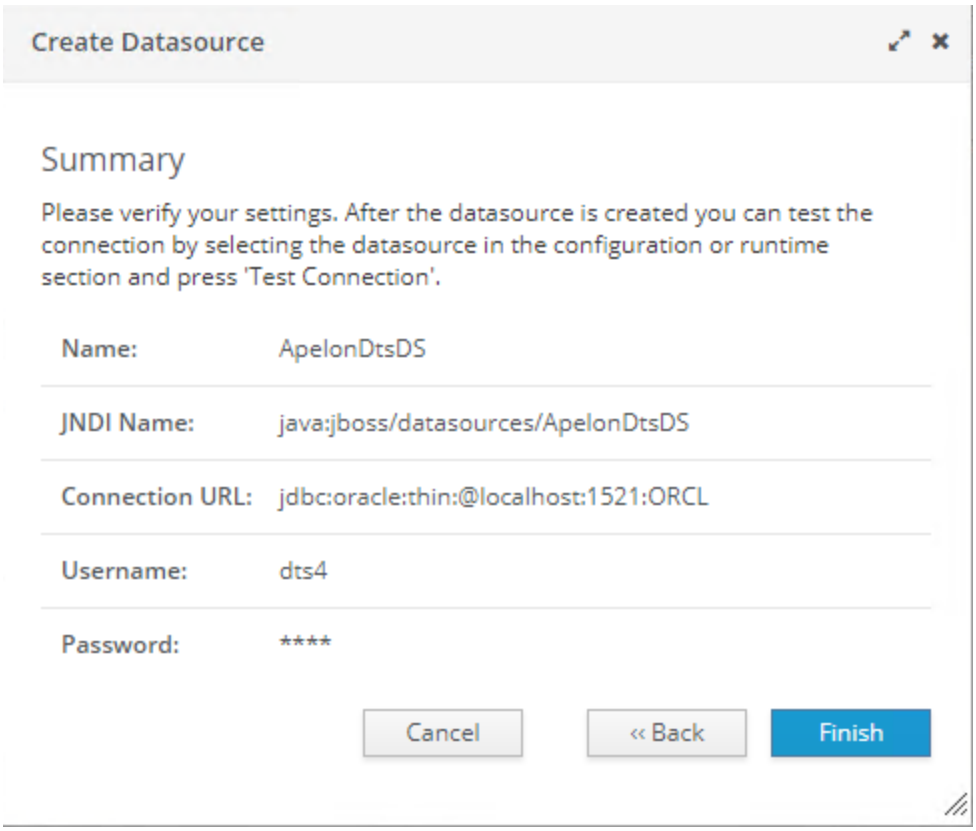
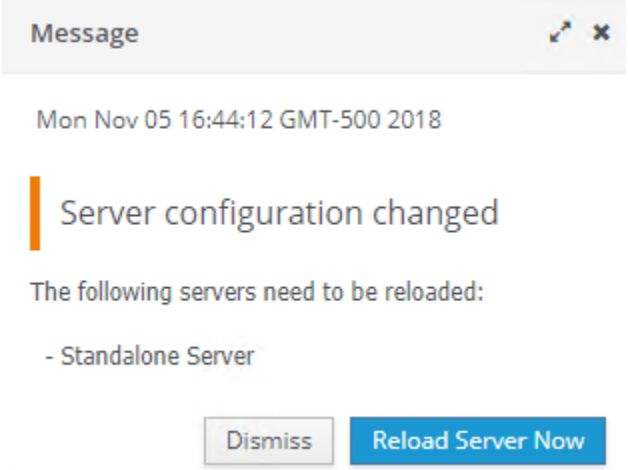



After clicking "Finish" a message will be displayed indicating the server configuration changed and to reload the server. Click "Reload Server Now".




You should receive a message that the Server was successfully loaded.
Now that the Datasource has been created, you may test the connection once again, from the dropdown next to it from the "Datasource" column in the "Configuration" tab.

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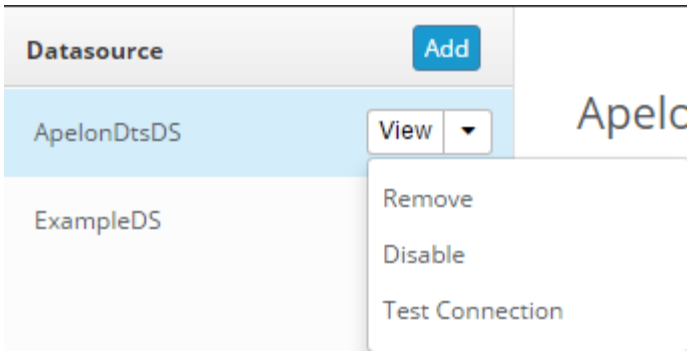
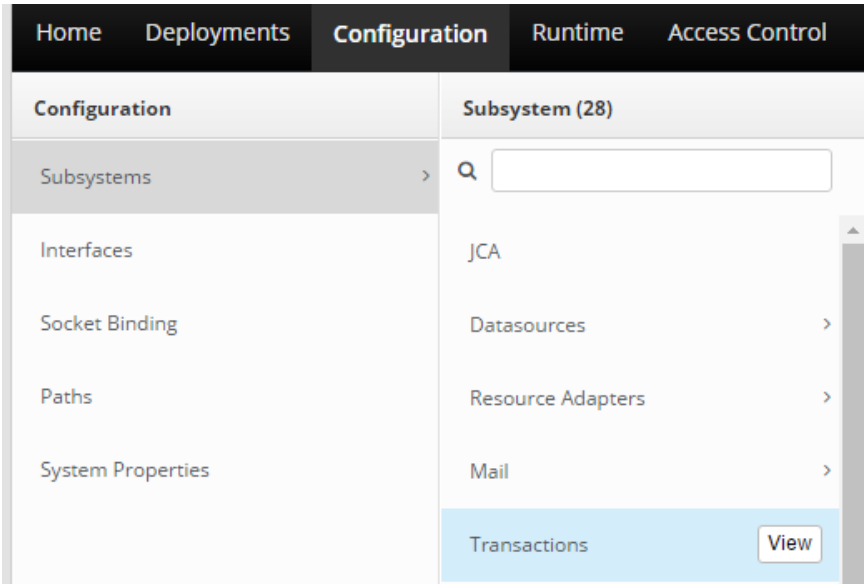



Ensure the connection test is successful before continuing.

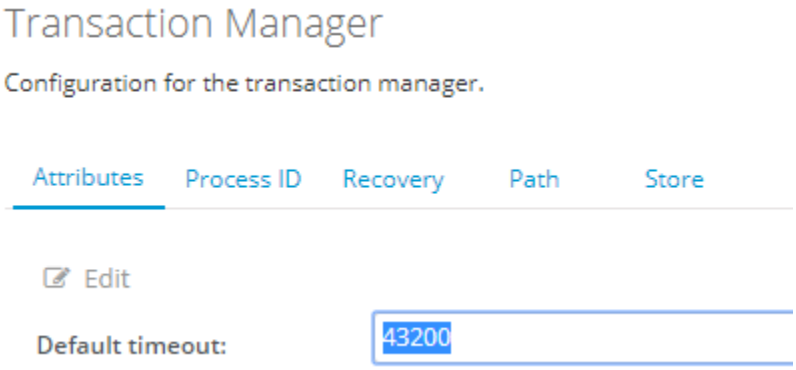
## I.5 Check WildFly Transaction Timeout Default

The WildFly Transaction Timeout Default is **set to 43200 seconds** to accommodate long running DTS transactions.

To edit or view the WildFly Transaction Timeout Default, from the "Configuration" tab select "Subsystems">"Transactions" and click "View".




Then click "Edit" and enter the new timeout value.

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Then click “Save”.  The WildFly server must be restarted for the change to take effect.

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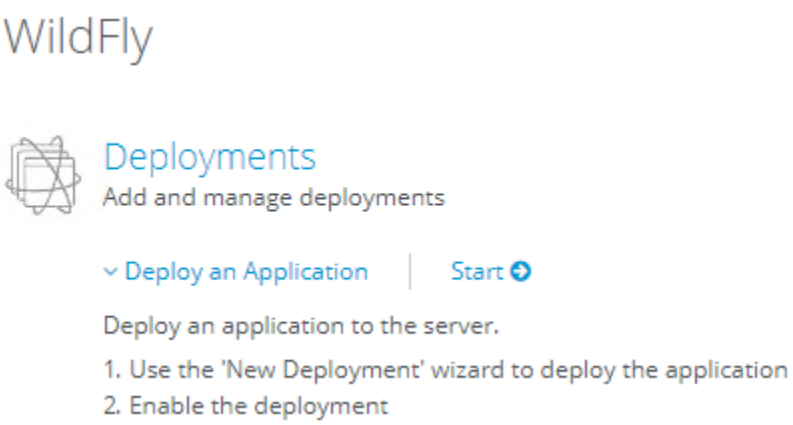
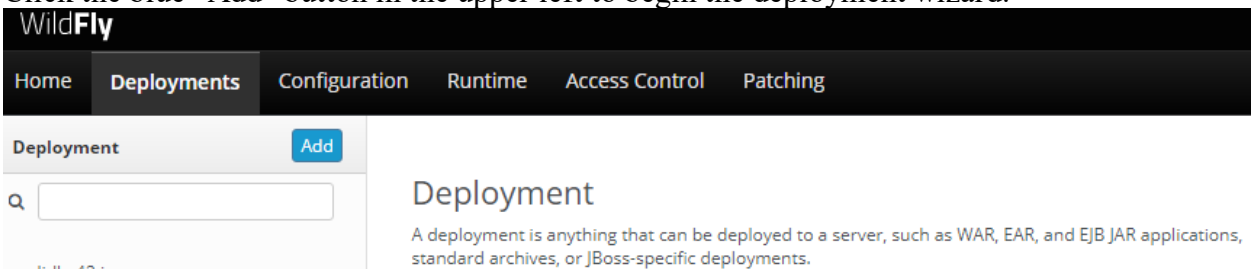
## I.6 Deploy Apelon DTS Server

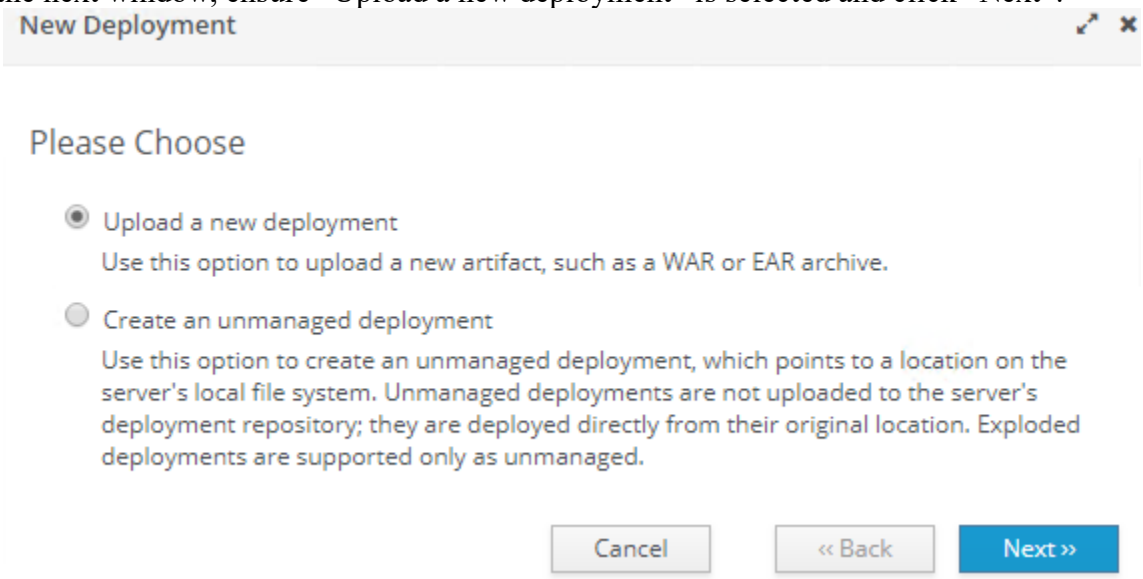
To deploy the Apelon DTS Server EAR file, click the Start arrow next to "Deploy an application" under the Deployments header from the Home tab.




Click the blue "Add" button in the upper left to begin the deployment wizard.




On the next window, ensure "Upload a new deployment" is selected and click "Next".




Click on "Choose File" to navigate to the `<DTS_HOME>\server\wildfly\standalone\deployments` directory and select

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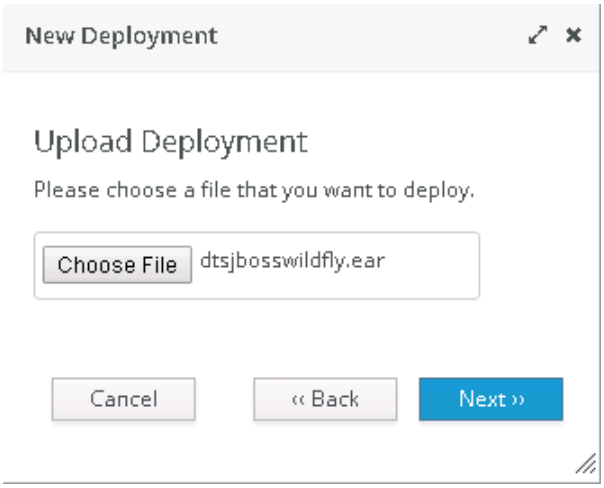
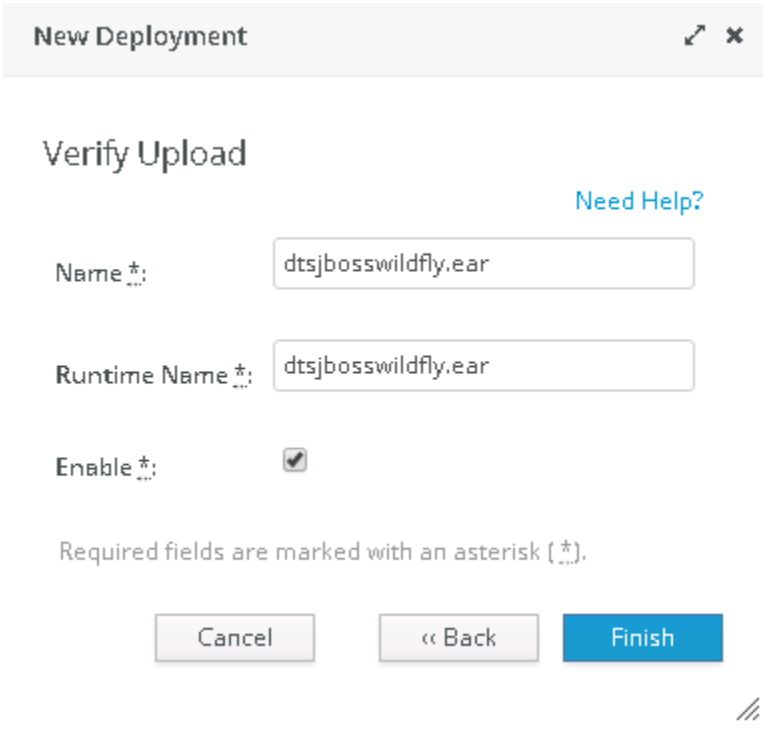
**`dtsjbosswildfly.ear`** (This is not a typo, WildFly is in reality the next iteration of JBoss, and as such the .ear file and deployed application still contain "jboss" in the name).
**NOTE:** For **Microsoft SQL Server** a `dtsjbosswildflyforsqlserver.ear` file that is specific to Microsoft SQL Server must be used.

- The SQL Server specific "`dtsjbosswildflyforsqlserver.ear`" file is in the following location:
  `<DTS_HOME>\server\wildfly\standalone\deployments\sqlserver\`




In the next window ensure the "Enable" check box is checked and then click "Finish".




WildFly will report that the deployment is in process.
****IMPORTANT****
**In the case of upgrading an earlier DTS schema version, Do Not Restart WildFly 12 until**

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**the Deployment has completely finished and you have verified that the Database Schema is fully deployed to the correct version (See section: Upgrade Apelon DTS 4.7.0 - 4.7.2 WildFly 12 Server & schema to DTS 4.8.0). Once the correct schema version is verified, SHUT DOWN and RESTART the WildFly server to ensure the changes are integrated.**

## I.7 Verify DTS Browser & Editor connections to WildFly 12 DTS Server

### I.7.1 Verify the DTS Browser

You can access the DTS Browser from: http://localhost:8080/dtsserverws.
To login to the DTS Browser, you will need to enter user credentials created in the WildFly 12 Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in the guide, the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.

### I.7.2 Verify the DTS Editor connection

Run the DTS Editor shortcut ( DTS Editor ) provided by the DTS 4 installation.
Connect to the WildFly 12 server by using an **Instance** of '**dtsjboss**' and default **Port** number '**8080**' along with the user credentials created in the WildFly 12 Configuration for Apelon DTS Server section.
**Note:** If you used the example users defined in this guide the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.
Click "Connect".

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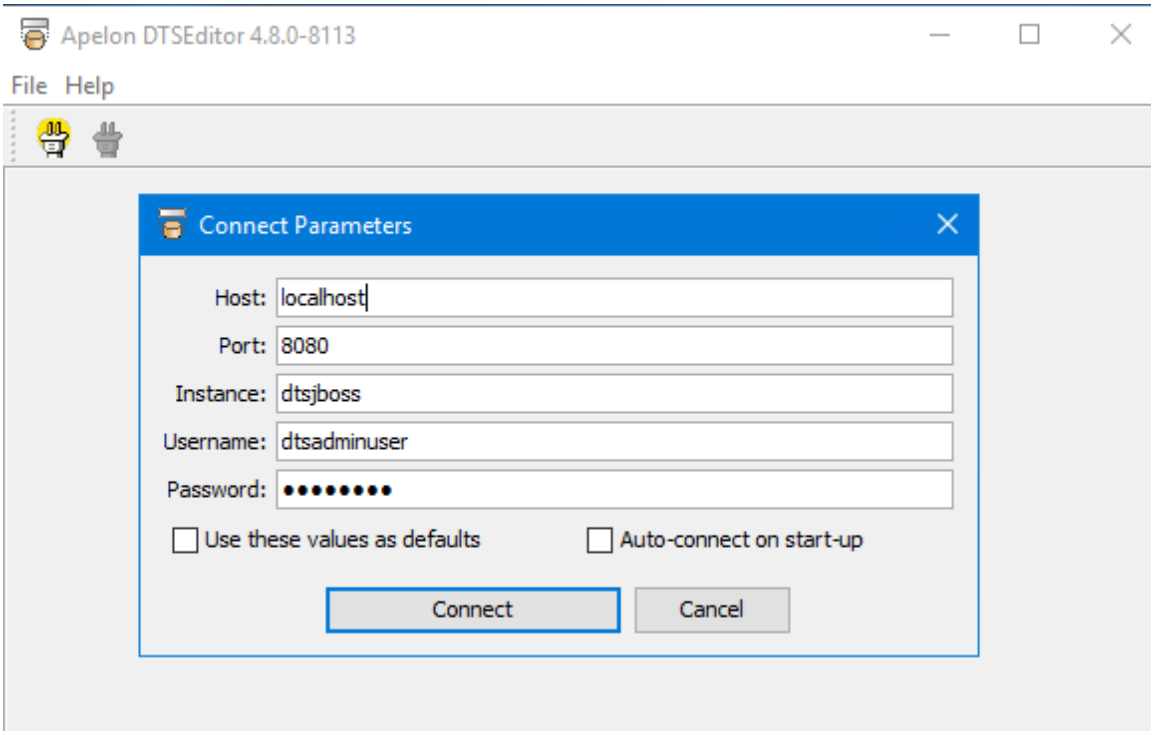


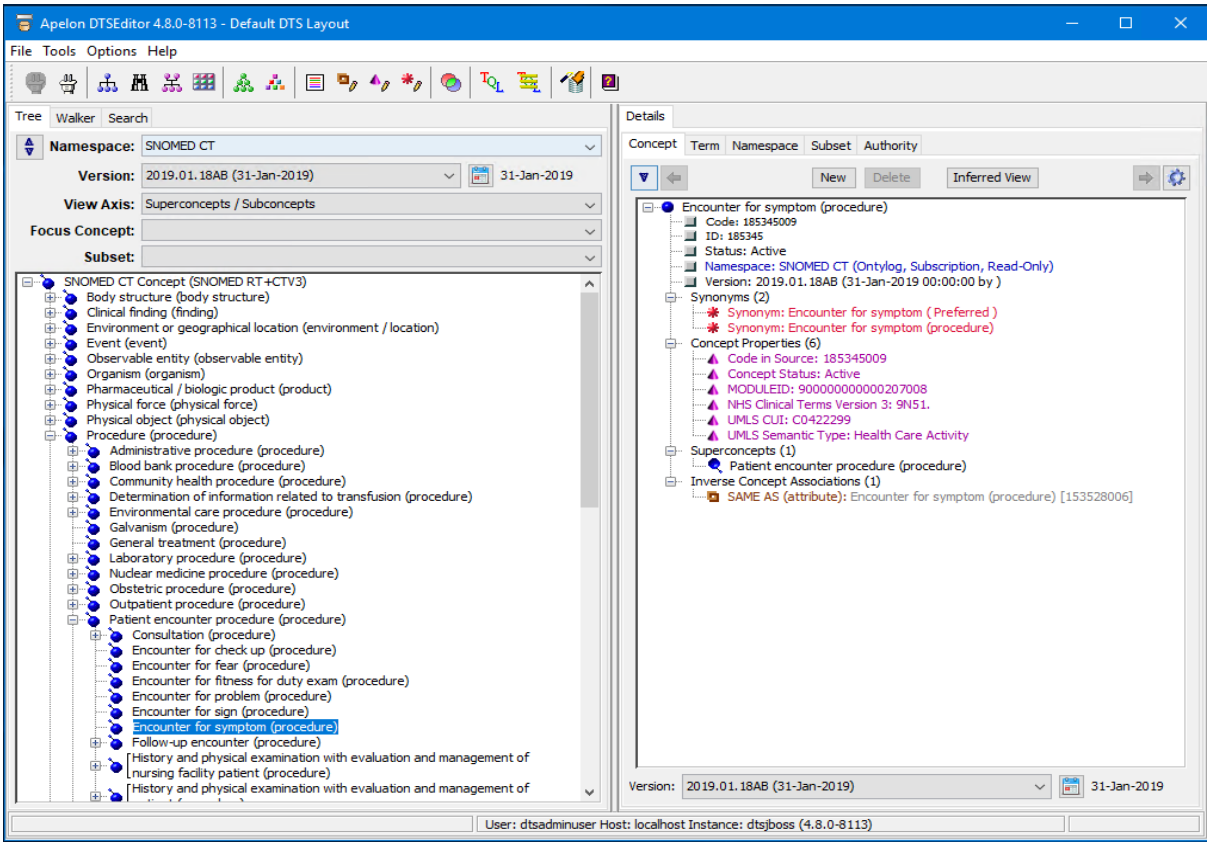


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## I.8 Setup WildFly 12 and DTS to start as a Windows Service

Follow these steps to get your WildFly 12 server running as a windows service.

1. Copy the **service** directory from **<WILDFLY12_HOME>\docs\contrib\scripts** to **<WILDFLY12_HOME>\bin**

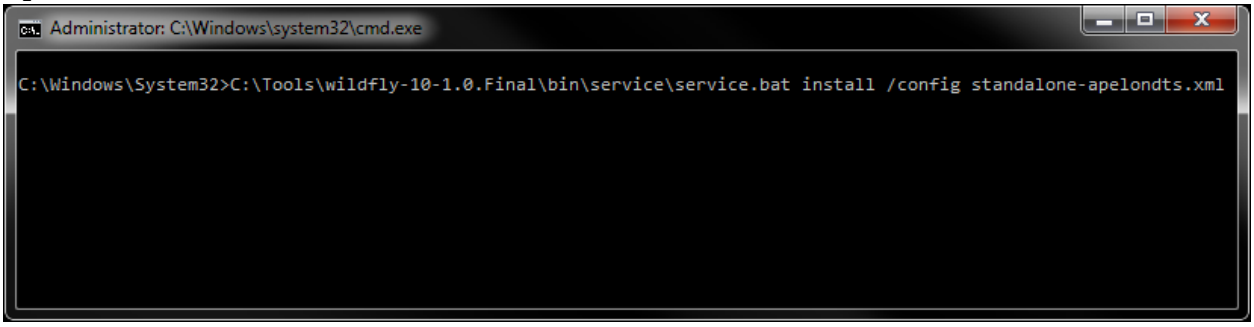
2. Edit service.bat file and set the windows service variables.
e.g.:
**set SHORTNAME=DTS4WildFly12**
**set DISPLAYNAME=DTS4_WildFly12**
**set DESCRIPTION=DTS4 WildFly12 Application Server**

*Note1: If present, please be sure to remove the quotations surrounding the Description value.*
*Note2: If the JBoss Management Port Number specified in the **standalone-apelondts.xml** provided by DTS4 is changed (i.e. from* `jboss.management.http.port:9990` *to* `jboss.management.http.port:XXXX`*), then the Controller Port Number specified in the **services.bat** found in the following line must be changed to match the JBoss Management Port Number:*

```
CONTROLLER=localhost:9990
```

3. Open a command prompt (as administrator) and change directory to the **<WILDFLY12_HOME>\bin\service** directory.

8. Issue the command: `service.bat install /config standalone-apelondts.xml`




If the command return is a success you will be able to manage your WildFly 12 AS from the windows services console.

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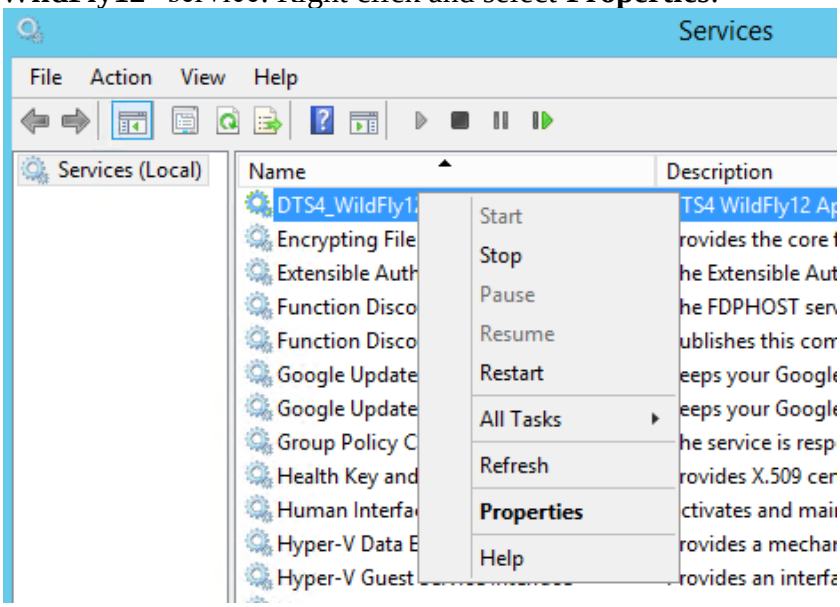
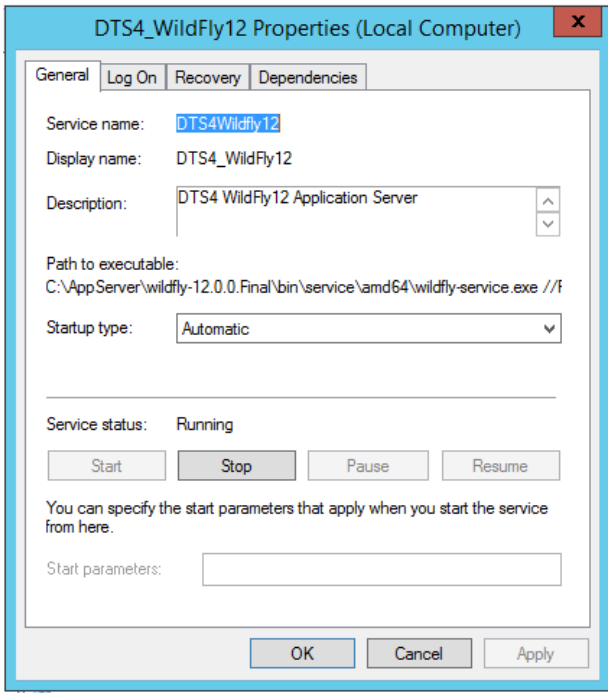
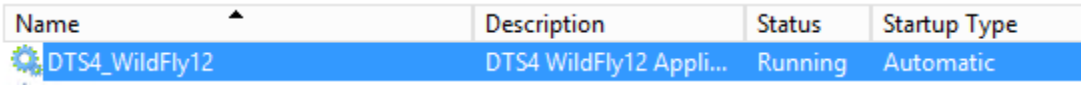
9. From the Windows Start menu choose **Administrative Tools > Services** and select the "**DTS4_WildFly12**" service. Right click and select **Properties**.




10. Perform the following:
    Set the *Startup type* to **Automatic or Automatic (Delayed Start)**
    **Start** the Service.
    Click **Apply**
    Click **OK**




11. The **"DTS4_WildFly12"** service is now **Running** and set to **Automatic**.

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## I.9 Setup WildFly 12 and DTS to start as a Linux Service

To install DTS as a daemon service on Linux, you will need to copy and configure the service launching scripts that are included with WildFly 12.

Follow this procedure to configure the service.

10. Create a new user which will be used to launch the service. For example:
    ```
    => useradd -r -d /tmp/ jbossas
    ```

11. The `jbossas` user needs to have permission to read, write and execute to the path where WildFly 12 was installed. One option to grant this permission is to change the ownership of the WildFly 12 installation folder to the new user that was created. For example:
    ```
    => chown -R jbossas /opt/wildfly-12.0.0.Final/
    ```

12. Optionally change the group membership of the WildFly 12 installation folder to the newly created user. For example:
    ```
    => chgrp -R jbossas /opt/wildfly-12.0.0.Final/
    ```

    Alternatively, add the jbossas user to a shared users group, and change the group of the WildFly 12 installation folder to this shared group.

13. Copy the "**<WildFly 12 Installation>/docs/contrib/scripts/init.d/wildfly.conf**" file to the folder "**/etc/default**" and rename it to just "**wildfly**". For example:
    ```
    => cp /opt/wildfly-
    12.0.0.Final/docs/contrib/scripts/init.d/wildfly.conf
    /etc/default/wildfly
    ```

14. Add or update the following lines in the newly created "**/etc/default/wildfly**" file, customizing as necessary for your installation.

```
# The username that should own the process
JBOSS_USER=jbossas

## The amount of time to wait for startup
STARTUP_WAIT=90

# The installation path of JBoss
JBOSS_HOME=/opt/wildfly-12.0.0.Final

# The name of the server config file to use for your Database.
JBOSS_CONFIG=standalone-apelondts.xml
```

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15. Copy the "**<WildFly 12 Installation>/docs/contrib/scripts/init.d/wildfly-init-redhat.sh**" file to the folder "**/etc/init.d**" and rename it to "**wildfly**"
```
=> cp /opt/wildfly-12.0.0.Final/docs/contrib/scripts/init.d/wildfly-init-redhat.sh /etc/init.d/wildfly
```

16. Modify the file "**<WildFly 12 Installation>/bin/standalone.conf**" to specify the Java JVM to use during when the service starts. Add a `JAVA_HOME` parameter to your file, customizing as necessary for your installation. Note – this parameter may already exist in the file – if it does – you can either modify the existing one, or comment it out. For example:

```
# Specify the location of the Java home directory.
#If set then $JAVA will be defined to $JAVA_HOME/bin/java, else
#$JAVA will be "java".
#
#JAVA_HOME="/opt/java/jdk"
JAVA_HOME=/opt/java/jdk1.8.0_131
```

17. Create the necessary links to the **/etc/init.d/wildfly** script so it starts and stops at the appropriate runlevels.
```
=> chkconfig wildfly on
```

18. The server is now configured to automatically start and stop with the system. To manually start the server, execute:
```
=> /etc/init.d/wildfly start
```

To manually stop the server, execute:
```
=> /etc/init.d/wildfly stop
```

To check the status of the server, execute:
```
=> /etc/init.d/wildfly status
```

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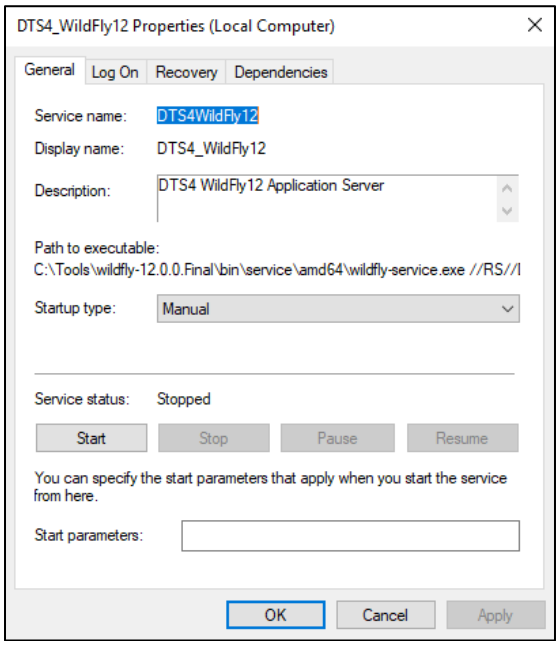
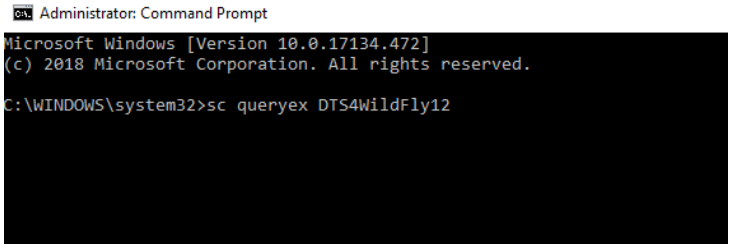
## I.10 Terminating the WildFly 12 Service using taskkill

Stopping the WildFly 12 Service in the Services Window sometimes does not shut down in a timely manner, sometimes returning an error that the service is not responding. In this case, using a taskkill command to terminate the service is an effective way of circumventing this Services issue. Here are the instructions for doing so:

19. In the Services Window, right-click on the WildFly 12 Service and choose Properties.
20. In the Properties Window, identify the Service Name and copy it.




21. Open a Command Window and type the following: `sc queryex [Service Name]`




22. This should produce information about the WildFly 12 Service, including the PID.
23. Type the following in the Command Window: `taskkill /pid [PID] /f`

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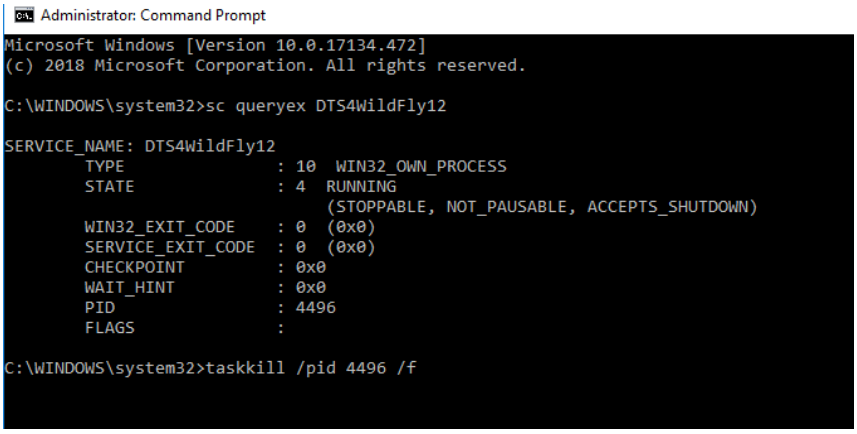
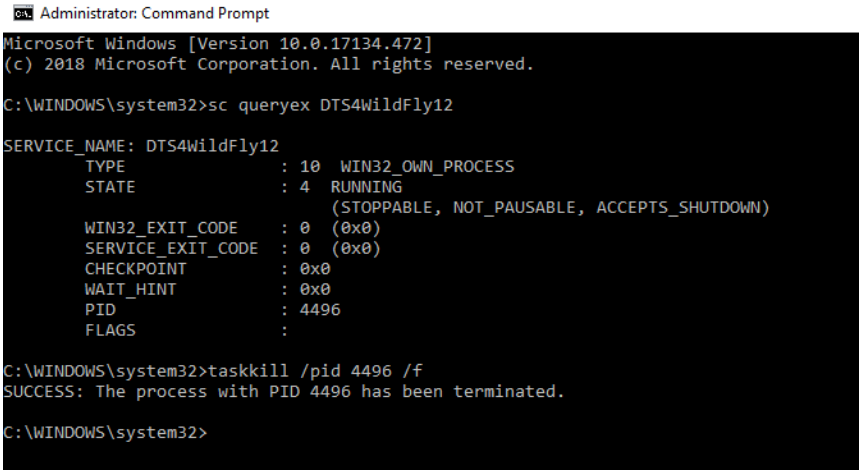



24. The Service should be terminated, as confirmed by the following message:

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## I.11 Upgrade Apelon DTS 4.7.0 - 4.7.2 WildFly 12 Server & schema to DTS 4.8.0

Perform the following steps to upgrade your Apelon DTS 4.7 WildFly 12 schema to Apelon DTS 4.8.0 WildFly 12 **(Note: DTS 4.7.1 and DTS 4.7.2 have the same schema version as DTS 4.8.0)**:

- Follow instructions in Section B for installing DTS 4.8.0 on the server to be upgraded.
- Stop the Apelon DTS WildFly 12 service.
- Copy the WildFly 12 configuration file from the DTS 4.8.0 home directory `<DTS_HOME>\server\wildfly\standalone\configuration` to the **<WILDFLY12_HOME>\standalone\configuration** folder. Replace the existing file with this new WildFly 12 configuration file.
- Restart the Apelon DTS WildFly 12 service.
- Review the Notes below before continuing to the next steps.
- Follow steps **I.4.2**(Deploy Database Driver) through **I.7**(Verify DTS Browser & Editor connections to WildFly 12 DTS Server) to finish configuring the Apelon DTS 4.8.0 WildFly 12 server.
- **NOTE1:** If upgrading from a DTS 4.7.0 schema to DTS 4.8.0, as instructed in section **I.6(**Deploy Apelon DTS Server**),** when deploying the "**dtsjbosswildfly.ear**" **Do NOT shut down or restart the WildFly 12 service while the schema is being upgraded**. This step could take some time, especially when upgrading DTS schemas in MySQL and SQL Server.
- **To verify the correct DTS 4.8.0 schema version, perform the following steps:**
    1. View the "server.log" file located in the **<WILDFLY12_HOME>\standalone\log** directory. Search the WildFly 12 "server.log" file for the statement:
        - "Schema Upgrade to 4.0.29 complete" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
        - "Schema Upgrade to 4.0.30 complete" – for MySQL 5.6 or MySQL 8.
    2. A second way to determine the schema upgrade was successful is from the DTS 4.8.0 DTS Editor.
        - Connect to the Apelon DTS WildFly 12 server.
        - Once the connection is established choose: **Help>About Apelon DTSEditor…**
        - In the help window that is launched click on the "*Details>>*" label. In the "Server Configuration:" section is displayed a "schema.version" value. The schema version should read:
            - "4.0.29" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
            - "4.0.30" – for MySQL 5.6 or MySQL 8.
- **NOTE2 - SQL Server Schema Upgrade:** If upgrading from a version older than DTS 4.4, not only may the SQL Server schema upgrade to version 4.0.29 take up to or longer than an hour, it may also require about as much available drive space for its database log

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file as is being used by the database prior to the schema upgrade. Consult with your SQL Server Database Administrator regarding the available drive space and the possibility of shrinking the database log after the schema is successfully upgraded to version 4.0.29.

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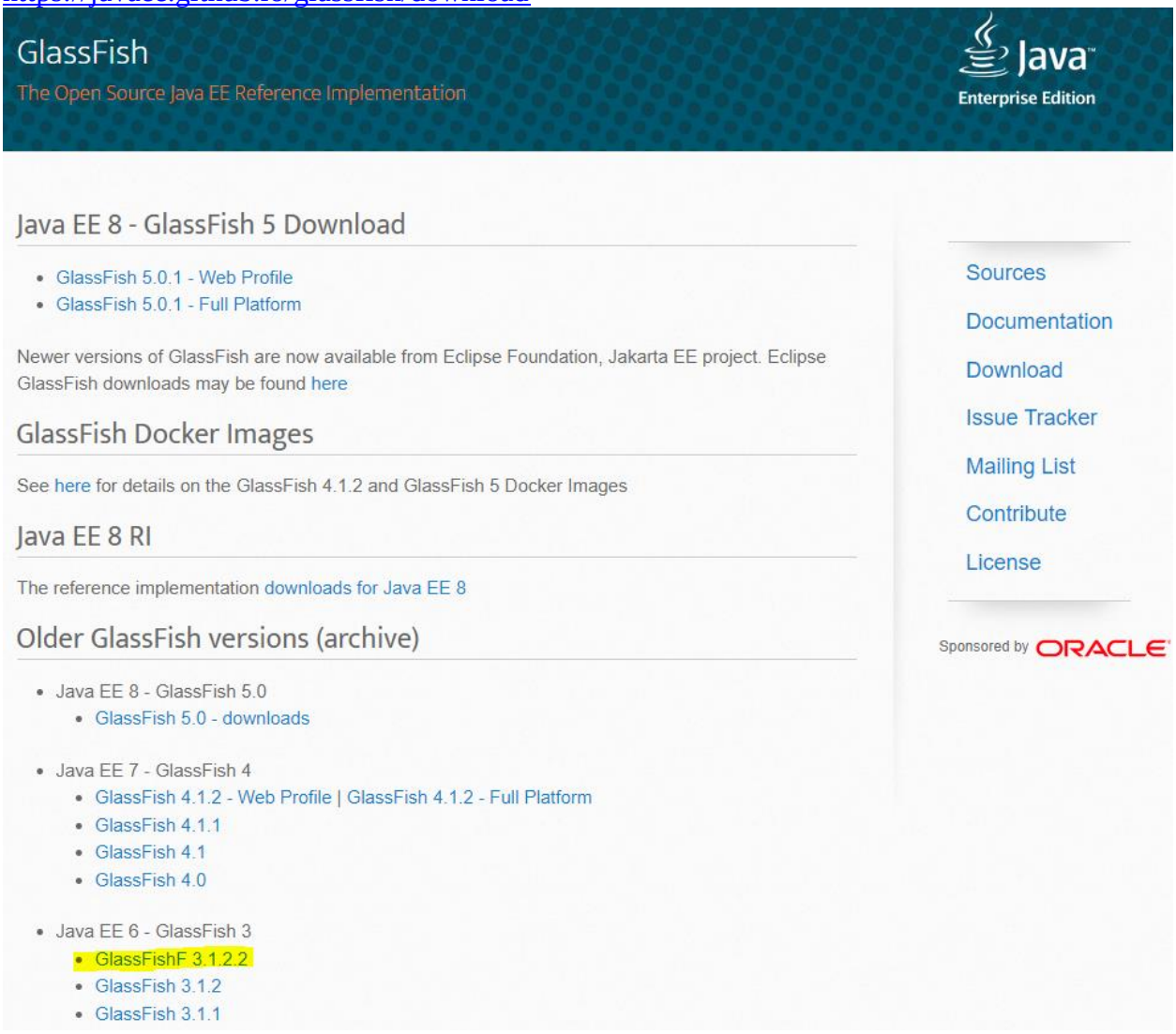
# J. GlassFish 3 Setup

***Note: GlassFish 3.1.2.2 12 requires the use of Java 8 JDK. See Java Environment Setup for a Server section above for additional details.***

## J.1 Install GlassFish

The DTS Server can be installed on the 3.1.2.2 series of the GlassFish Full Platform server. The GlassFish 3.1.2.2 installation package can be obtained from the GlassFish download site: https://javaee.github.io/glassfish/download




**Note – the 5.0 and 4.0 GlassFish series are not supported.**

Choose to download the "**glassfish-3.1.2.2.zip**" file which can be used for both Windows and Linux installations. You can follow this direct link to the "**glassfish-3.1.2.2.zip**" file: https://download.oracle.com/glassfish/3.1.2.2/release/index.html

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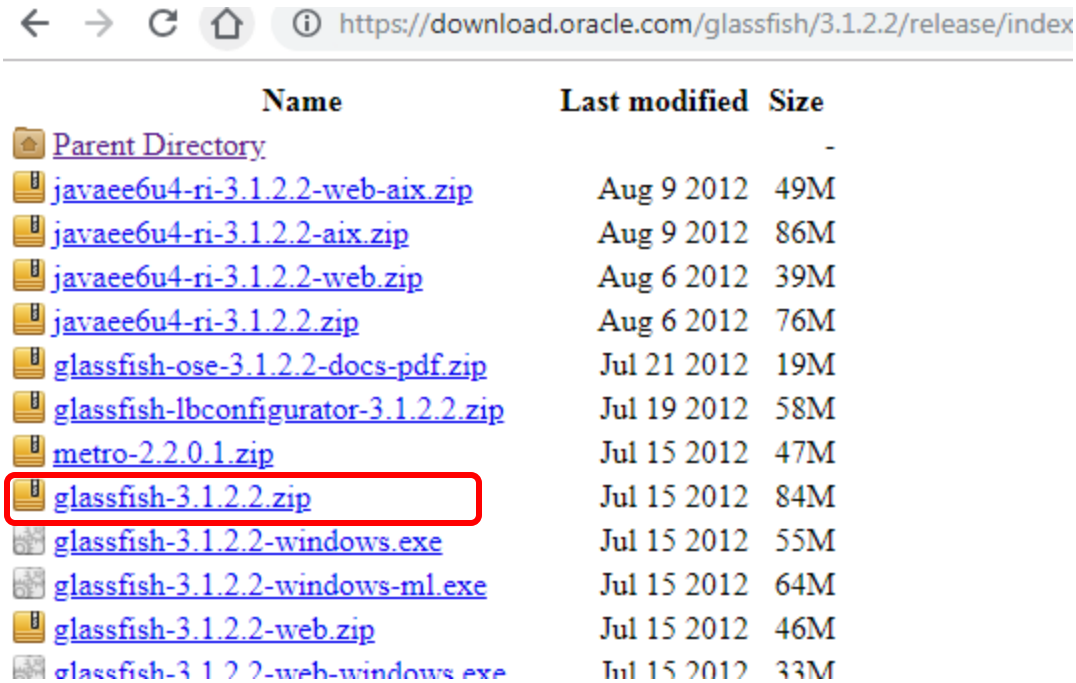


Just extract the compressed archive. **Unzip the "glassfish-3.1.2.2.zip" into a folder with a pathname that does NOT contain any spaces.** For example, extracting to the `C:\Tools` folder will place the GlassFish 3.1.2.2 files in the `C:\Tools\glassfish3` folder. We will identify this folder in the rest of the document as <GlassFish_HOME>.

**NOTE:** Using **Java 8** you will need to make the following additional edits:
Modify the **osgi.properties** file located in **…\glassfish3\glassfish\config**
Add the following line at the end:

```
jre-1.8=${jre-1.7}
```

Save and close this file.

Launch GlassFish by running this command in a console window:

```
glassfish3\bin\asadmin start-domain
```

Open http://localhost:4848 to validate that it is started.

## J.2 Install Database Driver

Copy the correct database driver for your installation into the folder **<GlassFish_HOME>\glassfish3\glassfish\domains\domain1\lib\ext** from the **<DTS_HOME>\lib** folder.
The driver you need is dependent on the database software that you are using.

- Oracle 12c
  - ojdbc7-4.1.jar
- Microsoft SQL Server 2016:
  - `mssql-jdbc-9.4.1.jre8.jar`
- Microsoft SQL Server 2019:

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    - mssql-jdbc-9.4.1.jre8.jar
- MySQL 8
    - mysql-connector-java-8.0.29.jar
- MySQL 5.6
    - mysql-connector-java-5.1.24.jar (**NOTE:** located in **<DTS_HOME>\server\GlassFish\lib\ext**)

Restart the GlassFish Server so that the new libraries are available.

```
glassfish3\bin\asadmin stop-domain
glassfish3\bin\asadmin start-domain
```

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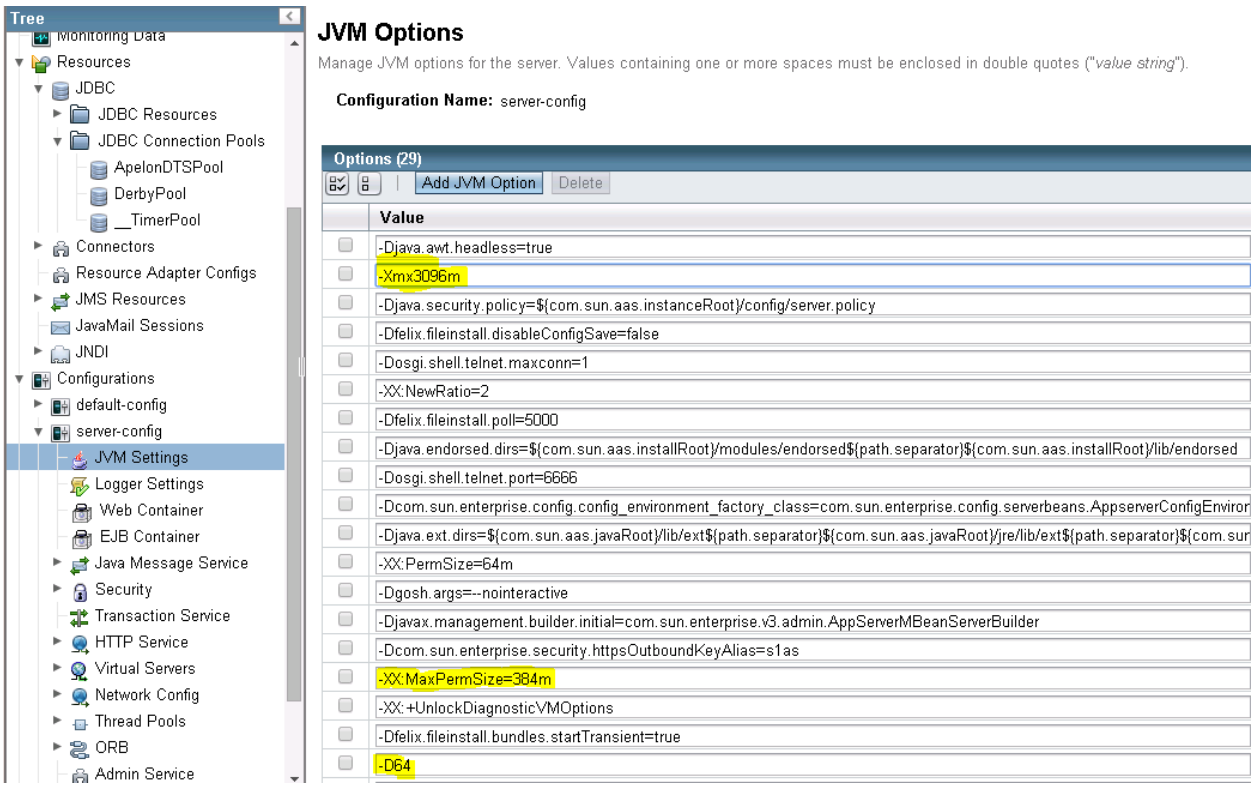
## J.3 JVM Memory Configuration

In the administrative application available at http://localhost:4848 browse to the **Configurations > server-config > JVM Settings** section.
Make the following changes in the **JVM Options** tab:

- Change MaxPermSize option to 384m ( -XXMaxPermSize=384m).
- Change Max heap to 4096m (–Xmx4096m). (*see notes below regarding recommended JVM memory allocations.*)
- In order for GlassFish to operate in 64 bit mode and utilize a memory limit higher than 2048m, you must also add a new JVM Option of '–D64'.
- Click Save.

***NOTE:*** *We recommend a memory limit of at least 4GB. If your DTS environment will be running Modular Classification, you will require a larger allocation to your JVM. On systems utilizing Modular Classification with 16 GB of RAM or more a setting of at least 8GB (4 GB min) is recommended.*

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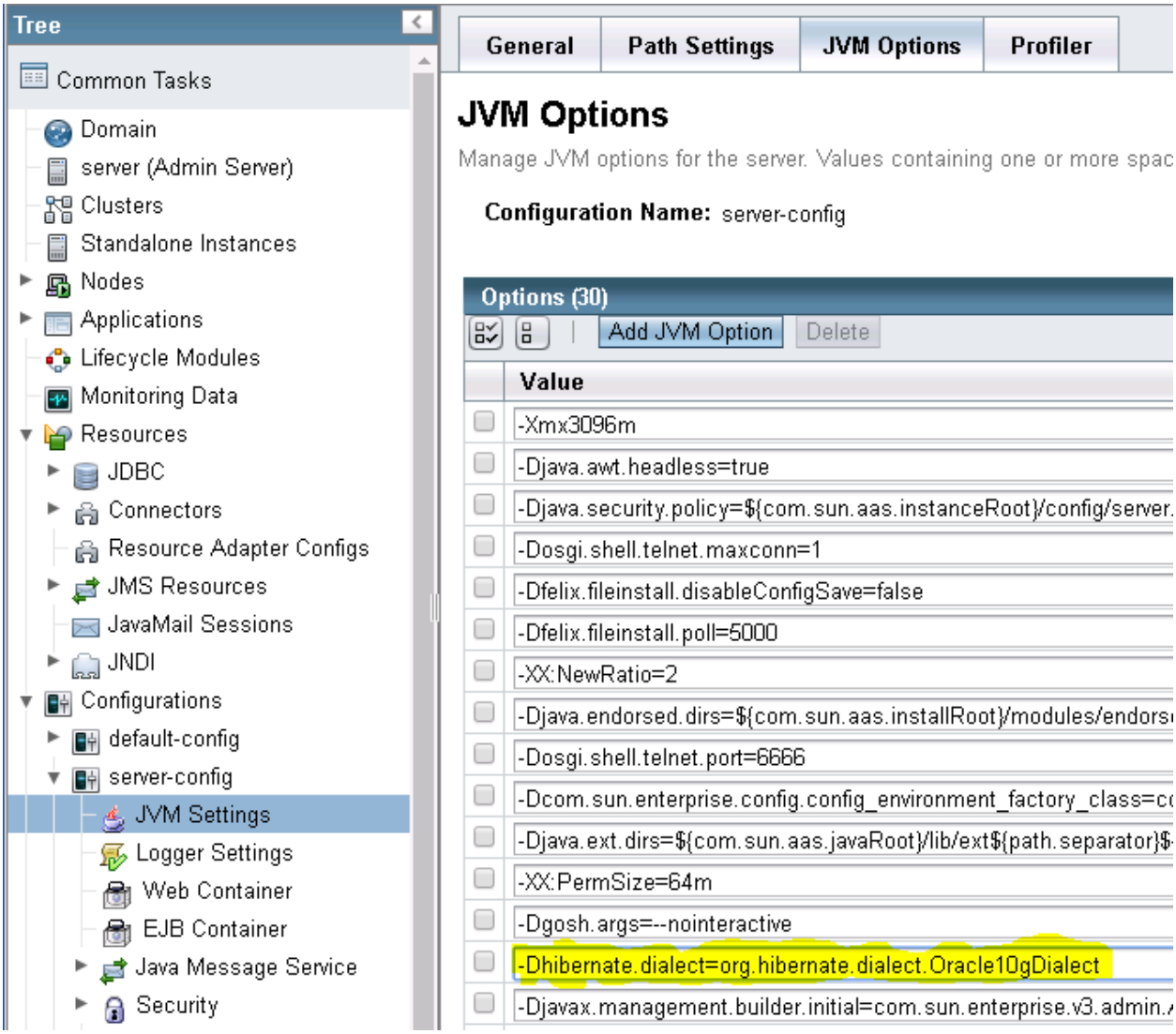
## J.4 Oracle 12c JVM Hibernate Dialect

If using **Oracle 12c** as the database connection then add the following hibernate dialect parameter to the GlassFish JVM Options.
In the administrative application browse to the **Configurations > server-config > JVM Settings** section.
Add and Save the following hibernate dialect parameter in the **JVM Options** tab:
`-Dhibernate.dialect=org.hibernate.dialect.Oracle10gDialect`




- ***Note:*** *For Oracle 12c see [Oracle 12c PGA_AGGREGATE_LIMIT]*

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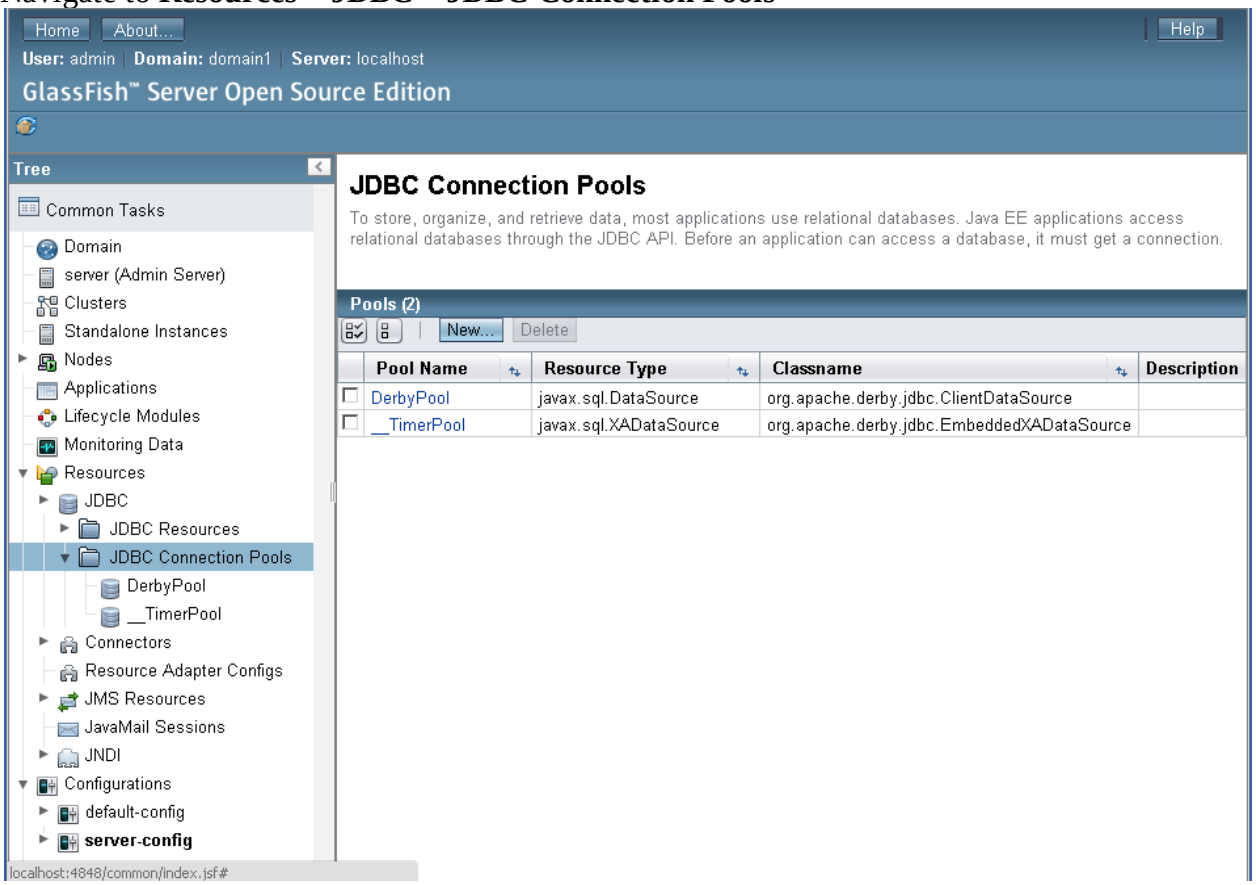
## J.5 Configure Database Connection Pool

The next step is to configure the database connection by creating a JDBC Connection Pool. Navigate to **Resources > JDBC > JDBC Connection Pools**

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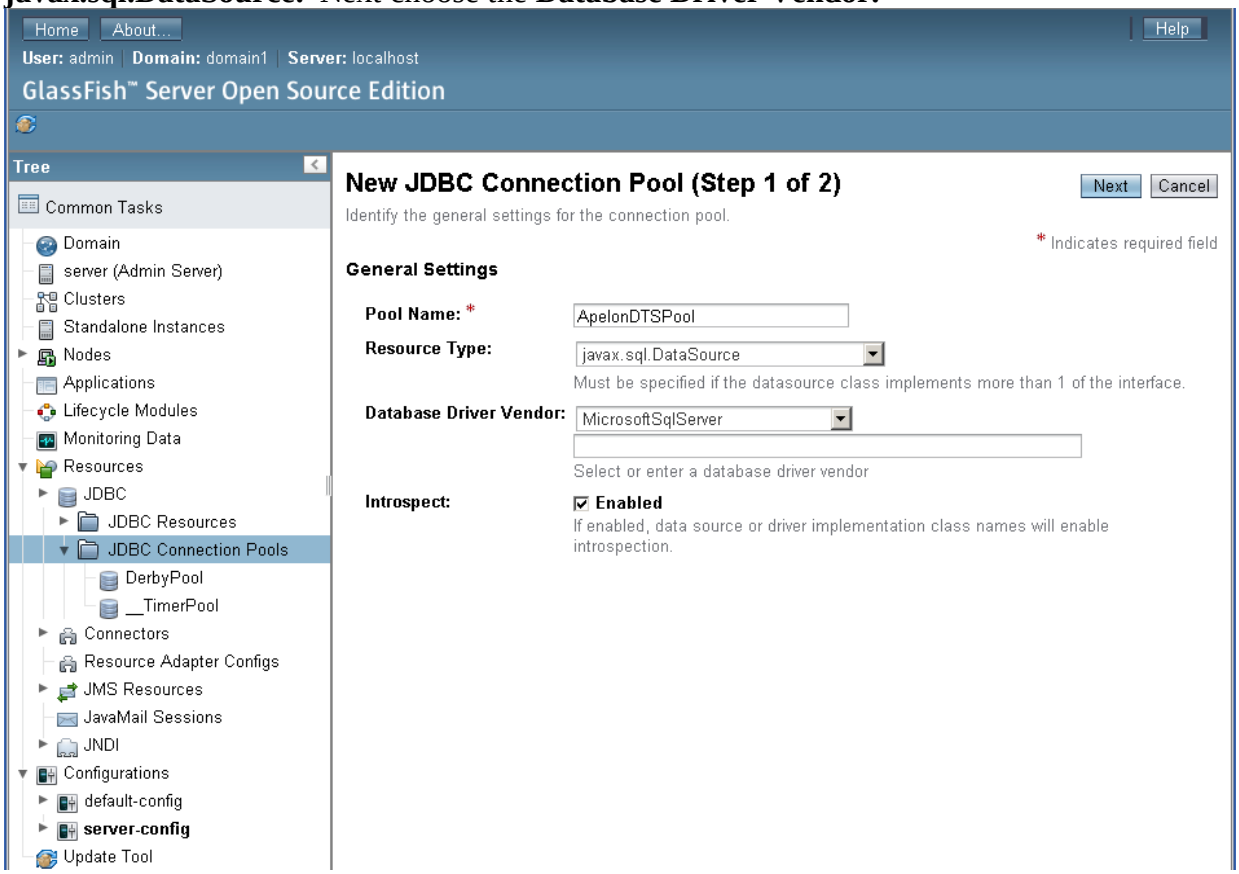
Click the **New** button, and create a new Pool named "**ApelonDTSPool**" with a Resource Type of **javax.sql.DataSource.** Next choose the **Database Driver Vendor.**




Click **Next**, and then specify the SQL connection information. This will vary depending on the database you are using.

- Microsoft SQL Server:
  - Datasource Classname: `com.microsoft.sqlserver.jdbc.SQLServerConnectionPoolDataSource`
  - Additional Properties
    - portNumber: `1433`
    - databaseName: `dts4`
    - user: `dts4`
    - password: `dts4`
    - serverName: `localhost`

- Oracle 12c:
  - Datasource Classname: `oracle.jdbc.pool.OracleDataSource`
  - Additional Properties
    - url:jdbc:oracle:thin:@[Host]:[Port]:[Database]
    - e.g. - url: jdbc:oracle:thin:@localhost:1521:orcl
    - user: `dts4`

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        - password: `dts4`
- for MySQL 5.6:
    - Datasource Classname: `com.mysql.jdbc.jdbc2.optional.MysqlDataSource`
    - Additional Properties
        - user: `dts4`
        - password: `dts4`
        - **`URL`**`: jdbc:mysql://[Host]:[Port]/[Database]`
        - `e.g. – URL: jdbc:mysql://localhost:3306/dts4`
- for MySQL 8:
    - Datasource Classname: `com.mysql.cj.jdbc.MysqlDataSource`
    - Additional Properties
        - user: `dts4`
        - password: `dts4`
        - **`UseSSL`**`: false`
        - **`URL`**`: jdbc:mysql://[Host]:[Port]/[Database]`
        - `e.g. – URL: jdbc:mysql://localhost:3306/dts4`

***Note:*** *There is a bug in the GlassFish 'Introspect' feature for the MySQL driver – it creates the URL property with the name of 'Url' which is incorrect, and will not work. Ensure that your URL parameter name is 'URL' (all uppercase). If a 'Url' property is present it MUST BE DELETED otherwise the existence of this property will cause connection to the DTS 4 Browser to fail.*

When the configuration is complete, select the newly created **ApelonDTSPool**, and click the **Ping** button to verify the connection.

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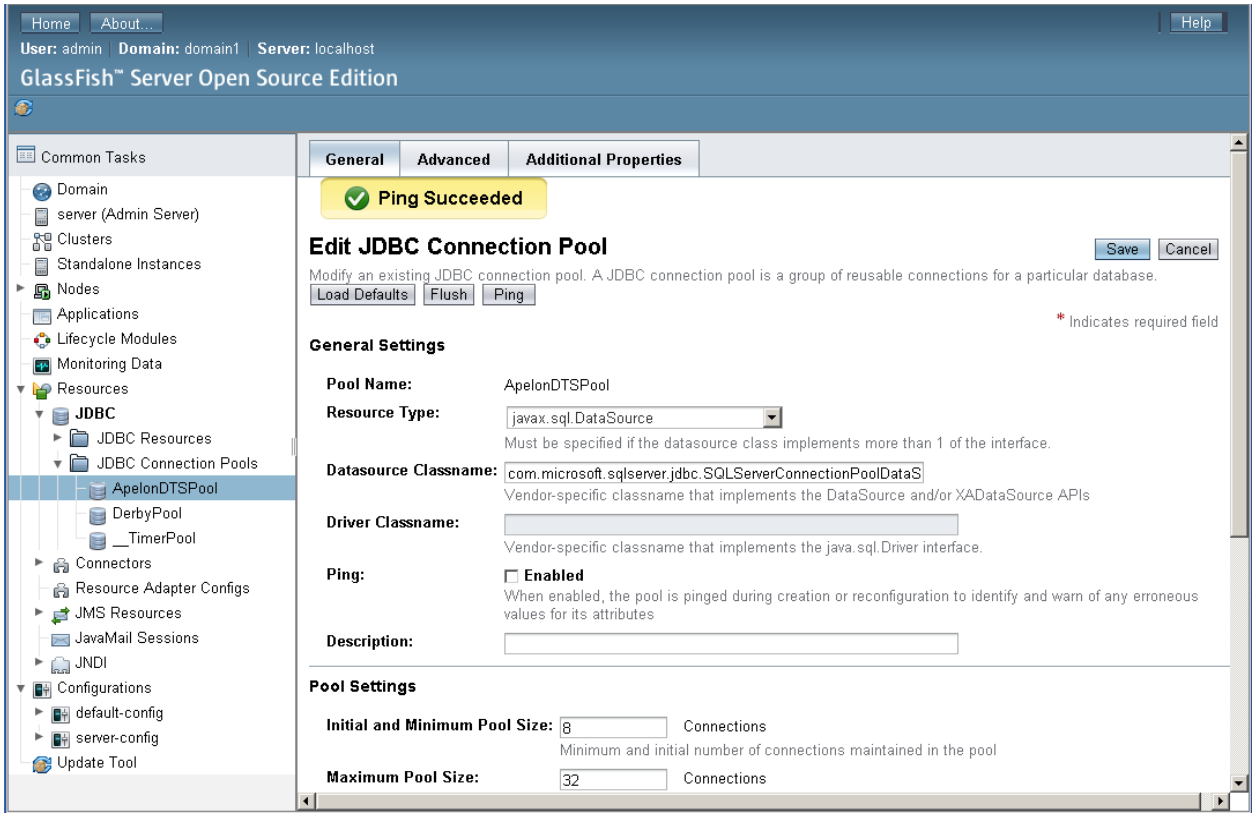


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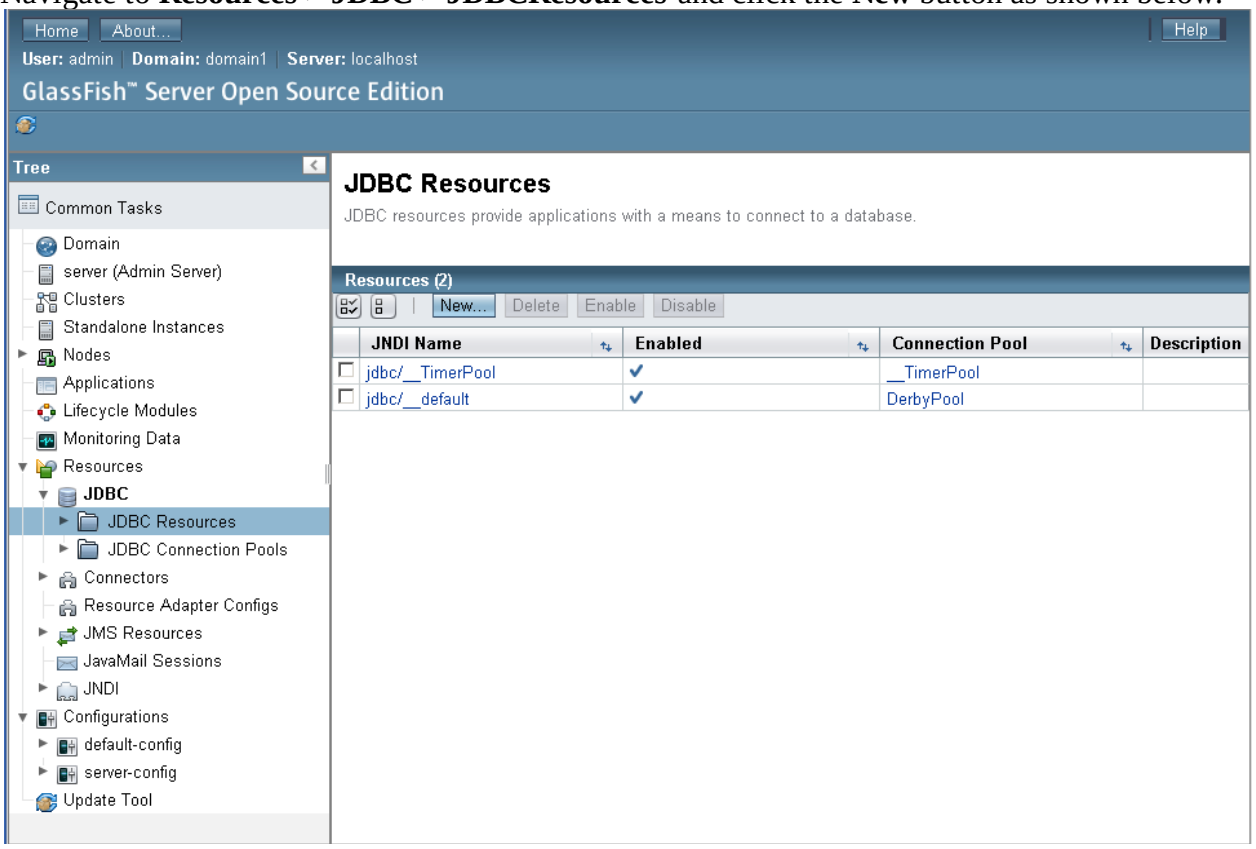
## J.6 Configure a JDBC Resource

Navigate to **Resources > JDBC > JDBCResources** and click the **New** button as shown below.

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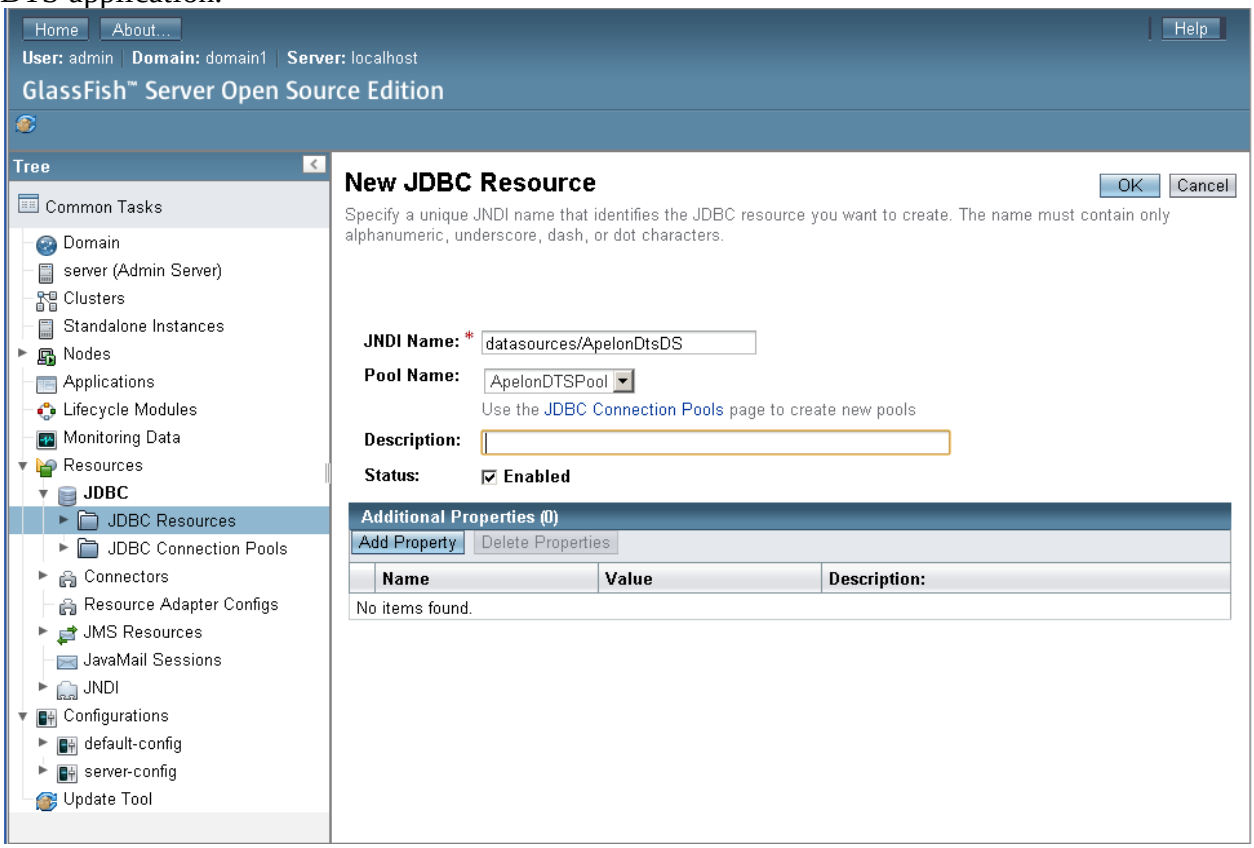
Create a new JDBC Resource named "**datasources/ApelonDtsDS**" as shown in the next screen. Connect it to the **ApelonDTSPool** in the Pool Name dropdown. Click **OK**.
This datasource is referenced by the dtsserverejb persistence.xml file which is embedded in the DTS application.

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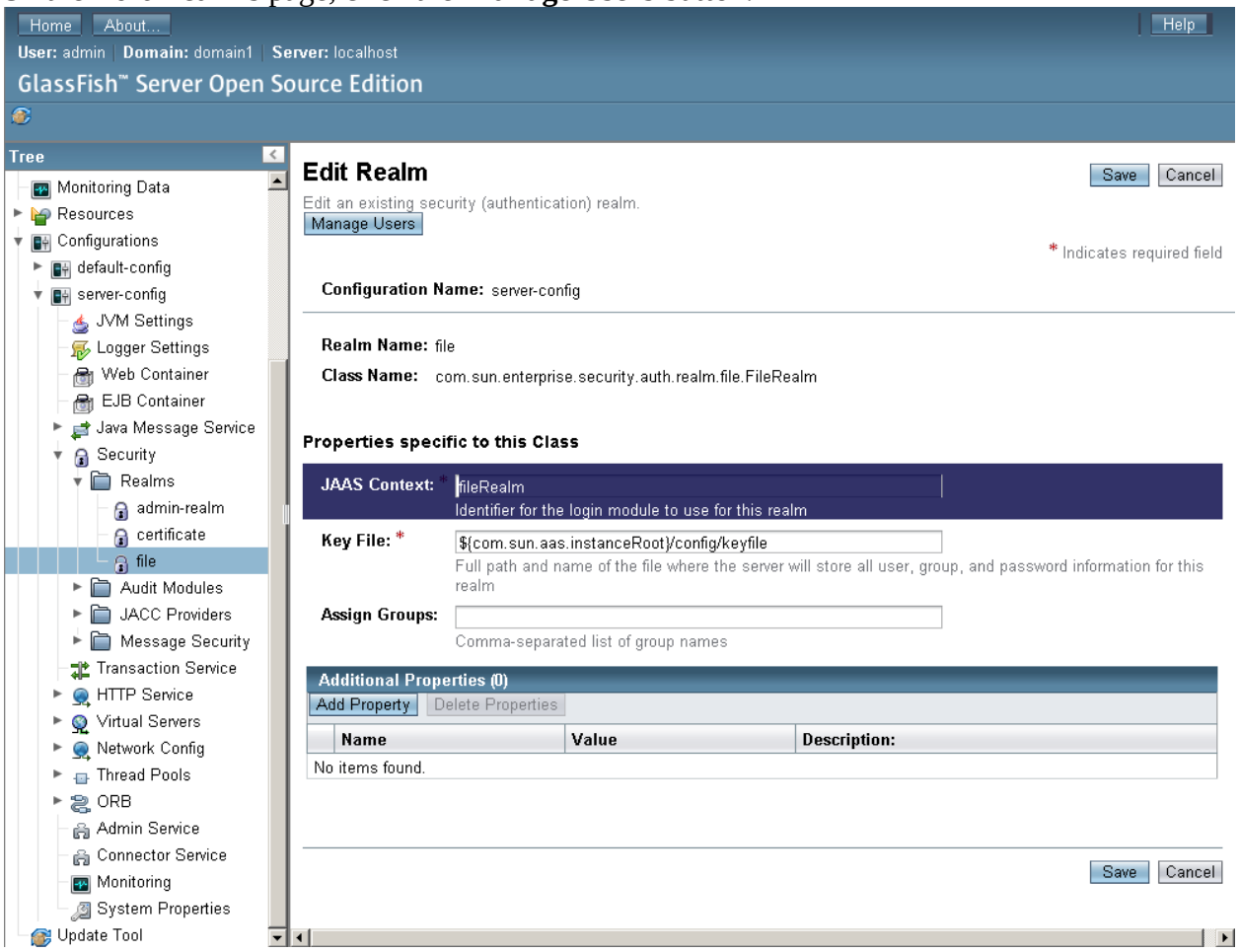
## J.7 GlassFish User Configuration for DTS Server

The first step for configuration of DTS Server users is to navigate to **Configurations > server-config > Security > Realms > file**

On the **Edit Realms** page, click the **Manage Users** button.

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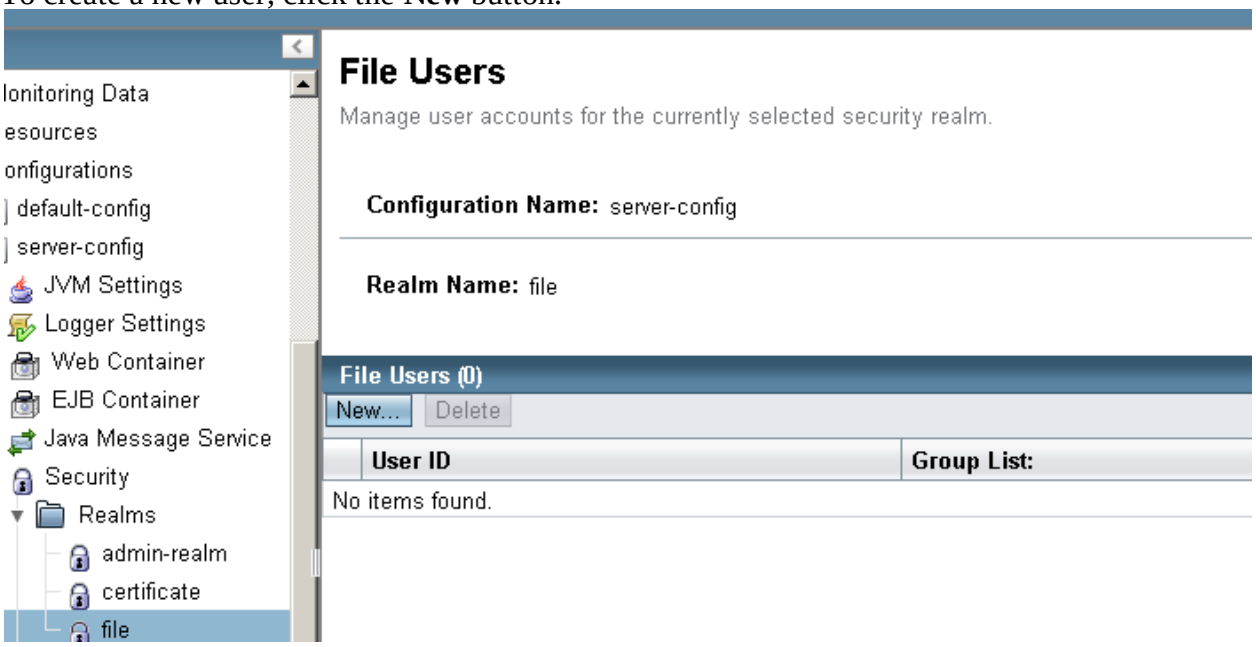
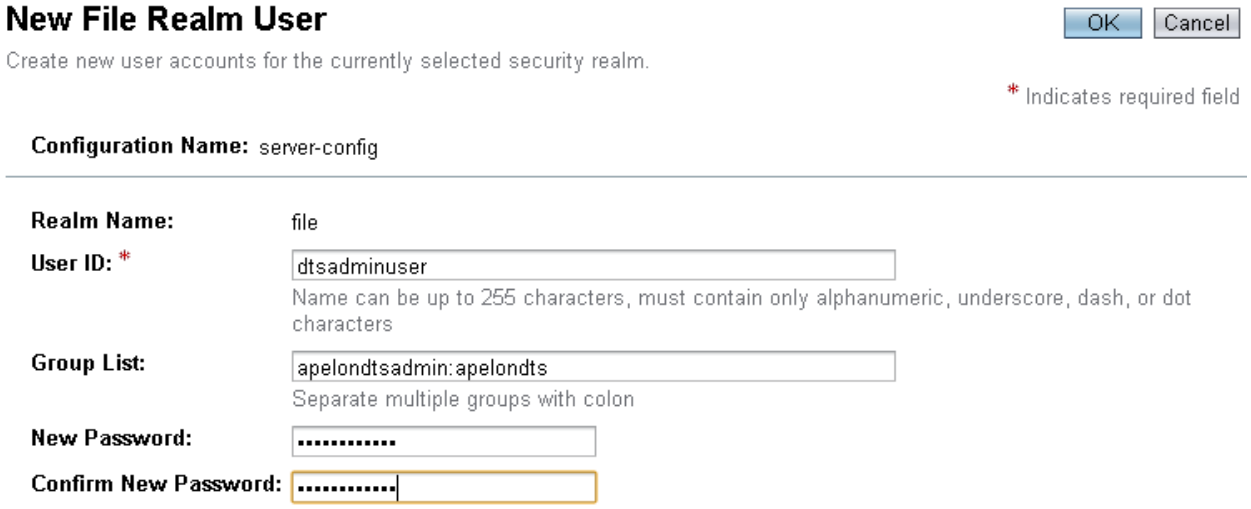
To create a new user, click the **New** button.




### J.7.1 GlassFish DTS Admin User Configuration

This is a *DTS admin user* example. You must grant a user with the ***apelondtsadmin*** role for every KB admin user/modeler that will connect to the Apelon DTS Server via either the DTS Browser or DTS Editor and ***requires*** the authority to access the ***DTS Editor User Manager*** to manage ***DTS User Roles and Permissions*** in the DTS Server. The user should also be granted the role **apelondts**.

Create a new user and make the user a member of the Group List "***apelondtsadmin:apelondts***", as shown below.




Click **OK** to complete the user creation.

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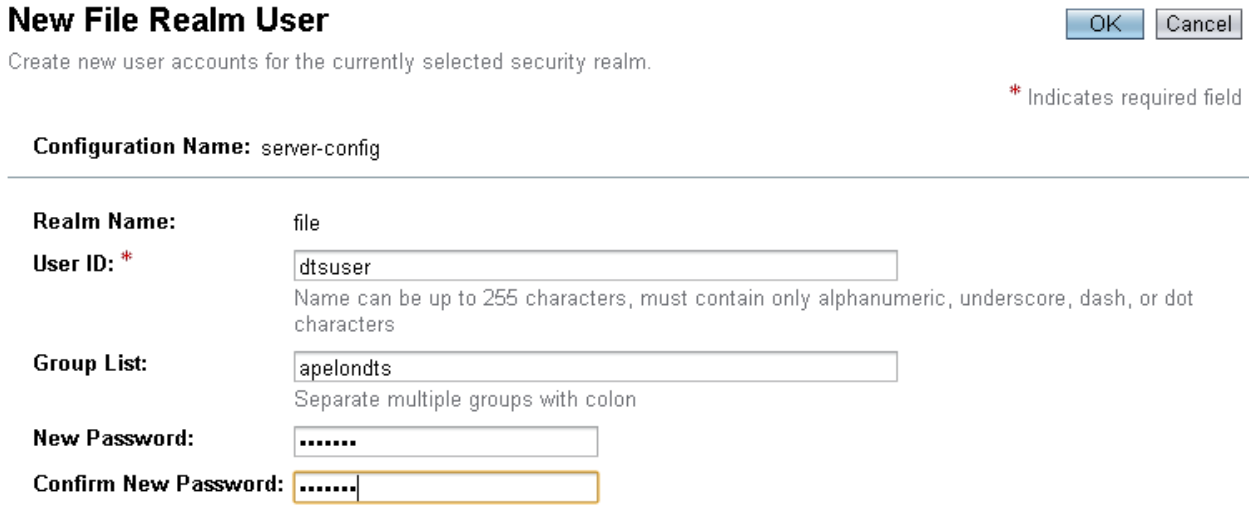
### J.7.2 GlassFish DTS User Configuration

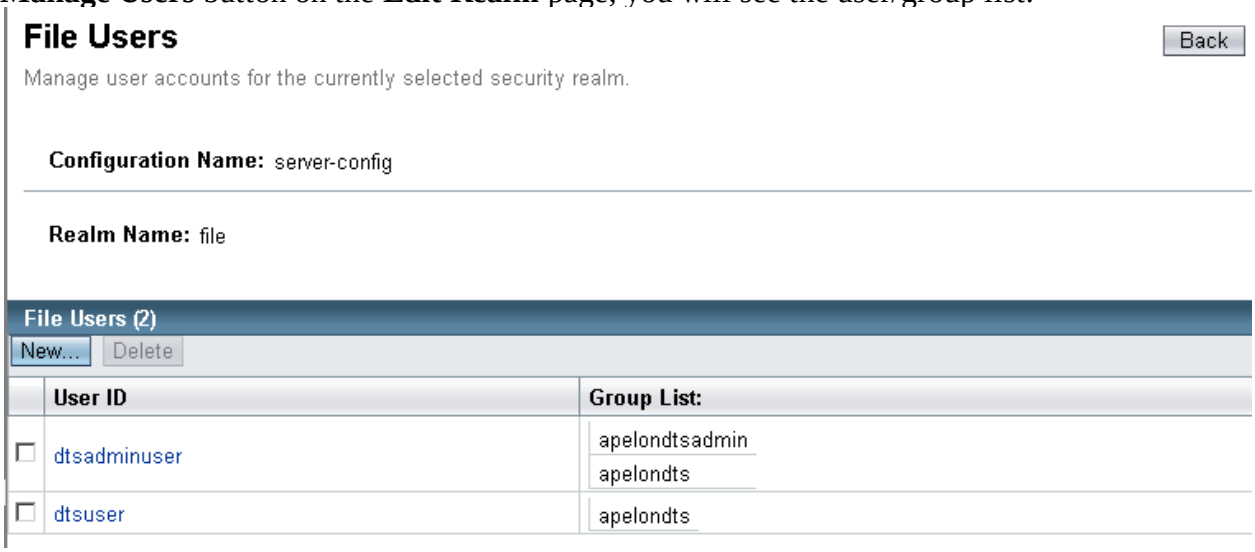
This is a general *DTS user* example. You must create a user with the ***apelondts*** role for every general DTS user/modeler who will connect to the Apelon DTS Server via either the DTS Browser or DTS Editor and ***does not require*** the authority to access the ***DTS Editor User Manager***.

Create a new user, and make the user a member of the Group List "***apelondts***", as shown below.




### J.7.3 GlassFish DTS User List

By navigating to **Configurations > server-config > Security > Realms > file** and clicking the **Manage Users** button on the **Edit Realm** page, you will see the user/group list.




### J.7.4 Securing the GlassFish Adminstration GUI

By default, the GlassFish Administration tool does not require a user name or password if you are connecting from the system where it is installed. To set a password, browse to **Configurations > server-config > Security > Realms > admin-realm** and click the **Manage Users** button.

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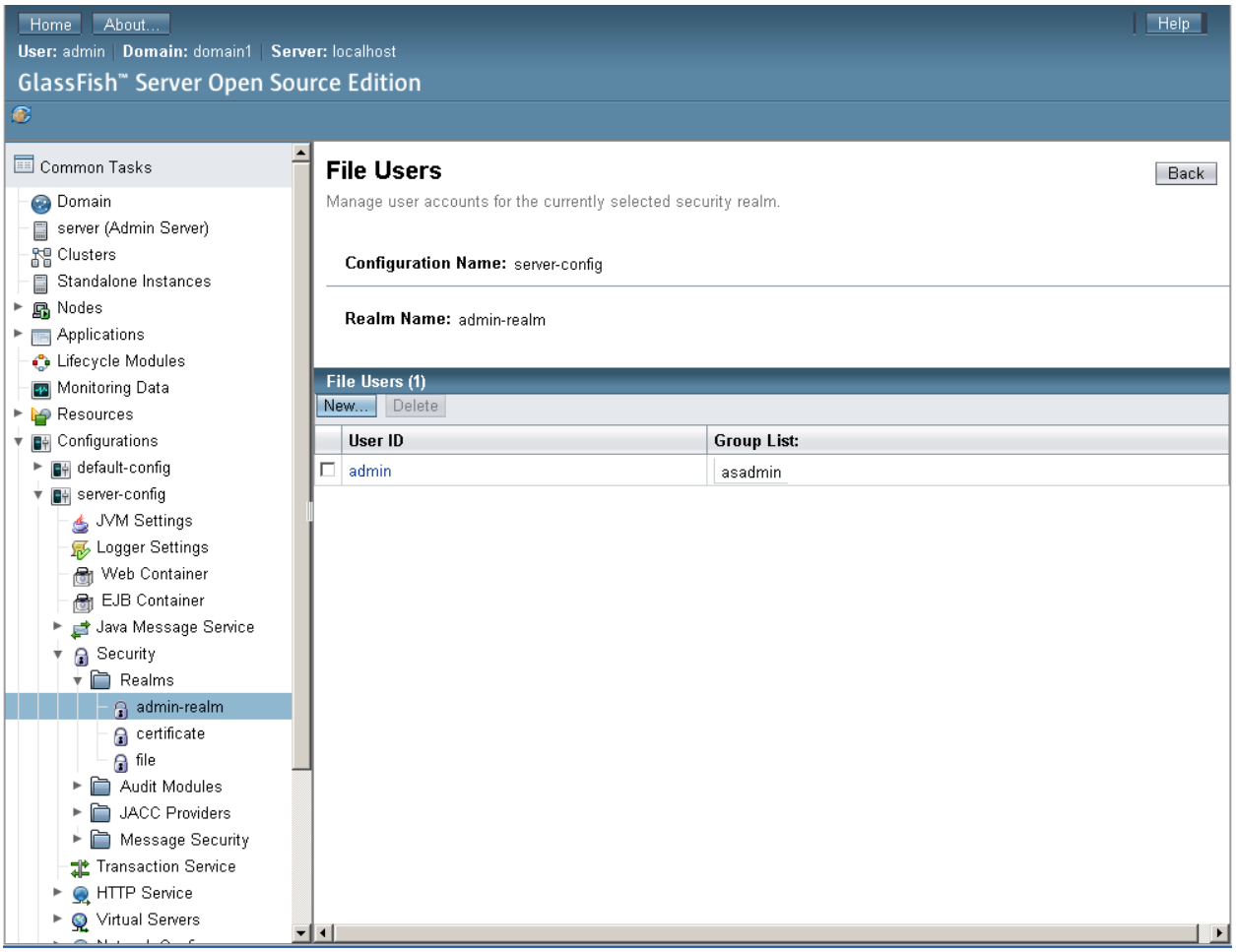


Click on the user admin, set a password for the user, and click Save. The GlassFish administration GUI will now require these credentials.

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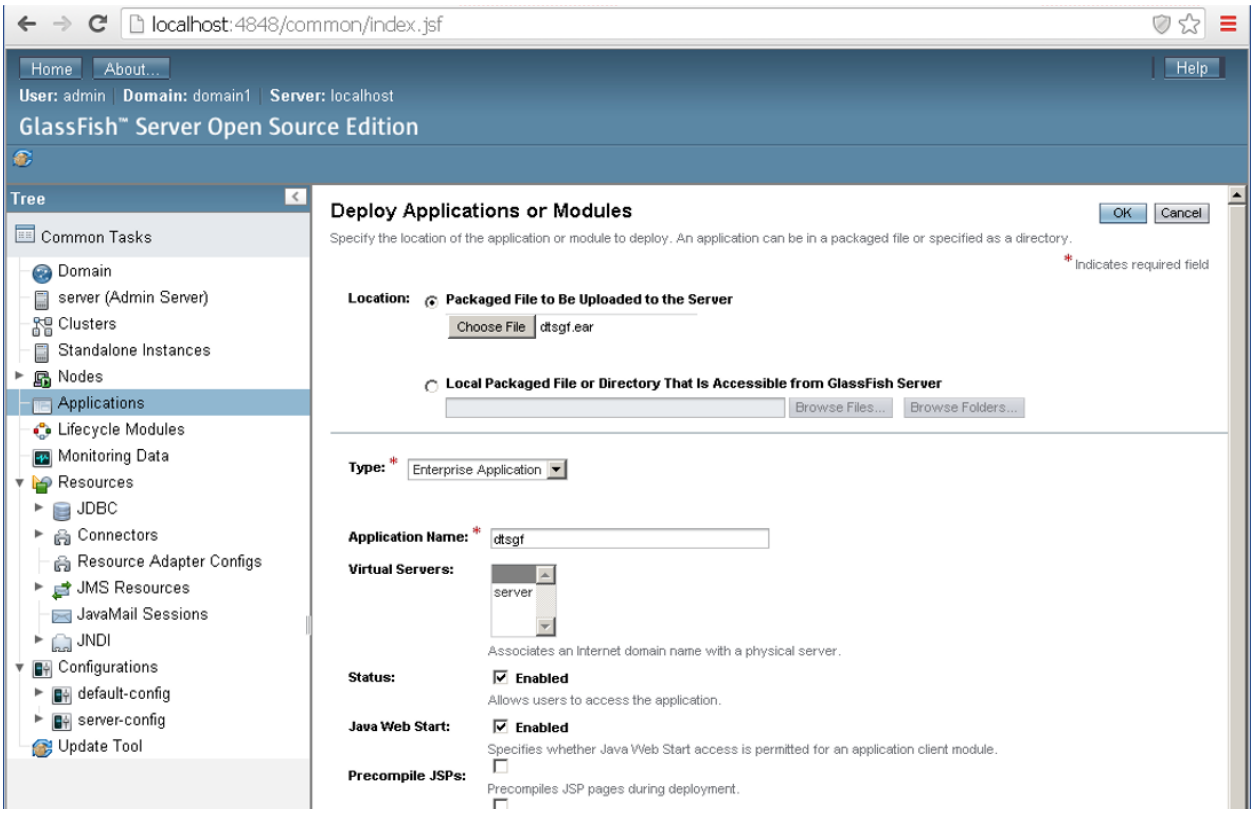
## J.8 Install the DTS Application

Navigate to the **Applications** node, and click the **Deploy** button. Select the `dtsgf.ear` file from the `<DTS_HOME>\server\GlassFish\standalone\deployments\` folder.

**NOTE:** For **SQL Server** a dtsgf.ear file that is specific to SQL Server must be used.

- For a DTS 4 Windows install the SQL Server specific `dtsgf.ear` file is in the following location:
  `<DTS_HOME>\server\GlassFish\standalone\deployments\sqlserver\`




The default values for all of the fields should be acceptable. Click **OK**.
Wait for application deployment to finish.

**NOTE: If performing a schema upgrade, Do NOT shut down or restart the GlassFish service while the schema is being upgraded (for more information see section: Upgrade Apelon DTS 4.7.0 - 4.7.2 GlassFish Server & schema to DTS 4.8.0).**
**SHUT DOWN and RESTART the GlassFish service to ensure the changes are integrated.**

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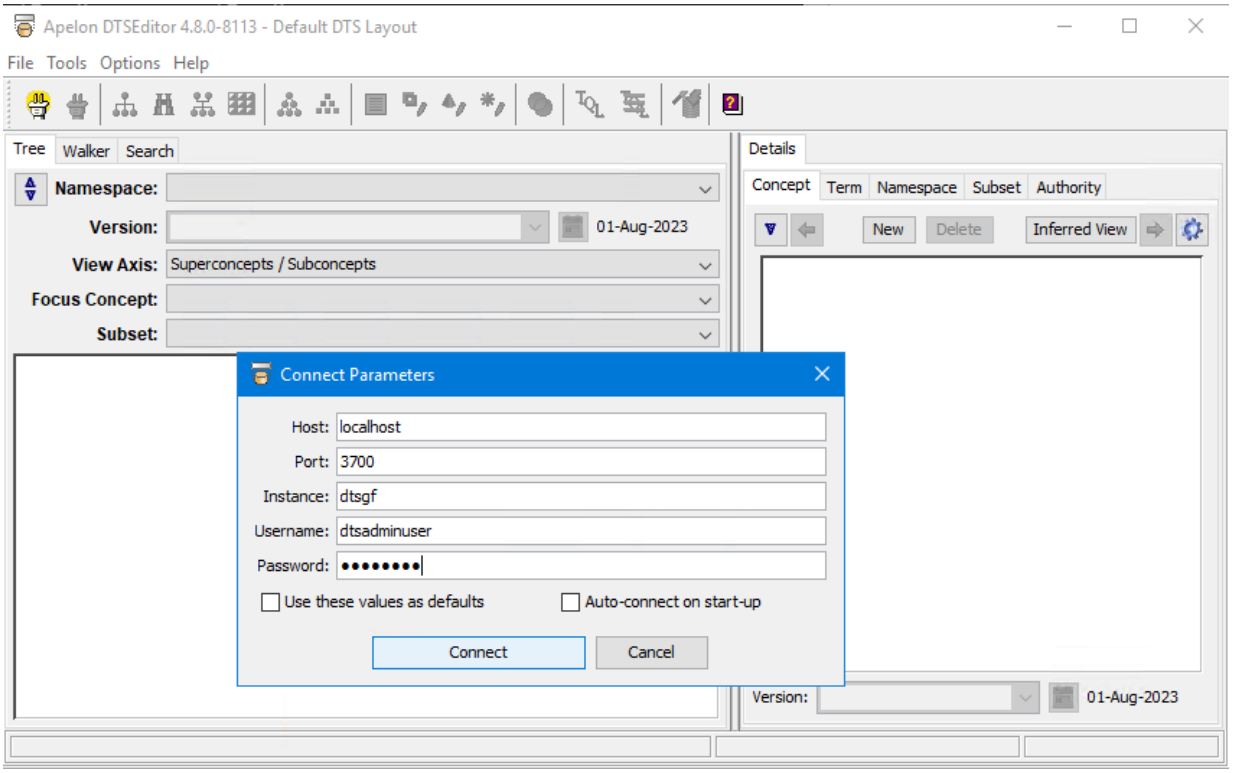
## J.9 Verify the DTS Application

Navigate to http://localhost:8080/dtsserverws to validate that the DTS Browser launches.

When connecting the DTS Editor to the GlassFish server – use an **Instance** of '**dtsgf**' and **Port** number **3700** along with the appropriate credentials created in the above GlassFish User Configuration for DTS Server section.

**Note:** If you used the example users defined in this guide the credentials would be either **dtsadminuser/dtsadmin** or **dtsuser/dts**.

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## Troubleshooting DTS Editor Connectivity Issues

There is a known issue when GlassFish is installed on a Linux server where the DTS Editor client may hang during the connection process to the server.

**Note** – this bug only impacts GlassFish installations on Linux. Windows installations are not affected.

This occurs because the GlassFish server is not identifying the correct IP address of the server where it is installed and sends the wrong address to the client during the connection sequence.

To test to see if your Linux GlassFish installation is likely to be impacted by this bug, run the following command:

```
[root@server]# resolveip `hostname`
IP address of server is 127.0.0.1
[root@server]#
```

Ideally, this command will return the external IP address of your server. If it does not (instead returning a local address such as 127.0.0.1) you will need to change the network configuration on the server.

One way to do this is to place the external IP address into your `/etc/hosts` file.

If your `/etc/hosts` file looks like this:

```
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4 server
```

Replace the 127.0.0.1 address at the beginning of the line with the external IP address of the system:

```
192.168.0.72 localhost localhost.localdomain localhost4 localhost4.localdomain4 server
```

The hostname command should now return the external IP address of the server:

```
[root@server]# resolveip `hostname`
IP address of server is 192.168.0.72
[root@server]#
```

The DTS Editor client will now connect to the server properly.

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## J.10 GlassFish DTS Client Timeouts

When the DTS Editor connects to a GlassFish DTS server, there is limit of 2 hours on any single long-running operation. Normally, this limit is long enough – but depending on the hardware and number of terminologies installed – users may find the need to lengthen this value. Long running operations such as classification have the highest likelihood of reaching the default timeout value.

The timeout value is specified in milliseconds – the default value is 7200000. This is the equivalent of 2 hours:
2 hours * 60 minutes * 60 seconds * 1000 milliseconds = 7200000

This value is entered in the startup script for the DTS Editor.

### J.10.1 Increasing the timeout value on Windows

Edit the following 2 files which are part of the DTS Editor installation:

**<*DTS_HOME*>\bin\ajwc.bat**
**<*DTS_HOME*>\bin\ajc.bat**

Calculate the new timeout value as shown above, and then edit the following lines with the new value:

```
rem GlassFish Client Timeout (in milliseconds) - 2 hours by default
set
CLIENT_TIMEOUT=com.sun.corba.ee.transport.ORBWaitForResponseTimeout=7200000
```

### J.10.2 Increasing the timeout value on Linux

Edit the following file which is part of the DTS Editor installation:

**<*DTS_HOME*>/bin/shell_functions**

Calculate the new timeout value as shown above, and then edit the following lines with the new value:

```
#GlassFish Client Timeout (in milliseconds) - 2 hours by default
CLIENT_TIMEOUT=com.sun.corba.ee.transport.ORBWaitForResponseTimeout=7200000
```

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## J.11 Setup GlassFish and DTS to start as a Windows Service

To install GlassFish DTS as a service on windows, you can use the service creation tools that are included with GlassFish. Follow the steps below to create a service launching script.

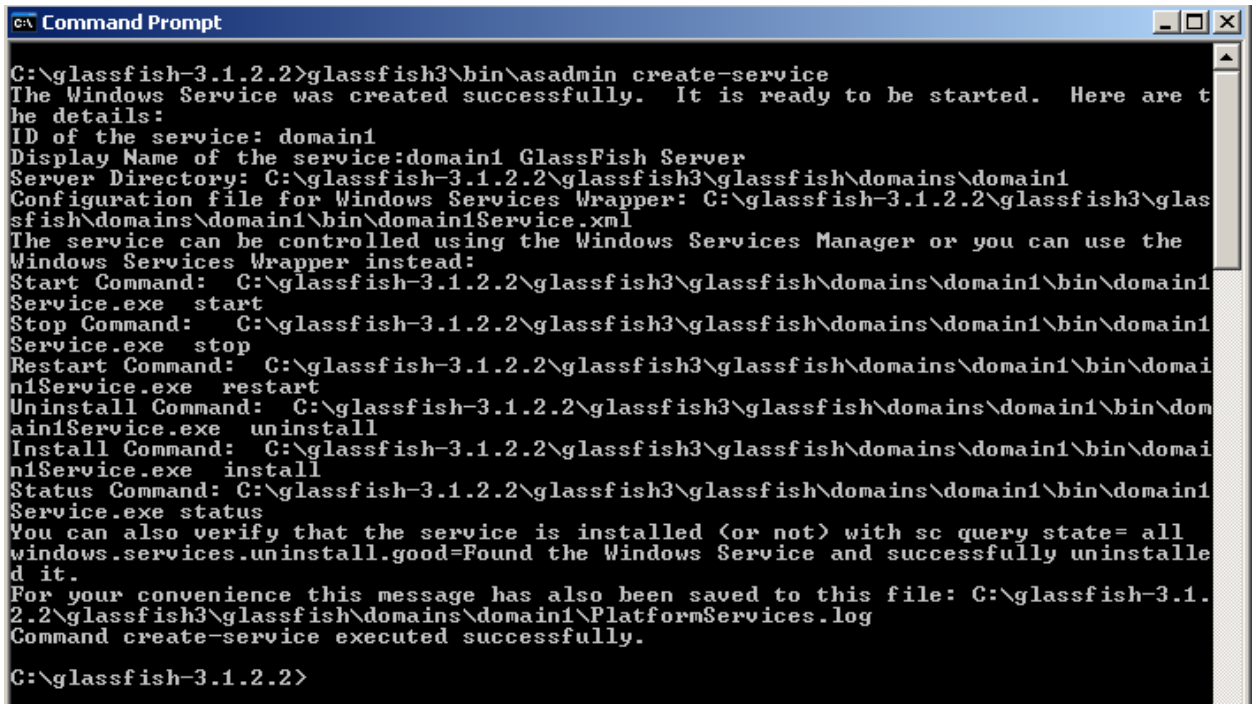
1. Open the file `<GlassFish_HOME>\glassfish3\glassfish\config\asenv.bat` in a text file editor.

2. Add an appropriate "AS_JAVA" variable to the end of the file so that GlassFish starts with the correct Java JVM. For example:

```
REM The location of the Java 1.8 installation on this
system
SET AS_JAVA=C:\Program Files\Java\jdk1.8.0_351
```

3. In a command console window, navigate to the folder that contains your glassfish installation.

4. Execute the command:
   => `glassfish3\bin\asadmin create-service`

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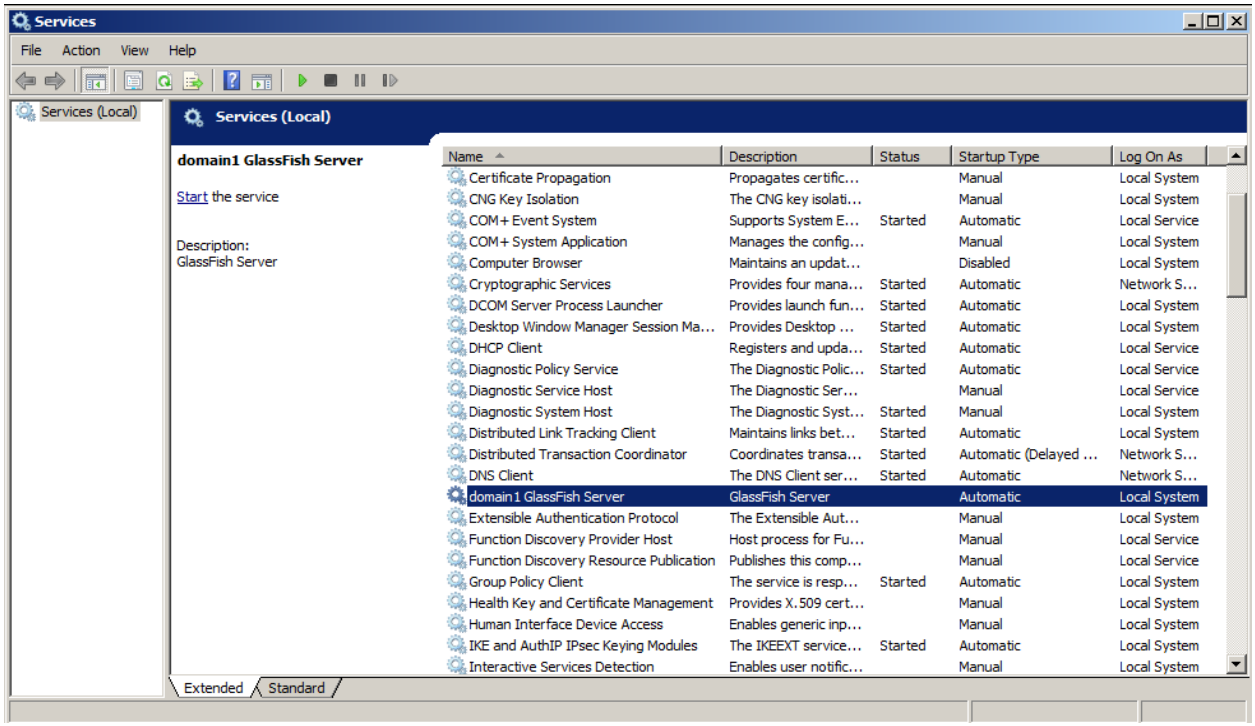
5. Open the Windows Service tool – from the Start Menu **Administrative Tools > Services**
   Locate the service "**domain1 GlassFish Server**"

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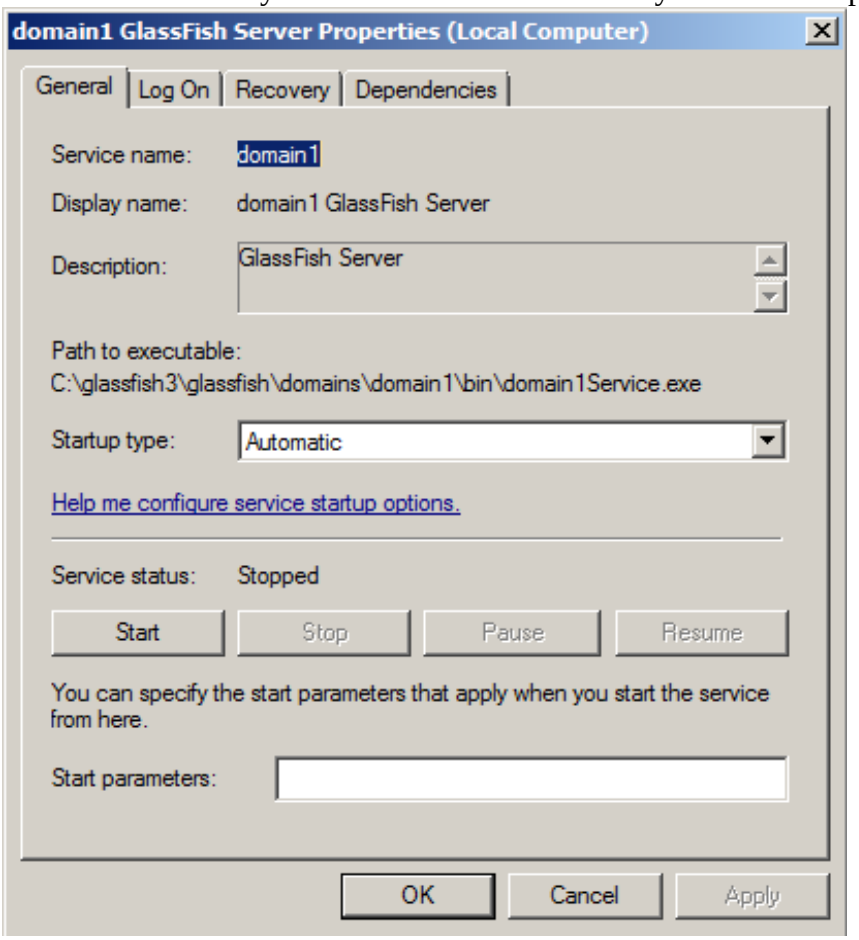
6. Right click on the service and click on the properties option. Verify that the service is set to start automatically. The service can be manually started or stopped from this dialog.




7. By default, the log file for the server console will be written to **<GlassFish_HOME>glassfish3\glassfish\domains\domain1\logs\server.log**

8. For advanced service configuration options, run the command
`=> glassfish3\bin\asadmin create-service --help`
or view the official documentation.

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## J.12 Setup GlassFish and DTS to start as a Linux Service

To install GlassFish DTS as a daemon service on Linux, you can use the service creation tools that are included with GlassFish. Follow the steps below to create a service launching script.

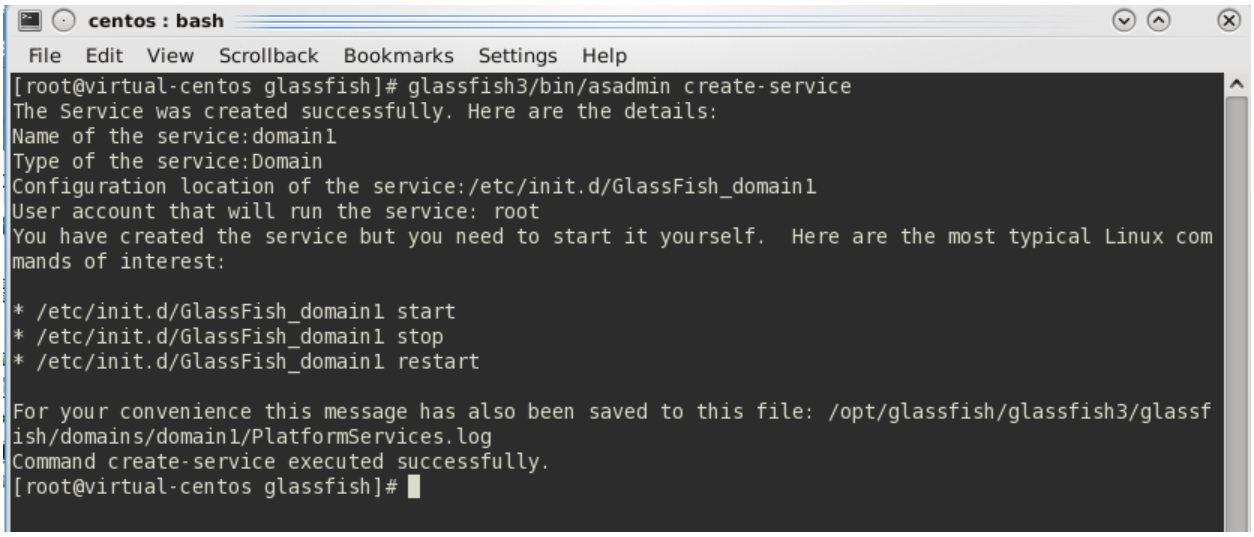
1. Open the file `<GlassFish_HOME>/glassfish3/glassfish/config/asenv.conf` in a text file editor.

2. Add an appropriate "AS_JAVA" variable to the end of the file so that GlassFish starts with the correct Java JVM. For example:

```
#The location of the Java 1.8 installation on this
system
AS_JAVA=/opt/java/jdk1.8.0_351
```

3. Navigate to the folder that contains your glassfish installation.

4. Execute the command:
   => `glassfish3/bin/asadmin create-service`




5. The server is now configured to automatically start and stop with the system. To manually start the server, execute:
   => `/etc/init.d/GlassFish_domain1 start`

   To manually stop the server, execute:

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```
=> /etc/init.d/GlassFish_domain1 stop
```

6. By default, the log file for the server console will be written to **glassfish3/glassfish/domains/domain1/logs/server.log**

7. For advanced service configuration options, run the command
   `=> glassfish3/bin/asadmin create-service --help`
   or view the official documentation.

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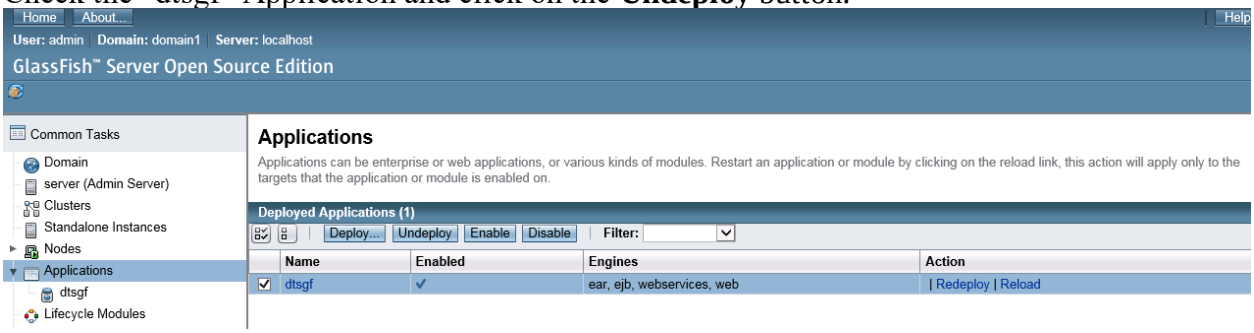
## J.13 Upgrade Apelon DTS 4.7.0 - 4.7.2 GlassFish Server & schema to DTS 4.8.0

Perform the following steps to upgrade your Apelon DTS 4.7 GlassFish server and schema to Apelon DTS 4.8.0 GlassFish **(Note: DTS 4.7.1 and DTS 4.7.2 have the same schema version as DTS 4.8.0)**:

- Follow instructions in Section B for installing DTS 4.8.0 on the server to be upgraded.
- Ensure you are using the most up-to-date database driver for GlassFish. Refer to step H.2 for instructions on installing the correct database driver for your GlassFish installation.
- Ensure your Apelon DTS GlassFish service is started.
- Start you GlassFish administrative application available at http://localhost:4848 and navigate to the **Applications** node.
- Check the "dtsgf" Application and click on the **Undeploy** button.




- When the dtsgf.ear undeployment is finished, shutdown the GlassFish service.
- Navigate to your GlassFish **applications** folder located in **<GlassFish_HOME>\glassfish3\glassfish\domains\domain1\applications.** Ensure the **dtsgf** folder has been removed. Delete the **dtsgf** folder if it wasn't removed during the Application undeployment.
- Restart your GlassFish service.
- Review the Notes below before continuing to the next steps.
- Start you GlassFish administrative application available at http://localhost:4848 and navigate to the **Applications** node. Follow steps **H.8**(Install the DTS Application) through **H.9**(Verify the DTS Application) to finish configuring the Apelon DTS 4.8.0 GlassFish server.
- **NOTE1:** Step **H.8**(Install the DTS Application), will upgrade the DTS 4.7.0 schema to DTS 4.8.0 schema when the DTS 4.8.0 "dtsgf.ear" is fully deployed. **Do NOT shut down or restart the GlassFish service while the schema is being upgraded**. This step could take some time, especially when upgrading DTS schemas in MySQL and SQL Server.
- **To verify the correct DTS 4.8.0 schema version, perform the following steps:**
    1. View the "server.log" file located in the `<GlassFish_HOME>\glassfish3\glassfish\domain\domain1\logs` directory. Search the GlassFish "server.log" file for the statement:
        - "Schema Upgrade to 4.0.29 complete" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.

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- "Schema Upgrade to 4.0.30 complete" – for MySQL 5.6 or MySQL 8.

2. A second way to determine the schema upgrade was successful is from the DTS 4.8.0 DTS Editor.
    - Connect to the upgraded Apelon DTS GlassFish server.
    - Once the connection is established choose: **Help>About Apelon DTSEditor…**
    - In the help window that is launched click on the "*Details>>*" label. In the "Server Configuration:" section is displayed a "schema.version" value. The schema version should read:
        - "4.0.29" – for Oracle 12c, SQL Server 2016, or SQL Server 2019.
        - "4.0.30" – for MySQL 5.6 or MySQL 8.

- **NOTE2 – DTS 4.5.1 GlassFish Reasoners:** You must remove any previously existing DTS 4.5.1 Reasoners used for Classification. Search the entire GlassFish installation directory for an existing **Reasoners** folder. Delete the entire folder and its contents.
- **NOTE3 - SQL Server Schema Upgrade:** When upgrading from a version older than DTS 4.4, not only may the SQL Server schema upgrade to version 4.0.29 take up to or longer than an hour, it may also require about as much available drive space for its database log file as is being used by the database prior to the schema upgrade. Consult with you SQL Server Database Administrator regarding the available drive space and the possibility of shrinking the database log after the schema is successfully upgraded to version 4.0.29.

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