Installation and Applying Maintenance

Universal Controller 7.8.x

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5.1 Installation and Applying Maintenance

There are separate procedures for installing and applying maintenance for Universal Controller.

5.1.1 Installation

Installation refers to the installation of Universal Controller 7.8.x on a machine with any supported platform that does not already contain an installed Controller.

If you are installing Universal Controller for the first time, see Universal Controller Installation for instructions.

5.1.2 Applying Maintenance

For Universal Controller 7.8.x, applying maintenance refers to the increase from a currently installed 6.1.x or later release of the Controller to a 7.8.x release of the Controller (for example, increase Controller 6.1.3.1 to Controller 7.8.0.0).

If you are applying maintenance to your version of Universal Controller, see Applying Maintenance to Universal Controller.

5.2 Database Permissions

In order to install Universal Controller, the database user configured for the Controller will require **DDL** (**D**ata **D**efinition **L**anguage) permission in the database during the install.

Once the install has been completed successfully, the configured database user requires only **DML** (**D**ata **M**anipulation **L**anguage) permissions for running the Controller.

6 Verifying Installation Package with PGP Signatures

6.1 Overview

For Universal Controller 7.8 and Universal Agent 7.8 forward, the installation packages are PGP-signed for security and authentication.

Verifying the files with digital signatures helps mitigate the risk of downloading and installing malicious or compromised software.

This page will show you how the signature interaction works and how you can verify the files once you download them.

6.2 Verifying PGP Signatures

The example provided uses The GNU Privacy Guard. Any OpenPGP compliant program should work successfully.

Each package has a corresponding .asc file (detached signature). For example, the release `universal-controller-7.8.0.0.zip` has a corresponding file, `universal-controller-7.8.0.0.zip.asc`.

These instructions assume you have already downloaded both of these files.

The example commands provided are for the verification of Universal Controller packages, but the instructions are the same for Universal Agent. The only difference in the commands are the file names.

6.2.1 1. Retrieve Public Key

Download the GPG public key from https://packages.stonebranch.com/uac/GPG-KEY-UAC.asc

6.2.2 2. Import and Certify the Public Key

Verify that the fingerprint of the public key is **B666 8901 95B2 A3E6 F8A2 1FC8 77D5 3847 2C46 C119**.

```
>gpg --import --import-options show-only GPG-KEY-UAC.asc
pub   rsa4096 2024-02-27 [C] [expires: 2027-02-26]
      B666890195B2A3E6F8A21FC877D538472C46C119
uid                      Stonebranch, Inc. <support@stonebranch.com>
sub   rsa4096 2024-02-27 [S] [expires: 2027-02-26]
sub   rsa4096 2024-02-27 [S] [expires: 2027-02-26]
```

Import the verified public key.

```
>gpg --import GPG-KEY-UAC.asc
gpg: key 77D538472C46C119: public key "Stonebranch, Inc. <support@stonebranch.com>" imported
gpg: Total number processed: 1
gpg:               imported: 1
```

Certify the public key by signing it with your private key.

```
>gpg --lsign B666890195B2A3E6F8A21FC877D538472C46C119

pub  rsa4096/77D538472C46C119
     created: 2024-02-27  expires: 2027-02-26  usage: C
     trust: unknown       validity: unknown
sub  rsa4096/2F768A37A6E81362
     created: 2024-02-27  expires: 2027-02-26  usage: S
sub  rsa4096/4836F914BEE9CDF3
     created: 2024-02-27  expires: 2027-02-26  usage: S
[ unknown] (1). Stonebranch, Inc. <support@stonebranch.com>


pub  rsa4096/77D538472C46C119
     created: 2024-02-27  expires: 2027-02-26  usage: C
     trust: unknown       validity: unknown
 Primary key fingerprint: B666 8901 95B2 A3E6 F8A2  1FC8 77D5 3847 2C46 C119

     Stonebranch, Inc. <support@stonebranch.com>

This key is due to expire on 2027-02-26.
Are you sure that you want to sign this key with your
key "*** <***>" (***)

The signature will be marked as non-exportable.

Really sign? (y/N) y
```

If you omit this step, then you will see the following warning when verifying the installation package signature.

```
gpg: WARNING: This key is not certified with a trusted signature!
gpg:          There is no indication that the signature belongs to the owner.
```

6.2.3 3. Verify the Installation Package Signature

Verify the installation packages.

```
>gpg --verify universal-controller-7.8.0.0.zip.asc universal-controller-7.8.0.0.zip
gpg: Signature made 04/02/24 15:45:21 Eastern Daylight Time
```

```
gpg:                using RSA key 7870D479A577FCF6518A62CD2F768A37A6E81362
gpg: Good signature from "Stonebranch, Inc. <support@stonebranch.com>" [full]
```

7 Universal Controller Installation

7.1 Overview

Universal Controller is a Java web application running in a Tomcat web container.

For this reason, the Universal Controller software and the procedure for installing Universal Controller on UNIX or Windows is basically the same.

Note

This installation procedure does not include the installation of Java, Tomcat, or a database; however, they all are prerequisites.

7.1.1 Applying Maintenance

For Universal Controller 7.8.x, applying maintenance refers to the increase from a currently installed 6.1.x or later release of the Controller to a 7.8.x release of the Controller (for example, increase Controller 6.2.0.1 to Controller 7.8.0.0).

See Applying Maintenance to Universal Controller for instructions.

7.2 Database Permissions

In order to install Universal Controller, the database user configured for the Controller will require **DDL** (**D**ata **D**efinition **L**anguage) permission in the database during the install.

Once the install has been completed successfully, the configured database user requires only **DML** (**D**ata **M**anipulation **L**anguage) permissions for running the Controller.

7.3 Pre-Installation Procedure

7.3.1 Overview

Before you install Universal Controller, you must perform the following pre-installation procedure:

Step 1	Determine the space requirements for Universal Controller software and the Universal Controller database.
Step 2	Install all required Universal Controller prerequisites.
Step 3	Download the platform-specific Universal Controller distribution file from the Stonebranch Customer Portal.

Note

You can install the Controller before, during, or after installation of Universal Agent.

7.3.2 Determining Space Requirements

7.3.2.1 Overview

The following space requirements must be determined for the Controller and its database.

7.3.2.2 Controller Space Requirements

The Universal Controller war file is approximately 110MB compressed and 200MB uncompressed, using a total of approximately 310MB of space when fully deployed.

However, the space requirements for the Controller are driven largely by logging. Logging requirements are based on the log levels selected in the Log Level and Platform Log Level Universal Controller system properties.

A minimum 2GB of space is recommended for logging and other operations that require the Controller file system, such as bulk (and list) import/export.

The Log File Retention Period in Days Universal Controller system property lets you specify the number of days that a Controller log file (and an Agent log file) is retained before it is purged. The default is 5 days.

7.3.2.3 Database Space Requirements

Each type of database software (MySQL, Microsoft SQL Server, Oracle) takes up different amounts of space. However, the space required for saved Controller data is the same; that is, for example, 1,000 tasks consume no more space in MySQL than they do in Oracle.

7.3.2.3.1 Calculating Space Requirements

Following the initialization of the Controller database, the initial table space size will be approximately 60MB.

Based on calculations using data from all task types, each Controller task instance consumes approximately 10KB of database space. You should estimate space requirements for your data based on your expected number of task executions per day and the duration for retaining history and activity data before purging.

7.3.2.3.2 Output Retrieval

An Agent always caches output. Output is stored in the database only if you do one or more of the following:

- Select Automatic Output Retrieval for a task.
- Create Email Notifications with output attachments for task.
- Retrieve output for a task instance.

A retrieved output file of 1K (for example) will require 2KB to 2.5KB of space in the database.

7.3.3 Installing Universal Controller Prerequisites

Before installing Universal Controller, on either Windows or UNIX (both Linux and AIX), you first must install the following prerequisites:

1. Java Runtime Environment
2. Apache Tomcat
3. Database

7.3.3.1 Downloading Java Runtime Environment

7.3.3.1.1 Introduction

You must download a Java Runtime Environment (JRE) appropriate for your platform:

Operating System	JRE	Supported Level
Windows, UNIX (Linux)	Oracle JRE	Levels 17 and 21
Windows, UNIX (Linux)	OpenJDK JRE	Levels 17 and 21
UNIX (AIX)	IBM JRE	Level 17

7.3.3.1.1.1 Oracle JRE

To download the Java Runtime Environment (JRE) for Windows and UNIX (Linux), access the Oracle site for Java JREs and download the appropriate package for your platform:

http://www.oracle.com/technetwork/java/javase/downloads/index.html

7.3.3.1.1.2 OpenJDK JRE

To download Red Hat's implementation of OpenJDK, a free and open source implementation of the Java Platform, Standard Edition (Java SE), access Red Hat's download site and download the appropriate package:

https://developers.redhat.com/products/openjdk/download/

Note

If Universal Controller produces an exception while exporting a dashboard widget or generating a scheduled chart report, a required dependency may not be installed.

7.3.3.1.1.3 IBM JRE

To download the IBM Java Runtime Environment (JRE) for UNIX (AIX), access the IBM site for Java JREs and download the appropriate package for your platform:

https://www.ibm.com/support/pages/node/6208334

7.3.3.2 Installing Apache Tomcat

Note

Apache Tomcat version 10.1.x is supported.

7.3.3.2.1 Install Apache Tomcat

Perform the following steps to install Apache Tomcat (download and installation procedure for Apache Tomcat may vary a bit for each platform):

Step 1	Select an appropriate method of installation: **Windows** We recommend using the GUI installer to create the Apache Tomcat Service: 1. Download the "32-bit/64-bit Windows Service Installer" from Tomcat 10.1.x. 2. Follow the instructions to install the package. **Windows or Linux/Unix** Download a tar.gz or zip package that you unzip into a directory: 1. Download an appropriate package from Tomcat 10.1.x. 2. Follow the instructions to unzip the appropriate package (tar.gz or zip) into a directory on your file system. **Linux/Unix: Redhat and Centos distributions** Instead of downloading a tar.gz or zip package, you can use the **yum** installer.

Step 2	In order to accommodate large workloads, Universal Controller requires that you configure the Java heap size options using the CATALINA_OPTS environment variable. The following table outlines the minimum recommended configuration.

z/Linux	`CATALINA_OPTS="-Xms512m -Xmx2048m -Xjit:optLevel=noOpt"`
All Other Platforms	`CATALINA_OPTS="-Xms512m -Xmx2048m"`

If you have installed Tomcat as a service on Windows, see Windows Service, below; otherwise, see **All Platforms**:

All Platforms

A recommended way to set the CATALINA_OPTS environment variable is to use the optional `setenv` script.

The script is placed into either the CATALINA_BASE/bin or CATALINA_HOME/bin directory and is named `setenv.bat` (on Windows) or `setenv.sh` (on Linux/Unix). The file must be readable.

Note

The CATALINA_BASE environment variable specifies location of the root directory of the "active configuration" of Tomcat. It is optional. It defaults to be equal to CATALINA_HOME.

By default, the `setenv` script file is absent. If the script file is present in both CATALINA_BASE and CATALINA_HOME, the file in CATALINA_BASE is preferred.

For example, to configure the CATALINA_OPTS environment variable for Java 8, you can create the following script file:

On Windows, `%CATALINA_BASE%\bin\setenv.bat`:

```
set "CATALINA_OPTS=-Xms512m -Xmx2048m"
```

On Linux/Unix, `$CATALINA_BASE/bin/setenv.sh:`

```
CATALINA_OPTS="-Xms512m -Xmx2048m"
```

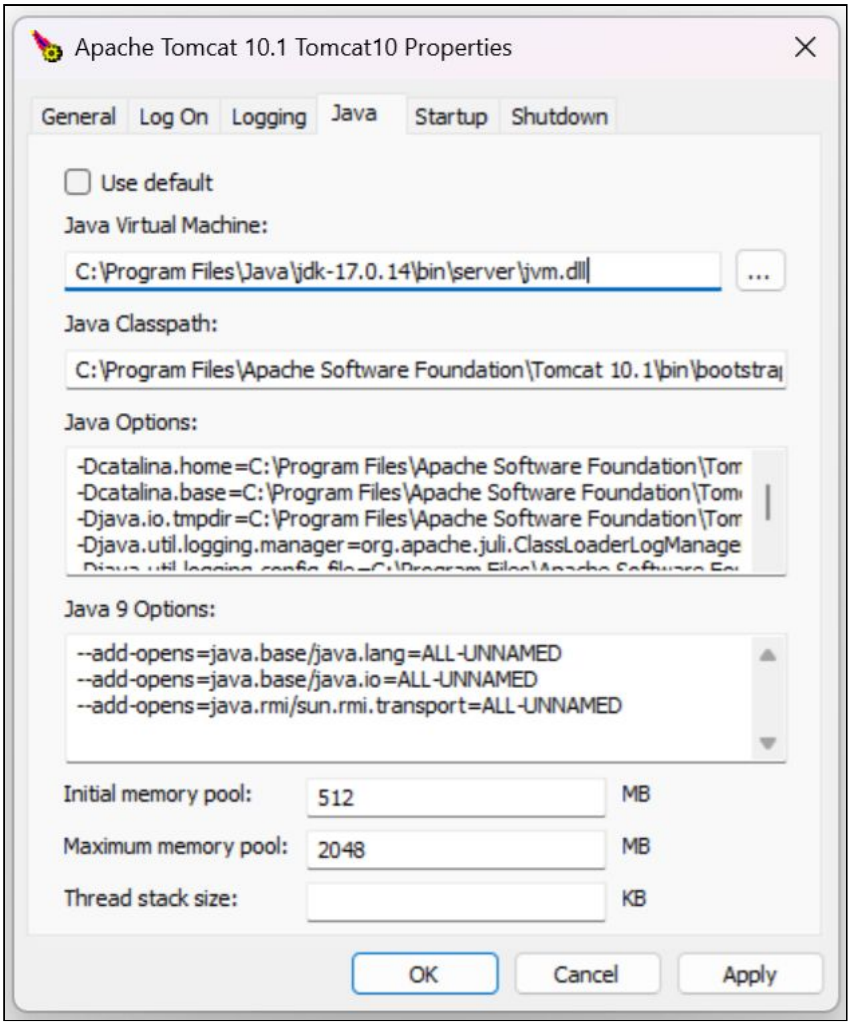
For additional Tomcat configuration details, including CATALINA_OPTS, see RUNNING.txt.

Windows Service

If you installed Tomcat as a Windows service, you can set values using the `$CATALINA_HOME\bin\tomcatw.exe` GUI tool.

Enter the parameters as follows (for Tomcat 10.1.x):

- Initial memory pool = minimum heap size (Xms)
- Maximum memory pool = Maximum heap size (Xmx)



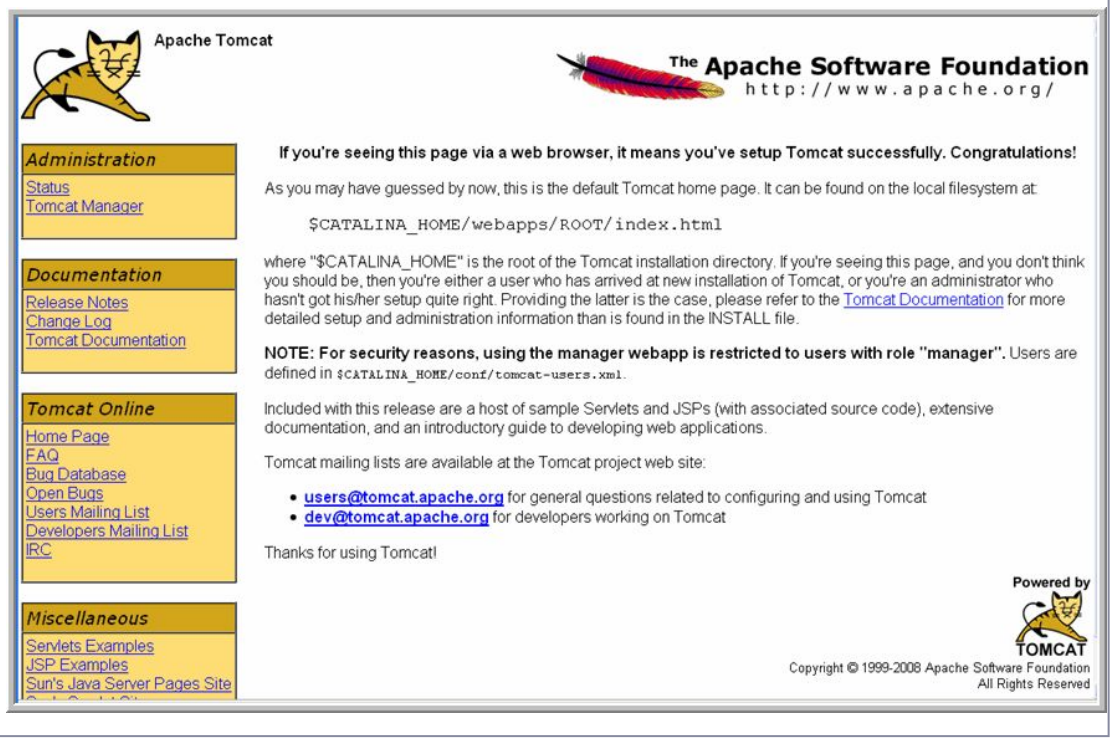
Note

Later, after you start Tomcat and log in to the Controller, you can validate these settings by running the **Memory Usage** operation, as follows:

1. From the **Administration** navigation pane, select **Configuration > Server Operations**.
2. Run the **Memory Usage** operation. The min and max numbers on the top line (Heap) should be similar to the above settings.

7.3.3.2.2 Start and Validate Apache Tomcat

Perform the following steps to start and validate Apache Tomcat:

Step 1	Tomcat is normally run as a system service or daemon. You can start Tomcat using the standard method for your operating system or by using a script, as follows: **Windows** Use Windows Services to start Tomcat or start Tomcat from the command line as follows: `net start <name of Tomcat service>`. **Linux** Start the Tomcat daemon using the script placed in the `/etc/init.d` directory for Tomcat: `service <name of Tomcat service> start`. **Windows or Linux** Start the service using the `$CATALINA_HOME/bin/startup.bat` or `$CATALINA_HOME/bin/startup.sh` scripts.
Step 2	Open a browser and go to the following URL: http://localhost:8080.
Step 3	The following screen displays, verifying that you have successfully installed and started Tomcat: 

7.3.3.2.3 Troubleshooting

7.3.3.2.3.1 Tomcat Post Limit: STATUS_MAX_POST_SIZE_EXCEEDED

Problem

The following error message displays:

```
The server did not receive the data that was sent to it.  Please see the documentation for isc.RPCResponse.STATUS_MAX_POST_SIZE_EXCEEDED
```

Resolution

Remove the post limit by specifying the following attribute on the **<Connector>** element in `conf/server.xml`:

```
maxPostSize="-1"
```

7.3.3.2.3.2 Special Characters Not Displaying Correctly

Problem

Some special characters not getting displayed correctly in your browser GUI.

Resolution

Tomcat on Windows requires you to define code page UTF-8 as the default code page for war files.

To do this, add the following to the Java options statement just as you did with the memory parameter:

```
-Dfile.encoding=UTF8
```

7.3.3.3 Installing a Database

7.3.3.3.1 Overview

Universal Controller can use a database space of an existing database or you can install a database specifically for the Controller.

We recommend an initial size of 100MB.

Note

In a High Availability environment, each cluster node connects to the same database.

7.3.3.3.1.1 Database Permissions

In order to install Universal Controller, the database user configured for the Controller will require **DDL** (**D**ata **D**efinition **L**anguage) permission in the database during the install.

Once the install has been completed successfully, the configured database user requires only **DML** (**D**ata **M**anipulation **L**anguage) permissions for running the Controller.

7.3.3.3.2 Database Management Systems

The following database management systems are supported:

- MySQL
- Microsoft SQL Server
- Oracle
- PostgreSQL

Databases that are compatible with and use the same JDBC drivers as the supported databases are also supported, for example AWS RDS (MySQL), MariaDB (MySQL), or Azure SQL Database (SQL Server). We recommend that customers periodically review the database documentation for Incompatibilities and Feature Differences as these may change over time.

7.3.3.3.2.1 MySQL

Info

MySQL 8.0.x is supported.

Step 1	Download MySQL installation instructions.
Step 2	Download MySQL (Windows only). • For Windows, select Windows (x86, 32-bit), MSI Installer • For Unix and Linux, you can use a tar.gz download or select a systems package installer appropriate for your environment, such as Yum.
Step 3	Install MySQL as per the instructions.
Step 4	Make a note of the user ID and password to be used later when installing the Controller.
Step 5	The database will be created automatically when you select MySQL during the Controller installation process.

MySQL Options

The following enhancements can be made to your MySQL database.

Speeding Up MySQL Performance

For Windows installations, you can speed up MySQL performance by adding the following parameter to the appropriate `MySQL.ini` file:

```
innodb_flush_log_at_trx_commit=0
```

For more information about this parameter, see the MySQL documentation:

- http://dev.mysql.com/doc/refman/8.0/en/innodb-parameters.html#sysvar_innodb_flush_log_at_trx_commit

Setting the MySQL max_allowed_packet Configuration Variable

A communication packet is a single SQL statement sent to the MySQL server, a single row that is sent to the client, or a binary log event sent from a master replication server to a slave.

If you want the Controller to handle big packets, you must increase the MySQL **max_allowed_packet** configuration variable on the database server.

For detailed information about this variable, refer to:

- MySQL 8.0.x reference manual

MySQL SSL/TLS Configuration

If you use SSL/TLS for JDBC communication to your MySQL environment, some additional configuration is required (depending on your needs).

The MySQL configuration property **sslMode** can be used to control the SSL behavior for database connections.

By default, network connections are SSL encrypted; the **sslMode** property permits secure connections to be turned off or different levels of security to be selected.

The following **sslMode** values are allowed:

sslMode Value	Description
"DISABLED"	Establish unencrypted connections.
"PREFERRED"	Establish encrypted connections if the server enabled them, otherwise fall back to unencrypted connections. (Default value)
"REQUIRED"	Establish secure connections if the server enabled them, fail otherwise.
"VERIFY_CA"	Similar to REQUIRED; but additionally, verify the server TLS certificate against the configured Certificate Authority (CA) certificates.
"VERIFY_IDENTITY"	Similar to VERIFY_CA; but additionally, verify that the server certificate matches the host to which the connection is attempted.

To change the default behavior of SSL (PREFERRED), add the following to the uc.properties configuration file where *sslModeValue* is one of the values listed above (DISABLED, PREFERRED, REQUIRED, VERIFY_CA, VERIFY_IDENTITY):

```
uc.db.url.append.properties=&sslMode=sslModeValue
```

This property replaced the deprecated legacy properties "`useSSL`", "`requireSSL`", and "`verifyServerCertificate`", which are still accepted but translated into a value for "`sslMode`".

If "`sslMode`" is not explicitly set:

- {`"useSSL=false"`} is translated to `"sslMode=DISABLED"`.
- {`"useSSL=true"`, `"requireSSL=false"`, `"verifyServerCertificate=false"`} is translated to `"sslMode=PREFERRED"`.
- {`"useSSL=true"`, `"requireSSL=true"`, `"verifyServerCertificate=false"`} is translated to `"sslMode=REQUIRED"`.
- {`"useSSL=true"` AND `"verifyServerCertificate=true"`} is translated to `"sslMode=VERIFY_CA"`.
- There is no equivalent legacy settings for `"sslMode=VERIFY_IDENTITY"`.

Note

For ALL server versions, the default setting of `sslMode` is "PREFERRED", and it is equivalent to the legacy settings of `useSSL=true`, requireSSL=false, and verifyServerCertificate=false, which are different from their default settings for Connector/J 8.0.12 and earlier in some situations.

Applications that continue to use the legacy properties and rely on their old default settings should be reviewed.

You may need to enable connections with TLSv1.2 and higher versions using the enabledTLSProtocols connection property. To specify the enabledTLSProtocols property, add the following to the uc.properties configuration file:

```
uc.db.url.append.properties=&enabledTLSProtocols=TLSv1.2
```

Prior to considering the enabledTLSProtocols connection property , you should verify the database connection using the latest Universal Controller maintenance release, as it may be using a more recent MySQL Connector/J, with functionality changed or added.

https://stonebranchdocs.atlassian.net/wiki/display/SMLRI/Universal+Controller+Maintenance+Lists

https://dev.mysql.com/doc/connector-j/8.0/en/connector-j-usagenotes-known-issues-limitations.html

7.3.3.3.2.2 Microsoft SQL Server

Microsoft SQL Server versions 2016, 2017, 2019 and 2022 are supported.

Step 1	Download and install MS SQL Server as per the Microsoft documentation.
Step 2	Create the Controller database. You can use any legal name, but we recommend the name **uc**. **Important** You must use a ***case-insensitive*** collation.
Step 3	Make a note of the userid and password to be used later when installing the Controller.

Note

Universal Controller automatically appends the `sendStringParametersAsUnicode` parameter to the URL, setting it to false.

When set to false, the Unicode translation property specifies that prepared parameters for character data are sent as ASCII or Multi-byte Character Set (MBCS) instead of Unicode.

jdbc:sqlserver://localhost:1433;databaseName=uc;sendStringParametersAsUnicode=false

7.3.3.3.2.3 Oracle

Oracle versions 19c and 21c are supported.

Step 1	Download and install Oracle as per the Oracle documentation.
Step 2	Create the Controller database. You can use any legal name, but we recommend the name **uc**.
Step 3	Make a note of the userid and password to be used later when installing the Controller.

If PDB (Pluggable Database) is being used for the Oracle Controller database, the JDBC URL should be used in EZCONNECT format and point to the PDB service, not the database SID.

For example:

```
jdbc:oracle:thin:@//dbhost:1521/pdbuc.userdomain
```

Oracle Options

The following enhancements can be made to your Oracle database.

Setting `open_cursors` Value for Large Imports

To facilitate large imports on Oracle, specify the maximum number of cursors that can be open by setting the `open_cursors` value to 1000.

(The cursors are used only during the import; they then are closed.)

Checking the Current Value of `open_cursors`

To check the current value for maximum open cursors, issue the following **sql*plus** utility command:

```
show parameter open_cursors
```

A listing similar to the following will display:

```
SQL> show parameter open_cursors;

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------------------------
open_cursors                         integer     1000
```

Setting a New Value for `open_cursors`

You can temporarily set the `open_cursors` value with the following SQL:

```
alter system set open_cursors=1000
```

To make a permanent change, you must set the `open_cursors` value in the initialization parameters file.

Note

If you do not set `open_cursors` to 1000, you could receive the following error message during large imports:

```
ORA-01000: maximum open cursors exceeded
```

Character Sets

Universal Controller does not stipulate a requirement for the Oracle database character set; for multilingual support, you can use the default Unicode character set of AL32UTF8.

https://docs.oracle.com/database/121/NLSPG/ch6unicode.htm#NLSPG317

Block Size

A block size of 8K is optimal for most systems, including Universal Controller.

https://docs.oracle.com/cd/B19306_01/server.102/b14211/iodesign.htm#i19636

7.3.3.3.2.4 PostgreSQL

PostgreSQL version 17 is supported.

Step 1	Download and install PostgreSQL as per the PostgreSQL documentation.
Step 2	Create the Controller database. You can use any legal name, but we recommend the name **uc**.
Step 3	Make a note of the userid and password to be used later when installing the Controller.

7.3.4 Downloading Universal Controller Software

7.3.4.1 Overview

This page tells you how to download the current Universal Controller 7.8.x software from the Stonebranch Customer Portal.

7.3.4.1.1 Versioning

Universal Automation Center software (Universal Controller and Universal Agent) packages are labeled with four numeric identifiers: Version.Release.Modification.Maintenance.

For example, for Universal Controller 7.8.0.0:

- 7 = Version 7
- 5 = Release 5

- 0 = Modification Level 0
- 0 = Maintenance Level 0

7.3.4.2 Downloading Current Products Software

To download the Universal Controller 7.8.x software:

Step 1	Log in to the Stonebranch Customer Portal. If you do not have a login, you can request one at support@stonebranch.com.
Step 2	Click the **Software Downloads** link.
Step 3	Click the **Universal Controller** link.
Step 4	Click the Universal Controller package link appropriate for your platform.
Step 5	Click **Save File** and browse to your save location. You can then use the software to install or apply maintenance to the Controller.

7.4 Installing Universal Controller

7.4.1 Introduction

This page tells you how to install Universal Controller.

The procedure is the same, unless otherwise noted, for both Windows and UNIX (Linux or AIX).

It assumes you already have performed all required Pre-Installation Procedure:

- Determined Determining Space Requirements

- Installed all Installing Universal Controller Prerequisites.
- Downloaded a Universal Controller Downloading Universal Controller Software.

7.4.2 Installation Procedure

To install Universal Controller:

1	Unpack the Downloaded Distribution File
2	Install the Controller
3	Deploy the Controller
4	Update the Universal Controller Start-up Properties
5	Verify the Installation
6	Apply the License Key
7	Enable LDAP Synchronization
8	Configure System Notifications

7.4.3 Unpack the Universal Controller Distribution File

To unpack the Universal Controller distribution file, use the following method appropriate for your platform:

Linux/Unix	`tar -xvf universal-controller-N.N.N.N.tar`
Windows	Use an appropriate archiving / unzipping product.

7.4.4 Install the Controller

To install the Controller, issue the following command that is appropriate for your platform:

Linux	`> sh install-controller.sh`
Windows	`> install-controller.bat`

The installation process writes the war file (`universal-controller-N.N.N.N-build.N.war`) to the Tomcat installation directory and renames it **`uc`** `.war` .

You must include command line switches that specify information the Controller needs to access the Tomcat installation directory, the war file, and the database. You can include additional command line switches, but they are not required.

If a required command line switch is missing from the command line, an error message will identify it during the installation process.

The Controller installation process writes the values for some command line switches to the Universal Controller Start-up Properties (opswise.properties), **`uc`** `.properties` (see the table, below). For any of those command line switches that are not required and, in fact, are not included on the command line, the Controller installation process writes their default value to **`uc`** `.properties` .

When the install script is run, the `uc.properties` file is created and owned by the current user. This user will have write permission for the **`uc.properties`** file.

It is important that the user starting Tomcat has both read and write access for the **`uc.properties`** file. The Controller cannot operate without read access, and without write access, the Controller cannot update the **`uc.properties`** to encrypt passwords and remove one-time use properties.

7.4.4.1 Command Line Switches

The following table describes the command line switches for the Controller installation process and identifies which are required.

For command line switches that have their value written to the Universal Controller Start-up Properties (uc.properties), **`uc`** `.properties` , the table also identifies the property in that file to which the value is written.

Note

All command line switches are case-sensitive.

Command Line Switch	Description	Default	Required	Controller Property
`--agentonly`	For an Agent-Only deployment If `--agentonly` is true, Universal Controller Start-up Properties (uc.properties) is deployed with an Agent-Only demonstration license.	false	No	

Command Line Switch	Description	Default	Required	Controller Property
`--controller-file`	Full path of the Universal Controller war file (`universal-controller-N.N.N.N-build.N.war`) from the downloaded Universal Controller package.	none	Yes	

`--dbname`	Universal Controller database name.
	
	The property uc.db.name should be set to the name of the database being connected to. It can be seen in the System Details widget under Database information as well as in the uc.log.
	
	• Oracle
	  • For Oracle, the uc.db.name property is for informational purposes only.
	• SQL Server
	  • If the `uc.db.url` property contains the attribute "DatabaseName" then the uc.db.name property is for informational purposes only, similar to Oracle.
	  • If however, the `uc.db.url` does not contain the database name, then the uc.db.name will be used to connect to the database by issuing the SQL "USE dbname", where dbname is the value of the uc.db.name property.
	• MySQL
	  • MySQL should not contain the database name in the uc.db.url property.
	  • MySQL will use the uc.db.name property to connect to the database specficied by also issuing the SQL "USE dbname" statement where dbname is the value of the uc.db.name property.
		uc	No	uc.db.name

`--dbpass`	Database user's password.	none	Yes	uc.db.password

<table>
<tr><th>Command Line Switch</th><th>Description</th><th>Default</th><th>Required</th><th>Controller Property</th></tr>
<tr>
<td><code>--dburl</code></td>
<td>JDBC connect URL.

Format: <code>jdbc:[database type]://localhost</code>

Examples (for MS SQLServer and Oracle, <code>uc</code> is the database name):

<table>
<tr><td>MySQL</td><td><code>jdbc:mysql://localhost:3306/</code></td></tr>
<tr><td>MS SQL Server</td><td><code>jdbc:sqlserver://localhost:1433;DatabaseName=uc</code></td></tr>
<tr><td>MS SQL Server JTDS</td><td><code>jdbc:jtds:sqlserver://localhost:1433/uc</code></td></tr>
<tr><td>Oracle</td><td><code>jdbc:oracle:thin:@//localhost:1521/ServiceName</code>
or
<code>jdbc:oracle:thin:@localhost:1521:XE</code></td></tr>
</table>

Note
Enclose the URL in quotation marks to guard against any special characters (for example: ; > < &) which are treated by the shell uniquely.

Unix
Enclose the URL in single quotation marks; for example:
<code>'jdbc:sqlserver://dbserver.local;instanceName=IN01;DatabaseName=uc'</code>
Windows
Enclose the URL in double quotation marks; for example:
<code>"jdbc:sqlserver://dbserver.local;instanceName=IN01;DatabaseName=uc"</code>

Refer to the jdbc documentation from your database supplier for specific jdbc driver URL parameters or options that might be needed for your environment. You may want to consult with your local DBA to discuss these parameters and options.

Refer to Installing a Database in this documentation for more information about suggested connection parameters, database configuration, and setup.</td>
<td>jdbc:mysql://localhost:3306/</td>
<td>No</td>
<td>uc.db.url</td>
</tr>
<tr>
<td><code>--dbuser</code></td>
<td>Database user name.</td>
<td>none</td>
<td>Yes</td>
<td>uc.db.user</td>
</tr>
</table>

Command Line Switch	Description	Default	Required	Controller Property
`--port`	Used by the Universal Controller to generate a unique Cluster Node **Node Id** in the format of **hostname:port-dbname**. **Note** This is meant to represent the value of the Tomcat HTTP/1.1 Connector port configured in the server.xml. It is used solely for **Node Id** generation and does not impact the Tomcat HTTP/1.1 Connector configuration.	8080	No	uc.servlet.port
`--rdbms`	Database type. Valid values are: • mysql • sqlserver • sqlserver-jtds • oracle * --rdbms ***is*** required if --dburl is used in the command. **Note** Customers have reported difficulty establishing secure SQL connections using the jTDS open source JDBC driver for Microsoft SQL Server (**--rdbms sqlserver-jtds**) when SSL/TLS is enabled on the server. We have received feedback that the issue can be resolved by installing a patched version of the jTDS driver from bug report https://sourceforge.net/p/jtds/bugs/725/. Stonebranch only bundles the official jTDS release, currently 1.3.1, with the Universal Controller. We do not include unofficial patches, and if you decide to use them, you do so at your own risk.	mysql	No *	uc.db.rdbms
`--tomcat-dir`	Path to the Tomcat installation directory (contains the directories: `/bin`, `/conf`, `/logs`, `webapps`). **Note** Enclose the path in quotes to guard against spaces or any special characters (for example: ; > < &), which are treated by the shell uniquely.	none	Yes	

7.4.4.2 Examples

Shown below are sample commands for installing the Controller on Linux and Windows platforms, using defaults for the database:

Linux	sh install-controller.sh --tomcat-dir ~/tomcat --controller-file ./universal-controller-N.N.N.N-build.N.war --dbuser root --dbpass userpass
Windows	install-controller.bat --tomcat-dir "c:\Program Files\Apache Software Foundation\Tomcat 9.0" --controller-file universal-controller-N.N.N.N-build.N.war --dbuser root --dbpass userpass **Note** In the Tomcat directory (--tomcat-dir), when quoting the directory is necessary due to spaces, do not use a single backslash before the ending quotation mark; use either a double backslash or no backslash to avoid the command shell from treating \" as an escape character.

7.4.5 Deploy the Controller

In this procedure, you will start Tomcat, which starts the Controller and builds your database tables. This process takes several minutes. When it is complete, the Controller is started and ready to use.

If Tomcat already was running when you installed the Controller, you do not need to stop and restart it; this process will occur automatically after you start the installation.

Step 1	Start Tomcat as follows:
	
	Linux
	Start the Tomcat daemon using the script placed in the `/etc/init.d` directory for Tomcat.
	
	`service [name of Tomcat service] start`
	
	Windows
	We recommend you use Windows Services to start Tomcat. Or, you can start Tomcat from the command line as follows:
	
	`net start [name of Tomcat service]`
	
	Linux or Windows
	You can start the service using the `$CATALINA_HOME/bin/startup.bat` or `$CATALINA_HOME/bin/startup.sh` scripts.

Step 2	During this initial startup, the Controller builds the database tables, a process that takes several minutes. You can view details in the Tomcat window or monitor the Controller log, as described below:
	
	Linux/Unix
	Users can tail the `uc.log` to monitor the deployment process, as follows:
	
	`tail -f $TOMCAT_DIR/uc_logs/uc.log`
	
	Windows
	Users can use a third-party tailing utility or open the log file using Notepad or other editor and scroll to the bottom to view the latest activity.
	
	`$TOMCAT_DIR\uc_logs\uc.log`
	
	Do not continue until you see output in the log similar to the following:
	
	2014-09-15-11:16:17:775 -0400 INFO [Ops.Cluster.Monitor.0] Cluster Monitor / ClusterWatchDog started (16951472)
	2014-09-15-11:16:17:778 -0400 INFO [Ops.Cluster.Monitor.0] No active node found. sb-server:8080-ops6100 becoming Active node.
	2014-09-15-11:16:17:778 -0400 INFO [Ops.Cluster.Monitor.0] Loading time zones
	2014-09-15-11:16:17:810 -0400 INFO [Ops.Cluster.Monitor.0] Setting System time zone to "America/New_York"
	2014-09-15-11:16:17:810 -0400 INFO [Ops.Cluster.Monitor.0] Initialize PubSubController
	2014-09-15-11:16:17:813 -0400 INFO [Ops.Cluster.Monitor.0] PubSubController Active Start Load: 0 Subscriptions
	2014-09-15-11:16:17:813 -0400 INFO [Ops.Cluster.Monitor.0] Server is now Running in Active mode. Previous mode was Passive
	2014-09-15-11:16:17:813 -0400 INFO [Ops.Cluster.Monitor.0] Setting server to ACTIVE.
	2014-09-15-11:16:17:814 -0400 INFO [Ops.Cluster.Monitor.0] Releasing lock and ending transaction
	2014-09-15-11:16:18:147 -0400 INFO [Ops.Cluster.Monitor.0] 617 database statements took 0 Seconds
	2014-09-15-11:16:18:149 -0400 INFO [Ops.Cluster.Monitor.0] Lock released and transaction ended
	2014-09-15-11:16:18:149 -0400 INFO [Ops.Cluster.Monitor.0] Creating OmsServerWatchDog
	2014-09-15-11:16:18:150 -0400 INFO [Ops.Cluster.Monitor.0] Creating AgentWatchDog
	2014-09-15-11:16:18:150 -0400 INFO [Ops.Cluster.Monitor.0] Creating ApplicationWatchDog

Step 3	When you see the following, the Controller is ready: • **INFO [Ops.Cluster.Monitor.0] Server is now Running in Active mode. Previous mode was Passive** • **INFO [Ops.Cluster.Monitor.0] Setting server to ACTIVE.**

You now have completed the install process and the Controller is running.

7.4.6 Update the Universal Controller Start-up Properties (uc.properties)

7.4.6.1 For AIX and z/Linux only

Follow this procedure to change two default values in the Universal Controller Start-up Properties (uc.properties), `uc.properties`, which is read by the Controller.

(The `uc.properties` file resides in `<tomcat directory>/conf`).

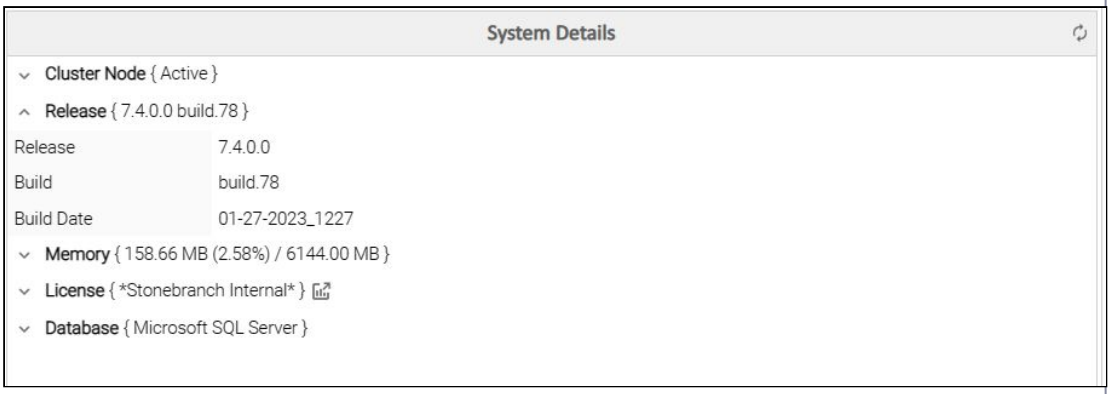
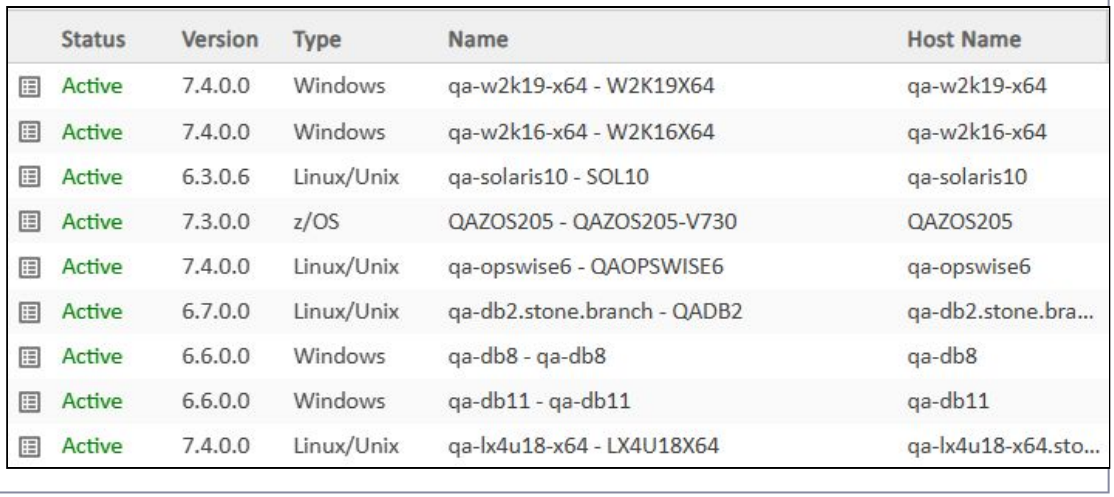
Step 1	Change the following two properties from their default value to the IBM AIX value:
	• `uc.trustmanager.algorithm=` (Java trust manager algorithm)
	  ◦ Default value = SunX509
	  ◦ IBM AIX = IbmX509
	• `uc.trustmanager.provider=` (Java trust manager provider)
	  ◦ Default value = SunJSSE
	  ◦ IBM AIX value = IBMJSSE2

Step 2	Restart Tomcat.

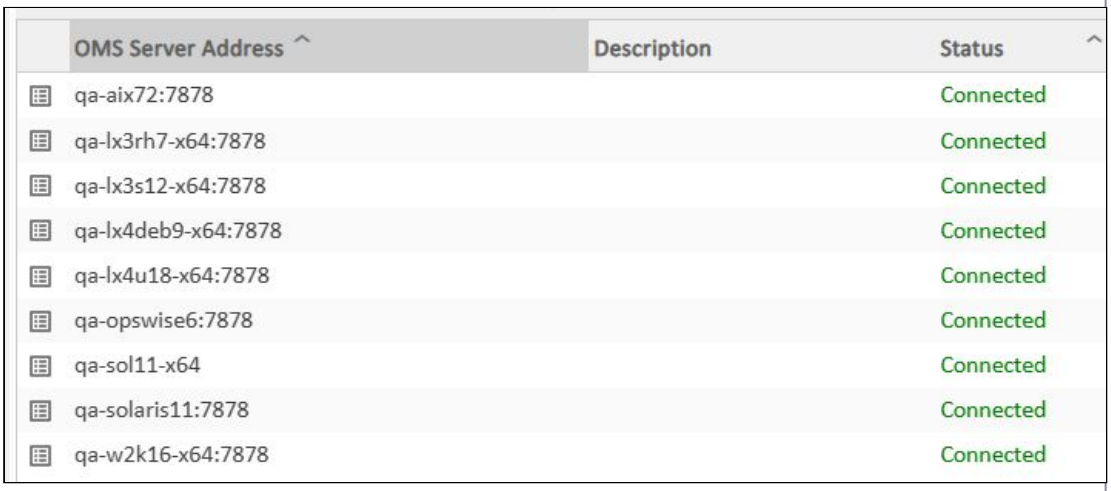
7.4.7 Verify the Installation

To make sure the Controller is installed, running, and communication with Universal Agent and Universal Message Service (OMS):

Step 1	Starting and Stopping Universal Controller.
Step 2	From your browser, access the Universal Controller user interface. http://localhost:8080/uc `localhost` represents the machine name where you installed the server.

Step 3	Log in with user **`ops.admin`** and no password. A Change Password dialog displays. 
Step 4	Enter a password in the **New Password** and **Confirm New Password** fields (the **Current Password** field should remain empty) and click **Change Password**. The Universal Controller Home Dashboard displays.
Step 5	The **System Details** Widgets provides current system information. Check the Release information to verify that the latest version number is displayed, as shown in the following example. 
Step 6	From the **Agents and Connections** navigation pane, select **Agents > All Agents** or **Agents > <type of Agent>**. You will see a list similar to the following example. Make sure the **Status** of the Agent is **Active**. 

Status	Version	Type	Name	Host Name
Active	7.4.0.0	Windows	qa-w2k19-x64 - W2K19X64	qa-w2k19-x64
Active	7.4.0.0	Windows	qa-w2k16-x64 - W2K16X64	qa-w2k16-x64
Active	6.3.0.6	Linux/Unix	qa-solaris10 - SOL10	qa-solaris10
Active	7.3.0.0	z/OS	QAZOS205 - QAZOS205-V730	QAZOS205
Active	7.4.0.0	Linux/Unix	qa-opswise6 - QAOPSWISE6	qa-opswise6
Active	6.7.0.0	Linux/Unix	qa-db2.stone.branch - QADB2	qa-db2.stone.bra...
Active	6.6.0.0	Windows	qa-db8 - qa-db8	qa-db8
Active	6.6.0.0	Windows	qa-db11 - qa-db11	qa-db11
Active	7.4.0.0	Linux/Unix	qa-lx4u18-x64 - LX4U18X64	qa-lx4u18-x64.sto...

Step 7	From the **Agents and Connections** navigation pane, select **System > OMS Servers**. You will see a list similar to the following example. Make sure the **Status** of the OMS Servers are **Connected**. 
Step 8	For more information about these components in the Universal Controller user interface, see: • Agents Overview • OMS Servers

7.4.8 Apply the License Key

Although you do not normally need to enter a license key immediately after installation, at some point you will need to follow these steps to enter your key:

Step 1	From the Services, select **Properties**. The Properties list displays.
Step 2	Click the **License Key** property Value field and enter your encrypted license key.
Step 3	Return to the **System Details** Widgets and review the License field to verify that the terms of your license are correct.
Step 4	Optionally, configure the Controller so that your system administrator receives notifications regarding System Notifications for License Violations and Expirations

7.4.8.1 License Information

The License field in the System Details widget (view the system-defined Home Dashboard or, on the Reporting navigation pane, click **Widgets**) identifies license information for:

- Expiry Date
- Distributed Agents
- z/OS Agents
- Tasks
- Monthly Executions
- Cluster Nodes
- UPPS
- USAP
- Customer

- Environment

7.4.9 Enable LDAP Synchronization

In order to log in to the Controller using Credentials for Running Tasks Authentication, you must set the LDAP Synchronization Enabled Universal Controller System property (**Administration > Configuration > Properties** in the Controller user interface) to **true**.

7.4.10 Configure System Notifications

System Notifications are emails sent to one or more Universal Controller system administrators based on either:

- System Notifications for License Violations and Expirations
- Status of a System Notification for System Operations
- System Notification for Data Backup / Purge Operations

Note

System Notifications are not the same as Email Notifications. Please refer to the following sections for explicitly defining Email Notifications.

- Sending Notifications on Status of an Agent
- Sending Notifications on Status of an OMS Server
- Sending Notifications on Status of a Cluster Node
- Email Notification Actions

In order for a system administrator to receive system notifications, you must configure the Controller for system notifications:

Step 1	Select an Email Connections on which the notifications will be sent and enable the Use for System Notifications field. **Note** Only one Email Connection can be used for system notifications. If this field is checked in an Email Connection Details, it will appear unchecked on all other Email Connection Details. If you then check this field in another Email Connection Details, it automatically will be unchecked from the Details in which it had been checked.
Step 2	Identify the Universal Controller Administrator(s) that will receive the system notifications by entering one or more valid email addresses for those administrators in the Administrator Email Address Universal Controller system property.
Step 3	If you want to identify the source system that is sending the system notifications in the Subject line of the emails, enter a value in the System Identifier Universal Controller system property.

7.4.10.1 System Notifications for License Violations and Expirations

When you have configured the Controller for system notification, notifications automatically are sent to the specified system administrator(s) for the following license issues:

- License violations
- Expired licenses
- Invalid licenses

7.4.10.1.1 License Violations

A system notification is sent for the following license violations:

- User attempts to create a task that exceeds the licensed maximum number of task definitions.
- User attempts to enable a trigger that exceeds the licensed maximum number of enabled triggers.
- Agent registration attempt exceeds the licensed maximum number of Agents.

The License field in the System Details widget (view the system-defined Home Dashboard or, on the Reporting navigation pane, click **Widgets**) identifies these maximum numbers (see License Information

7.4.10.1.2 License Expiration

A system notification is sent at the following times if a license will expire in 7 days or sooner:

- Warning sent daily at midnight, processed same time as midnight log rollover, starting 7 days prior to license expiration.
- Warning sent on Controller start-up (or a cluster node becoming the Active cluster node) if license is within 7 days of expiring.
- Warning sent on License Key property change (if new license is still within 7 days of expiring).

A system notification is sent at the following times if a license has expired:

- Sent daily at midnight, processed same time as midnight log rollover.
- Sent on Controller start-up (or a cluster node becoming the Active cluster node).
- Sent on License Key property change (if new license still expired).
- System paused on license expiration.

Note

A License Expiration message also displays on the Console when you log in to the Controller if the license will expire within the week and when the license already has expired.

7.4.10.1.3 Invalid Licenses

A system notification is sent at the following times if a license is invalid:

- Sent on Controller start-up (or a cluster node becoming the Active cluster node).
- System paused on invalid license.

7.4.10.2 System Notification for System Operations

For any Controller task, you can select a system operation to be performed when any instance of that task reaches one or more specific statuses. You also can select whether or not to send system notifications based on the success and/or failure of that system operation.

For detailed information on how to set up these system notifications, see System Operation Actions.

7.4.10.3 System Notification for Data Backup / Purge Operations

For any scheduled Data Backup / Purge operation, you can select to receive system notifications.

For detailed information on how to set up system notifications for Data Backup / Purge operations, see Data Backup - Purge.

7.5 Adding a Cluster Node

7.5.1 Overview

When you install Universal Controller, you create a single instance (cluster node) of the Controller. To operate Universal Automation Center in a High Availability (HA) environment, you must add one or more cluster nodes. Each cluster node should be installed on a separate machine.

This page tells you how to add one or more cluster nodes.

7.5.1.1 Requirements for Adding a Cluster Node

Each cluster node in an HA environment must connect to the same Universal Controller database. If one of the cluster nodes stops processing, another cluster node continues processing with the same data.

Each cluster node in an HA environment must be the same version and build of the Controller. To ensure this, you can either:

- Install the downloaded version of the Controller on a second machine.
- Download a new version of the Controller software, update the current version, and then install the new version on a second machine.

It is strongly recommended that an HA environment has at least two OMS Servers, although you do not need an OMS Server for every cluster node if your HA environment contains three or more cluster nodes.

7.5.1.2 Procedure for Adding a Cluster Node

This page describes the following procedure:

1	Copy and Unpack the Downloaded Distribution File
2	Install the Controller
3	Deploy the Controller
4	Verify the Installation
5	Adding an OMS Server

This procedure assumes you already have performed any required Pre-Installation Procedure steps for the cluster node being added.

7.5.2 Copy and Unpack the Universal Controller Distribution File

Copy the downloaded distribution file, which was used to install the current, single instance of Universal Controller, from its current location to the machine on which you want to install a new instance of the Controller.

To unpack the Universal Controller distribution file, use the following method appropriate for your platform:

Linux/Unix	`tar xvf uc-controller-N.N.N.N.tar`
Windows	Use an appropriate archiving / unzipping product.

7.5.3 Install the Controller

To install the Controller, issue the following command that is appropriate for your platform:

Linux	`> sh install-controller.sh`

Windows	> install-controller.bat

You must include command line switches that specify information the Controller needs to access the Tomcat installation directory, the war file, and the database. You can include additional command line switches, but they are not required.

If a required command line switch is missing from the command line, an error message will identify it during the installation process.

The Controller installation process writes the values for some command line switches to the Universal Controller Start-up Properties (uc.properties), `uc.properties` (see the table, below). For any of those command line switches that are not required and, in fact, are not included on the command line, the Controller installation process writes their default value to `uc.properties`.

7.5.3.1 Command Line Switches

The following table describes the command line switches for the Controller installation process and identifies which are required.

For command line switches that have their value written to the Universal Controller Start-up Properties (uc.properties), `uc.properties`, the table also identifies the property in that file to which the value is written.

Note

All command line switches are case-sensitive.

Command Line Switch	Description	Default	Required	Controller Property
--controller-file	Full path of the Universal Controller war file from the downloaded Universal Controller package.	none	Yes	

Command Line Switch	Description	Default	Required	Controller Property

--dbname	Universal Controller database name.
	
	The property uc.db.name should be set to the name of the database being connected to. It can be seen in the System Details widget under Database information as well as in the uc.log.
	
	• Oracle
	  • For Oracle, the uc.db.name property is for informational purposes only.
	• SQL Server
	  • If the `uc.db.url` property contains the attribute "DatabaseName" then the uc.db.name property is for informational purposes only, similar to Oracle.
	  • If however, the `uc.db.url` does not contain the database name, then the uc.db.name will be used to connect to the database by issuing the SQL "USE dbname", where dbname is the value of the uc.db.name property.
	• MySQL
	  • MySQL should not contain the database name in the uc.db.url property.
	  • MySQL will use the uc.db.name property to connect to the database specficied by also issuing the SQL "USE dbname" statement where dbname is the value of the uc.db.name property.
		uc	No	uc.db.name=

--dbpass	Database user's password.	none	Yes	uc.db.password=

<table>
<tr><th>Command Line Switch</th><th>Description</th><th>Default</th><th>Required</th><th>Controller Property</th></tr>
<tr><td>--dburl</td><td>JDBC connection URL.

Format: <code>jdbc:<jdbc vendor>:<other jdbc vendor data></code>

Examples (for MS SQLServer, <code>uc</code> is the database name; for Oracle, <code>XE</code> is the SID):

<table><tr><td>MySQL</td><td><code>jdbc:mysql://localhost:3306/</code></td></tr><tr><td>MS SQL Server</td><td><code>jdbc:sqlserver://localhost:1433;DatabaseName=uc</code></td></tr><tr><td>MS SQL Server JTDS</td><td><code>jdbc:jtds:sqlserver://localhost:1433/uc</code></td></tr><tr><td>Oracle</td><td><code>jdbc:oracle:thin:@//localhost:1521/ServiceName</code>
or
<code>jdbc:oracle:thin:@localhost:1521:XE</code></td></tr></table></td><td>jdbc:mysql://localhost</td><td>No</td><td>uc.db.url=</td></tr>
<tr><td>--dbuser</td><td>Database user name.</td><td>none</td><td>Yes</td><td>uc.db.user=</td></tr>
<tr><td>--port</td><td>Used by the Universal Controller to generate a unique Cluster Node Node Id in the format of hostname:port-dbname.

Note
This is meant to represent the value of the Tomcat HTTP/1.1 Connector port configured in the server.xml.
It is used solely for Node Id generation and does not impact the Tomcat HTTP/1.1 Connector configuration.</td><td>8080</td><td>No</td><td>uc.servlet.port</td></tr>
</table>

Command Line Switch	Description	Default	Required	Controller Property
--rdbms	Database type. Valid values are: • mysql • sqlserver • oracle * --rdbms ***is*** required if --dburl is used in the command.	mysql	No *	uc.db.rdbms=
--tomcat-dir	Path to the Tomcat installation directory (contains the directories: `/bin`, `/conf`, `/logs`, `webapps`).	none	Yes	

7.5.3.2 Examples

Shown below are sample commands for installing the Controller on Linux and Windows platforms, using defaults for the database:

Linux	sh install-controller.sh --tomcat-dir ~/tomcat --controller-file ./uc-controller-N.N.N.N-build.N.war --dbuser root --dbpass userpass
Windows	install-controller.bat --tomcat-dir "c:\Program Files\Apache Software Foundation\Tomcat 8.5" --controller-file uc-controller-N.N.N.N-build.N.war --dbuser root --dbpass userpass **Note** In the Tomcat directory (--tomcat-dir), when quoting the directory is necessary due to spaces, do not use a single backslash before the ending quotation mark; use either a double backslash or no backslash to avoid the command shell from treating \" as an escape character.

7.5.4 Deploy the Controller

In this procedure, you will start Tomcat, which starts the Controller and builds your database tables. This process takes several minutes. When it is complete, the Controller is started and ready to use.

If Tomcat already was running when you installed the Controller, you do not need to stop and restart it; this process will occur automatically after you start the installation.

Step 1	Start Tomcat as follows:
	
	Linux
	Start the Tomcat daemon using the script placed in the `/etc/init.d` directory for Tomcat.
	
	`service [name of Tomcat service] start`
	
	Windows
	We recommend you use Windows Services to start Tomcat. Or, you can start Tomcat from the command line as follows:
	
	`net start [name of Tomcat service]`
	
	Linux or Windows
	You can start the service using the `$CATALINA_HOME/bin/startup.bat` or `$CATALINA_HOME/bin/startup.sh` scripts.

Step 2	You can view details of the start-up in the Tomcat window or monitor the Controller log, as described below:
	
	Linux/Unix
	Users can tail the `uc.log` to monitor the deployment process, as follows:
	
	`tail -f $TOMCAT_DIR/uc_logs/uc.log`
	
	Windows
	Users can use a third-party tailing utility or open the log file using Notepad or other editor and scroll to the bottom to view the latest activity.
	
	`$TOMCAT_DIR/uc_logs/uc.log`

Step 3	When you see the following, the Controller is ready: • **INFO [Ops.Cluster.Monitor.0] Server is now Running in Passive mode.** • **INFO [Ops.Cluster.Monitor.0] Setting server to PASSIVE.**

Step 4	**AIX and z/Linux only**: Follow this procedure to change two default values in the Universal Controller Start-up Properties (uc.properties), `uc.properties`, which is read by the Controller.
	
	(The `uc.properties` file resides in `<tomcat directory>/webapps/uc/WEB-INF/properties`).
	
	1. Change the following two properties from their default value to the AIX - z/Linux value:
	• `uc.trustmanager.algorithm=` (Java trust manager algorithm)
	  • Default value = SunX509
	  • AIX - z/Linux value = IbmX509
	• `uc.trustmanager.provider=` (Java trust manager provider)
	  • Default value = SunJSSE
	  • AIX - z/Linux value = IBMJSSE2
	
	2. Restart Tomcat.

You now have completed the install process and the Controller is running.

7.5.5 Verify the Installation

To make sure the new cluster node is installed and running properly:

Step 1	Log in to the originally installed Controller.
Step 2	Verify that the **Cluster Node Status** Widgets illustrates an Active and a Passive cluster node.
Step 3	For detailed information on the new (and original) cluster nodes, select **Resources > System >** Cluster Nodes.

Note

The Apply the License Key for the installed Universal Controller applies to all instances (cluster nodes) of that Controller; no additional licensing is required.

Configure System Notifications configured for the installed Universal Controller apply to all instances (cluster nodes) of that Controller; no additional system notifications have to be configured.

7.5.6 Adding an OMS Server

To add a second OMS Server to an HA environment (which creates an OMS cluster), you must install Universal Agent on a machine where one of the additional cluster nodes has been added.

7.5.6.1 Add OMS Server to OMS Server Record

You must specify all members of an OMS cluster in your HA environment in the same Creating OMS Server Records.

The OMS Servers list screen will contain a single entry for all OMS cluster members defined in the record. (The OMS Servers list screen could have additional entries for an OMS Server or OMS cluster outside of your HA environment. For example, OMS Servers outside a firewall would connect to a different message database and serve different Agents, but would connect to to the same Controller.)

7.5.6.2 OMS Server Message Database

Members of an OMS cluster in an HA environment must use the same OMS Server Message Database.

The OMS SPOOL_DIRECTORY - OMS configuration option configuration option specifies the name of the directory where the OMS maintains its message database. For each OMS Server, you must set this option to a location shared by all of the OMS Servers in the HA environment.

7.6 Applying Maintenance to Universal Controller

7.6.1 Overview

For Universal Controller 7.8.x, applying maintenance refers to the increase from a currently installed 6.1.x or later release of the Controller to a 7.8.x release of the Controller (for example, increase Controller 6.2.0.1 to Controller 7.8.0.0).

Java 11 support is dropped starting in Universal Controller 7.8.x. Support for Tomcat versions 8.5.x and 9.0.x has also been dropped starting in Universal Controller 7.8.x.

See Universal Controller 7.8.x Prerequisites for supported versions.

7.6.2 Universal Controller Maintenance

As a precautionary measure, it is highly recommended that you back up the Universal Controller database prior to applying maintenance.

Note

These instructions assume that you are running a High Availability Universal Controller system: a system configured with ***Active*** and ***Passive*** Controllers (cluster nodes). If you are running a single Controller, disregard the steps for the ***Passive*** Controllers.

To apply maintenance to the currently installed release of Universal Controller:

Step 1	From the Stonebranch Customer Portal, download the Universal Controller 7.8.x package (for instructions, see Downloading Universal Controller Software).
Step 2	If any JDBC drivers have been added to the Controller installation, these should be backed up prior to the application of maintenance and then copied back after the application. Instructions for adding drivers can be found here.
Step 3	Unpack the Universal Controller distribution file, using the following method appropriate for your platform: **Windows** Use an appropriate archiving / unzipping product. **Linux/Unix** `tar -xvf universal-controller-N.N.N.N.tar`

Step 4	Stop the Tomcat container in which the ***Passive*** cluster node is deployed.
	
	Windows
	Use the services application to stop Tomcat. You also can issue the stop command on a command line:
	
	`net stop [name of Tomcat service]`
	
	UNIX
	Stop the daemon using the script found in the `/etc/init.d` directory for Tomcat.
	
	`service [name of Tomcat service] stop`
	
	Windows or UNIX
	Stop the service using the `$CATALINA_HOME/bin/shutdown.bat` or `$CATALINA_HOME/bin/shutdown.sh` scripts:
	• **Windows**
	`cd $CATALINA_HOME\bin`
	`shutdown`
	• **Linux/Unix**
	`cd $CATALINA_HOME/bin`
	`./shutdown`

Step 5	Stop the Tomcat container in which the ***Active*** cluster node is deployed, using one of the methods shown in Step 4.

Step 6

For the ***Active*** cluster node deployment:

1. Delete the existing **deployment directory** and **war** file from your **webapps** directory.

   The Controller installation process renamed the unpacked **war** file (`universal-controller-N.N.N.N-build.N.war`) as `uc.war` , so the following would be your **deployment directory** and **war** file:

   ```
   [tomcat-install]\webapps\uc
   [tomcat-install]\webapps\uc.war
   ```

   Note

   If you want to rename the **deployment directory** and ***uc.war*** for back-up, you must do so outside of the Tomcat folder.

2. Copy the **war** file from the new downloaded package to your **webapps** directory and rename the **war** file `uc.war` .
3. Start the Tomcat container in which the ***Active*** cluster node is deployed.

   Note

   We recommend that all Universal Controller users clear their browser cache and close their browser prior to re-opening and navigating back to the Universal Controller URL to ensure that the most recent client updates are loaded.

4. Log in to the ***Active*** cluster node deployment with user **ops.admin** or a user with equivalent authorization and verify the installation (see **Verify the Installation**, below).

   Note

   If you have deployed any JDBC driver jar files (or in the case of DB2, a JDBC driver license jar file) to the `$CATALINA_HOME/webapps/uc/WEB-INF/lib` directory, you must recopy these files to this directory and restart Tomcat after your initial validation.

Step 7

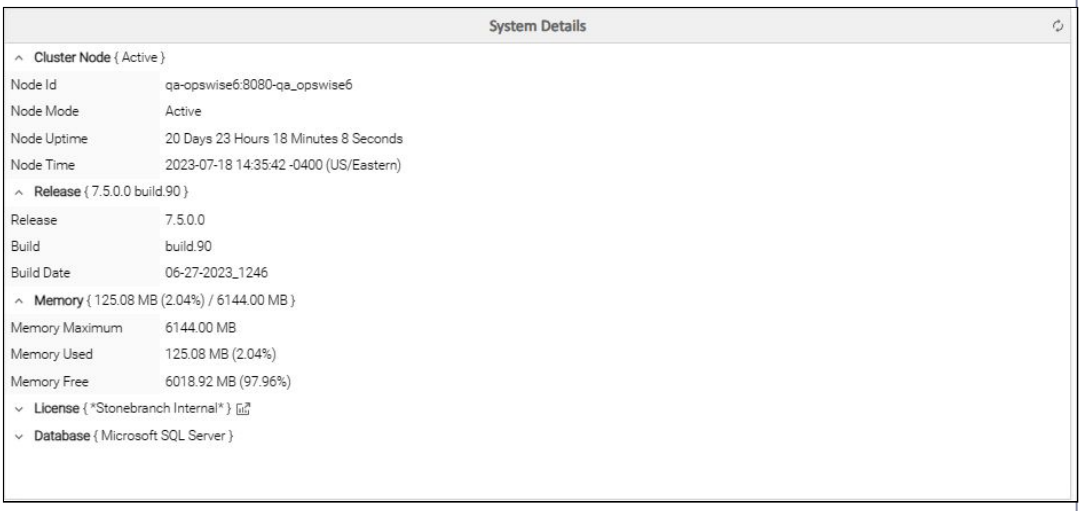
Repeat Step 6 for the ***Passive*** cluster node deployment.

7.6.3 Verify the Installation

To make sure the Controller is installed, running, and communication with Universal Agent and Universal Message Service (OMS), verify the installation after you have logged on:

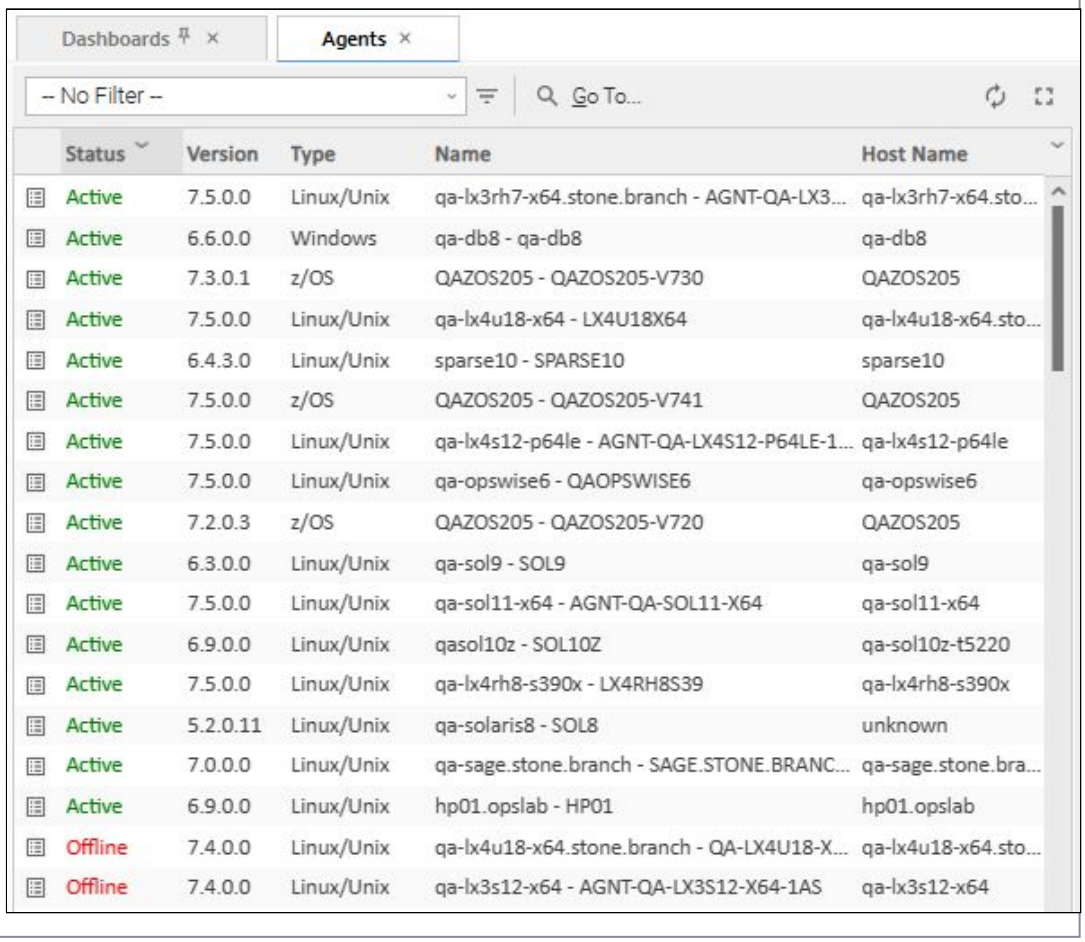
Step 1

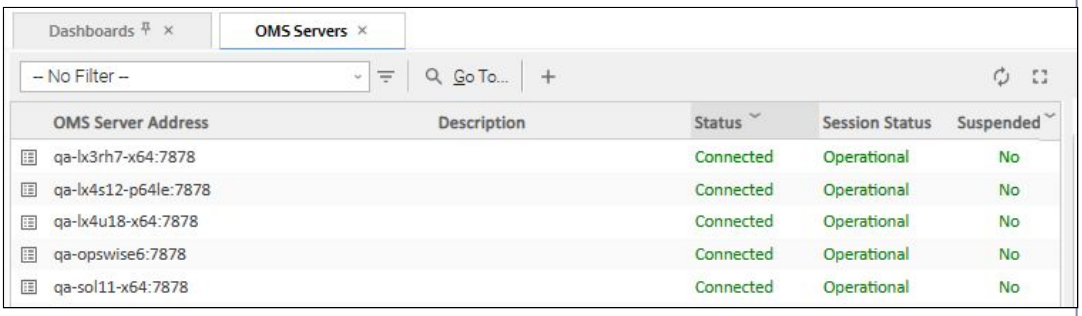
From the Home dashboard, verify that the System Details widget displays the appropriate Universal Controller release.



Step 2

From the **Agents** navigation pane, select **Agents > All Agents** or **Agents > <type of Agent>**. You will see a list similar to the following example. Make sure the **Status** of the Agent is **Active**.



Step 3	From the **System** navigation pane, select **System > OMS Servers**. You will see a list similar to the following example. Make sure the **Status** of the OMS Servers are **Connected**. 
Step 4	For more information about these components in the Universal Controller user interface, see: • Agents Overview • OMS Servers

7.7 Docker Containers

7.7.1 Introduction

Starting from version 7.8.0.0, Universal Controller is available as a custom Docker image. The image is based on the official images for Eclipse Temurin project, which provides OpenJDK binaries.

The following base image is used:

- eclipse-temurin:21-jdk-ubi9-minimal

This image is based on the official Red Hat ubi9-minimal image.

For more information on getting started with OpenShift, see the OpenShift Start-Up Guide.

7.7.2 Supported Versions

The Docker image uses JDK 21 and Tomcat 10.1.

7.7.3 Image Labels

Universal Controller images have various labels set with helpful metadata. We follow Docker best practices and use the suggested OCI labels for our images. The following labels are included:

OCI Label	Description	Example Value
org.opencontainers.image.authors	The contact details of the organization that created the image.	support@stonebranch.com
org.opencontainers.image.base.digest	The digest of the base image the Controller image was created with.	`sha256:9b629358f6b374d7f6096d36e34c8c6444d87a1e331b3456d03f5d0df70fb339`
org.opencontainers.image.base.name	The name of the base image the Controller image was created with.	docker.io/library/eclipse-temurin:21-jdk-ubi9-minimal
org.opencontainers.image.created	An ISO8601 timestamp of when the image was created.	`2025-03-04T15:51:6Z`
org.opencontainers.image.description	A description of the Controller image and what it is used for.	Universal Controller can be used for Orchestrating Automation for Hybrid IT Environments
org.opencontainers.image.ref.name	The name of the component in the image.	universal-controller
org.opencontainers.image.title	The title for the image.	Universal Controller, Tomcat 10.1, JDK 21
org.opencontainers.image.vendor	The organization distributing the image.	Stonebranch, Inc.
org.opencontainers.image.version	The version of the Controller inside the image.	1. Non-feature branch builds: 7.8.0.0+build.96 2. Feature branch build: 7.8.0.0+build.FB_OC_B-173432.90, 7.8.0.0+build.FB_WA_B-18231.205

7.7.4 Downloading a Universal Controller Docker Image

The Universal Controller Docker image can be downloaded from the Customer Portal.

7.7.5 Tomcat Configuration

Unless specified, Tomcat uses the default maximum heap size for the Java Virtual Machine (JVM), which is 1/4 of physical memory. Depending on the environment (Docker, OpenShift, Kubernetes, etc.) this value can be interpreted differently.

In order to accommodate large workloads, Universal Controller requires you to configure the initial and maximum heap size parameters using the CATALINA_OPTS environment variable. The following is the minimum recommended configuration:

```
CATALINA_OPTS="-Xms512m -Xmx2048m"
```

Customizing Universal Controller with the Entry-Point Script

The entry-point script manages all customizations before starting the Universal Controller. It overrides the entry-point script from the base image.

The entry-point script can perform the following customizations:

- Read secrets from a file.
- Convert environment variables to startup properties.
- Configure SSL for Tomcat.

7.7.5.1 Reading Secrets from a File

The entry-point script can read a secret from a file and convert it to an environment variable. For example, if `UC_DB_PASSWORD_FILE` is set, the script reads the file and sets `UC_DB_PASSWORD` to the contents of the file.

Three secrets are supported: `UC_DB_PASSWORD_FILE`, `UC_TRUSTMANAGER_TRUSTSTORE_PASSWORD_FILE` and `KEYSTORE_PASSWORD_FILE`.

7.7.5.2 Converting Environment Variables to Startup Properties

All Universal Controller startup properties (`uc.properties`) can be specified as environment variables simply capitalizing the property name and replacing `.` with `_`. For example `uc.db.rdbms` becomes `UC_DB_RDBMS`.

Note

A single underscore (_) in the property name needs to be replaced with a double underscore (__) in the environment variable name.

For example, `uc.system_identifier` becomes `UC_SYSTEM__IDENTIFIER`.

The entry-point script converts environment variables to properties and adds/updates them in `uc.properties` file.

Only environment variables with the following prefixes can be converted:

- `UC_` → General Universal Controller settings.
- `SAML_` → SAML authentication settings.
- `JDK_` → Java-related settings.

The following environment variable is set by default in order to log Universal Controller messages to the console:

`UC_LOGGING_APPENDERS=console`.

7.7.5.3 Configuring SSL For Tomcat

The entry-point script configures SSL if the following environment variables are set:

- `KEYSTORE_PASSWORD`
- `TOMCAT_CERT_PATH`
- `TOMCAT_KEY_PATH`

Specifically, the entry-point script does the following:

- Converts the SSL certificate & key into a PKCS12 keystore.
- Uses `openssl` to generate `/tmp/keystore.p12`.
- **Updates Tomcat's `server.xml` for HTTPS.** If a keystore is generated:
  - Backs up the existing `server.xml`.

- Removes existing SSL configurations.
- Adds a new SSL/TLS HTTP/1.1 Connector that references the generated keystore. Uses the `KEYSTORE_PASSWORD` environment variable value as the password.

7.7.6 Docker Container Ports

The following ports may need to be mapped when running containers from the Universal Controller image.

Port	Description
8080	Tomcat Non-SSL/TLS HTTP/1.1 Connector Port
8443	Tomcat SSL/TLS HTTP/1.1 Connector Port (JSSE Implementation)

7.7.7 License

Licenses for the products installed within the images:

- UAC: The project license is in the End User License Agreement (see the `/licenses` folder in the image).
- OpenJDK: The project license is GNU GPL v2 with Classpath Exception.
- Tomcat: The project license is Apache License, Version 2.0.

As with all Docker images, these likely also contain other software which may be under other licenses (such as Bash, etc from the base distribution, along with any direct or indirect dependencies of the primary software being contained).

As for any pre-built image usage, it is the image user's responsibility to ensure that any use of this image complies with any relevant licenses for all software contained within.

8 Starting and Stopping Universal Controller

This page provide platform-specific instructions for starting and stopping Universal Controller 7.8.x.

8.1 Starting and Stopping the Controller on UNIX

Note

These procedures are appropriate for all supported systems of UNIX.

Linux	To start or stop the Controller (all versions), issue the following commands:
	`$CATALINA_HOME/bin/startup.sh`
	`$CATALINA_HOME/bin/shutdown.sh`
	or
	`service tomcat start`
	`service tomcat stop`
	If you have configured your system with **init.d**, you also can use the following commands:
	`/etc/init.d/tomcat start`
	`/etc/init.d/tomcat stop`

AIX	The procedures for starting and stopping the Controller are dependent on how Tomcat was configured when the Controller installed.

8.2 Starting and Stopping the Controller on Windows

To start or stop the Controller (all versions) from the DOS prompt, use the following commands:

```
net stop $Tomcat_Service_Name
net start $Tomcat_Service_Name
```

Note

`$Tomcat_Service_Name` may vary based on the version of Tomcat installed on your machine.