



LabVantage 8.5

Installation and Upgrade Guide for JBoss

Revision 04

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03	AMills	01-Sep-2020	Changed some text provided in the examples for Oracle database creation statements. Added expanded examples for RHEL.
04	AMills	03-Nov-2020	Added instructions needed to configure single-sign-on when JBoss update 8 or later is used.

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1 INSTALLATION OVERVIEW

A complete installation of LabVantage will require a database management system (DBMS) as well as an enterprise application server. For the database, you may use either Microsoft SQL Server or Oracle. For the application server, you may choose Red Hat JBoss, Oracle WebLogic, or IBM WebSphere. Refer to these vendor's installation requirements for information on supported platforms and their respective installation steps. This document will guide you through the process of configuring these components so that LabVantage can be properly deployed.

If you are planning to perform an in-place upgrade from an earlier version of LabVantage or a migration to a new platform, please continue reading chapters 2 and 3 before proceeding to chapter 21.

2 PLANNING YOUR INSTALLATION

Most of the data processing and all web page requests happen on the application server tier. For this reason, you should consider the purpose for this installation and the user load. For example, if this is a development install that does not require low downtime or high recoverability and only serves 5 to 10 users at a time, the need for a clustered install with a load balancer is negated. If you require a clustered server installation, follow the JBoss cluster configuration steps provided here or provided by your application server vendor. If you are upgrading from a prior release of LabVantage with the assistance of LabVantage Professional Services, planning will be different. Please consider the following topics as you plan.

2.1 Site Requirements

Prior to installation, the customer and LabVantage Solutions, Inc. must have mutually agreed, in writing, on the feasibility of the installation based on the customer's site requirements and expectations. Minimally, this *Site Requirements* document must include:

1. Network architecture and the hardware/software configuration of each machine.
2. DBMS and Application Server configurations (such as single-instance or clustered).
3. Expected load (such as the number of concurrent users).
4. All functionality desired by the customer but not provided in the LabVantage installation distribution.

2.2 Certified LabVantage EAR

The procedures in these documents refer to a "Certified LabVantage EAR". This is defined as the labvantage.ear that has been tested and certified for release by LabVantage Solutions Inc. and has not been modified in any way. These procedures do not cover all possible methodologies that may be required to successfully deploy and run anything other than a "Certified LabVantage EAR", as such procedures would be dependent on the custom code within the EAR.

2.3 Machine Names

When naming machines, follow the rules set forth by the Internet Engineering Task Force (www.ietf.org) at RFC-Editor.org. In general:

- Use only characters drawn from the alphabet (A-Z), digits (0-9), and the minus sign (-). Do not use any other characters.
- If using a Windows operating system, limit the machine name to 15 characters.

Below is an excerpt from the "RFC 952 DoD Internet Host Table Specification".

A "name" (Net, Host, Gateway, or Domain name) is a text string up to 24 characters drawn from the alphabet (A-Z), digits (0-9), minus sign (-), and period (.). Note that periods are only allowed when they serve to delimit components of "domain style names". (See RFC-921, "Domain Name System Implementation Schedule", for background). No blank or space characters are permitted as part of a name. No distinction is made between upper and lower case. The first character must be an alpha character. The last character must not be a minus sign or period. A host which serves as a GATEWAY should have "-GATEWAY" or "-GW" as part of its name. Hosts which do not serve as Internet gateways should not use "-GATEWAY" and "-GW" as part of their names. A host which is a TAC should have "-TAC" as the last part of its host name, if it is a DoD host. Single character names or nicknames are not allowed.

Throughout this documentation, you will be asked to enter a hostname for a value. You should always use your fully qualified domain name (FQDN) in place of <hostname>. An example is

yourhostname.yourdomainname.xxx -or for another example- lvappserver.labvantage.com

2.4 Time Synchronization

It is very important to install and configure your database and application server to be in the same time zone. The database time and application server time must be synchronized. Failure to configure your system in this manner will result in unpredictable behavior by LabVantage LIMS.

2.5 HTTPS

LabVantage Solutions requires running the LabVantage application over an HTTPS connection to enhance security and utilize advanced browser features. This document provides suggested guidelines for configuring an HTTPS connection in the respective sections for each of the supported application servers. While LabVantage has some basic guidelines for some encryption options, ultimately, LabVantage views this as an issue your organization must address internally in order to adhere to any requirements of your data security team. If you cannot or choose not to deploy LabVantage on your network using this type of encryption, you are taking the risk of transmitting passwords and other sensitive information in plain text. Prepare for SSL encryption by obtaining a certificate that you will install on your application server.

2.6 Release Notes

LabVantage publishes a [Release Notes](#) document through [VantageCare](#). Each revision of LabVantage will contain important information in the Release Notes regarding installation and upgrade options. When upgrading, review the interim Release Notes for all previous versions to understand the implications of the upgrade procedure, making certain to complete all required post-upgrade tasks.

2.7 Supported Software

The LabVantage application runs in a multi-tier architecture consisting of an Application Server tier (Application Server and JDK), Database tier (Database Management System and JDBC driver), and Client tier (Web Browser). A combination of these tier components constitutes a "platform" on which to run LabVantage.

LabVantage is expected to run with few (if any) restrictions on the platforms as long as those platforms meet the minimal version requirements specified in the "Supported Software" section of the Release Notes. However, there may be unforeseen issues that are platform-specific or operating system-specific in an

otherwise compatible version that inhibit expected operation or cause outright failure. In these cases, while LabVantage Solutions, Inc. will always attempt to ensure that the solution is effective in the customer's environment, a specific support exception may arise where LabVantage will not be supported on the specific offending combination unless (or until) the third-party manufacturer has provided a fix or workaround to address unique failure scenarios. In most cases, LabVantage Solutions, Inc. will attempt to coordinate the effort with the customer and the manufacturer. For the highest level of assurance, LabVantage recommends that you choose one of the certified platforms.

2.8 Installation Verification

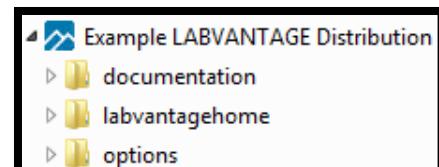
This document includes some signature lines as examples of where you might document your installation and configuration options. Consult with your validation team to determine if you will require signatures for these steps and to determine if additional signature lines will be required. See [Appendix A: Identification of Executors and Reviewers](#).

3 LABVANTAGE DISTRIBUTIONS

This chapter illustrates the locations of the software provided by LabVantage. This includes an ISO image that can be written to a DVD or mounted as a local drive. If you purchased JBoss from LabVantage, LabVantage provides a Red Hat JBoss EAP distribution that is packaged separately from the LabVantage distribution.

3.1 LabVantage Software

The LabVantage Distribution contains all software that is manufactured by LabVantage Solutions, as well as files related to some third-party software options. This image can be downloaded from [VantageCare](#) under "LABVANTAGE Software Downloads". Once you have mounted this image, you will find three top-level directories and some additional documentation about this release. The following sections describe the directories found within.



3.1.1 Documentation

This directory contains all technical documentation relevant to the distributed LabVantage release. The LabVantage Documentation provided with the distribution (listed below) reflects the revisions that were completed at the time of release. [R] denotes the document revision number and [V] denotes the LabVantage version. Updates to these documents are available as a separate download from VantageCare. The "documentation" directory also contains other files that describe the LabVantage configuration (such as Configuration Reports and Data Model Diagrams). Since the names and formats of these files vary for each release, see your Release Notes for details concerning the files provided.

VantageCare Software Downloads Example

Download : LABVANTAGE 8.4.x Documentation (4)			
<input type="radio"/>		LabVantage 8.4.x Installation Documentation - Revision 190826-84	LabVantageInstall_190826-84.zip
<input type="radio"/>		LabVantage 8.4.x Product Documentation (WAR file) - Revision 191111-84	LabVantageDoc_WAR_191111-84.zip
<input type="radio"/>		LabVantage 8.4.x Product Documentation (HTM format) - Revision 191111-84	LabVantageDoc-HTM_191111-84.zip
<input type="radio"/>		LabVantage 8.4.x Release Notes - Revision 200309-84	LabVantage-8.4.x-ReleaseNotes_200309-84.zip

The example above shows

LabVantage-[V]-ReleaseNotes_[R]	Release Notes for this LabVantage version.
LabVantageDoc-HTM_[R] LabVantageDoc-WAR_[R]	LabVantage Product Documentation in HTM and WAR format. Documentation Installation explains how to use or deploy these.
LabVantageInstall_[R]	LabVantage Installation Documentation.

Installation Verification: Record the names of the files that you have downloaded

File Type	Example	Actual
Installation Software	DM0850.366.01_00.ZIP	
Release Notes	LabVantage-8.5.x-ReleaseNotes_200629-85.zip	
Product Documentation	LabVantageDoc_WAR_200626-85.zip	

Installation Verification: Initials indicate verification of the actual file names recorded above.

Role	Initials	Date
Executor		
Reviewer		

3.1.2 labvantagehome

This directory contains all files needed to install LabVantage. You will be instructed to copy the full contents of this directory onto your Application Server at the appropriate time. Section 3.2 provides a structural overview and guidelines for use. See [LabVantage HOME](#) below for more information. The configuration procedures for each supported Application Server provide server-specific procedures.

3.1.3 Options

This directory contains files related to third-party software options that are available for use with the specific LabVantage version being installed. These sub-directories exist within.

EmpowerInterface	Installer for the LabVantage Toolkit application on the Empower server. See Empower Connector Installation → Prerequisite Conditions and Configurations
EventService	Installer for the LabVantage Event Service on the Empower Server.
Jasper	Jaspersoft Studio ReadMe and preconfigured Jasper Reports templates to assist in creating reports. See "Concepts of Reporting" in the <i>LabVantage Product Documentation</i> .
LOM	Installer for the LabVantage Object Model .NET application used with the Empower Conector.
NWA	The files needed to deploy the North West Analytics analyses included in this module.

3.2 LabVantage HOME

During the configuration of your application server, you will set an environment variable called LABVANTAGE_HOME. This will refer to the full path for your installation's "labvantagehome" directory. You will copy the installation scripts to this folder. This directory contains everything required to:

- Install and run the LabVantage Console
- Add, configure, and maintain LabVantage Databases and Applications

LabVantage Console cannot start unless it finds the labvantagehome directory. Accordingly, during LabVantage installation, you are directed to copy the labvantagehome directory from the ISO to a location that is accessible by the Application Server (such as the root of the hard drive on the machine hosting the Application Server), then set a LABVANTAGE_HOME environment variable that points to this directory.

The following general rules apply:

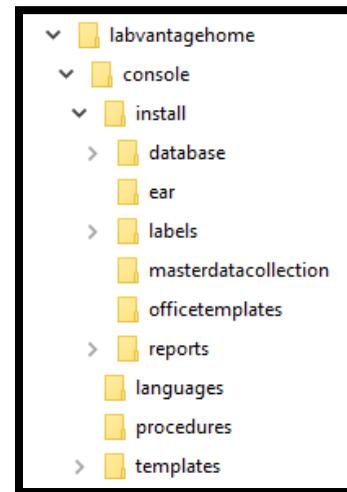
- The LABVANTAGE_HOME variable must point to only one directory on the local machine.
- Do not include spaces in the path to or for the folder name of your LABVANTAGE_HOME. For example, do not use: C:\Program Files\Lab Vantage Home
- After installing, you can move or rename the labvantagehome directory, but the LABVANTAGE_HOME variable must point to that new name. For example, if you rename it labvantagehome8, the LABVANTAGE_HOME variable must be updated point to it.

3.2.1 Setting the LabVantage Home

The preferred method of setting LABVANTAGE_HOME is to set a JVM property to ensure that the variable is specific to the JVM in which the server instance is running. During JBoss configuration, we have you set this as a system property. During installation, if you have a server license from LabVantage you are directed to copy your LabVantage license file (labvantage.lic) into the LABVANTAGE_HOME root directory. The directory structure of LABVANTAGE_HOME differs subtly depending on how you manage and deploy Applications. This is described in [Application Management](#)

3.2.2 Console Directory

Do not modify the contents of the "install" and "procedures" directories. Adding or removing files in these directories will result in failure of installations and upgrades. The "console" directory contains all files required to initiate a standard LabVantage installation and upgrade:



Directory	Contents
database	Installation and upgrade scripts for LabVantage databases.
ear	LabVantage Console EAR (labvantageconsoleNN.ear) Certified LabVantage EAR (labvantage.ear) LabVantage EJBs (sapphire.jar)

	LabVantage "checkcode" application (diagnostics.jar). See the Release Notes for usage guidelines.
labels	Bartender Labels (*.btw). The labels\OOB directory contains Bartender Labels provided for use with the OOB LabVantage product.
reports	Jasper Reports and configuration files. The reports\OOB directory contains reports and files provided for use with the OOB LabVantage product.
logs	log files generated by LabVantage Console
procedures	property files used by Ant scripts to build EARs (buildear.xml) and upgrade EARS (upgradeear.xml)

3.2.3 LabVantage Console EAR

The procedures in this document direct you to copy and deploy the "LabVantage Console EAR". This contains the LabVantage Console Web application which provides the functionality to perform LabVantage-specific operations on databases and Applications. This file is located in LABVANTAGE_HOME\console\install\ear. The LabVantage Console EAR file is typically named labvantageconsoleNN.ear, where NN is the major version of LabVantage. See also [The LabVantage EAR](#).

3.3 Red Hat JBoss EAP Distribution

If you purchased JBoss from LabVantage, LabVantage provides a Red Hat JBoss EAP distribution that is packaged separately from the LabVantage distribution. Below is an example of a typical Red Hat JBoss EAP distribution structure that is provided by LabVantage on a CD or ISO image. In an actual distribution, the build number and date code of the distribution indicate the JBoss EAP version.

Directory	Contents
EAP Binary	Red Hat JBoss EAP binary distribution for JBoss EAP zip installation.
EAP Patches	Patches issued by Red Hat that can be applied to JBoss EAP.
EAP Security Advisories	Security Advisories issued by Red Hat for JBoss EAP.
JBCS Apache HTTP Server	JBoss Core Services Apache HTTP Server used to front clustered standalone EAP instances.
JBCS Apache Jsvc	JBoss Core Services Apache Jsvc used to install the Windows service.
Red Hat Documentation	Documentation issued by Red Hat for JBoss EAP and JBoss Core Services.

- ▼  Example Red Hat JBoss EAP 7 Distribution
 -  EAP Binary
 -  EAP Installer
 -  EAP Javadocs
 -  EAP Maven Repository
 -  EAP Patches
 -  EAP Quickstarts
 -  EAP Security Advisories
 -  EAP Source Code
 -  JBCS Apache HTTP Server
 -  JBCS Apache Jsvc
 -  JBCS OpenSSL
 -  JBCS Web Connectors
 -  Red Hat Documentation

Other directories contain software and code provided by Red Hat as part of their JBoss EAP distribution but are not used to install and configure JBoss for use with LabVantage. For example, "JBCS Web Connectors" contains a module for mod_jk, but LabVantage uses mod_cluster (which is already packaged in JBCS Apache HTTP Server).

Installation Verification: Initials indicate the person performing this procedure has read and understood the topics in this chapter [LabVantage Distributions](#) to include having read and understood the *Release Notes* relevant to the version of LabVantage being installed.

Role	Initials	Date
Executor		
Reviewer		

4 INSTALL AND CONFIGURE YOUR DATABASE

If you are performing an in-place upgrade of an existing LabVantage system to include the application of a maintenance release, please proceed directly to [LabVantage Upgrades](#)

Installation Verification: Enter ‘Yes’ or ‘No’ for an installation or an upgrade. Upgrading a system will not require execution of the procedures described in this chapter.

Role	This is a new installation	This is an Upgrade	Initials	Date
Executor				
Reviewer				

Each instance of LabVantage will require at least two database schemas. These could be in separate physical databases if required. One schema is for administration of the software and a second schema for storage of the application’s operational data. The administration schema maintains the installation in terms of patching, upgrades and other general options. This “AdminDB” schema can be used to control more than one LabVantage database. For example, ‘production’ and ‘validation’ could share one AdminDB. The steps in this chapter describe how to create these schemas.

You have two options for a database. These are Microsoft SQL Server or Oracle. Installation of the database software and creation of a database should be performed according to the procedures supplied by the manufacturer. If you have installed the Microsoft SQL Server software, you may jump to [Microsoft SQL Server DBMS Configuration](#). If Oracle, continue to section 4.1.

Installation Verification: Enter Yes or No for Oracle and Microsoft databases. Skip section 4.1 if MS SQL Server.

Role	This is an Oracle DBMS installation	This is a MSSQL DBMS installation	Initials	Date
Executor				
Reviewer				

4.1 Oracle DBMS Configuration

The person performing these steps must be an experienced Oracle database administrator. You must carefully consider your preferred datafile management strategy, backup strategy, performance goals and the like. LabVantage does not have requirements or recommendations for any of these topics. The sections of this document addressing Oracle database configuration are meant to serve as minimal examples. The only requirements are that you establish at least two tablespaces, two user accounts, grant the roles as described below, and create a fileout directory. The examples show SQL statements that can be issued using the tool of your choice as the user SYS or SYSTEM.

4.1.1 Create Tablespaces

These are minimal examples that are generalized guidelines. Your specifics may differ depending on your site requirements. The examples below should not be considered required values. Adjust your tablespace and datafile creation statements as needed. As a minimum, create two tablespaces. One will be for your

transactional data. The second is for indexing. These two tablespace names will be needed when the LabVantage application is installed later. Size according to your needs. Use autoextend if desired. Name the tablespace and datafiles according to your internal requirements.

General advice about creating datafiles:

- 1) If you are not using Oracle Managed Files (OMF), it is advisable to provide a full valid path to your datafile locations.
- 2) The use of BIGFILE tablespaces is to be avoided. In some limited cases, experienced DBAs may choose to use BIGFILE when setting up a tablespace for LOB storage such as those used by the LabVantage application to store attachments. An example of this is not provided since it is not required.
- 3) The example below provides a maximum file size of 4G. It is fairly uncommon to find systems that support larger file sizes. Following the example, you will need to monitor the growth of your system and add more datafiles when needed.
- 4) Oracle OFA suggests using the SID in the datafile names. Substitute accordingly.

- | | |
|----|---|
| 1. | Create a tablespace for the LabVantage system to store data. Follow your own local practices and standard specifications for Oracle database datafiles. Here is an example: |
|----|---|

```
CREATE TABLESPACE LVSSPACE
DATAFILE 'LVSSPACE01.dbf'
SIZE 800M MAXSIZE 4000M
AUTOEXTEND ON NEXT 400M;
```

Installation Verification: Record the actual tablespace creation statement or process. Attach additional pages as needed.

- | | |
|----|--|
| 2. | Create an index tablespace for the LabVantage system. LabVantage will write index data to this tablespace. Here is an example: |
|----|--|

```
CREATE TABLESPACE LVSIDX
DATAFILE 'LVSIDX01.dbf'
SIZE 400M MAXSIZE 4000M
AUTOEXTEND ON NEXT 400M;
```

Installation Verification: Record the actual tablespace creation statement or process. Attach additional pages as needed.

4.1.2 Create Users and Grant Roles

These accounts will be used to install and administer your LabVantage system. Create one user for the **AdminDB** schema and at least one user for the **LabVantage** schema. Additional schema owners may be required if you intend to have multiple schemas per database. Examples could be ‘production’, ‘validation’, and others. These are user-based schemas. The usernames are open to your own designations. You will need to know these usernames and passwords during the application installation. Example usernames: admindb and labvantage. If you will be using BusinessObjects, create a BusinessObjects administrative user such as boadm.

- | | |
|----|--|
| 1. | Create the required user accounts. The following SQL statement can be used as an example. Repeat for each account as needed. |
|----|--|

```
CREATE USER <username> IDENTIFIED BY <password>
DEFAULT TABLESPACE <data space created above>
QUOTA UNLIMITED ON <data space created above>
QUOTA UNLIMITED ON <index space created above>;
```

Example:

```
create user labvantage identified by labvantage
default tablespace lvsspace
quota unlimited on lvsspace
quota unlimited on lvsidx;
```

Installation Verification: Record the actual user creation statement or process. Attach additional pages as needed.

- | | |
|----|--|
| 2. | Grant the required roles. Repeat for each account as needed. |
|----|--|

```
GRANT create session, create procedure, create trigger, create table,
create sequence, create view, create type TO <username>;
```

Installation Verification: Record the actual grant statement or process. Attach additional pages as needed.

4.1.3 Create a fileoutdir

This directory is required in order to install LabVantage. A database directory must be created and called "FILEOUTDIR". A database directory is a reference to a predefined disk location where the database is allowed to write files to the database's file system. This location must be a valid path on the database server. It must be writeable by the owner of the Oracle software. LabVantage installations will fail without this directory. This database directory is used by the LabVantage database API as a location to write files as needed. This could include an information file that may be written during an upgrade. These files are typically smaller than 100KB each. Available disk space should be of minimal concern. Creating a separate O/S file system directory is recommended but not necessary. The file system directory name can be any value, but the database must recognize this directory as the FILEOUTDIR.

- | | |
|----|---|
| 1. | Create a folder on your database's operating system. Typically, this is placed within the path %ORACLE_BASE%\orafiles (forward slash for LINUX) |
|----|---|

Installation Verification: Record the actual folder path and name:

- | | |
|----|--|
| 2. | Establish a connection to your database as the user SYS. |
|----|--|

- | | |
|----|--|
| 3. | Execute this SQL statement, which creates a directory named "fileoutdir" and points it to the %ORACLE_BASE%\orafiles folder:
<pre>create or replace directory fileoutdir as '%ORACLE_BASE%\orafiles';</pre> (Use a forward slash for LINUX) |
|----|--|

Installation Verification: Record the actual create statement or process for adding this directory:

- | | |
|----|---------------------|
| 4. | Execute this grant: |
|----|---------------------|

```
grant read,write on directory fileoutdir to PUBLIC;
```

Initials indicate verification that the actual database actions were taken on an Oracle database as described in this section.

Role	Initials	Date
Executor		
Reviewer		

You have completed the configuration options necessary for an Oracle database. Please proceed to [Install JBoss](#).

4.2 Microsoft SQL Server DBMS Configuration

Microsoft SQL Server is the alternative to using Oracle as your relational database management system. The person performing these procedures must be an experienced SQL Server database administrator who is familiar with the SQL Server version in use. The screen captures in this document are provided solely for guidance. SQL Server software must be installed and running. Ensure that the SQL Server Browser service is started.

LabVantage uses an AdminDB (Admin database) schema and at least one LabVantage database. You will be repeating these steps for each database schema. If you will be using Business Objects (BO), you must also repeat the steps to provide a BO administrative database schema. LabVantage imposes a limit of 30 characters on all SQL Server object names. Make certain all names you specify here (such as usernames, passwords, etc.) are no longer than 30 characters.

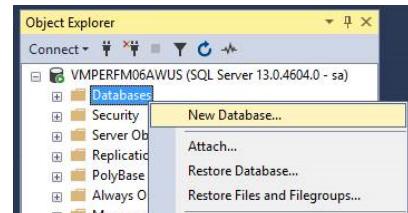
4.2.1 Create a New Database

The screen captures in this procedure demonstrates adding the administrative database to your MS SQL system. When repeating this procedure for additional purposes, substitute database names <DBNAME> and logon names as appropriate. Actual values can be recorded in the table at the end of this chapter.

1. Open the SQL Server Management Studio and connect with these settings:

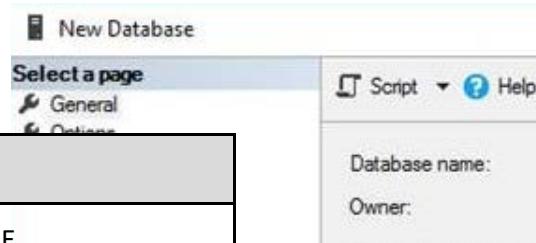
Setting	Value
Server Type	Database Engine
Server name	Select the machine hosting the database
Authentication	SQL Server Authentication
Login	sa
Password	Enter the password for the sa login

2. Choose "Databases", then right-click and choose "New Database". This opens the "New Database" dialog:



3. In the "New Database" dialog, specify this information:

Setting	Value
Database name	DBNAME
Server name	Leave this as <default>



4. Under "Select a page", click "Options", specify the desired "Collation Setting". When used with an MS SQL Server DBMS, LabVantage assumes a case-insensitive collation. You must therefore select a Collation Setting that is case-insensitive (_CI), e.g., SQL_Latin1_General_CI_AS.

Record your actual value:

The "Compatibility Level" setting is native to the SQL Server version. Set it according to Microsoft recommendations for the SQL Server version in use.

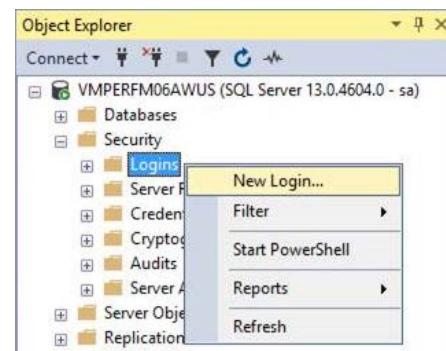
Click OK.

4.2.2 Create a Login

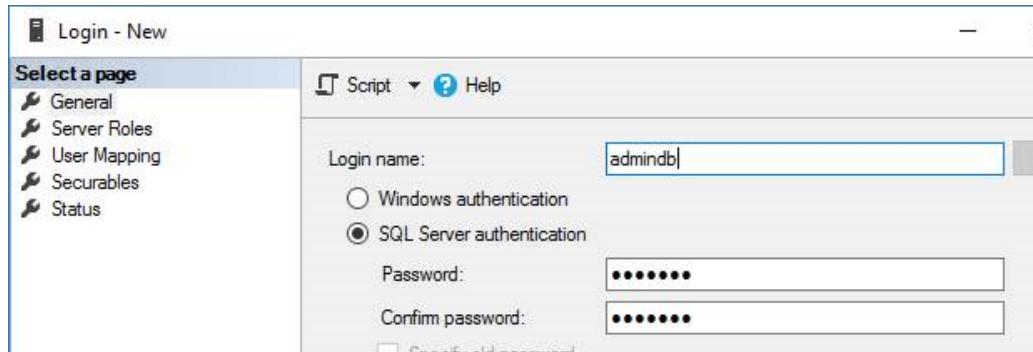
It is recommended that the login name should match the database name.

1. Choose Security → Logins, then right-click and choose **New Login**.

This opens the "General" page of the "New Login" dialog.



2. In the *General* page of the *New Login* dialog, specify this information:



Login name	DBNAME
Password	*your secure password*
Default database	DBNAME

3. Click **User Mapping** in the left panel. This opens the *User Mapping* page of the *New Login* dialog.

4.	<p>Confirm these settings as illustrated.</p> <p>The row corresponds to the DBNAME User column has the DBNAME The Default Schema is: dbo The Database role membership section has db_owner checked</p>	
5.	Click OK.	
6.		Test your connection by disconnecting, then making certain you can connect to the Database Engine as DBNAME.

4.2.3 Enable Row Versioning-Based Isolation

Execute the following statement (where DBNAME is the name of the database):

```
ALTER DATABASE DBNAME SET read_committed_snapshot ON
```

Installation Verification: Use this table to record the actual values

Example	Actual Server Name	Actual DBNAME	Actual Login Name	Row Versioning-Based Isolation Enabled
myserver.domain.com				N/A
admin				Yes / No
labvantage				Yes / No
BOadm				Yes / No

Initials below indicate verification that the actual database actions were taken on an Microsoft SQL Server database as described in this section.

Role	Initials	Date
Executor		
Reviewer		

5 INSTALL JBoss

This document describes the installation and configuration of a stand-alone instance of Red Hat JBoss EAP 7.2 for use with the LabVantage application. Review the *LabVantage Release Notes* for supported platforms and choices for a JDK, JDBC Driver, and JBoss EAP version before continuing.

In some steps, editing XML files and other scripting will be required. LabVantage recommends the use a text editor that understands XML standards (such as Notepad++). Some files may have operating system security which will require editing using Administrator-level permissions. If you copy from this document, do not copy directly into the XML file. Rather, filter it through your text editor to eliminate unwanted characters. Also note that any line breaks resulting from the copy must be eliminated in the XML file along with all other illegal characters.

Red Hat Enterprise LINUX (RHEL) is the recommended UNIX-based platform. RHEL is to denote UNIX-based variants supported by Red Hat. If installing on RHEL, install JBoss as a user with rwx access of 755 on all directories. Do not install JBoss as the user 'root'. We recommend creating a "labvantage" (or similar) user who will own and perform the JBoss installation. This user should also be the account to start JBoss. To avoid confusion with other Red Hat JBoss components and utilities, the terms "JBoss" and "JBoss EAP" refer to Red Hat JBoss Enterprise Application Platform. Windows conventions are used for variables and directory paths throughout this configuration guide. Modify as required for RHEL. When available, differences between Windows and RHEL are noted.

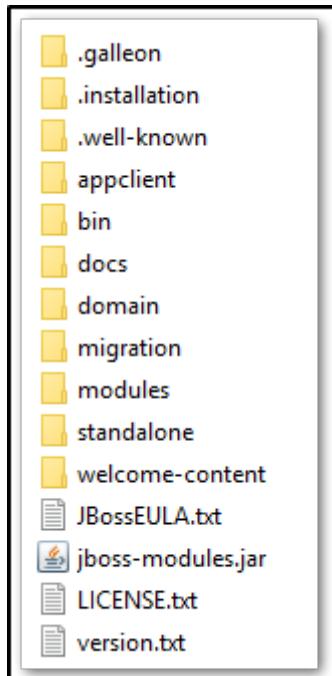
When specifying connections, hostname is used rather than IP address. This assumes proper mapping and resolution through your DNS. Best practice dictates the use of the fully qualified domain name (FQDN) when specifying a host name. An example is myhost.mydomain.com.

If you purchased JBoss from LabVantage, the Red Hat JBoss EAP 7.2 binary is provided in the "EAP Binary" directory of the Red Hat JBoss EAP Distribution. This is the base JBoss EAP 7.2.0 server version. The filename is jboss-eap-7.2.0.zip. You will extract this ZIP file onto your middle-tier application server. After installing, you will configure several aspects of JBoss and apply patches.

5.1 Extract JBoss

Extracting the ZIP file will create a folder called "jboss-eap-72". The eventual full path will be identified as your JBOSS_HOME. This can be at the root of a folder structure or within another directory. It is recommended that you do not use a directory path that contains spaces. On RHEL, this is typically within /opt

1.	Record the host name of the application server. Create or identify the location where you will extract the JBoss ZIP. Fully qualified host name: _____
	Actual Path: _____
2.	Extract the ZIP file to your actual path. The extracted folder structure under jboss-eap-7.2 is shown to the right. If required, you may modify the folder path at this time.
3.	Record the actual full JBOSS_HOME path



	Actual JBOSS_HOME: _____
--	--------------------------

Installation Verification: Initials indicate JBoss is extracted to the indicated path.

Role	Initials	Date
Executor		
Reviewer		

5.2 Setup a Dedicated JDK

Following the Release Notes, choose a Java Developer Kit (JDK). Download the JDK for your specific operating system and architecture. The architecture of the JDK must match that of your operating system (both must be 32-bit, or both must be 64-bit).

5.2.1 Extract the JDK.

1.	<p>If you use an Oracle JDK 8, the MSI and RPM installers (for Windows and RHEL) will install a system-wide JDK. Rather than using this system-wide JDK, you should create a local copy of the entire JDK directory for use exclusively by JBoss. For the Windows MSI and RHEL RPM system-wide installers, you can take a copy of the installed JDK directory. For RHEL and other UNIX variants, you can use the BIN installer to choose a dedicated location. If you require further information, both Oracle and Red Hat provide detailed guidelines for JDK installation.</p> <p>Setup the JDK such that it will be dedicated for use exclusively by JBoss. This ensures that the JDK used by JBoss will not be overwritten by subsequent automatic JDK updates.</p> <p>Record the JDK Version: _____ Record the JAVA_HOME: _____</p>
2.	<p>Using a text editor, edit JBOSS_HOME\bin\standalone.conf.bat (Windows) or standalone.conf (RHEL).</p>
3.	<p>Search the file to find the line that contains this text: Specify the location of the Java home directory</p>
4.	<p>Below the commented text, edit the line that is highlighted as shown in red below. Set the JAVA_HOME to the location of your Java Home directory following the example</p> <pre>rem # Specify the location of the Java home directory (it is recommended # that rem # this always be set). If set, then "%JAVA_HOME%\bin\java" will be # used as rem # the Java VM executable; otherwise, "%JAVA%" will be used (see below). Windows Example: set "JAVA_HOME=C:\jdk1.8.0_162" RHEL Example: JAVA_HOME="/opt/jdk1.8.0_201"</pre> <p>Record the actual JAVA_HOME which should match step 1: _____</p>

- | | |
|----|---|
| 5. | Save the file. You will continue to edit this file in the next section. |
|----|---|

Installation Verification: Initials indicate the actual JAVA_HOME in step 4 matches step 1

Role	Initials	Date
Executor		
Reviewer		

5.2.2 Set Initial JVM Allocation

Continue editing JBOSS_HOME\bin\standalone.conf.bat (Windows) or standalone.conf (RHEL). Set the JVM runtime option for Java heap and Metaspace as shown below. 8GB heap space is considered the minimum for most LabVantage installations to experience acceptable performance. This assumes a server with 4 CPUs and 16G RAM. Increase the MetaspaceSize to 1g. For both the Java heap and the MetaspaceSize, set the initial and maximum to the same value. Further tuning of these memory parameters may be required as your load increases.

- | | | | | | |
|---------|---|---------|---|------|---|
| 1. | If using Windows, search the file to find the line with this text

JVM memory allocation pool parameters

In RHEL, search for

Specify options to pass to the Java VM | | | | |
| 2. | Edit the line immediately after this commented line to match these values:

<table border="1"><tr><td>Windows</td><td>set "JAVA_OPTS=-Xms8g -Xmx8g -XX:MetaspaceSize=1g
-XX:MaxMetaspaceSize=1g"</td></tr><tr><td>RHEL</td><td>JAVA_OPTS="-Xms8g -Xmx8g -XX:MetaspaceSize=1g
-XX:MaxMetaspaceSize=1g -Djava.net.preferIPv4Stack=true"</td></tr></table> | Windows | set "JAVA_OPTS=-Xms8g -Xmx8g -XX:MetaspaceSize=1g
-XX:MaxMetaspaceSize=1g" | RHEL | JAVA_OPTS="-Xms8g -Xmx8g -XX:MetaspaceSize=1g
-XX:MaxMetaspaceSize=1g -Djava.net.preferIPv4Stack=true" |
| Windows | set "JAVA_OPTS=-Xms8g -Xmx8g -XX:MetaspaceSize=1g
-XX:MaxMetaspaceSize=1g" | | | | |
| RHEL | JAVA_OPTS="-Xms8g -Xmx8g -XX:MetaspaceSize=1g
-XX:MaxMetaspaceSize=1g -Djava.net.preferIPv4Stack=true" | | | | |
| 3. | Enter this text on one line. Save the file. You will continue to edit this file in the next section. | | | | |

Installation Verification: Record the actual values.

Xms and Xmx: _____ MetaspaceSize and MaxMetaspaceSize: _____

Role	Initials	Date
Executor		
Reviewer		

5.2.3 Set Heap Dump on OOM Error

This configures the server to generate a Java heap dump when an Out-Of-Memory (OOM) error is thrown by the JVM and write the dump to a specified storage location.

1.	First, create a directory for your dump files. Examples include C:\dumps in Windows or /opt/dumps in RHEL. Refer to your JDK documentation if you want to explore other options for specifying file location using HeapDumpPath.
2.	<p>Continue editing JBOSS_HOME\bin\standalone.conf.bat (Windows) or standalone.conf (RHEL).</p> <p>For Windows, these two lines may not exist. Add them or edit as needed. If adding, it is recommended to add these to the end of the file.</p> <pre>rem # Set Heap Dump on OOM Error. set "JAVA_OPTS=%JAVA_OPTS% -XX:+HeapDumpOnOutOfMemoryError -XX:HeapDumpPath=PATH"</pre> <p>Where: "PATH" is the full path to your dump file directory in hprof format. Enter the statement on one line.</p> <p>For RHEL, the line may already exist but is commented out. Remove the comment mark and verify that you have a /opt/dumps directory. Otherwise, alter the Heap Dump Path.</p> <pre>JAVA_OPTS="\$JAVA_OPTS -XX:+HeapDumpOnOutOfMemoryError - XX:HeapDumpPath=/opt/dumps"</pre>

Installation Verification: Record the actual Heap Dump Path

Actual PATH: _____

Role	Initials	Date
Executor		
Reviewer		

5.2.4 Set G1 Garbage Collector

This configures the server to use the G1 Garbage Collector. Java has added this functionality in the Oracle and JDK platforms, and this framework has been shown to significantly improve runtime class instance creation and teardown behaviors. Refer to [Oracle documentation](#) for additional information about G1.

1.	<p>Continue editing your standalone configuration file. These two lines will not exist. Add them to the end of the file.</p> <p>Windows</p> <pre>rem # Set G1 Garbage Collector set "JAVA_OPTS=%JAVA_OPTS% -XX:+UseG1GC -XX:MaxGCPauseMillis=200"</pre> <p>RHEL</p> <pre># Set G1 Garbage Collector JAVA_OPTS="\$JAVA_OPTS -XX:+UseG1GC -XX:MaxGCPauseMillis=200"</pre>
2.	<p>Save your changes.</p> <p>You will continue editing the file in the next section.</p>

Installation Verification: The G1 Garbage Collector lines are added to this file.

Role	Initials	Date
Executor		
Reviewer		

5.2.5 Set Date Format Standardization per Locale

Starting in JDK 11, Java has reordered of the priority of its date format standardization. LabVantage relies on the older order. To keep the previous order, we suggest adding the following JVM option so that your date formats will stay consistent. This prioritization can be specified regardless of which Java version is in use. For more information, see: [Oracle's JDK 11 Supported Locales](#) document.

- | | |
|----|---|
| 1. | <p>Continue editing your standalone configuration file. These two lines will not exist. Add them to the end of the file.</p> <p>Windows</p> <pre>rem # Set Date Format Standardization per Locale set "JAVA_OPTS=%JAVA_OPTS% -Djava.locale.providers=JRE,CLDR"</pre> <p>RHEL</p> <pre># Set Date Format Standardization per Locale JAVA_OPTS="\$JAVA_OPTS -Djava.locale.providers=JRE,CLDR"</pre> |
| 2. | Save your changes. |

Installation Verification: The Set Date Format Standardization lines are added to this file.

Role	Initials	Date
Executor		
Reviewer		

6 CREATE A LABVANTAGE STANDALONE INSTANCE PROFILE

JBoss uses profiles to set application options. An example profile is provided with the installation of JBoss. You will copy this profile to create a new profile and begin adding the configurations required for LabVantage.

6.1 Establishing a Profile

Determine the name you will use for your profile. For the remainder of this document, this directory is referred to using the variable PROFILE. The name you give the profile is discretionary. However, LabVantage recommends:

- Non-Clustered installs: "standalone_lvNN" where NN is the LabVantage version (such as standalone_lv8 for LabVantage 8).
- OR
- Clustered installs: "standalone_lvNNcluster" where NN is the LabVantage version (such as standalone_lv8cluster for LabVantage 8). Although not required, it is recommended to retain the name "standalone" to identify this as a standalone profile.

1.	Navigate the file system to JBOSS_HOME										
2.	Copy and paste the existing "standalone" directory (including all contents) to the same JBOSS_HOME. Rename the copy to your decided profile name. Record your directory/profile name: _____										
Installation Verification: Initials indicate a directory has been created as a copy of "standalone".											
<table border="1"><thead><tr><th>Role</th><th>Initials</th><th>Date</th></tr></thead><tbody><tr><td>Executor</td><td>_____</td><td>_____</td></tr><tr><td>Reviewer</td><td>_____</td><td>_____</td></tr></tbody></table>			Role	Initials	Date	Executor	_____	_____	Reviewer	_____	_____
Role	Initials	Date									
Executor	_____	_____									
Reviewer	_____	_____									
Role	Initials	Date									
Executor	_____	_____									
Reviewer	_____	_____									

6.2 Create a Directory for LABVANTAGE_HOME

Each JBoss profile you create can use a different LabVantage Home if required. Create this directory now.

1.	An example path for the LabVantage home could be on the root of your file system for Windows or within your /opt path for RHEL. Avoid using spaces in the path. Create this path if necessary. You may use any mount point where the installation user has read, write, and execute access.
2.	Copy and paste the "labvantagehome" directory from your installation media to the root of your file system or your selected path. Record the full path to your LabVantage Home: _____
3.	For clustered installs, the LabVantage Home will be copied to other nodes after you have finished configuring. Record the host name(s) FQDN of host: _____

Installation Verification: Initials indicate a directory has been created and populated as a LabVantage Home.

Role	Initials	Date
Executor		
Reviewer		

6.3 Add a JBoss Management User

You must create a Management User in order to log onto the JBoss Management Console and Command Line Interface (CLI).

1. Make a copy of JBOSS_HOME\bin\add-user.bat (or add-user.sh in RHEL), then rename the copy. This name is discretionary. However, unless your requirements dictate otherwise, LabVantage recommends using the following standardized naming convention:
 - If this is a non-clustered standalone instance, LabVantage recommends renaming the file to add-user_lvNN.bat (or add-user_lvNN.sh), where NN is the LabVantage version.
 - If this is a clustered standalone instance, LabVantage recommends renaming the file to add-user_lvNNcluster.bat (or add-user_lvNNcluster.sh), where NN is the LabVantage version.

Renaming the add-user batch file becomes important as you create multiple standalone instances. For example, adding a different "add-user.bat" script for each standalone instance lets you use the same management user for multiple standalone instances without throwing an error.
2. Using a text editor, edit the file you created as a copy in step 1.
3. Find the line with:

Windows	Setup Jboss specific properties
RHEL	Setup the JVM
4. Before that line in this file, add the below two lines:

Windows	rem Set JAVA_HOME set "JAVA_HOME=<your JAVA_HOME>"
RHEL	# Set JAVA_HOME JAVA_HOME="<your JAVA_HOME>"

Be sure to set <your JAVA_HOME> to the path you created in [Setup a Dedicated JDK](#)
5. Including the pre-existing lines, compare your new lines to the below example. The most significant added line is highlighted in red. This is showing a Windows example.

	<pre> rem Set JAVA_HOME set "JAVA_HOME=C:\jdk1.8.0_162" rem Setup JBoss specific properties if "%JAVA_HOME%" == "" (set JAVA=java Record your actual JAVA_HOME= path: _____ </pre>
6.	Search the file to find a line with: Uncomment to override standalone and domain user location
7.	Copy the line immediately after this line. Example: <pre> rem set "JAVA_OPTS=%JAVA_OPTS% - Djboss.server.config.user.dir=..\standalone\configuration - Djboss.domain.config.user.dir=..\domain\configuration" </pre>
8.	Paste the copied line to add another line immediately after this one.
9.	Remove the 'rem' or '#' portion from the line you pasted.
10.	Change the \standalone\ portion to the PROFILE you created in Establishing a Profile
11.	Unless you have chosen a different domain directory, remove this portion <pre> -Djboss.domain.config.user.dir=..\domain\configuration </pre>
12.	Including the pre-existing lines, compare your new line to this example: Windows: <pre> rem Uncomment to override standalone and domain user location rem set "JAVA_OPTS=%JAVA_OPTS% - Djboss.server.config.user.dir=..\standalone\configuration - Djboss.domain.config.user.dir=..\domain\configuration" set "JAVA_OPTS=%JAVA_OPTS% -Djboss.server.config.user.dir= ..\standalone_lv8\configuration" </pre> RHEL: <pre> # Uncomment to override standalone and domain user location #JAVA_OPTS="\$JAVA_OPTS-Djboss.server.config.user.dir=../standalone/configuration- Djboss.domain.config.user.dir=../domain/configuration" JAVA_OPTS="\$JAVA_OPTS -Djboss.server.config.user.dir=../standalone_lv8/configuration" </pre> The highlighted portion should be all on one line with no spaces between -Djboss.server.config.user.dir=..\PROFILE\configuration Save the file. Record your actual -Djboss.server.config.user.dir= value: _____
13.	Open a command window (DOS or terminal) and navigate to JBOSS_HOME\bin.
14.	Depending on your environment execute the script you edited starting in step 1.

		Non-Clustered	Clustered	Example
	Windows	add-user_lvNN.bat	add-user_lvNNclust.bat	prompt>add-user_lv85.bat
	RHEL	add-user_lvNN.sh	add-user_lvNNclust.sh	shell>./add-user_LV85.sh
15.	Answer the questions as described in this and the next 6 steps. An example of the final screen is shown in step 24. Record your actuals in step 25			
	For the first prompt, type the letter 'a'. This adds a Management User. Press [Enter]			
16.	For the second prompt, enter a username. Unless your local practices dictate otherwise, LabVantage recommends a username of JBossAdmin. This username is case-sensitive. Press [Enter].			
17.	Enter a password following your local requirements. For Windows system, the password cannot contain exclamation marks (!), hashes (#), or semicolons (;). Press [Enter] and re-type the password. These login credentials are encrypted and cannot be recovered if lost. Keep the credentials in a safe, secure place.			
18.	When asked "What groups do you want this user to belong to?", just press "Enter". We will not create any groups. Some informational text will be displayed.			
19.	When asked "Is this correct yes/no?", enter y or n (for yes and no).			
20.	When asked "Is this new user going to be used for one AS process to connect to another AS process?", enter n (for no). 'Yes' is applicable only to domains.			
21.	As directed, please "Press any key to continue...".			
22.	Compare your results to the expected Windows example shown here. Prompts are shown in blue text, visible entries are shown in red. A RHEL example is shown after this one. Record your actuals in step 23. Please note that this is an example only. Your actual input and output may vary. C:\jboss-eap-7.2\bin> add-user_lv85.bat What type of user do you wish to add? a) Management User (mgmt-users.properties) b) Application User (application-users.properties) (a): a Enter the details of the new user to add. Using realm 'ManagementRealm' as discovered from the existing property files. Username : JBossAdmin Password requirements are listed below. To modify these restrictions edit the add-user.properties configuration file. - The password should be different from the username. - The password must not be one of the following restricted values {root, admin, administrator} - The password must contain at least 8 characters, 1 alphabetic character(s), 1 digit(s), 1 non-alphanumeric symbol(s) Password : Re-enter Password :			

	<pre>What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank for none)[]: About to add user 'JBossAdmin' for realm 'ManagementRealm' Is this correct yes/no? y Added user 'JBossAdmin' to file 'C:\jboss-eap...' Added user 'JBossAdmin' to file 'C:\jboss-eap...' Added user 'JBossAdmin' with groups to file 'C:\jboss-eap...' Added user 'JBossAdmin' with groups to file 'C:\jboss-eap...' 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? n Press any key to continue . . . C:\jboss-eap-7.2\bin></pre>
	<p>This example is for Red Hat Enterprise Linux. Please bear in mind that this is an example only. Your actual input and server responses may vary. Record your actuals in the table below.</p> <p>RHEL Example:</p> <pre>[1V bin]\$./add-user_lv85.sh</pre> <p>What type of user do you wish to add?</p> <ul style="list-style-type: none">a) Management User (<code>mgmt-users.properties</code>)b) Application User (<code>application-users.properties</code>) <p>(a): a</p> <p>Enter the details of the new user to add.</p> <p>Using realm 'ManagementRealm' as discovered from the existing property files.</p> <p>Username : <code>JBossAdmin</code></p> <p>Password recommendations are listed below. To modify these restrictions edit the <code>add-user.properties</code> configuration file.</p> <ul style="list-style-type: none">- 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) <p>Password :</p> <p>Re-enter Password :</p> <p>What groups do you want this user to belong to? (Please enter a comma separated list, or leave blank for none)[]:</p> <p>About to add user 'jbossadmin' for realm 'ManagementRealm'</p> <p>Is this correct yes/no? yes</p> <pre>Added user 'jbossadmin' to file '/opt/...' Added user 'jbossadmin' to file '/opt/...' Added user 'jbossadmin' with groups to file '/opt/...' Added user 'jbossadmin' with groups to file '/opt/...' 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 [1V bin]\$</pre>
23.	Record the actual values you entered for these prompts in the table below:

Prompt	Example	Actual
Script name	add-user_lv85.bat	
What type of user...?	a	
Username	JBossAdmin	
Password		Store in a secure location!
Is this correct?	y	
Is this new user going to be used for one AS process...?	n	

Installation Verification: Initials indicate the script ran without error and the above values were supplied

Role	Initials	Date
Executor		
Reviewer		

If you are planning for a clustered installation, proceed to chapter 7.

If not, proceed to [Perform Initial JBoss Startup](#)

7 JBOSS SETUP REQUIREMENTS FOR CLUSTERED INSTALLATIONS

This chapter provides some procedures to follow on any additional nodes of a cluster. This chapter does not apply to systems that are being installed on one JBoss application server. The processes assumes you have [Setup a Dedicated JDK](#) on any additional nodes and that you have copied the JBOSS_HOME directories from the node configured in chapter 6 to additional nodes.

7.1 Test Multicast (Clustered Standalone Instances Only)

By default, JBoss EAP uses UDP multicast protocol to synchronize file-persistent data, replicate information across a cluster, and conduct failover/recovery operations. Accordingly, JBoss requires a class D network with an address range of 224.0.0.0 to 239.255.255.255. If this is a clustered standalone instance, test your network using the McastSenderTest and McastReceiverTest classes in jboss-client.jar by running the commands shown below. UDP multicast is the preferred protocol for inter-node communication. However, if your network cannot use multicast, you can configure the JGroups stack to communicate using TCP unicast in the next section [Changing the JGroups Stack from UDP to TCP](#).

To test your network for multicast, execute these commands from the JAVA_HOME\bin directory, where:

- M1 and M2 denote the machines hosting the first and second node of the cluster, respectively.
- JBOSS_HOME is the full path to the JBoss EAP installation directory.
- -mcast_addr is the UDP multicast address to use for the test. For the purposes of this test, you can use the default 230.0.0.4, or any multicast address that is free.
- -port is the port on which the multicast address listens. For the purposes of this test, you can use the default 45688, or any port associated with the multicast address that is free (just to give it a port assignment).

-bind_addr is the hostname of the local machine (HOSTNAME_M1 for machine M1 and HOSTNAME_M2 for machine M2).

1.	Run this on M1 (the test will use M1 as the machine that will send multicast packets). Substitute in a forward slash (/) for the backslash (\) in this and all following examples when using RHEL. java -cp JBOSS_HOME\bin\client\jboss-client.jar org.jgroups.tests.McastSenderTest -mcast_addr 230.0.0.4 -port 45688 - bind_addr HOSTNAME_M1
2.	Run this on M2 (the test will use M2 as the machine that will receive multicast packets): java -cp JBOSS_HOME\bin\client\jboss-client.jar org.jgroups.tests.McastReceiverTest -mcast_addr 230.0.0.4 -port 45688 - bind_addr HOSTNAME_M2
3.	Type something on M1 (the sending machine), then press "Enter". You should see what you typed on M2 (the receiving machine).
4.	The following steps will execute the test in the opposite direction. Run this on M2 (the test will use M2 as the machine that will send multicast packets): java -cp JBOSS_HOME\bin\client\jboss-client.jar org.jgroups.tests.McastSenderTest -mcast_addr 230.0.0.4 -port 45688 - bind_addr HOSTNAME_M2

5.	Run this on M1 (the test will use M1 as the machine that will receive multicast packets): <code>java -cp JBOSS_HOME\bin\client\jboss-client.jar org.jgroups.tests.McastReceiverTest -mcast_addr 230.0.0.4 -port 45688 - bind_addr HOSTNAME_M1</code>
6.	Type something on M2 (the sending machine), then press "Enter". You should see what you typed on M1 (the receiving machine).

Installation Verification: Initials indicate a successful test of Multicast on all nodes. An alternative to a successful test is to change to JGroups Stack to use TCP unicast as described in section 7.2. If this section was not successful, enter N/A for executor and reviewer.

Role	Initials	Date
Executor		
Reviewer		

7.2 Changing the JGroups Stack from UDP to TCP

As stated in the previous section, JBoss EAP defaults to UDP multicast protocol for synchronizing file-persistent data, replicating information across a cluster, and conducting failover/recovery operations. If your network cannot use UDP multicast, you can change the JGroups stack to use TCP unicast. If you must use TCP, be advised that some tuning may be involved. For example, you are more likely to experience timeouts involving mod_cluster communication with Apache front-ends (such as the common "Failed to send STATUS" errors). Synchronization, replication, and failover/recovery are also slower than UDP. Also be advised that when new cluster members are added, you must explicitly specify them in the TCP stack.

Edit JBOSS_HOME\PROFILE\configuration\standalone-ha.xml using any text editor and implement the changes shown below in red text.

1.	In the jgroups subsystem, change the default stack to "tcp". Make all other changes as described below in the TCP stack.
2.	Add the TCPPING protocol. For initial_hosts, add the hostnames or IPs of all cluster members. These are shown as HOST1 and HOST2 below (replace with your values). Note that the default jgroups-tcp port is 7600. Make certain all cluster members specified by HOST at port 7600 are accessible over the network. If they cannot be accessed, the cluster members will not join.
3.	Set the port_range to 0 (zero).
4.	Comment the MPING protocol.
5.	Compare your changes to the example file shown here. Changes are highlighted in red. <code><subsystem xmlns="urn:jboss:domain:jgroups:5.0"> <channels default="ee"></code>

```
<!--<channel name="ee" stack="udp" cluster="ejb" />-->
<channel name="ee" stack="tcp" />

</channels>
<stacks>
    <stack name="udp">
        :
        :
    </stack>
    <stack name="tcp">
        <transport type="TCP" socket-binding="jgroups-tcp" />
        <protocol type="TCPPING" >
            <property
                name="initial_hosts">HOST1[7600],HOST2[7600]</property>
            <property name="port_range">0</property>
        </protocol>
        <!--<socket-protocol type="MPING" socket-binding="jgroups-mping" />-->
        <protocol type="MERGE3" />
        <protocol type="FD_SOCK" />
        <protocol type="FD_ALL" />
        <protocol type="VERIFY_SUSPECT" />
        <protocol type="pbcast.NAKACK2" />
        <protocol type="UNICAST3" />
        <protocol type="pbcast.STABLE" />
        <protocol type="pbcast.GMS" />
        <protocol type="MFC" />
        <protocol type="FRAG3" />
    </stack>
</stacks>
</subsystem>
```

6. Save the file. Later in this procedure, there is a section where you will Set JBoss Bind Addresses. You will then setup the private interface. Be certain you do this, as JGroups uses the private interface.

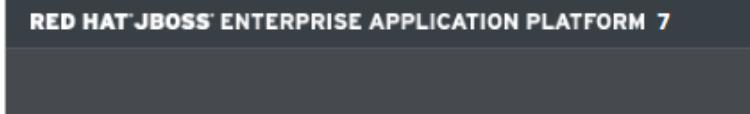
Installation Verification: Initials indicate a setup of unicast on all nodes. Enter N/A if not applicable for this installation.

Role	Initials	Date
Executor		
Reviewer		

8 PERFORM INITIAL JBOSS STARTUP

This chapter provides a means to start JBoss using the command line. This will not be the standard practice once you have finished configuring JBoss and you have a background service or process running. Perform an initial JBoss startup as described below in order to perform the first few initial configuration steps and log into the JBoss Management Console. The startup commands shown below are initial startup commands. They are provided only to let you log into the JBoss Management Console and setup the first few initial configuration steps.

1.	Make sure your database is started and is listening for connections.
2.	The startup command you use will depend on whether the instance is non-clustered or clustered. Construct your command as appropriate for Windows or RHEL. Substitute your values for JBOSS_HOME, HOSTNAME, PROFILE, and CONFIG
Win	JBOSS_HOME\bin\standalone.bat -bmanagement HOSTNAME -b HOSTNAME -Djboss.server.base.dir=JBOSS_HOME\PROFILE -c CONFIG
RHEL	JBOSS_HOME/bin/standalone.sh -bmanagement HOSTNAME -b HOSTNAME -Djboss.server.base.dir=JBOSS_HOME/PROFILE -c CONFIG
	<p>...where</p> <ul style="list-style-type: none">• JBOSS_HOME is the full path to the JBoss EAP installation directory• HOSTNAME is the hostname of the local machine. Never specify 0.0.0.0, 127.0.0.1, or localhost.• PROFILE is the name of the standalone instance profile you created in Create a LabVantage Standalone Instance Profile.• CONFIG is the standalone instance configuration file. Enter one of the following (depending on whether this is a non-clustered or clustered instance):<ul style="list-style-type: none">• standalone.xml for a non-clustered instance.• standalone-ha.xml for a clustered instance.
	Record your actual command:
3.	Open a command window and issue this command. Make certain it starts without errors. Clustered standalone instances do not start their cluster-aware services (and thus not indicate their indicate cluster status) until a clustered application is deployed. Therefore, non-clustered and clustered standalone instances look similar on initial startup prior to configuration and application deployment.
4.	Compare the last three lines to the below. Actual values may vary. You are waiting to see a message indicating that the EAP services have started.

	<pre>INFO [org.jboss.as] (Controller Boot Thread) WFLYSRV0060: Http management interface listening on http://HOSTIP:9990/management INFO [org.jboss.as] (Controller Boot Thread) WFLYSRV0051: Admin console listening on http://HOSTIP:9990 INFO [org.jboss.as] (Controller Boot Thread) WFLYSRV0025: JBoss EAP 7.2.0.GA (WildFly Core 6.0.11.Final-redhat-00001) started in 3113ms - Started 306 of 527 services (321 services are lazy, passive or on-demand)</pre>
5.	<p>Test JBoss by entering the proper URL into your browser's address bar. An example is <code>http://HOSTNAME:8080</code> ...where HOSTNAME is your FQDN host name. Example http://myserver.mydomain.com:8080.</p> <p>JBoss uses port 8080 by default. Unless you have made specific configurations otherwise, you can assume it is listening on this port.</p> <p>A Welcome page loads.</p> <p>You can further test by clicking the Administration Console link and providing the credentials created in section 6.3 Add a JBoss Management User</p> 

Installation Verification: Initials indicate a JBoss Enterprise Application Platform Welcome Page loads.

Role	Initials	Date
Executor		
Reviewer		

Note: To stop JBoss while running in the command (or terminal) window, press [Ctrl]-C and terminate the process when prompted.

9 CONFIGURE JBOSS

These modifications are required in order to make sure JBoss runs in an efficient manner when connecting to a database and serving up pages that are dynamically loaded by users of the LabVantage application.

9.1 Add IIOP-OpenJDK Subsystem

These modifications add an IOP-OpenJDK subsystem to make COBRA classes available during the process of adding a LabVantage database and running the application . If these changes are not made, LabVantage database install scripts will fail when adding a new database and LabVantage Maintenance pages will not render in upgraded databases.

1.	Make sure JBoss is not running. Stop JBoss if it is running.
2.	Edit JBOSS_HOME\PROFILE\configuration\standalone.xml (if this is a non-clustered standalone instance) or JBOSS_HOME\PROFILE\configuration\standalone-ha.xml (if this is a clustered standalone instance). Make the changes in steps 3 through 6 below.
3.	Add the "org.wildfly.iiop-openjdk" module definition to the end of the extensions element as shown in red below. This should be added immediately before the </extensions> closing tag. <pre><server xmlns="urn:jboss:domain:8.0"> <extensions> : <extension module="org.wildfly.iiop-openjdk" /> </extensions></pre>
4.	Add the "urn:jboss:domain:iiop-openjdk" subsystem as shown in red below. This should be added immediately before the "urn:jboss:domain:jaxrs" subsystem shown below. <pre><subsystem xmlns="urn:jboss:domain:iiop-openjdk:2.1"> <orb socket-binding="iiop"/> <initializers security="identity" transactions="spec"/> <security server-requires-ssl="false" client-requires-ssl="false"/> </subsystem> <subsystem xmlns="urn:jboss:domain:jaxrs:1.0"/></pre>
5.	In the <interfaces> element, add the "unsecure" interface as shown in red below. This should be added immediately before the </interfaces> closing tag. <pre><interfaces> : <interface name="unsecure"> <inet-address value="\${jboss.bind.address.unsecure:127.0.0.1}" /> </interface> </interfaces></pre>
6.	In the socket-binding-group element, add the "iiop" and "iiop-ssl" socket binding definitions as shown in red below. These should be added immediately after the "https" socket binding definition.

```
<socket-binding-group name="standard-sockets" default-interface="public" port-offset="\${jboss.socket.binding.port-offset:0}">
  :
  <socket-binding name="https" port="\${jboss.https.port:8443}" />
  <socket-binding name="iiop" interface="unsecure" port="3528"/>
  <socket-binding name="iiop-ssl" interface="unsecure" port="3529"/>
  :
</socket-binding-group>
```

7. Save all changes to the file. You will continue editing this file in the next section.

Installation Verification: Initials indicate these changes were made and saved.

Role	Initials	Date
Executor		
Reviewer		

9.2 Modify JBoss Logger

Edit JBOSS_HOME\PROFILE\configuration\standalone.xml (if this is a non-clustered standalone instance) or JBOSS_HOME\PROFILE\configuration\standalone-ha.xml (if this is a clustered standalone instance). Add the lines shown in red below to the JBoss logging subsystem. This is required for running Axis/JAX web services, as this removes the dependency JBoss 7 invokes on its own logger.

1. Search to find the following subsystem portion of this file:

```
<subsystem xmlns="urn:jboss:domain:logging"
```

2. Add the two highlighted lines as shown in red below.

```
<subsystem xmlns="urn:jboss:domain:logging:6.0">
  <add-logging-api-dependencies value="false"/>
  <use-deployment-logging-config value="false"/>
  <console-handler name="CONSOLE">
    <level name="INFO"/>
```

3. Save all changes. You will continue editing this file in the next section.

Installation Verification: Initials indicate these changes were made and saved.

Role	Initials	Date
Executor		
Reviewer		

9.3 Modify Infinispan Caches

This is a workaround for a known Infinispan session locking issue that prevents multiple requests from the same user to access an HTTP session. There is a solution for non-clustered standalone instances which is different for clustered standalone instances. The solutions are done in the Infinispan subsystem as shown below. Red Hat will advise when it is fixed. JBoss must not be running during this procedure.

9.3.1 Solution for Non-Clustered Installs

Edit JBOSS_HOME\PROFILE\configuration\standalone.xml. Remove the "locking" and "transaction" elements as shown below.

1.	Search to find the following subsystem portion of this file: <pre><subsystem xmlns="urn: jboss: domain: infinispan"</pre>									
2.	<u>Remove</u> the two highlighted lines as shown in red below. <pre><subsystem xmlns="urn: jboss: domain: infinispan: 7.0"> : <cache-container name="web" default-cache="passivation" module="org.wildfly.clustering.web.infinispan"> <local-cache name="passivation"> <locking isolation="REPEATABLE_READ" /> <transaction mode="BATCH" /> <file-store passivation="true" purge="false" /> </local-cache> </cache-container></pre>									
3.	Save all changes.									
4.	Compare your resulting section of this file to this: <pre><subsystem xmlns="urn: jboss: domain: infinispan: 7.0"> : <cache-container name="web" default-cache="passivation" module="org.wildfly.clustering.web.infinispan"> <local-cache name="passivation"> <file-store passivation="true" purge="false" /> </local-cache> </cache-container></pre>									
Installation Verification: Initials indicate these changes were made and saved. Enter N/A for the next section. If this is a clustered install, indicate that this section was not executed by entering N/A here.										
<table border="1"><thead><tr><th>Role</th><th>Initials</th><th>Date</th></tr></thead><tbody><tr><td>Executor</td><td></td><td></td></tr><tr><td>Reviewer</td><td></td><td></td></tr></tbody></table>		Role	Initials	Date	Executor			Reviewer		
Role	Initials	Date								
Executor										
Reviewer										

9.3.2 Solution for Clustered Installs

Edit JBOSS_HOME\PROFILE\configuration\standalone-ha.xml. Add the specified attributes to the "distributed-cache" element and remove the "locking" and "transaction" elements as shown below.

1.	Search to find the following subsystem portion of this file: <pre><subsystem xmlns="urn:jboss:domain:infinispan"</pre>
2.	<u>Remove</u> the two highlighted lines as shown in red below. <pre><subsystem xmlns="urn:jboss:domain:infinispan:7.0"> : <cache-container name="web" default-cache="dist" module="org.wildfly.clustering.web.infinispan"> <transport lock-timeout="60000"/> <distributed-cache name="dist"> <locking isolation="REPEATABLE_READ" /> <transaction mode="BATCH" /> <file-store/> </distributed-cache> </cache-container></pre>
3.	Add the highlighted text: <pre><distributed-cache name="dist" owners="3"></pre>
4.	Save all changes.
5.	Compare your resulting section of your file to this: <pre><subsystem xmlns="urn:jboss:domain:infinispan:7.0"> : <cache-container name="web" default-cache="dist" module="org.wildfly.clustering.web.infinispan"> <transport lock-timeout="60000"/> <distributed-cache name="dist" owners="3"> <file-store/> </distributed-cache> </cache-container></pre>

Installation Verification: Initials indicate these changes were made and saved. If this is not a clustered install, indicate this section was not executed by entering N/A

Role	Initials	Date
Executor		
Reviewer		

For the distributed-cache, the "owners" attribute defines the number of cluster nodes that will hold session data. It is set to "3". If the cluster contains more than three nodes, it is recommended to change this value to the number of nodes in the cluster.

Although the "owners" attribute defines the number of nodes that will actually (physically) hold session data, a given session is always accessible on any node. Any node can query the cache and retrieve the session. If a node is not an owner, a remote procedure call retrieves the value from one of the owners. The primary advantage of using this attribute is that if an owner node goes down, other owner nodes will be holding their own session data.

9.4 Install a JDBC driver.

This section describes how to install a core module for a JDBC driver. For supported drivers see the LabVantage Release Notes. During this procedure, JBoss EAP should be stopped.

1.	In JBOSS_HOME\modules\system\layers\base\com, create the directory structure specified below, depending on your DBMS and JDBC driver. Use forward slashes (/) instead of backslashes (\) if installing on RHEL. Oracle: Create this directory structure <code>oracle\main</code> Microsoft: Create this directory structure <code>microsoft\main</code> Record the actual JDBC driver path: _____				
2.	Copy the JDBC driver file to the 'main' directory you just created in step one. Examples of JDBC driver files are <code>ojdbc8.jar</code> and <code>mssql-jdbc-7.0.0.jre8</code>				
3.	In the same directory, create a text file called <code>module.xml</code> . Using a text editor on this file, enter the text below. Replace JAR with the name of the jar file (such as <code>ojdbc8.jar</code> , <code>mssql-jdbc-7.0.0.jre8</code> , or other). <table border="1"><tr><td style="vertical-align: top; padding-right: 20px;">Oracle</td><td><?xml version="1.0" encoding="UTF-8"?> <module xmlns="urn:jboss:module:1.0" name="com.oracle"> <resources> <resource-root path="JAR" /> </resources> <dependencies> <module name="javax.api"/> <module name="javax.transaction.api"/> </dependencies> </module></td></tr><tr><td style="vertical-align: top; padding-right: 20px;">Microsoft</td><td><?xml version="1.0" encoding="UTF-8"?> <module xmlns="urn:jboss:module:1.0" name="com.microsoft"> <resources> <resource-root path="JAR" /> </resources> <dependencies> <module name="javax.api"/> <module name="javax.transaction.api"/> <module name="javax.xml.bind.api"/> </dependencies> </module></td></tr></table>	Oracle	<?xml version="1.0" encoding="UTF-8"?> <module xmlns="urn:jboss:module:1.0" name="com.oracle"> <resources> <resource-root path=" JAR " /> </resources> <dependencies> <module name="javax.api"/> <module name="javax.transaction.api"/> </dependencies> </module>	Microsoft	<?xml version="1.0" encoding="UTF-8"?> <module xmlns="urn:jboss:module:1.0" name="com.microsoft"> <resources> <resource-root path=" JAR " /> </resources> <dependencies> <module name="javax.api"/> <module name="javax.transaction.api"/> <module name="javax.xml.bind.api"/> </dependencies> </module>
Oracle	<?xml version="1.0" encoding="UTF-8"?> <module xmlns="urn:jboss:module:1.0" name="com.oracle"> <resources> <resource-root path=" JAR " /> </resources> <dependencies> <module name="javax.api"/> <module name="javax.transaction.api"/> </dependencies> </module>				
Microsoft	<?xml version="1.0" encoding="UTF-8"?> <module xmlns="urn:jboss:module:1.0" name="com.microsoft"> <resources> <resource-root path=" JAR " /> </resources> <dependencies> <module name="javax.api"/> <module name="javax.transaction.api"/> <module name="javax.xml.bind.api"/> </dependencies> </module>				
4.	Record your value for JAR: _____ Save all changes.				
5.	Navigate to JBOSS_HOME\bin\				
6.	Using a text editor, edit <code>jboss-cli.bat</code> (Windows) or <code>jboss-cli.sh</code> for RHEL				
7.	Search to find the line that states:				

	Windows	rem Setup JBoss specific properties
	RHEL	# Setup the JVM

Add the first two lines shown below by inserting these before the line you found.

Windows:

```
rem Set JAVA_HOME
set "JAVA_HOME=C:\jdk1.8.0_162"

rem Setup JBoss specific properties
if "%JAVA_HOME%" == "%" (
    set JAVA=java
```

RHEL:

```
# Set Java Home
JAVA_HOME="/opt/jdk1.8.0_201"
```

Use the path to the Java Home you created in section [5.2 Setup a Dedicated JDK](#)

8. Record the value for JAVA_HOME: _____ Save all changes.
9. Start JBoss as described in [Perform Initial JBoss Startup](#)

10. Open a separate DOS (or terminal) window. Navigate to JBOSS_HOME\bin.

Enter the JBoss CLI by issuing this command (replace HOSTNAME with yours):

```
jboss-cli.bat --connect --controller=HOSTNAME:9990
```

For RHEL

```
./jboss-cli.sh --connect --controller=HOSTNAME:9990
```

You will see this:

```
[standalone@HOSTNAME:9990 /]
```

11. Issue a command all on one line corresponding to your DBMS

Oracle	/subsystem=datasources/jdbc-driver=oracle:add(driver-name=oracle,driver-module-name=com.oracle,driver-class-name=com.oracle.jdbc.driver.OracleDriver)
Microsoft	/subsystem=datasources/jdbc-driver=microsoft:add(driver-name=microsoft,driver-module-name=com.microsoft,driver-class-name=com.microsoft.sqlserver.jdbc.SQLServerDriver)

12. The system responds with

```
{ "outcome" => "success" }
[standalone@hostname:9990 /]
```

13. In the DOS (or terminal) window showing the JBoss console log, you will see the driver load with version information as shown in the examples below.

	Oracle	INFO [org.jboss.as.connector.deployers.jdbc] (MSC service thread 1-8) WFLYJCA0018: Started Driver service with driver-name = oracle
	Microsoft	INFO [org.jboss.as.connector.subsystems.datasources] (ServerService Thread Pool -- 36) WFLYJCA0004: Deploying JDBC-compliant driver class com.microsoft.sqlserver.jdbc.SQLServerDriver (version 6)

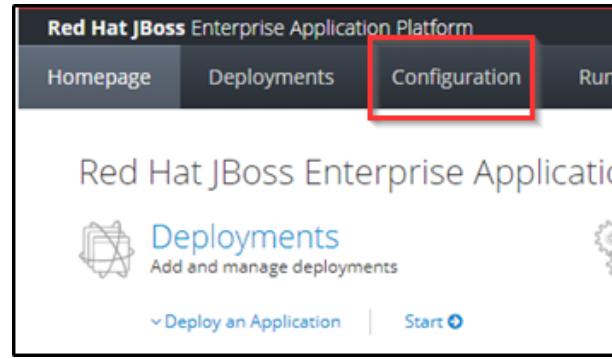
Installation Verification: Initials indicate the appropriate driver has been installed.

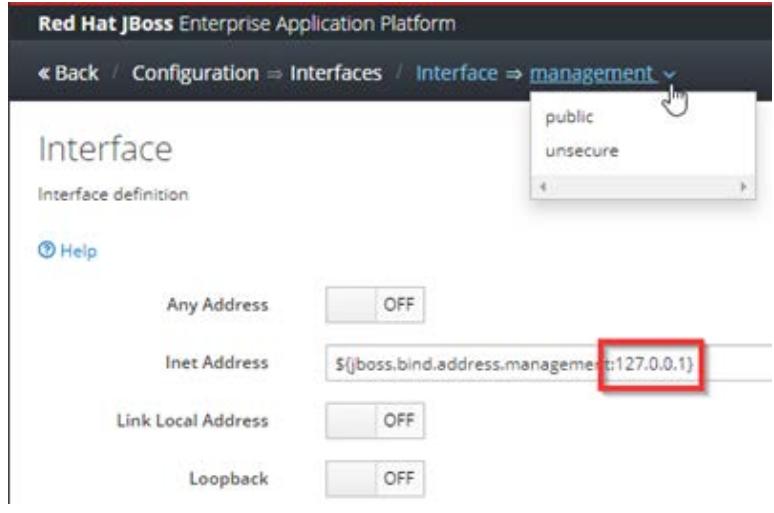
Role	Initials	Date
Executor		
Reviewer		

9.5 Set JBoss Bind Addresses

If you have the CLI open, use [CTRL]-C to exit the CLI but leave the JBoss command window running. This procedure leads you through the process of logging into the JBoss Management Console to set the bind addresses for the management, public, and unsecure network interfaces. This can be done for both clustered and non-clustered standalone instances. In clustered standalone instances, the private network interface is also exposed and must be set, as it is the default interface used by JGroups.

1.	In the previous section you started the JBoss EAP. Refer to the end of Perform Initial JBoss Startup for instructions on how to access the Administrative Console.
2.	Using the tabs at the top, click Configuration
3.	Navigate to Interfaces → Management... View. Next, choose Edit



4.	<p>There are three interfaces. For each of these, you will be changing the Inet Address. Note that you can switch between the interfaces as demonstrated in the top right of this example. Change the address from 127.0.0.1 (shown in the red rectangle) to the fully qualified domain name (FQDN) of the server.</p>									
5.	<p>Review your entry. This should be the same value you entered in Perform Initial JBoss Startup. Never specify 0.0.0.0, 127.0.0.1, or localhost. Doing so will prevent clients from being able to connect to your application server. Use the name defined in your HTTPS certificate.</p> <p>Example: yourhost.yourcompanyname.com</p>									
6.	Save. A message dialog is displayed indicating that the server configuration has changed. Click "Reload Server Now". A confirmation message is then displayed.									
7.	Select the "public" interface. In a similar manner, change the address from 127.0.0.1 to the FQDN of the host machine.									
8.	Select the "unsecure" interface. In a similar manner, change the address from 127.0.0.1 to the FQDN of the host machine.									
9.	If this is a clustered standalone instance, select the "private" interface. In a similar manner, change the address 127.0.0.1 to the FQDN of the host machine. This is important in clustered standalone instances, since the "private" interface is the default interface used by JGroups									
10.	Record your actual values in the table below:	<table border="1"> <tbody> <tr> <td>Management bind address</td><td></td></tr> <tr> <td>Public bind address</td><td></td></tr> <tr> <td>Unsecure bind address</td><td></td></tr> <tr> <td>Private bind address</td><td></td></tr> </tbody> </table>	Management bind address		Public bind address		Unsecure bind address		Private bind address	
Management bind address										
Public bind address										
Unsecure bind address										
Private bind address										

Installation Verification: Initials indicate the Management Console has been configured.

Role	Initials	Date
Executor		
Reviewer		

9.6 Deploy the LabVantage Console

Copy the LabVantage Console EAR file from LABVANTAGE_HOME\console\install\ear to JBOSS_HOME\PROFILE\deployments. The name of the file to copy is: labvantageconsole80.ear

Installation Verification: Initials indicate the LV Console EAR file has been copied.

Role	Initials	Date
Executor		
Reviewer		

9.7 Start JBoss With Your New Profile

If JBoss is currently running, stop it first. The command you will issue in this process will leverage your new profile. The bind addresses for the network interfaces were set in the JBoss profile configuration, this is how you will start JBoss from this point forward.

1. Construct your startup command by following the below example. This command will be entered as one line.

Win	JBOSS_HOME\bin\standalone.bat -Djboss.server.base.dir=JBOSS_HOME\PROFILE -c CONFIG
RHEL	JBOSS_HOME/bin/standalone.sh -Djboss.server.base.dir=JBOSS_HOME/PROFILE -c CONFIG

...where

- JBOSS_HOME is the full path to the JBoss EAP installation directory (as recorded in [Extract JBoss](#)).
- PROFILE is the standalone instance profile you created in [Create a LabVantage Standalone Instance Profile](#).
- CONFIG is the standalone instance configuration file. Enter one of the following (depending on whether this is a non-clustered or clustered instance):
 - standalone.xml for a non-clustered instance.
 - standalone-ha.xml for a clustered instance.

	Record your actual startup command: <hr/>
2.	Using the operating system command line, enter your command.
3.	Verify that JBoss starts without errors. Clustered standalone instances do not start their cluster-aware services (and thus not indicate their cluster status) until a clustered application is deployed. Therefore, non-clustered and clustered standalone instances look similar on initial startup prior to configuration and application deployment. The last three lines should look something like this: INFO [org.jboss.as] (Controller Boot Thread) WFLYSRV0060: Http management interface listening on http://HOSTIP:9990/management INFO [org.jboss.as] (Controller Boot Thread) WFLYSRV0051: Admin console listening on http://HOSTIP:9990 INFO [org.jboss.as] (Controller Boot Thread) WFLYSRV0025: JBoss EAP 7.2.0.GA (Wildfly Core 3.0.10.Final-redhat-1) started in 2251ms - Started 481 of 680 services (362 services are lazy, passive or on-demand)
Installation Verification: Initials indicate JBoss started without errors.	

Role	Initials	Date
Executor		
Reviewer		

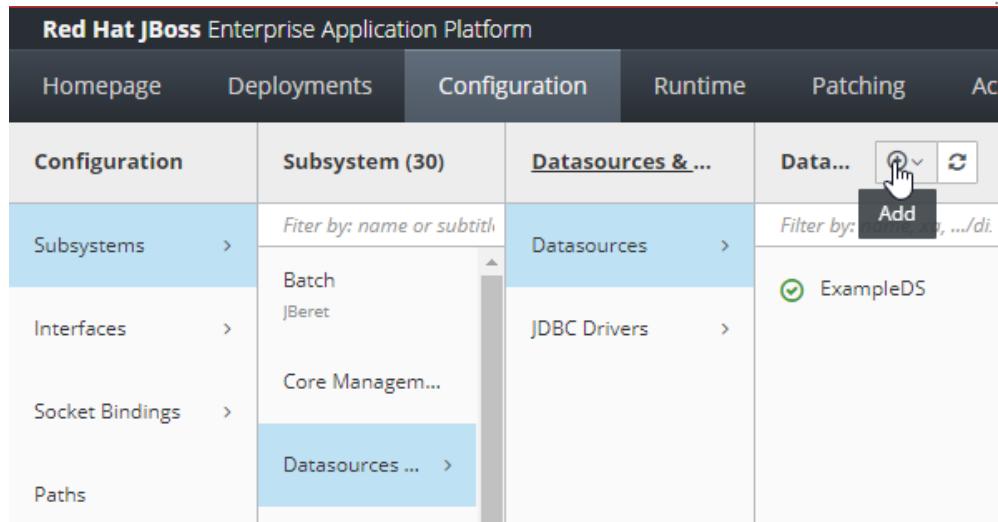
Notes for future reference:

- Other startup parameters for clustered instances (such as multicast address and node identifier) are defined in the server profile configuration, not in the startup options. You will set startup parameters for clusters later in this procedure.
- On startup, JBoss generates these directories within a profile (if they do not already exist):
 - "tmp" is where JBoss extracts zipped deployments. Although not required, LabVantage recommends deleting the "tmp" directory between JBoss restarts in order to keep it at a modest size. It will be recreated on server startup.
 - "data" is where file-based system data are stored. Since we do file-based deployment and do not use JMS, we do not use the data directory. If deleted, it will be recreated on server startup.
 - "log" is where JBoss maintains its server logs. If you do not need your server logs, you can delete the "log" directory between JBoss restarts. It will be recreated on server startup.
- To stop JBoss while running in the command (or terminal) window, press [Ctrl-C] and terminate the process when prompted.
- "Restart JBoss" means stop, then start as described above.

9.8 Create Data Sources

This uses the JBoss Management Console to create data sources for the AdminDB and LabVantage schemas. With JBoss running, access the Administrative Console as before. Adding datasources is required in order to enable a connection to a database from the application server.

1. Select Configuration → Subsystems → Datasources & Drivers → Datasources → Add.



2. Click Add Datasource. Create data sources as follows.

On the first page, choose the "Custom" Datasource.

Choosing a specific vendor is not recommended, as the defaults provided are incorrect for LabVantage and you would have to change them anyway.

Click Next.

3. Step 2/6: Datasource Attributes

Name:

Enter an easy to identify pool-name identifier to be used by JBoss. We recommend using easily identifiable names (such as admindb and labvantage).

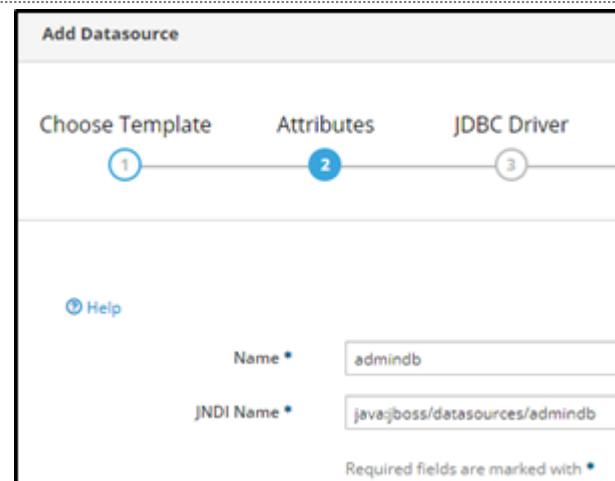
JNDI Name:

Enter the JNDI name of the data source. When specifying the JNDI name, you must add the prefix java:jboss/datasources/

Example JNDI name for the AdminDB schema:

java:jboss/datasources/admindb

Example JNDI name for the LabVantage schema: java:jboss/datasources/labvantage

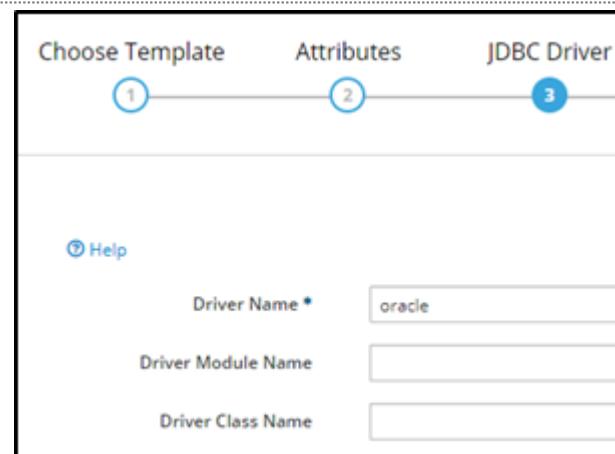


4. Step 3/6: JDBC Driver

Use the drop-list to choose the Driver Name specific to your database. This shows the drivers installed as core modules.

The remaining fields can remain empty.

Click Next.



5. Step 4/6: Connection Settings

Connection URL

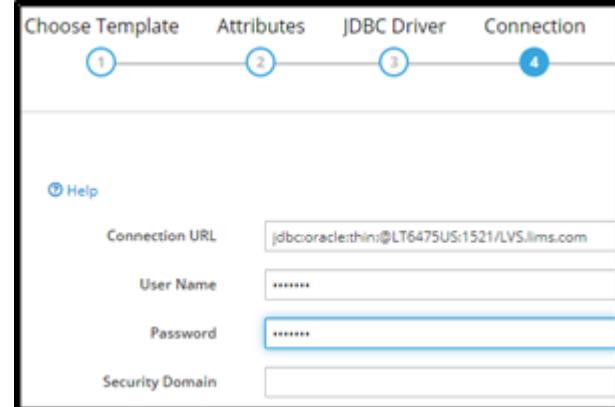
Using the syntax shown below, replace hostname, port, service_name, databasename, and instancename with your values.

Username and Password

Credentials for the schema owner

Security Domain

Leave this blank



Connection URL Syntax

Oracle	jdbc:oracle:thin:@ hostname : port / service_name
--------	--

Microsoft	jdbc:sqlserver:// hostname : port ;databaseName= databasename ;instanceName= instancename
-----------	---

	<p>Note that this entry does not contain spaces or return characters. If the only SQL Server instance is the default instance, you may use instanceName=.</p>												
6.	<p>Step 5/6: Test Connection Read the notes about creating your datasource during the test. Test the connection for the data source by clicking "Test Connection". Make certain you receive a success notification. Now click Next.</p> <div style="border: 1px solid black; padding: 10px;"> <p>Choose Template Attributes JDBC Driver Connection Test Connection</p> <p>1 2 3 4 5</p> <p>On this page you can test the connection of your datasource.</p> <p>Please note that testing the connection changes the semantics of this wizard:</p> <ul style="list-style-type: none"> If you press Test Connection for the first time, the datasource is created in advance. If you go back and change settings, this will modify the newly created datasource. Please note that you can change the name and JNDI bindings once the datasource has been created. If you cancel the wizard, the datasource will be removed again. This might require a reload of the server. <p>If you choose to continue without testing the connection, the datasource will be created after finishing the wizard.</p> <p style="text-align: right;">Test Connection </p> </div>												
7.	<p>Summary Verify your settings, then click "Finish".</p> <div style="border: 1px solid black; padding: 10px;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>Name</td> <td>admindb</td> </tr> <tr> <td>JNDI Name</td> <td>java:jboss/datasources/admindb</td> </tr> <tr> <td>Connection URL</td> <td>jdbc:oracle:thin:@LT6475US:1521/LV\$lims.com</td> </tr> <tr> <td>Driver Name</td> <td>oracle</td> </tr> <tr> <td>User Name</td> <td>***** @</td> </tr> <tr> <td>Password</td> <td>***** @</td> </tr> </tbody> </table> <p style="text-align: right;">Cancel < Back Finish</p> </div>	Name	admindb	JNDI Name	java:jboss/datasources/admindb	Connection URL	jdbc:oracle:thin:@LT6475US:1521/LV\$lims.com	Driver Name	oracle	User Name	***** @	Password	***** @
Name	admindb												
JNDI Name	java:jboss/datasources/admindb												
Connection URL	jdbc:oracle:thin:@LT6475US:1521/LV\$lims.com												
Driver Name	oracle												
User Name	***** @												
Password	***** @												
8.	<p>A message dialog is displayed indicating that the server configuration has changed. Click "Reload". A confirmation message is then displayed. Click Close. You may be prompted to reload once more. JBoss should automatically enable the newly created data source. Repeat the above for a second datasource you will call "labvantage"</p>												

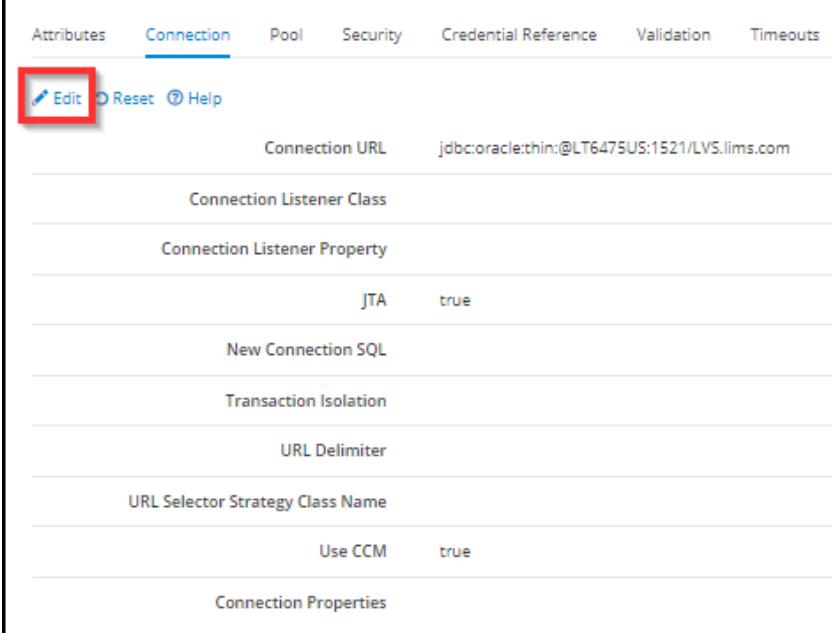
Installation Verification: Initials indicate two datasources have been created. Record the names of these datasources:

Example	Actual	
admindb		
labvantage		
	Role	Initials
	Date	
	Executor	
	Reviewer	

9.9 Configure the Data Sources

The two datasources added through the JBoss Administration Console will require some settings to help optimize the resources allocated to making connections to these databases. This process will be repeated for each of your two data sources.

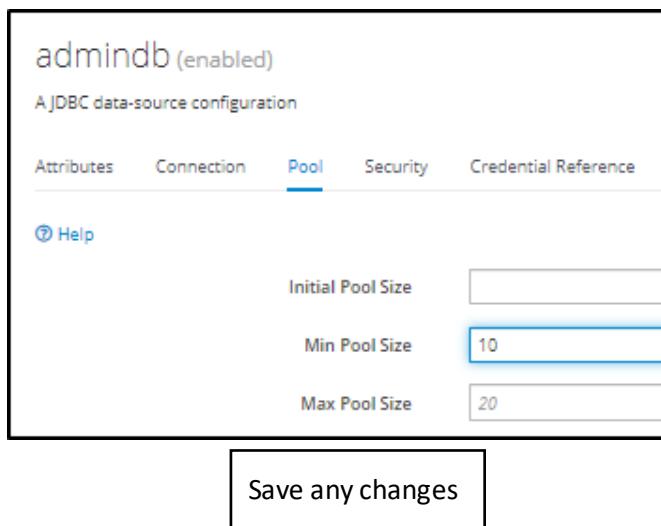
1.	Select Configuration → Subsystems → Datasources & Drivers → Datasources → DATASOURCENAME → View. ...where DATASOURCENAME is the name of the data source created in Create Data Sources
2.	Click the "Connection" tab. Note! Changes are not automatically saved in this page. You must save any changes you make before moving to a different tab.
3.	The values for "Use JTA?" and "Use CCM?" must both be "true" as shown. If these are not set to "true", click Edit to make these changes. Save any changes. If they are already set to true, continue without editing.



The screenshot shows the 'Connection' tab of a data source configuration. At the top, there are three buttons: 'Edit' (highlighted with a red box), 'Reset', and 'Help'. Below the buttons, the 'Connection URL' is set to 'jdbc:oracle:thin:@LT6475US:1521/LVS.lims.com'. There are several other fields listed: 'Connection Listener Class', 'Connection Listener Property', 'JTA' (set to 'true'), 'New Connection SQL', 'Transaction Isolation', 'URL Delimiter', 'URL Selector Strategy Class Name', 'Use CCM' (set to 'true'), and 'Connection Properties'.

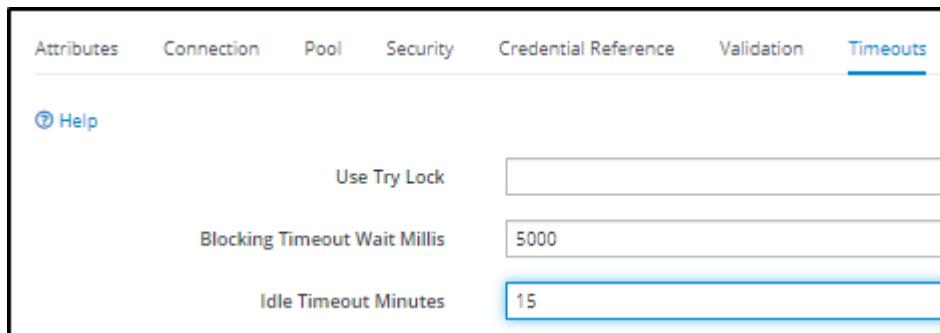
4. Click the "Pool" tab, then click "Edit".
 The optimal settings will vary depending on your configuration and use case. Here are some minimal recommendations to get you started. Set the "Min Pool Size" and "Max Pool Size" for each data source per datasource:

	AdminDB	LV
Min	10	30
Max	20	100



The screenshot shows the 'admindb' data source configuration in the 'Pool' tab. The 'Initial Pool Size' is set to 10, 'Min Pool Size' is set to 10, and 'Max Pool Size' is set to 20. A 'Save any changes' button is located at the bottom right.

5. Click the "Timeouts" tab, then click "Edit".
 Set the "Blocking Timeout Millis" to 5000. This blocks a maximum of 5 seconds while waiting for a permit for a connection, after which it will throw an exception.



The screenshot shows the 'admindb' data source configuration in the 'Timeouts' tab. The 'Blocking Timeout Wait Millis' is set to 5000 and 'Idle Timeout Minutes' is set to 15. A 'Save any changes' button is located at the bottom right.

6. Set the "Idle Timeout Minutes" to 15. This closes a connection from the Java pool after the thread has been idle for 15 minutes.
 Click "Save" and "Reload" when notified that the server configuration has changed
7. Repeat this procedure for your second datasource.

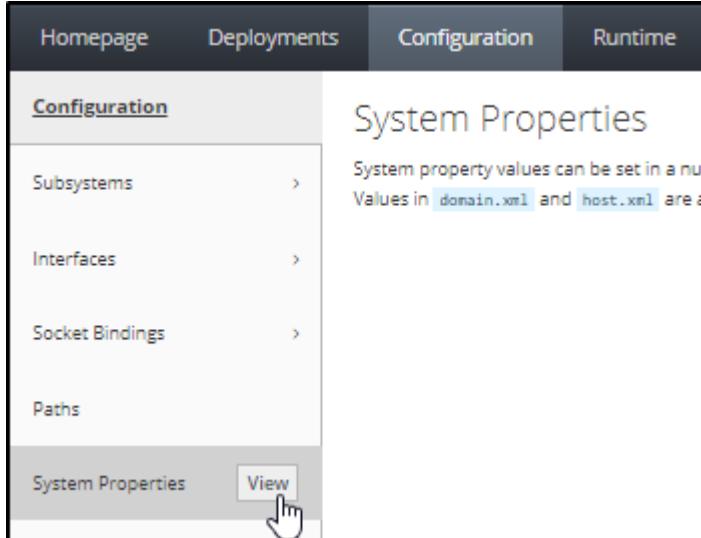
Installation Verification: Initials indicate two datasources have been modified. Record the names of these datasources:

Example	Actual
admindb	
labvantage	

Role	Initials	Date
Executor		
Reviewer		

9.10 Create System Properties

Using the JBoss Management Console, you will set the LABVANTAGE_HOME and other properties.

1. Select Configuration → Subsystems → System Properties → View	
2. Click Add	

3. In the *Add System Property* dialog, create the LABVANTAGE_HOME system property and set its value (example value shown):
- Note the forward slash. This is interpreted in an XML file, so you must use a forward slash whether you are running in Windows or RHEL.

Add System Property

[Help](#)

Name *

Value

Required fields are marked with *

Cancel **Add**

This is the absolute location and name of the LABVANTAGE_HOME directory you created in an earlier procedure. For example, if your LABVANTAGE_HOME directory is called labvantagehome in the root of a Windows OS, enter: C:/labvantagehome

Example for RHEL: /opt/labvantagehome

4. Record the actual property name and value. In the *Add System Property* dialog click **Add**

Property Name	Value

5. If this is not a clustered install, you have completed this procedure and will "N/A" the remaining steps of this section. For clustered installs, create a second system property by clicking **Add**.

6. You will be adding a property named jboss.node.name. This is the "Node Name", which JBoss uses to identify each node in the cluster. Each clustered standalone instance must have a unique value. Although this is a discretionary value, LabVantage recommends JB1 for node 1, JB2 for node 2, and so on. Determine what values you will use for each unique node in your cluster and record your actuals here. Add additional pages as needed.

Node 1: _____ Node 2: _____ Node 3: _____ .

7. In the *Add System Property* dialog, create the `jboss.node.name` system property and set its value (example value shown):

Note that the value must be unique on each node of your system.

Record your actual Value:

Click **Add**.

Add System Property

Help

Name *

Value

Required fields are marked with *

Cancel Add

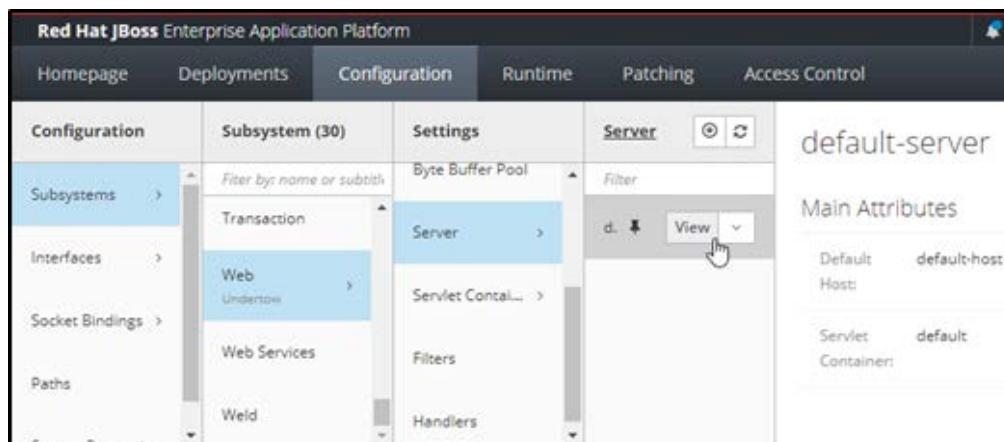
Installation Verification: Initials indicate the values recorded in this section are the actuals as entered by the executor.

Role	Initials	Date
Executor		
Reviewer		

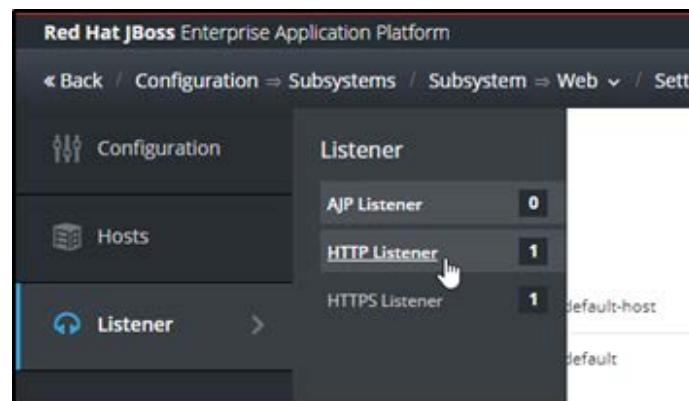
9.11 Set Undertow Listener Attributes

This defines the operational parameters of each connector that uses the Undertow Web Server listener. You will have more than one listener. For example, you will have an HTTP and an HTTPS listener. Others are possible. Each will require configuration following these steps. Repeat this process for each listener as needed.

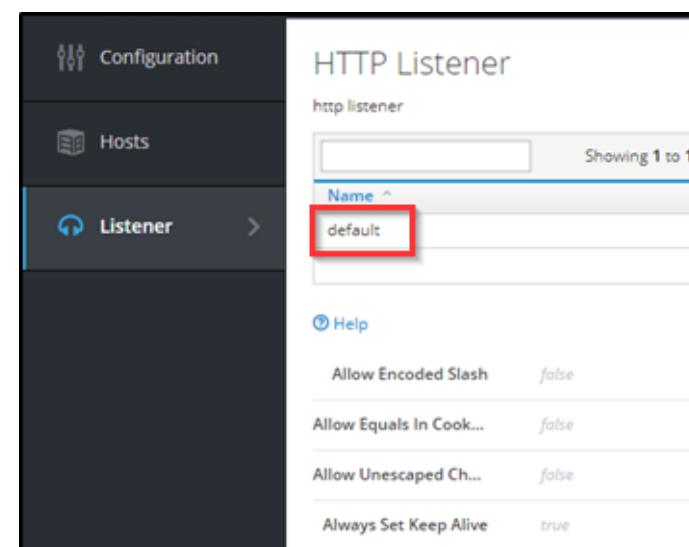
1. Select Configuration → Subsystems → Web Undertow → Server → default-server → View



2. In the "Listener" tab, select one of the three listeners for the default-server configuration:
- 1) For the HTTP connector, select "HTTP Listener".
 - 2) For the HTTPS connector, select "HTTPS Listener".
 - 3) For the AJP connector (clustered standalone instances only), select "AJP Listener"



3. Click to select the default configuration.
 Click "Edit"
 Set the attributes specified below to the indicated values for HTTP, HTTPS (if applicable), and AJP connectors (if a clustered standalone instance).



- 4.
- 1) Always set these for the "HTTP Listener" (default port 8080), whether the instance is non-clustered or clustered.
 - 1) Set these for the "HTTPS Listener" if you will be running a non-clustered instance over an HTTPS connection (default port 8443). For clustered instances, the HTTPS connection is set at the input port for JBCS Apache HTTP Server (default port 443).
 - 2) For clustered instances, also set these for the "AJP Listener".

Attribute	Value	Description
Enable http2	OFF (false)	Determines if HTTP/2 protocol is enabled for the HTTP (or HTTPS) listener. Tests have shown that this must be set to "false" (disabled) to prevent problems related primarily to header compression. This attribute does not apply to the AJP listener, which uses AJP protocol.
Max header size	65536	Maximum size of request and response headers entering the HTTP connector. The default is 1048576.

	Max headers	65536	Maximum number of headers processed per request. The default is 200.
	Max parameters	65536	Maximum number of parameters processed per request. The default is 1000.
	Max post size	1024000000000	Maximum size of incoming post requests. The default is 1048576. This cannot be set to "unlimited", so it is set to 1 TB. The maximum is 9 PB.
	URL Charset	UTF-8	Character set used to decode URLs received from the browser. This is the default value.

5. For clustered installs, set this additional attribute for the "AJP Listener"

Attribute	Value	Description
Max ajp packet size	65536	Maximum size of request and response headers entering the AJP connector. The default is 8192. The maximum is 65536. This must match the values of the LimitRequestFieldSize and ProxyIOBuffer directives in httpd.conf. You will be setting this when you configure JBoss Core Services for Apache HTTP server.

6. Click "Save" and "Reload" when notified that the server configuration has changed. Repeat this procedure for each listener. Circle Yes or No for each listener that was configured.

AJP(clusters)	HTTP		HTTPS	
	YES	NO	YES	NO

Installation Verification: Initials indicate the values recorded in this section are the actuals for each listener indicated as entered by the executor.

Role	Initials	Date
Executor		
Reviewer		

9.12 Set Instance Id Variable (Clustered Standalone Instances Only)

If this is a clustered standalone instance, you must set an Instance ID variable for Undertow as follows. This will read the jboss.node.name variable. If this is not a clustered install, this section is not applicable.

1. Select Configuration → Subsystems → Web Undertow → Global Settings → View.

The screenshot shows the 'Undertow Configuration' page under 'Global Settings'. It lists several configuration parameters:

- Default Security Domain: [REDACTED]
- Default Server: default-server
- Default Servlet Container: default
- Default Virtual Host: default-host
- Instance ID: \${jboss.node.name} % (This field is highlighted with a red rectangular box.)
- Statistics Enabled: false

2. If the "Instance Id" is not set, click "Edit", then set it to \${jboss.node.name} as shown above.
Save any changes.

3. The JBoss Management Console does not write the node name into the standalone-ha.xml file.
To work around this, edit JBOSS_HOME\PROFILE\configuration\standalone-ha.xml.

Locate the "undertow" subsystem (it contains the "http", "https", and "ajp" connector definitions).

Set the attribute `instance-id="${jboss.node.name}"` as shown in red below.

```
<subsystem xmlns="urn:jboss:domain:undertow:7.0" instance-id="${jboss.node.name}">
```

Installation Verification: Initials indicate execution of this procedure.

Role	Initials	Date
Executor		
Reviewer		

9.13 Set Servlet/JSP Properties

This disables tag pooling, thus helping to prevent JBoss from throwing OOM errors resulting from large JSPs and/or thread counts. Continue using the JBoss Management Console for this process.

1. Select Configuration → Subsystems → Web Undertow → Servlet Container → default → View

The screenshot shows the JBoss configuration interface with the following navigation path:

- Homepage
- Deployments
- Configuration**
- Runtime
- Patching
- Access Control

- Configuration** tab selected.
- Subsystems** section:
 - Filter by name or subtitle: **Web Undertow**
 - Subsystems:
 - Security Legacy
 - Socket Bindings
 - Paths
 - System Properties
- Web Undertow** section selected.
- Servlet Container** section:
 - Filter: **default**
 - View** button highlighted with a mouse cursor.

2. Click the **JSP** tab.

Click **Edit**.

The screenshot shows the JSP configuration page with the following details:

- Back / Configuration > Subsystems > Subsystem = Web > Set
- JSP** tab selected.
- Buttons: **Edit** (highlighted), **Reset**, **Remove**, **Help**.
- Check Interval: 0
- Development: false

3. Set "Tag pooling" to "OFF (false)"

Save.

Reload the server when prompted.

The screenshot shows the JSP configuration page with the following settings:

- Optimize Scriptlets: OFF
- Recompile On Fail: OFF
- Scratch Dir: (empty)
- Smap: ON
- Source VM: 1.8
- Tag Pooling: OFF (highlighted with a mouse cursor)
- Target VM: 1.8
- Trim Spaces: OFF
- X Powered By: ON

Installation Verification: Initials indicate tag pooling is off.

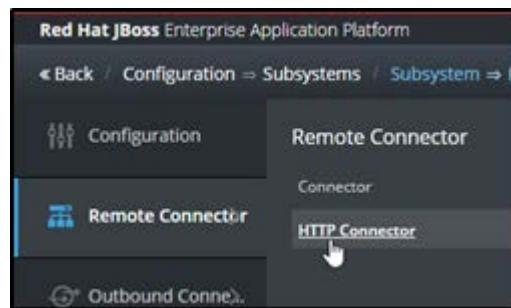
Role	Initials	Date
Executor		
Reviewer		

9.14 Set Remoting Security Realm

This allows HTTP connections for remote services.

1. Select Configuration → Subsystems → Remoting → View

In the "Remote Connector" tab, select "HTTP Connector"



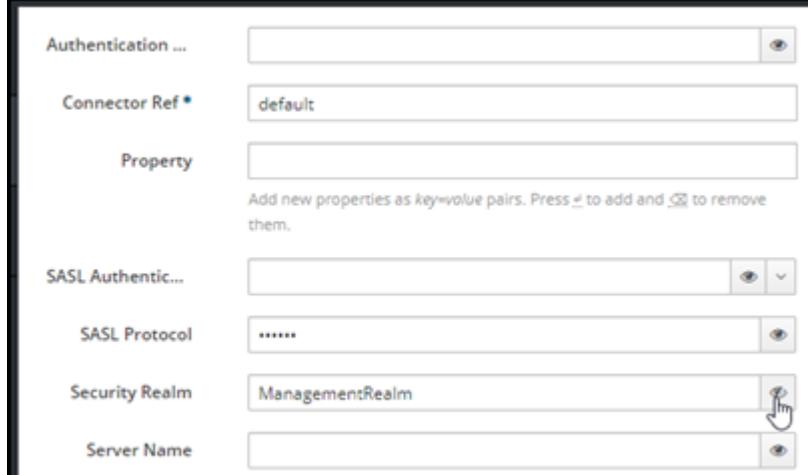
2. Click **http-remoting-connector**

Click "Edit".

Change the security-realm from "ApplicationRealm" to "ManagementRealm".

Save.

Reload the server if prompted.



Authentication ...	
Connector Ref *	default
Property	Add new properties as key:value pairs. Press ⌘ to add and ⌘ to remove them.
SASL Authentic...	
SASL Protocol
Security Realm	ManagementRealm
Server Name	

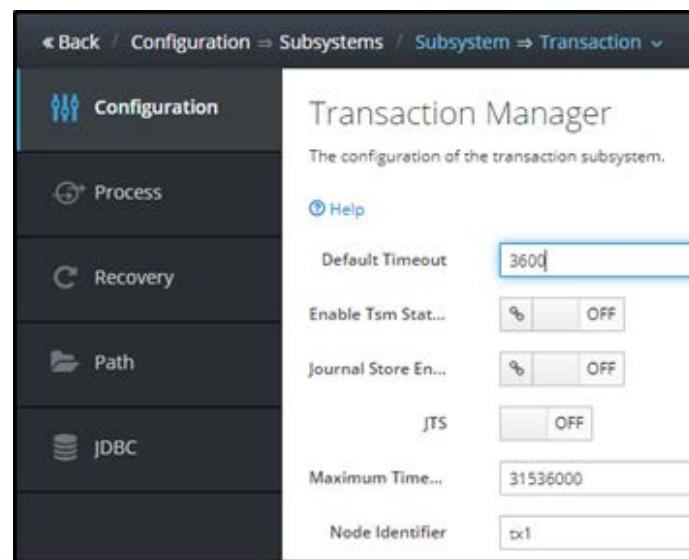
Installation Verification: Initials indicate the Security Realm is set to ManagementRealm.

Role	Initials	Date
Executor		
Reviewer		

9.15 Set Container Attributes

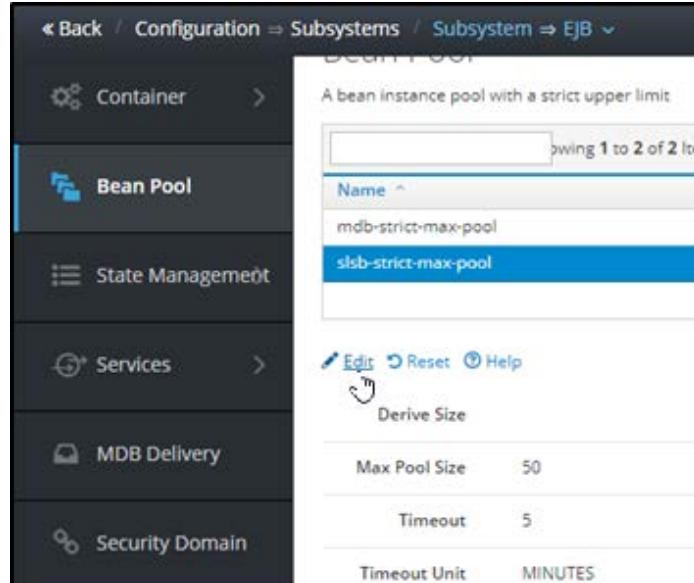
This tunes JBoss's JTA Transaction and EJB3 containers for use with the LabVantage application.

1. Select Configuration → Subsystems → Transaction → View
 Click **Edit**.
 Set the "Default Timeout" to 3600.
 This sets a one-hour timeout for all distributed transactions processed through JBoss's JTA.



2. Set the "Node Identifier" to a value that is unique to this server instance. Although this is a discretionary value, LabVantage recommends using txn, where n is an integer defining the instance. Examples:
- If this is a non-clustered standalone instance, we recommend setting this to tx1.
 - If this is a clustered standalone instance, we recommend setting this to tx1 for the first node, tx2 for the second node, and so on.
- Save.

3. Select Configuration → Subsystems → EJB → View.
 Select the "Bean Pool" tab.
 For both the "slsb-strict-max-pool" and "mdb-strict-max-pool":
 - 1) Click "Edit".
 - 2) Select a blank (no value) for the "Derive Size". These will be set to specific sizes rather than derived.
 - 3) Set the "Max Pool Size" to 50. This allows up to 50 pooled instances for stateless session beans and message-driven beans, respectively.
 - 4) Save, then reload the server if prompted.



Installation Verification: Initials indicate the JBoss JTA Transaction and EJB3 container attributes have been modified as described.

Role	Initials	Date
Executor		
Reviewer		

9.16 Activate HTTPS

To enhance security and utilize advanced browser features, LabVantage Solutions requires running the LabVantage application over an HTTPS connection. HTTPS is the protocol designed to communicate encrypted data. If you require additional information, JBoss EAP 7 HTTPS configuration options are extensively covered in the following Red Hat documents, which are provided as PDFs in the Red Hat JBoss EAP Distribution:

How to Configure Server Security

https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.2/html-single/how_to_configure_server_security/index

Security Architecture

https://access.redhat.com/documentation/en-us/red_hat_jboss_enterprise_application_platform/7.2/html/security_architecture/index

If you choose to allow plain-text transmissions of data and passwords to and from clients over HTTP, be aware that certain browsers may restrict the use of the video/camera option in LabVantage Attachments. Automatic geolocation of a user and the Empower interface may also be unavailable. The user logon page message is designed to detect the security of your connection. Use the "Logon Page" properties to choose your options as described in [Logon Page Configuration](#).

HTTPS configuration for JBoss EAP differs depending on whether you have a non-clustered JBoss EAP server instance or a clustered JBoss EAP server instance fronted by JBCS Apache HTTP Server:

- For a non-clustered JBoss EAP server instance, HTTPS is configured in the profile configuration for the JBoss EAP server instance (JBOSS_HOME\PROFILE\configuration\standalone.xml). Continue with this section if this is your choice.
- For a clustered JBoss EAP server instance fronted by JBCS Apache HTTP Server, HTTPS is configured in the ssl.conf file of each JBCS Apache HTTP Server instance (see JBCS Apache HTTP Server 2.4 HTTPS Configuration). It is NOT configured for the JBoss EAP server instance, as the connection between Apache and JBoss is AJP. See Red Hat's Load Balancing Guide. Skip the rest of this section if this is your choice. This section will just cover the non-clustered JBoss EAP instance.

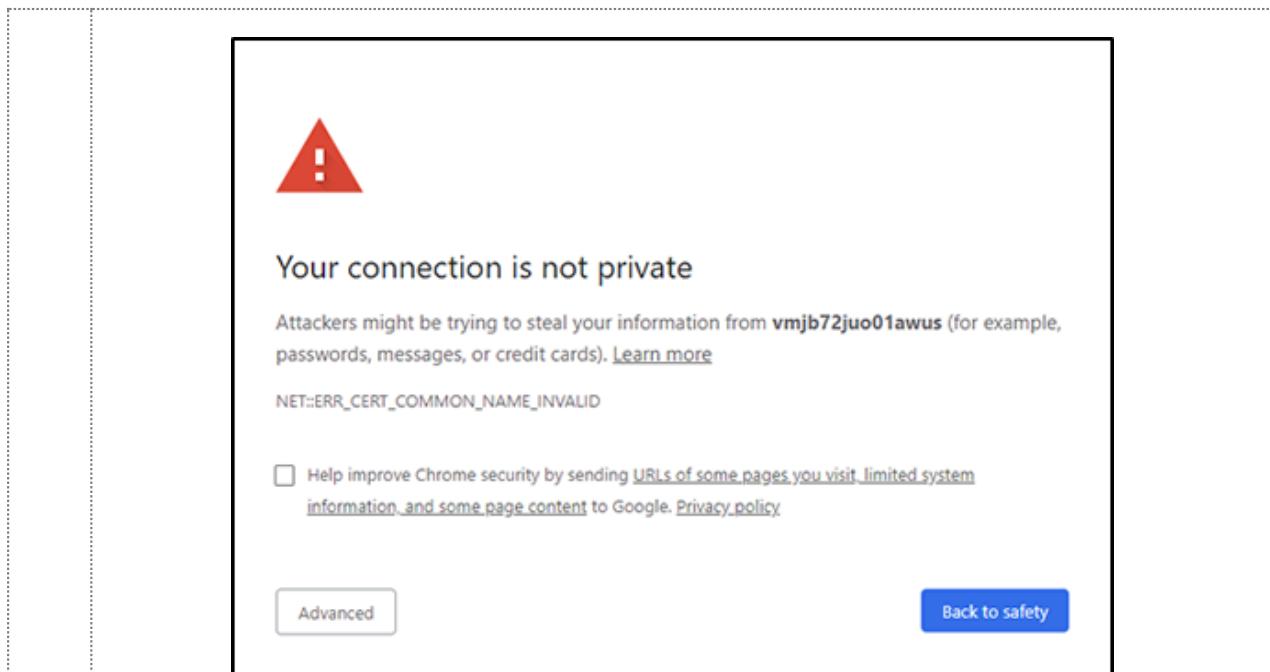
There are many ways to configure an HTTPS connection in JBoss EAP 7. Choose the option that satisfies your security requirements. This document only introduces two approaches. These are Self-Signed certificates and Certificate Authority (CA) signed certificates.

9.16.1 Self-Signed Certificate

The simplest and most straightforward approach (but not the strongest) is to use the provided generate-self-signed-certificate-host feature in standalone.xml using the Application Realm's <ssl> definition. This certificate is good for performing initial startup testing. However, for production and even most development and validation systems, you should acquire a CA signed certificate so that the full capabilities

of secure connections can be realized. Since your implementation of HTTPS security will likely be different than what is described here, these steps are considered suggested guidelines rather than a verifiable procedure.

1.	To begin testing a self-signed certificate, stop JBoss.
2.	In the JBoss EAP server instance configuration file (JBoss_EAP_HOME\PROFILE\configuration\standalone.xml), change the <ssl> keystore definition in the ApplicationRealm. Example: <pre><management> <security-realms> : : <security-realm name="ApplicationRealm" > <server-identities> <ssl> <keystore path="application.keystore" relative- to="jboss.server.config.dir" keystore- password="password" alias="server" key- password="password" generate-self-signed-certificate- host="localhost" /> </ssl> </server-identities></pre>
3.	Ensure that the Undertow HTTPS Listener is configured as specified in the Set Undertow Listener Attributes procedure of the JBoss EAP 7 Configuration (example shown below). Note that the default HTTPS listener is already setup to look at the Application Realm. <pre><subsystem xmlns="urn:jboss:domain:undertow:7.0"> : : <https-listener name="https" socket-binding="https" security- realm="ApplicationRealm" max-post-size="102400000000" max-header- size="65536" max-parameters="65536" max-headers="65536" enable- http2="true" /></pre>
4.	Start JBoss as described in Perform Initial JBoss Startup .
5.	Test connectivity to your HTTPS port by opening browser and entering a URL using the following example: <code>https://HOSTNAME.domain.com:HTTPS_PORT/labvantageconsole80</code> ... where HOSTNAME.domain.com is your fully qualified domain name and HTTPS_PORT is your SSL port number.
6.	Because self-signed certificates aren't completely secure or trusted by your browser, your browser may display something similar to the below. These screenshots are taken from Chrome. Every browser/version can have a different display or process for bypassing this warning.



7. You can still move forward by pressing the "Advanced" button and proceeding anyway.



Installation Verification: Initials indicate HTTPS port is accessible and the LabVantage Console displays as a result of the test in this section.

Role	Initials	Date
Executor		
Reviewer		

9.16.2 Certificate Authority Signed Certificate

If you did not choose the Self-Signed certificate, another option is to acquire a certificate from an issuing internet authority. Certificate Authority (CA) Certificates certify the ownership of a public key by the named subject of the certificate. They can be purchased in numerous formats (*.cer, *.crt, *.ca-bundle, *.pem, *.p7b, *.p7s) and converted to and from formats using special executables like openssl and Java keytool. JBoss EAP 7 works best with a Java keystore in JKS format, and the keystore file used to house this cert is created in the PROFILE\configuration directory.

For Production, Validation or other installations that need security, it is assumed you will obtain a commercial certificate from a certificate authority (CA) and thereby acquire the files required for your organization such as the certificate and any required keys. Many organizations purchase a certificate for

their domain or have their own PKIs (Public Key Infrastructures), each containing multiple CAs. Consult your IT infrastructure team to obtain a commercial certificate.

Describing all possible variations of files required for your organization is beyond the scope of this document. It is therefore assumed that you have obtained the necessary cert before the start of this installation process.

Your IT department may obtain or generate *.pfx archive files that contains certificate-key pairs. A common approach (your requirements may differ) is to use openssl to combine the private key with the certificate, then use keytool to import into the keystore. Here is an example of the commands to convert and insert the certificate:

```
keytool -genkey -keyalg RSA -keystore keystore.jks -keysize 2048
```

Add the root CRT certificate. Note the syntax is the same if you need to add any intermediate certs. Consult your IT infrastructure team for this information.

```
JAVAHOME/keytool -import -alias rootCA -keystore  
JBOSS_DEPLOYMENT_CONFIG_FOLDER/keystore.jks -trustcacerts -file root.crt
```

Add the LabVantage cert to the keystore:

```
JAVAHOME/keytool -import -alias labvantage -keystore  
JBOSS_DEPLOYMENT_CONFIG_FOLDER/keystore.jks -file lvs.crt
```

Verify results:

```
JAVAHOME/keytool -list -alias labvantage -keystore  
JBOSS_DEPLOYMENT_CONFIG_FOLDER/keystore.jks
```

After you have obtained you JKS keystore with certificate, you must configure the server instance configuration file. An example is shown in step 1 below. Step 2 is a double-check to make certain you have set the Undertow HTTPS connector attributes.

1.	To begin testing a certificate, stop JBoss.
2.	In the JBoss EAP server instance configuration file (JBOSS_HOME\PROFILE\configuration\standalone.xml), change the <ssl> keystore definition in the ApplicationRealm. Example: <pre><management> <security-realms> : : <security-realm name="ApplicationRealm" > <server-identities> <ssl> <keystore path="keystore.jks" relative- to="jboss.server.config.dir" keystore- password="password" key-password="password"/> </ssl> </server-identities> </security-realm> </security-realms> </management></pre>

3. Ensure that the Undertow HTTPS Listener is configured as specified in the [Set Undertow Listener Attributes](#) procedure of the JBoss EAP 7 Configuration (example shown below). Note that the default HTTPS listener is already setup to look at the Application Realm.

```
<subsystem xmlns="urn:jboss:domain:undertow:7.0">
  ...
  ...
<https-listener name="https" socket-binding="https" security-
realm="ApplicationRealm" max-post-size="1024000000000" max-header-
size="65536" max-parameters="65536" max-headers="65536" enable-
http2="true" />
```

4. Start JBoss as described in [Perform Initial JBoss Startup](#).

5. Test connectivity to your HTTPS port by opening browser and entering a URL using the following example:

`https://HOSTNAME.domain.com:HTTPS_PORT/labvantageconsole80`

... where HOSTNAME.domain.com is your fully qualified domain name and HTTPS_PORT is your SSL port number.

Installation Verification: Initials indicate HTTPS port is accessible and the LabVantage Console displays as a result of the test in this section.

Role	Initials	Date
Executor		
Reviewer		

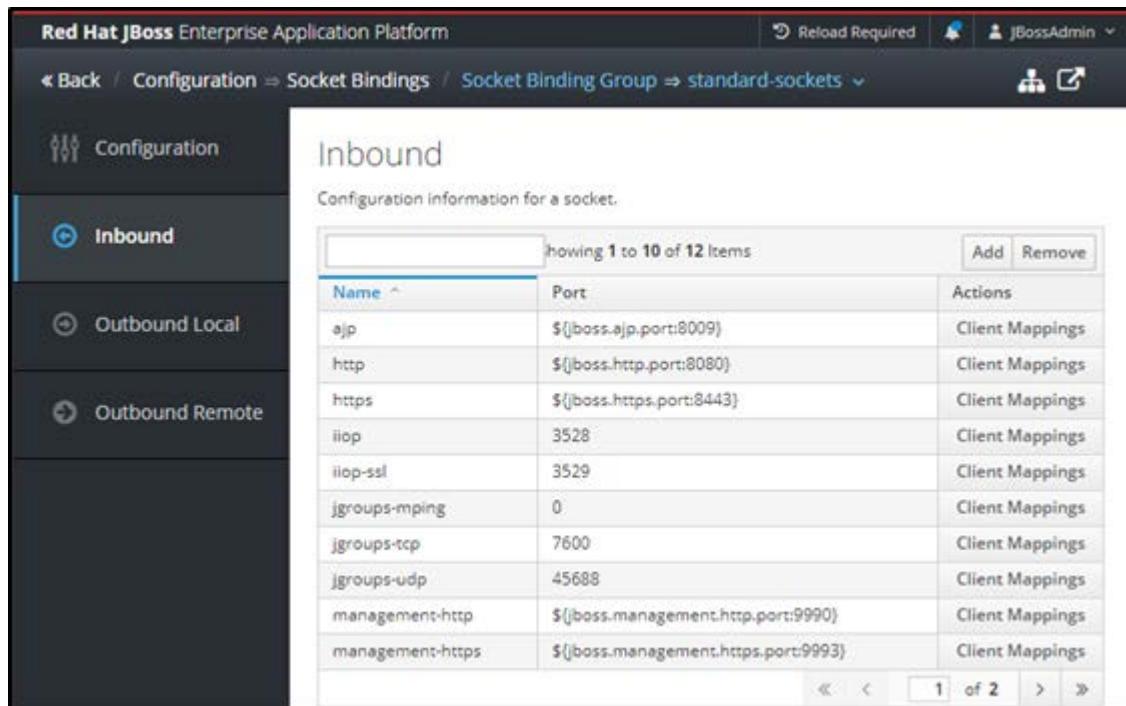
9.17 Review Multicast Address (Clustered Instances Only)

If this is a clustered standalone instance and JBoss is using the UDP stack, JGroups is now communicating over the default multicast address and port (230.0.0.4:45688). If this address is satisfactory, you can skip this step. This step is optional and is provided in case you desire to change the multicast address and port. You can also skip this step if using the TCP Stack.

All standalone clustered instances that are members of the same cluster must use the same multicast address. Each cluster's multicast address must be unique (even if the cluster consists of a single node).

1. Using the JBoss Management Console, select Configuration → Socket Binding. For the "standard-sockets binding group, click "View". In the "Socket Binding Groups" tab, select "Inbound".
- If you want to change the default multicast address (or port), select the JGroups cluster socket, click "Edit", then provide the new socket definition under "Multicast". Note that there are two multicast socket definitions that must be changed:
- jgroups-udp is used for peer node discovery for the entire UDP stack.
 - jgroups-mping is used to ping nodes for initial discovery when the cluster starts.

2. Here is an example



The screenshot shows the JBoss configuration interface for the 'standard-sockets' group under 'Socket Bindings'. The left sidebar has categories: Configuration, Inbound (selected), Outbound Local, and Outbound Remote. The main panel is titled 'Inbound' and displays a table of 12 items. The table columns are Name, Port, and Actions. The data is as follows:

Name	Port	Actions
ajp	\$(jboss.ajp.port:8009)	Client Mappings
http	\$(jboss.http.port:8080)	Client Mappings
https	\$(jboss.https.port:8443)	Client Mappings
iiop	3528	Client Mappings
iiop-ssl	3529	Client Mappings
jgroups-mping	0	Client Mappings
jgroups-tcp	7600	Client Mappings
jgroups-udp	45688	Client Mappings
management-http	\$(jboss.management.http.port:9990)	Client Mappings
management-https	\$(jboss.management.https.port:9993)	Client Mappings

3. Record your actual values for jgroups-mping and jgroups-udp:

jgroups-mping: _____ jgroups-udp: _____

Installation Verification: Initials indicate the actual values as recorded by the executor.

Role	Initials	Date
Executor		
Reviewer		

9.18 Restart JBoss

After all configuration changes have been made, the JBoss EAP requires a restart.

10 APPLY JBOSS EAP 7 PATCHES

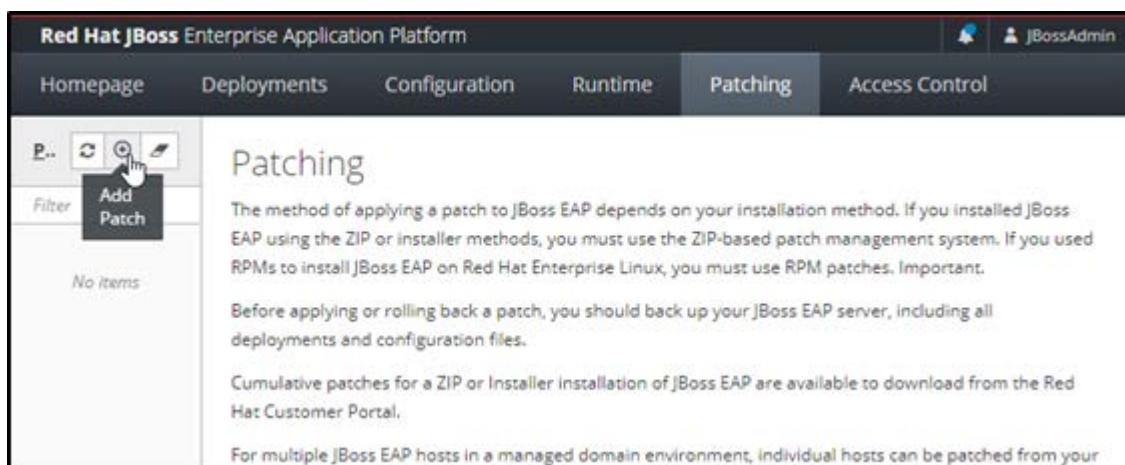
This procedure can be used whether you are installing JBoss EAP 7 for the first time, or you are upgrading to LabVantage 8.5 and already have an existing JBoss EAP installation. As a minimum, you must apply either one of these Red Hat patches: jboss-eap-7.2.6.zip or 7.2.7.zip. These are provided in the "EAP Patches" directory of the Red Hat JBoss EAP Distribution. Copy them to a directory that can be accessed by the server. Additional patch levels may be recommended by the LabVantage support team.

This procedure demonstrates application of patches to JBoss EAP 7.2.0, which is the base server version provided by Red Hat. Subtle differences may be encountered if jboss-eap-7.2.7.zip is applied to JBoss EAP 7.2.1 through 7.2.6 (such as differences regarding file conflicts). If you require more information concerning patching mechanisms and options, see the Red Hat JBoss Enterprise Application Platform 7.2 Patching and Upgrading Guide, which is also included in the Red Hat JBoss EAP Distribution.

Back up your entire JBoss EAP 7.2 installation prior to applying any patches. This will let you recover your installation if a patch does not successfully roll back.

Apply patch jboss-eap-7.2.7.zip as shown in the procedure below.

1. Using the JBoss Management Console, select the "Patching" tab, then click "Add Patch".



The screenshot shows the JBoss Management Console interface under the "Patching" tab. On the left, there's a toolbar with icons for creating, deleting, and editing patches, and a "Filter" dropdown. A prominent "Add Patch" button is highlighted with a mouse cursor. Below the toolbar, a message states: "The method of applying a patch to JBoss EAP depends on your installation method. If you installed JBoss EAP using the ZIP or installer methods, you must use the ZIP-based patch management system. If you used RPMs to install JBoss EAP on Red Hat Enterprise Linux, you must use RPM patches. Important." It also mentions backing up the server before applying patches and provides links for cumulative patches and multiple hosts.

2. Choose the patch file to be applied.

Record the actual patch applied.

Click "Next".



The screenshot shows the "Upload Patch" step of the patching process. It features a large upload icon with the number "1" above it, followed by the text "jboss-eap-7.2.7-patch.zip". To the right, there's a "Configure patch" link with a number "2" above it. At the bottom, there are "Cancel", "Back", and "Next >" buttons.

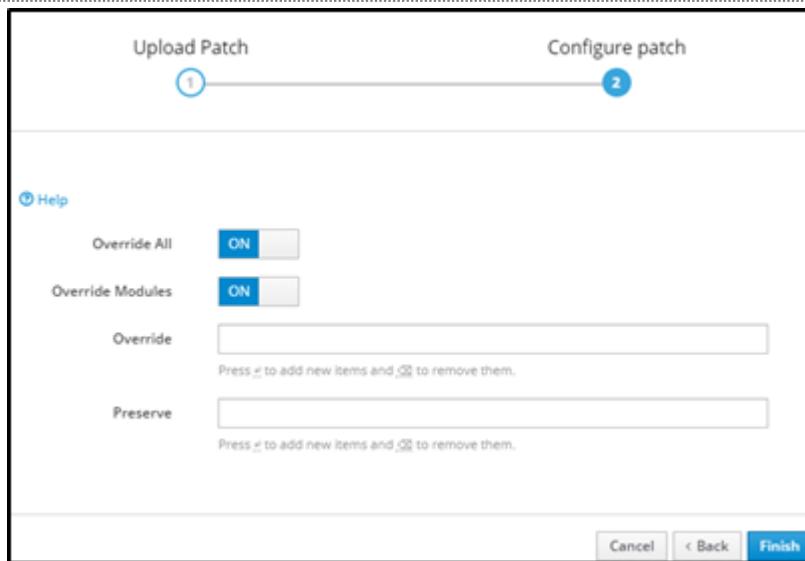
In the resulting page of this wizard, you may be presented with a list of potential conflicts. Overriding conflicts in a file will overwrite the existing file in its entirety. If this patch overrides jboss-cli.bat (or .sh), you will need to reset JAVA_HOME in jboss-cli.bat (or jboss-cli.sh) by performing the steps starting at step 5 of [Install a JDBC driver](#), after you have finished applying all patches. Other files may require attention if you have modified them for your purposes.

The JBoss Management Console does not provide selective override options, which are available only with the JBoss Command Line Interface (CLI).

3. Any conflicts with existing files are reported.

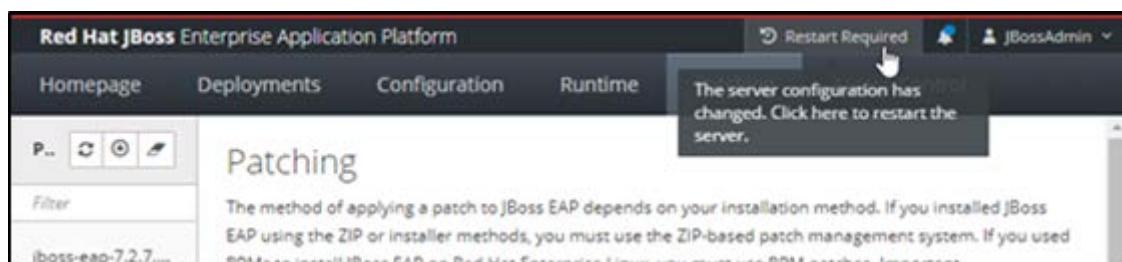
If your server reports any, select "Override all" then click "Finish".

If no conflicts are reported, you will not see the conflict dialog, and you can proceed.



4. After the patch installation is complete, you can acknowledge the success message.

This will return you to the Patching page with a message you can click to restart the server.



Click the link to restart the server.

Installation Verification: Initials indicate the actual values as recorded by the executor.

Role	Initials	Date
Executor		
Reviewer		

11 RUNNING JBoss AS A SERVICE

Until this point, you have started JBoss using a command window. While this is acceptable during the install process, it is not suitable for long-term use. The process described in this chapter establishes a Windows service which can run in the background or start automatically when a server reboots.

Red Hat provides documentation of the configuration steps needed on both a Windows and a RHEL platform. This procedure takes excerpts from Red Hat's [Installation Guide for Red Hat Enterprise Application Platform](#). If you are running on the RHEL platform, please follow the instructions provided by Red Hat within chapter 4.1 of their guide. This will include editing the jboss-eap.conf file. Follow those instructions with one addition. At the end of said conf file, add this line: EXPORT JBOSS_BASE_DIR.

To install a Windows Service, you need the JBoss Core Services Apache Jsvc package. If you purchased JBoss from LabVantage, Jsvc packages are provided in the "JBCS Apache Jsvc" directories of the Red Hat JBoss EAP 7 Distribution, with each labeled by version number. The filename follows this convention:

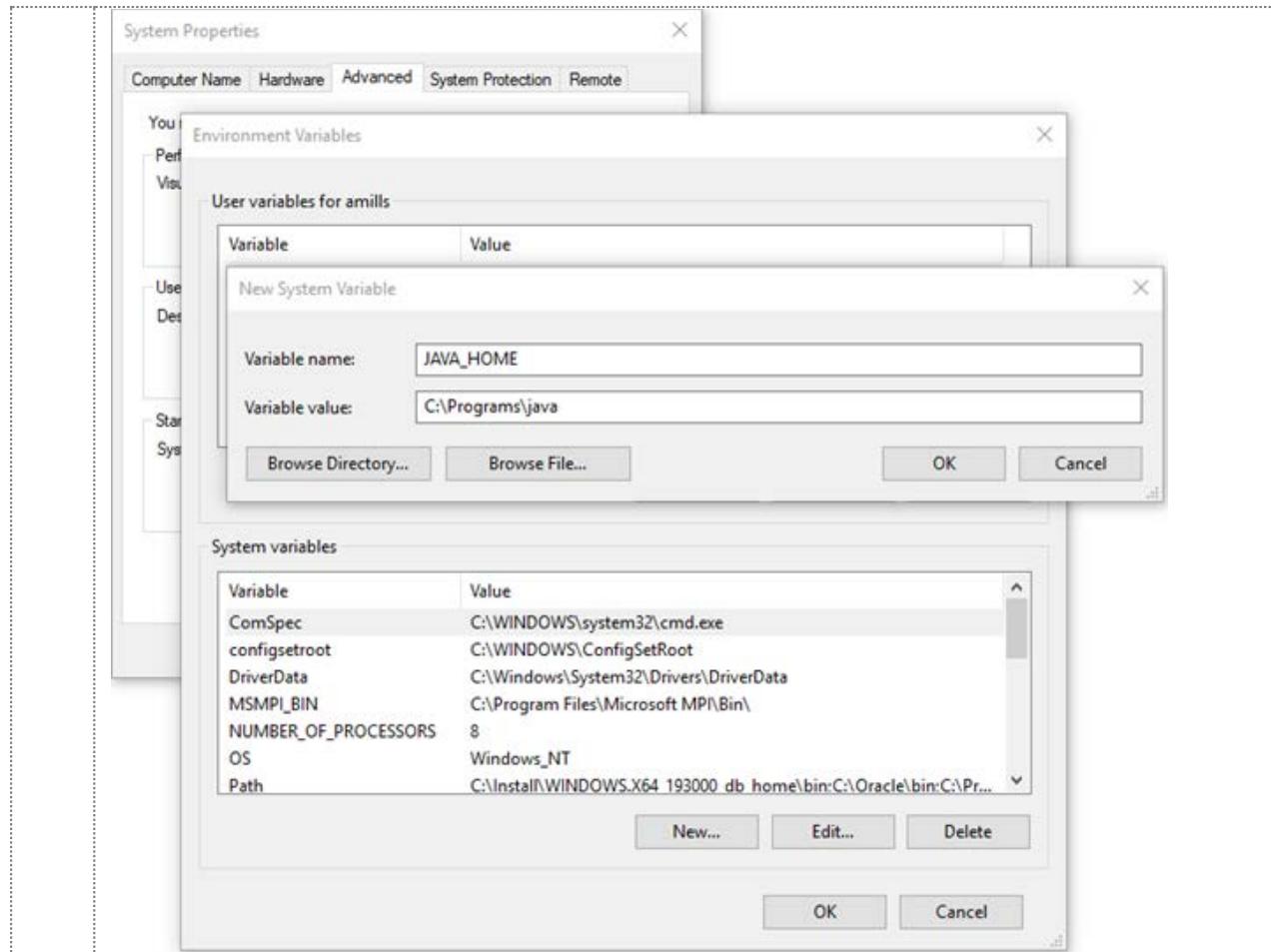
- jbcs-jsvc-VERSION-OS-ARCHITECTURE.zip

where VERSION is the package version and OS-ARCHITECTURE is the operating system and processor architecture.

If you purchased JBoss directly from Red Hat, login to your Red Hat account and download the latest Red Hat JBoss Core Services Apache Jsvc package from the Red Hat Customer Portal.

This approach to starting JBoss as a service utilizes a file found in your JBOSS_HOME\bin\ The file is called service.bat. It looks for your jbcs-jsvc directory to be within the same directory hierarchy as your JBOSS_HOME. If you need to extract the jbcs-jsvc to a different location, you can edit the service.bat file.

1.	<p>Refer to Chapter 4.3 of the Red Hat JBoss Enterprise Application Platform 7 Installation Guide which includes the following Prerequisites</p> <ol style="list-style-type: none">1. Install JBoss2. Sign into the server with Administrator privileges3. Set the JAVA_HOME system environmental variable4. Stop JBoss <p>At this point within this procedure, you have already installed JBoss. You should sign into your server's desktop as an administrator.</p>
2.	<p>Confirm your JAVA_HOME system environment variable is set to the full path as defined when you installed your JDK during Setup a Dedicated JDK. If you did not create an environmental variable at that time, you must do so now. An example is provided below.</p> <p>You will be creating a JBOSS_HOME variable. This will be set as the full path to the JBoss EAP installation directory</p> <p>Example: C:\jboss-eap-7.2</p> <p>Guidelines:</p> <ol style="list-style-type: none">1. When you set JAVA_HOME, remember not to install any other system JDK that conflicts with the JAVA_HOME variable.2. When you set JBOSS_HOME, remember that it must match the JBoss instance you are running. If you try to run a JBoss instance that does not match JBOSS_HOME, an error will be generated indicating a failure to validate the configuration file.



3. Create or confirm your System Environmental Variables for JAVA_HOME and JBOSS_HOME. Record the values here.

JAVA_HOME: _____ JBOSS_HOME: _____

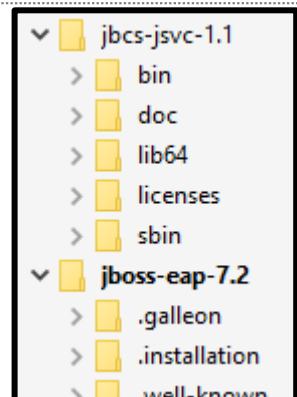
4. Create another System Environmental Variable called NOPAUSE. Set the value to: 1.

5. Obtain the **jbcsv-jsvc** ZIP file as identified in the introduction to this procedure. Extract the zip file to the same directory that contains the JBOSS_HOME. If JBOSS_HOME is at the root of the file system, extract to the root.

6. The extracted folder structure should now be at the same directory depth as JBOSS_HOME.

An example is shown here where 'jboss-eap-7.2' is the JBOSS_HOME.

Record the JBCS Apache Jsvc Version:



7. It is important to specify the service installation command line with all of the attributes described below (rather than the command suggested by Red Hat). If you do not specify the attributes as directed below, the service will be unstable, and you will likely have to kill the process to stop it.
- In a Command window running as an Administrator, run this command from the JBOSS_HOME\bin directory:
- ```
service install /name NAME /desc "DESCRIPTION" /base JBOSS_HOME\PROFILE /config CONFIG /controller MGMTINT /jbossuser JBOSSUSER /jbossppass PASSWORD
```
- ...where
- NAME is the name you want to use to identify the service.
  - DESCRIPTION is the description you want to appear in the services dialog.
  - JBOSS\_HOME is the full path to the JBoss EAP installation directory.
  - PROFILE is the standalone instance profile you created in Create a LabVantage Standalone Instance Profile.
  - CONFIG is the standalone instance configuration file. Enter one of the following depending on whether this is a non-clustered or clustered instance:
    - standalone.xml for a non-clustered instance.
    - standalone-ha.xml for a clustered instance.
  - MGMTINT is the management interface you defined in [Set JBoss Bind Addresses](#). This is in the format HOSTNAME:9990.
  - JBOSSUSER is the username of the JBoss management user you created in [Add a JBoss Management User](#).
  - PASSWORD is the plain text password for the JBoss management user you created in Add a JBoss Management User.
  - An example is shown below to demonstrate syntax. Note that these are example values for the variables described above.

```
service install /name JBossEAP72 /desc "JBoss Enterprise Application Platform 7.2" /base C:\jboss-eap-7.2\standalone_lv8 /config standalone.xml /controller myhostname:9990 /jbossuser JBossAdmin /jbossppass $ecurePazzword
```

8. Verify that you can start and stop the Windows Service (refer to Microsoft Windows documentation if required). On some Windows systems, you may have to kill the process to stop the service. The reasons for this vary among systems and do not exhibit consistent behavior.

Installation Verification: Initials indicate the Windows service successfully started.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

## 12 NEXT STEPS

At this point, you have completed the standard JBoss installation requirements for a basic LabVantage installation. The only required remaining items are the creation of your database objects and LV application using the LabVantage Console. Those topics are covered starting in [LabVantage Console Setup](#).

This chapter outlines some additional important topics that are included in the next few chapters. These include considerations for clustered installations and recommendations for heightened security. While these topics are optional, some of these procedures are required when you are setting up a cluster. Requirements for clusters are addressed in chapters 13 and 14. Additionally, LabVantage recommends securing your JBoss EAP by making some standard configuration changes in chapter 16. Lastly, the management of log files is addressed in chapter 17.

Finalize and test the LabVantage application configuration using the steps in chapter 18. From there, you can return here to clone one standalone node for node two and other nodes (if using a cluster). Additionally, you may find success with applying additional security after the LV application has been confirmed to be operational.

| Chapter | Topic                                                      |
|---------|------------------------------------------------------------|
| 13      | <a href="#">JBoss EAP 7 Standalone Cluster Setup</a>       |
| 14      | <a href="#">JBoss Core Services Apache HTTP Server 2.4</a> |
| 15      | <a href="#">Database Connection Checkers</a>               |
| 16      | <a href="#">Securing JBoss</a>                             |
| 17      | <a href="#">JBoss Log File Management</a>                  |

## 13 JBOSS EAP 7 STANDALONE CLUSTER SETUP

This chapter describes how to setup two clustered instances of Red Hat JBoss EAP 7 for use with LabVantage. This should be considered a baseline configuration, as production clusters will vary depending on your requirements and documentation mutually agreed upon by the customer and LabVantage Solutions, Inc.

The overall procedure involves copying the directories you have already configured on node one over to node two. This includes the LabVantage Home. Therefore, you should have completed the entire installation of LabVantage and JBoss before you begin this procedure. This is labeled a "Standalone Cluster" because each node of the cluster uses a stand-alone profile. This allows each node of the cluster to continue operating independently should any other node be taken offline. If you desire a single point of entry with a load balancer, you will also install and configure [JBoss Core Services Apache HTTP Server 2.4](#) by following the steps in Chapter 14.

The definitions below apply throughout this document:

| Term     | Definition                                                                   |
|----------|------------------------------------------------------------------------------|
| Instance | Clustered standalone JBoss server runtime profile.                           |
| Machine  | Physical or virtual computer on the network.                                 |
| Cluster  | Basic two-node horizontal cluster (two machines, each hosting one instance). |
| Node     | Instance uniquely designated by a node name.                                 |
| M1       | Machine that hosts the first node of the cluster.                            |
| M2       | Machine that hosts the second node of the cluster.                           |

This document uses Windows conventions for variables and directory paths. Adjust accordingly for RHEL.

### 13.1 Two-Node Horizontal Cluster High-Level Architecture

Two appendices show high-level diagrams of an example cluster setup. Please review [Appendix B: Diagram of a Two-Node Horizontal Cluster](#) and [Appendix E: Two-Node Horizontal Cluster Data Sources](#)

### 13.2 Server Instance Setup on M1

Perform these steps on the first node of your cluster which will be called "M1":

- |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <p>Setup a JBoss EAP clustered standalone instance on M1 as described starting at the beginning of this document. This means that M1 should have a fully functional LabVantage installation running in a clustered standalone JBoss instance. Before proceeding, be certain you can log into the LabVantage Application. M1 and M2 will use the same database schema. Therefore add the Admin Database, LabVantage Database, and a LabVantage Production Application only once. This happens when you setup the clustered standalone instance on M1.</p> <p>Install a Production Application on M1 as directed in the procedure <a href="#">Adding a LabVantage Production Application</a>. Do not attempt to cluster a Development Type Application.</p> |
| 2. | Stop JBoss. Delete the contents of the log, tmp, and data directories in JBOSS_HOME\PROFILE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

Installation Verification: Initials indicate the prerequisites have been met, the architecture diagrams have been reviewed, JBoss is stopped and the log, tmp, and data directories are cleared.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

### 13.3 Server Instance Setup on M2:

Using this procedure and M1 as the source, you will copy the JBoss Home, JDK home, JBCS directory and LabVantage Home to the identical directory structure on M2. If this is not possible, you will need to repeat the entire installation procedure starting with [Install JBoss](#) on M2. The following adjustments will be required after the copy is made or during the repeat of the install procedure on M2.

1. LABVANTAGE\_HOME on M2 is a full copy of the LABVANTAGE\_HOME on M1
2. In [Set JBoss Bind Addresses](#), the bind addresses of M2 must be set here to allow a remote service to start the M2 instance
3. In [Create System Properties](#), the value of jboss.node.name on M2 must be unique (different than M1).
4. In [Set Container Attributes](#), the node identifier for M2 must be unique (different than M1).
5. If using the UDP stack, in [Review Multicast Address](#), M1 and M2 (all instances in the cluster) must use the same multicast address and port. If you changed it from the default on M1, you must also change it on M2
6. If using the TCP stack, in [Changing the JGroups Stack from UDP to TCP](#), make certain all cluster members specified by HOST are accessible over the network.
7. Do not add LabVantage Databases or a LabVantage Application. M2 will use the same schemas as M1, and you will redeploy the application on M2 in this procedure.
8. If installing using the full procedure, be certain to restart JBoss when directed to do so in each of the above procedures. Verify that you can start and stop the Windows Service if using Windows.
9. Start JBoss on M2.
10. Using the URL for M2, open the LabVantage Console.
11. Navigate to the Applications page. The Application List shows the LabVantage Application in LABVANTAGE\_HOME on M1 because the Application is registered in the AdminDB. However, the EAR is not physically deployed in the current JBoss instance:

12. Deploy the EAR by clicking "deploy". The Console will then copy the Application EAR from LABVANTAGE\_HOME and deploy it in JBoss.

| Applications                                                     |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
|------------------------------------------------------------------|-------------------------------------------------------|------|-------------------------------|----------------------------------------------------------------------------------------------------------------|-------|--------|--------------------------------------------------------------------------------------------------------|
| LabVantage                                                       |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
| LabVantage HOME:                                                 | C:\labvantagehome8                                    |      |                               | Full path reference to the LabVantage HOME location.                                                           |       |        |                                                                                                        |
| LabVantage EAR File:                                             | C:\labvantagehome8\console\install\ear\labvantage.ear |      |                               | Full path reference to the LabVantage EAR file.                                                                |       |        |                                                                                                        |
| LabVantage EAR Build:                                            | 08                                                    |      |                               | LabVantage EAR build. Applications are compared to this build reference to determine if upgrading is required. |       |        |                                                                                                        |
| Application List                                                 |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
| Application                                                      | Description                                           | Type | EAR                           | Version                                                                                                        | Build | Status | Actions                                                                                                |
| labvantage                                                       | labvantage ear                                        | Prod | [APP_HOME]\ear\labvantage.ear | 8.                                                                                                             | 08    | OK     | <a href="#">delete</a> <a href="#">upgrade</a> <a href="#">build</a> <a href="#">BAK home undelete</a> |
| <a href="#">Add Application</a>                                  |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
| Warning: No LabVantage applications currently deployed in JBoss! |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |

13. Click "Return to application list".

| Deploy Application                                                                                                         |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|
| Deploying application 'labvantage'                                                                                         |  |  |  |  |  |  |  |
| LABVANTAGE_HOME: C:\labvantagehome8-                                                                                       |  |  |  |  |  |  |  |
| APPLICATION_HOME: C:\labvantagehome8\applications\labvantage                                                               |  |  |  |  |  |  |  |
| Copying application from C:\labvantagehome8\applications\labvantage\ear to jBoss deploy directory                          |  |  |  |  |  |  |  |
| - copying :labvantagehome8\applications\labvantage\ear to C:\jboss-eap-7\standalone\lv8\cluster\deployments\labvantage.ear |  |  |  |  |  |  |  |
| <a href="#">Application deploy complete</a>                                                                                |  |  |  |  |  |  |  |
| <a href="#">Return to application list</a>                                                                                 |  |  |  |  |  |  |  |

14. After the EAR has actually deployed, refreshing the page shows the deployment:

| Applications                    |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
|---------------------------------|-------------------------------------------------------|------|-------------------------------|----------------------------------------------------------------------------------------------------------------|-------|--------|--------------------------------------------------------------------------------------------------------|
| LabVantage                      |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
| LabVantage HOME:                | C:\labvantagehome8                                    |      |                               | Full path reference to the LabVantage HOME location.                                                           |       |        |                                                                                                        |
| LabVantage EAR File:            | C:\labvantagehome8\console\install\ear\labvantage.ear |      |                               | Full path reference to the LabVantage EAR file.                                                                |       |        |                                                                                                        |
| LabVantage EAR Build:           | 08                                                    |      |                               | LabVantage EAR build. Applications are compared to this build reference to determine if upgrading is required. |       |        |                                                                                                        |
| Application List                |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |
| Application                     | Description                                           | Type | EAR                           | Version                                                                                                        | Build | Status | Actions                                                                                                |
| labvantage                      | labvantage ear                                        | Prod | [APP_HOME]\ear\labvantage.ear | 8.                                                                                                             | 08    | OK     | <a href="#">delete</a> <a href="#">upgrade</a> <a href="#">build</a> <a href="#">BAK home undelete</a> |
| <a href="#">Add Application</a> |                                                       |      |                               |                                                                                                                |       |        |                                                                                                        |

15. Logoff of LabVantage Console and stop JBoss.

16. Delete these directories from the M2 LABVANTAGE\_HOME:

LABVANTAGE\_HOME\console

LABVANTAGE\_HOME\applications\APPLICATION\_HOME\ear

17. This step is optional. It removes the ambiguity of having multiple "Managed EARs" and (one on each node). This provides one centralized point from which to upgrade and manage the AdminDB (Admin database), LabVantage databases, and LabVantage Application. LabVantage Console will no longer run on M2. M2 will simply run the clustered instance.

Delete the LabVantage Console EAR file (labvantageconsoleNN.ear) from JBOSS\_HOME\PROFILE\deployments. Also delete deployment marker file (labvantageconsoleNN.ear.deployed)

Note: Future upgrades of LabVantage will require manual copying of the labvantage.ear to all members of the cluster into the deployment directory.

18. Start JBoss. Test the deployment by logging on at  
`http://HOSTNAME_M2:8080/APPLICATIONNAME` ( ...where HOSTNAME\_M2 is the hostname of the machine and 8080 is the HTTP port number

Installation Verification: Initials indicate the LabVantage application can be reached on M2.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

### 13.4 Test the Cluster

This section serves to check that Infinispan is operating as expected.

1. On M2, stop JBoss. On M1, start the clustered JBoss instance by executing the command shown below using a command window. Windows syntax is shown. For RHEL, execute standalone.sh and use forward-slashes. While this could be accomplished using the service and checking the log files, this method allows you to monitor the messages while the system starts.
- ```
JBOSS_HOME\bin\standalone.bat -Djboss.server.base.dir=JBOSS_HOME\PROFILE -c standalone-ha.xml
```
- ...where
- JBOSS_HOME is the full path to the JBoss EAP installation directory.
 - PROFILE is the standalone instance profile you created in Create a LabVantage Standalone Instance Profile.
2. You should observe a Jgroups node name assigned to M1. In this example, a new "cluster view" for the node identified as JB1 is recognized as part of a cluster.
- ```
INFO [org.infinispan.remoting.transport.jgroups.JGroupsTransport] (MSC service thread 1-7) ISPNO00078: Starting JGroups channel ejb
```
- ```
INFO [org.infinispan.remoting.transport.jgroups.JGroupsTransport] (MSC service thread 1-7) ISPNO00094: Received new cluster view for channel ejb: [JB1|0] (1) [JB1]
```
- ```
INFO [org.infinispan.remoting.transport.jgroups.JGroupsTransport] (MSC service thread 1-7) ISPNO00079: Channel ejb local address is JB1, physical addresses are [192.168.0.14:55200]
```
3. On M2, start the clustered JBoss instance by executing the same command that was issued in step 1.

4. You should observe a Jgroups node name assigned to M2. In this example, a new "cluster view" for the node identified as JB2 is recognized as part of a cluster.

```
INFO [org.infinispan.remoting.transport.jgroups.JGroupsTransport] (MSC service thread 1-7) ISP000078: Starting JGroups channel ejb
INFO [org.infinispan.remoting.transport.jgroups.JGroupsTransport] (MSC service thread 1-7) ISP000094: Received new cluster view for channel ejb: [JB1|1] (2) [JB1, JB2]
INFO [org.infinispan.remoting.transport.jgroups.JGroupsTransport] (MSC service thread 1-7) ISP000079: Channel ejb local address is JB1, physical addresses are [192.168.0.3:55200]
```

5. On M1, you should see something like the messages shown in the example below when the instance on M2 joins the cluster. JGroups detects the new instance and accepts it as a member of the cluster. Modules treated as deployments are shown as part of the topology after the nodes are balanced.

```
INFO [org.infinispan.CLUSTER] (thread-4,null,null)
ISP000094: Received new cluster view for channel ee: [JB1|1] (2) [JB1, JB2]
INFO [org.infinispan.CLUSTER] (thread-4,null,null)
ISP100000: Node JB2 joined the cluster
INFO [org.infinispan.CLUSTER] (remote-thread--p7-t1) [Context=client-mappings]
ISP100002: Starting rebalance with members [JB1, JB2], phase READ_OLD_WRITE_ALL, topology id 2
INFO [org.infinispan.CLUSTER] (remote-thread--p7-t1) [Context=client-mappings]
ISP100010: Finished rebalance with members [JB1, JB2], topology id 5
INFO [org.infinispan.CLUSTER] (remote-thread--p4-t1) [Context=labvantage.ear.labvantage.war]
ISP100002: Starting rebalance with members [JB1, JB2], phase READ_OLD_WRITE_ALL, topology id 2
INFO [org.infinispan.CLUSTER] (remote-thread--p4-t3) [Context=default-server]
ISP100010: Finished rebalance with members [JB1, JB2], topology id 5
```

6. To test connectivity between nodes, using the remote desktop connection on M1, launch a browser. Connect to the LabVantage application by using

[http://HOSTNAME\\_M2:8080/APPLICATIONNAME](http://HOSTNAME_M2:8080/APPLICATIONNAME)

... where HOSTNAME\_M2 is the name of M2

7. The LabVantage application should be accessible.

Do the same steps and test on M2 for a connection to M1.

Installation Verification: Initials indicate the tests in this procedure were successful.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

## 14 JBOSS CORE SERVICES APACHE HTTP SERVER 2.4

After setting up a JBoss EAP cluster, or if you are using a load balancer to connect to a clustered JBoss EAP 7 instance, perform these procedures. This chapter describes the installation and configuration of Red Hat JBoss Core Services Apache HTTP Server 2.4 for use with the JBoss EAP 7.x mod\_cluster service running in clustered standalone instances. For an example, see [Appendix C: Diagram of Two-Node Cluster Apache](#).

### 14.1 Before You Begin

- |    |                                                                                                                                                                                                                                                                                            |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Review <a href="https://access.redhat.com/articles/2026253#EAP_72">https://access.redhat.com/articles/2026253#EAP_72</a> . Ensure that you are using one of the JBoss Core Services Apache HTTP Server configurations supported by Red Hat.                                                |
| 2. | Ensure that the JBoss cluster is fully operational and capable of running the LabVantage application.                                                                                                                                                                                      |
| 3. | Shutdown JBoss on all nodes.                                                                                                                                                                                                                                                               |
| 4. | When specifying connections, this document uses hostname rather than IP address. It is recommended that you use the fully qualified domain name (FQDN) for proper mapping and resolution through your DNS. An example of this is: myhost.mydomain.com rather than just the hostname alone. |
| 5. | Read the Red Hat <a href="#">Apache HTTP Server Installation Guide</a> . This is part of JBoss Core Services. Red Hat's Compatibility Matrix indicates support for JBoss Core Services version <a href="#">2.4.29</a> . LabVantage has additionally tested JBCS <a href="#">2.4.37</a>     |

### 14.2 Planning

JBoss Core Services Apache HTTP Server provides many configuration options. The example procedure in this guide sets up a two-node horizontal cluster as shown in the diagram in Appendix C: Diagram of Two-Node Cluster Apache. "M1" and "M2" denote the machines that host node1 and node2 of the JBoss EAP cluster. Red Hat advises that this configuration is suitable whether you use one of the JBoss Core Services Apache HTTP Server inputs as the point-of-entry, or you connect a load-balancer to each HTTPD Server input. The JBoss EAP instances themselves handle the actual node failover through recovery systems directed through JBoss EAP's JGroups communication services.

If you are running clustered JBoss EAP instances, connect your load-balancer to each HTTPD Server instance on M1 and M2. If one of the JBoss EAP instances fails, failover should be transparent to users. If one of the machines fails, your load-balancer should direct users to the HTTPD instance on the surviving node. Just for your information, this will also provide some functionality without a load-balancer by using the HTTPD instance on M1 (or M2) as the point-of-entry. If one of the JBoss EAP instances fails, failover should be transparent, but if the machine hosting HTTPD fails, you would have to access the HTTPD on the surviving node. This is not a practical setup and is definitely not recommended in a production environment, but it is worth mentioning to provide more information concerning JBoss Core Services Apache HTTP Server capabilities.

If you are running a single clustered JBoss EAP instance and you must use a load-balancer to connect to the machine, set up JBoss Core Services Apache HTTP Server on that machine and connect your load-balancer to

the HTTPD instance. The procedure remains the same except for a few changes that are noted in the relevant locations. Note that this applies only to a clustered JBoss EAP instance.

It is recommended to install Apache using a path that does not contain spaces. Otherwise, you may need to refer to the HTTPD\_HOME as "C:/PROGRA~1" if installed in "C:/Program Files" or "C:/PROGRA~2" if installed in "C:/Program Files (x86)" on Windows.

## 14.3 Notes for Apache Installations on RHEL

### 14.3.1 Prerequisites

The following packages are required to run Red Hat JBoss Core Services Apache HTTP Server 2.4.37 on Red Hat Enterprise Linux: **elinks, krb5-workstation, mailcap**

To install these prerequisites on RHEL, issue the following command as the root user:

```
yum install elinks krb5-workstation mailcap
```

### 14.3.2 Running the Apache HTTP Server Post-Installation Script

After you have installed Apache following [Red Hat's Installation Guide](#)

|    |                                                        |
|----|--------------------------------------------------------|
| 1. | On a command line, change to the HTTPD_HOME directory. |
| 2. | Issue the following command:<br>./.postinstall         |

### 14.3.3 Starting or Stopping Apache HTTP Server

To start Apache HTTP Server, on a command line as root user, change to HTTPD\_HOME/sbin/ and issue the following command:

```
. /apachectl start
```

To stop Apache, change 'start' to 'stop'

### 14.3.4 Setting up Apache HTTP Server for SysV

Using the Apache HTTP Server with a system daemon provides a method of starting the Apache HTTP Server services at system boot. The system daemon also provides start, stop and status check functions. The default system daemon for RHEL 6 is SysV and for RHEL 7 and 8, the default is systemd.

To determine which system daemon is running, issue

```
ps -p 1 -o comm=.
```

If you receive a response of 'init', you are using SysV.

If you receive a response of 'system', you are using systemd. In this case, please skip to 14.3.5.

|    |                                                                                                                        |
|----|------------------------------------------------------------------------------------------------------------------------|
| 1. | Following Red Hat's instructions for your platform, install Apache to run as a service.                                |
| 2. | As the root user, execute the .postinstall.sysv script:<br><pre># cd HTTPD_HOME<br/># sh httpd/.postinstall.sysv</pre> |

|    |                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3. | SysV commands can only be issued by the root user. To enable the Apache HTTP Server services to start at boot using SysV:<br><br># chkconfig jbcsvs-htpd24-htpd on |
| 4. | To start the Apache HTTP Server using SysV:<br><br># service jbcsvs-htpd24-htpd start                                                                              |
| 5. | To stop the Apache HTTP Server using SysV:<br><br># service jbcsvs-htpd24-htpd stop                                                                                |

**Installation Verification:** Initials indicate the the changes in section 14.3 for SysV were made and the Apache HTTP server responds as expected. For additional information on Apache, refer to [Red Hat Enterprise Linux 6 Deployment Guide: Running Services](#)

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

#### 14.3.5 Setting up Apache HTTP Server for SystemD

Execute this process only if you received a response of "system" when issuing this command

```
ps -p 1 -o comm=.
```

|    |                                                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Following Red Hat's instructions for your platform, install Apache to run as a service.                                                                                           |
| 2. | As the root user, execute the .postinstall.systemd script:<br><br># cd HTTPD_HOME<br># sh httpd/.postinstall.systemd                                                              |
| 3. | Systemd commands can only be issued by the root user. To enable the Apache HTTP Server services to start at boot using SysV:<br><br># systemctl enable jbcsvs-htpd24-htpd.service |
| 4. | To start the Apache HTTP Server using Systemd:<br><br># systemctl start jbcsvs-htpd24-htpd.service                                                                                |
| 5. | To stop the Apache HTTP Server using SysV:<br><br># systemctl stop jbcsvs-htpd24-htpd.service                                                                                     |

**Installation Verification:** Initials indicate the the changes in section 14.3 were made for SystemD and the Apache HTTP server responds as expected.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

To verify the status of the Apache HTTP Server using systemd (the status operation can be executed by any user):   # systemctl status jbcsvs-`httpd24`-`httpd`.service

## 14.4 Notes for Apache Installations on Windows

After you have installed Apache using the Red Hat JBoss Core Services Apache HTTP Server Installation Guide some adjustments should be made.

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | If you have Microsoft IIS or other web server software installed, ensure that you disable or reconfigure it to avoid port conflicts<br><ol style="list-style-type: none"><li>1. Stop the <b>World Wide Web...</b> service, and change the <b>Startup Type</b> to <b>Manual</b>.</li><li>2. Configure IIS to use different ports.</li></ol> <p>Alternatively, you can configure <b>httpd.conf</b> before installing the Apache HTTP Server service and change Listen to a port to one that does not conflict with other ports already in use. See section 14.5</p> |
| 2.  | At the Command Prompt as an administrative user, change to the <b>HTTPD_HOME\etc</b> directory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3.  | Run the following command to finish the install the Apache HTTP Server<br>call postinstall.httpd.bat                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.  | Install the Apache HTTP Server service with the following command:<br>Option1: httpd -k install<br>Option 2: httpd -k install -n "JBCSApacheHTTPD24" -f "HTTPD_HOME\etc\httpd\conf\httpd.conf"                                                                                                                                                                                                                                                                                                                                                                    |
| 5.  | Follow the rest of this procedure to ensure that the account used to run the service has full control over the <b>HTTPD_HOME</b> folder and subfolders.<br>Right-click the <b>HTTPD_HOME</b> folder and click Properties.                                                                                                                                                                                                                                                                                                                                         |
| 6.  | Select the Security tab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 7.  | Click the Edit button                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 8.  | Click the Add button                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 9.  | In the text box, enter <b>LOCAL SERVICE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 10. | Select the Full Control check box for the <b>LOCAL SERVICE</b> account                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 11. | Click OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 12. | Click the Advanced button                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 13. | Inside the Advanced Security Settings dialog, select LOCAL SERVICE and click Edit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

- |     |                                                                                                                                                       |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14. | Select the check box next to the Replace all existing inheritable permissions on all descendants with inheritable permissions from this object option |
| 15. | Click OK through all the open folder property windows to apply the settings                                                                           |

Installation Verification: Initials indicate the above changes were made and saved to the httpd.conf file.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

## 14.5 Configure httpd.conf

Now that Apache has been installed, continue configuring for a cluster.

Edit `HTTPD_HOME\etc\httpd\conf\httpd.conf` (Windows) or `HTTPD_HOME/conf/httpd.conf` (RHEL) and perform the operations specified below.

- |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <p>For the Listen directive, specify the socket as the hostname of the local machine at port 80 as shown in the example below. This is the port on which Apache will accept requests.</p> <p>HOSTNAME is the name of the local machine. In order for Apache to connect and proxy through mod_cluster to JBoss EAP by the hostname, use the same fully qualified hostname as you specified in the <a href="#">Set JBoss Bind Addresses</a> procedure.</p> <pre># Modify request input port for the local machine Listen HOSTNAME:80</pre>                                                                                                               |
| 2. | <p>Increase the maximum allowed header size and input buffer throughput by adding the <code>LimitRequestFieldSize</code> and <code>ProxyIOBufferSize</code> directives and setting them to 65536 as shown below. This is the maximum allowable value. The default is 8192. These values provided the best overall performance during testing.</p> <pre># Increase header size and buffer throughput . LimitRequestFieldSize 65536 ProxyIOBufferSize 65536</pre> <p>The values assigned to these directives must match "Max ajp packet size" set for the Undertow AJP connector (as described in <a href="#">Set Undertow Listener Attributes</a>).</p> |
| 3. | <p>Ensure that the overall directive for all HTTP ports in httpd.conf is set to "Require all granted" as shown below. This removes any access restrictions during setup.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                                                                                                                                                                                                                                                                                                                   | # Controls who can get stuff from this server.<br>Require all granted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------|------------|----------|---------|-----|----------|---------------------------------------------------------------------------------------------|-----------|-----|----|-------------------------------------|------------------------|-----|---|------------------------------------------------------------------------------------------------------------|
| 4.                                                                                                                                                                                                                                                                                                                                | <p>Change the default values of the following directives as shown below.</p> <table border="1"> <thead> <tr> <th>Directive</th><th>Default Value</th><th>Change to:</th><th>Comments</th></tr> </thead> <tbody> <tr> <td>Timeout</td><td>120</td><td>600</td><td>This is the number of seconds Apache will wait for certain events before failing a request.</td></tr> <tr> <td>KeepAlive</td><td>Off</td><td>On</td><td>This allows persistent connections.</td></tr> <tr> <td>Max KeepAlive Requests</td><td>100</td><td>0</td><td>A value of zero indicates that an unlimited number of requests will be allowed on a persistent connection.</td></tr> </tbody> </table> | Directive  | Default Value                                                                                              | Change to: | Comments | Timeout | 120 | 600      | This is the number of seconds Apache will wait for certain events before failing a request. | KeepAlive | Off | On | This allows persistent connections. | Max KeepAlive Requests | 100 | 0 | A value of zero indicates that an unlimited number of requests will be allowed on a persistent connection. |
| Directive                                                                                                                                                                                                                                                                                                                         | Default Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Change to: | Comments                                                                                                   |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| Timeout                                                                                                                                                                                                                                                                                                                           | 120                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 600        | This is the number of seconds Apache will wait for certain events before failing a request.                |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| KeepAlive                                                                                                                                                                                                                                                                                                                         | Off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | On         | This allows persistent connections.                                                                        |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| Max KeepAlive Requests                                                                                                                                                                                                                                                                                                            | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0          | A value of zero indicates that an unlimited number of requests will be allowed on a persistent connection. |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| 5.                                                                                                                                                                                                                                                                                                                                | <p>The next changes will rotate the two most commonly used log files on a 24-hour cycle, uniquely identified by a suffix nnnnnnnnnn which is time in seconds. Note that there are other parameters that can be used instead of '86400' like '100M' which would rotate the logs after they have reached a file size of 100 Megabytes. In Apache versions 2.4.5 and beyond the files can also be circularly rotated with a specified number of files. Please consult the <a href="#">Apache rotatelogs.exe documentation</a> for more details.</p>                                                                                                                            |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| 6.                                                                                                                                                                                                                                                                                                                                | Search for: ErrorLog logs/error_log                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| 7.                                                                                                                                                                                                                                                                                                                                | <p>Comment out the line you found in step 6. Add this line:</p> <pre>ErrorLog "   HTTPD_HOME/sbin/rotatelogs.exe -l HTTPD_HOME/var/log/httpd/error_log 86400"</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| 8.                                                                                                                                                                                                                                                                                                                                | Search for: CustomLog logs/access_log combined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| 9.                                                                                                                                                                                                                                                                                                                                | <p>Comment out the line you found in step 8. Add this line:</p> <pre>CustomLog "   HTTPD_HOME/sbin/rotatelogs.exe -l HTTPD_HOME /var/log/httpd/access_log 86400" combined</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| <p>Installation Verification: Initials indicate the above changes were made and saved to the httpd.conf file.</p> <table border="1"> <thead> <tr> <th>Role</th><th>Initials</th><th>Date</th></tr> </thead> <tbody> <tr> <td>Executor</td><td></td><td></td></tr> <tr> <td>Reviewer</td><td></td><td></td></tr> </tbody> </table> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Role       | Initials                                                                                                   | Date       | Executor |         |     | Reviewer |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| Role                                                                                                                                                                                                                                                                                                                              | Initials                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Date       |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| Executor                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |
| Reviewer                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                                                                            |            |          |         |     |          |                                                                                             |           |     |    |                                     |                        |     |   |                                                                                                            |

You will continue editing this file in the next section.

## 14.6 Configure Multi-Processing Module (MPM)

Configuring the MPM for Apache will optimize LabVantage as it processes requests. There are three common MPM options for RHEL, but only one for Windows. The examples provided below will need to be customized based on system resources and activity.

### 14.6.1 MPM for Windows

For RHEL installations you may skip this section and advance to MPM for RHEL. Increasing ThreadsPerChild will increase the maximum concurrent connections. The recommendation is 150 threads per core. These must be tuned according to your use of Apache

- |    |                                                                                                                                                                                        |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Edit <code>HTTPD_HOME\etc\httpd\conf\httpd.conf</code> and add the four lines below:<br><br>ThreadStackSize 6291456<br>ThreadsPerChild 600<br>ThreadLimit 600<br>MaxRequestsPerChild 0 |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- |    |                                       |
|----|---------------------------------------|
| 2. | Save the file with these lines added. |
|----|---------------------------------------|

Installation Verification: Initials indicate the above changes were made and saved to the `httpd.conf` file.

| Role     | Initials | Date |
|----------|----------|------|
| Executor |          |      |
| Reviewer |          |      |

### 14.6.2 MPM for RHEL

It is important to understand the differences between the MPMs and their functionalities. You will have to decide, based on the available resources and expected workload, which MPM configuration will be a good fit for you. More information can be found in Red Hat's [Apache HTTP Server Reference Guide](#).

This documentation will suggest making changes to the Prefork, Worker or Event MPM.

- |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Edit your <code>HTTPD_HOME/conf.modules.d/00-mpm.conf</code> file                                                                                                                                                                                                                                                                                                                                                                                        |
| 2. | Search for the preferred MPM. Comment out the MPM you want to disable and uncomment the one you wish to use.<br><br>This example shows how to enable prefork. Do not take this example as a recommendation to use the Prefork MPM in every situation.<br><br><code>LoadModule mpm_prefork_module modules/mod_mpm_prefork.so<br/>#LoadModule mpm_worker_module modules/mod_mpm_worker.so<br/>#LoadModule mpm_event_module modules/mod_mpm_event.so</code> |
| 3. | Edit <code>HTTPD_HOME/conf/httpd.conf</code> and add the desired section. Examples are in Step #4.                                                                                                                                                                                                                                                                                                                                                       |
| 4. | Note that these directives will need to be tailored and are not recommendations.<br><br><code># Prefork<br/>&lt;IfModule mpm_prefork_module&gt;<br/>StartServers 2</code>                                                                                                                                                                                                                                                                                |

```
MinSpareServers 2
MaxSpareServers 5
MaxClients 200 #must be tailored to tune Apache correctly
ServerLimit 200 #must be tailored to tune Apache correctly
MaxRequestsPerChild 100
</IfModule>

Worker
<IfModule mpm_worker_module>
 ServerLimit 16
 StartServers 2
 MaxRequestWorkers 150
 MinSpareThreads 25
 MaxSpareThreads 75
 ThreadsPerChild 25
</IfModule>

Event
<IfModule mpm_event_module>
 ServerLimit 4
 MaxRequestWorkers 150
 ThreadsPerChild 25
 AsyncRequestWorkerFactor 2
</IfModule>
```

5. Save the file with these lines added.

Installation Verification: Initials indicate the above changes were made and saved to the httpd.conf file.

Role	Initials	Date
Executor		
Reviewer		

## 14.7 Configure mod\_cluster

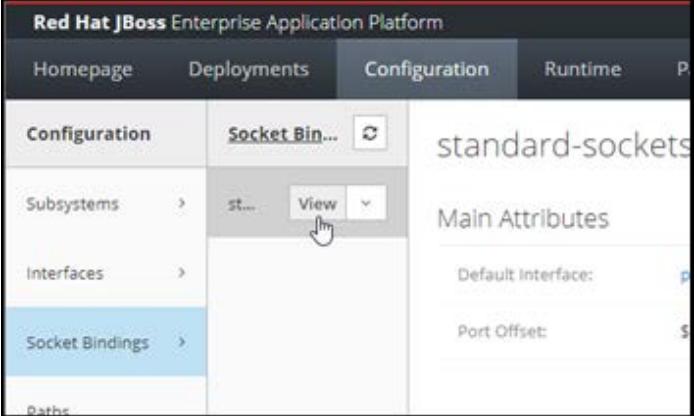
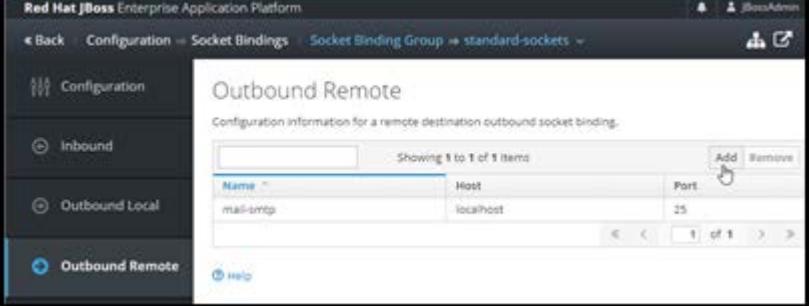
This section explains how to configure and test the mod\_cluster modules which is designed to help you create an optimal configuration for apache-based load balancers. This sets the mod\_cluster configuration files for static proxy in JBoss Core Services Apache HTTP Server. You will also create an Outbound Remote Connector for each static proxy

1. Edit `HTTPD_HOME\etc\httpd\conf.d\mod_cluster.conf` (Windows) or `HTTPD_HOME/conf.d/mod_cluster.conf` (RHEL). The content of the mod\_cluster configuration files for Windows and RHEL is shown below. Their content should differ only by the `MemManagerFile` (as indicated below).

The `mod_proxy_balancer` module is already commented in the `00-proxy.conf` file, so you can ignore that comment at the beginning of the file

```
mod_proxy_balancer should be disabled when mod_cluster is used
LoadModule proxy_cluster_module modules/mod_proxy_cluster.so
LoadModule cluster_slotmem_module modules/mod_cluster_slotmem.so
LoadModule manager_module modules/mod_manager.so
```

	<pre> LoadModule advertise_module modules/mod_advertise.so  MemManagerFile "C:/Program Files/jbcs-htpd24-2.4/var/cache/mod_cluster" [USUALLY SHOWN IN WINDOWS]  MemManagerFile cache/mod_cluster [USUALLY SHOWN IN RHEL]  &lt;IfModule manager_module&gt;     Listen 6666     &lt;VirtualHost *:6666&gt;         &lt;Directory /&gt;             Require ip 127.0.0.1         &lt;/Directory&gt;         ServerAdvertise on         EnableMCPMReceive         &lt;Location /mod_cluster_manager&gt;             SetHandler mod_cluster-manager             Require ip 127.0.0.1         &lt;/Location&gt;     &lt;/VirtualHost&gt; &lt;/IfModule&gt;</pre>				
2.	<p>You will be making changes to the IfModule directive by substituting values for these variables:</p> <ul style="list-style-type: none"> <li>• HOSTNAME is the name of the local machine.</li> <li>• PORT is the port you want to use for mod_cluster traffic. If you want to use the default port 6666, be advised that Google Chrome has recently blocked port 6666 (among others), so you must add the switch --explicitly-allowed-ports=6666 to the Chrome executable startup command (or use a different browser).</li> <li>• "ServerAdvertise" is "Off" to disable multicast autodiscovery for mod_cluster. You will be configuring static proxies later in these procedures.</li> <li>• "Require id" is intended to list the IP addresses of nodes that are allowed to join. To simplify troubleshooting in the event of errors, it is best to comment this and begin with the "Require all granted" directive as shown.</li> <li>• Add "MaxKeepAliveRequests" and set it to zero (unlimited requests on a single connection). Add "KeepAliveTimeout" and set it to 60</li> </ul>				
3.	<p>Make the changes highlighted in red using your values as described in step 3. Record your actuals.</p> <table border="1"> <thead> <tr> <th>Example</th> <th>Actual</th> </tr> </thead> <tbody> <tr> <td> <pre> &lt;IfModule manager_module&gt;     Listen HOSTNAME:PORT     &lt;VirtualHost HOSTNAME:PORT&gt;         &lt;Directory /&gt;             # Require ip 127.0.0.1             Require all granted          &lt;/Directory&gt;         ServerAdvertise Off         EnableMCPMReceive</pre> </td> <td> <p>HOSTNAME:PORT (commented) (added) (altered)</p> </td></tr> </tbody> </table>	Example	Actual	<pre> &lt;IfModule manager_module&gt;     Listen HOSTNAME:PORT     &lt;VirtualHost HOSTNAME:PORT&gt;         &lt;Directory /&gt;             # Require ip 127.0.0.1             Require all granted          &lt;/Directory&gt;         ServerAdvertise Off         EnableMCPMReceive</pre>	<p>HOSTNAME:PORT (commented) (added) (altered)</p>
Example	Actual				
<pre> &lt;IfModule manager_module&gt;     Listen HOSTNAME:PORT     &lt;VirtualHost HOSTNAME:PORT&gt;         &lt;Directory /&gt;             # Require ip 127.0.0.1             Require all granted          &lt;/Directory&gt;         ServerAdvertise Off         EnableMCPMReceive</pre>	<p>HOSTNAME:PORT (commented) (added) (altered)</p>				

	<pre> KeepAliveTimeout 60 MaxKeepAliveRequests 0  &lt;Location /mod_cluster_manager&gt;     SetHandler mod_cluster-manager     # Require ip 127.0.0.1     Require all granted  &lt;/Location&gt; &lt;/VirtualHost&gt; &lt;/IfModule&gt; </pre>	(commented) (added)
4.	Save all changes. Make certain you can start and stop the JBoss Core Services Apache HTTP Server service.	
5.	In the JBoss Management Console, select Configuration → Socket Bindings → standard-sockets  Then click "View" for the standard-sockets Socket Binding Group:	
6.	Select the "Outbound Remote" Socket Binding Group  Then click "Add".	

7. Specify a chosen "Name" for the static proxy. In this example, we used proxy1.

Actual: \_\_\_\_\_

For "Host" and "Port", specify the hostname of the local machine and the port for mod\_cluster traffic.

Host: \_\_\_\_\_

Port: \_\_\_\_\_

Then click Add.

Add Outbound Remote

Help

Name \* proxy1

Fixed Source Port % OFF

Host \* HOSTNAME\_M1

Port \* 6666

Source Interface

Source Port

Required fields are marked with \*

Cancel Add

8. Create an additional Outbound Remote Connector for each static proxy by repeating steps 5 through 7. Each "Name" must be unique, and "Host" and "Port" must the hostname of the local machine and the port for mod\_cluster traffic. The example below shows two proxies ("proxy1" and "proxy2") configured for two different host machines:

## Outbound Remote

Configuration information for a remote destination outbound socket binding.

Showing 1 to 3 of 3 Items			Add	Remove
Name	Host	Port		
mail-smtp	localhost	25		
proxy1	HOSTNAME_M1	6666		
proxy2	HOSTNAME_M2	6666		

Installation Verification: Initials indicate execution of this procedure.

Role	Initials	Date
Executor		
Reviewer		

## 14.8 Disable Advertise (UDP)

1. Select Configuration → Subsystems → ModCluster → default → View

Then click "Edit":

The screenshot shows the 'Configuration' screen for the 'Proxy > default' subsystem under the 'Modcluster' subsystem. The 'Advertising' tab is active. A red box highlights the 'Edit' button at the top right of the configuration panel.

2. In the "Advertising" tab,

disable (turn OFF)  
"Advertise"

Then Save.

The screenshot shows the same configuration screen as above, but the 'Advertise' dropdown menu is now highlighted with a red box, indicating it has been modified to 'OFF'.

3. A message dialog is displayed indicating that the server configuration has changed.

Click "Reload Server Now".

A confirmation message is then displayed.

Ensure "Advertise" is set to "false".

The next section will continue from here.

The screenshot shows the configuration screen with the 'Advertise' setting changed to 'false'. Other settings like 'Advertise Security Key' and 'Advertise Socket' are also visible in the configuration panel.

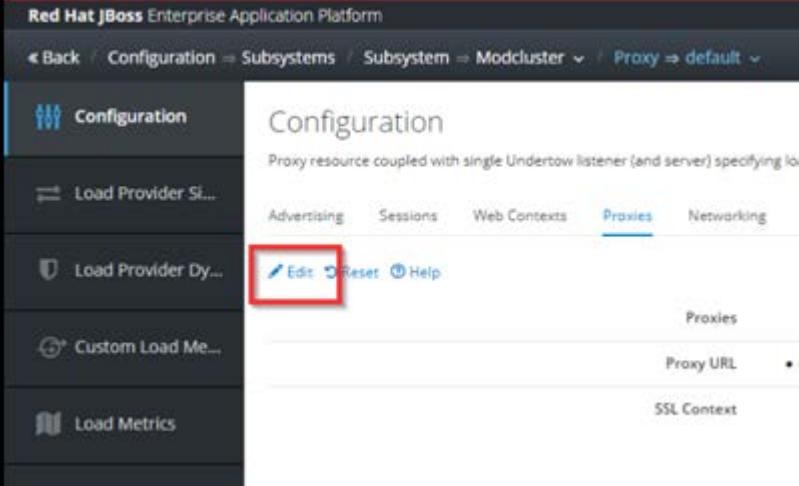
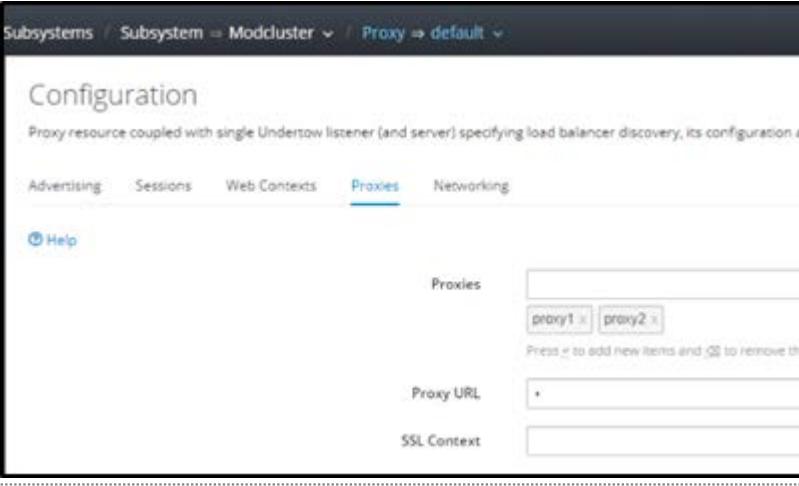
Installation Verification: Initials indicate execution of this procedure.

Role	Initials	Date
Executor		
Reviewer		

## 14.9 Send Minimal Information from Apache

To prevent attackers from obtaining extra information about your platform, set your ServerTokens directive to Prod as described here: <https://httpd.apache.org/docs/2.4/mod/core.html#servertokens>

## 14.10 Set Proxies Defined by Outbound Remote Connectors

1.	In the "Proxies" tab, click "Edit":  
2.	Specify the names of the Outbound Remote Connectors you made for the Proxies. As shown below, each must be entered on a new line within the text editor:   Save.
3.	Proxies are displayed in the Proxies tab.  Installation Verification: Initials indicate execution of this procedure.

Executor		
Reviewer		

## 14.11 Test mod\_cluster and HTTP Port

1. Start JBoss Core Services Apache HTTP Server on each machine. Verify the basic Apache configuration and functionality through the hostname at port 80:  
`http://HOSTNAME`

2. The Apache Test Page is displayed



- ### 3. Start the JBoss cluster.

4. Verify the functionality of the Mod Cluster Manager on each machine through this URL:

`http://HOSTNAME:PORT/mod_cluster_manager`

where `HOSTNAME` is the hostname of the local machine and `PORT` is the port for mod\_cluster traffic.

5. In a cluster, you should see both nodes of the cluster as shown in this example.

Here we have two nodes: JB1 and JB2

Two hosts are shown HOSTNAME\_M1  
and HOSTNAME\_M2



- |    |                                                                                                                                                                                                                                                                                                                                                                                                       |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6. | Verify the Apache connection to JBoss's Undertow Web Server through the hostname at port 80:<br><code>http://HOSTNAME/APPLICATIONNAME</code><br>where APPLICATIONNAME is the name of your LabVantage Application.                                                                                                                                                                                     |
| 7. | You should see the LabVantage login page. This is the URL that Apache expects at its input on port 80. Accordingly, be certain you try this from a remote Web client and through your load-balancer to make certain the load-balancer outputs the proper request to Apache. Note that mod_cluster has automatically configured a context for the Web app and will continue to do so for all Web apps. |

Installation Verification: Initials indicate the JBCS Apache HTTP Server connects to the Undertow Web Server as tested in this procedure.

Role	Initials	Date
Executor		
Reviewer		

## 14.12 JBCS Apache HTTP Server 2.4 HTTPS Configuration Example

For a clustered JBoss EAP server instance fronted by JBCS Apache HTTP Server, HTTPS is configured in the ssl.conf file of each JBCS Apache HTTP Server instance. It is NOT configured for the JBoss EAP server instance, as the connection between Apache and JBoss is AJP.

There are many ways to configure an HTTPS connection in JBCS Apache HTTP Server. As with JBoss EAP 7, describing all possible variations of files required for your organization is beyond the scope of this document. It is therefore assumed that your installations will obtain the required certificate and key files. One common approach is shown below. Note that depending on your internal requirements and file types, your installation may require setting the Server Certificate Chain or Certificate Authority (CA) directives. This can be determined by your IT department.

If you require additional information, JBCS Apache HTTP Server HTTPS configuration options are extensively covered in Red Hat's documents which are also provided in the Red Hat JBoss EAP Distribution. See Red Hat JBoss Core Services 2.4.29 (or 2.4.37) [Apache HTTP Server Connectors and Load Balancing Guide](#).

This is the LVS preferred approach but should not be taken as the only valid configuration option. In the JBCS Apache HTTP Server instance, edit the ssl.conf file located in the httpd\conf.d directory. Note that HTTPD\_HOME varies depending on operating system, so just look for httpd\conf.d\ssl.conf.

- |    |                                                                                                                                                                                                                                                                          |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Stop Apache HTTP Server                                                                                                                                                                                                                                                  |
| 2. | For the Listen directive in the ssl.conf file, specify the HTTPS socket as the hostname of the local machine at port 443 as shown in the example below. HOSTNAME is the FQDN of the host.<br><br><code># Listen localhost:443</code><br><code>Listen HOSTNAME:443</code> |

3. For installations using a certificate and key file, specify the full path to your certificate and key file for the Server Certificate and Server Private Key directives (respectively) as shown in the examples below.

Values for SSLCertificateFile and SSLCertificateKeyFile are single-line entries with no return characters

```
Server Certificate:
Point SSLCertificateFile at a PEM encoded certificate. If
the certificate is encrypted, then you will be prompted for a
pass phrase. Note that a kill -HUP will prompt again. A new
certificate can be generated using the genkey(1) command.
SSLCertificateFile "C:/Program Files/jbcs-htpd24-
2.4/etc/ssl/certs/localhost.crt"
```

# Windows Example

```
SSLCertificateFile "C:/Program Files/jbcs-htpd24-
2.4/etc/ssl/certs/FILENAME.crt"
```

# RHEL Example

```
SSLCertificateFile /opt/labvantage/jbcs-htpd24-
2.4/httpd/conf/openssl/pki/tls/certs/localhost.crt
```

```
Server Private Key:
If the key is not combined with the certificate, use this
directive to point at the key file. Keep in mind that if
you've both a RSA and a DSA private key you can configure
both in parallel (to also allow the use of DSA ciphers, etc.)
SSLCertificateKeyFile "C:/Program Files/jbcs-htpd24-
2.4/etc/ssl/private/localhost.key"
```

# Windows Example

```
SSLCertificateKeyFile "C:/Program Files/jbcs-htpd24-
2.4/etc/ssl/private/FILENAME.key"
```

# RHEL Example

```
SSLCertificateKeyFile /opt/labvantage/jbcs-htpd24-
2.4/httpd/conf/openssl/pki/tls/private/localhost.key
```

4. Start Apache Server

Installation Verification: Initials indicate HTTPS has been configured for Apache.

Role	Initials	Date
Executor		
Reviewer		

## 14.13 Log File Management

LabVantage does not offer advice on how to establish a log file retention policy for Apache. Some options are presented in Apache's documentation including [Piped Logs](#). If this option seems to be risky, you might set up an operating system job to periodically delete log files that are beyond a certain age or remember to delete them manually.

## 15 DATABASE CONNECTION CHECKERS

If your database connection is interrupted, JBoss may drop the connection from the pool and not be able to recover it. This can be problematic if your installation experiences periodic short-term interruptions due to events such as brief ISP outages on a WAN. If this is the case, JBoss offers classes to regain the connection when the database connection returns:

A connection checker is provided by JBoss. For Oracle databases, this is available as  
`org.jboss.jca.adapters.jdbc.extensions.oracle.OracleValidConnectionChecker`

Similarly, JBoss offers an Exception Sorter

`org.jboss.jca.adapters.jdbc.extensions.oracle.OracleExceptionSorter`

For Microsoft SQL Server, these are

`org.jboss.jca.adapters.jdbc.extensions.mssql.MSSQLValidConnectionChecker`

and

`org.jboss.jca.adapters.jdbc.extensions.mssql.MSSQLEXceptionSorter`

Be advised that connection checkers should not be used for planned long-term outages such as cold backups. Such long-term outages will cause the pools to get stuck in a loop due to frequent checks and re-checks. The recommended approach is to shut down JBoss prior to any planned database outages.

Set these in the "Validation" section of each Data Source configuration. Set "Validate On Match" = true and "Background Validation" = false. Remember that you must disable the data source before setting these, then re-enable when done. For an example, see [Appendix D: Example of Configuring a Database Connection Checker](#). The example shows the OracleValidConnectionChecker set for the labvantage data source.

- |    |                                                                                                                                                                                                            |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Select Configuration → Subsystems → Datasources & Drivers → Datasources → DATASOURCENAME → View.<br>...where DATASOURCENAME is the name of the data source created in <a href="#">Create Data Sources</a>  |
| 2. | Click the "Validation" tab. Click "Edit"                                                                                                                                                                   |
| 3. | Set the "Valid Connection Checker" and "Exception Sorter" as appropriate.<br>Record your values in the tables below.<br>Click "Save" and "Reload" when notified that the server configuration has changed. |
| 4. | Repeat this procedure for any other datasources.                                                                                                                                                           |

Installation Verification: If these datasources were not enabled for connection checkers, indicate with an N/A

Record the value entered for the Connection Checker:

Datasource Name	Actual value for Valid Connection Checker

Record the actual value entered for the Exception Sorter:

Datasource Name	Actual value for Exception Sorter

Initials indicate the actual values (if any) were entered and saved by the Executor

Role	Initials	Date
Executor		
Reviewer		

#### NOTES:

- OracleValidConnectionChecker uses Oracle's oracle.jdbc.OracleConnection.pingDatabase() method to determine if the JDBC connection is still valid and functional. If any connection in the pool is determined to be invalid or dysfunctional, methods in OracleValidConnectionChecker should automatically take another connection from the pool (or create one if necessary).
- As load increases, OracleValidConnectionChecker has the potential to affect performance, since it will run every time a connection is borrowed from the pool.
- The Data Source also provides commented parameters that let you specify your own SQL to check connections (think "select 1 from dual"), but this has the potential to reduce performance more than the OracleValidConnectionChecker.
- For information concerning oracle.jdbc.OracleConnection.pingDatabase(), see <https://docs.oracle.com/database/121/JAJDB/oracle/jdbc/OracleConnection.html>.

## 16 SECURING JBOSS

The LabVantage application will operate successfully and as expected without additional security measures. The LabVantage application does not require you to configure cipher suite algorithms or the other options demonstrated in this section. These topics are excerpts from Red Hat's JBoss Enterprise Application Platform Security guide. These chosen topics have started to become industry standards.

### 16.1 JBoss Command Line Interface (CLI)

Several sections of this document take advantage of the JBoss CLI to simplify the process for making configuration changes. To start the JBoss CLI follow these steps.

1.	Open a command (or UNIX terminal) window.
2.	Navigate to JBOSS_HOME\bin (forward slash for LINUX)
3.	Enter the JBoss CLI by issuing this command (replace HOSTNAME with yours): <code>jboss-cli.bat --connect --controller=HOSTNAME:9990 (RHEL) ./jboss-cli.sh --connect --controller=HOSTNAME:9990</code>
4.	You will see this: [standalone@HOSTNAME:9990 /]

Once you have the above prompt, you may issue CLI commands as shown below. You can leave this interface open and issue additional commands as needed. There is no need to close the CLI and restart between subsequent configuration changes.

### 16.2 Set SSL Protocol Versions

Transport Layer Security (TLS) replaces Secure Sockets Layer (SSL). These are cryptographic protocols designed to provide communications security over a computer network. Several versions of the protocols find widespread use in applications such as web browsing, email, and more. Websites can use TLS to secure all communications between their servers and web browsers. LabVantage cannot give definitive recommendations. However, TLSv1.3 is most recent and considered the most secure at the time this document was published. TLSv1.2 is generally accepted also. This configuration change is not possible using the CLI approach described above. You will need to edit your standalone profile file directly.

1.	In the standalone configuration file (standalone.xml for non-clustered or standalone-ha.xml for clustered), locate the following tag: <code>&lt;security-realm name="ManagementRealm"&gt;</code>
2.	Immediately after this line, add these lines: <code>&lt;server-identities&gt;   &lt;ssl&gt;     &lt;engine enabled-protocols="TLSv1.3" /&gt;   &lt;/ssl&gt; &lt;/server-identities&gt;</code> Record the actual TLS protocol that is enabled: _____ Save the file.

3. This should result in a "security-realm" section that looks like the below with your actual TLS.

```
<security-realm name="ManagementRealm">
 <server-identities>
 <ssl>
 <engine enabled-protocols="TLSv1.3"/>
 </ssl>
 </server-identities>
 <authentication>
 <local default-user="$local" skip-group-loading="true"/>
 <properties path="mgmt-users.properties" relative-to="jboss.server.config.dir"/>
 </authentication>
 <authorization map-groups-to-roles="false">
 <properties path="mgmt-groups.properties" relative-to="jboss.server.config.dir"/>
 </authorization>
</security-realm>
```

Please note that only one TLS protocol/version can be specified for JBoss.

Initials indicate a TLS protocol was enabled as recorded in step 2.

Role	Initials	Date
Executor		
Reviewer		

### 16.3 Set Cipher Suite Algorithms

Before a client application and a server can exchange data over an SSL/TLS connection, these two parties need to agree first on a common set of algorithms to secure the connection. Browsers support a rather large selection of cipher suites. Some are stronger than others. Consult with your company's IT infrastructure team to determine the cipher suites your company prefers to support. There are security and performance balancing decisions that every organization must make. LabVantage cannot give definitive recommendations. Two commonly used suites are `TLS_RSA_WITH_AES_128_CBC_SHA` and `TLS_RSA_WITH_AES_256_CBC_SHA`. See the JBoss Documentation for references.

1. [Start JBoss CLI](#) as described above.
2. Issue a command with your desired suite(s). This should be on one line. Example:  
`/subsystem=undertow/server=default-server/https-listener=https:write-attribute(name=enabled-cipher-suites,value="SUITE_1,SUITE_2")`  
...where SUITE\_1 and SUITE\_2 are your chosen suites. Add others as required. See above introductory paragraph for examples.

Record your Actual:

Initials indicate a cipher suite algorithm was enabled as recorded in step 2.

Role	Initials	Date
Executor		
Reviewer		

## 16.4 Reroute Requests to a Secure HTTPS Port

If you have completed the steps to [activate HTTPS for non-clustered](#) or for [clustered installations](#), requests going to your HTTP port can now be redirected to your encrypted channel. If this is a standalone installation, that will be the JBoss HTTPS port. If a cluster and a load balancer is being used, then the topmost level of access for the environment is at the load balancer HTTPS port. If no load balancer is used, then the cluster is accessed through the JBCS Apache HTTP Server HTTPS Port.

This security measure prevents clients from accessing LabVantage using plain-text transmissions. Choose one of the two procedures in this section depending on your installation type.

### 16.4.1 Non-Clustered Installations

1.	<p><a href="#">Start JBoss CLI</a> as described above.</p>
2.	<p>Issue a command substituting in your values. This should be on one line. Example:</p> <pre>/subsystem=undertow/configuration=filter/rewrite=http-to- https:add(redirect="true", target= "https://myhostname.fullyqualified.com:443%U")</pre> <p>...where myhostname.fullyqualified.com is your server host and domain and where 443 is your HTTPS port number..</p> <p>Record your Actual:</p> <hr/>
3.	<p>Issue a command to redirect any requests for port 8080:</p> <pre>/subsystem=undertow/server=default-server/host=default-host/filter- ref=http-to-https:add(predicate="equals(%p,8080)")</pre> <p>...where 8080 is your HTTP port number.</p>

Initials indicate all requests to a non-clustered HTTP port will be redirected.

Role	Initials	Date
Executor		
Reviewer		

#### 16.4.2 Clustered Installations

1.	<p><u><a href="#">Start JBoss CLI</a></u> as described above.</p>
2.	<p>Issue a command substituting in your values. This should be on one line. Example:</p> <pre>/subsystem=undertow/configuration=filter/rewrite=http-to-https:add(redirect="true",target="https://myhostname.fullyqualified.com:443%U")</pre> <p>...where myhostname.fullyqualified.com is your server host and domain and where 443 is your HTTPS port number..</p> <p>Record your Actual:</p>
3.	<p>Issue a command to redirect any requests for port 8080:</p> <pre>/subsystem=undertow/server=default-server/host=default-host/filter-ref=http-to-https:add(predicate="equals(%p,8080)")</pre> <p>...where 8080 is your HTTP port number.</p>
4.	<p>Edit <code>HTTPD_HOME\etc\httpd\conf\httpd.conf</code>(Windows) or <code>HTTPD_HOME/conf/httpd.conf</code>(RHEL) and add the following lines:</p> <pre>RewriteEngine On RewriteRule ^/\$ https://myhostname.fullyqualified.com:443 / [R,L] RewriteRule ^(.*)\$ https://myhostname.fullyqualified.com:443 \$1 [R,L]</pre> <p>...where myhostname.fullyqualified.com is your topmost server host and domain and where 443 is your topmost HTTPS port number.</p> <p>Record your Actual:</p>

Initials indicate all requests to a clustered HTTP port will be redirected.

Role	Initials	Date
Executor		
Reviewer		

## 16.5 Disable the JBoss Management Console

The JBoss Management Console does require login credentials to access. However, this interface is susceptible to brute force attack and accepts HTTP requests over a default port of 9990. Since any changes to this console affect the `standalone(_ha).xml` file, this runtime tool can change your backend configuration. Disable this console to add security to your JBoss installation. Alternatively, block port 9990 using firewall rules.

1.	<p><u>Start JBoss CLI</u> as described above.</p>
2.	<p>Issue this command on one line:</p> <pre>/core-service=management/management-interface=http-interface :write-attribute(name=console-enabled,value=false)</pre>
3.	<p>If you require a graphical user interface for continual monitoring and configuration, enable HTTPS on the management interface using the below CLI commands. This will require that you have installed an HTTPS certificate. It may also disrupt your ability to use the CLI which can prevent you from taking additional security measures below. Use with caution.</p> <pre>/core-service=management/management-interface=http-interface:write-attribute(name=ssl-context, value=httpsSSC)</pre> <pre>/core-service=management/management-interface=http-interface:write-attribute(name=secure-socket-binding, value=management-https)</pre> <pre>/core-service=management/management-interface=http-interface:undefined-attribute(name=socket-binding)</pre>
Initials indicate JBoss Management Console is disabled.	

Role	Initials	Date
Executor		
Reviewer		

## 16.6 Disable Remote Access to JMX

Remote access to the JMX subsystem allows for JDK and application management operations to be triggered remotely. To prevent an attacker from being able to determine all the JBoss mBeans being used and disallow remote access to the JMX, remove the remote connector.

1.	<p><u>Start JBoss CLI</u> as described above.</p>
2.	<p>Issue this command</p> <pre>/subsystem=jmx/remoting-connector=jmx :remove</pre>
Initials indicate this command has been issued.	

Role	Initials	Date
Executor		
Reviewer		

## 16.7 Removing Informational Undertow Response Headers

The default JBoss EAP undertow subsystem includes two response headers that are appended to each HTTP response by the default-host. Although these can be useful for development and debugging purposes, removal of these headers can help protect information about the server in use. This prevents an attacker from being able to readily leverage any vulnerability that may be discovered about this platform.

These steps will remove: Server, which is set to JBoss-EAP/7 and X-Powered-By, which is set to Undertow/1

1.	<p><a href="#">Start JBoss CLI</a> as described above.</p>
2.	<p>Issue this command to remove JBoss-EAP/7 from the header <code>/subsystem=undertow/server=default-server/host=default-host/filter-ref=server-header:remove</code></p>
3.	<p>Issue this second command to remove X-Powered-By from the header <code>/subsystem=undertow/server=default-server/host=default-host/filter-ref=x-powered-by-header:remove</code> reload</p>

Initials indicate these commands have been issued.

Role	Initials	Date
Executor		
Reviewer		

## 16.8 Enable Firewall Rules on the JBoss Host

Port exposure on an application server system is made worse by poor firewall rules. Exception rules should only include the ports needed, and for the systems needing them. For instance, AJP presents some security risk but is required if setting up a cluster. However, it is only required for the mod\_cluster instances.

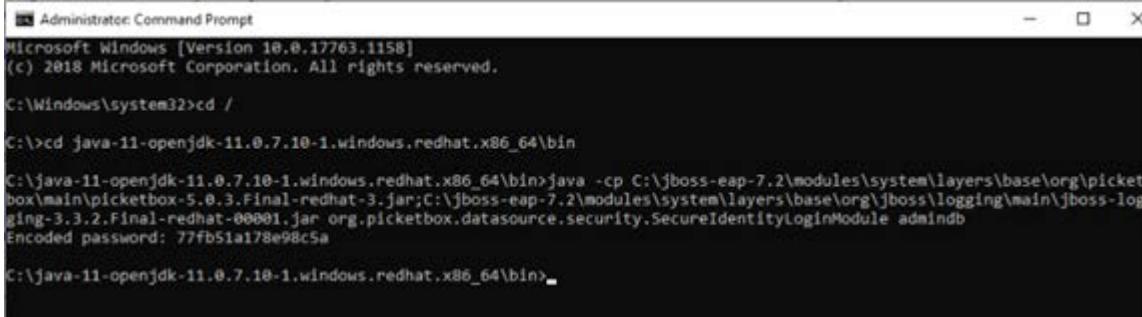
Therefore, the only systems that need to communicate on the AJP port are the other nodes of the cluster. Likewise, since the mod\_cluster is running on the HTTPS port, the only system that needs access to it is the loadbalancer. Good firewall rules will significantly reduce exploitation exposure, which can be as effective as having all the above security-related changes in place.

## 16.9 Encrypting Datasource Passwords

The following procedure replaces the JBoss EAP 7 standalone/standalone-ha XML plain text datasource passwords with a reference to a security policy that defines a connection using an encrypted password.

These examples use Windows syntax. Modify the directory and classpath delimiters as required for RHEL operating systems.

1. Depending on your version of JBoss, Java, and patching level of these you may need to adjust the command you will issue in step 2.

	<p>Navigate to <code>JBOSS_HOME\modules\system\layers\base\org\picketbox\main</code> Here you will find a <code>picketbox-xxx.jar</code>. Typically this will be "picketbox-5.0.3.Final-redhat-1.jar". If it is not, you will need to substitute your value into the command in step 2.</p> <p>Navigate to <code>JBOSS_HOME\modules\system\layers\base\org\jboss\logging\main</code> Here you will find a <code>jboss-logging-xxx.jar</code>. Typically this will be "jboss-logging-3.3.2.GA-redhat-2.jar". Again, if you have something different, please substitute it into your command in step 2.</p>
2.	<p>Generate the encrypted password by executing this command on one line from the <code>JAVA_HOME\bin</code> directory. Substitute your values for <code>ADMINDB</code> or <code>LABVANTAGE</code> and others.</p> <pre>java -cp JBOSS_HOME\modules\system\layers\base\org\picketbox\main\picketbox- 5.0.3.Final-redhat- 1.jar;JBOSS_HOME\modules\system\layers\base\org\jboss\logging\main\jboss- logging-3.3.2.GA-redhat-2.jar org.picketbox.datasource.security.SecureIdentityLoginModule PASSWORD</pre> <p>...where <code>JBOSS_HOME</code> is the full path to the <code>JBOSS_HOME</code> directory and <code>PASSWORD</code> is the password (text string) you want to encrypt</p> <p>This returns a 128-bit Blowfish encrypted password key as shown in the example below. This example encrypts the <code>ADMINDB</code> password.</p>  <pre>Administrator: Command Prompt Microsoft Windows [Version 10.0.17763.1158] (c) 2018 Microsoft Corporation. All rights reserved.  C:\Windows\system32&gt;cd /  C:\&gt;cd java-11-openjdk-11.0.7.10-1.windows.redhat.x86_64\bin  C:\java-11-openjdk-11.0.7.10-1.windows.redhat.x86_64\bin&gt;java -cp C:\jboss-eap-7.2\modules\system\layers\base\org\picketbox\main\picketbox-5.0.3.Final-redhat-3.jar;C:\jboss-eap-7.2\modules\system\layers\base\org\jboss\logging\main\jboss-logging-3.3.2.Final-redhat-00001.jar org.picketbox.datasource.security.SecureIdentityLoginModule admindb Encoded password: 77fb51a178e98c5a  C:\java-11-openjdk-11.0.7.10-1.windows.redhat.x86_64\bin&gt;</pre>
	<p>Repeat for other schemas as needed. Record these encoded password values in a safe place as you will need it in step 5.</p>
3.	<p>In the standalone configuration file (<code>standalone.xml</code> for non-clustered or <code>standalone-ha.xml</code> for clustered), locate the <code>Security Subsystem</code> section. It will begin with:</p> <pre>&lt;subsystem xmlns="urn:jboss:domain:security:1.2"&gt;</pre>
4.	<p>Each data source will require a unique security domain name. For example, you will need one for <code>ADMINDB</code> and a different one for <code>LABVANTAGE</code>. Record your planned security domain names:</p> <p>ADMINDB: _____ LABVANTAGE: _____</p>
5.	<p>Create Security Domains as shown in the example below remembering that you will add a separate domain for each purpose as prompted to record in step 4. Substitute the schema username and the encrypted password key value generated in step 2</p> <pre>&lt;security-domain name="<b>encryptedADMINDbpassword</b>" cache-type="default"&gt;   &lt;authentication&gt;</pre>

```
<login-module
 code="org.picketbox.datasource.security.SecureIdentityLoginModule"
 flag="required">
 <module-option name="username" value="USERNAME" />
 <module-option name="password"
 value="5b8b633421f26f7de2049358c0b74d18" />
 </login-module>
</authentication>
</security-domain>
```

6. Find the section of this file that identifies your data source. Here is an example

```
<datasource jta="true" jndi-name="java:jboss/datasources/admindb"
...where admindb is the data source ID.
```

7. Between the datasource opening and closing tag, you will find a security section for each datasource. Example:

```
<security>
 <user-name>USERNAME</user-name>
 <password>PASSWORD</password>
</security>
```

8. Remove the username and password lines replacing them with one line as highlighted here in red

```
<security>
 <security-domain>encryptedADMINDBpassword</security-domain>
</security>
```

9. Save the file.

The examples in this process have demonstrated encryption of the ADMINDB password. Repeat this process starting at step 6 for other schemas in order to prevent exposure of the schema owner password within this file. Keep in mind that any time the schema owner password is changed, such as to conform to password expiration rules, steps 2 to 5 will need to be repeated.

Initials indicate the standalone.xml or standalone.-ha.xml (clustered) file was altered following the steps in this procedure.

Role	Initials	Date
Executor		
Reviewer		

## 17 JBOSS LOG FILE MANAGEMENT

In this section, we will detail some practices for logging output. Making these changes should have positive effects on logging performance, disk space management, and support for using the logs effectively. There are at least three systems that are writing log files. If you have installed Apache, that makes four. This chapter considers just the JBoss logs. The database logs, Apache, and any other third-party software will generate their own log files. Consider those other systems in your comprehensive plan for log file management.

### 17.1 Disable Console Logging

This stops JBoss Console output. If you are running as a service, this output goes to stdout log files, which can grow indefinitely. Rarely are these logs needed for troubleshooting since they only report entries related to using the JBoss Console.

- |    |                                                                                                     |
|----|-----------------------------------------------------------------------------------------------------|
| 1. | <a href="#">Start JBoss CLI</a> as described above.                                                 |
| 2. | Issue this command<br><code>/subsystem=logging/root-logger=ROOT:remove-handler(name=CONSOLE)</code> |

Initials indicate this command has been issued.

Role	Initials	Date
Executor		
Reviewer		

### 17.2 Define a Log File Retention Policy

The default logging level for JBoss is INFO. This might be too detailed of a log file level for systems that have demonstrated reliable operation in a high-volume production deployment. While this procedure does not alter the logging level, you should consider changing this to WARN or ERROR for performance reasons after the system has been proven to be stable. For an initial installation, INFO is an appropriate level. An additional consideration is the maximum size you want for these files and how many copies to retain. This helps prevent any out-of-disk-space conflicts that may result from retaining an unlimited number of log files indefinitely. The default FILE handler creates a new log file each time you start JBoss. Historical logs are retained indefinitely. This example definition will create a new log file once a 200 MB size is reached and will retain 100 of the resulting files. Adjust this policy to suit your needs.

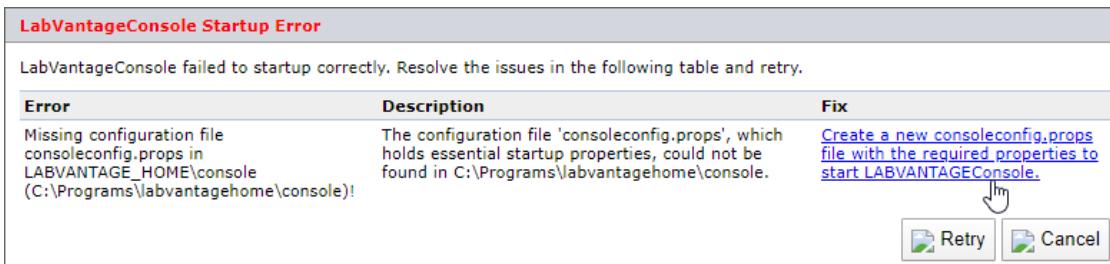
- |    |                                                                                                                                                                                                                                                                                                                                                                   |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | <a href="#">Start JBoss CLI</a> as described above.                                                                                                                                                                                                                                                                                                               |
| 2. | Issue these commands<br><code>/subsystem=logging/size-rotating-file-handler=SIZEDFILE:add(file={path="server.log",relative-to="jboss.server.log.dir"},rotate-size=200m,max-backup-index=100)</code><br><code>/subsystem=logging/root-logger=ROOT:add-handler(name=SIZEDFILE)</code><br><code>/subsystem=logging/root-logger=ROOT:remove-handler(name=FILE)</code> |

Initials indicate these commands have been issued.

Role	Initials	Date
Executor		
Reviewer		

## 18 LABVANTAGE CONSOLE SETUP

This chapter assumes you have completed the installation and configuration of your database and application server as described in previous chapters. You should have also copied your license file into your LABVANTAGE\_HOME unless you have a database-specific license. You will apply a database-specific license in [Adding a New LabVantage Database Schema](#). Following the below steps, you will initiate the console by invoking a script that will create a configuration file on your application server. If you are performing an in-place upgrade of an existing LabVantage installation, your console will not require these setup steps. The upgrade process is described in [LabVantage Upgrades](#).

1.	If not already started, start your database
2.	If not already started, start your application server
3.	<p>Using the below model, enter the correct URL into your browser's address bar.</p> <p>https://HOSTNAME:PORT/labvantageconsole80</p> <p>where</p> <p>HOSTNAME = the fully qualified name of the application server host</p> <p>PORT = the application server's HTTPS port (normally 443). Alternatively, you may use the HTTP protocol and port if you have not configured SSL</p> <p>labvantageconsole80 = the name of the LabVantage Console EAR file as described in <a href="#">LabVantage Console EAR</a></p>
4.	When the page loads, you will observe a LabVantage Console Startup error. This is due to a missing configuration file that will be addressed when you click the 'Fix' link in the next step.  
5.	Click the hyperlink under the "Fix" column. The <i>Add LabVantageConsole Configuration Settings</i> dialog prompts you for the name of your administrative datasource (commonly admindb).
6.	For Admin database, enter the name of your datasource created in <a href="#">Create Data Sources</a> . For Admin DBMS, choose Oracle or SQL Server.

	<p>Installation Verification: Record the actual values</p> <table border="1"> <tr> <td>Admin database</td><td></td></tr> <tr> <td>Admin DBMS:</td><td></td></tr> </table> <p>Click OK.</p>	Admin database		Admin DBMS:			
Admin database							
Admin DBMS:							
Note:	<p>The LabVantage Console is equipped with its own self-check routines that monitor the overall configuration. For example, if you provide an incorrect JNDI name, the Console may show some possible remedies. The below is an example from JBoss.</p> <div style="border: 1px solid #ccc; padding: 5px;"> <p><b>LabVantageConsole Startup Error</b></p> <p>LabVantageConsole failed to startup correctly. Resolve the issues in the following table and retry.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Error</th> <th>Description</th> <th>Fix</th> </tr> </thead> <tbody> <tr> <td>Failed to locate admin database datasource Reason: Failed to locate datasource for databaseid 'MyFault'</td> <td>The admin database datasource 'MyFault' defined in 'C:\labvantage\home84\console\consoleconfig.props' could not be found or is incorrectly defined on the application server.</td> <td> <p>Check:</p> <ol style="list-style-type: none"> <li>1. The admindb datasource has been defined in your application server</li> <li>2. The com.labvantage.sapphire.server.admindb property is set to the JNDI name for the admin database datasource</li> <li>3. The datasource JDBC connection properties are correct in the datasource definition</li> </ol> </td> </tr> </tbody> </table> <p style="text-align: right;"> </p> </div>	Error	Description	Fix	Failed to locate admin database datasource Reason: Failed to locate datasource for databaseid 'MyFault'	The admin database datasource 'MyFault' defined in 'C:\labvantage\home84\console\consoleconfig.props' could not be found or is incorrectly defined on the application server.	<p>Check:</p> <ol style="list-style-type: none"> <li>1. The admindb datasource has been defined in your application server</li> <li>2. The com.labvantage.sapphire.server.admindb property is set to the JNDI name for the admin database datasource</li> <li>3. The datasource JDBC connection properties are correct in the datasource definition</li> </ol>
Error	Description	Fix					
Failed to locate admin database datasource Reason: Failed to locate datasource for databaseid 'MyFault'	The admin database datasource 'MyFault' defined in 'C:\labvantage\home84\console\consoleconfig.props' could not be found or is incorrectly defined on the application server.	<p>Check:</p> <ol style="list-style-type: none"> <li>1. The admindb datasource has been defined in your application server</li> <li>2. The com.labvantage.sapphire.server.admindb property is set to the JNDI name for the admin database datasource</li> <li>3. The datasource JDBC connection properties are correct in the datasource definition</li> </ol>					
7.	<p>A successful configuration will present the <i>LabVantageConsole Logon</i> prompt.</p> <p>Enter the username and password you created in <a href="#">Install and Configure Your Database</a></p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>LabVantageConsole Logon</b></p> <p>Enter the username and password for the admin database:</p> <p>Username: <input type="text" value="admindb"/></p> <p>Password: <input type="password" value="*****"/></p> <p style="text-align: right;"> </p> </div>						
8.	<p>A successful logon loads the LabVantage Console. The left frame provides navigation. The right frame shows the current state of the item selected on the left.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p><b>LabVantageConsole 8.5</b></p> <p><b>Configuration</b></p> <ul style="list-style-type: none"> <li>Console</li> <li>Configuration</li> <li>Databases</li> <li>Applications</li> </ul> <p><b>Utilities</b></p> <p>Platform: JBoss7x (standalone_lv8) Hostname: LT6475US LabVantage HOME: C:\Programs\labvantage\home Console Build: 0850.313.01 LabVant</p> </div>						

The next procedure in [LabVantage Datasources](#) will continue from here.

Throughout this documentation, navigation is the Console is described using the tree hierarchy in the left frame. For example, the "Configuration" link is referred to as "Configuration → Console → Configuration". If you would like to learn more about using the Console, please see chapter 25 [Using the LabVantage Console](#).

**Installation Verification:** Initials indicate that the LabVantage console has been configured as described in this chapter. A successful login has loaded the console.

Role	Initials	Date
Executor		
Reviewer		

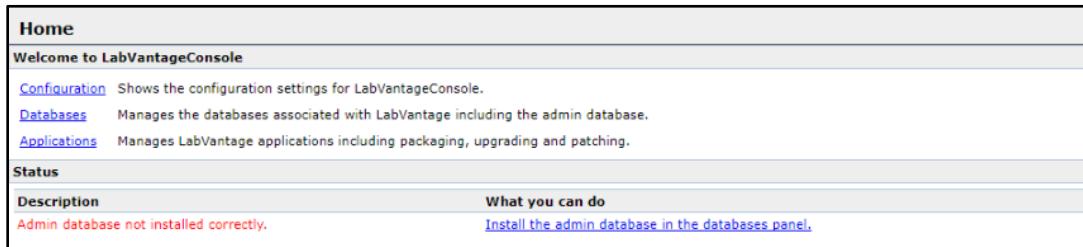
## 19 LABVANTAGE DATABASES AND DATASOURCES

Now that you have installed a database and configured your application server console, you will use the LabVantage Console to connect the LabVantage application to a datasource. This will allow the LabVantage installer to create the necessary tables, data, and other database objects required for LabVantage to run. These datasources are identified as databases in the console. The installation and the upgrade process both require you to use this console to complete this process. When you add a database to the console, this will populate the empty schema you created in [Install and Configure Your Database](#).

### 19.1 Installing a New Admin Database (AdminDB)

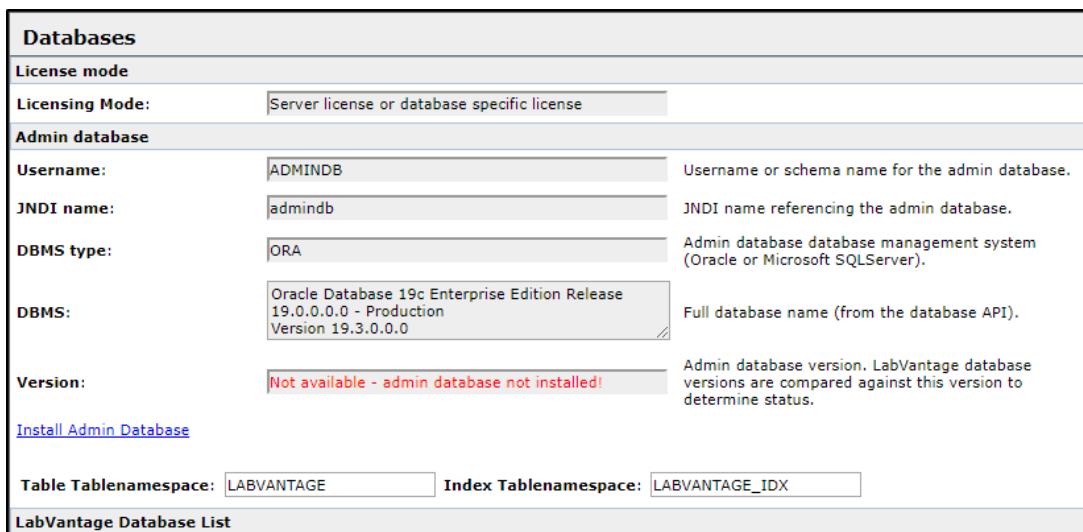
The administrative database is the first of two database schemas required to operate LabVantage. After populating this schema, you can add other instances.

1. If you disconnected from the LabVantage Console after the previous process, reconnect following the instructions in step 3 of [LabVantage Console Setup](#)
2. Using the left panel navigate through Configuration to **Databases** (if not already shown)
3. The Status column reports "Admin database not installed correctly". Click the hyperlink **Install the admin database in the databases panel**.



The screenshot shows the LabVantage Console Home page. The main navigation menu includes Home, Configuration, Databases, and Applications. Below the menu, there's a Status section. It displays a table with one row: Description (Admin database not installed correctly) and What you can do (Install the admin database in the databases panel).

4. Confirm or correct the username, JNDI name (datasource name), table and index tablenamespaces. The default values will be lvsspace and lvsidx for the namespaces. These values need to match what you created in [Install and Configure Your Database](#)



The screenshot shows the Databases configuration page. Under License mode, the Licensing Mode is set to "Server license or database specific license". In the Admin database section, the Username is "ADMINDB", the JNDI name is "admindb", the DBMS type is "ORA", and the DBMS is "Oracle Database 19c Enterprise Edition Release 19.0.0.0 - Production Version 19.3.0.0". The Version field shows a red error message: "Not available - admin database not installed!". Below the form, there's an "Install Admin Database" button. At the bottom, the Table Tablenamespace is set to "LABVANTAGE" and the Index Tablenamespace is set to "LABVANTAGE\_IDX".

**Installation Verification:** Record the actual Table Tablespacename and Index Tablespacename

Table Tablespacename: \_\_\_\_\_ Index Tablespacename: \_\_\_\_\_

5. Click the hyperlink for **Install Admin Database**

6. Wait until you see this message:

Ant file 'LABVANTAGEHOME/console/install/database/installer.xml', target 'installer' complete

...where LABVANTAGEHOME is the path to your LabVantage Home directory.

Click **Return to database list.**

The "Admin database" section now shows AdminDB details. The "Version" number of the AdminDB will display your current build number which will be different than the example shown below. This screen capture demonstrates an Oracle DBMS. You will continue from here in the next section [Adding a New LabVantage Database Schema](#)

<b>Databases</b>							
<b>License mode</b>							
<b>Licensing Mode:</b> Server license or database specific license							
<b>Admin database</b>							
<b>Username:</b>	ADMINDB	Username or schema name for the admin database.					
<b>JNDI name:</b>	admindb	JNDI name referencing the admin database.					
<b>DBMS type:</b>	ORA	Admin database database management system (Oracle or Microsoft SQLServer).					
<b>DBMS:</b>	Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production Version 19.3.0.0.0	Full database name (from the database API).					
<b>Version:</b>	0850.313.01	Admin database version. LabVantage database versions are compared against this version to determine status.					
<b>LabVantage Database List</b>							
Database	JNDI Name	Build	Patch	DBMS	Status	License	Actions
<a href="#">Add LabVantage Database</a>							

**Installation Verification:** Initials indicate that the LabVantage console has been configured as described in this section. The Admin database is successfully populated.

Role	Initials	Date
Executor		
Reviewer		

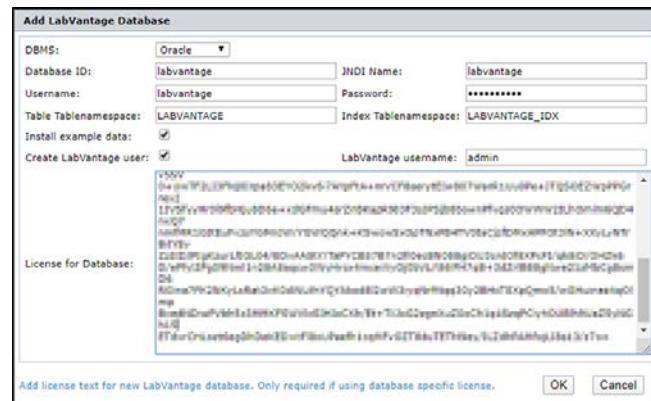
## 19.2 Adding a New LabVantage Database

You can add as many LabVantage databases (schemas) as required according to your license agreement with LabVantage. Each active LabVantage schema uses about 400 MB RAM for permanent caching of system properties, data, and other information such as business rules and connection details. When activating multiple LabVantage databases, you must therefore consider available memory resources.

1. Click **Add LabVantage Database** (pictured in section 19.1 above). This is found in the Databases page of the LabVantage Console.

2. The *Add LabVantage Database* dialog appears.

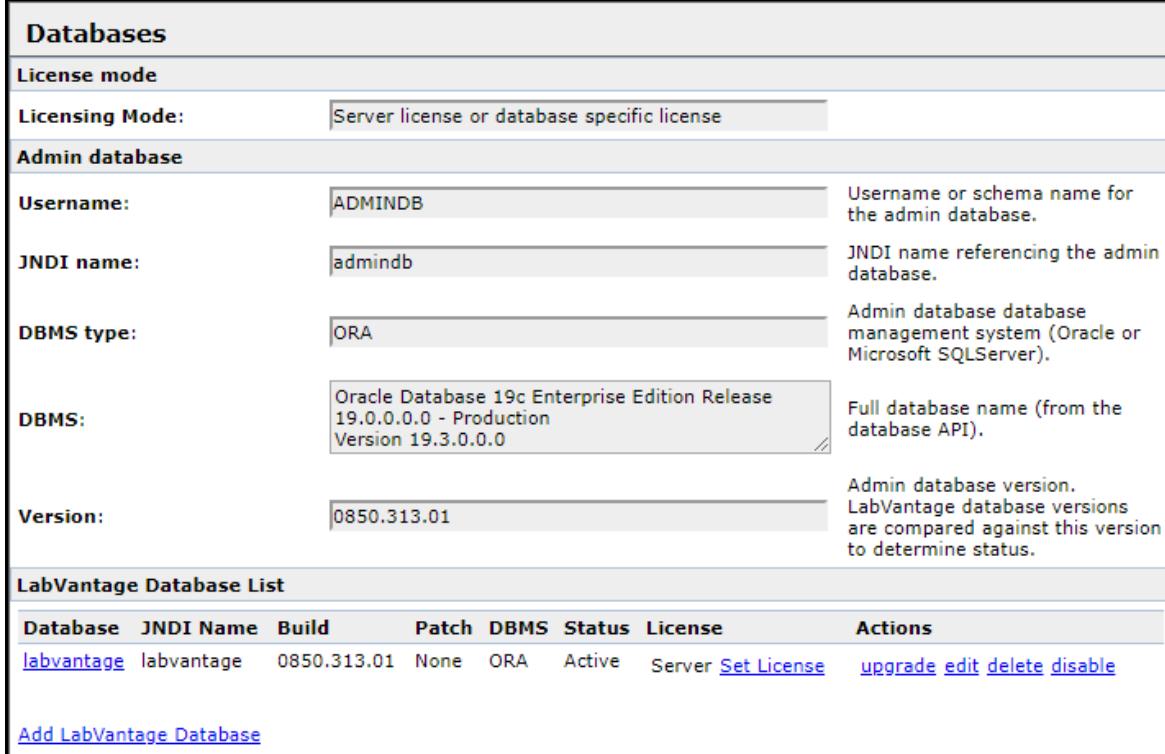
This screen capture shows an example of a completed dialog. Continue to the next step and record your actual values.



3. Enter or choose the required values following these guidelines:

Field	Value	Actual
DBMS	This identifies the manufacturer of the DBMS in use. Choose Oracle or SQL Server.	
Database ID	Enter a unique name. This value will appear on a selectable list for your end users as they sign on to the LIMS application. Make this name something that your users will be able to easily identify. It is possible to change this in the future if needed.	
JNDI Name	<p>This is the name of the data source that defines the connection to the database. It is not the full JNDI name. JBoss refers to it as the "management pool name". It is the name that you identified for the labvantage datasource in <a href="#">Create Data Sources</a>.</p> <p>For example, JBoss uses the JNDI subcontext <code>java:jboss/datasources</code>. If the JNDI name of the data source is <code>java:jboss/datasources/labvantage</code>, you would enter 'labvantage' here.</p>	

	Username	Owner of the LabVantage schema that you created in <a href="#">Install and Configure Your Database</a> .	
	Password	Password for the owner of the LabVantage schema.	
	Table Tablespacename	For Oracle DBMS, name of the data tablespace. You created this in <a href="#">Install and Configure Your Database</a>	
	Index Tablespacename	For Oracle DBMS, name of the index tablespace.	
	Database	For SQL Server DBMS, the name of the database.	
	Install example data	Check this if you want example data installed to help you get started using LabVantage. This is recommended for new development systems but not recommended when you install your production system.	
	Create LabVantage user	Check this. If you do not create a LabVantage user at this time, you will not be able to sign on to the LabVantage application for the purpose of creating other user accounts.	
	LabVantage username	Enter a logon username for the administrative user. This will be an account that will have access to the LabVantage user interface. The password for this account will be the same as the username you create here. This user can be disabled later or you may change the password after initial logon if needed.	
	License for Database:	If LabVantage has provided you a separate license for each database, please apply the license by opening the license file using a text editor. Copy and paste the contents into this window. Please see <a href="#">Adding a Database-Specific License</a> . If you do not have individual licenses per database, leave this field blank.	
4.	Click <b>OK</b> to begin installing your database tables and other objects.		
5.	Wait until you see this message:  Ant file 'LABVANTAGEHOME/console/install/database/installer.xml', target 'installer' complete  ...where LABVANTAGEHOME is the path to your LabVantage Home directory.		

	<p>Click <a href="#">Return to database list</a>.</p>
6.	<p>The "LabVantage Database List" section now shows database details. The "Status" should be "Active". The Build number will match the AdminDB Version and will be different than the example shown here. This example shows Oracle. Microsoft SQL Server will show different values.</p>  <p>Detailed description of the screenshot: The screenshot shows the 'Databases' configuration page. It has two main sections: 'License mode' and 'Admin database'. Under 'Admin database', there are fields for 'Username' (ADMINDB), 'JNDI name' (adminedb), 'DBMS type' (ORA), 'DBMS' (Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production Version 19.3.0.0), and 'Version' (0850.313.01). Below this is a table titled 'LabVantage Database List' with one row for 'labvantage'. The table columns are Database, JNDI Name, Build, Patch, DBMS, Status, License, and Actions. The 'Actions' column for the first row contains links for upgrade, edit, delete, and disable. At the bottom of the page is a link to 'Add LabVantage Database'.</p>
	<p>The Console always compares the AdminDB version with the current LabVantage build number. If they do not match, the Console will issue a Status message.</p>
7.	<p>Logoff of the LabVantage Console</p>
8.	<p>Restart the Application Server.</p>

**Installation Verification:** Initials indicate that the LabVantage console has been configured as described in this section. The labvantage database schema is successfully populated.

Role	Initials	Date
Executor		
Reviewer		

## 19.3 Adding a Database-Specific License

Prior to LabVantage 8.5, LabVantage Solutions issued license files per application server. This provided a pool of concurrent license connections that were shared across all databases. This alternate database-specific license type allows for multiple LabVantage Databases (i.e. Development and Validation) to be hosted on the same server with different license limits. If you have not been issued a database-specific license, this section does not apply to you and you can proceed to Chapter 20 [Adding an Application](#).

If you are adding a new database, the *Add LabVantage Database* provides a field for entering the license text. If you have already added a database and need to convert to a database-specific license or if you have been issued a new license, follow these steps.

**Installation Verification:** Enter 'Yes' or 'No'. Yes indicates this section will be skipped.

Role	A Server License is applied. This section is not applicable.	Initials	Date
Executor			
Reviewer			

1. Sign into the LabVantage Console and navigate to Configuration → Console → Databases
2. In this example, two databases have been added. The first is using a database-specific license. The second uses a server license. Click either hyperlink to either update or set the license.

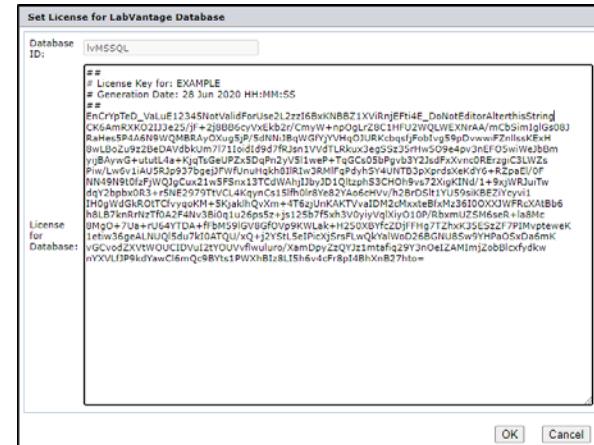
LabVantage Database List							
Database	JNDI Name	Build	Patch	DBMS	Status	License	Actions
IvMSSQL	IvMSSQL	0850.361.01	None	MSS	Active	Database <a href="#">Update License</a>	<a href="#">upgrade</a> <a href="#">edit</a> <a href="#">delete</a> <a href="#">disable</a>
IvOracle	IvOracle	0850.361.01	None	ORA	Active	Server <a href="#">Set License</a>	<a href="#">upgrade</a> <a href="#">edit</a> <a href="#">delete</a> <a href="#">disable</a>

3. The *Set License for LabVantage Database* dialogue opens with an empty License field.

4. Using any text editor, open the labvantage.lic file provided to you by LabVantage Solutions.

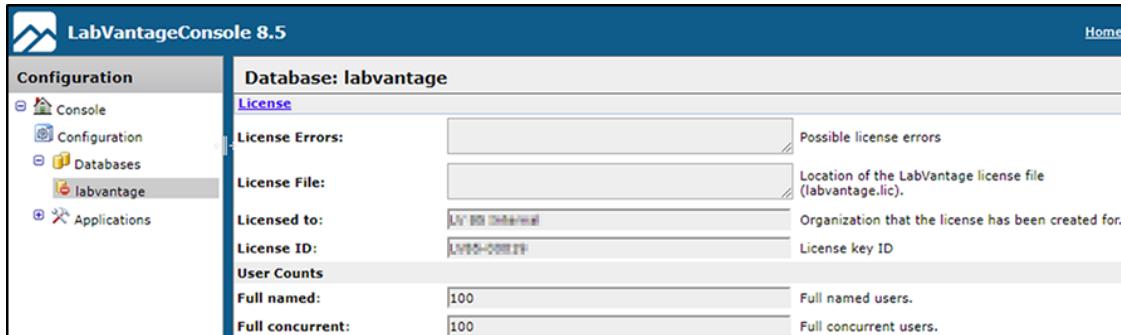
Copy the entire contents of the file and paste it into your license field. Do not alter any of the text or you will invalidate the license key.

Example:



5. Click **OK**.

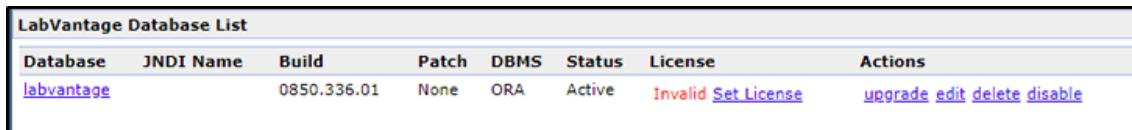
If a valid license has been entered, the details will be shown if you navigate to Configuration → Console → Databases → <database name>



The screenshot shows the LabVantageConsole 8.5 interface. On the left, there's a sidebar with 'Configuration' expanded, showing 'Console', 'Configuration', 'Databases' (which is selected), and 'Applications'. The main area is titled 'Database: labvantage' and has a 'License' tab selected. It displays the following information:

Field	Description	
License Errors:	Possible license errors	
License File:	Location of the LabVantage license file (labvantage.lic).	
Licensed to:	UVM Internal	
License ID:	UVM-00001	
User Counts		
Full named:	100	Full named users.
Full concurrent:	100	Full concurrent users.

If an invalid license is entered or if your temporary license has expired, the license status will be 'Invalid'. Click **Set License** to make a correction.



The screenshot shows the 'LabVantage Database List' page. It has a table with the following data:

Database	JNDI Name	Build	Patch	DBMS	Status	License	Actions
labvantage		0850.336.01	None	ORA	Active	Invalid <a href="#">Set License</a>	<a href="#">upgrade</a> <a href="#">edit</a> <a href="#">delete</a> <a href="#">disable</a>

**Installation Verification:** Initials indicate that the LabVantage console has been configured as described in this section. A valid license has been entered and the console reflects a Database license is applied.

Role	Initials	Date
Executor		
Reviewer		

## 20 ADDING AN APPLICATION

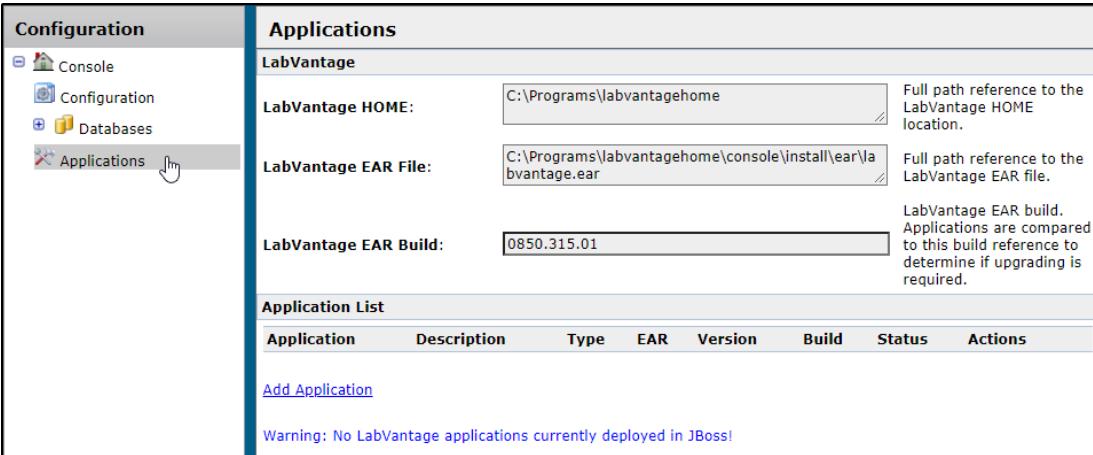
An "Application" defines an EAR-based deployment in the application server's JVM. An EAR maintained through the LabVantage Console is referred to as a "Managed EAR". When you deploy a managed EAR, the LabVantage Console adds an APPLICATION\_HOME directory to LABVANTAGE\_HOME\applications. For example, if the application name is "labvantage", the APPLICATION\_HOME becomes...

LABVANTAGE\_HOME\applications\labvantage

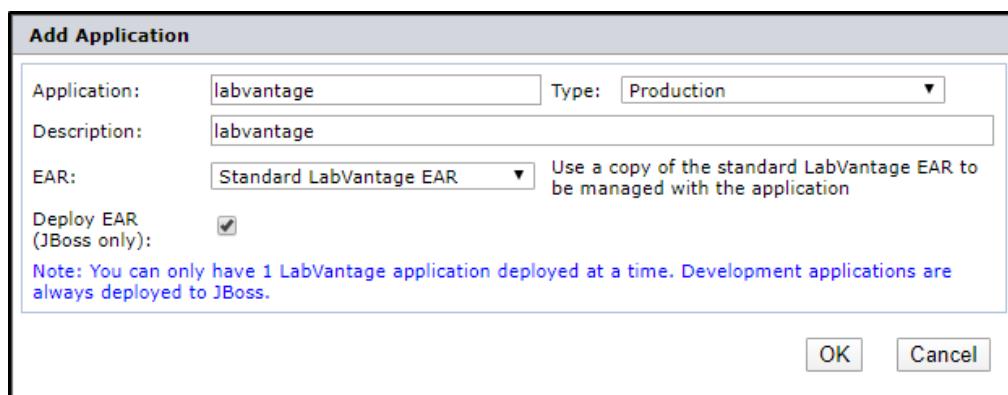
You will provide this application name when you execute this procedure. When the application is added, the EAR is copied and deployed to the application server. Additional supplementary information is available in section 24.1

### The LabVantage EAR

This procedure requires that all prior procedures in this installation guide have been completed including the startup of the database and application server.

1.	If you disconnected from the LabVantage Console after the previous process, reconnect following the instructions in <a href="#">LabVantage Console Setup</a>
2.	Using the left panel, navigate to <b>Applications</b> . 
Note	If you are running in JBoss and this is the first Application you are adding, LabVantage Console displays the message "Warning: No LabVantage applications currently deployed in JBoss!". This is expected behavior.
3.	Click the <b>Add Application</b> hyperlink.

4. If you are running in JBoss some additional options will be available in the *Add Application* dialog.



JBoss deployments allow you to choose between a Type of 'Production' or 'Development'. JBoss allows only one EAR to be deployed at a time. Because of this you are allowed to add an application without deploying it.

5. Enter a unique Application name. This will become the name of the Managed EAR. The example above shows 'labvantage'. See the introductory paragraph for this chapter for more information.

6. For Type, choose 'Production'. See supplementary section 24.1.3 [Application Installation Types](#) for a description and for your options with the JBoss Development type.

7. Choose one of three options for EAR

#### **Standard LabVantage EAR**

Deploys a "Managed EAR". This option is considered the "standard" installation, as it deploys the "Certified LabVantage EAR". The "Certified LabVantage EAR" is defined as the labvantage.ear that has been tested and certified for release by LabVantage Solutions Inc., and has not been modified in any way. It is located in LABVANTAGE\_HOME\console\install\ear (see [LABVANTAGE\\_HOME EAR Management Structure](#)). This is typically the option to use when you are installing LabVantage for the first time. This registers the Application with the AdminDB and lets you manage the EAR using LabVantage Console.

#### **Select EAR...**

Also deploys a "Managed EAR". This option is provided for installing EARs other than the standard EAR provided by LabVantage. Use the lookup to select the EAR you want to deploy. Like the "Standard LabVantage EAR" option, this registers the Application with the AdminDb and lets you manage the EAR using LabVantage Console.

#### **Unmanaged EAR**

Deploys an "Unmanaged EAR". This option lets you register the Application in the AdminDB without actually defining the EAR. You will not be able to manage the EAR using LabVantage Console (all management functionality is disabled). This option is useful if you package, upgrade, and patch your own EARs using your own processes rather than using the LabVantage Console.

**Installation Verification:** Record the actual values selected

Field	Example	Actual
-------	---------	--------

Application	labvantage	
Type	Production	
Description	labvantage	
EAR	Standard LabVantage EAR	
Deploy EAR	Yes (ticked)	

8. Click OK.
9. Wait until you observe the message "Application install complete".  
Click "Return to application list".
10. The "Application List" section now shows details about the installed Application. Your actual values will vary depending on your installation choices.

Applications					
<b>LabVantage</b>					
LabVantage HOME:	C:\Programs\labvantagehome		Full path reference to the LabVantage HOME location.		
LabVantage EAR File:	C:\Programs\labvantagehome\console\install\ear\labvantage.ear		Full path reference to the LabVantage EAR file.		
LabVantage EAR Build:	0850.313.01		LabVantage EAR build. Applications are compared to this build reference to determine if upgrading is required.		
<b>Application List</b>					
Application	Description	Type	EAR	Version	Build
LabVantage <a href="#">labvantage</a>	Production Deployment	Prod	[APP_HOME]\ear\labvantage.ear	8.5	0850.313.01 OK
<a href="#">delete</a> <a href="#">upgrade</a> <a href="#">build</a> <a href="#">RAK</a> <a href="#">home</a> <a href="#">undeploy</a> 					

11. Click the hyperlink for your application name in the Application List. The example above shows this as 'labvantage'.
12. Confirm or correct the Startup Settings.  
The Admin database is shown as 'admindb' in this example. Also verify the Admin DBMS.  
If changes were necessary, click the **Save Changes** hyperlink.
13. Logoff of LabVantage Console, then restart the JBoss application server software.

Application: labvantage	
<u>General</u>	
Application:	labvantage
Application Description:	labvantage
Type:	Production
<u>EAR Configuration</u>	
<u>Components</u>	
<u>Patches</u>	
<u>Startup Settings</u>	
Admin database:	admindb
Admin DBMS:	Oracle

**Installation Verification:** Initials indicate that the LabVantage console has been configured as described in this section. An application has been added with a status of "OK".

Role	Initials	Date
Executor		
Reviewer		

At this point, your installation of the LabVantage application is complete. If you selected the option to deploy the application as described in this chapter, no further steps for deployment are necessary.

Additional topics for consideration are:

[Chapter 22 Deploying the LabVantage Product Documentation](#)

[Chapter 23 Patches and Components](#)

[Chapter 24 Supplementary Information](#)

[Chapter 25 Using the LabVantage Console](#)

[Chapter 26 Optional Third-Party Installations](#)

## 21 LABVANTAGE UPGRADES

This chapter addresses existing installations that will be upgraded to a newer version. This could include applying a maintenance release (MR) or a major version change such as LV8.4 to LV8.5. Upgrading LabVantage may also require that you upgrade your database version, application server version, or operating system version. See the LabVantage Release Notes for supported platforms. In some cases, this may even require a full new installation of server software. If necessary, you should follow the configuration procedures for your platform. Please see [Install JBoss](#) to complete the configuration for a new platform. This document does not provide the steps required to upgrade those third-party systems. Consult the manufacturer's guides for those procedures. This chapter explains how to use the [LabVantage Console](#) to upgrade the objects and data within your database schemas as well as upgrading the managed application you have deployed.

It is not possible to predict the effects "project code" may have on an upgrade. We define "project code" as "custom changes to the LabVantage data model and LabVantage application code that may have been made for a specific customer's project". As such, these are the only initial conditions that we can guarantee will work with the following standardized LabVantage upgrade procedure:

1. Your existing LabVantage installation was installed using the procedures and tools described throughout the LabVantage Installation Documentation for your version of LabVantage.
2. You are upgrading from a LabVantage 6, 7, or 8 version. Your existing (to be upgraded) LabVantage databases were populated using the standard database installation scripts and the LabVantage Console as directed in the LabVantage Installation Documentation.
3. Your existing (to be upgraded) LabVantage application was registered and deployed using the standard Certified LabVantage EAR (the labvantage.ear that has been tested and certified for release by LabVantage Solutions Inc., and has not been modified in any way). The LabVantage Console was previously configured as directed in the LabVantage Installation Documentation.

Changes to your existing (to be upgraded) "project code" may cause unexpected behavior that we cannot predict, and thus may require specialized treatment on a per-instance basis.

When running LabVantage database upgrade scripts, the LabVantage Console is designed to upgrade a LabVantage database under these "nominal upgrade conditions" meaning:

1. Both the existing LabVantage database and application are at the same build number (version), and that existing build number is lower than the new build to which you are upgrading.
2. The LabVantage upgrade is performed in the sequence specified throughout all procedures (Upgrade Existing Admin Database, Upgrade Existing LabVantage Database, then Upgrade Existing Applications). Note that each of these procedures concludes with a restart of the Application Server.

Oracle users may encounter package state errors if a LabVantage database upgrade is not performed under the "nominal upgrade conditions" described above. See [Workaround for Oracle Package State Errors](#) for some possible fixes if the nominal conditions were not met at the start of the upgrade.

### 21.1 Before You Begin

Preparing for an upgrade involves extensive planning. Best practices dictate that you should create a copy of your existing system and run through the entire upgrade on a test machine first. If any problems are encountered, your production system will not be affected. This will also help you gauge the amount of downtime that will be required to complete your upgrade. When you have experience with the upgrade, full system backups should be taken as a fallback position should the upgrade encounter unexpected issues during or after the upgrade. LabVantage does not offer the option of downgrading a system or reverting to a prior

version. Similarly, LabVantage does not support importing “just what changed” after an export was taken to begin an upgrade on a parallel system.

### 21.1.1 LABVANTAGE\_HOME\install and \procedures Directories

If you have modified the contents of your existing (to be upgraded) LABVANTAGE\_HOME\install or LABVANTAGE\_HOME\procedures directories, the upgrade will fail. Verify that the contents of these directories have not been altered or added to.

### 21.1.2 Install or Upgrade to the Latest Application Server Software

If you are running in JBoss EAP 6 or earlier, these versions are no longer supported for LV8.5 and cannot be cleanly upgraded in place to JBoss 7.1 or 7.2. You must therefore install and configure [JBoss](#) EAP 7.1 or 7.2 before upgrading LabVantage. Follow the requirements in the *Release Notes*. Use these guidelines:

1.	If upgrading from LV6, you will need to establish a new LABVANTAGE_HOME. If upgrading LV7 or higher, you will be using your existing labvantagehome directory and upgrading your existing application therein. You will not be adding a new application or a new database.
2.	If you have received a new license file (labvantage.lic), replace your old license file with the new file given to you by LabVantage Solutions. See <a href="#">Setting the LabVantage Home</a> .
3.	When <a href="#">configuring your Application Server</a> , point your AdminDB and LabVantage data sources to your existing AdminDB and LabVantage schemas. The following rules apply to the data sources: <ol style="list-style-type: none"><li>1. The JNDI name of your AdminDB data source can be anything you wish, as long as it is prefixed by java:jboss/datasources/as directed in the procedure. For example, the suggested java:jboss/datasources/admindb is a suitable JNDI name for your new AdminDB data source.</li><li>2. The JNDI name of your LabVantage data source must be the same as the JNDI name of your pre-upgrade LabVantage data source (and must be prefixed by java:jboss/datasources/as directed in the procedure). For example, if your pre-upgrade JNDI name was named labvantage, your new JNDI name for the new data source must be java:jboss/datasources/labvantage.</li></ol>
4.	If you are using the HTTP/2 protocol, you must disable it by setting the Undertow attribute "Enable http2" to "false". See <a href="#">Configure the Application Server</a>

### 21.1.3 Use of the dbo Schema for Microsoft SQL Server

It is generally good practice to store database objects in the dbo schema. This was not always possible for some legacy LabVantage installations that used Microsoft SQL Server as a database. Instead, LabVantage required linking a login, database user, default database, database schema, and database user’s default schema. As new versions of LV were released, existing installations were recommended but not required to move from any existing “labvantage” schema to the dbo schema. A utility exists in the distribution for this purpose. This script can be found in...

LABVANTAGE\_HOME\console\install\database\mss\_lvtransfer2dbo.sql

Starting in LabVantage 8.5, database objects in LabVantage must now reside in the dbo schema in order to avoid failure during upgrade. This failure could present itself in the LabVantage Console during the upgrade process with a message similar to this...

```
Error running Ant file
'C:\labvantagehome\console\install\database\installer.xml'.
Exception: Failed to execute ANT file
'C:\labvantagehome\console\install\database\installer.xml'.
Reason: SapphireException: SQLException: Invalid object name
'query'.
Show full stack trace
Failed to execute ANT file
'C:\labvantagehome\console\install\database\installer.xml'.
Reason: SapphireException: SQLException: Invalid object name
'query'.
SapphireException: SQLException: Invalid object name 'query'.
```

If your database platform is Microsoft and you have any LabVantage objects in a database or schema other than the dbo schema, execute this process

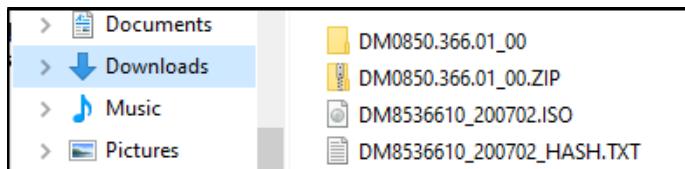
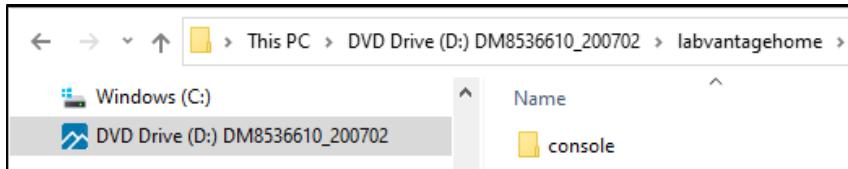
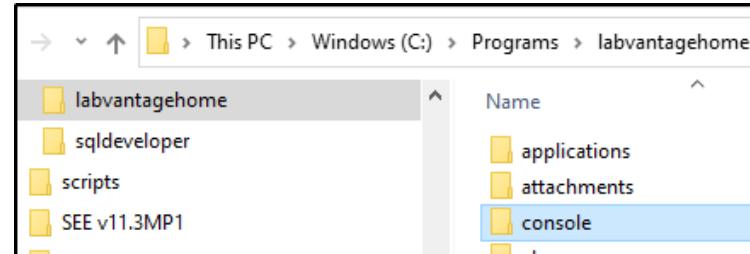
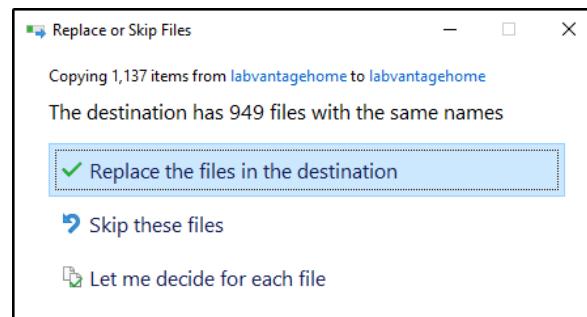
1.	Locate the script file above. Load it into SSMS in a session logged in with the “labvantage” (application owner) login. This script can be loaded either by opening the file directly or by copy/paste into a blank query window. Execute the contents. This will create a procedure called dbo.LV_Transfer2dbo.
2.	Execute the LV_Transfer2dbo procedure, specifying the schema name that contains objects which will now be transferred to the dbo schema. Here is an example:  exec dbo.LV_Transfer2dbo 'labvantage'  ...where 'labvantage' is the schema that currently owns the objects  This will move all database objects in the “labvantage” schema to the dbo schema.
Note	Use caution when adding objects using SSMS as it may add unnecessary hard-coded qualifiers that will be saved as such unless edited out. These qualifiers will not save to the dbo schema thereby presenting problems for any future upgrades.

**Installation Verification:** Initials indicate that nominal upgrade conditions have been met or addressed as described thus far in this chapter.

Role	Initials	Date
Executor		
Reviewer		

## 21.2 Upgrading the LabVantage Console from LV7 or LV8

If you are upgrading from LabVantage 6, please skip to section 21.3 [Upgrading the LabVantage Console from LV6](#). This procedure refers to the LabVantageConsole EAR files as labvantageconsoleNN.ear. This is a general procedure that applies to upgrading existing installations. If upgrading a JBoss cluster some additional steps are required as described below.

1.	Stop the application server software. If running in a cluster, stop all nodes.	
2.	Mount the ISO image that you have downloaded and unzipped from VantageCare. This is the software version to which you are upgrading.	
3.	Copy the 'console' directory from the labvantagehome folder of your installation media.	
4.	Replace/overlay your existing installation's labvantagehome\Console directory with what you have copied from the ISO image.	
5.	When prompted, replace and merge the files in the target directory.	
6.	Un-deploy the labvantageconsoleNN.ear that is currently deployed in your Application Server. In its place, deploy the new labvantageconsoleNN.ear that is provided in your updated LABVANTAGE_HOME\Console\install\ear directory. How you do this depends on the Application Server in use:  <b>JBoss:</b> Replace the existing labvantageconsoleNN.ear in JBOSS_HOME\PROFILE\deployments. <b>Other:</b> Undeploy the existing labvantageconsoleNN.ear. Deploy the new EAR.	
7.	You can also take this opportunity to undeploy the old and deploy the new labvantagedoc.war. See <a href="#">Deploying the LabVantage Product Documentation</a> .	
8.	Clear the application server cache. In JBoss this is accomplished by deleting the contents of three directories within JBOSS_HOME\PROFILE\ Delete the contents of these directories including any subdirectories: <b>data, log, tmp</b> . Do not delete any other folders or files.	

- |    |                                                                                                                                 |  |  |  |
|----|---------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| 9. | Start the application server software. For non-clustered systems, proceed to section 21.4 <a href="#">Upgrading the AdminDB</a> |  |  |  |
|----|---------------------------------------------------------------------------------------------------------------------------------|--|--|--|

Installation Verification: Indicate the system state by entering either 'Yes' or No'. Initials indicate the successful completion of steps to this point.

Role	System is not clustered	System is clustered	Initials	Date
Executor				
Reviewer				

For non-clustered installations the remainder of the steps in this procedure are not applicable.

- |     |                                                                                                                                                                                                                                                                                                               |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10. | If you are upgrading a JBoss cluster, complete sections 21.4 <a href="#">Upgrading the AdminDB</a> to section 21.6 on M1. Then return to the next step of this procedure.                                                                                                                                     |
| 11. | Stop all nodes of the cluster (M1, M2, and so forth). Clear the cache as described in step 8.                                                                                                                                                                                                                 |
| 12. | On M2 and all other nodes, delete the old (pre-upgrade) LABVANTAGE_HOME directory.                                                                                                                                                                                                                            |
| 13. | Copy the entire LABVANTAGE_HOME directory from M1 to M2 and all other nodes.                                                                                                                                                                                                                                  |
| 14. | On M2 and others, delete the old (pre-upgrade) LabVantage EAR from the JBOSS_HOME\PROFILE\deployments directory.                                                                                                                                                                                              |
| 15. | On M2 and others, copy the upgraded LabVantage EAR from the LABVANTAGE_HOME\applications\applicationname\ear directory on M1 to the JBOSS_HOME\PROFILE\deployments directory (where applicationname is the name of your Application).                                                                         |
| 16. | On M2, create a "runtime" LABVANTAGE_HOME by deleting the following directories from the "full" LABVANTAGE_HOME: <ul style="list-style-type: none"><li>• LABVANTAGE_HOME\console</li><li>• LABVANTAGE_HOME\applications\applicationname\ear (where applicationname is the name of your Application)</li></ul> |
| 17. | Restart JBoss on all nodes of the cluster. Your upgrade is complete. You may want to review chapter 23 <a href="#">Supplementary Information</a>                                                                                                                                                              |

Installation Verification: For a clustered system, the upgrade of the Console has been performed on all nodes of the cluster. If required, attach a list of all nodes affected.

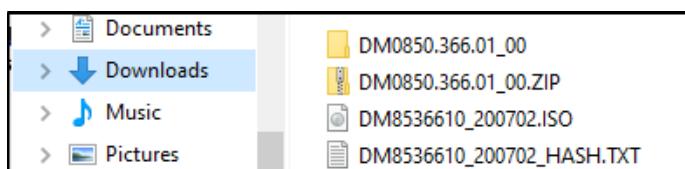
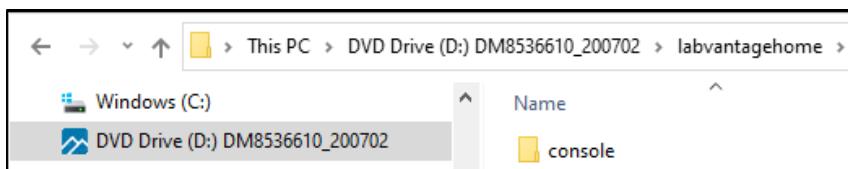
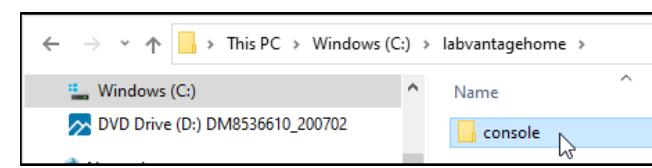
Role	Initials	Date
Executor		
Reviewer		

## 21.3 Upgrading the LabVantage Console from LV6

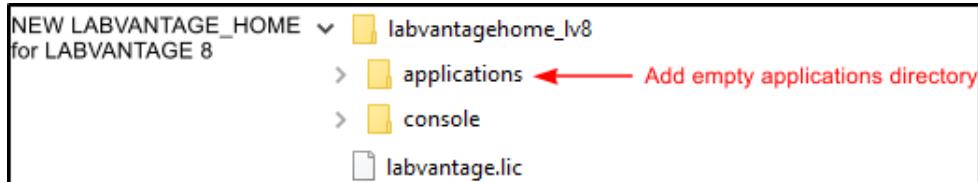
Upgrading from LabVantage 6 requires a different procedure than upgrading from LV7 or LV8. The main points include the need to manually alter the labvantageconfig.props file and the need to create a new LabVantage\_Home. The new LV8 home will be overlaid with your LV6 applications folder, then upgraded.

### 21.3.1 Upgrade Process

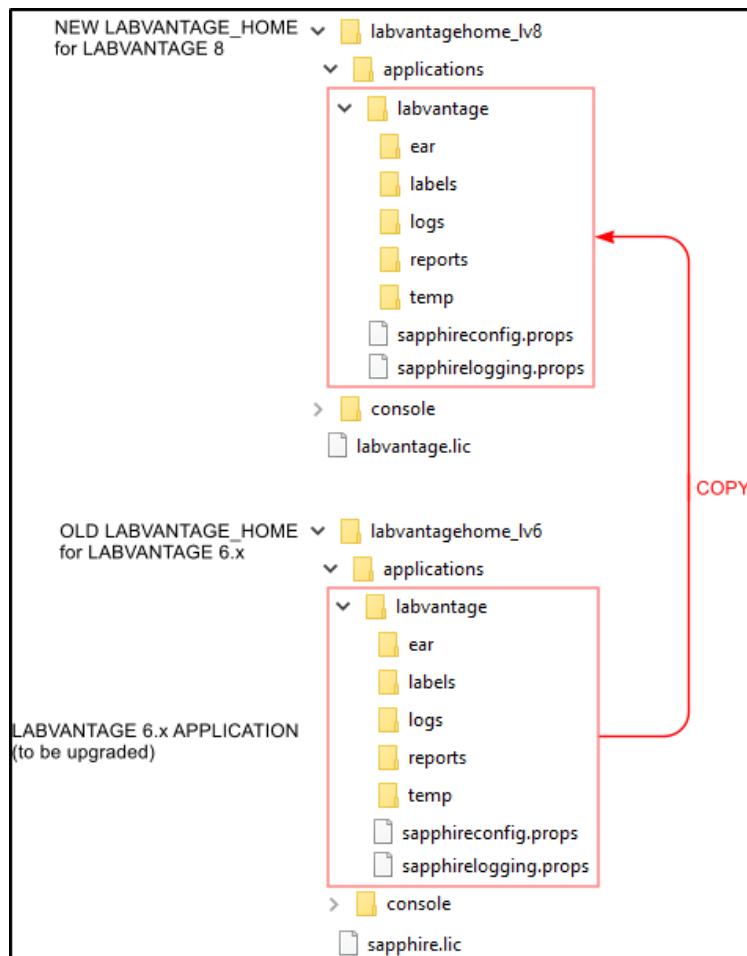
These steps apply to a system that is being upgraded from LabVantage version 6.

1.	As described in section 21.1.2, you should have completed the configuration of your JBoss 7 application server. During this process you should have configured a new <a href="#">LabVantage HOME</a> directory rather than pointing to your existing LV6 LabVantage Home.
2.	Mount the ISO image that you have downloaded and unzipped from VantageCare. This is the software version to which you are upgrading. 
3.	Copy the 'console' directory from the labvantagehome folder in the downloaded media. 
4.	Paste the console folder and its contents into your new labvantagehome. 
5.	Deploy the new labvantageconsoleNN.ear that is provided in your updated LABVANTAGE_HOME\console\install\ear directory. How you do this depends on the Application Server in use: JBoss: Copy this file to JBOSS_HOME\PROFILE\deployments. Other: Deploy this EAR according to your normal deployment process.
6.	With your new Application Server started, sign in to your LabVantage Console. Example URL: <a href="https://FQDN:PORT/labvantageconsole80">https://FQDN:PORT/labvantageconsole80</a>
7.	Upgrade your LabVantage 6.x AdminDB schema as directed in <a href="#">Upgrading the AdminDB</a>
8.	Upgrade your LabVantage 6.x LabVantage schema as directed in <a href="#">Upgrading a LabVantage Database</a> then return here and proceed to the next step.
9.	Stop the Application Server.

10. If your new LabVantage HOME does not have an 'applications' subdirectory, create one now.



11. Copy your old LabVantage applications folder (to be upgraded) from your old LABVANTAGE\_HOME\applications directory (for LabVantage 6.x) to the new LABVANTAGE\_HOME\applications directory for (LabVantage 8):



12. Using any text editor, open the labvantageconfig.props file in the new LABVANTAGE\_HOME\applications directory (for LabVantage 8). Make the following changes.

13. Find this line:

```
com.labvantage.sapphire.server.admindb=admindb
```

If necessary, change this to the name of your data source that defines the connection to the AdminDB if your new system does not use admindb to identify this datasource.

14. Delete these four lines:

```
com.labvantage.sapphire.server.queueconnectionfactory
```

	com.labvantage.sapphire.server.apq com.labvantage.sapphire.server.tdq com.labvantage.sapphire.server.wpq	
15.	Save all changes. No additional deletions are required. As a minimum, an Oracle database with admindb as a datasource name in the application server would have these lines:  <pre>#LabVantage Config Properties #Day Mon dd hh:mm:ss ZON yyyy com.labvantage.sapphire.server.admindb=admindb com.labvantage.sapphire.server.admindbms=ORA</pre>	
16.	Start the Application Server. Sign into the LabVantage Console.	
17.	Upgrade your LabVantage 6.x application as directed in <a href="#">Upgrading an Existing Production Application</a> . As noted in that procedure, you will select the "Upgrade Managed EAR" option, and you must deploy the upgraded EAR using the "deploy" link in LabVantage Console as directed.	
18.	<p>Clear your application server cache. In JBoss this is accomplished by deleting the contents of three directories within JBOSS_HOME\PROFILE\  Delete the contents of these directories including any subdirectories: <b>data, log, tmp</b>.  Do not delete any other folders or files.</p> <p>Restart your application server software. Your upgrade is complete. If you need to configure additional nodes of your cluster, please see <a href="#">Additional Nodes in a Cluster</a> below.</p>	
Installation Verification: Initials indicate successful installation of one node in a cluster. If additional nodes require an installation, attach documentation of those configurations.		
<b>Role</b>	<b>Initials</b>	<b>Date</b>
Executor		
Reviewer		

### 21.3.2 Obsolete Tables to Drop After an Upgrade

The following tables are no longer used by the LabVantage 8 application. You have the option of leaving them there for legacy purposes. Or, it is safe to drop them from your AdminDB schema.

#### LV6 Tables that can be dropped in LV8 or later versions

HILOSEQUENCES	JBM_ID_CACHE	JBM_ROLE	TIMERS
JBM_CLUSTER	JBM_MESSAGE	JBM_TX	

JBM_COUNTER	JBM_MSG_REF	JBM_TX_EX	
JBM_DUAL	JBM_POSTOFFICE	JBM_USER	

Installation Verification: Initials indicate that this section was reviewed. Indicate your decision with a ‘Yes’ or ‘No’

Role	Tables Dropped	Tables Retained	Initials	Date
Executor				
Reviewer				

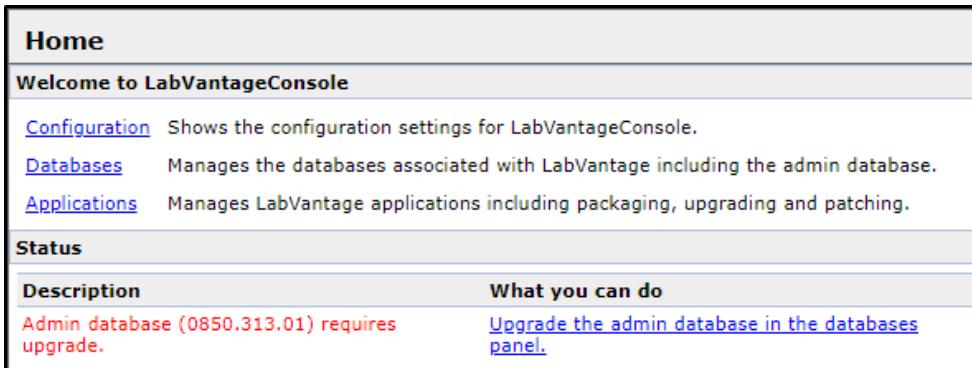
### 21.3.3 Additional Nodes in a Cluster

Since LV6 cannot be upgraded directly in-place, perform any additional server installations and setup on your additional nodes in your cluster according to the cluster setup instructions in [Configure the Application Server](#).

## 21.4 Upgrading the AdminDB

In this section, you will use the LabVantage Console to upgrade the administrative database schema from an older version to a newer version. The beginning of this section assumes you are executing this process after completing section 21.2 or 21.3. If you are performing these steps outside of this context, restart the application server software before beginning.

1. Sign into the LabVantage Console. The LabVantage application checks to see if your AdminDB build number matches the build number of the Console. If there is a mismatch, the home page presents a message in red with a hyperlink in the “What you can do” column.



The screenshot shows the LabVantage Console Home page. At the top, it says "Welcome to LabVantageConsole". Below that is a "Status" section. In the "Description" column, it says "Admin database (0850.313.01) requires upgrade." In the "What you can do" column, there is a blue hyperlink: "Upgrade the admin database in the databases panel."

2. Click **Upgrade the admin database in the databases panel**.

3. On the Databases page, click the **Upgrade Admin Database** hyperlink.

Databases		
<b>License mode</b>		
Licensing Mode:	Server license or database specific license	
<b>Admin database</b>		
Username:	ADMINDB	Username or schema name for the admin database.
JNDI name:	admindb	JNDI name referencing the admin database.
DBMS type:	ORA	Admin database database management system (Oracle or Microsoft SQLServer).
DBMS:	Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production Version 19.3.0.0.0	Full database name (from the database API).
Version:	0850.313.01	Admin database version. LabVantage database versions are compared against this version to determine status.
<a href="#" style="color: red; border: 2px solid red; padding: 2px;">Upgrade Admin Database</a>		

4. Wait until you see the message:

```
Ant file 'LABVANTAGEHOME/console/install
/database/installer.xml', target 'installer'
complete
```

...where LABVANTAGEHOME is the path to your LabVantage Home directory.

Click [Return to database list](#).

```
[executesql] Executing C:\lv85quickstart\labvantage\sql\upgrade\upgradeadmndb.sql
[executesql] Execute SQL complete
Finished target: upgradeadmndb
[installer] Installer complete
Finished target: admindbinstaller
```

[Ant file 'C:\lv85quickstart\labvantage\build.xml'](#)

[Return to database list](#)

5. Any LabVantage databases defined in the AdminDB are now shown in the "LabVantage Database List". Any requiring upgrade will have a status of "Requires Upgrade". To upgrade any of these LabVantage databases, proceed to [Upgrading a LabVantage Database](#).

Databases							
<b>License mode</b>							
Licensing Mode:	Server license or database specific license						
<b>Admin database</b>							
Username:	ADMINDB	Username or schema name for the admin database.					
JNDI name:	admindb	JNDI name referencing the admin database.					
DBMS type:	ORA	Admin database database management system (Oracle or Microsoft SQLServer).					
DBMS:	Oracle Database 19c Enterprise Edition Release 19.0.0.0 - Production Version 19.3.0.0.0	Full database name (from the database API).					
Version:	0850.315.01	Admin database version. LabVantage database versions are compared against this version to determine status.					
<b>LabVantage Database List</b>							
Database	JNDI Name	Build	Patch	DBMS	Status	License	Actions
labvantage	labvantage	0850.313.01	None	ORA	Requires Upgrade	Server <a href="#">Set License</a>	<a href="#">upgrade</a> <a href="#">edit</a> <a href="#">delete</a> <a href="#">disable</a>

Installation Verification: Initials indicate the Admin database upgrade completed.

Role	Initials	Date
Executor		
Reviewer		

## 21.5 Upgrading a LabVantage Database

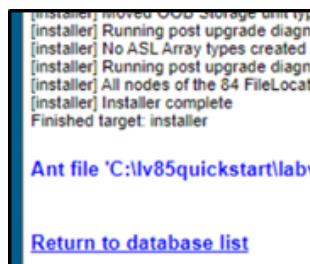
In this section, you will use the LabVantage Console to upgrade a labvantage database schema from an older version to a newer version. The beginning of this section assumes you are executing this process after (or as a part of) completing section 21.4. If you are performing these steps outside of this context, restart the application server software before beginning.

1. Sign into the LabVantage Console. Navigate to Configuration → Databases. The LabVantage application checks to see if your labvantage database schema build number matches the build number of the AdmindDB. If there is a mismatch, the database list presents a message in red for the Status column. You will find hyperlinks in the “Actions” column.

LabVantage Database List							
Database	JNDI Name	Build	Patch	DBMS	Status	License	Actions
labvantage	labvantage	0850.313.01	None	ORA	Requires Upgrade	Server <a href="#">Set License</a>	<a href="#">upgrade</a> <a href="#">edit</a> <a href="#">delete</a> <a href="#">disable</a>

2. Click **upgrade** for the database you want to upgrade.
3. Choose what the upgrade script will do with the existing data:
- Update the LabVantage configuration (recommended)**  
This option inserts new rows but does not change existing data in tables. This is what you would most likely do during an upgrade, as it does not affect your existing data.
  - Overwrite the LabVantage configuration**  
This option inserts new rows but overwrites all existing data in tables.

4. Click OK.
- 
- The dialog box shows the following options:  
Database ID: lab0840jbs640  
JNDI Name: labvantage  
Update Options:  
 Update the LabVantage configuration (recommended)  
 Overwrite the LabVantage configuration  
Buttons: OK, Cancel

5. Wait until you see the message:
- ```
Ant file 'LABVANTAGEHOME/console/install /database/installer.xml', target 'installer' complete
```
- ...where LABVANTAGEHOME is the path to your LabVantage Home directory.
- Click **Return to database list**.
- 
- The terminal window displays the following log output:
[installer] moved OOB Storage Unit type
[installer] Running post upgrade diagno
[installer] No ASL Array types created
[installer] Running post upgrade diagno
[installer] All nodes of the 84 FileLocat
[installer] Installer complete
Finished target: installer

Ant file 'C:\lv85quickstart\labv

[Return to database list](#)

6. The "LabVantage Database List" section now shows that the upgraded database has a Status of "Active". Logoff of the LabVantage Console.
7. Restart the Application Server software.

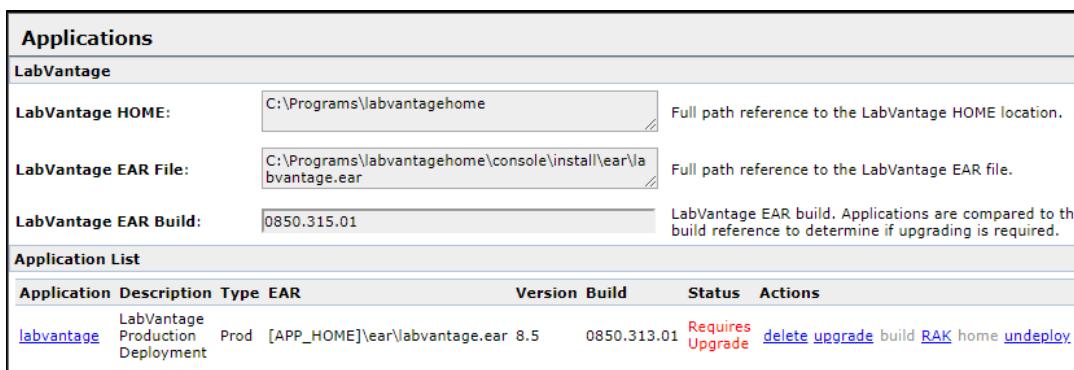
Installation Verification: Initials indicate the LabVantage database upgrade completed.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

21.6 Upgrading an Existing Production Application

In this section, you will use the LabVantage Console to upgrade a deployed production labvantage application EAR from an older version to a newer version. The beginning of this section assumes you are executing this process right after completing section 21.5. Note that the end of that section includes a restart of the application server which is required before beginning this procedure. The "upgrade" Action for Production Applications is available only when the "Status" of the Application is "OK" or "Requires Upgrade".

1. Sign into the LabVantage Console and navigate to Configuration → Applications



The screenshot shows the 'Applications' configuration page. It includes fields for 'LabVantage HOME' (C:\Programs\labvantagehome), 'LabVantage EAR File' (C:\Programs\labvantagehome\console\install\ear\labvantage.ear), and 'LabVantage EAR Build' (0850.315.01). Below this is an 'Application List' table:

| Application | Description | Type | EAR | Version | Build | Status | Actions |
|-------------|-----------------------|------|-------------------------------|---------|-------------|------------------|--|
| labvantage | Production Deployment | Prod | [APP_HOME]\ear\labvantage.ear | 8.5 | 0850.313.01 | Requires Upgrade | delete upgrade build RAK home undeploy |

2. For the application to be upgraded, click the **upgrade** hyperlink.

3. On the *Upgrade Production Application* page, choose your preferred option.

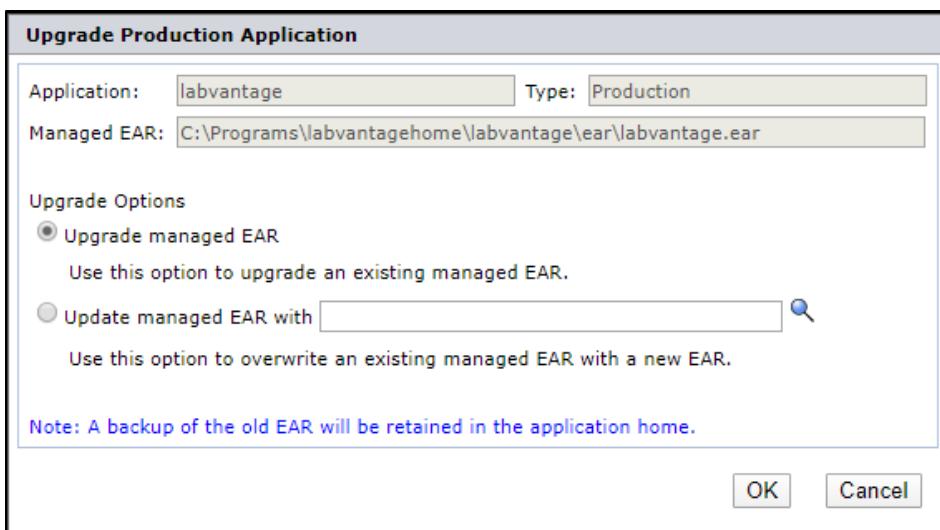
- **Upgrade Managed EAR**

This upgrades your current managed EAR with the latest code from the new LabVantage EAR in LABVANTAGE_HOME\console\install\ear. This is the recommended option to choose when upgrading your Application, since it overwrites all core code to provide the latest changes but preserves your custom code. The new EAR is generated in the Application home EAR directory. A backup copy is made of the pre-upgrade EAR.

- **Update Managed EAR with...**

This overwrites your current managed EAR with the new EAR you specify in the entry field. This option does not upgrade the Application, it replaces it. The EAR will be redeployed if it was previously deployed. A backup copy is made of the pre-upgrade EAR

4. Click OK.



5. Wait until you see the message "Upgrade Complete".

Click **Return to application list**.

6. The "Application List" section now shows details about the upgraded Application. If you are running in JBoss and are upgrading from LabVantage 6 to LabVantage 8, the EAR will not automatically deploy in JBoss. You will see a "deploy" link. Click the "deploy" link, then allow at least one minute for the EAR to deploy in JBoss.

7. Logoff of LabVantage Console, then restart the Application Server software.

Installation Verification: Initials indicate the Production application upgrade completed.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

21.7 Upgrading an Existing Development Application (JBoss Only)

This procedure is only applicable if you are running in JBoss and upgrading an existing LabVantage *Development Application*. For any other circumstance, this procedure cannot be executed.

A Development Application upgrade updates the exploded deployed EAR with newer code from the LabVantage EAR in the LABVANTAGE_HOME\console\install\ear directory. Upgrade options let you define the file sets of the exploded EAR you want to be updated with the latest files from the latest LabVantage EAR. If running within a concurrent versioning system (CVS), the Application Upgrade dialog shown below automatically un-checks file sets that have a parent CVS directory, so overwrite only files that you are not maintaining in a CVS sandbox.

The "upgrade" Action for Development Applications is available only when the "Status" of the Application is "OK" or "Requires Upgrade". Perform these procedures in the "Applications" page of LabVantage Console.

1. Sign into the LabVantage Console and navigate to Configuration → Applications



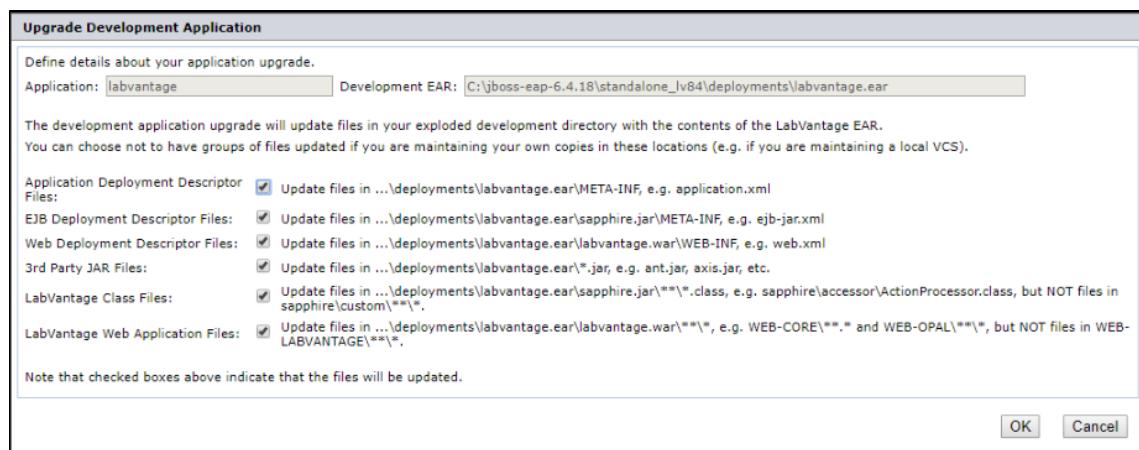
| Application | Description | Type | EAR | Version | Build | Status | Actions |
|-------------|-------------|------|-------------------------------|---------|-------------|------------------|--|
| labvantage | Production | Prod | [APP_HOME]\ear\labvantage.ear | 8.5 | 0850.313.01 | Requires Upgrade | delete upgrade build RAK home undeploy |
| | | | Deployment | | | | |

2. For the application to be upgraded, click the **upgrade** hyperlink.

3. Choose the files to be updated. In the examples below, files are referenced from JBOSS_HOME\[profile]\deployments\earname.ear, where

- [profile] is the name of the JBoss server profile.
- earname is the identifier of the EAR file.

As an example, the table below uses APPNAME to represent the Application name:



4. On the Upgrade Production Application page, choose your preferred option.

- **Application Deployment Descriptor Files**
Deployment descriptor files for the EAR in APPNAME.ear\META-INF
- **EJB Deployment Descriptor Files**
Deployment descriptor files for the EJBs in APPNAME.ear\sapphire.jar\META-INF
- **Web Deployment Descriptor Files**
Deployment descriptor files for the WAR in APPNAME.ear\APPNAME.war\META-INF
- **3rd Party JAR Files**
JAR files provided by third-party sources in APPNAME.ear\lib*.jar
- **LabVantage Class Files**
Class files for the APIs in APPNAME.ear\sapphire.jar\[path]*.class
- **LabVantage Web Application Files**
Web Application files in APPNAME.ear\APPNAME.war\[path]*.*

- | | |
|----|---|
| 5. | Click OK. |
| 6. | A successful upgrade is indicated by a "complete" notification. Click " Return to application list ". |
| 7. | Details about the upgraded application are shown. Logoff of LabVantage Console, then restart the Application Server software. |

21.8 Workaround for Oracle Package State Errors

When running LabVantage database upgrade scripts, the LabVantage Console is designed to upgrade a LabVantage database before an upgrade is applied to the application. The LabVantage application must not be running. The problems are caused by the fact that LabVantage Console uses multiple database sessions while running the LabVantage database upgrade scripts. This can cause the upgrade to fail and throw package state errors if a PLSQL package created in one session invalidates information that has been cached in a previous session. If you have deviated from the "nominal upgrade conditions" previously described, you can try one of these workarounds for this problem:

21.8.1 If running in JBoss

For others see section 9.5.2. You can temporarily force the LabVantage Console to route all activity through a single database session by restricting the number of connection pools created as follows:

- | | |
|----|--|
| 1. | Edit the data source that connects to the LabVantage database being upgraded. |
| 2. | Record your current values for "Min Pool Size" and "Max Pool Size".
Change both the "Min Pool Size" and "Max Pool Size" to 2. Save. |
| 3. | Restart JBoss. When JBoss attempts to deploy the LabVantage application, JBoss will fail deployment and throw multiple errors in the server log (such as "Unable to get managed connection from data source", "Failed to get connection from DataSource", and so on). This is because JBoss cannot create the connections required to run the application. This should not affect the upgrade or the JDBC connection used by the database upgrade. |
| 4. | Proceed with the database upgrade as directed (run the upgrade scripts, then restart JBoss). |
| 5. | Change the "Min Pool Size" and "Max Pool Size" back to their original values as recorded in step 2. Save. |
| 6. | Restart JBoss |

At this point, your upgrade of the LabVantage application is complete. Additional topics for consideration are:

[Chapter 22 Deploying the LabVantage Product Documentation](#)

[Chapter 23 Patches and Components](#)

[Chapter 24 Supplementary Information](#)

[Chapter 25 Using the LabVantage Console](#)

[Chapter 26 Optional Third-Party Installations](#)

22 DEPLOYING THE LABVANTAGE PRODUCT DOCUMENTATION

LabVantage provides a software operation help system that can be accessed and searched using a browser. This can be deployed through your application server as a separate WAR file. This help application receives periodic updates that are posted to [VantageCare](#).

Download the current *LabVantage Product Documentation* for your version of LabVantage.

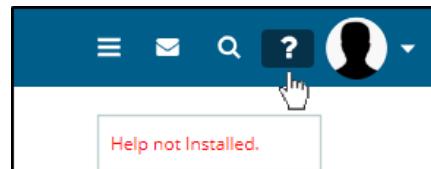
This file is posted as a LabVantageDoc_WAR_date-version ZIP file. Alternatively, you can download the HTML version for use locally without an application server or for inclusion in some other deployment.

Example of downloading the LV 8.5 *Product Documentation* from VantageCare through Software Downloads.

| + | Download link | Description |
|---|--|-------------|
| + | Download : Software Release Schedule (1) | |
| + | Download : Support Matrix (1) | |
| + | Download : LABVANTAGE 8.5.x Documentation (4) | |
| ○ |  LabVantage 8.5.x Installation Documentation - Revision 200626-85 | |
| ● |  LabVantage 8.5.x Product Documentation (WAR File) - Revision 200626-85 | |
| ○ |  LabVantage 8.5.x Product Documentation (HTM File) - Revision 200626-85 | |
| ○ |  LabVantage 8.5.x Release Notes - Revision 200629-85 | |

22.1 Deploying LabVantageDoc as a WAR

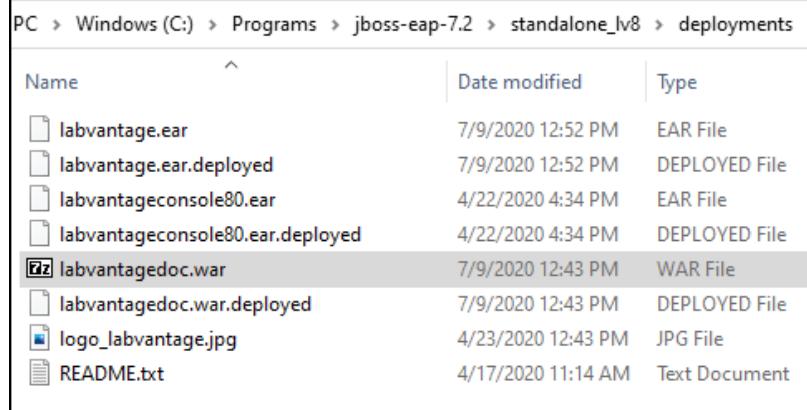
If the Product Documentation WAR file is not deployed in the Application Server, a "Help not installed" message is displayed in the "Help" menu. This is controlled by the "helpgizmo" in the LabVantage application which is pre-configured to display this message. Follow this procedure to deploy the help system.



1. Unzip the file you obtained from VantageCare.
This should result in a single folder that contains a single WAR file.

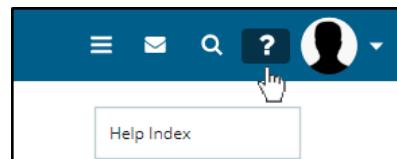


2. Deploy the labvantagedoc.war. If using JBoss, simply copy this file to your profile deployments directory.
Repeat this step for all nodes in your cluster unless your system is configured to use a common Help URL. See [Configuration of the Help Gizmo](#).



3. After deploying the WAR file, you can access it at this URL:
`http://hostname:port/labvantagedoc`

| | |
|----|---|
| | where
hostname is the FQDN name of the application server.
port is the port number for the Application Server's HTTP listener |
| 4. | The Help gizmo in LabVantage LIMS assumes the same root for the URL to the product documentation as is used for the LIMS application. If you have deployed the ProductDoc WAR on the same host, you can access it now through LIMS. |



22.2 Configuration of the Help Gizmo

Additional configuration is not usually required. In the LabVantage application, the "Help URL Root" property of the Help Gizmo is provided to let you specify the full URL of the root directory for the deployed labvantagedoc.war. If you leave this property blank, it defaults to using the same root URL as the labvantage application. For example: <https://FQDN.com> becomes <https://FQDN.com/labvantagedoc> when the Product Documentation is accessed from within LIMS. It uses the default Application Server port. If left blank, this property gets the port number for the Application Server's HTTP listener that is set in Application Management → Startup Settings. Note that this is specified as a requirement at the end of each procedure for Adding Applications in the Application Configuration section. See the LabVantage Product Documentation for more information regarding the Help Gizmo. If you deployed the labvantagedoc.war on a different machine and/or you are not running on the Application Server's default HTTP port, you will need to configure the Help Gizmo through System Administration → Web Page Designer → Gizmos in LIMS. This help application is not secured. It does not require a username or password. It does not interact with any datasource. Therefore, it does not require HTTPS.

22.3 LabVantage Logfile Configuration Changes

These changes increase the size and number of logs kept for LabVantage. These changes are recommended to maintain a reasonable history of logs. The default installation of LabVantage may apply these settings automatically.

| | |
|----|---|
| 1. | Navigate the file system to LABVANTAGE_HOME |
| 2. | Navigate to applications then your application named folder. |
| 3. | Edit labvantagelogging.props. |
| | Look for RollingFileAppender settings.
<pre>log4j.appender.errors=org.apache.log4j.RollingFileAppender log4j.appender.errors.MaxFileSize=10MB log4j.appender.errors.MaxBackupIndex=10 log4j.appender.errors.Append=true log4j.appender.errors.File=\${labvantage_home}\applications \\${applicationid}\logs\labvantage_errors.log log4j.appender.errors.Threshold=ERROR log4j.appender.errors.layout.ConversionPattern=%-23d %-5p [%X{threadid} [%X{databaseid}]] %-30X{logcontext} : %m%n log4j.appender.errors.layout=org.apache.log4j.PatternLayout</pre> |

4. Change `MaxFileSize` to 200.
Change `MaxBackupIndex` to 100.
Save

Initials indicate these settings have been saved to the LabVantage log file configurations.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

23 PATCHES AND COMPONENTS

If you receive an installer file from LabVantage Solutions, it will be either a Patch or a Component. One-off patches can be downloaded from VantageCare. Components may require an additional purchase. Patches and Components are distributed in zip format and can contain multiple files or a directory structure. Maintenance Releases (MRs) are not considered patches. Rather, MRs are upgrades that can contain multiple patches. See chapter 21 for the upgrade procedure. An MR changes the third digit in the version number. For example, 8.5.1 is an MR to 8.5.0. All MRs are cumulative. They do not require intermediate patches or upgrades. This chapter addresses how to use the LabVantage Console to apply one-off patches or components.

23.1 Patches

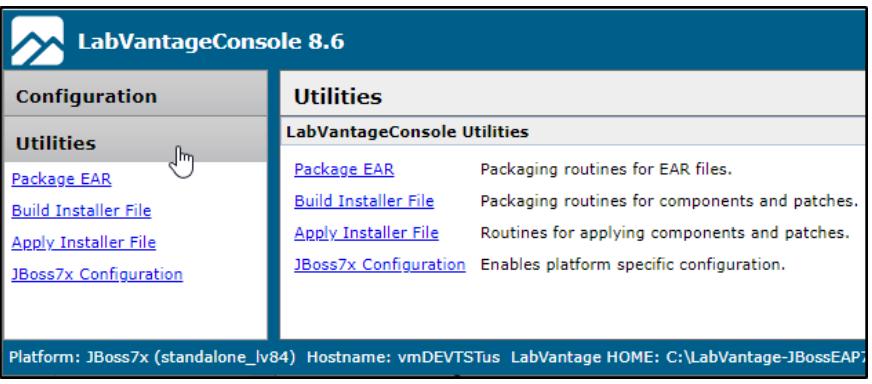
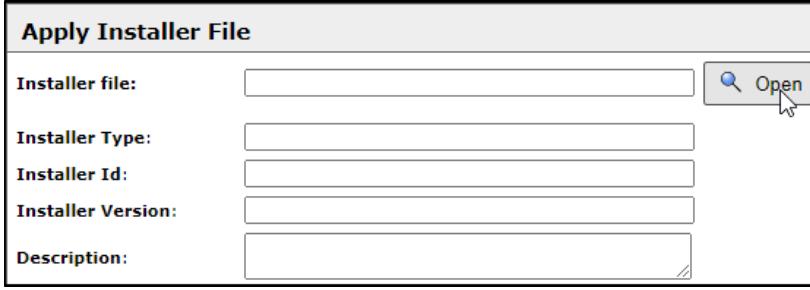
Patches effect repairs to an existing LabVantage Application, LabVantage Database, or LABVANTAGE_HOME. With regard to LabVantage Applications, patches can be applied to Managed EARs (Production or Development) but cannot be applied to Unmanaged EARs.

23.2 Components

Components add functionality to an existing LabVantage Application, LabVantage Database, or LABVANTAGE_HOME. Components contain files required to implement the additional functionality. This can include JAR files, Web Application files, servlet definitions, SQL files, and CTT files.

23.3 Applying a Patch or Component

Follow this procedure if you have received or downloaded an installer file from LabVantage. Each file is distributed with its own unique set of instructions. Begin by downloading your zip file onto your application server but do not unzip it unless otherwise instructed to do so.

| | | |
|----|---|--|
| 1. | Sign into the LabVantage Console.
Navigate to Utilities
→ Apply Installer File |  |
| 2. | Use the Open button to navigate to the folder and file on your computer where the installer file is located. |  |
| 3. | These fields are populated: | |

| | |
|-------------------|--|
| Installer File | Name of the Installer file (with .zip extension). |
| Installer Type | "Patch" indicates that the Installer File will be applying a Patch to the Target.
"Component" indicates that the Installer File will be adding a Component to the Target. |
| Installer Id | Unique identifier for the Patch or Component (assigned when the Patch or Component was built). |
| Installer Version | Version of the Patch or Component (assigned when the Patch or Component was built). |
| Description | Description of the Installer File. |

4. Review the "[Installer Files](#)" section if you require information regarding how and where the Patch or Component will be applied.

| Installer Files | | | | | | | |
|---|-------------|----------|-------------------------------|-----------------|-------------|--------|---|
| Target File Path | Description | Target | Target DBMS | Target Platform | Target JAR | Action | |
| Select Install Application | | | | | | | |
| <input checked="" type="radio"/> labvantage | labvantage | Dev | [JBoss_DEPLOY]\labvantage.ear | 8.6 | 0860.012.01 | OK |  |
| Select Install Database | | | | | | | |
| <input checked="" type="radio"/> lvMSSQL | lvMSSQL | lvMSSQL | 0860.012.01 | None | MSS | Active | |
| <input type="radio"/> lvOracle | lvOracle | lvOracle | 0860.012.01 | None | ORA | Active | |

Rows that will not be installed due to database or platform requirements that have not been met are shown with a grey background.

5. Click **Apply Installer**.

Notes: Details concerning each Patch are put into a cumulative patch.xml. The patch.xml is maintained in the META-INF directory of the EAR file. A copy of patch.xml is also maintained in LABVANTAGE_HOME/console. The LabVantage Console does not automatically redeploy patched EARs in JBoss.

23.4 Installer File Options

When installing a patch or component as shown in step 4 of section 23.3, your options will vary based on the type of installer file you have and what this patch or component will do. The row(s) beneath "Installer Files" section shows registered Applications and/or Databases. These are identified by the "Select Install Application" or "Select Install Database" sections. If there are no Application-type patches (such as Java classes or Web files), the Applications are not shown. If there are no database-type patches (such as SQL or CTT), the databases are not shown. You can select only one Application and/or Database from a list. Only Applications

and Databases that can accept the Installer File are preceded by a selection radio button. Select the Application or Database to which the Installer File will be applied. These options could include:

| | | |
|------------------|---|---|
| Target File Path | Name of the file affected by the Installer file. | |
| Description | Description of the Patch or Component. | |
| Target | Application | LabVantage Application. |
| | EAR | EAR file. |
| | JAR | JAR file identified in the "Target JAR" field below. |
| | WAR | WAR file. |
| | WEB XML | WAR deployment descriptor (WEB_INF\web.xml) into which XML snippets will be inserted. Servlet definitions (<servlet> and <servlet-mapping>) and filter definitions (<filter> and <filter-mapping>) are currently supported. |
| | LV_HOME | LABVANTAGE_HOME\console directory. |
| | APP_HOME | LABVANTAGE_HOME\applications\APPLICATION_HOME directory. |
| | Database | LabVantage database. This can be a CTT file (generated by LabVantage Configuration Transfer Tools) or a SQL file. |
| None | | "None" indicates that no action is taken. The Installer File remains untouched. |
| | | |
| Target DBMS | Database targeted by the Installer File | |
| Target Platform | Application Server targeted by the Installer File | |
| Target JAR | JAR file that is patched when the target is JAR | |
| Action | Add | Adds the provided item to the Target. For example, if the "Target" is "EAR", this could add a new JAR into the Target EAR and update the classpath in sapphire.jar/META-INF/MANIFEST.MF and the WAR's META-INF/MANIFEST.MF. |
| | Replace | Replaces the file (or directory) in the "Target" component. |
| | Backup & Replace | Replaces the file (or directory) in the "Target" component, but retains a copy called [filename]_[installerid] in the "Target". |
| | Delete | Deletes the file (or directory) in the "Target" component. |
| | Execute CTT/SQL | If "Target" is "Database", these apply the CTT or SQL file to the target database. |

24 SUPPLEMENTARY INFORMATION

Throughout this installation guide, various chapters address the procedures for configuring LabVantage. To assist with troubleshooting or to help you make the best choices for your installation, the topics in this chapter are provided for your reference.

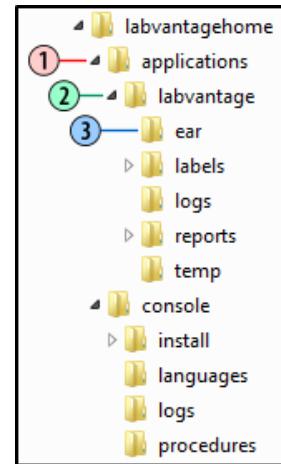
24.1 The LabVantage EAR

An EAR is an Enterprise Application aRchive. This file format is used by LabVantage Solutions for packaging the Java modules designed by LabVantage. This section describes how the EAR is deployed.

24.1.1 LABVANTAGE_HOME EAR Management Structure

An "Application" defines an EAR-based deployment in the Application Server's JVM. An EAR maintained by LabVantage Console is referred to as a "Managed EAR". When you deploy a "Managed" EAR, LabVantage Console adds an APPLICATION_HOME directory to LABVANTAGE_HOME\applications (item 1 at left). For example, if the Application name is "labvantage", the LabVantage Console:

1. Creates the LABVANTAGE_HOME\applications\labvantage directory, which becomes the APPLICATION_HOME (item 2 at right).
2. Copies supporting directories (such as "reports" and "labels") from LABVANTAGE_HOME\console\install to LABVANTAGE_HOME\applications\labvantage.
3. Creates the labvantageconfig.props and labvantagelogging.props files in APPLICATION_HOME. These files are configured through LabVantage Console and the LabVantage Application, respectively.
4. Creates a new EAR in APPLICATION_HOME\ear (item 3 at right) and makes a copy of the pre-deployed EAR. Examples
 - APPLICATION_HOME\ear\labvantage.ear is the new deployed EAR.
 - APPLICATION_HOME\ear\labvantage.ear-orig is the copy of the pre-deployed EAR.
5. Registers the Application by adding it to the "Application" table in the Admin Database (AdminDB). Registration allows LabVantage Console to keep track of Applications in each APPLICATION_HOME directory.



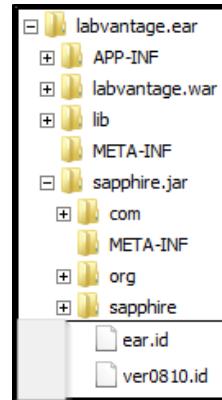
When installing Applications, you can also deploy an "Unmanaged EAR", which does not create an APPLICATION_HOME\ear directory (item 3). You will not be able to manage the EAR using LabVantage Console (all management functionality is disabled). This option is useful if you package, upgrade, and patch your own EARs using your own processes (rather than those of LabVantage Console). The location of APPLICATION_HOME can be retrieved using the LabVantage Java Public API method `sapphire.util.HttpUtil.getApplicationHome()`.

Important notes: Do not modify the contents of the "install" and "procedures" directories. Adding or removing files in these directories will result in failure during installations and upgrades. Only one LabVantage EAR can be deployed in an Application Server instance, and the EAR can contain only one LabVantage WAR.

24.1.2 EAR Identifier

When an Application is added and the EAR is deployed, an ear.id file is added to the root of sapphire.jar (example to the right). A new ear.id file is generated each time LabVantage Console is used to modify a deployed EAR. This includes upgrading an Application, applying an Installer File, or using the "Package EAR" development tools. The ear.id file contains the System.currentTimeMillis() as the identifier of the EAR. The timestamp in the ear.id file is registered in the EARID column of the ServerInstance table in the LabVantage Database.

LabVantage Console checks the ServerInstance table to make certain that only one unique EarID is registered for each combination of ApplicationId and DatabaseListId. Below is an example of the output from a query selecting a row from this table.



| SERVERINSTANCE | | | | |
|----------------|---------------|-----------|----------------------|---------------------|
| HOSTID | APPLICATIONID | PINGDT | AUTOMATIONSERVERFLAG | EARID |
| LT6433US | labvantage | 27-SEP-18 | Y | 18-Sep-2018 07:15PM |

If this check fails, the offending server instance is disabled and all subsequent attempts to log onto LabVantage Console will result in an error message to this effect. Here is an example:

Your server configuration is invalid! Last error message was: Incorrect EAR identifier (222) found on host 'hostname' for application 'labvantage' and database '<dbname>. Server connections will be disabled - check that the same EAR is used throughout the system configuration. More information may be in the server logs. You need to correct the errors, then restart LabVantage.

24.1.3 Application Installation Types

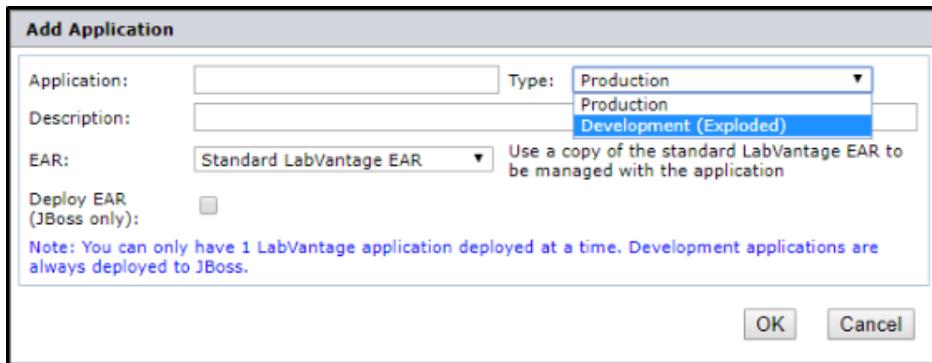
When an application is added through the LabVantage console for deployment in JBoss, you can choose between a Production or a Development installation. For WebSphere and WebLogic, only a Production type of installation is allowed. If LabVantage will run in a cluster, you must choose a Production installation. Development installs will not run in a JBoss cluster.

- Production:** When you deploy a "Production" Application, LabVantage Console deploys a single EAR file in the Application Server. Deploying a "Production" Application is recommended when the Application will run in an environment that does not require or allow 'hot' modifications. To change a Production installation may require that you repackage the EAR.
- Development:** Choose this type when you are actively changing the Application code in a development environment. Development Applications can be deployed only in JBoss. When you deploy a Development Application, the LabVantage Console deploys an exploded EAR in the current JBoss server profile. The LabVantage Console can upgrade and patch the exploded EAR, as well as generate a new EAR file.

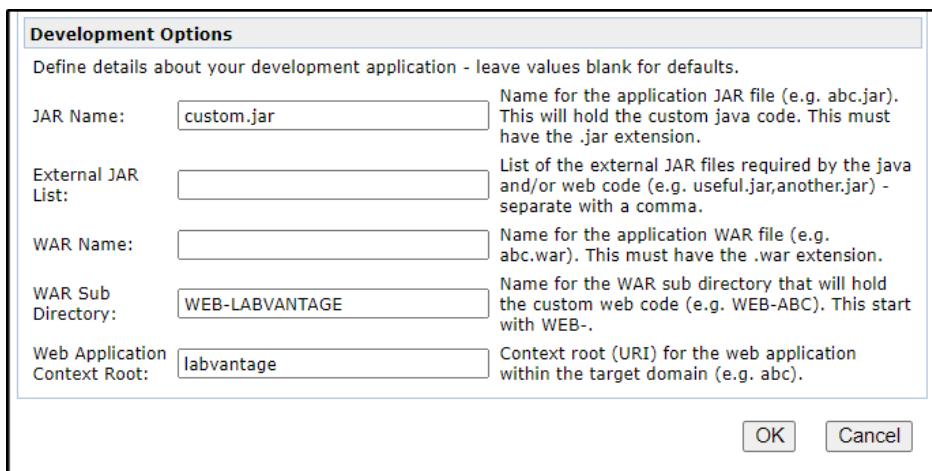
24.1.4 Development Installations

If you are running in JBoss, you can choose to install deploy the LabVantage EAR as an exploded file structure. This would allow you to alter the application without redeploying the EAR. Do not choose this installation type if you will be configuring a cluster. This section describes your options when installing a “Development” Type application. An example of adding a Development Type through the LabVantage Console is shown:

See [Adding an Application](#) for how to begin.



Once you have chosen a Development type as shown above, the *Development Options* are available. Choose your options following the below recommendations.



| | |
|------|---|
| 1. | JAR Name: Name of the JAR file (including the .jar extension) that holds your custom Java code. Such custom code should not be added to sapphire.jar, as this file will be overwritten during upgrades. Typically this is the same name as your application with a JAR extension. |
| 2. | External JAR List: Comma-delimited list of external and third-party JAR files added to the exploded deployment for your custom Java code |
| 3. | WAR Name: The name of the application WAR file including the .war extension. Set this to override the default WAR name in your EAR. |
| Note | A LabVantage EAR can contain only one WAR file. |
| 4. | WAR Sub Directory: Name for the WAR subdirectory that holds your custom Web application code (prefixed by WEB-) |

| | |
|----|---|
| 5. | WAR Application Context Root: Context root (URI) for the Web application within the target domain. Setting this means you must log onto LabVantage using the URI in the URL. Example:

http://hostname:port/URI

where <ul style="list-style-type: none">• hostname is the name of the local machine.• port is the port number for the Application Server's active listener• URI is the Web Application Context Root Example using JBoss default http listener port with "myserver" as hostname and "mywebapp" as the Web Application Context Root: http://myserver:8080/mywebapp |
| 6. | Click OK. Wait until you see the message "Application install complete". Logoff from the LabVantage Console. Restart the JBoss (or other) application server software. |

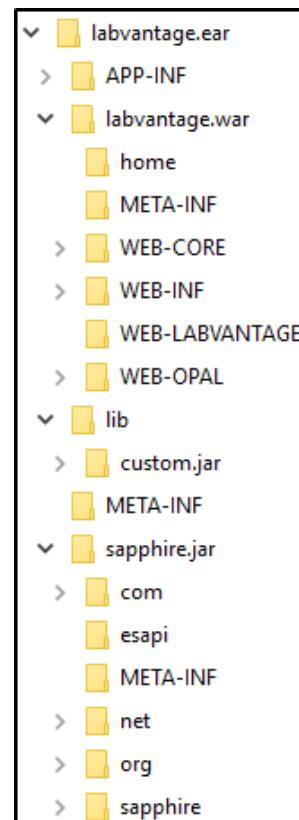
This type of application install will unzip the LabVantage EAR and create directories in the JBoss profile deployments directory.

At the right is an example exploded deployment (EAR, JAR, and WAR directories vary depending on the Development Options chosen). Note that:

1. When installing an exploded deployment, the EAR is a directory containing the Application deployment descriptor files (META-INF), JAR files, WAR files and lib directory for external/third-party JAR files.
2. The JAR you specified using the "JAR Name" Development Option has become a subdirectory in lib for your custom code. A default class package of sapphire.custom.<JarName> has been created.
3. labvantage.war has become a directory containing all the web files and renamed according to "War Name" Development Option (if you specified one). The WAR directory contains the custom code development directory (WEB- followed by the Application name)

Do not add your custom code into the JAR directory sapphire.jar. It will be lost during an upgrade. Put your custom code in the JAR you specified using the "JAR Name" Development Option. Do not add custom code to other WAR directories. It will be lost during an upgrade.

A "build" directory is created in LABVANTAGE_HOME, and an application-build.props file is created there.



The application-build.props file contains a default starting set of build properties that can be modified and used to re-package the exploded deployment into a new EAR.

24.1.5 JBoss File-Based Deployments

If JBoss allows a file-based deployment, it creates an [appname].ear.deployed file in the deployments directory (such as labvantage.ear.deployed). The presence of this file does not necessarily mean the deployment was successful. Rather, it means JBoss did not experience any service interruptions while deploying it. When doing file-based deployments, JBoss uses the existence of the *.deployed file to

determine a successful deployment. It is therefore possible that a file-based deployment may fail but still be flagged as successful by both JBoss and LabVantage Console. Examine the JBoss server log to determine if a file-based deployment is successful.

24.2 Web Browsers

LabVantage should function as intended with default browser settings, provided the browser complies with the requirements specified in Installation Requirements for LabVantage 8.5 as listed in the Release Notes.

Connecting to Empower servers may require lowering browser security when using Internet Explorer.

LabVantage Solutions requires connecting to the LabVantage application over an HTTPS connection to enhance security and utilize advanced browser features. This could require that you import or trust a certificate used by the application server.

In some cases, it may be necessary to clear the browser's cache after upgrading.

25 USING THE LABVANTAGE CONSOLE

Starting in chapter 18 of this guide, you will be using the LabVantage Console to configure your installation of LabVantage. Aside from installation, upgrade, and patching instructions offered in their respective chapters, the Console offers additional configuration options as described here.

25.1 Database Management

This section describes database management functionality available in the LabVantage Console. Functionality described below is available in Configuration → Console → Databases.

| LabVantage Database List | | | | | | | |
|---|-----------|-------------|-------|------|--------|---|---|
| Database | JNDI Name | Build | Patch | DBMS | Status | License | Actions |
| lvMSSQL | lvMSSQL | 0860.012.01 | None | MSS | Active | Database Update License | upgrade edit delete disable |
| lvOracle | lvOracle | 0860.012.01 | None | ORA | Active | Server Set License | upgrade edit delete disable |
| Add LabVantage Database | | | | | | | |

25.1.1 Managing All Databases

Four hyperlinks are available under the Actions column for each database. These are: upgrade, edit, delete, and disable. To manage licenses, please see [Adding a Database-Specific License](#). To add a database to the console, please see [Adding a New LabVantage Database](#)

| | |
|---------|---|
| upgrade | See Upgrading a LabVantage Database |
| edit | <p>This allows you to change the data source connection information. For example:</p> <div style="border: 1px solid #ccc; padding: 10px; width: fit-content; margin: auto;"><p>Edit LabVantage Database</p><p>Database ID: <input type="text" value="lvMSSQL"/> JNDI Name: <input type="text" value="lvMSSQL"/></p><p>Username: <input type="text" value="example"/> Password: <input type="password" value="*****"/></p><p style="text-align: right;"><input type="button" value="OK"/> <input type="button" value="Cancel"/></p></div> <p>The "JNDI Name" is the name of the data source that defines the connection to the database. It is not actually the JNDI name. JBoss refers to it as the "management pool name", while other Application Servers refer to it simply as the "data source name". Essentially, it is the name of the data source, but without the prefix that defines the Application Server's JNDI subcontext. For example, JBoss uses the JNDI subcontext java:jboss/datasources. If the JNDI name of the data source is java:jboss/datasources/admindb, you would enter admindb here.</p> |
| delete | Removes the database from the AdminDB tables. This does not affect the contents of the database. The schema user, data, and database tables remain untouched. This database will no longer appear in the console. You will be asked to confirm before this action is carried out. The datasource remains active in the application server. Upon restart of the application server software, the database is not accessible to end-users. Recovery of this |

| | datasource will require that you re-register it through the “Add LabVantage Database” link. | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|---|-------------|-----------|-------|---------|---|---|---------|---------|-------------------------|---------|-------------|------|-----|--------|---|---|--------------------------|----------|-------------|------|-----|---------|------------------------------------|--|
| disable | <p>Changes the status to ‘Invalid’. An example is below. Upon restart of the application server software, this database will no longer be accessible to users. The datasource remains active in the application server. Use this option to temporarily suspend access to a datasource through LabVantage.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>LabVantage Database List</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Database</th> <th>JNDI Name</th> <th>Build</th> <th>Patch</th> <th>DBMS</th> <th>Status</th> <th>License</th> <th>Actions</th> </tr> </thead> <tbody> <tr> <td>lvMSSQL</td> <td>lvMSSQL</td> <td>0860.012.01</td> <td>None</td> <td>MSS</td> <td>Active</td> <td>Database Update License</td> <td>upgrade edit delete disable</td> </tr> <tr> <td>lvOracle</td> <td>lvOracle</td> <td>0860.012.01</td> <td>None</td> <td>ORA</td> <td>Invalid</td> <td>Server Set License</td> <td>upgrade edit delete enable</td> </tr> </tbody> </table> </div> <p>The disable hyperlink toggles to ‘enable’. Use enable to once again change the status if possible. This might not be possible if the datasource details are incorrect, have changed, or the datasource is not active in the application server. Use the edit action to correct the connection details. The upgrade action is not available when the status is Invalid.</p> | Database | JNDI Name | Build | Patch | DBMS | Status | License | Actions | lvMSSQL | lvMSSQL | 0860.012.01 | None | MSS | Active | Database Update License | upgrade edit delete disable | lvOracle | lvOracle | 0860.012.01 | None | ORA | Invalid | Server Set License | upgrade edit delete enable |
| Database | JNDI Name | Build | Patch | DBMS | Status | License | Actions | | | | | | | | | | | | | | | | | | |
| lvMSSQL | lvMSSQL | 0860.012.01 | None | MSS | Active | Database Update License | upgrade edit delete disable | | | | | | | | | | | | | | | | | | |
| lvOracle | lvOracle | 0860.012.01 | None | ORA | Invalid | Server Set License | upgrade edit delete enable | | | | | | | | | | | | | | | | | | |

25.1.2 View the Details for a Selected Database

Five sections are available for each database. To view the details for a database, click the hyperlink for the name within Configuration → Console → Databases. These five sections include General, Connections, Components, Patches, and License. These fields are presented as view-only. To make modifications, please see section 25.1.1. To expand the details for each section, click the hyperlinked text for that section.

| |
|--|
| Database: lvOracle |
| General |
| Connections |
| Components |
| Patches  |
| License |

| | |
|------------------------|---|
| General | <p>Displays the name you provided for your users to see when selecting a database from the login page. All other information is not visible to end-users. The status must be ‘Active’ for users to be able to access this database through LIMS. Other information is available including (among others):</p> <p>License Status: Shows the current status. If Invalid, the license has either expired or the checksum has failed. Contact LabVantage Support.</p> |
| Connections | If users are accessing the database, those connections will be shown here. There will always be a system user connection for internal processing purposes. |
| Components and Patches | If you have applied an Installer File , the details will be shown here. |
| License | This displays the details about your license to use LabVantage. This will include the user limits, modules purchased, expiration date, and other licensing details. See Adding a Database-Specific License or labvantagehome |

25.2 Application Management

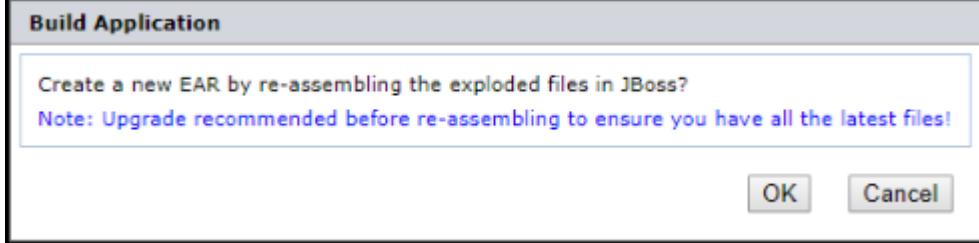
Functionality described below is available in Configuration → Console → Applications. See [Adding an Application](#) for procedures to add applications. The Applications list displays seven columns. These are described here.

| Applications | | | | | | | |
|----------------------------|---|--|-------------------------------|---------|-------------|---|--|
| LabVantage | | | | | | | |
| LabVantage HOME: | C:\Programs\labvantagehome | Full path reference to the LabVantage HOME location. | | | | | |
| LabVantage EAR File: | C:\Programs\labvantagehome\console\install\ear\labvantage.ear | Full path reference to the LabVantage EAR file. | | | | | |
| LabVantage EAR Build: | 0850.313.01 | LabVantage EAR build. Applications are compared to this build reference to determine if upgrading is required. | | | | | |
| Application List | | | | | | | |
| Application | Description | Type | EAR | Version | Build | Status Actions | |
| LabVantage | Production Deployment | Prod | [APP_HOME]\ear\labvantage.ear | 8.5 | 0850.313.01 | OK delete upgrade build RAK home undeploy  | |

| | | | |
|-------------|---|--|--|
| Application | Unique name given the Application when it was added. | | |
| Description | Text entered for the Description when the Application was added. | | |
| Type | Application Installation Type: Prod (Production) or Dev (Development). Development is for JBoss only. It deploys an exploded EAR. | | |
| EAR | Location of the EAR:
[APP_HOME] indicates the Application home directory under LABVANTAGE_HOME\applications.
[JBoss_DEPLOY] indicates the deploy directory for the JBoss server profile. | | |
| Version | LabVantage general version number of the managed EAR. | | |
| Build | LabVantage build number for the managed EAR. | | |
| Status | OK Application version matches the LabVantage EAR in the LABVANTAGE_HOME\console\install\ear directory.
Requires Upgrade Application EAR is an older version than the LabVantage EAR in the LABVANTAGE_HOME\console\install\ear directory.
Newer Version Application EAR is a newer version than the LabVantage EAR in the LABVANTAGE_HOME\console\install\ear directory.
Version Unavailable Console cannot determine the version of the EAR.
Missing Home Application home directory was not found for the Application.
Missing JBoss Deployed Application was not found for the Application.
No EAR Cannot find the Application EAR in the expected location.
Unrecognized EAR An error occurred getting the Application details. | | |

25.2.1 Managing Applications

The Actions column on the application list will provide hyperlinks for each row. Use these hyperlinks to carry out any actions as needed.

| | |
|---------|--|
| delete | <p>Opens a dialog that lets you delete the Application from the Applications table in the AdminDB tables and offers these options:</p> <p>Delete Application Home Directory. Tick to select this option if you want to also delete the directory in LABVANTAGE_HOME\applications. Otherwise, the directory and its contents are unaffected.</p> <p>For JBoss Development application installations, a second option is offered. Delete EAR Directory. Tick to select this option to remove also the EAR directory from JBoss deployments.</p> <p>Once your options are selected, click OK to confirm and the Console executes the deletion. This action requires you to log out of the console and restart the application server software.</p> |
| upgrade | <p>This is only available for managed applications. See Upgrading an Existing Production Application</p> |
| build | <p>Available only for Development Applications (JBoss only). This is not available for Unmanaged EARs. This action generates an EAR using the contents of the exploded</p> <div style="text-align: center; margin: 10px auto; width: fit-content;">  <p>JBoss deploy directory. The resulting EAR is a zipped/reassembled version of the exploded files (all files that exist in the deploy directory go into the EAR). It is important to upgrade the Application before building to ensure that the LabVantage files are up-to-date.</p> <p>The generated EAR is a mirror of the exploded EAR (including the same deployment descriptor files used on your machine, extraneous files, and so on).</p> </div> |
| RAK | <p>If you want to use the LabVantage Java Public API to call LabVantage remotely by passing in as a constructor to the sapphire.accessor classes, you need to generate a Remote Access Key (RAK) file for the Application and LabVantage database. The RAK file provides information needed to find the Application Server and establish a connection to the LabVantage database (such as information about the Application Server's naming service, the name of the database and Application, and the JNDI prefix for the Application's EJBs).</p> <p>To generate a RAK file, click "RAK", then select the database. A confirmation dialog is then issued. This creates a RAK file called [ApplicationName][DatabaseId].RAK and stores it in LABVANTAGE_HOME\rakfiles.</p> |

| | |
|--------------------|---|
| | <p>Generate Application RAK File</p> <p>Application: labvantage Database: lab0840jbs640 ▾</p> <p>OK Cancel</p> |
| | <p>If running in JBoss, you must add these lines to your RAK file (where USERNAME and PASSWORD are your JBoss administrative Username and Password):</p> <pre>java .naming .security .principal=USERNAME java .naming .security .credentials=PASSWORD</pre> |
| undeploy or deploy | <p>This is available only if running in JBoss. This is not available for Unmanaged EARs.</p> <p>For Production Applications, deploy copies managed EAR from application home EAR directory to the JBoss deployments directory. Undeploy deletes the EAR from the JBoss deployments directory. Development applications are implicitly deployed when they are created. There is no option to "undeploy".</p> |
| traffic light | Green = deployed. Red = not deployed. |

25.2.2 Viewing and Managing Application Details

Six sections are available for each application. To view the details for an application, click the hyperlink for the name within Configuration → Console → Applications. These six sections include General, EAR Configuration, Components, Patches, Startup Settings and Logon Page Configuration. Some of the fields in this section are view-only. Others permit modifications.

| |
|--|
| Application: labvantage |
| General |
| EAR Configuration |
| Components |
| Patches |
| Startup Settings |
| Logon Page Configuration |

| | |
|--------------------------|--|
| General | Displays the application name, description, and type. No modifications are allowed. |
| EAR Configuration | Shows the current/actual configuration of the EAR - highlighted discrepancies are shown from the application build properties found in [APP_EAR]\META-INF\application-build.props. Modifications are allowed to the Web Context root URI which applies within the target domain. |
| Components and Patches | If you have applied an Installer File , the details will be shown here. |
| Startup Settings | Modifications are allowed to the properties that are used to start the LabVantage application. See Startup Settings . |
| Logon Page Configuration | Several properties offer advanced configuration for the page that opens when end users are prompted for their username and password. Some of these options extend to the LIMS user interface and display options. See Logon Page Configuration |

LabVantage will store many of these details in a file called labvantageconfig.props. The property names below are the property as it appears in the labvantageconfig.props file (see the LABVANTAGE_HOME Reference). When running in WebLogic or WebSphere, LabVantage Console cannot automatically populate the labvantageconfig.props file that is created when you add the Production Application. WebLogic and WebSphere users must therefore manually enter the two "Required" Startup Settings specified in the table below. The LabVantage application will not start until you set these.

25.2.3 Startup Settings

As described at the beginning of this chapter, several application options affect the startup of LabVantage. This section describes these options. Some properties require a value. LabVantage will not start unless these properties are set to the correct values. Some properties are optional. LabVantage will start and run if these are not set, but LabVantage will issue a warning in its log. Some properties are advanced. These settings are for users who need to change their default Application Server settings.

| Startup Settings | | |
|--------------------------------|-------------------------------------|--|
| Admin database: | admindb | JNDI name of the admin database that the application will use during startup. |
| Admin DBMS: | Oracle | DBMS type of the admin database that the application will use during startup. |
| JNDI EJB Prefix: | | Defines the EJB JNDI lookup prefix. |
| JNDI Security Protocol: | | Defines the security protocol for JBoss implementations. |
| HTTP Port: | | Defines the HTTP port for system generated URLs. |
| Provider Port: | | Defines the provider (app server) port for system generated URLs. |
| SMTP Host: | | Defines the SMTP host for emails generated within the system. |
| Email from Address: | | Defines the default 'from' address for emails generated within the system. |
| Security Email Address: | | Defines the email address for security emails generated within the system. |
| Compression Filter: | <input checked="" type="checkbox"/> | Enables/disables the compression filter for this application (Note: Filter cannot be enabled if entry has been removed from web.xml) |
| Add Headers Filter: | <input checked="" type="checkbox"/> | Enables/disables the headers filter for this application (Note: Filter cannot be enabled if entry has been removed from web.xml) |

Required – Must have accurate values to start LabVantage

| | |
|----------------|---|
| Admin Database | This is the name of the data source that defines the connection to the AdminDB. This is not the JNDI name. JBoss refers to it as the "management pool name", while other Application Servers refer to it simply as the "data source name". Essentially, it is the name of the data source, but without the prefix that defines the Application Server's JNDI subcontext. For example, JBoss uses the JNDI subcontext java:jboss/datasources. If the JNDI name of the data source is java:jboss/datasources/admindb, the value of com.labvantage.sapphire.server.admindb in labvantageconfig.props would be admindb. |
| Admin DBMS | The property name: in labvantageconfig.props is com.labvantage.sapphire.server.admindbms. Set this to ORA for Oracle or MSS for Microsoft SQL Server |

Optional

| | |
|------------------------|---|
| SMTP Host | Path and name of the machine hosting the SMTP server (for LabVantage-generated email). Property name: com.labvantage.sapphire.server.smtphost |
| Email From Address | Sending email address for LabVantage-generated email.
Property name: com.labvantage.sapphire.server.emailfromaddress |
| Security Email Address | Destination email address for notifications of LabVantage-generated security violations. Property name: com.labvantage.sapphire.server.securityemailaddress |

Advanced

| | |
|--|--|
| JNDI EJB Prefix | Application Server's naming subcontext for JNDI names. If not specified, JNDI names will be used explicitly. Use this property if JNDI names are created within a context that is not explicitly defined by the names themselves. Property name: com.labvantage.sapphire.server.jndiprefix |
| JNDI Security Protocol | Security protocol for JBoss. |
| HTTP Port | Port number for the Application Server's HTTP listener. Use this property if the application server is not running on the default port. If not specified, the Application Server's default is used. These default ports for HTTP are:

JBoss: 8080
WebSphere: 9080
WebLogic: 7001

Property name: com.labvantage.sapphire.server.httpport |
| Provider Port | Port number for the Application Server's naming service (bootstrap port). Use this property if the Application Server's naming service is not running on the default port. If not specified, the Application Server's default is used. These default HTTP ports are:

JBoss: 1099
WebSphere: 2809
WebLogic: 7001

Property name: com.labvantage.sapphire.server.providerport |
| Compression Filter
Add Headers Filter | During Application startup, these properties are intended to enable or disable the functionality of the filter code in web.xml (see http://www.oracle.com/technetwork/java/filters-137243.html). When disabled, the filter classes and filter declaration/servlet mapping in web.xml are still in place, but they should do nothing. On the other hand, these properties cannot be enabled if your web.xml does not specify the relevant filter declaration.

Property names:

com.labvantage.sapphire.server.filter.compression
com.labvantage.sapphire.server.filter.addheaders |

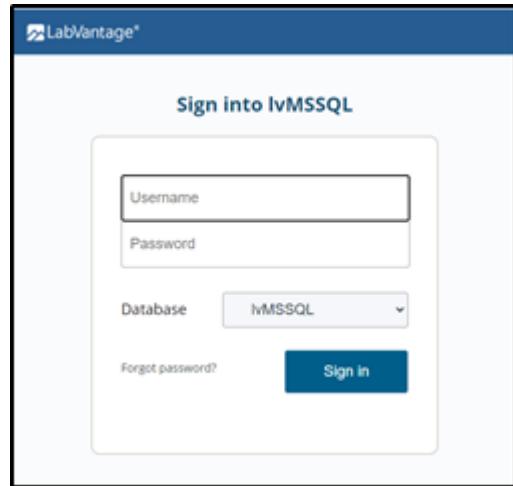
| | |
|-----------|---|
| | <p>Note that if the above properties do not exist in labvantageconfig.props for a filter, the relevant filter is enabled by default. If you add any of these properties to labvantageconfig.props, setting them to "N" will disable the filter. Example: com.labvantage.sapphire.server.filter.compression=N disables the Compression Filter.</p> |
| Server ID | <p>This property will not be visible in the Console. This documentation is here for your information in case you are setting up a cluster.</p> <p>When running multiple JVMs from single server instances in a cluster, it becomes important to uniquely identify each LabVantage instance based on something other than the server hostname (particularly for automation purposes). This is particularly useful when there are two JVMs on the same server with the same hostname. In this case, each JVM can be assigned its own "serverid" to identify a specific labvantageconfig.props file. To do this, add the following JVM system property:</p> <pre><property name="LABVANTAGE_SERVER" value="serverid"/></pre> <p>During server startup, LabVantage tries to find the labvantageconfig.props file by looking in the APPLICATION_HOME directory in the following order and accepting the first file it finds:</p> <ol style="list-style-type: none"> 1. labvantageconfig_hostname_serverid.props 2. labvantageconfig_hostname.props 3. labvantageconfig_serverid.props 4. labvantageconfig.props_platform (this is used internally to identify the Application Server) 5. labvantageconfig.props <p>The system also looks for "sapphireconf_xxx" for backward-compatibility.</p> |

25.2.4 Logon Page Configuration

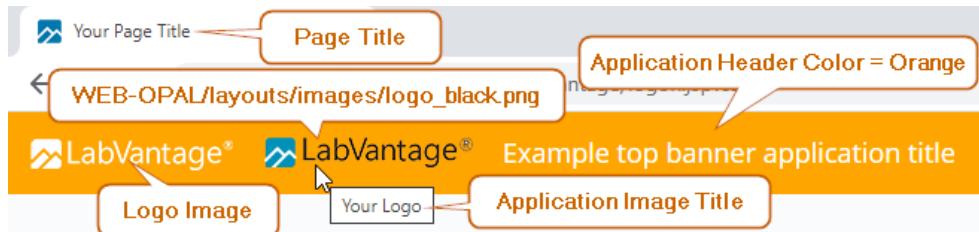
As described at the beginning of this chapter, several application options affect the user logon page. This table describes these options. These are categorized into Logon Page, Logon Subdomain, Single Sign On, Forgot/Reset password, Browser Checks, and Logon Page Languages.

Logon Page

These properties affect the presentation of the page that is rendered to users as they are providing their application credentials. An example is provided below.



| Property | Description | Example Demonstrated Below |
|-------------------|-------------------------------|--------------------------------------|
| Application Title | Top banner Application title. | Example top banner application title |

| Application Image | Top banner Application image. Name of an image file found in WEB-OPAL/layouts/images |  |
|--------------------------|---|---|
| Application Image Title | Top banner Application image title. | Your Logo |
| Application Header Color | Top banner color. | Orange |
| Page Title | Web page title. | Your Page Title |
| Example of above options |  | |
| Property | Description | Example or Default |
| Default Database | Database to show in database dropdown (by default) before a selection is made. List is sorted alphabetically. The default will be the first on the list. | Production |
| Show Database | Determines whether or not the database dropdown is shown. | Default is "Yes" (ticked) |
| Databases in selection | Semicolon separated list of databases shown in the databases dropdown. Any database not named in this list will not appear on the dropdown. If no databases are named, all active databases are shown. | Example: Production;Validation |
| Allow Database Selection | Determines whether or not a database (other than the default) can be selected in the dropdown. Options are "Yes", "No", and "Text Field Only". This last option requires the user to type a valid database ID during logon. | Default is "Yes" |
| Enter Logon Details Text | Logon group box text (such as "Enter logon details and select a database"). This is reevaluated on change of the database and [database] can be used as a token in the text to replace with database alias/id. | Default is: Sign into [database] |
| Username Prompt Text | Username input prompt text. | Username |

| | | |
|----------------------------------|---|--|
| Allow AutoComplete | Determines if the Username input field allows auto-complete. If "Yes", the browser uses its own mechanism to store and recall the username and password to the site. | Default is "Yes" |
| Password Prompt Text | Password input prompt text. | Password |
| Database Prompt Text | Database selection prompt text. | Database |
| Logon Button Text | Text on the face of the logon button. | Sign in |
| Invalid Logon Message Text | Logon error message that appears when one of the three fields is empty and the user clicks Logon. An invalid password attempt is different. | You need to enter a username and password. |
| Disabled User Text | The error message that is presented when a user attempts to reset their password through "Forgot Password" and the status of their account is "Disabled" | This username is disabled - you cannot reset the password of a disabled user. |
| Cookies Not Enabled Message Text | Error message issued when cookies are not enabled on the browser. | You do not have cookies enabled on your browser. Some pages may not function properly. |
| Unsecure Connection Message Text | LabVantage checks the URL of the request to the application server. If an HTTPS connection is not established, a message is displayed on the Logon screen warning of the unsecure connection. Use the token [logonsecureURL] to insert a link into the message. | Your connection to the application is not secure. Certain content may not function as designed.

To access secure URL, click [logonsecureURL]"

(where [logonsecureURL] is the value of "Secure Logon URL" below). |
| Secure Logon URL | This is the full URL for the HTTPS redirect if someone attempts to use HTTP. | https://fqdn:443/labvantage |
| RTL Text | Determines the direction in which the logon page is rendered. When not checked, the logon page is rendered left-to-right. When checked, the page is rendered right-to-left. | Default is "No" |

Logon Subdomain

Caution: Advanced use only - requires manual configuration steps to create labvantage_{LOGON}_SUBDOMAIN.xml files with subdomain-specific logon page overrides. You must store these XML files in the appropriate location within the LabVantage EAR.

| | |
|----------------|---|
| Subdomain Mode | <p>When ticked, this allows you to create separate logon page configurations for different subdomains. The subdomain-specific labvantage.logon_SUBDOMAIN.xml file will be read for overrides. This includes the possibility to load overrides to the values stored in your labvantage.logon.props file. An example of a subdomain is:</p> <p>subdomain.maindomain.com</p> <p>...where maindomain.com is your main domain. An example of the URL for end users is:</p> <p>https://subdomain.maindomain.com/labvantage</p> <p>For example, this could set the default database and logon page languages for each subdomain. This requires that you manually create, modify, and properly position each subdomain XML file. The subdomain value in the URL must match the subdomain value identified in any XML file names you create.</p> |
| Main Domain | For subdomain configuration mode, enter your main domain. Example:
labvantage.com |

Database Aliases

Use this section to add one or more rows. This allows the logon page to translate the database identifier into a string that may be more readily identified by users. Example:

| Database Aliases | | | |
|-------------------|------------|------------|-------------------------|
| Database Aliases: | Database | Alias | Database Alias |
| | labvantage | Production | Remove |
| | | | Add Row |

Single Sign On (SSO) See [Single Sign On \(SSO\)](#)

Forgot/Reset Password

| Property | Description |
|---------------------------|--|
| Show Forgot Password | Default is "Yes" (ticked). Set to "No" in order to hide the "Forgot password?" link. |
| Forgot Password Text | Forgot password text. Default is: "Forgot password?" |
| Forgot Password Message | Forgot password message. Default is: "We cannot lookup or send your old password, but we will send you an email with a link to let you change it." |
| Enter Reset Password Text | Text that appears after clicking "Forgot password?" Default is: "Enter your username and email address" |
| Reset Password Text | Text that appears as a boilerplate on the Reset Password screen. Default is: "Reset password". |

| | |
|-----------------------------|--|
| Email Prompt Text | Text that appears on the Reset Password screen prompting the user to enter their email address. Default is: "Email" |
| Reset Password Button Text | Text that appears on the button face for sending the password reset request. Default is: "Reset Password" |
| Return to Logon Button Text | Text that appears on the button face after clicking the Reset Password button. Default is: "Return to Logon" |
| Request Email Subject Text | When a password reset is requested, LabVantage sends the user an email. This will be the subject line of that email. Default is: "LabVantage Reset Password Request". |
| Request Email Message Text | <p>Request password change email message text. Message is assumed to be in HTML format. Default is:</p> <pre><p>We have received a request to reset your password.</p> <p>Click on the <i>Reset Password</i> link below to receive a further email with your new temporary password.</p> <p>If you have not requested a password reset then please ignore this email.</p> <p>Reset Password</p> <p>You can manually copy and paste the following text into your browser if the link doesn't work.</p> <p>[resetpasswordlink]</p></pre> |
| Request Email Sent Text | Request password change email sent text. Default is: "We have sent you an email with a link to confirm the reset password request." |
| Reset Email Subject Text | Once the request is confirmed by way of the hyperlink sent via email, a temporary password will be sent. This is the subject line for the temporary password email. Default is: "LabVantage Password Reset". |
| Reset Email Message Text | <p>Reset password email message text. Message is assumed to be in HTML format. Default is:</p> <pre><p>Your password has been reset to: [newpassword]</p> <p>Goto the LabVantage logon page to logon.</p> <p>Immediately after logon you will be prompted to create a new password.</p></pre> |
| Reset Email Sent Text | Reset email sent message. Default is: "We have sent you an email with your new temporary password.". |
| Invalid Password Reset Text | Invalid reset request text which will appear if one of these fields is left blank. Default is: "You need to enter a username and email address." |

| | |
|-------------------------------------|---|
| Invalid User/Email Combination Text | Invalid username/email combination error message which appears when the system does not have this combination of username and email address. Default is: "Unrecognized username/email combination - please try again" |
| Expired Reset Link Text | Expired reset password link message. Default is: "This link for a password reset has expired. If you still wish to reset your password, go to the LabVantage logon page and click the 'Forgot password' link." |
| Email Send Failure Text | Email send failure error message. Default is: "Failed to send reset password email - please contact your system administrator." |
| External Authentication Text | External authentication error message. Default is: "Your password is managed by an external authentication system and cannot be changed here - contact your system administrator to reset your external password." |
| Invalid System Email Text | Invalid system email setup error message. Default is: "Your system is not configured correctly to reset passwords - contact your system administrator to configure the system mail settings." |

Browser Checks

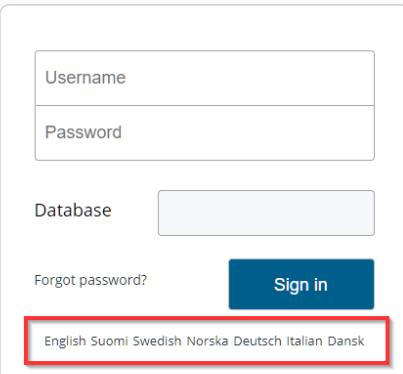
| Property | Description |
|------------------------|---|
| Allow Chrome Browser | Tick to allow the Google Chrome browser. If not allowed, the Invalid Message Text is displayed, and you can elect to prevent a login. |
| Minimum Chrome Version | Determines the minimum version of Chrome permitted. Leave blank for no minimum. Example: 83.0 |
| Maximum Chrome Version | Determines the maximum version of Chrome permitted. Leave blank for no maximum. Example 84.0.4147.89 |
| Allow IE Browser | Tick to allow the Microsoft Internet Explorer browser. If not allowed, the Invalid Message Text is displayed, and you can elect to prevent a login. |
| Minimum IE Version | Determines the minimum version of IE permitted. Leave blank for no minimum. |
| Maximum IE Version | Determines the maximum version of IE permitted. Leave blank for no maximum. |
| Allow Edge Browser | Tick to allow the Microsoft Edge browser. If not allowed, the Invalid Message Text is displayed, and you can elect to prevent a login. |
| Minimum Edge Version | Determines the minimum version of Edge permitted. Leave blank for no minimum. |

| | |
|----------------------------------|--|
| Maximum Edge Version | Determines the maximum version of Edge permitted. Leave blank for no maximum. |
| Allow Safari Browser | Tick to allow the Apple Safari browser. If not allowed, the Invalid Message Text is displayed, and you can elect to prevent a login. |
| Minimum Safari Version | Determines the minimum version of Safari permitted. Leave blank for no minimum. |
| Maximum Safari Version | Determines the maximum version of Safari permitted. Leave blank for no maximum. |
| Prevent Login | Prevent login if any of the browser checks are violated including an attempt to use some browser other than those listed above. With this ticked, the "Sign in" button will be disabled on clients that are not using an allowed browser. |
| Invalid Browser Message Text | This message is displayed when the browser is not one of the allowed browsers. For example: Firefox. The default text is:
"This browser version combination ([browsername], [browserversion]) is not supported by this version of LabVantage." |
| Unsupported Browser Message Text | This message is displayed when the browser is allowed but the version on the client machine is not between the minimum and maximum values. The default text is:
"This browser ([browsername], [browserversion]) is not recommended for this application." |

Logon Page Languages

Caution: Advanced use only! This requires manual configuration of files stored on the application server including steps to create labvantageologon_LANGUAGEID.xml files with language-specific text overrides.

| | |
|-----------|---|
| Languages | Click Add Row to show different language options at the bottom of the logon screen. This allows the logon page to override all of the above texts with different texts according to the language selected by the user. |
|-----------|---|

| Example | <table border="1" data-bbox="442 213 1237 713"> <thead> <tr> <th data-bbox="442 213 747 249">Language ID</th><th data-bbox="747 213 1095 249">Description</th><th data-bbox="1095 213 1237 249"></th></tr> </thead> <tbody> <tr><td data-bbox="442 255 747 297">en</td><td data-bbox="747 255 1095 297">English</td><td data-bbox="1095 255 1237 297">Remove</td></tr> <tr><td data-bbox="442 325 747 367">fi</td><td data-bbox="747 325 1095 367">Suomi</td><td data-bbox="1095 325 1237 367">Remove</td></tr> <tr><td data-bbox="442 394 747 437">se</td><td data-bbox="747 394 1095 437">Swedish</td><td data-bbox="1095 394 1237 437">Remove</td></tr> <tr><td data-bbox="442 464 747 506">no</td><td data-bbox="747 464 1095 506">Norska</td><td data-bbox="1095 464 1237 506">Remove</td></tr> <tr><td data-bbox="442 534 747 576">de</td><td data-bbox="747 534 1095 576">Deutsch</td><td data-bbox="1095 534 1237 576">Remove</td></tr> <tr><td data-bbox="442 604 747 646">it</td><td data-bbox="747 604 1095 646">Italian</td><td data-bbox="1095 604 1237 646">Remove</td></tr> <tr><td data-bbox="442 673 747 715">dk</td><td data-bbox="747 673 1095 715">Dansk</td><td data-bbox="1095 673 1237 715">Remove</td></tr> </tbody> </table> <p data-bbox="442 734 605 762">Save Changes</p> | Language ID | Description | | en | English | Remove | fi | Suomi | Remove | se | Swedish | Remove | no | Norska | Remove | de | Deutsch | Remove | it | Italian | Remove | dk | Dansk | Remove |
|---|---|------------------------|-------------|--|----|---------|------------------------|----|-------|------------------------|----|---------|------------------------|----|--------|------------------------|----|---------|------------------------|----|---------|------------------------|----|-------|------------------------|
| Language ID | Description | | | | | | | | | | | | | | | | | | | | | | | | |
| en | English | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| fi | Suomi | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| se | Swedish | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| no | Norska | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| de | Deutsch | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| it | Italian | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| dk | Dansk | Remove | | | | | | | | | | | | | | | | | | | | | | | |
| | <p data-bbox="430 808 747 836">Click Save Changes. Note:</p> <p data-bbox="430 853 1459 916">LabVantage does not supply these language translations or XML files. Adding these to your console requires that you also create the XML files and translated texts.</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| Example logon page with language selections | <p data-bbox="535 977 784 1005">Sign into LabVantage</p>  | | | | | | | | | | | | | | | | | | | | | | | | |

25.3 Server Management

LabVantage Console provides server management properties in Configuration → Console → Configuration. Information specific to the Application Server and the settings it requires to start LabVantage is displayed here. This is divided into four sections: Platform, Startup Settings, License, and JVM Properties.

25.3.1 Platform

These properties pertain to the LabVantage Console EAR deployment.

| Property | Description |
|----------|--|
| Platform | Application Server in use (JBoss, WebSphere, or WebLogic). |

| | |
|------------------|--|
| Platform Version | Version of the Application Server (if LabVantage Console can determine it from the Application Server's API methods). |
| Hostname | Resolved name of the machine running the Application Server. |
| LabVantage HOME | Absolute location of the LABVANTAGE_HOME directory. |
| Build Date | Date and time the LabVantage Console EAR was built. |
| Build | Unique build number of the LabVantage Console EAR. |
| Patch | Number of the LabVantage Console patch currently applied (displays 00 if none). |
| Version | Version of LabVantage Console. Unlike the "Build", this is not a unique number. Accordingly, please reference the "Build" number when contacting LabVantage Support. |
| Locale | Locale setting for LabVantage Console. |

25.3.2 Startup Settings

These properties define LabVantage Console startup parameters.

| Property | Description |
|----------------|--|
| Admin Database | This is the name of the data source that defines the connection to the database. When LabVantage Console starts, it uses this name to find the AdminDB. The AdminDB persists information concerning LabVantage builds, databases, and deployed Applications. |
| Admin DBMS | Database Management System in use (Oracle or SQL Server). |

25.3.3 License

This is a summary of entitlements provided by your LabVantage license. The page is self-explanatory, listing each entitlement followed by the number of users and other information pertaining to the relevant entitlement. Example:

| <u>License</u> | | |
|-------------------------|--|---|
| License File: | C:\LabVantage-JBossEAP7\labvantagehome\labvantagehome84\ | Location of the LabVantage license file. |
| Licensed to: | LV 85 Internal | Organization that the license is issued to. |
| License ID: | LV85-00020 | License key ID. |
| <u>User Counts</u> | | |
| Full named: | 100 | Full named users. |
| Full concurrent: | 100 | Full concurrent users. |

25.3.4 Java VM Properties

LabVantage Console executes `getProperties()` on `System` and other objects (such as those instantiated in the Application Server), then displays the values of properties defined for the JVM and OS in which the Application Server is currently running. If you are new to Java, see the documentation provided by Oracle. Here is a link to the Oracle Java Tutorial to get you started:

<http://download.oracle.com/javase/tutorial/essential/environment/sysprop.html>

| <u>Java VM Properties</u> | |
|-----------------------------------|---|
| <code>awt.toolkit</code> | <code>sun.awt.windows.WToolkit</code> |
| <code>file.encoding</code> | <code>Cp1252</code> |
| <code>file.encoding.pkg</code> | <code>sun.io</code> |
| <code>file.separator</code> | <code>\</code> |
| <code>java.awt.graphicsenv</code> | <code>sun.awt.Win32GraphicsEnvironment</code> |
| <code>java.awt.printerjob</code> | <code>sun.awt.windows.WPrinterJob</code> |

25.4 Utilities

Please see chapter 23 [Patches and Components](#) for information regarding the Utilities pages of the LabVantage Console.

26 OPTIONAL THIRD-PARTY INSTALLATIONS

This chapter describes the steps necessary to install and configure two optional products available from LabVantage. A third section addresses an example of how you might install software to enable single-sign-on. The Empower Connector is a licensed module that facilitates integration with Waters' Empower Chromatography Data System. The North West Analytics module (<https://www.nwasoft.com/>) is a statistical package. LabVantage supports same-sign-on integration with an LDAP system such as Microsoft Active Directory. Such an integration does not require third-party software. Single-sign-on allows authentication to pass through from the client's desktop to LabVantage thus eliminating the logon page. This will require additional software.

26.1 Empower

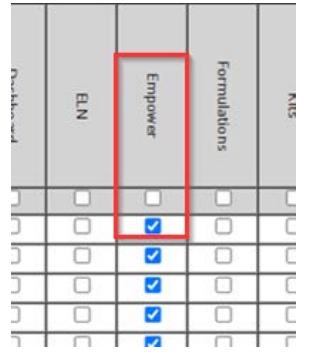
This section describes installation of the optional LabVantage Empower Connector module. This module provides bidirectional communication between LabVantage and the Empower CDS system through downloading of data from LabVantage to create SampleSetMethods. Subsequent uploading occurs from Empower at the conclusion of acquisition and processing of a SampleSet. The upload and download operations are configured by the Empower Policy in the LabVantage application. In order to perform these procedures, the LabVantage application must be installed and running. A complete install of the Empower Connector for LabVantage includes installations of three components. These are the LabVantage Object Modeler (LOM), the LabVantage Event Service, and the LabVantage Empower Interface. These installs will be carried out on the Empower server. The installation path can be the same for all three components.

26.1.1 Prerequisite Conditions and Configurations

Important notes before you begin

1. The Empower CDS must be installed on the Empower server. Sign in as an administrator account to confirm the password. This administrator account will be used by background processing.
2. Use an Empower client to sign in as a normal user account to verify connectivity.
3. The use of HTTPS connections is required for the Empower interface.
4. In Windows Server operating systems, Internet Explorer security is maximized by default. When installing on Windows Server, adding the LabVantage application as a trusted site and/or reducing the IE security level is required.

These steps are required before installing additional software.

| | |
|----|---|
| 1. | <p>Log onto the LabVantage application with your defined system administrator privileges.
Navigate to System Admin → Security → Module Users</p> |
| 2. | <p>Confirm that your LabVantage license key includes the Empower Connector module, and access to this module is provided to all required users.</p> <p>Save any changes as required.</p>  <p>The screenshot shows a grid of checkboxes for various modules. The 'Empower' column is highlighted with a red border. In the row corresponding to the second user listed, the checkbox in the 'Empower' column is checked, indicating that the user has access to the Empower module.</p> |

3. Navigate to System Admin → Configuration → Policies. Query for and edit the **SecurityPolicy**.
4. Edit the Sapphire → Custom node to allow the LabVantage Object Model (LOM) to connect to the LabVantage application.

The screenshot shows the 'Edit Policy: SecurityPolicy' screen. On the left, there's a navigation tree with 'Policy: SecurityPolicy' selected. Under it, 'Details' and 'Sapphire (P)' are expanded, showing 'Custom' and 'Virtual (P)' nodes. The main area has two tabs: 'REST Services' and 'WebServices'. The 'WebServices' tab is highlighted with a red box. Within 'WebServices', the 'Enable' dropdown is set to 'Yes', and other options like 'Action Processing', 'Allow Action Class Processing', and 'Allow unregistered SQL' are also visible.

Within the WebServices group, change Enable to “Yes” and Allow Unregistered SQL to “Yes”.

5. Continue scrolling down within the policy to find Session Management → DedicatedConnectionId. This property value must be set to “Yes” for HTTPS connections. This is the default setting. Save all changes.

26.1.2 Obtain Information Needed During this Procedure

These values will be prompted for during this process. Verify that you can connect to LabVantage using...

| Value | Description | Actual |
|--------------------------------|---|--------|
| Web Protocol | Needs to be HTTPS | |
| LabVantage App Server Hostname | Example:
https://<fqdn>:<port>/<application>
...where fqdn is the fully qualified domain name of your server | |
| HTTPS port number | Default is 443. If you are using a different port, this must be known. | |
| LabVantage Application Name | Example:
https://<fqdn>:<port>/<application> | |
| Database ID | The identifier you assigned in Adding a New LabVantage Database | |
| Empower Connections | | |

| | | |
|---|---|--|
| Empower Administrative account password | Credentials are needed to make connections for polling the signoffs | |
| Empower Root project name | Used to identify downloaded data. | |
| Empower schema name | Required to set up LOM for bidirectional communications. | |
| Empower database name | Required to set up LOM for bidirectional communications. | |
| Empower system name | Required to set up LOM for bidirectional communications. | |

Installation Verification: Initials indicate confirmation of recorded values and that prerequisite conditions and configurations are met.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

26.1.3 Installation Media

Within the [LabVantage Distribution](#), you will find an “options” directory. Locate the LOM, Event Service, and Empower Interface installer files for Microsoft. Each file is provided in the package format described below. See the [Release Notes](#) for your specific version to determine the supported platforms.

| Directory | File | Installs | Purpose |
|------------------|--|--|---|
| LOM | LabVantage LOM Setup.msi | 32-bit LabVantage Object Model .NET application. | Communicates with another application that uses a 32-bit COM library. |
| EventService | LabVantage Event Service Setup.msi | 32-bit LabVantage Event Service on the Empower server. | Performs the signoff poll used to upload results on signoff. |
| EmpowerInterface | LabVantage Empower Interface Setup.msi | 32-bit LabVantage Toolkit application on a server that is running Empower. | Downloads a SampleSetMethod and uploads Results. |

Use only the 32-bit versions with a 32-bit installation of Empower. Do not use the 64-bit versions of the LabVantage LOM and LabVantage Event Service installers. They will not work with the 32-bit Empower Interface. The 64-bit versions (labeled with 'x64' at the end of the file name) are made available for use when integrations are needed with other 64-bit applications.

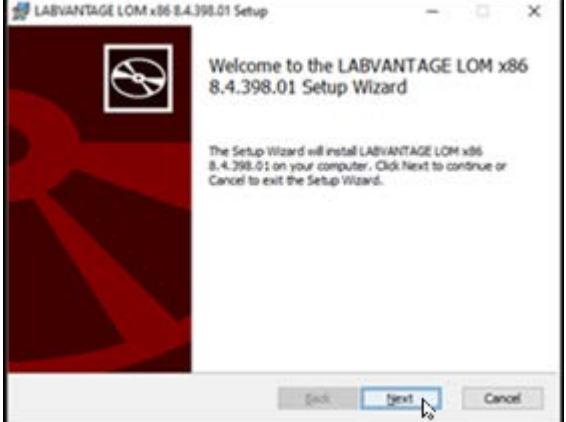
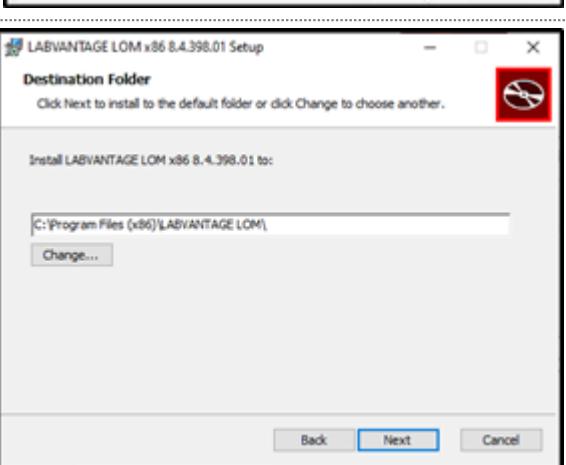
If removal of these applications is required, uninstall them in the following order:

1. Empower Interface
2. Event Service
3. LOM

If the LOM is uninstalled first, the others cannot be removed because the deregistration relies on the LOM.

26.1.4 LabVantage LOM Setup

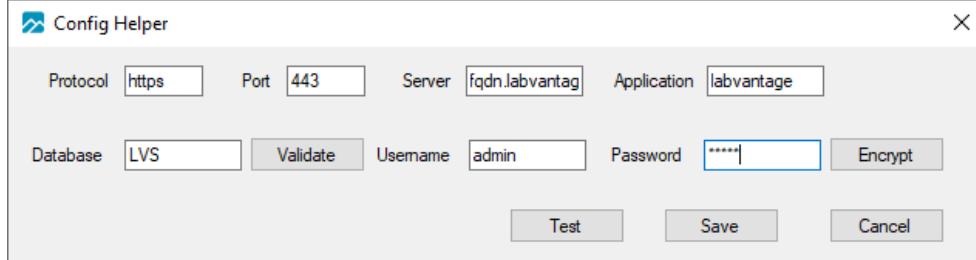
This procedure installs the LabVantage Object Model (LOM). This is required by other Empower components. Perform this install on the Empower server and clients.

| | | |
|----|---|--|
| 1. | Mount the LabVantage installation media on the Empower server or client. Launch the installer by executing the file <code>LOM_Setup.msi</code> . | |
| 2. | <p>The wizard launches and presents a Welcome screen.
Click Next.</p> <p>On Page Two...
Read and accept the terms of the End-User License Agreement.
Click Next.</p> |  |
| 3. | <p>Select your install path.
The default folder is Program Files, but the LOM can be installed anywhere.
The LOM will also be installed into the Global Assembly Cache (GAC).
You can install all of the components into one centralized folder.</p> <p>Click Next.</p> |  |
| 4. | <p>On the final wizard page, click Install. This installs the LOM and copies its files.
You may be prompted with a User Account Control dialog. Accept it.
When installation is complete, the <code>LOMConfigHelper.exe</code> program is launched to configure the connection to the LabVantage server.</p> | |
| 5. | Do not click Finish on the <i>LABVANTAGE LOM</i> installer until you have completed the next section. Continue with the <i>Config Helper</i> in the next section. | |

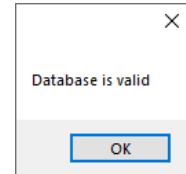
26.1.5 LabVantage LOM Configuration

During the LOM installation, the LOMConfigHelper.exe program is launched to configure the connection to the LabVantage server. Proceed as follows:

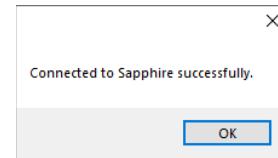
1. In the "Config Helper" dialog, enter the Protocol, Server, Port, and Application you recorded earlier:



2. Click **Validate**. A successful configuration is indicated as shown here. This has validated that your protocol, server, application, and database are accessible. Click OK.



3. After entering your admin username and password, click **Test**. This checks to see if your username and password can connect. If the test is successful, click **OK**.



4. If desired, click **Encrypt** to leverage LabVantage's password encryption. Click **Save**.

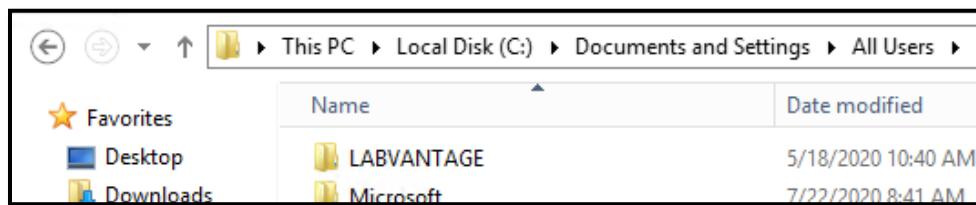
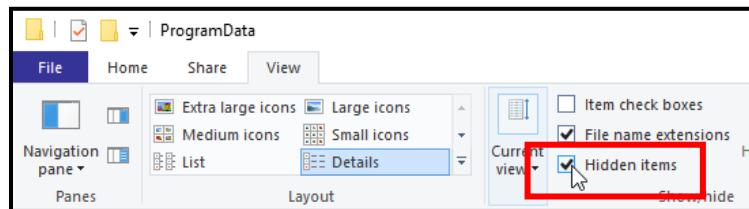
5. Click **Finish** on the LABVANTAGE LOM installer. Continue with the Config Helper in the next section.

Installation Verification: Initials indicate sections 26.1.4 and 26.1.5 have been completed. Record the host name for this installation.

| Host Name | Role | Initials | Date |
|-----------|----------|----------|------|
| | Executor | | |
| | Reviewer | | |

Notes on the LabVantage LOM files

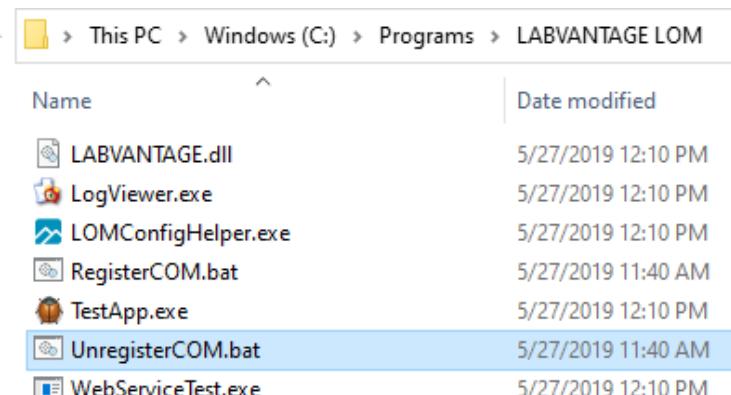
1. The settings files, logs and local databases are stored in the Common Application Data directory. In Windows Server versions, this is typically C:\Documents and Settings\All Users\LABVANTAGE. This is a hidden directory path on most systems. In order to access it, you will likely need to type the folder path. Example:



On client PCs, these files might be in C:\ProgramData\LABVANTAGE

An alternative to accessing these directories is to turn on your Windows Explorer option to show hidden items

2. In the installation folder, you will find a LOMConfigHelper.exe application. This is the application that set the connection details.
3. In the installation folder, you will find TestApp.exe and LogViewer.exe applications. TestApp.exe can be used to test the connection to LabVantage and run queries and actions. LogViewer.exe can be used to view LabVantage logs.



26.1.6 LabVantage Empower Event Service Setup

This procedure installs the LabVantage Event Service. This service performs the signoff poll used to upload results automatically on signoff. Therefore, this step is required only if you plan to use upload on Empower signoffs. This is installed only on a single client or server of the Empower system.

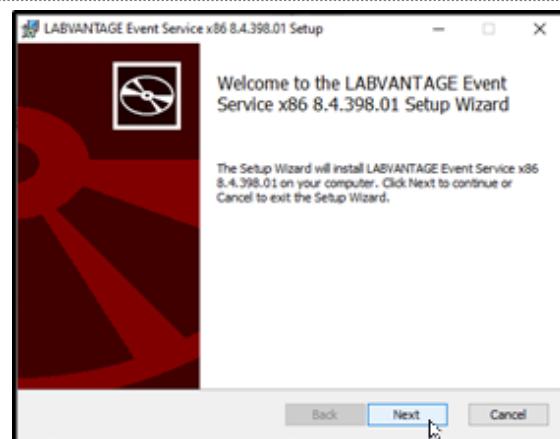
- | | |
|----|---|
| 1. | Mount the LabVantage installation media. Launch the installer by executing the file LabVantage Event Service Setup.msi. |
|----|---|

2. The wizard launches and presents a Welcome screen.
Click **Next**.

On Page Two...

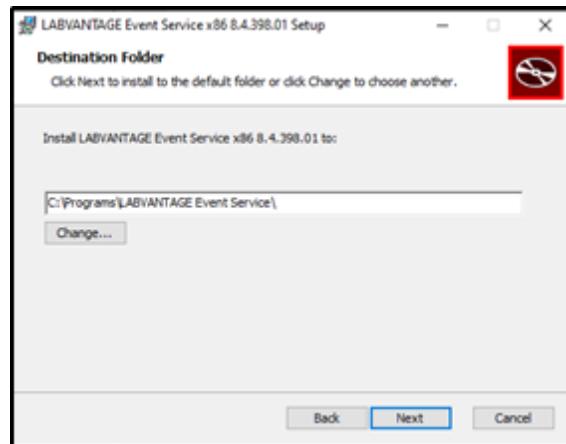
Read and accept the terms of the End-User License Agreement.

Click **Next**.



3. Select your install path.
You can install all of the components into one centralized folder or a different location.

Click **Next**.



4. On the final wizard page, click **Install**. This installs the Event Service and copies its files.
You may be prompted with a User Account Control dialog. Accept it.
When installation is complete, click **Finish**.

5. The installer should have created a service called LABVANTAGEEventService in auto mode. This service should have started. Make certain it has started.

6. The installer should have started the configuration and monitoring application LabVantageEventServiceConfig.exe, which displays a LabVantage logo icon in the system tray.
Make certain you can see the LabVantage logo icon.

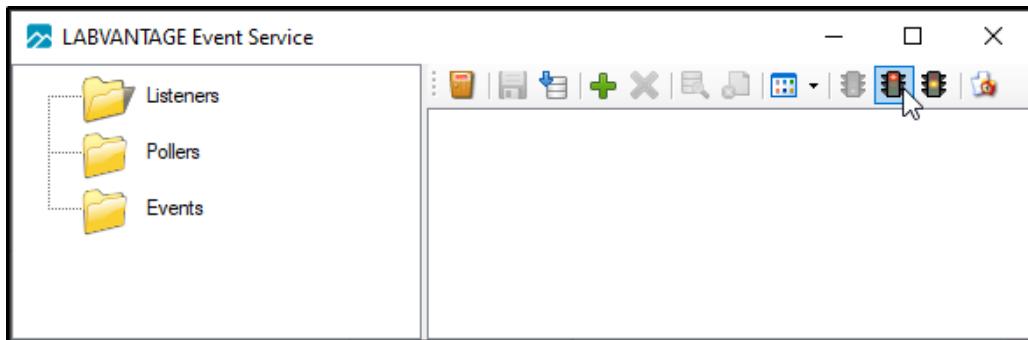


26.1.7 Configure the LabVantage Event Service

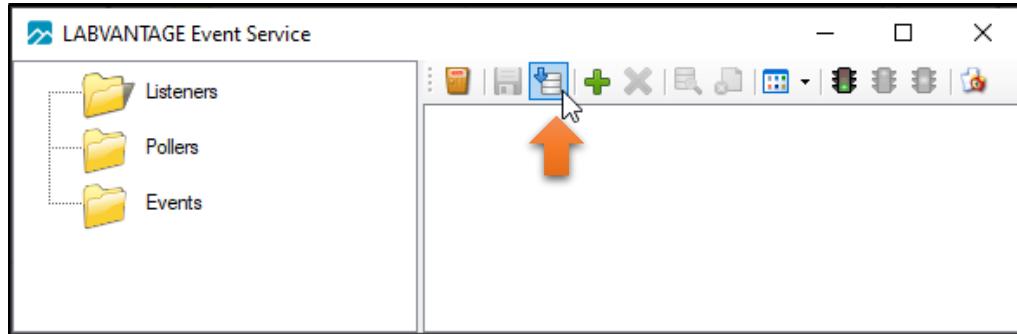
On the system where the LabVantage Event Service has been installed, perform these steps:

1. If the configuration and monitoring application LabVantageEventServiceConfig.exe is not started, start it from the installation directory by launching `LABVANTAGEEventService.exe`.

2. Double-click the LabVantage icon in the system tray. The configuration application should open:



3. Stop the service by clicking the red traffic light icon as highlighted above. The green traffic light icon should now be enabled.
4. Click Import as highlighted below.

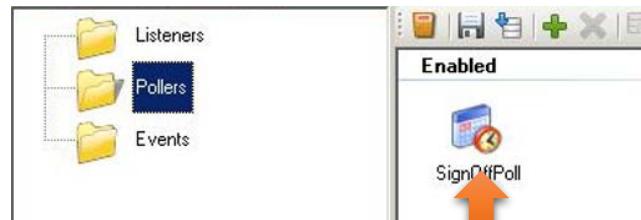


5. Import the event data by selecting "EmpowerEventDataImport.xml" (if installing in a 32-bit environment) or "EmpowerEventDataImport_x64.xml" (if installing in a 64-bit environment) from the Common Application Data folder (where the logs and config files are located). This opens the Import File dialog, which will be used to import all necessary settings.

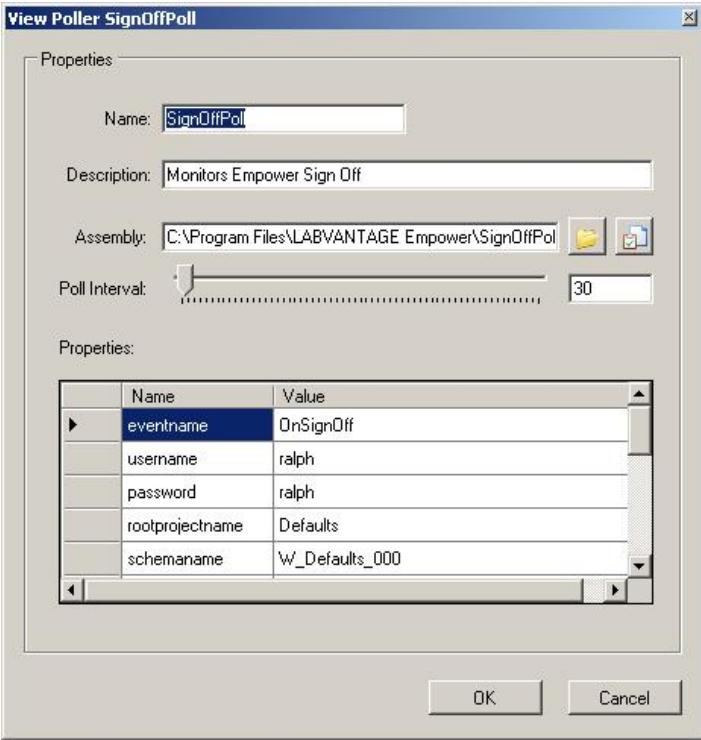
Navigate to the Common Application Data folder (typically this path is C:\Documents and Settings\All Users\Application Data\LabVantage). When navigating to this folder you may find that the Application Data subfolder is hidden. Therefore, when you are at the All Users folder, simply type it in.

6. Locate the EmpowerEventDataImport.xml (or EmpowerEventDataImport_x64.xml) file to import by clicking the Open button.

7. Click Pollers in the tree view on the left. Double-click the SignOffPoll. This is where we configure the polling to check for signoffs.



8. Confirm that the name of the Poller is SignOffPoll, with an appropriate description.

| 9. | Confirm that the Assembly references the "SignOffPoll.dll" in the LabVantage Empower Interface program files folder. If the file path is different, use the file browser to select "SignOffPoll.dll" in the LabVantage Empower Interface installation directory. | | | | | | | | | | | | |
|-----------------|---|---|-------|-------------|-----------|-----------|---|----------|-------|---|----------|------------|---|
| 10. | <p>Set the Poll Interval to a realistic value. The default is 30 seconds, meaning that every 30 seconds after a poll, it will navigate through all the projects and find valid signoffs to send to LabVantage.</p> <p>Configure the polling properties as required, referring to the table below. Refer to the Empower Connector documentation for a complete description of these properties.</p>  <table border="1" data-bbox="833 734 1432 967"> <thead> <tr> <th>Name</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>eventname</td> <td>OnSignOff</td> </tr> <tr> <td>username</td> <td>ralph</td> </tr> <tr> <td>password</td> <td>ralph</td> </tr> <tr> <td>rootprojectname</td> <td>Defaults</td> </tr> <tr> <td>schemaname</td> <td>W_Defaults_000</td> </tr> </tbody> </table> | Name | Value | eventname | OnSignOff | username | ralph | password | ralph | rootprojectname | Defaults | schemaname | W_Defaults_000 |
| Name | Value | | | | | | | | | | | | |
| eventname | OnSignOff | | | | | | | | | | | | |
| username | ralph | | | | | | | | | | | | |
| password | ralph | | | | | | | | | | | | |
| rootprojectname | Defaults | | | | | | | | | | | | |
| schemaname | W_Defaults_000 | | | | | | | | | | | | |
| 11. | You must customize all polling properties (including the schema and project name) to deliver what the user's Empower system expects to see. One way to find this information is to place the Empower Download application into debug mode (set the Debug property to Y). To do this, launch the Empower Download application. Click the LabVantage logo at the top left. Select the Show Info option to open the panel. When the debug panel appears, select the Arguments tab. This shows all Empower details that have been passed to it. | | | | | | | | | | | | |
| 12. | Click "OK" after configuring the polling properties. | | | | | | | | | | | | |
| 13. | These Polling Properties can be used | | | | | | | | | | | | |
| | <table border="1" data-bbox="319 1495 1481 1936"> <thead> <tr> <th>Name</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>eventname</td> <td>OnSignOff</td> <td>Leave this as it is. This is the event to fire when signoffs are found.</td> </tr> <tr> <td>username</td> <td></td> <td>This must be the Empower username to connect with for execution of the polling.</td> </tr> <tr> <td>password</td> <td></td> <td>This must be the Empower password for the account used for the execution of the polling. This is required. Even if the account has no password. You can select the entered field,</td> </tr> </tbody> </table> | Name | Value | Description | eventname | OnSignOff | Leave this as it is. This is the event to fire when signoffs are found. | username | | This must be the Empower username to connect with for execution of the polling. | password | | This must be the Empower password for the account used for the execution of the polling. This is required. Even if the account has no password. You can select the entered field, |
| Name | Value | Description | | | | | | | | | | | |
| eventname | OnSignOff | Leave this as it is. This is the event to fire when signoffs are found. | | | | | | | | | | | |
| username | | This must be the Empower username to connect with for execution of the polling. | | | | | | | | | | | |
| password | | This must be the Empower password for the account used for the execution of the polling. This is required. Even if the account has no password. You can select the entered field, | | | | | | | | | | | |

| | | |
|---------------------|----------------------------|--|
| | | right click and encrypt to store the encrypted value. You will need to enter this accordingly. |
| rootprojectname | | Rooted project that will be used to gain access to all other projects. |
| schemaname | | Name of the Empower schema (previously determined). |
| systemname | NoSystem or value
_____ | Name of the Empower system name, or the text 'NoSystem' if none. |
| typename | Administrator | Type name required to gain access to the projects. Typically Administrator. |
| database | | Name of the Empower database (previously determined). |
| triggsignoffmask | *Level 1*Approval* | Mask to look for to trigger the sending of the signoff to LabVantage. If this is left blank then all signoffs will be processed. An example is "*Level 1*Approval*" which would look for all 1st signoffs with the reason Approval. |
| usersignoffmask | *Level 1*Review* | Mask to look for to find the related signoff for the user id. For instance if this is set to "*Level 1*Review" it would look for signoffs with the same result id as the encountered signoff that have first signoff with the Review reason. |
| policynodecolumn | eu_PolicyNode | Column to use for the policy node. This defaults to eu_PolicyNode. |
| projectpollinterval | 100 | Number of milliseconds to wait between projects when iterating through projects to see what signoffs are available. The default is 100. |
| signoffsendinterval | 100 | Number of milliseconds to wait between signoffs when posting signoffs to LabVantage. The default is 100. |
| userfield | SignOffUser | Field on the signoff record to use for the user id (impersonation). The default is to use SignOffUser based on the signoff located from the property usersignoffmask. |

14. Select the Events folder tree on the left, then double-click the SignOffEvent event.

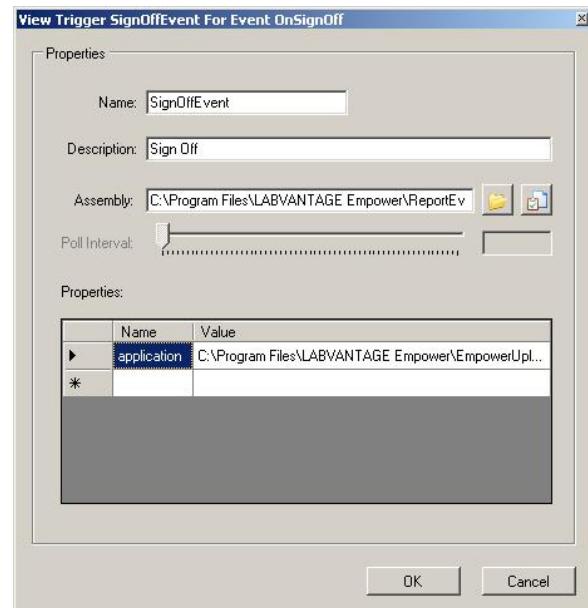


15. Confirm that the name of the Event is "SignOffEvent" with an appropriate description.

16. Confirm that the Assembly references the "ReportEvent.dll" file in the LabVantage Empower Interface installation directory. If the file path is different, use the file browser to select "ReportEvent.dll" in the LabVantage Empower Interface installation directory.

17. Make certain there is one property with the name "application" and the value "[LabVantage Empower Installation Directory]\EmpowerExport.exe", where [LabVantage Empower Installation Directory] is the path to where the LabVantage Empower Interface was installed (such as C:\Program Files\LabVantage Empower\).

Click **OK**.



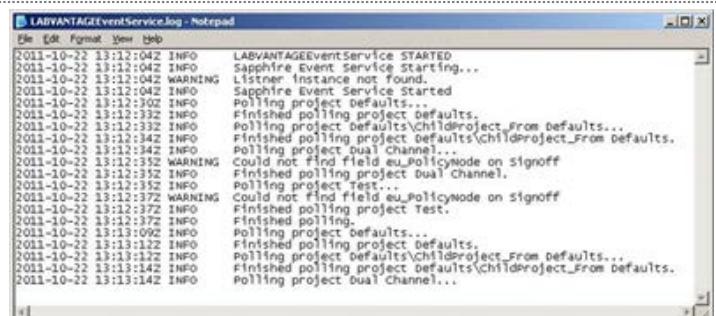
18. Click the "Save" button on the main window. This saves all changes.



19. Restart the Service using the green traffic light. Confirm that the red traffic light icon is now enabled.



20. Confirm that the Poller is successfully cycling through the various projects without error. This can be confirmed by examining the LabVantageEventService.log file in the Common Application Data directory



```

LABVANTAGEEventService.log - Notepad
File Edit Format View Help
2011-10-22 13:12:10Z INFO LABVANTAGEEventService STARTED
2011-10-22 13:12:10Z INFO Sapphire Event Service starting...
2011-10-22 13:12:10Z INFO Listening on port 8080...
2011-10-22 13:12:10Z INFO Sapphire Event Service Started
2011-10-22 13:12:30Z INFO Polling project defaults...
2011-10-22 13:12:33Z INFO Finished polling project defaults
2011-10-22 13:12:34Z INFO Finished polling project defaults\ChildProject_From Defaults...
2011-10-22 13:12:34Z INFO Finished polling project defaults\ChildProject_From Defaults...
2011-10-22 13:12:35Z WARNING Could not find field eu_PolicyMode on signoff
2011-10-22 13:12:35Z INFO Finished polling project Dual Channel...
2011-10-22 13:12:37Z WARNING Could not find field eu_PolicyMode on signoff
2011-10-22 13:12:37Z INFO Finished polling project Test...
2011-10-22 13:12:37Z WARNING Could not find field eu_PolicyMode on signoff
2011-10-22 13:12:37Z INFO Finished polling project Test...
2011-10-22 13:12:37Z INFO Finished polling...
2011-10-22 13:12:37Z INFO Polling project defaults...
2011-10-22 13:13:12Z INFO Finished polling project defaults\ChildProject_From Defaults...
2011-10-22 13:13:14Z INFO Finished polling project defaults\ChildProject_From Defaults...
2011-10-22 13:13:14Z INFO Polling project Dual channel...

```

Installation Verification: Initials indicate sections 26.1.6 and 26.1.7 have been completed. Record the host name for this installation.

| Host Name | Role | Initials | Date |
|-----------|----------|----------|------|
| | Executor | | |
| | Reviewer | | |

Notes concerning the LabVantage Event Service

1. The configuration tool can be closed and will reappear in the system tray. To permanently close the application, right-click on the system tray icon and select Exit Application.
2. The data created in the configuration tool and the data used by the Event Service is in SapphireEvents.xml, which is in the Common Application Data directory (like the other log files and configuration files).
3. When the polling is first run, it will iterate through all projects and build a state of signoffs that are currently in the system. The existing signoffs are not posted to LabVantage. This cache is saved in projectsignoffcache.xml, which is in the Common Application Data directory.
4. If you would like any previous signoffs to be picked up, you can manually modify the signoffids. For example, setting the ID to 1 would mean any signoff with an ID greater than 1 would be processed.

26.1.8 LabVantage Empower Interface Setup

This procedure installs the LabVantage Interface application, which performs the download of a SampleSetMethod and the upload of Results.

- | | |
|----|--|
| 1. | Mount the LabVantage installation media on the Empower server or client. Launch the installer by executing the file LABVANTAGE Empower Interface Setup.msi |
|----|--|

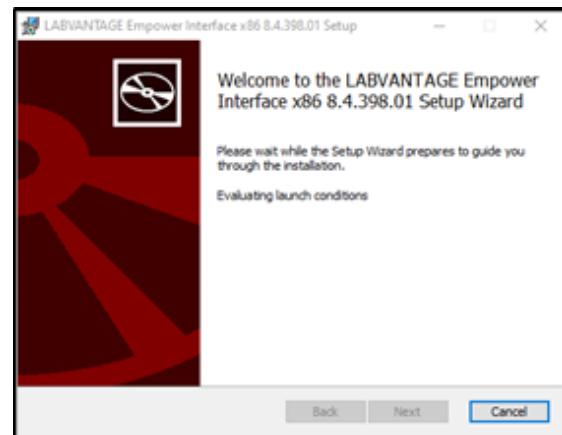
2. The wizard launches and presents a Welcome screen.

Click Next.

On Page Two...

Read and accept the terms of the End-User License Agreement.

Click Next.

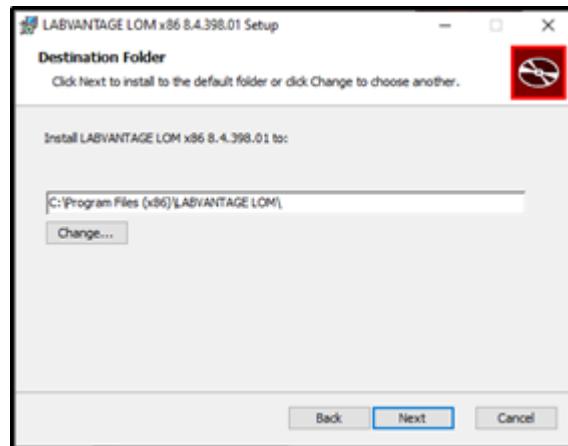


3. Select your install path.

The default folder is Program Files, but the software can be installed anywhere.

You can install all of the components into the same folder folder.

Click Next.

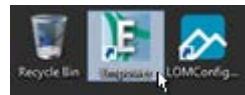


4. On the next wizard page, click **Install**. You may be prompted with a User Account Control dialog. Accept it.

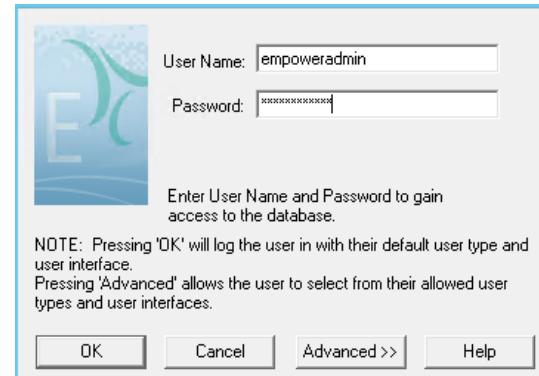
This installs the Empower Interface and copies its files. The installation should run a console application to update the registry with the toolkit menu items. If the menu items cannot be seen later in the Empower Project View or Quick Start, you can manually execute EmpowerRegistryInstaller.exe from the installation directory.

5. When installation is complete, the wizard prompts you to click **Finish** to exit the Setup Wizard. Click **Finish** to exit the wizard.

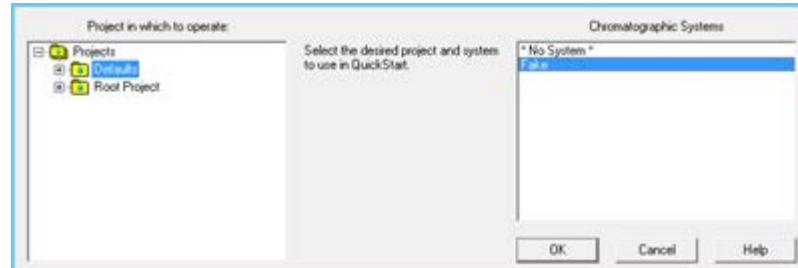
6. Confirm the installation by launching the Empower Quickstart application. This example shows the shortcut on your desktop.



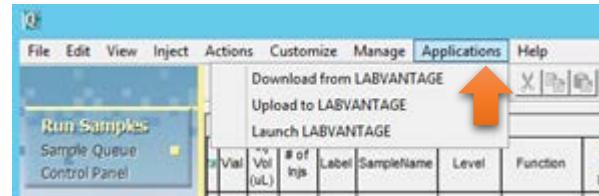
7. Enter your Empower administrator username and password



8. Select a Project and click OK.

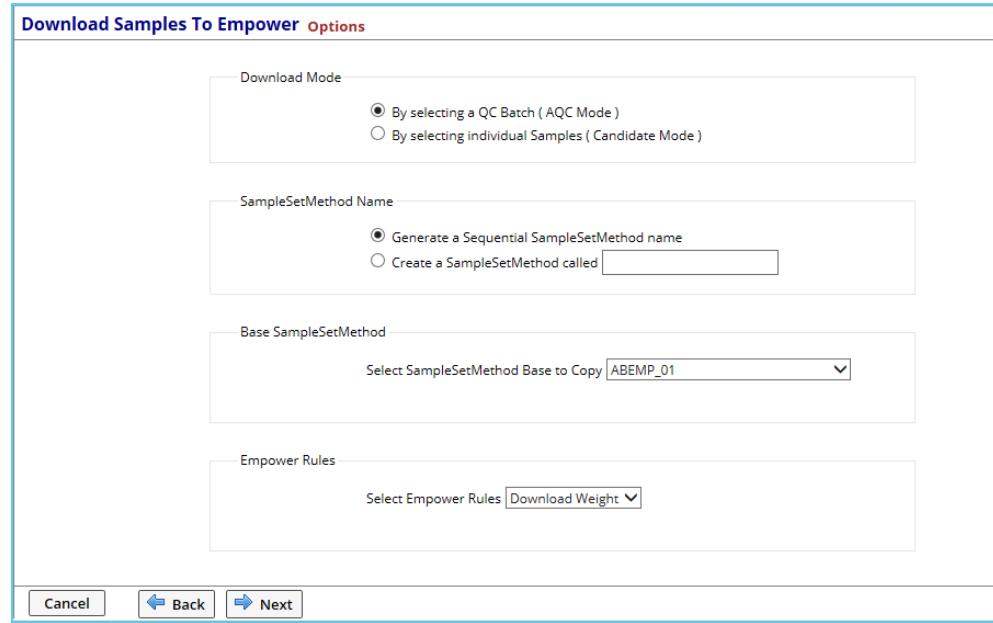


9. Open the Applications menu item.



10. Choose **Download from LABVANTAGE**. Depending on your system configuration, you may get a LabVantage Logon dialog. Sign into LabVantage using an account that has been granted the Empower module.

11. Your test is successful if you see the *Download Samples To Empower Options*



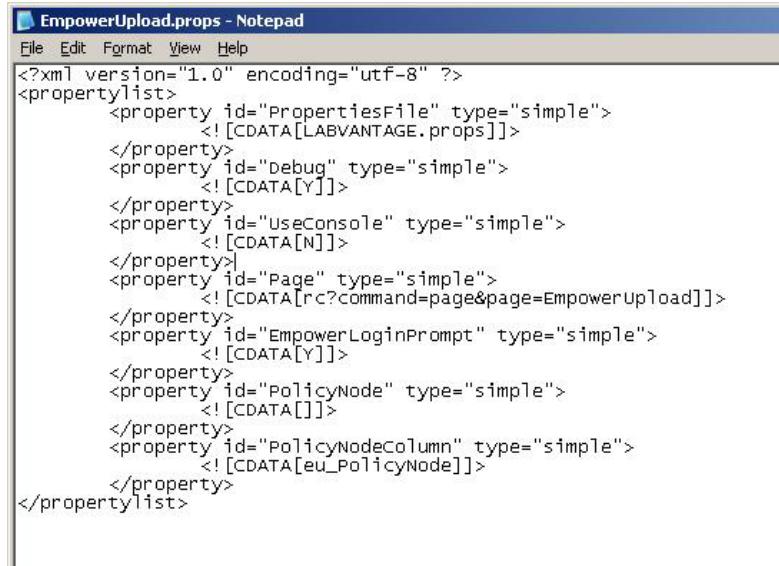
12. If the drop selections are empty for the SampleSetMethod and Empower Rules, this is to be expected. At this time, no association has been made between your current Empower Project and any Policy Node in LIMS. These configurations will be added later. Click **Cancel**.

Installation Verification: Initials indicate section 26.1.8 has been completed. Record the host name for this installation.

| Host Name | Role | Initials | Date |
|-----------|----------|----------|------|
| | Executor | | |
| | Reviewer | | |

Notes concerning Empower Interface installations:

- Like the LOM, all configuration files and logs can be found in the common Application Data folders.
- By default, the Toolkit application uses the centralized LabVantage.props file for connection information. This is located in the common application data folder. However, you can use a different version of this by modifying the toolkit applications props file. For example, you can edit EmpowerUpload.props and change the PropertyFile value to another file name in the Common Application data folder or an absolute path:



```

EmpowerUpload.props - Notepad
File Edit Format View Help
<?xml version="1.0" encoding="utf-8" ?>
<propertylist>
    <property id="PropertiesFile" type="simple">
        <! [CDATA[LABVANTAGE.props]]>
    </property>
    <property id="Debug" type="simple">
        <! [CDATA[Y]]>
    </property>
    <property id="UseConsole" type="simple">
        <! [CDATA[N]]>
    </property>
    <property id="Page" type="simple">
        <! [CDATA[rc?command=page&page=EmpowerUpload]]>
    </property>
    <property id="EmpowerLoginPrompt" type="simple">
        <! [CDATA[Y]]>
    </property>
    <property id="PolicyNode" type="simple">
        <! [CDATA[]]>
    </property>
    <property id="PolicyNodeColumn" type="simple">
        <! [CDATA[eu_PolicyNode]]>
    </property>
</propertylist>

```

- In the configuration files (EmpowerUpload.props and EmpowerDownload.props), you will find the custom column to use as Policy Node column (PolicyNodeColumn). By default, this is eu_PolicyNode.

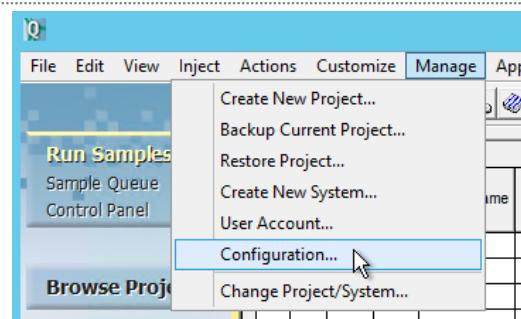
26.1.9 Empower Custom Field Setup

These Empower custom fields must be defined in every Empower project used for LabVantage LIMS integration. The table below presents the specific case-sensitive field name, type, and size of each.

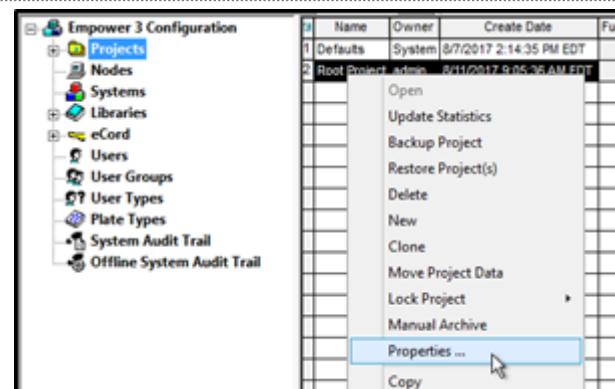
| Name | Field Type | Type, Width, and Source | Description |
|-------------------|------------|---|---|
| eu_PolicyNode | SampleSet | Text, 80, Keyboard | During the download of a new SampleSetMethod, the user chooses a download rule, which equates to a Policy node ID. This is recorded in the SampleSet to define how the SampleSet is to be uploaded. |
| eu_LIMSQCBatchID | SampleSet | Text, 40, Keyboard | During the download of a new SampleSetMethod, this records the ID of the QCBatch, either which was downloaded in AQC mode, or created in Candidate Mode. |
| eu_LIMSID | Sample | Text, 40, Keyboard | During the download mapping, every SampleSetLine mapped records either the SampleID or the ReagentLotID for that line. |
| eu_SDCID | Sample | Text, 20, Keyboard | During the download mapping, for the SampleSetLine, an indicator if the eu_LIMSID is either a Sample or ReagentLot |
| eu_UploadFlag | Sample | Boolean, Keyboard | During the download mapping, for the SampleSetLine, an indicator that the SampleSetLine is not to have its results uploaded |
| eu_LIMSDatasetkey | Sample | Text, 200, Keyboard | During the download mapping, for the SampleSetLines that are mapped, this is the link(s) to the sdidata records that are associated with this SampleSetLine. |
| eu_ExcludeFlag | Sample | Boolean
Default=No
Translation
0=No
1=Yes
Keyboard | An indicator in the Base SampleSetMethod that suggest that this Inject Samples SampleSetLine should not be mapped. Typical use is that position 1 of the SampleSetMethod may be for an Injection Blank and no sample should be mapped to this position. |

Procedure

1. Launch the Empower Configuration Manager from within Empower Quickstart.



2. Select your project. You could select Defaults. Or you could select the Root Project for all your LIMS Projects.
Right-click your project.
Click **Properties...**



3. Select the **Custom Fields** tab.
Add or configure the seven mandatory custom fields for each of your LIMS projects. These custom fields are described above.

| General Custom Fields Access Integrity Processing | | | | |
|---|------------------|------------|------------|-------|
| E | Name | Type | Field Type | Width |
| 4 | LVTM | Text | Sample | 20 |
| 5 | Level Values | Enum | Sample | 32 |
| 6 | Sample Matrix | Enum | Sample | 32 |
| 7 | SampleName | Text | Sample | 32 |
| 8 | SampleWeight | Real (0.0) | Sample | 11 |
| 9 | eu_Custom | Real (0.0) | Component | 12 |
| 10 | eu_ExcludeFlag | Boolean | Sample | 3 |
| 11 | eu_LMSDatasetKey | Text | Sample | 200 |
| 12 | eu_LMSID | Text | Sample | 40 |
| 13 | eu_LMSQCBatchID | Text | Sample Set | 40 |
| 14 | eu_PolicyNode | Text | Sample Set | 80 |
| 15 | eu_SDCID | Text | Sample | 20 |
| 16 | eu_UploadFlag | Boolean | Sample | 3 |
| 17 | kathy | Real (0.0) | Peak | 12 |

Once these are configured, click OK

Installation Verification: Initials indicate custom fields have been added or configured. Record the Empower Project name.

| Project Name | Role | Initials | Date |
|--------------|----------|----------|------|
| | Executor | | |
| | Reviewer | | |

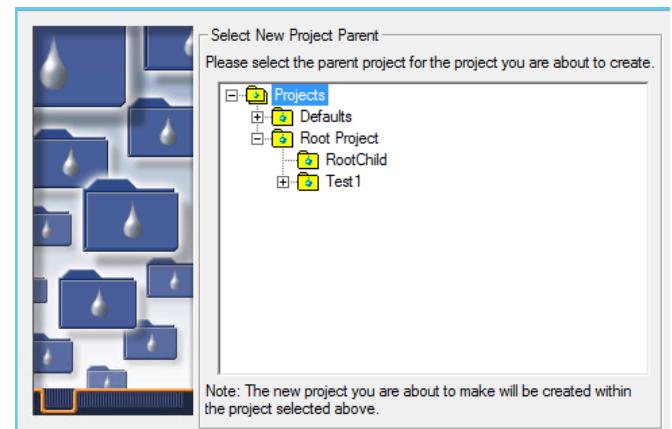
26.1.10 Empower Client Setup

On each Empower client that requires integration with LabVantage LIMS, you will install two components that you have previously installed on the Empower server. Please see [LabVantage LOM Setup](#) and [LabVantage Empower Interface Setup](#) for the two components that will require installation and configuration on each client.

26.1.11 LabVantage Empower Connector Configuration

Refer to the LabVantage *Empower Connector* documentation for details on associating the Empower Project to the Policy node. Next, carry out the steps listed here.

- Determine the parent root project for this installation and record it. The example here displays the hierarchy as shown when you add a new Project.

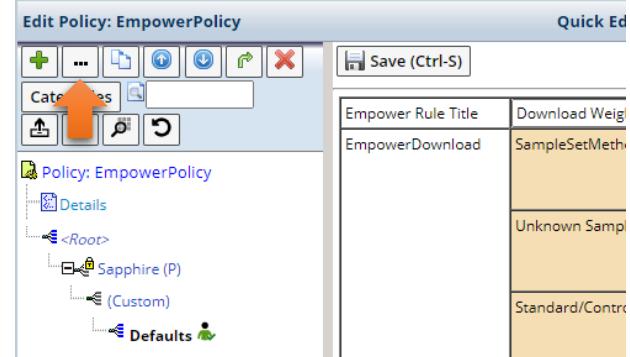


- Sign into LabVantage as a user who has access to the System Administration menus. Navigate to System Admin → Configuration → Policies

- Edit the EmpowerPolicy.

Select the **Defaults** node.

Click the ellipsis button above the policy node tree.

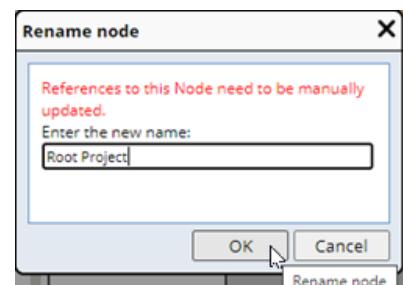


- Rename the Defaults node to match the name of the parent root project.

In this example the parent is “Root Project”

Click **OK**.

Record the new name:



The node is now labeled with your new name.

| | |
|----|--|
| 5. | In Empower Quickstart, run the Download from LabVantage menu item. Depending on your system configuration, you may get a LabVantage Logon dialog. |
| 6. | Logon to LabVantage. You should see the first page of the <i>Download Samples to Empower Options</i> showing your configurations to this point. |

Installation Verification: Initials indicate section 26.1.11 is completed.

| Root Project Name | Role | Initials | Date |
|-------------------|----------|----------|------|
| | Executor | | |
| | Reviewer | | |

Continue following the LabVantage Empower Connector documentation for further configuration options.

26.2 North West Analytics (NWA)

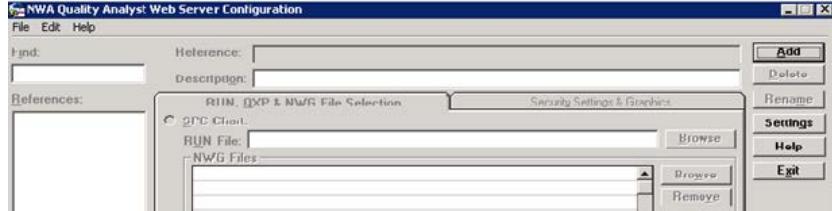
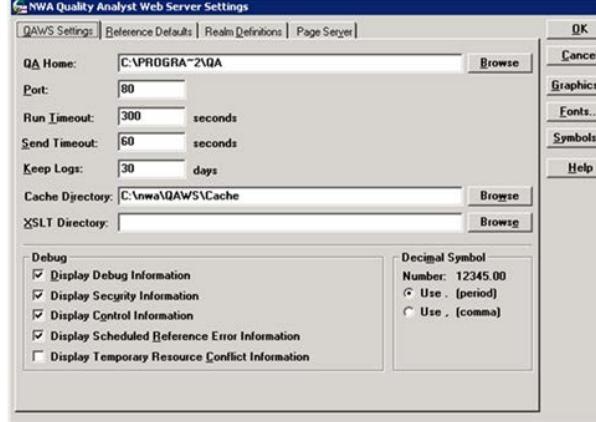
This section addresses the configuration of North West Analytics' Quality Analyst Web Server software. This allows LabVantage to execute run files for statistical evaluation of data. Before beginning, you must follow NWA's documentation to install and test the Web Server.

26.2.1 Requirements

- NWA Quality Analyst (referred to as "NWA QA") requires 32-bit Oracle ODBC drivers. You must therefore install the 32-bit Oracle Client, even if you are running in a 64-bit Windows OS and using a 64-bit Oracle DBMS. The 32-bit Oracle Client will provide the required 32-bit ODBC drivers, as well as the 32-bit SQL*Net and SQL*Plus. This NWA QA client will be used to build runfiles.
- NWA Quality Analyst Web Server (referred to as "NWA QAWS") is supported on a limited number of platforms and versions. Please see the [Release Notes](#) for operating system requirements.

26.2.2 Configuration

This procedure configures NWA QAWS to use LabVantage runtime files.

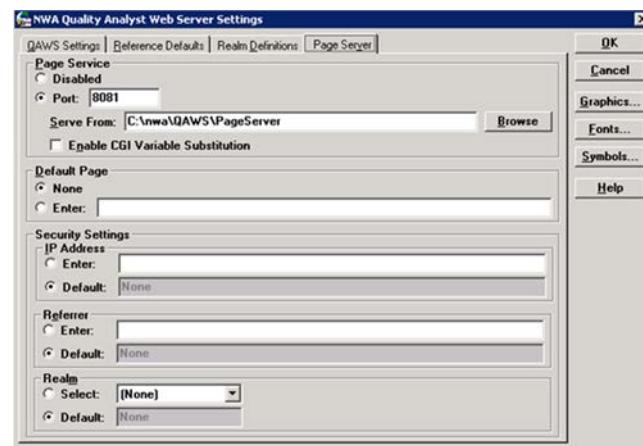
| | |
|----|--|
| 1. | <p>On the machine hosting NWA QAWS, create directories for the Web Server Cache and Page Server. During this procedure, we will assume these directories are C:\NWA\QAWS\Cache and C:\NWA\QAWS\PageServer, respectively. Record your actual values:</p> <p>Web Server Cache path: _____</p> <p>Page Server Cache path: _____</p> |
| 2. | Launch the Web Server Configuration program (Start → Programs → NWA Quality Analyst Web Server → Web Server Configuration). |
| 3. | <p>Click the "Settings" button on the right.</p>  |
| 4. | <p>Specify values for "QA Home" and "Cache Directory".</p> <p>"QA Home" is the path to where NWA Quality Analyst (not NWA QAWS) is installed.</p> <p>"Cache Directory" is the NWA QAWS cache directory you just created.</p>  |

5. If the default port (port 80) is already in use (or another available port is desired), you can change the "Port". However, if you change the port to anything other than 80, you must specify the port in the "NWA Policy" in the LabVantage application, located at the "System Admin → Configuration → Policies". In the NWA Policy, set the property "NWA Server Configuration → QAWS Port Number" to the new port number.

Installation Verification: Record the actual values for QAWS Settings

| Property | Value |
|-------------------|---|
| QA Home: | |
| Cache Directory: | |
| Port Number: | |
| Choose an option: | <input type="checkbox"/> This is port 80. No additional configuration is needed.
<input type="checkbox"/> Port 80 not available. The "NWA Policy" was updated. |

5. Select the "Page Server" tab.
 Select the "Port" radio button.
 For "Port", enter a port that is not in use.
 The Web Server port must be different than the Page Server port.
 For "Serve From", enter the page server directory you just created. Leave the "Enable CGI Variable Substitution" checkbox unchecked.



Installation Verification: Record the actual values for Page Server settings

| Property | Value |
|---------------|-------------------|
| Port Number: | |
| Serve From: | |
| Enable CGI... | Enabled (checked) |

6. Click "OK" and acknowledge any warning messages that may appear.
 7. Select File → Save in the Web Server Configuration dialog, then select File → Exit.
 8. Launch the Web Server (Start → Programs → NWA Quality Analyst Web Server → Web Server).

| | |
|-----|--|
| 9. | A prompt asks for the activation key. Enter the activation key (including dashes) for NWA Quality Analyst Web Server and record it. |
| 10. | Click "OK" in the NWA QAWS License validation dialog. |
| 11. | The QA Web Server window will show the full version, serial number, configured directories, and configured ports. Verify that this information is correct and that there are no error messages regarding port conflicts. Close the QA Web Server dialog. |

Installation Verification: Initials indicate section 26.2.2 is completed and values recorded by Executor.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

26.2.3 Verification

To verify the NWA QAWS Page Server configuration, we will create a file, place it in the Page Server directory, and access it from a remote system. Make certain NWA QAWS is running before executing the steps below. Begin by verifying that no errors occur when starting NWA QAWS.

| | |
|----|---|
| 1. | Navigate to the NWA QAWS Page Server directory. |
| 2. | Create a plain text file in this directory named "test.txt" and place the following text in it:
<i>File from page server test.</i> |
| 3. | Save and close the file. From the remote system, login as a normal Windows or domain user account (this is meant to represent a typical end-user). |
| 4. | Open a Web browser and enter the following URL into the address field:
<code>http://<server name>.<domain>:<Page Server port>/test.txt</code> |
| 5. | Verify that the contents of the "test.txt" file placed on the Page Server directory are displayed in the Web browser. The Page Server should now properly serve content to a typical end-user system. |

Installation Verification: Initials indicate a successful test of the NWA QAWS.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

26.2.4 Deploying LabVantage Runfiles

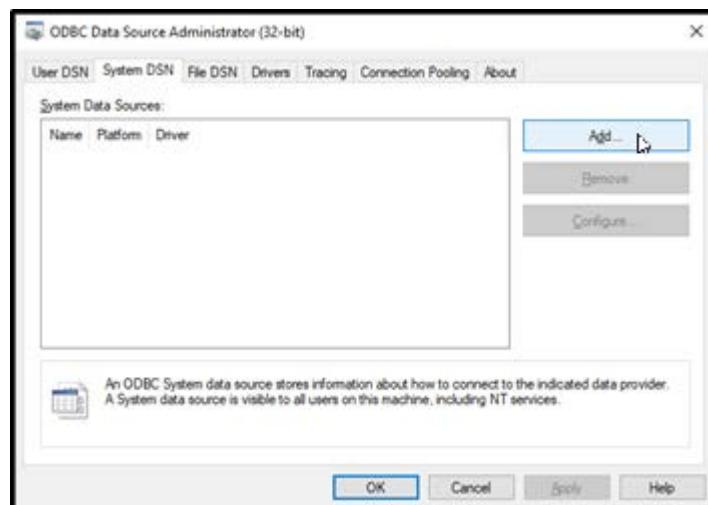
This example deploys "Stability Analytics" runfiles distributed by LabVantage Solutions. This procedure is to be performed on the server where the NWA Web Server is installed. If using an Oracle DBMS, the tnsnames.ora file must define the Service Name. An example is shown below with TNS_ALIAS, HOSTNAME, DBPORT, and TNS_SERVICENAME as variables representing your values.

```
TNS_ALIAS =  
(DESCRIPTION =  
  (ADDRESS = (PROTOCOL = TCP)(HOST = HOSTNAME)(PORT = DBPORT))  
  (CONNECT_DATA =  
    (SERVER = DEDICATED)  
    (SERVICE_NAME = TNS_SERVICENAME)  
  )  
)
```

| 1. | <p>The LabVantage Distribution contains the "Stability Analytics" runfiles in the "nwa/QAWS/QAData" folder. Copy the QAData folder from the LabVantage Distribution to C:\NWA\QAWS\QAData where C: is the installation drive and NWA is the installation folder.</p> <p>Record the actual path: _____</p> | | | | | | | | | | |
|---------------------------|---|---------------------|----------------|------------------------|---------------------------|------------------------|---------------------------|---------------------------|------------------------|---------------------------|------------------------|
| 2. | <p>If you are using a Microsoft SQL Server DBMS, you must rename these files as shown below. Oracle DBMS implementations do not require file name changes.</p> <table border="1"><thead><tr><th>Original File Name:</th><th>New File Name:</th></tr></thead><tbody><tr><td>StabilityAnalytics.DAT</td><td>OraStabilityAnalytics.DAT</td></tr><tr><td>StabilityAnalytics.NWH</td><td>OraStabilityAnalytics.NWH</td></tr><tr><td>MSSStabilityAnalytics.DAT</td><td>StabilityAnalytics.DAT</td></tr><tr><td>MSSStabilityAnalytics.NWH</td><td>StabilityAnalytics.NWH</td></tr></tbody></table> | Original File Name: | New File Name: | StabilityAnalytics.DAT | OraStabilityAnalytics.DAT | StabilityAnalytics.NWH | OraStabilityAnalytics.NWH | MSSStabilityAnalytics.DAT | StabilityAnalytics.DAT | MSSStabilityAnalytics.NWH | StabilityAnalytics.NWH |
| Original File Name: | New File Name: | | | | | | | | | | |
| StabilityAnalytics.DAT | OraStabilityAnalytics.DAT | | | | | | | | | | |
| StabilityAnalytics.NWH | OraStabilityAnalytics.NWH | | | | | | | | | | |
| MSSStabilityAnalytics.DAT | StabilityAnalytics.DAT | | | | | | | | | | |
| MSSStabilityAnalytics.NWH | StabilityAnalytics.NWH | | | | | | | | | | |
| 3. | <p>Installation Verification: Choose an option</p> <ul style="list-style-type: none"><input type="checkbox"/> Oracle database is in use. No modification of file names is necessary<input type="checkbox"/> Microsoft SQL Server is in use and file names were modified as shown <p>Open the Microsoft ODBC Administrator. On a 64-bit Windows OS, run the ODBC administrator from C:\Windows\SysWOW64\odbcad32.exe (not C:\Windows\System32\odbcad32.exe). Make certain the 32-bit Oracle ODBC drivers are installed as specified in Requirements.</p> | | | | | | | | | | |

4. Select the "System DSN" tab

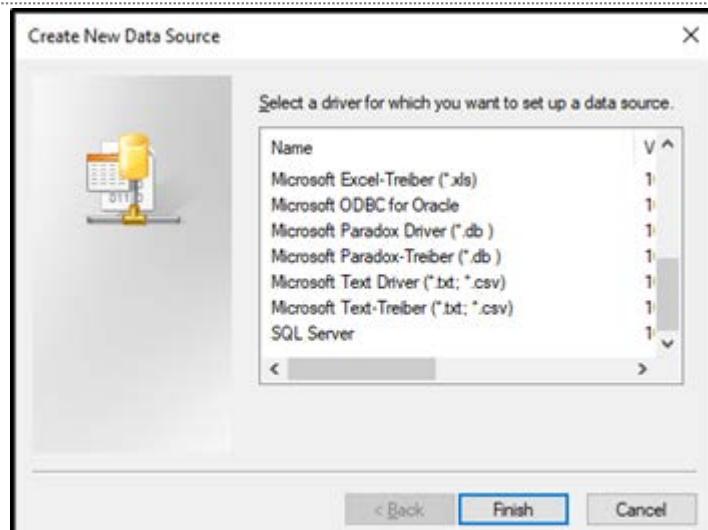
Click the "Add" button.



5. Choose the driver to setup a Data Source.

Record your selection in the table after step 7 of this procedure.

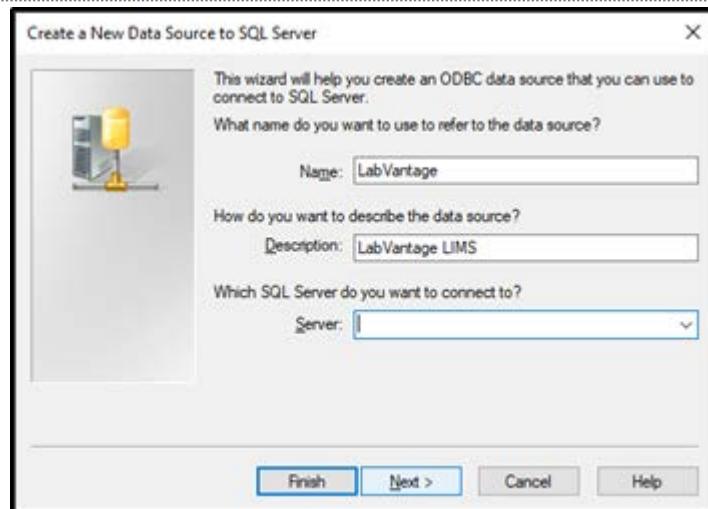
A Microsoft SQL Server example will be shown.



6. Enter the values to connect to the LabVantage database.

Record your selection in the table after step 7 of this procedure.

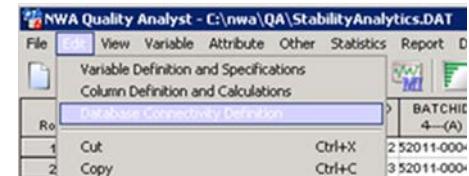
Complete the Data Source Wizard



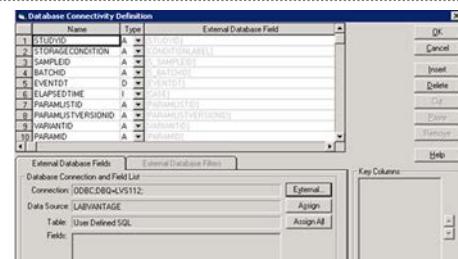
| | |
|----|---|
| 7. | <p>Using a text editor, edit the file C:/NWA/QAWS/QAData/StabilityAnalytics.NWH. Look for a pattern beginning with ODBC. Set the values as described below, depending on your DBMS:</p> <p>Oracle</p> <pre>ODBC ;DBQ=TNSSERVICENAME ;UID=USERID ;PWD=PASSWORD</pre> <p>Set DBQ to the TNS Alias that is defined in the 32-bit Oracle Home's tnsnames.ora file.</p> <p>Set UID and PWD to the database UserId and Password (respectively).</p> <p>Microsoft</p> <pre>ODBC ;UID=USERID ;PWD=PASSWORD</pre> <p>Set UID and PWD to the database UserId and Password (respectively).</p> <p>Note that SQL Server does not use the DBQ parameter. At the time this was written, the StabilityAnalytics.NWH file for SQL Server was provided with a DBQ parameter and value (similar to the Oracle example shown above), but this is scheduled to be removed at some undetermined time in the future. Therefore, you should examine your file. If your file has a DBQ parameter and value similar to the Oracle example shown above, delete the DBQ parameter and value. The resulting string should be in the format shown in the SQL Server example above.</p> |
|----|---|

Installation Verification: Record actual values for

| | Actual Value |
|---------------------|---|
| Datasource Driver | |
| Datasource Name | |
| ODBSString (step 7) | |
| 8. | Run NWA Quality Analyst. Select the option: "Open an Existing DataSet". |
| 9. | Browse and choose the file "StabilityAnalytics.DAT" from the C:/NWA/QAWS/QAData folder. |
| 10. | You will be prompted to enter values for the "parameters" used in the SQL. Click the "Cancel" button. Choose "Use Previous Data". |
| 11. | Under the "Edit" menu, choose "Database Connectivity Definition". |



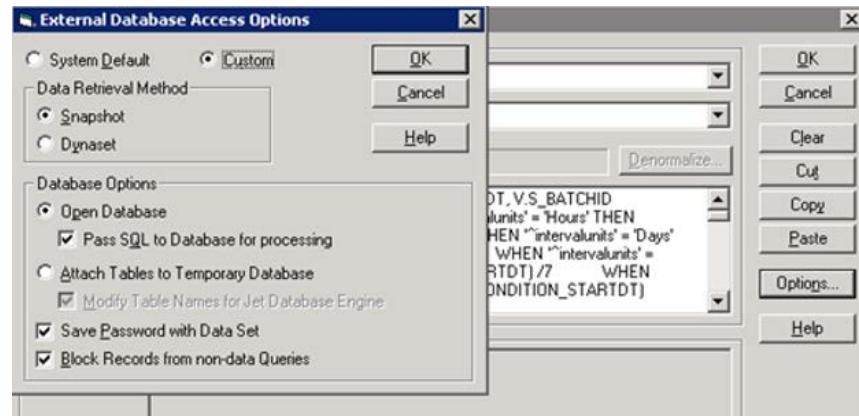
12. Click the "External..." button.
Specify the System DSN for the LabVantage database.



13. Enter the password for the database when prompted.
Click OK.



14. Click the "Options..." button.
Choose "Custom".
Check the "Pass SQL to database for processing" checkbox.
Click OK.



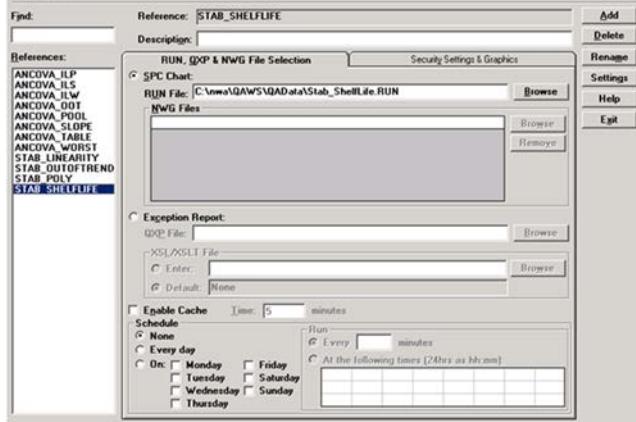
15. Click OK. Save the configuration, then exit NWA QA

16. The following steps will configure references for each of the .RUN files. Open the file C:\Program Files\QAWS\QAWS.CFG using a text editor.

17. Copy these lines and paste them at the end of the QAWS.CFG file:

```
[REFERENCE :ANCOVA_ILP]
RUNfile=C:\NWA\QAWS\QAData\Ancova_ILP.RUN
[REFERENCE :ANCOVA_ILS]
RUNfile= C:\NWA\QAWS\QAData\Ancova_ILS.RUN
[REFERENCE :ANCOVA_ILW]
RUNfile= C:\NWA\QAWS\QAData\Ancova_ILW.RUN
[REFERENCE :ANCOVA_OOT]
RUNfile= C:\NWA\QAWS\QAData\Ancova_OOT.RUN
[REFERENCE :ANCOVA_POOL]
RUNfile= C:\NWA\QAWS\QAData\Ancova_Pool.RUN
[REFERENCE :ANCOVA_SLOPE]
RUNfile= C:\NWA\QAWS\QAData\Ancova_Slope.RUN
[REFERENCE :ANCOVA_TABLE]
RUNfile= C:\NWA\QAWS\QAData\Ancova_Table.RUN
[REFERENCE :ANCOVA_WORST]
RUNfile= C:\NWA\QAWS\QAData\Ancova_Worst.RUN
[REFERENCE :STAB_LINEARITY]
RUNfile= C:\NWA\QAWS\QAData\Stab_Linearity.RUN
[REFERENCE :STAB_OUTOFTRENDIR]
RUNfile= C:\NWA\QAWS\QAData\Stab_OutOfTrendIR.RUN
```

| | |
|-----|---|
| | <pre>[REFERENCE:STAB_POLY] RUNfile= C:\NWA\QAWS\QAData\Stab_Poly.RUN [REFERENCE:STAB_SHELF LIFE] RUNfile= C:\NWA\QAWS\QAData\Stab_ShelfLife.RUN</pre> |
| 18. | Save the file. |
| 19. | Launch the Web Server Configuration program (Start → Programs → NWA Quality Analyst Web Server → Web Server Configuration). |
| 20. | Make certain all of the Stability Analytics References you just added are displayed in the References panel on the left. |



Configuration of NWA for LabVantage Stability Analytics is complete.

Installation Verification: Initials indicate section 26.2.4 is complete.

| Role | Initials | Date |
|----------|----------|------|
| Executor | | |
| Reviewer | | |

26.3 Single Sign On (SSO)

LabVantage provides an implementation of a Web Single Sign On (SSO) architecture that allows LabVantage to delegate user authentication using the SAML2.0 Shibboleth3 Service Provider (SP) module installed in a proxy server. This example shows how the Shibboleth SAML2 service provider (SP) module can be installed and configured in a proxy server and setup LabVantage for logon using the samltest.id test site. Since Red Hat provides their own JBCS Apache HTTP Server 2.4, this example uses that as the proxy server. This example can be performed on non-clustered JBoss EAP standalone instances. It can also be successfully performed on each node in a cluster. However, custom configuration is required to make Shibboleth work through a load balancer as a single URL from the load balancer to Apache, and from there to each node. The degree and type of custom configuration required will depend on the type of load balancer used. As such, there is no repeatable procedure that applies to all possible custom configurations. Refer to Shibboleth documentation for more information. It is expected that a SAML2 authentication infrastructure is in place. Expertise in administering SAML2 Web SSO authentication is required. These procedures use the samltest.id test site to verify that the configuration is functional. Production installations must verify against their existing Shibboleth SAML2 implementation. This example uses JBCS Apache HTTP Server 2.4 as the proxy server. Accordingly, install it on the same machine as JBoss EAP as described in [Install JBoss Core Services Apache HTTP Server 2.4](#).

LabVantage also supports the Waffle SSO servlet filter for Kerberos authentication. Only Windows operating systems are supported. At a high-level, installing the Waffle SSO servlet filter requires:

1. Exploding your application.ear and application.war (where "application" is the context root of your web application).
2. Packaging the jars required by Waffle into your application.ear as custom project jars.
3. Adding the servlet definition and filter mapping information to the deployment descriptor of your application.war.
4. Repackaging your application.war and application.ear.

These tasks require knowledge of LabVantage application architecture, development tools, and custom project code (if any). Accordingly, users who want to install the Waffle SSO servlet filter are advised to contact LabVantage Technical Support for assistance.

26.3.1 Download and Install Shibboleth2 SP

This procedure guides you through the installation of Shibboleth

| | |
|----|---|
| 1. | Download the latest Shibboleth2 SP (3.1 has been tested) from
https://shibboleth.net/downloads/service-provider/latest/ |
| 2. | Install Shibboleth2 SP per Shibboleth instructions. |
| 3. | Copy apache24.config from /shibboleth-sp/etc/shibboleth/ to httpd_home/etc/httpd/conf.d/ |
| 4. | Rename apache24.config to shibd.conf |
| 5. | Add the highlighted line in shibd.conf immediately after the "location" directive.

<Location /Shibboleth.sso>
AuthType None
Require all granted
</Location>
ProxyPass /Shibboleth.sso ! |

6. Continue editing the shibd.conf file to specify protected locations (replace WEBAPPROOTCONTEXT with your application root context):

```
<Location /WEBAPPROOTCONTEXT/rc/login>
    AuthType shibboleth
    ShibRequestSetting requireSession 1
    require valid-user
</Location>
<Location /WEBAPPROOTCONTEXT/testss.jsp>
    AuthType shibboleth
    ShibRequestSetting requireSession true
    require valid-user
</Location>
<Location /WEBAPPROOTCONTEXT/esigss.jsp>
    AuthType shibboleth
    ShibRequestSetting requireSession true
    require valid-user
</Location>
```

7. Start Apache HTTP Server and make certain the Shibboleth Daemon service is started, then go to this URL (replace APACHEWEBROOTURL with your Apache root URL, such as the default HOSTNAME at port 80):

APACHEWEBROOTURL/Shibboleth.sso/Session

26.3.2 Exchange SAML2 Metadata XMLs with IDP

To establish trust relationship, the IDP and SP must exchange metadata XMLs that contain certificate keys. You can use the samltest.id test IDP or a given set of IDP metadata as described below.

1. For the samltest.id test IDP, the IDP metadata is downloaded from the URI as configured by this line in the shibboleth2.xml file:

```
<MetadataProvider type="XML" validate="true"
    url="https://samltest.id/saml/idp" backingFilePath="SAMLtest.xml" />
```

Alternatively, if given the IDP metadata, it can be stored locally and referenced in the shibboleth2.xml by adding this:

```
<MetadataProvider type="XML" file="C:\opt\shibboleth-
sp\XXX_IDP_METADATA.xml" />
```

2. Shibboleth2 SP must submit metadata XMLs to the IDP either by upload to samltest.id or submission to the IDP administrator. In order to generate a correct Metadata file, you must first edit the shibboleth2.xml and enter the correct SP entityID. In the example below, the entityID in ApplicationDefaults is the SP entityID, while the entityID in SessionInitiator is the IDP entityID.

```
<ApplicationDefaults entityId=
    https://HOSTNAME.DOMAIN.com/shibboleth" REMOTE_USER="eppn subject-id
    pairwise-id persistent-id"
    cipherSuites="DEFAULT:!EXP:!LOW:!aNULL:!eNULL:!DES:!IDEA:!SEED:!RC4:
    !3DES:!kRSA:!SSLv2:!SSLv3:!TLSv1:!TLSv1.1">
```

If you are testing against samltest.id, configure the SSO IDP as:

| | |
|----|---|
| | <pre><SSO entityID="https://samltest.id/saml/idp" discoveryProtocol="SAMLDS" discoveryURL="https://ds.example.org/DS/WAYF" forceAuthn="true"> SAML2 </SSO></pre> <p>If you plan to use IDP authentication for ESig, configure the logout element by using Local-only:</p> <pre><Logout>Local</Logout></pre> <p>Generate and download a Metadata XML file by starting the Shibboleth 2 Daemon Service, then entering this URL into the browser:</p> <pre>APACHEWEBROOTURL/Shibboleth.sso/Metadata</pre> <p>The metadata file is generated and downloaded from the browser. Save it to any location to be submitted to the IDP administrator.</p> |
| 3. | To test against the samltest.id test IDP, upload the generated Metadata.XML to https://samltestid/upload.php . |

26.3.3 Mapping

Modification of attribute-map.xml is needed to extract attributes from IDP authentication assertion.

An attribute or the Name User Id from IDP authentication assert after successful authentication must be mapped to a LabVantage SysUserId or Logon Name for the User to logon to LabVantage in attributemap.xml.

| | |
|----|---|
| 1. | For testing against the samltest.id site, if we want to extract uid and mail attributes, the following two lines must be added to the attribute mappings:

<pre><Attribute name="urn:oid:0.9.2342.19200300.100.1.1" id="AJP_uid"/> <Attribute name="urn:oid:0.9.2342.19200300.100.1.3" id="AJP_mail"/></pre> |
| 2. | For a regular attribute mapping example, if a specific customer's IDP has REMOTE_USER in an attribute called HHSID, it must be added to the attribute mapping as follows:

<pre><Attribute nameFormat="urn:oasis:names:tc:SAML:2.0:attrname-format:unspecified" name="HHSID" id="AJP_HHSID"/></pre> |
| 3. | Some IDPs may just send an authenticated NameID by default. The following example shows mapping NameID to the attribute AJP_eppn, which is to be mapped to the LabVantage SysUserId or Logon Name in LabVantage Console (as shown in Setup LabVantage for SSO).

<pre><Attribute name="urn:oasis:names:tc:SAML:1.1:nameid-format:unspecified" id="AJP_eppn"> <AttributeDecoder xsi:type="NameIDAttributeDecoder" formatter="\$Name" defaultQualifiers="true" /> </Attribute></pre> |
| 4. | It is important to setup the mapping correctly. Otherwise, the following LabVantage error message appears after authentication with the IDP: "Not Authenticated. Single Sign On handler cannot determine user name."

The AJP_ prefix tells Shibboleth SP to extract the attribute and pass it to the AJP connector. |

26.3.4 Allowing Mapped Attributes

Beginning in JBoss 7.2.8, a [security fix](#) will prevent attributes from being passed into the AJP connector unless attributes are allowed through a JDK startup parameter. What this means is that for any system patched to JBoss 7.2.8 or higher, the standalone configuration used to start JBoss will require further modification. This modification will need to be performed on all nodes of a cluster. While this change is not necessary for JBoss 7.2.7 or earlier, it is a good idea to make this change now in order to prevent issues should you decide to apply a higher JBoss patch later.

| | |
|----|---|
| 1. | In the previous section you would have named some custom attributes. For example:

AJP_uid and AJP_mail |
| 2. | Attributes will need to be allowed by modifying
JBOSS_HOME\bin\standalone.conf.bat (Windows) or standalone.conf(RHEL).

Open this file using a text editor. |
| 3. | Add a line:

Windows

set "JAVA_OPTS=%JAVA_OPTS% -
Dio.undertow.ajp.allowedRequestAttributesPattern=. *"

RHEL

JAVA_OPTS="\$JAVA_OPTS -
Dio.undertow.ajp.allowedRequestAttributesPattern=. *"

Please note that the above string is one line. There are no spaces or return characters after the hyphen (-). |
| 4. | Save your modified file. |

Allowing any attribute would not be secure if the AJP port is exposed and accessible by remote clients. If firewall restrictions properly limit AJP access to internal access from your httpd proxies, then AJP cannot be abused by any remote client regardless of the io.undertow.ajp.allowedRequestAttributesPattern setting.

Otherwise, besides using the '.*' wild card, you would have to manually specify any and all custom AJP attribute names you need to allow in the io.undertow.ajp.allowedRequestAttributesPattern property for requests with such attributes to be allowed. An example is:

```
set "JAVA_OPTS=%JAVA_OPTS%-Dio.undertow.ajp.allowedRequestAttributesPattern=AJP_mail"
```

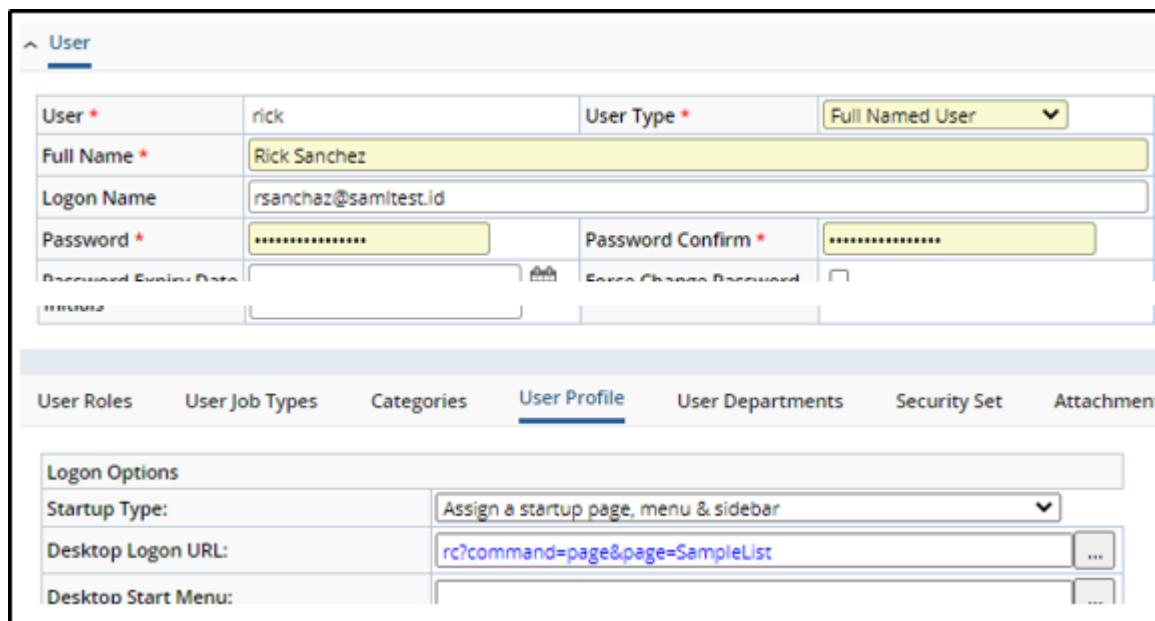
Each individual attribute name requires an additional line in this file.

26.3.5 Setup LabVantage for SSO

The samltest.id test site has 3 preconfigured users: rick, morty, and sheldon. To test Shibboleth, you must create at least one of these Users in LabVantage and set the Logon Name to redirect to samltest.id as follows:

| | |
|----|---|
| 1. | Sign into the LabVantage application as a user who has access to the System Administration menus and has been granted the Security module |
|----|---|

2. Navigate to System Admin → Security → Users. Add a user as shown.



3. In the example above, the Logon Name redirects you to samltest.id for verification as User "rick". The "Logon URL" determines the page that opens after logon. This same example could be followed for Sheldon and Morty. Save all changes.
4. Log off of LabVantage.
5. Sign into the [LabVantage Console](#).
6. Navigate to Configuration → Console → Applications. Select your application. Expand the [Logon Page Configuration](#).
7. Set "Enable Single Sign On" to Yes. This enables the internal LabVantage Single Sign On functionality. When enabled, the logon.jsp page automatically redirects to the Request Controller logon URL without asking for a Username and Password.
8. Enter the Database Name or ID for "Single Sign On Database". This is the database to which you will logon when using SSO. This is the Database Id for Oracle, or the Database Name for SQL Server. SSO must have one (and only one) LabVantage database for SSO Users. This is required because Users will not have a logon page to choose a database.
9. Optionally, provide a "Single Sign On Logoff URL". This is the page to display when logging off with SSO. This is provided because the logon page does not apply to SSO Users. This page is typically a customer's "User landing page". If this is not specified, Users will see a page with a message confirming that the User has logged out, and the user will be prompted to close the browser window.
10. Optionally, provide a "Single Sign On ESig URL". This is the URL for electronic signatures with SSO enabled. This applies only to SAML2.0 Web SSO where the SAML2 IDP supports the force re-

| | |
|-----|---|
| | <p>authentication attribute in the SAML2 protocol If you want to use LDAP for ESig authentication, configure LDAP external authentication first and set this property value to:</p> <pre>/[applicationname]/rc?command=page&page=StandardESigForm</pre> <p>...where [applicationname] = the name of your application. If your application is named 'labvantage', you may use this example:</p> <pre>/labvantage/rc?command=page&page=StandardESigForm</pre> |
| 11. | Set a "User Id Attribute Name". This is the attribute name from the SSO authenticated user to map to the LabVantage User SysUserId or Logon Name. This would be the AJP_uid, AJP_mail, AJP_HHSID, or AJP_eppn attribute names discussed in the Mapping section. In our previous examples, we are passing AJP_mail . |
| 12. | Log out of LabVantage Console then restart the application server software. |

26.3.6 Test SSO

This section gives an example using SAML. Before beginning, start the Shibboleth 2 Daemon Service.

| | | |
|----|---|---|
| 1. | <p>Using your browser, navigate to the URL of your LabVantage application.</p> <p>If you are testing using the samltest.id test site, you should be redirected to samltest.id, and should therefore see this:</p> |  |
| 2. | Enter the username and password you just created (such as rick/psych). You should see the page specified by the "Logon URL". | |

Single Sign On configuration is complete.

26.3.7 Additional Information

This is additional information concerning the LabVantage implementation of Shibboleth SSO.

| | |
|----|---|
| 1. | To log on as a User who is not a valid User in the SSO IDP (such as a "super user"), you can use the normal logon.jsp with the parameter sso=n

Example: https://HOSTNAME:PORT/APPLICATION/logon.jsp?sso=n |
| 2. | Handling ESig in a Web SSO application is complex because the foundation of SSO is that a User need authenticate only once. There are several options to deal with this: <ol style="list-style-type: none"> 1. Use LDAP external authentication for Esig. 2. If your requirements do not include electronic signature, you may turn off ESig. This is not always recommended. 3. In the LabVantage application, configure the advancedtoolbar Element's "Electronic Signature" property to use "Require Reason Only". This executes an ESig prompt following |

| | |
|--|---|
| | <p>a button onClick event. However, the prompt asks for only an Audit Reason, not for re-authentication.</p> <p>4. Use the force re-authentication SAML2 attribute to handle ESig authentication. Not all SAML2 IDP implements the protocol, so check with your IDP administrator to confirm its support. Shibboleth2 IDP supports force-reauthentication, and the SSO ESig URL can be configured as /Shibboleth.sso/Logout?return=[esigpageurl]. This URL tells Shibboleth SP to do a local logout, then return back to the ESig page URL. Since the ESig page URL is protected, Shibboleth SP will redirect the browser to force re-authenticate against the IDP as shown below:</p> <p>3. If you use the force re-authentication SAML2 attribute, the electronic signature process will first present the SAML page.</p> <p>After providing the Username and Password, the "Require Reason Only" audit dialog opens:</p> <p>4. When Web SSO is enabled, switching Job Type will not re-authenticate. No Job Type should be configured to require re-authentication.</p> <p>5. This class: sapphire.ext.BaseWebSSOHandler holds the default LabVantage SSO implementation. Methods in this class can be overridden to provide a custom implementation specific to an SSO environment.</p> |
|--|---|

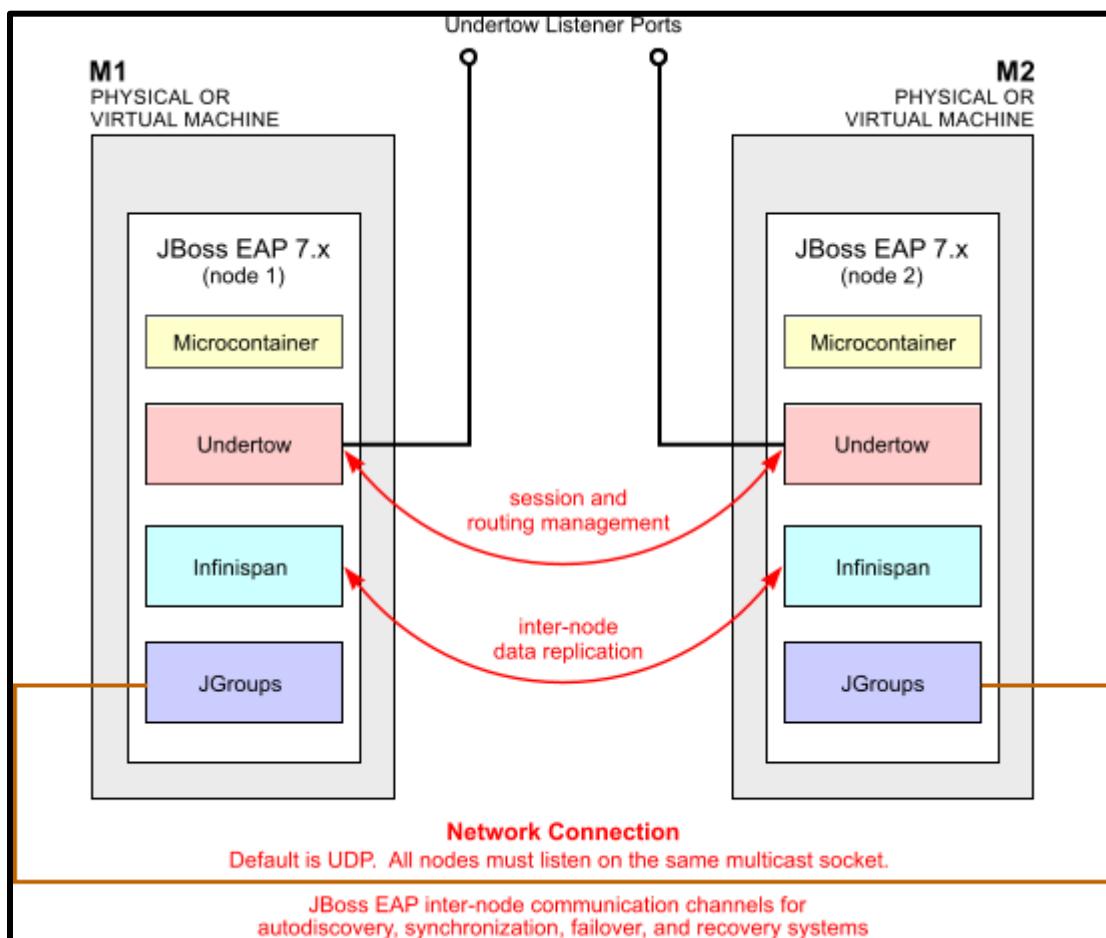
27 APPENDIX A: IDENTIFICATION OF EXECUTORS AND REVIEWERS

Print and sign or electronically sign this page to identify the personnel involved in this installation procedure.

| Printed Name | Signature | Initials |
|--------------|-----------|----------|
| | | |
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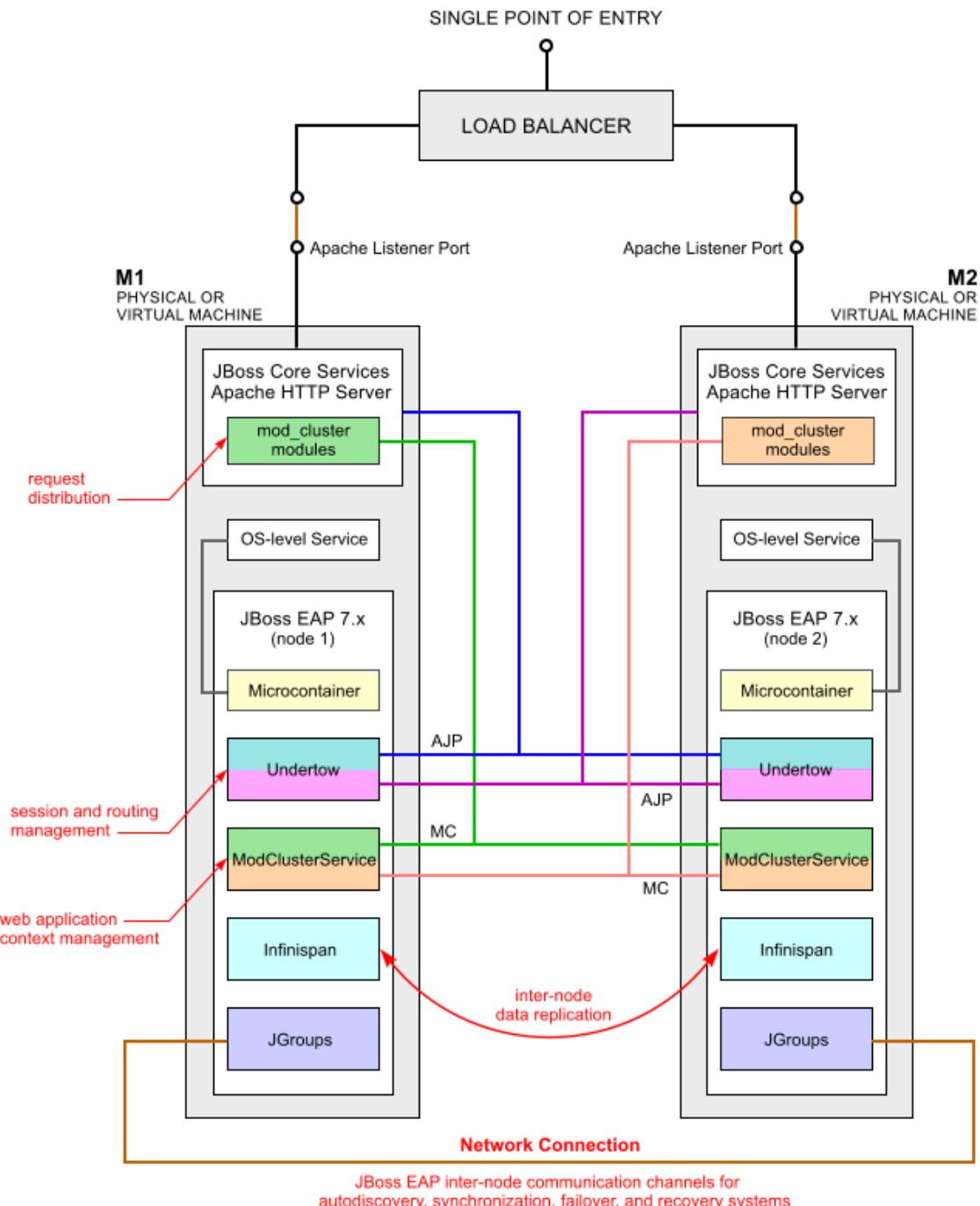
28 APPENDIX B: DIAGRAM OF A TWO-NODE HORIZONTAL CLUSTER

This diagram serves to illustrate the targeted JBoss architecture that will be achieved by executing the procedures in [JBoss EAP 7 Standalone Cluster Setup](#)



29 APPENDIX C: DIAGRAM OF TWO-NODE CLUSTER APACHE

This diagram illustrates a two-node horizontal cluster using JBoss Core Services and the Apache HTTP server front end which is the result of installing and configuring [JBoss Core Services Apache HTTP Server 2.4](#).



30 APPENDIX D: EXAMPLE OF CONFIGURING A DATABASE CONNECTION CHECKER

This screen capture shows an example of setting a Database Connection Checker as configured in [Database Connection Checkers](#). This example is for Oracle. It is accomplished by editing the datasource through the JBoss Management Console.

Red Hat JBoss Enterprise Application Platform JBossAdmin

< Back / Configuration ⇒ Subsystems / Subsystem ⇒ Datasourc... Drivers / Datasources & Drivers ⇒ Datasources

labvantage (enabled)
A JDBC data-source configuration

Attributes Connection Pool Security Credential Reference **Validation** Timeouts Statements / Tracking

⑦ Help

Check Valid Connection SQL:

Valid Connection Checker ...: org.jboss.jca.adapters.jdbc.extensions.oracle.OracleValidConnectionChecker

Valid Connection Checker ...:
Add new properties as key=value pairs. Press ↵ to add and ⌘⌫ to remove them.

Validate On Match: ON

Background Validation: OFF

Background Validation Mil...: MILLISECONDS

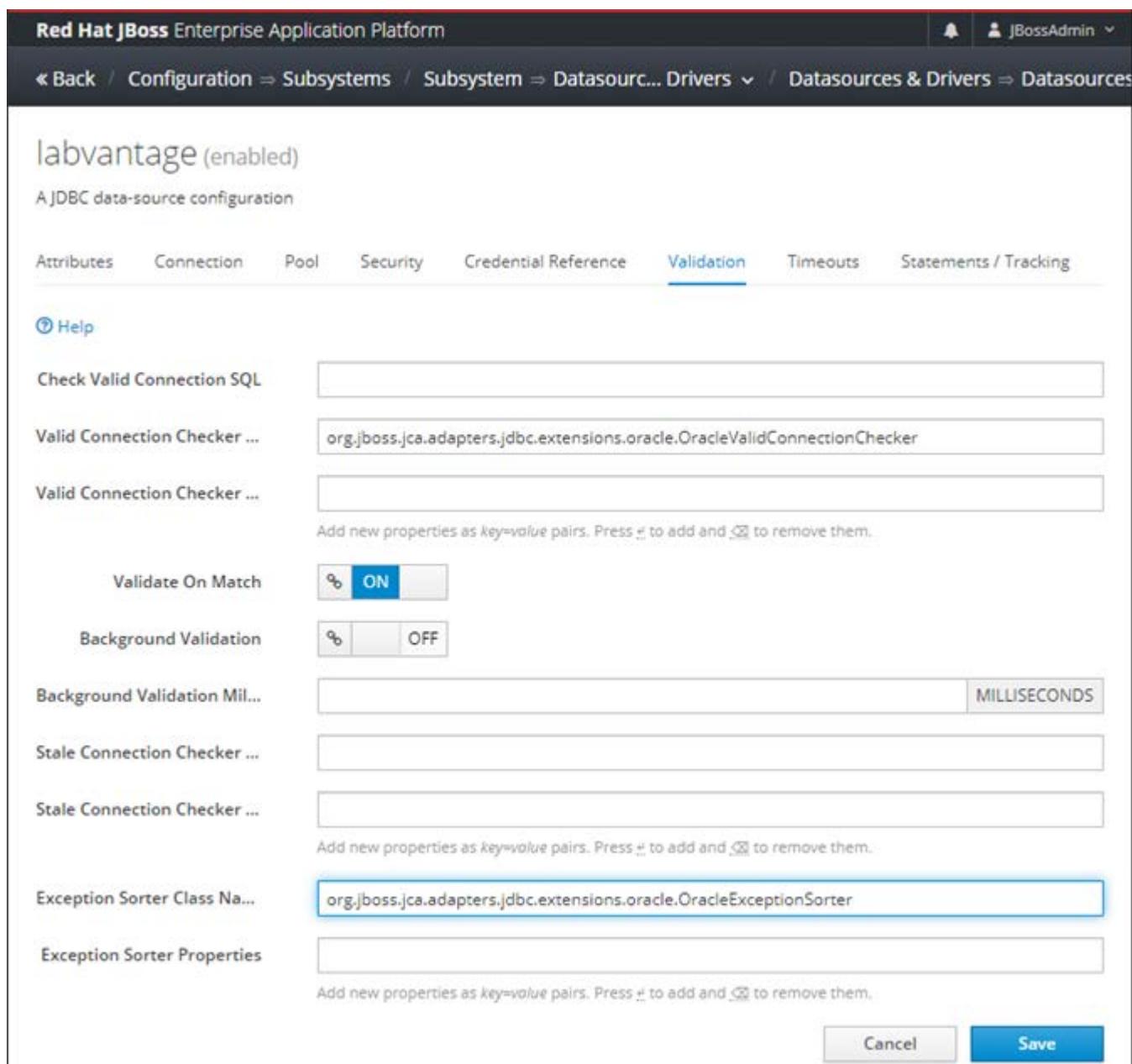
Stale Connection Checker ...:

Stale Connection Checker ...:
Add new properties as key=value pairs. Press ↵ to add and ⌘⌫ to remove them.

Exception Sorter Class Na...: org.jboss.jca.adapters.jdbc.extensions.oracle.OracleExceptionSorter

Exception Sorter Properties:
Add new properties as key=value pairs. Press ↵ to add and ⌘⌫ to remove them.

Cancel **Save**



31 APPENDIX E: Two-NODE HORIZONTAL CLUSTER DATA SOURCES

This diagram serves to illustrate the targeted data source architecture that will be achieved by executing the procedures in [JBoss EAP 7 Standalone Cluster Setup](#)

